Manually Operated

Rescue Hoist Ground Support Equipment

ZGS-11000-2 v2

Operation and Maintenance Manual

United States Patent # 7,429,031 B1

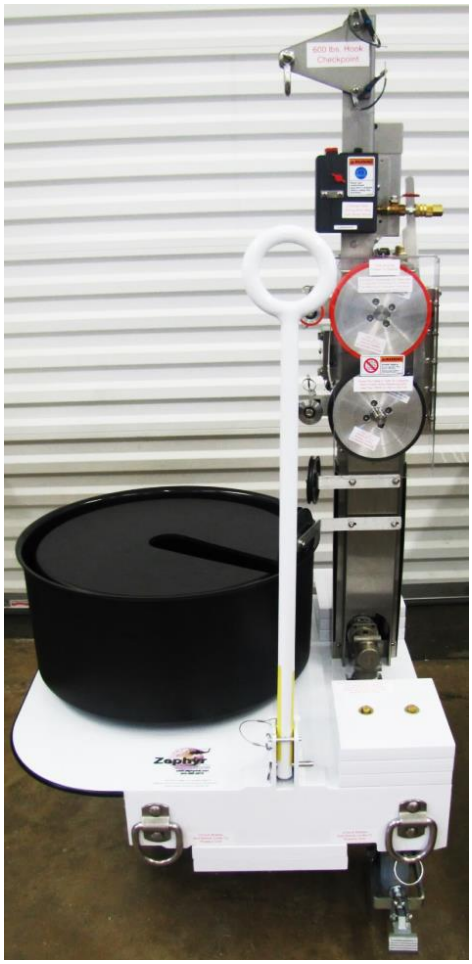


Table of Contents

Table of Figures

DEFINITIONS OF WARNINGS, CAUTIONS and NOTES contained in this manual

WARNING

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

CAUTION

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		

Safety Precautions

WARNING

Before operation of the Rescue Hoist Ground Support Equipment (RHGSE), thoroughly review the entire manual to prevent damage to the cable, hoist, helicopter, or operator.

Never operate the RHGSE with loose clothing, jewelry, ties, long hair, or anything that may become entangled.

CAUTION

Always observe the cable and be prepared to stop at any time.

Load Displays are sealed, but when water washing **do not hit the display direct with a stream of water** or some moisture may get inside, damaging the display.

Never store the RHGSE under a plastic bag, especially in humid or wet weather conditions**,** as it may trap moisture and cause the capstans to swell. If this occurs the capstans will need to be replaced before operating the RHGSE.

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 simply process and there are no costs involved.

Once logged in, go to "Product Info" and select "Manual 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 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 recommended that you register your RHGSE with us, the serial number on the Manual RHGSE is located on the control box. 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.

1.0) Introduction

The purpose of this manual is to describe the operation and maintenance of the Zephyr International LLC Manually Operated Rescue Hoist Ground Support Equipment (RHGSE).

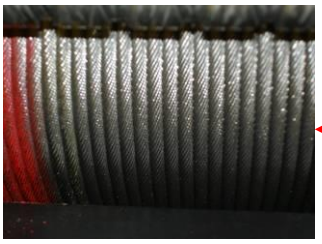
2.0) Purpose of the Equipment

The equipment is designed to facilitate inspecting and maintaining the rescue hoist and the cable.

Design Attributes:

- Human-powered transport to and from the helicopter in order to perform pre and post flight checks 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 manual 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.
- Accommodates any rescue hook and bumper configuration.
- Cleans and dries the cable during post flight inspections, after saltwater use.
- Capability to lubricate the cable, if required by the manufacturer.
- Specifically designed to tension the cable without having to fly the helicopter after a complete cable inspection.
- The system has been designed to provide approximately 605 lbs. maximum tension to the cable. It is balanced so that the center of mass is in line with the cable as it applies the tension.

Figure 1 Manual RHGSE



Maintains clean & tight cable storage on the rescue hoist drum.

Figure 2 RHGSE usage results in tight wraps

3.0) 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.**

1. Remove the screws that hold the wheel chock blocks.
2. 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.**
3. Unlock the swivel locks in order to freely move the RHGSE around.
4. Remove and unpack the parts stored in the Rotatub.

Figure 3 Shipping crate

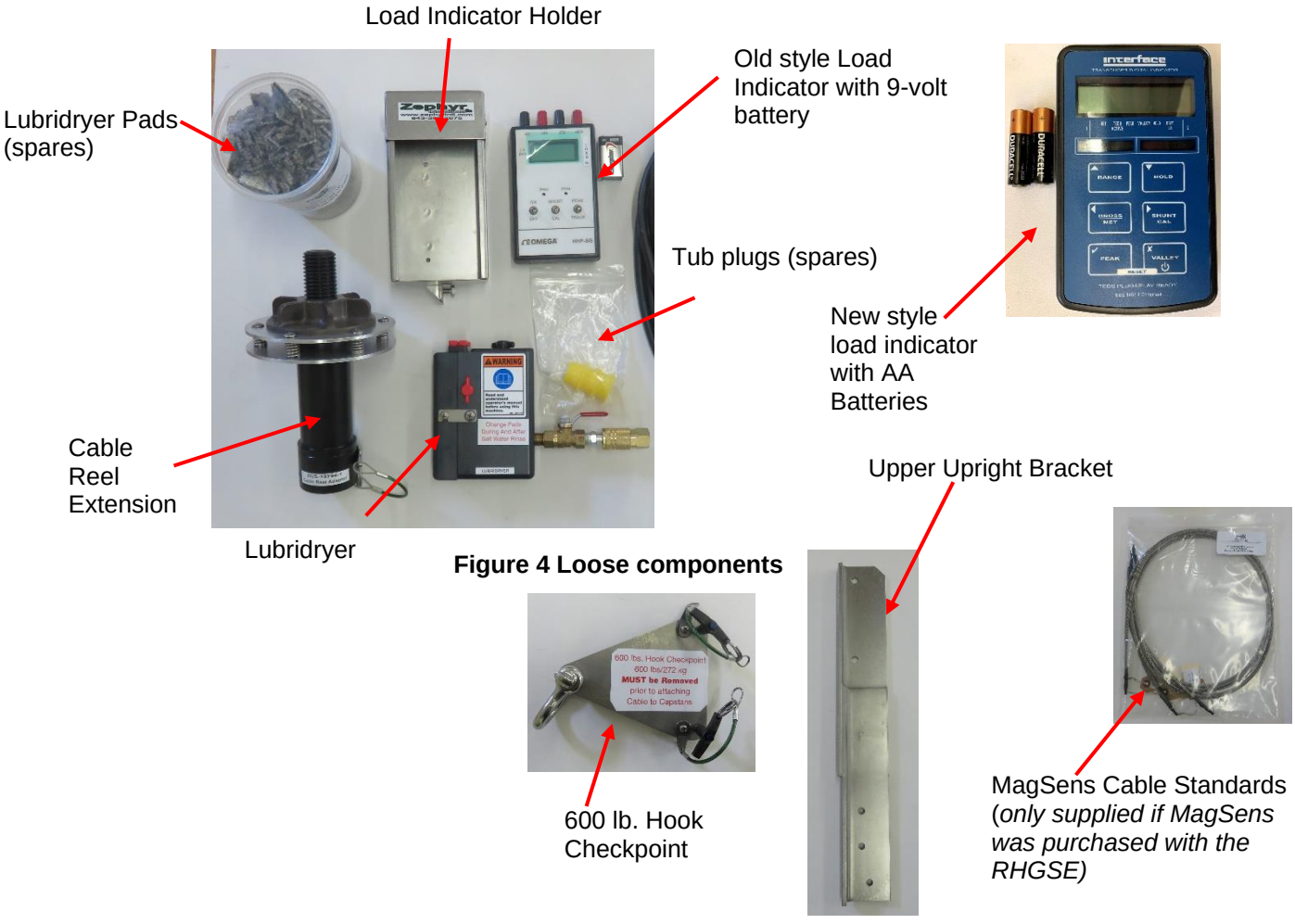


Figure 4 Loose components

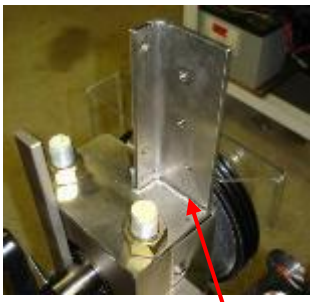
Figure 5 Misc. Components

4.0) Setup the Equipment

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

Lubridryer

Load indicator



Upright bracket

Upper Upright bracket

600 lbs. Hook Checkpoint

Figure 6 Setting Up

NOTE

Upper Upright Bracket may remain in place permanently.

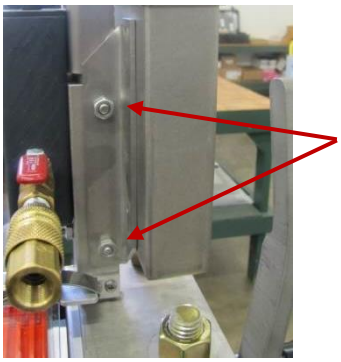
Attach the Upper Upright Bracket to the inside of the Upright Bracket with the supplied (1) ¼-20 x ¾" long screw and locknut.

ZGS-10245-1 Upper Upright Bracket

Upright Bracket

Attach to this hole location

Figure 7 Upper Upright Bracket assembly



Attach Lubridryer and Load Indicator holder using the supplied hardware.

Figure 8 Lubridryer Assembly

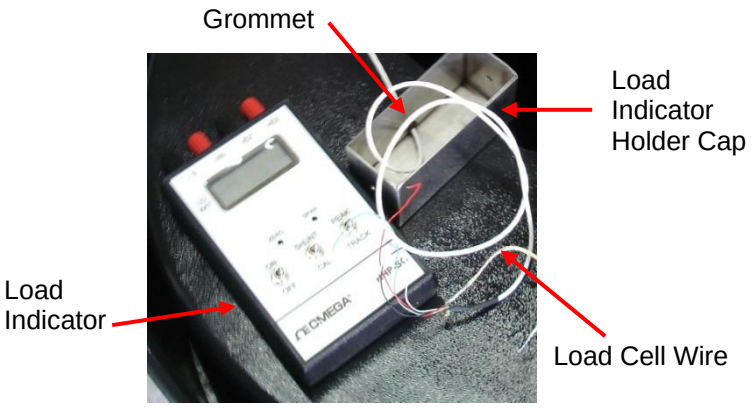


Figure 9 Attaching the Load Cell to the Display

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

Install the 9 volt battery.
Attach the wires to the load cell indicator as follows:

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

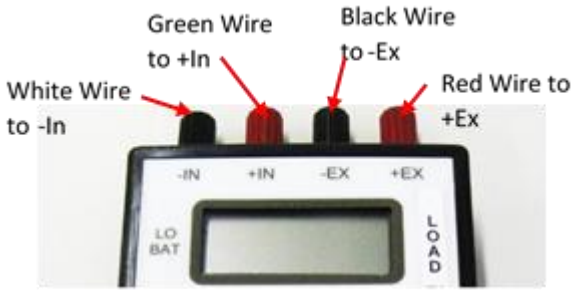


Figure 10 Load cell display terminals

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

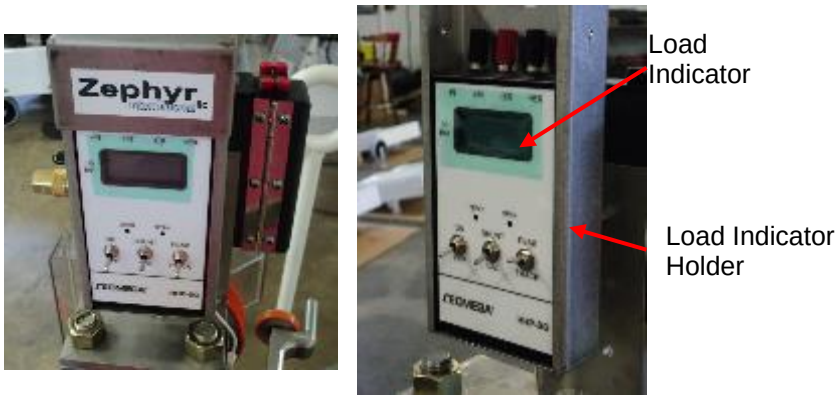
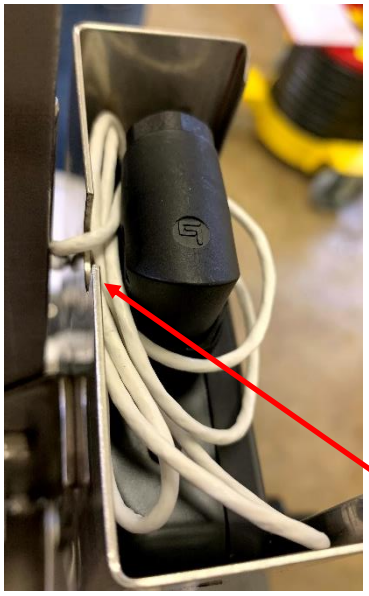


Figure 11 Old Style Load Indicator Holder

For the new style load indicator, (2 AA) batteries are included and 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. To power on, press and hold “Valley” button for 3 seconds.



Load cell wire slot

Figure 12 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 13 600 lb. Hook Check Adapter

5.0) Theory of Operation

The cable is paid out from the helicopter hoist and is wrapped three times around the capstans 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.

The RHGSE is manually operated by rotating the crank handle when the helicopter hoist is extending, and a band clutch applies a back torque on the capstans to develop a heavy load in the cable when the helicopter hoist is retracting. The hand crank handle is self-disengaging so that when the RHGSE is used in the retracting direction the crank handle does not rotate. The rotating tub is mounted to a clutch that is adjustable to compensate for the taper in the spooler and tub. 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 has been added to allow 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 easily drained via a removable plug. The RHGSE can be used with different size cable by changing the capstans.

The RHGSE weighs 605 lbs dry and is transported to the helicopter via a tow handle that is held in the upright position by a set of spring clips attached to the base. The tow handle can be attached to either side of the RHGSE as desired. A transparent cover is provided to enclose the capstans while in use. An adapter is provided to facilitate installing a new cable into the rescue hoist.

The RHGSE consists of:

Figure 14 RHGSE Description

5.1 Manual Operation Extending

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

5.2 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 measures the force applied and the value is displayed on the indicator while retracting.

5.3 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 cleans 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 605 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 applied often.

5.4 Cable Tensioning System

When extending the capstans are driven 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.

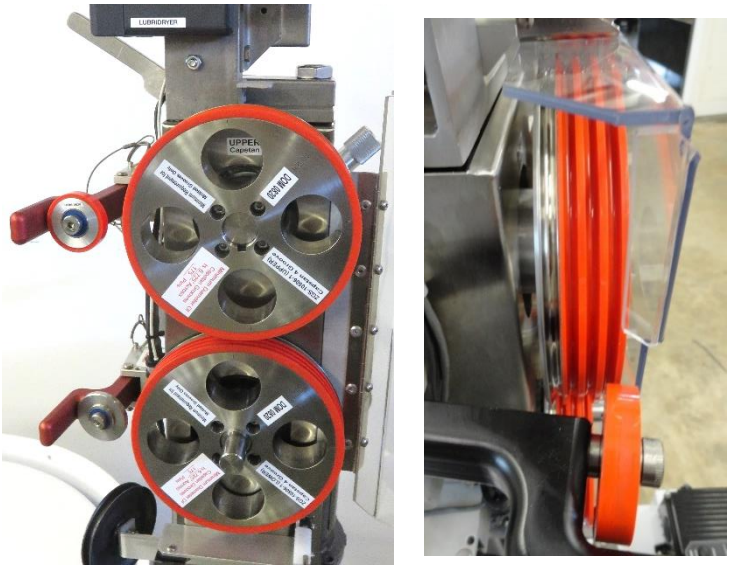


Figure 15 4 Groove Capstans

5.4.1 Different Size Capstans Explained

The RHGSE is supplied with the appropriate capstans for your rescue hoist maintenance needs as determined prior to purchasing. The RHGSE 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 have 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 in 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

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.

5.5 Provision for Installing New Cables

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

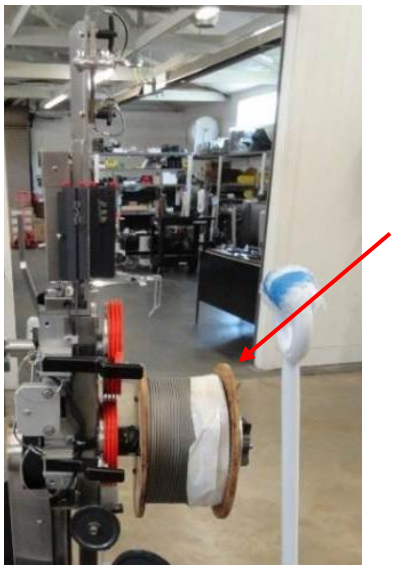


Figure 17 Goodrich Cable Reel

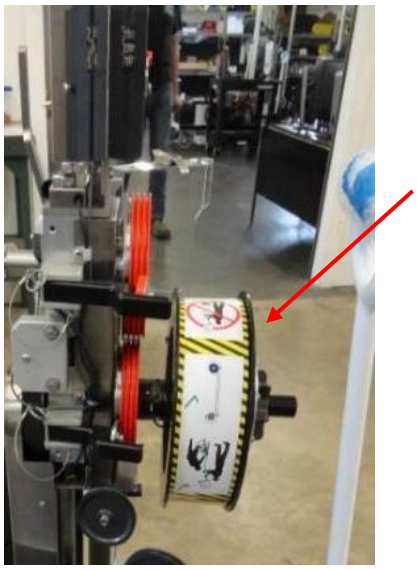


Figure 16 Breeze Cable Reel

The cable reel adapter can adapt both OEMs cable reels.

5.6 Safety Features

WARNING

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

Figure 18 No Step Warning Labels

Figure 19 High Visibility Spooler

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

6.0) Operation of the Equipment

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

The RHGSE operation requires:

- Attaching the cable to the system through the Lubridryer over capstans and into the Rotatub.
- Adjusting the spooler position.
- Adjusting the Rotatub position fully clockwise to start.
- Operating the rescue hoist controls while cranking the handle to the take up cable in the down mode.
- Setting 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.
- Filling with water and draining the rotating tub.
- Using the Lubridryer to dry the cable.

6.1) Installing the cable in the Lubridryer

Open the capstan cover and pay out approximately 16 feet of cable from the helicopter hoist. Open the Lubridryer by flipping the latch up and opening the Lubridryer. Position the cable in the Lubridryer and close the Lubridryer by lowering the latch over the screw. After the cable is in position turn the Red Valve Screw counter clockwise 3 turns to allow oil to flow to the Lubridryer pads.

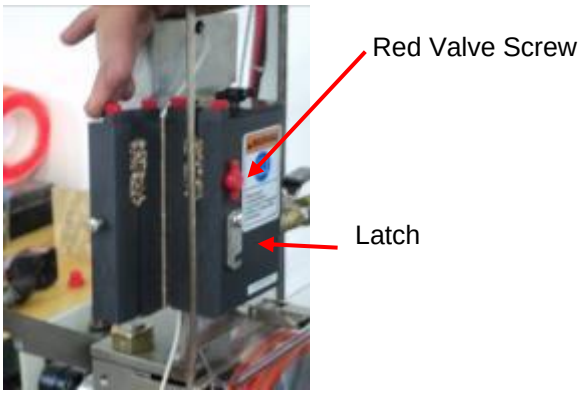


Figure 20 Lubridryer

6.2) Wrapping cable around capstans

NOTE

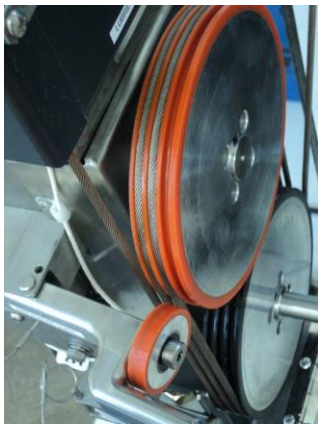
Three groove capstans are shown but the process is the same for the four groove capstans.

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.

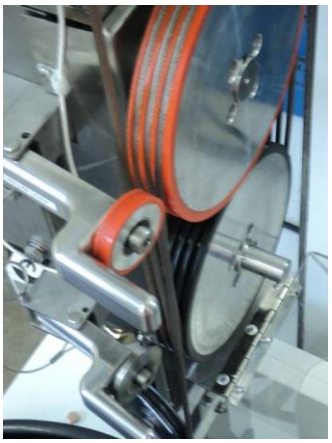
Wrap the cable around the capstans three times starting with the lower capstan innermost groove as shown, while insuring the cable is pulled tight into the capstan grooves.

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 Lubridyer cover

Figure 21 Cable wrapping sequence

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.

CAUTION

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

CAUTION

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

Guide the cable through the guide rollers and through the slot in the spooler then turn the hook assembly upside down and position the cable in the slot of the spooler as shown below.

CAUTION

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.

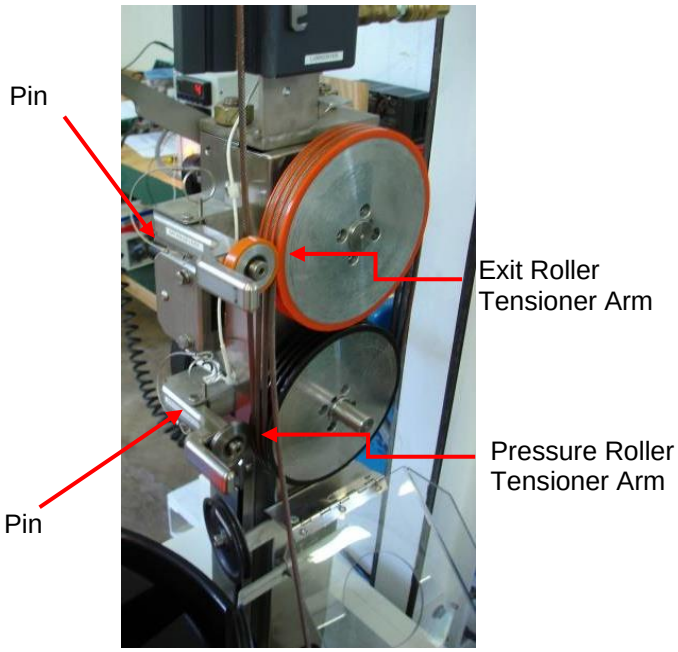


Figure 22 Tensioner Arms

CAUTION

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.

NOTE

It is important that the cable be at the bottom of the cut out in the spooler.

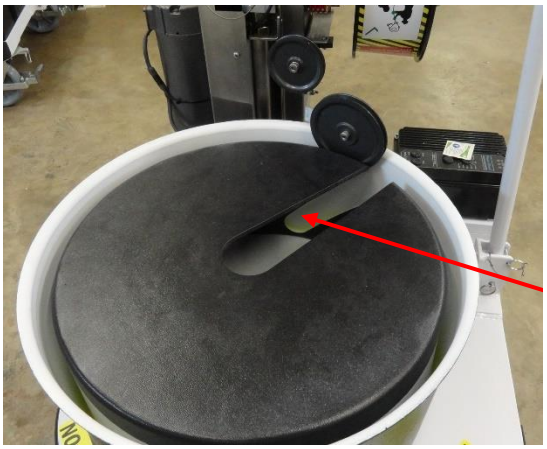


Figure 23 Spooler Cutout

Set the hook on top of the spooler.

Figure 24 Proper cable positioning in Rotatub and Spooler

6.4) Setting the Rotatub and Spooler orientation

With the cable wrapped on the capstans and the wire in the tub and through the guide pulleys, 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 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.

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 cutout in the spooler. Before operating the hoist close and latch the capstan cover.

6.5) Actuating the Brake Handle

When reeling out the Brake Handle must be in the released position and when reeling in the crank handle should be disengaged and the brake handle must be in the applied position to apply a heavy load to the cable.

Shown is the Brake Handle disengaged

Shown is the Brake Handle engaged and crank handle disengaged

Figure 25 Brake Handle Actuation

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

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

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 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 while extending.

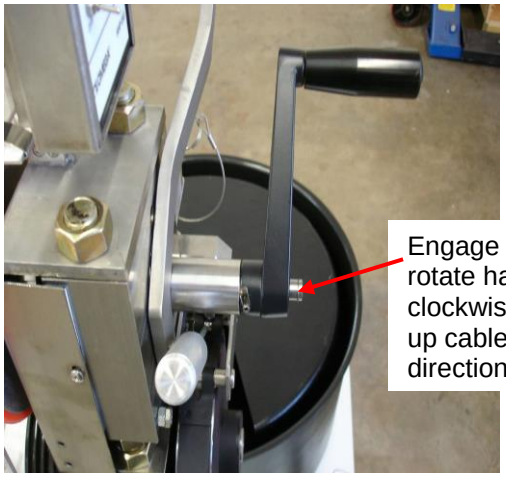


Figure 26 Hand crank

Extend the cable completely; always paying careful attention to the helicopter hoist and to the condition of the cable. If the cable snags in the Lubridryer pads for any reason such as a kink or a broken wire or broken strand; the cable will loosen between the top of the Lubridryer and an increase in crank resistance will be felt. In this event, the cable needs to be replaced; run the cable out into the drum and follow the manufacturer's instructions for replacing the hoist cable. Absent any deficiencies noted during inspection, run the hoist in the down direction until the helicopter hoist is stopped by the full out limit switches.

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

When reeling in, the crank handle must be disengaged.

6.7.1. Starting the application of the Retracting load

Activate load display by flipping switch to “ON” or by pressing and holding “Valley” button for 3 seconds. Rotate the 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), w*ith 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 drum, 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.

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.

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.

6.7.3 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 7.15 for detailed instructions.

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 605 lbs (275 kg) when it is dry, it will start to lift off the ground at approximately 605 lbs (275 kg). 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 GSE just starts to lift off the ground.

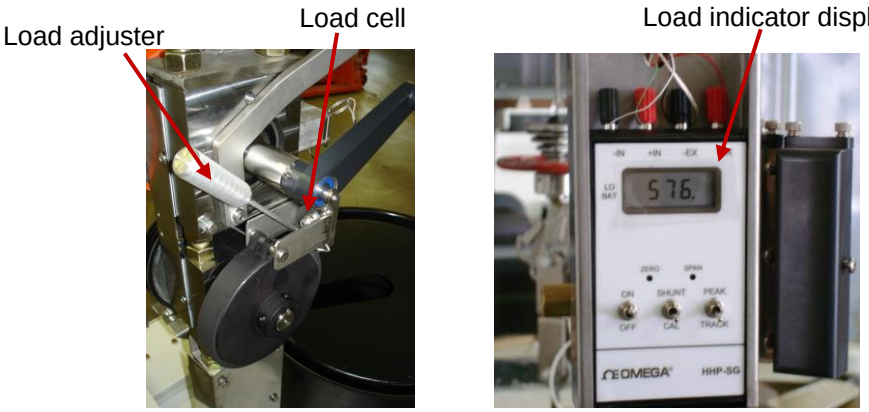


Figure 27

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.

IMPORTANT NOTE

When conditioning a new cable, go slow to allow the cable to acclimate itself to the smaller diameter rescue hoist drum.

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 then increased to the maximum load in order to condition the cable properly. The brake disc should be allowed to cool after 2 or 3 consecutive cycles.

6.8) 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.

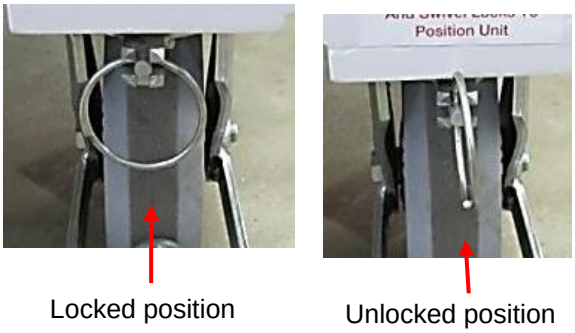


Figure 28 Swivel Locks

The system 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.

6.9) 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 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.

Shown used pads

Shown one set of screws, bushing and pad

New pads installed

Figure 29 Lubridryer Components

6.10) 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.

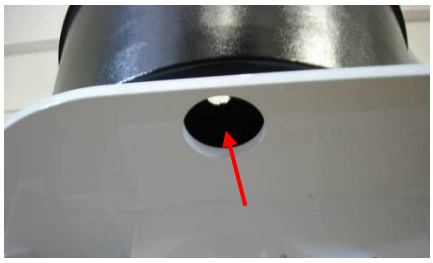
When oil is added to the reservoir and the valve is open the oil seeps through a small hole to lubricate the rear pad. The front pad should be soaked in oil before installing it, open the oil reservoir and dip the pads into the oil filled reservoir. Therefore, it is recommended to always keep a spare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

Figure 30 Lubrication Valve

Figure 31 Compressed Air attachment

6.11) Performing a fresh water wash

Fill the rotating tub ¾ 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. *(See section 6.13)* 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 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.



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

If shop air is unavailable remove 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.

Figure 32 Water Drains

6.12) Using the Lubridryer

After extending the cable into the Rotatub, and filling the Rotatub with water, then applying the brake handle, and just prior to running the cable up into the helicopter hoist, attach an airline to the airline connection located at the back of the Lubridryer. 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 leaving the Lubridryer.

6.13) Removing the cable from the RHGSE

CAUTION

Observe Cable always to prevent damage.

Remove the hitch pins from their storage hole and rotate the tensioner assemblies away from the capstans and reinstall the hitch pins to hold the tensioner wheel off the cable. Unwrap the cable from the capstans and carefully remove the twist by lifting the hook out of the spooler slot and placing it 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.

6.14) Changing the capstans to accommodate a different cable size.

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

NOTE

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

Remove the capstans and mark them according to their location, i.e. top or bottom. 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.

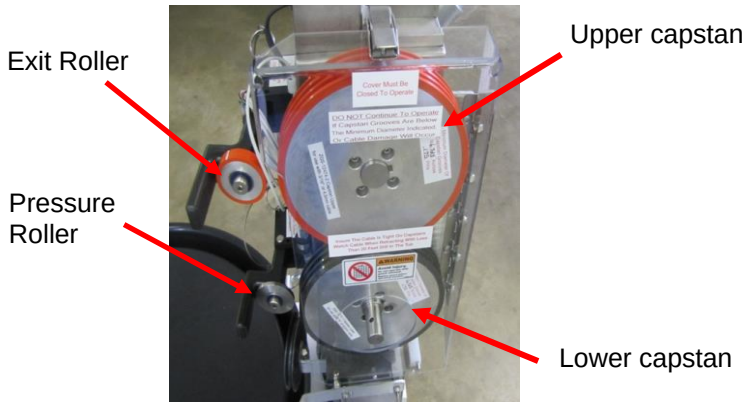


Figure 33 Changing Capstans

6.15) Removing the cable from the hoist

The RHGSE can coil the cable for removal and disposal. Run the cable completely out into the Rotatub. Bypass the full out limit switch on the hoist as directed in the 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.

Remove the hook assembly from the cable. 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.

6.16) 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.

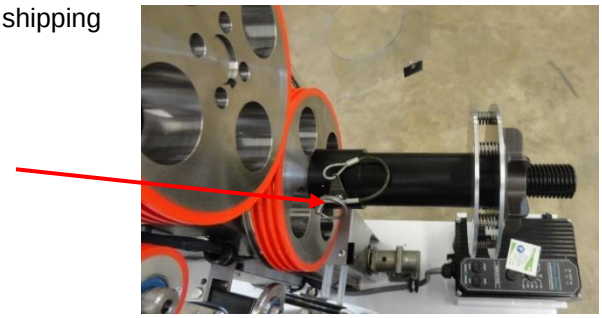
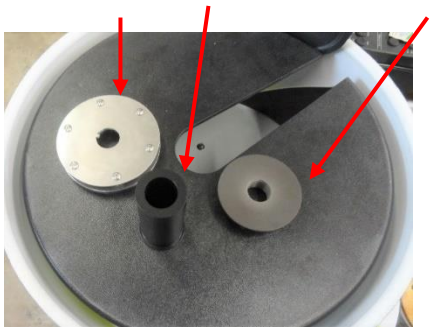


Figure 34 Cable Reel Adapter Pin



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

Figure 35 Cable Reel Adapter Components

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

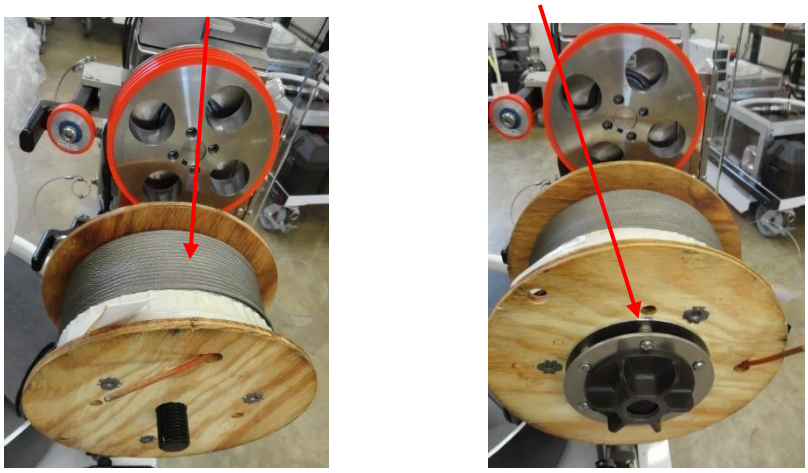


Figure 36 Mounting Goodrich Style

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.

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,

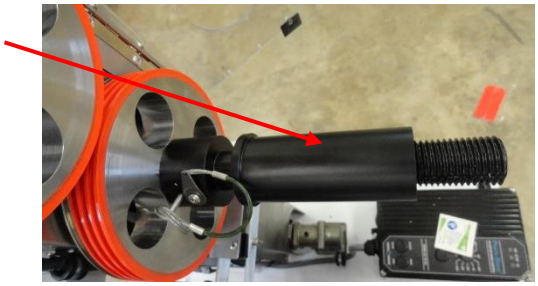
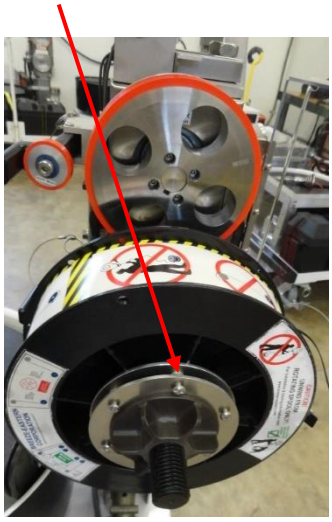


Figure 37 Breeze Style Adapter Configuration

Slide the B style cable reel onto the adapter.

Attach the clutch and nut.



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.

Figure 38 Clutch Assembly

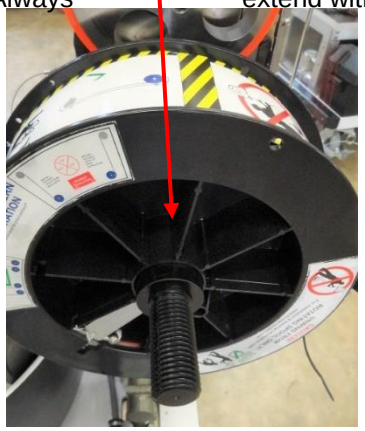
6.17) Pre-Conditioning a new Cable

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.



IMPORTANT NOTE

The process of pre- conditioning a new cable does induce some twist into the cable. In order to relieve the initial twist the hoist should be flown and the cable extended in flight and then retracted with a 200 to 300 lb. load.

Figure 39 B Style Adapter Assembly

⚠ 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.

⚠ 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 extended the cable in flight; otherwise, the cable will acquire additional twisting and damage to the equipment and cable can occur.

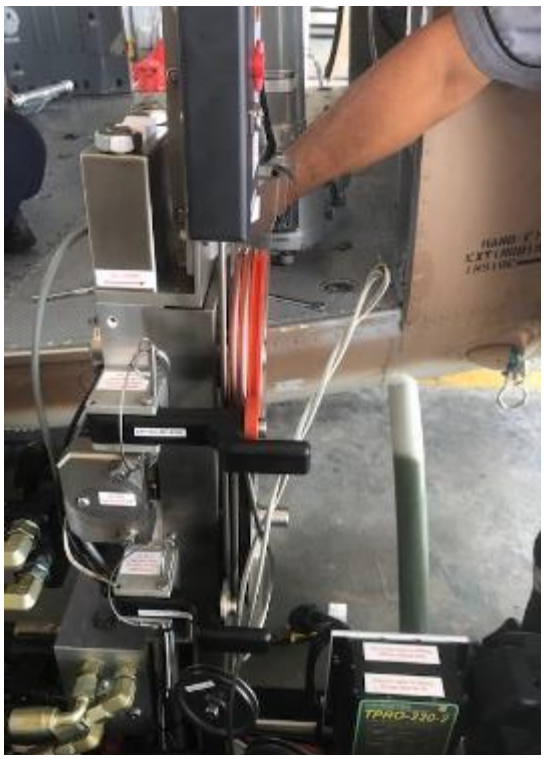


Figure 40 Improper Conditioning Result

6.18) Hook Attachment Check

A hook check is available to attach the rescue hook to in order to perform the hook load test. When the wheels of the RHGSE come off the ground there will be a 600 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 GSE Lifting Assembly.

Retract cable, lifting Manual RHGSE off the ground.

Extend cable, lowering the Manual RHGSE to the ground.

Figure 41 600 lb. Load Check Assembly

7.0) Maintenance of the RHGSE

Periodicity	Conditions	Paragraph #
Daily		
Perform a Quick Check on Rotatub Slip Clutch		7.3
Visually Inspect the Capstans		7.5
Change the Lubridryer Pads		7.6
Monthly	Scheduled	
Lubricate the Capstan Drive chain		7.7
Visually Inspect the Capstans		7.5
Measure the Rotatub Slip		7.3
Check and adjust the Brake Handle pivot bolt tightness		7.12
Check the brake band		7.11
On-Condition	As needed	
Adjust the Rotatub Slip value		7.4
Measure the Capstans		7.8
Change the Capstans		7.9
Replace the Exit Roller		7.10
Replace the Brake Band		7.13
Annually	Scheduled	
Check the load display Scaling		7.21
Check the Brake Band		7.11
Every 5 years	Scheduled	
Replace the capstans		7.9
Replace the Exit Roller		7.10

7.1) Storage of the RHGSE

After using the RHGSE it should be stored indoors in a dry location. Use compressed air to blow off any water remaining on the RHGSE or towel dry.

NOTE

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

An optional breathable cover is available , request ZGS-11380-2.

7.2) General preventive maintenance

- Keep the RHGSE relatively dry.
- 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 set out to dry or blow off excess water with compressed air.
- 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

7.3) 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.

Perform a Dynamic Slip Load test by placing the Linear Push/Pull Spring Scale in the hole on the Rotatub. Actuate the crank handle in the Extend direction and measure the force required to stall the Rotatub. The force measured should be **2-3lb (.90-1.36kg)**.

Figure 42 Quick Slip Load Check of Rotatub

7.4) Rotatub clutch adjustment

Remove Spooler from the Rotatub

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

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.

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.

NOTE

There are two possible methods to adjust the Rotatub clutch torque. The most accurate method is with a Torque measuring screwdriver, and the other method is with a spring scale.

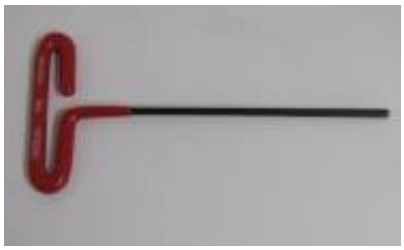


Figure 43 Adjusting clutch adjustment screws

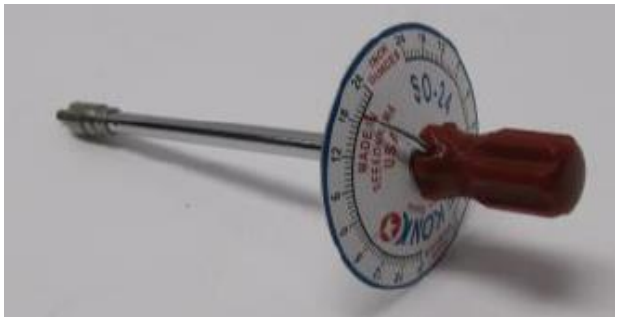
CAUTION

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 screwdriver is available for use, proceed with method #1. Alternatively, if a Push/Pull Linear scale is available, use method #2.

#1 - Torque Screwdriver 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.



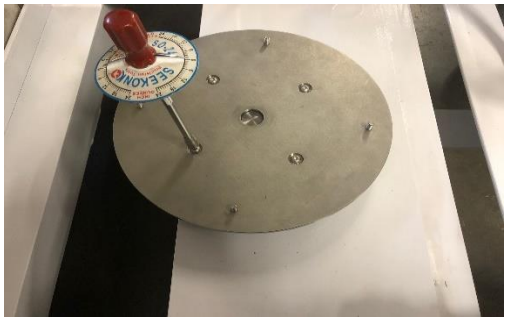


Figure 44 Torque Screwdriver Method

#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.

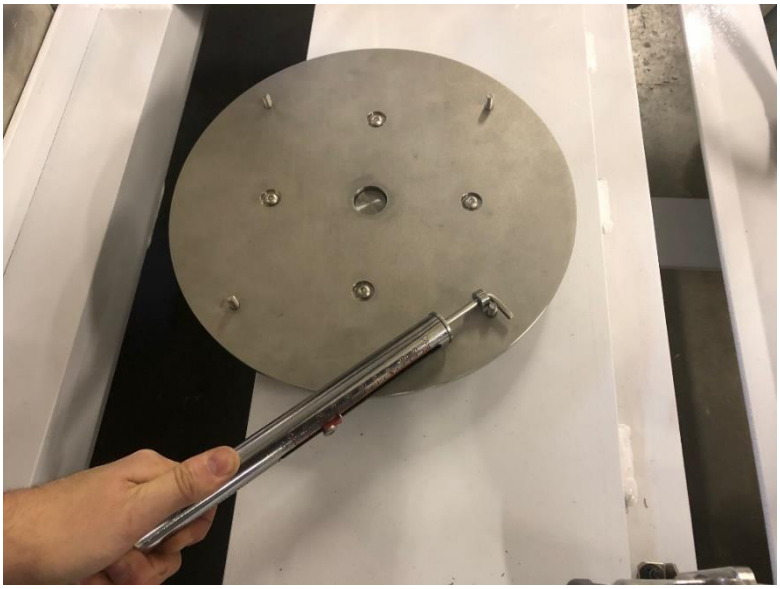


Figure 45 Measuring the Rotatub slip value

NOTE

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

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

Perform a Dynamic Slip Load test by placing the Linear Push/Pull Spring Scale in the hole on the Rotatub. Actuate the crank handle and rotate 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.

Reinstall all washers and lock nuts in the Rotatub.

7.5) Visually Check the Capstans

Before every use observe the first inboard urethane groove of the lower capstan. 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 , or cause twisting of the cable.

7.6) Changing the Lubridryer pads

NOTE

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

Figure 46 New Pads Installed

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.

NOTE

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

Figure 47 Oil shut off screw

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.

7.7) 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 48 Oil the Chain

7.8 Capstans: Measuring Process

CAUTION

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.

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

Figure 49 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

7.9) Changing the Capstans

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.

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

Figure 50 Changing Capstans

7.10) 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.

7.11 Check the brake band.

The brake operation should be smooth. Check the pivot bolt is tight per section 7.12.

7.11.1 Inspect the brake band

Inspect 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.

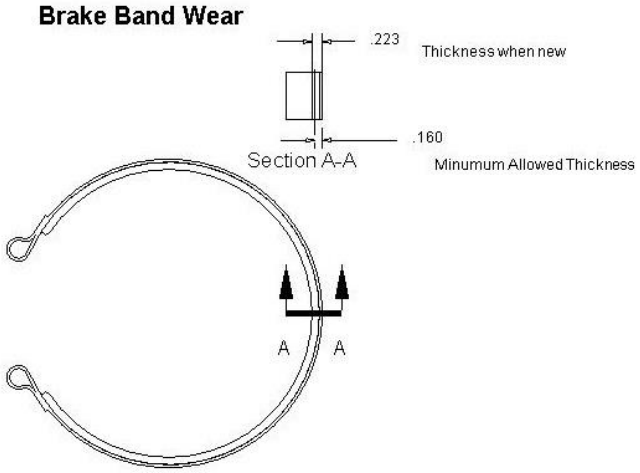


Figure 51 Brake Band Wear Limit

7.12) 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.

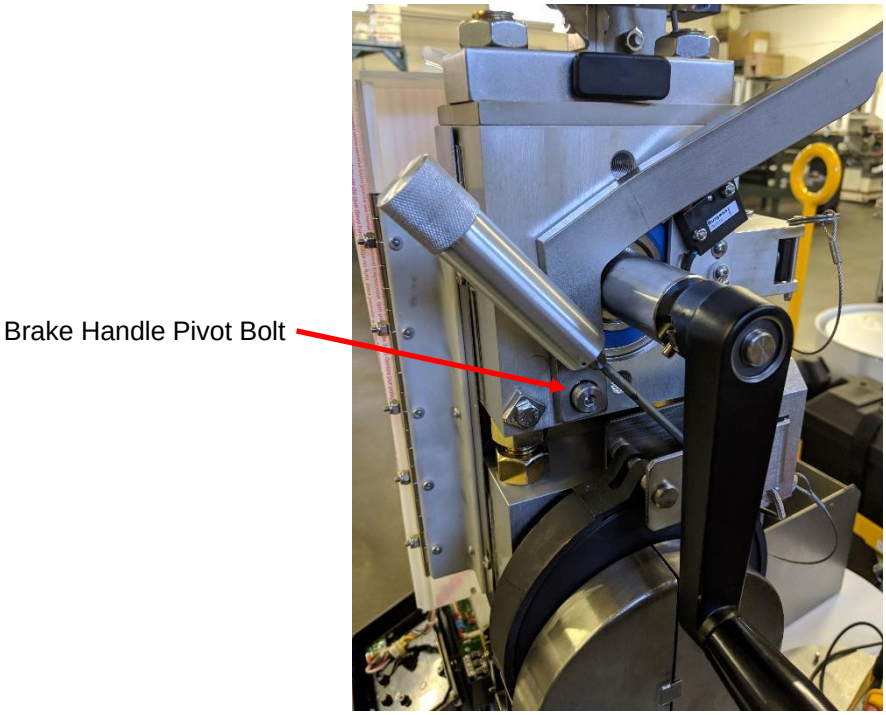


Figure 52 Brake Handle Pivot Bolt

7.13) Remove and replace the brake band

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

Unscrew the load adjuster completely from the Brake Pin, and remove the Brake Band assembly. Then carefully work the clutch band and load adjuster pin off of the Brake Drum

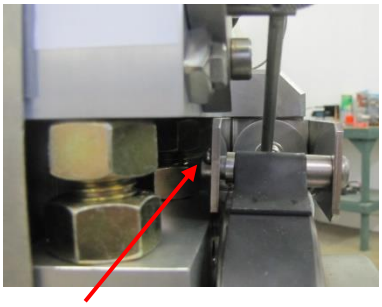


Figure 53 Remove Cotter Pin

To install, insert the Brake Pin into the brake band and slip the brake band onto the Brake Drum.
Install the Load Cell Clevis Pin and the Thick and Thin Spacers into the Brake Band as shown below.

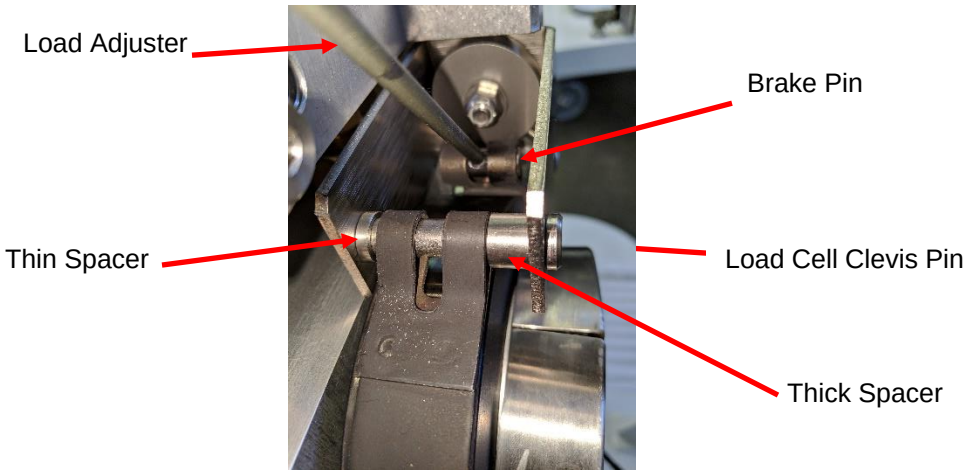


Figure 54 Remove Load Adjuster and Brake Pin

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.

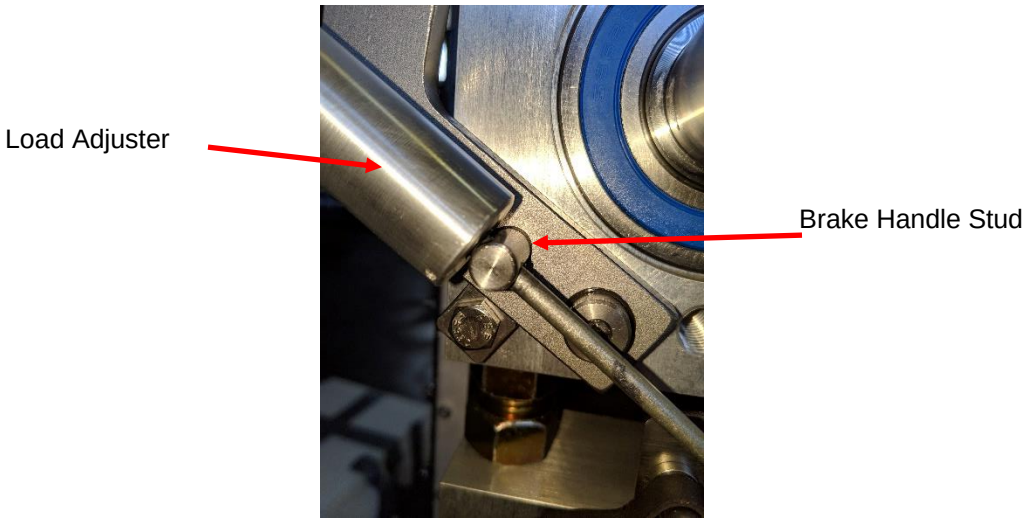


Figure 55 Brake Handle Stud and Load Adjuster

7.14 Load Brake and load cell removal and replacement

It is only required to remove the clutch assembly when adjusting the head to tighten the capstan drive chain. Any adjustment between the upper and lower heads requires removing the load cell assembly. Remove the (2) hex head bolts and unscrew the load adjuster completely. Then remove the cotter pin from the load cell clevis pin and remove the entire load cell assembly.

If it is required to remove the clutch band then, unscrew the load adjuster completely. Remove the cotter pin from the load cell clevis pin. Then carefully work the clutch band and load adjuster pin out from under the load cell mounting plate.

If the clevis and through hole load cell are disassembled the load display will need to be readjusted. It is not required to remove the load cell or the attachment bolt. Use light grease on the pivot bolt and the load adjuster shaft.

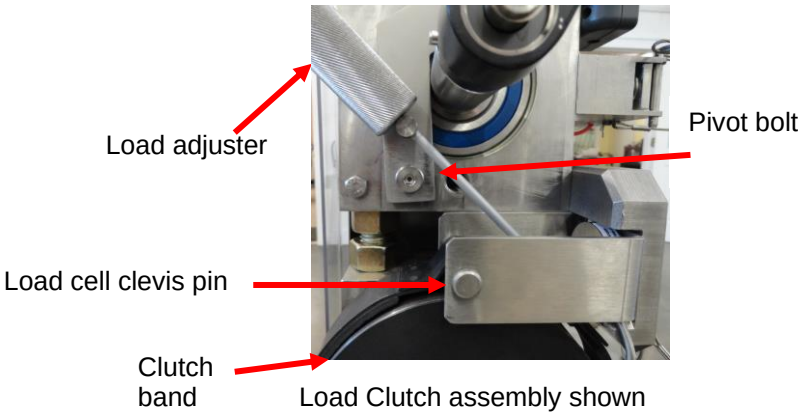


Figure 57

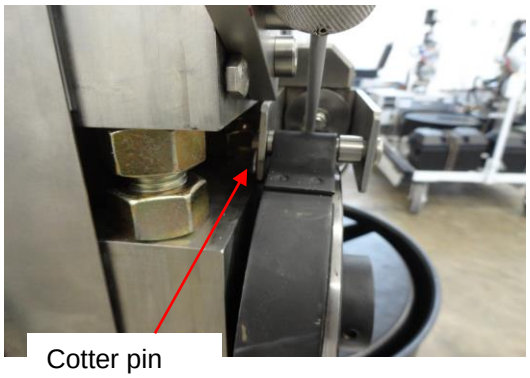


Figure 56

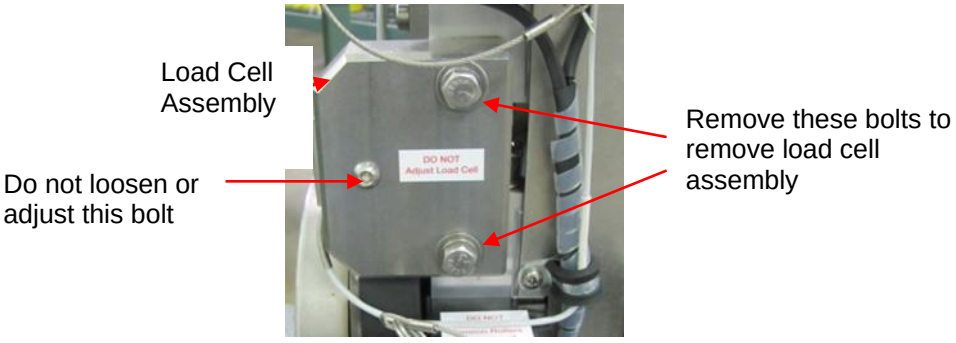


Figure 58

7.15) Chain and belt adjustments

Before making any adjustments remove the cover, for the vertical belt and chain, by removing the four screws and remove the load clutch assembly. *(See section 7.14)* Remove the load cell and clevis assembly by removing the two bolts holding the load brake reaction plate to the heads. The capstan heads are coupled by a capstan chain. The heads are adjustable on two threaded rods. To make any adjustments to the chain or vertical drive belt, it requires the loosening and adjusting all of the ten (10) nuts from the top of the upright assembly down. When making adjustments, always loosen the large nuts on the threaded rod from the top down and then tighten from the bottom up while checking the belt or chain for proper tension. Ensure the upright components are square to each other and the base when completely tight.

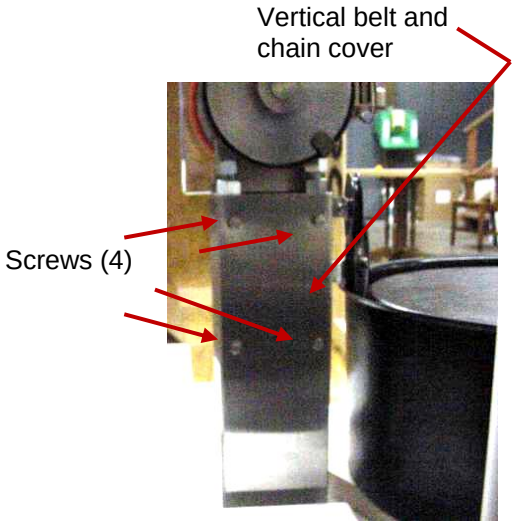


Figure 59

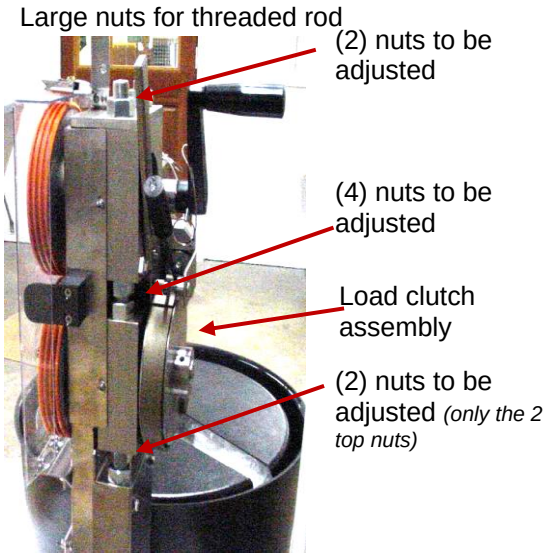


Figure 60

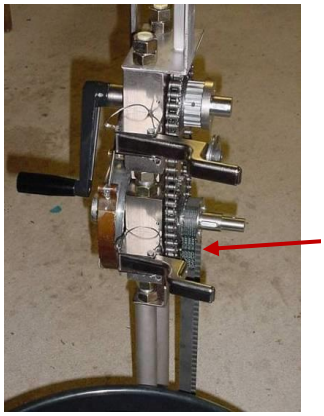


Figure 61

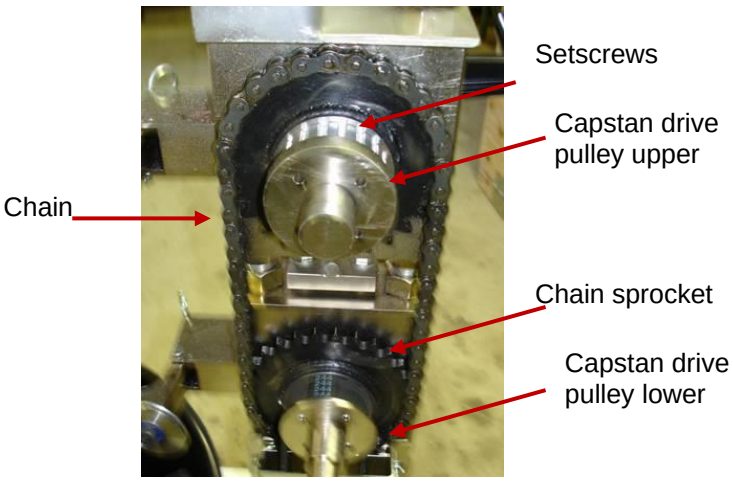


Figure 62

7.16) Capstan drive chain adjustment (for reference)

The upper capstan chain should checked every year depending on usage. Check for excessive chain looseness by removing the capstans, removing the chain cover to expose the chain. Check the chain by pressing on the chain. The chain should be tight with a small deflection of 1/32 of an inch with moderate hand force. While the chain cover is off check the torque on the setscrews of the chain sprockets and capstan drive pulleys.

7.17) Vertical drive belt adjustment (for reference)

Remove the lower vertical belt cover. Adjust the lower capstan head upwards to obtain approximately 1/8 inch deflection with a light hand force.

7.18) Vertical drive belt replacement (for reference)

Lower the lower capstan head enough that the vertical drive belt can be removed and replaced.

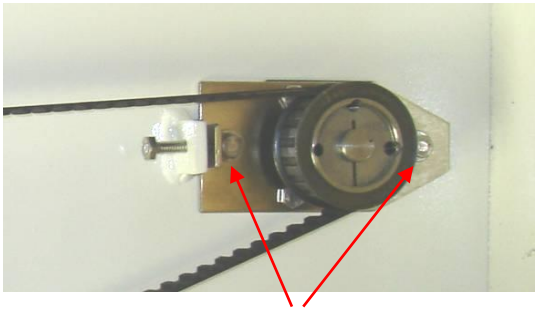
7.19) Drum drive belt adjustment (for reference)

Loosen the two screws, located underneath the base, which hold the Anglegear assembly to the base. Turn the drum belt adjusting screw so as to tighten the drum drive belt, such that a small deflection of approximately 1/16 an inch is obtained with moderate hand force.

Figure 63

7.20) Drum drive belt replacement (for reference)

Loosen the two screws that hold the Anglegear assembly to the base. Turn the drum belt adjusting screw so as to loosen up the drum drive belt to remove and replace.



Loosen these screws to adjust or replace the drum drive belt

Figure 65

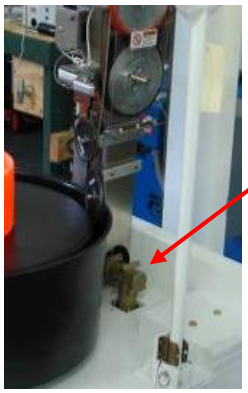


Figure 64

7.21 Checking and Verifying the load display

Old Style Display (reference)

The load display is for reference only. It is adjusted when new and does not require precise scaling. 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 display 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 display.

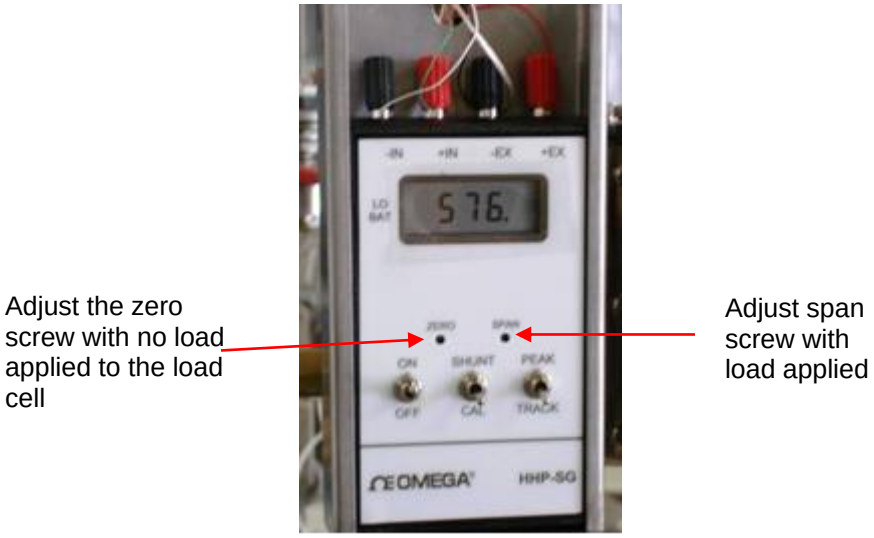


Figure 66 Old Style Display

9320 Load Cell Hand Held Digital Indicator is the new style

NOTE

The load display is for reference only.

The load display is set and scaled at the factory and is ready to go for normal use upon unpacking and installing on the RHGSE.

(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.

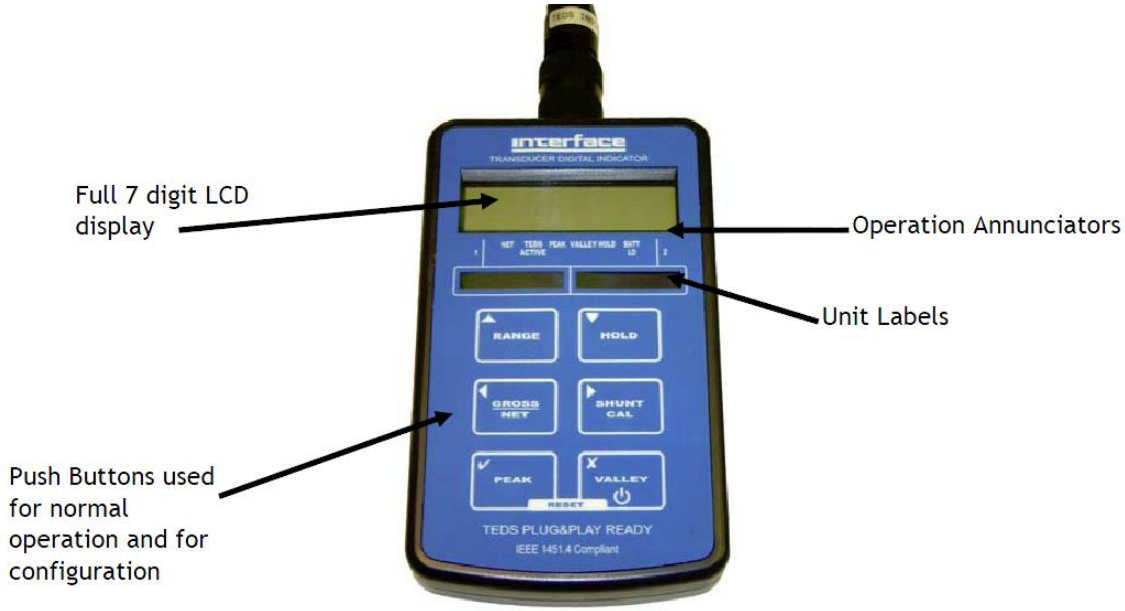


Figure 67 (new Style)

Introduction

The 9320 Portable Strain Display Load Cell/Force transducer readout is a microprocessor based portable instrument designed to interface with any full bridge sensor with an output sensitivity of up to 50mV/V. Bridge resistances from 85Ω upwards can be used with the 9320.

Configuration and scaling of the 9320 is achieved using the front panel push buttons to navigate through a very simple menu structure.

User functions available on the 9320 include:

Range Selection
Display Hold/Freeze
Gross/Net indication selection
Peak Hold selection
Valley Hold selection
Shunt Cal check

The 9320 is powered by two internal non-rechargeable AA alkaline batteries.

There are six push buttons on the front panel of the 9320, which are available for use in normal operation. Each of these is described below:

Front Panel Button	Function of Button in Normal Operation Mode
VALLEY	To switch the 9320 ON or OFF press and hold the button
RANGE	The RANGE button allows the user to toggle between two independent scales. The range that has been selected is highlighted by an annunciator.
HOLD	The HOLD button allows you to hold/freeze the current display value when the button is pressed. Pressing the HOLD button again releases the display. The HOLD annunciator is illuminated when in the HOLD mode, and the display will flash, to alarm further that the user is not viewing instantaneous display values.
GROSS NET	The GROSS/NET button, when pressed, allows the user to toggle between displaying the Gross or Net display values. This can be useful in many applications where it is necessary to display the change in display value from a certain part of the measurement range. When in NET mode the NET annunciator is lit. When in GROSS mode, the NET annunciator is not lit.
SHUNT CAL	The SHUNT CAL button allows the user to press this at any point in time. The standard unit shunts a 100kΩ resistor across the negative excitation and negative signal connections. If this is performed at the end of the calibration procedure, then a figure can be noted, so the user can check calibration accuracy or connection integrity. The button has to be held down to operate. When held down the SHUNT CAL annunciator is lit and the display will flash, to alarm further that the user is not viewing instantaneous display values.
PEAK	When the PEAK button is pressed the display will show the last Peak reading. To reset the Peak readings press the PEAK and VALLEY buttons simultaneously. When in PEAK mode the PEAK annunciator will be lit and the display will flash, to alarm further that the user is not viewing instantaneous display values. To turn off Peak mode press the PEAK button.
VALLEY	When the VALLEY button is pressed the display will show the last Valley reading. To reset the Valley readings press the VALLEY and PEAK buttons simultaneously. When in VALLEY mode the VALLEY annunciator will be lit and the display will flash, to alarm further that the user is not viewing instantaneous display values. To turn off the Valley mode press the VALLEY button.

Figure 68

TEDS must be disabled for live scaling to be used.
To disable TEDS:
Hold **VALLEY** for 3 seconds to turn on display
Press the **RANGE** and **HOLD Buttons** for 5 seconds.
Important: Ensure that **Range 1** is selected prior to scaling process. (The selected range is indicated by an arrow). Verify which unit of measure is required prior to scaling process.
SEnS 5.0 is displayed press **VALLEY Button**
Set rES is displayed, press **VALLEY Button**
If CALibrAt is displayed, press **VALLEY Button**
tedS is displayed, press **PEAK Button**
EnAbLEd? Is displayed, press **VALLEY Button**

To scale the meter:

Figure 69

Sens 5.0 is displayed

1.) Set up and attach the rescue hoist cable to the RHGSE

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 crank handle and rotate clockwise as the cable pays out keeping time with the speed of the cable.

3.) Press 

once to get to **Set rES** calibration menu

4.) Press 

PEAK Button

This parameter sets the decimal point position for the display and the resolution. The decimal point position is moved one place to the right each time you press the up and down arrow buttons together. By using the left and right arrows individually this selects the digit and the up and down arrows allows increment or decrement of the digits. Set the resolution to 000000.0
The resolution can be set to 000000.0 by pressing the **Gross Button** and **Hold Button** at the same time.
Press **PEAK Button**

5.) The best method of scaling is the LIVE scaling method, as this reads in the sensor signal at two scaling points and scales the 9320 automatically.

6.) LIVE SCALING PROCEDURE

When **CALibrAt** is displayed press **PEAK Button**
LIVE? Will now be displayed, press **PEAK Button**
USE SC? Will now be displayed, press **VALLEY Button**

7.) You will then be prompted to **APPLY LO.** At this point ensure that the low scaling stimulus (no cable load) is applied to the sensor and allow to settle of approx. 3 seconds, then press **PEAK Button**

8.) You will then be prompted to **dISP LO**. Press **PEAK Button** to enter the display value (000) required with the low stimulus applied to the sensor. The value can be entered by using the left arrow and right arrow buttons to select a digit and the up arrow and down arrow to change the digit. When the value has been set press **PEAK Button**.

9.) For Electric RHGSE turn off the extend power switch; begin to retract slowly while applying the load brake handle and increasing the load with the load adjuster until the RHGSE just lifts off the ground; maintain hover of RHGSE with steady retract speed for 3 seconds.

10.) This will satisfy **APPLY HI** and then pressing **PEAK Button.**

11.) You will then be prompted with **DISP HI.** Press **PEAK Button** to enter the display value required **(load marked on the RHGSE frame label in lbs. or Kg.)** while the high stimulus is still applied to the sensor. The value can be entered using the left and right arrow button to select a digit and the up and down arrow buttons to change the digits value. When the value has been set, press the **PEAK Button.**

12.) You should now see ***donE*** displayed. This means the scaling was successful, press the **PEAK Button**

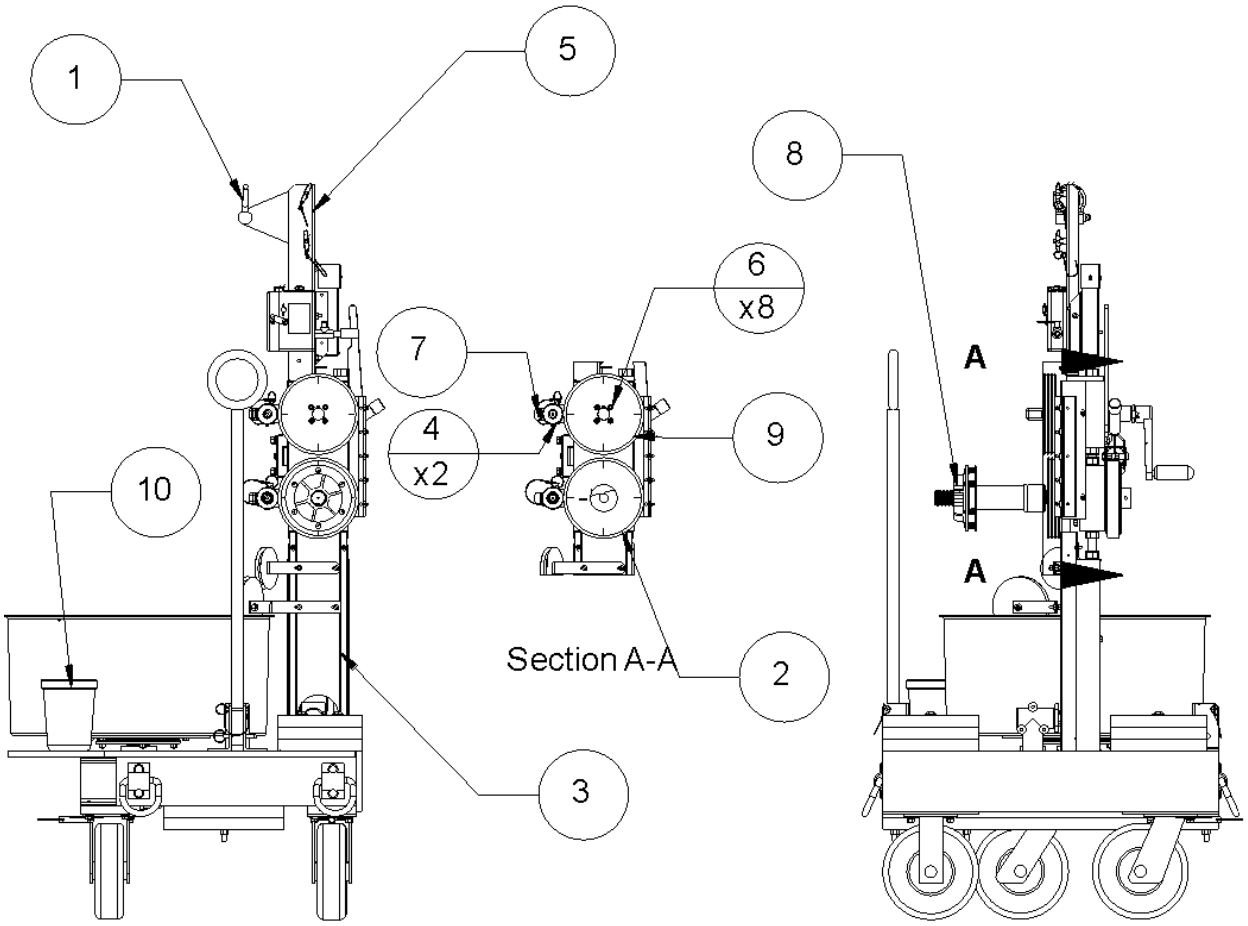
13.) Carefully lower the RHGSE to the ground and retract the cable under a 100 lb./45.35 Kg. load

8.0) Replacement Parts List

Part Number	Part Name	Qty
	Belts	
ZGS-10025-1	Drum Drive Belt	1
ZGS-10040-1	Vertical Drive Belt	1
	Capstans and Cover	
ZGS-12474-2	Upper Capstan (orange) for B style Hoists	1
ZGS-10113-20	Upper Capstan (orange) for G style Hoists	
ZGS-12474-1	Lower Capstan (black) for B style Hoists	1
ZGS-10113-20-1	Lower Capstan (black) for G style Hoists	
ZGS-10328-3	Capstan Cover Assembly	1
	Clutch	
ZGS-10369-1	Clutch Band	1
	Drum & Spoolers	
ZGS-10022-1	Rotatub	1
ZGS-10357-1	Cable Spooler Basic	1
ZGS-10149-1	Rotatub Plug	Set of 5
	Handles	
ZGS-11240-1	Manual Handcrank Bearing Assembly	1
ZGS-10111-1	Tow Handle	1
ZGS-11242-1	Tow Handle Quick Release Pin	1
	Load Indication	
ZGS-11099-2	Load Cell	1
9320 was ZGS-11100-2	Load Cell Indicator Display	1
	Lubridryer	
ZGS-10126-1	Lubridryer Bushings	Set of 2
ZGS-10104-10	Lubridryer Pads	100 in pkg
	Tensioning Wheels/Rollers	
ZGS-10127-1	Pressure Roller Assembly	1
ZGS-10258-1	Tension Wheel	1
ZGS-10259-1	Tension Wheel Large	1
ZGS-10294-1	Exit Roller Assembly	1
ZGS-10047-2	Tension Release Hitch Pins	Set of 2
ZGS-11109-1	Load Adjuster	1
	Misc	
ZGS-10454-1	Cable Reel Adapter Assembly	1
ZGS-11443-1	Manual GSE Lifting Assembly	1

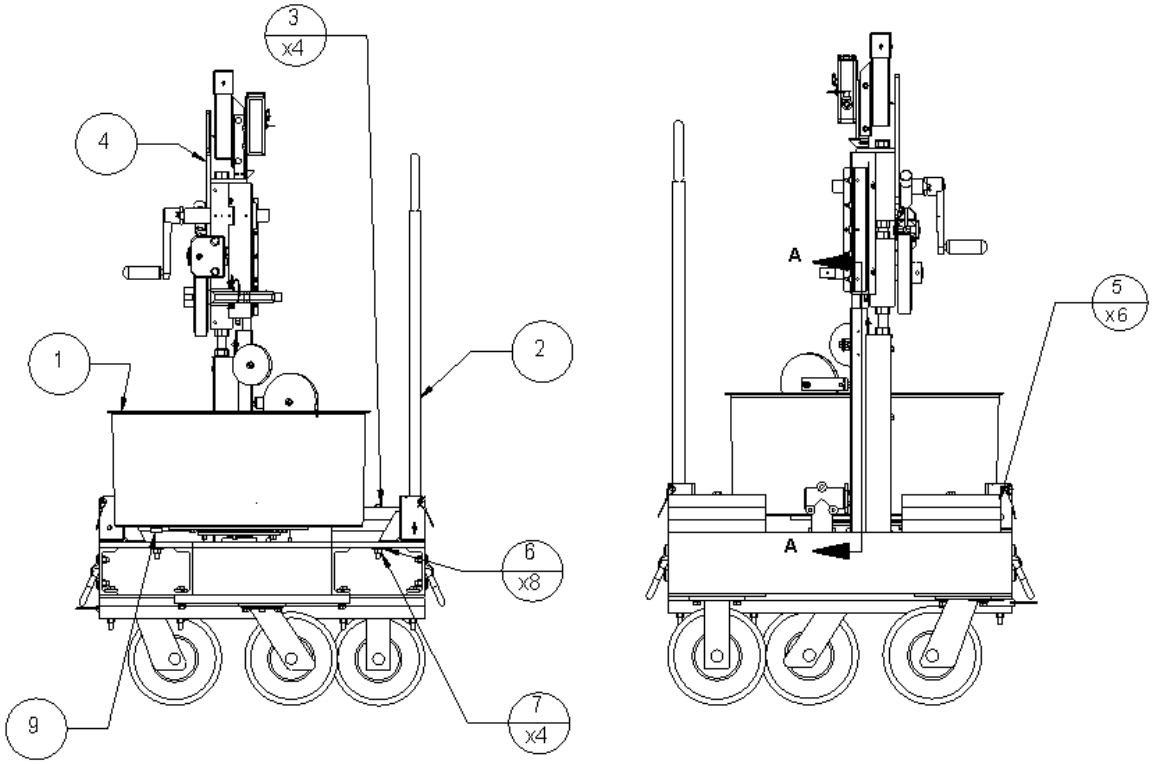
9.0) Illustrated Parts Breakdown

ZGS-11000-2v2 – Manual GSE4+



Item	Qty	Part Number	Part Name	Rev
1	1	ZGS-11443-1	Manual GSE Lifting Assembly	A
2	1	ZGS-12474-1	Capstan 4.5 mm cable	
3	1	ZGS-11000-30	Manual GSE 4 Tripod	C
4	2	4883	.25-20 x .75 long SHCS	
5	1	ZGS-10245-1	Upright Upper assembly	A
6	8	4876	10-32 x 1.25 SHCS	
7	1	ZGS-10129-1	Tensioner assy upper	
8	1	ZGS-10794-1	Cable Reel Adapter Assembly	B
9	1	ZGS-12474-2	Capstan Upper 4.5 mm cable	D
10	1	ZGS-10104-10	Container of Lubridryer Pads	

ZGS-11000-30 – Manual GSE 4 Tripod

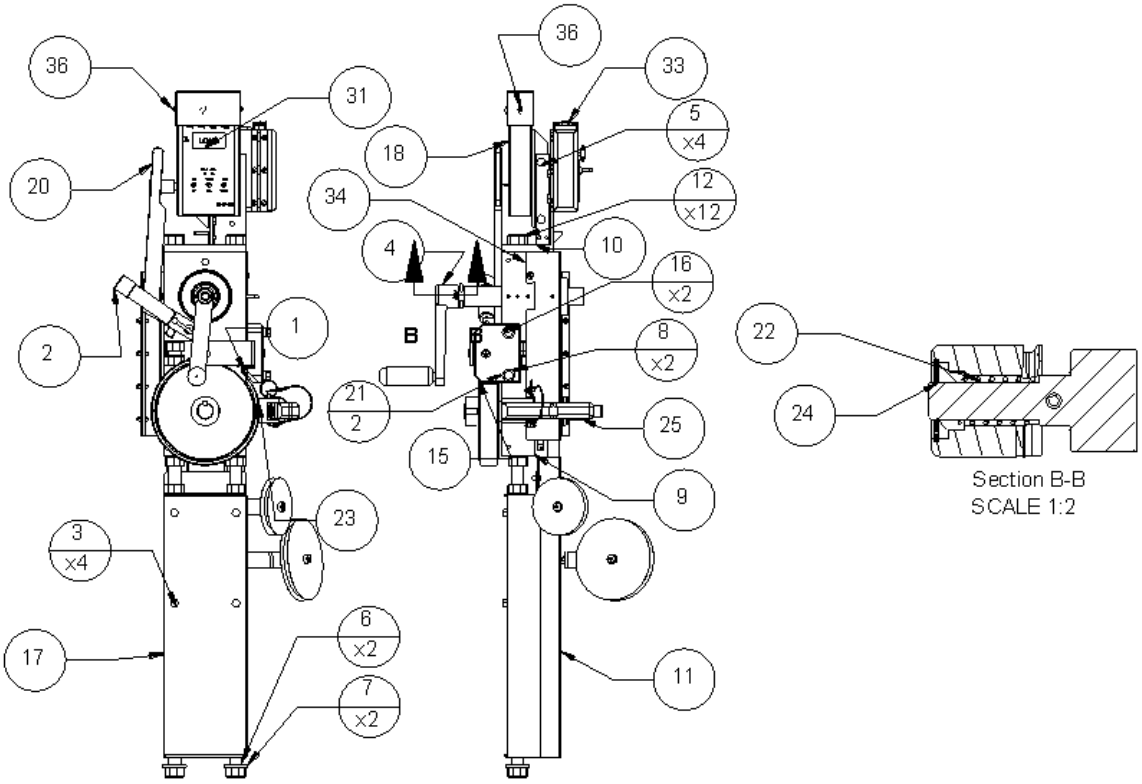


Section A-A

SCALE 1:12

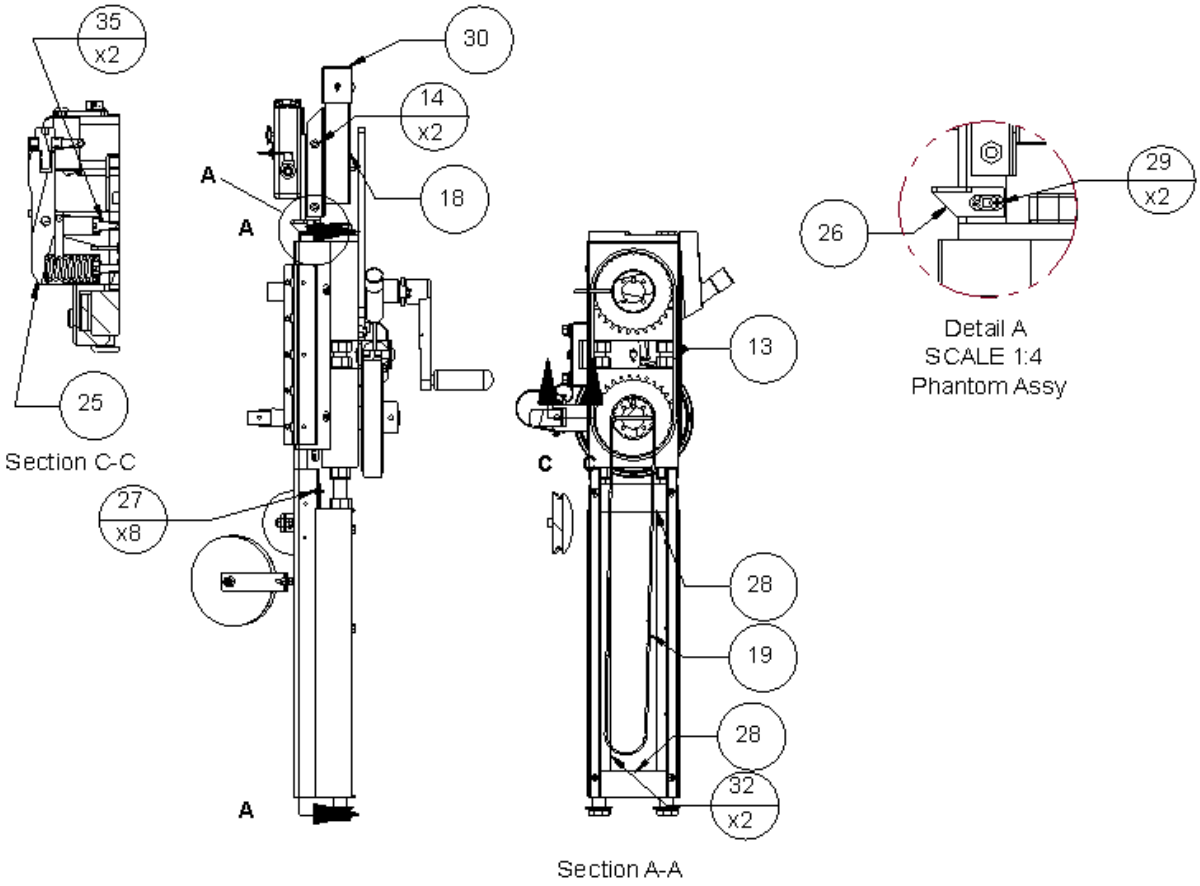
Item	Qty	Part Number	Part Name	Revision
1	1	ZGS-10022-1	Tub , GSE	C
2	1	ZGS-11127-1	Base Tripod	D
3	4	624	3-8 Bolt 4.5 inch long	
4	1	ZGS-11139-1	Upright Assembly Manual GSE	
5	6	ZGS-11097-2	Ballast 1B	
6	8	3062	3-8 Flat Washer	
7	4	2677	.38 locknut grade 8	
8	1	ZGS-10357-1	Spooler Basic	A
9	1	ZGS-10149-1	Tub Plug	A

ZGS-11139-1 – Upright Assembly Manual GSE (page 1)



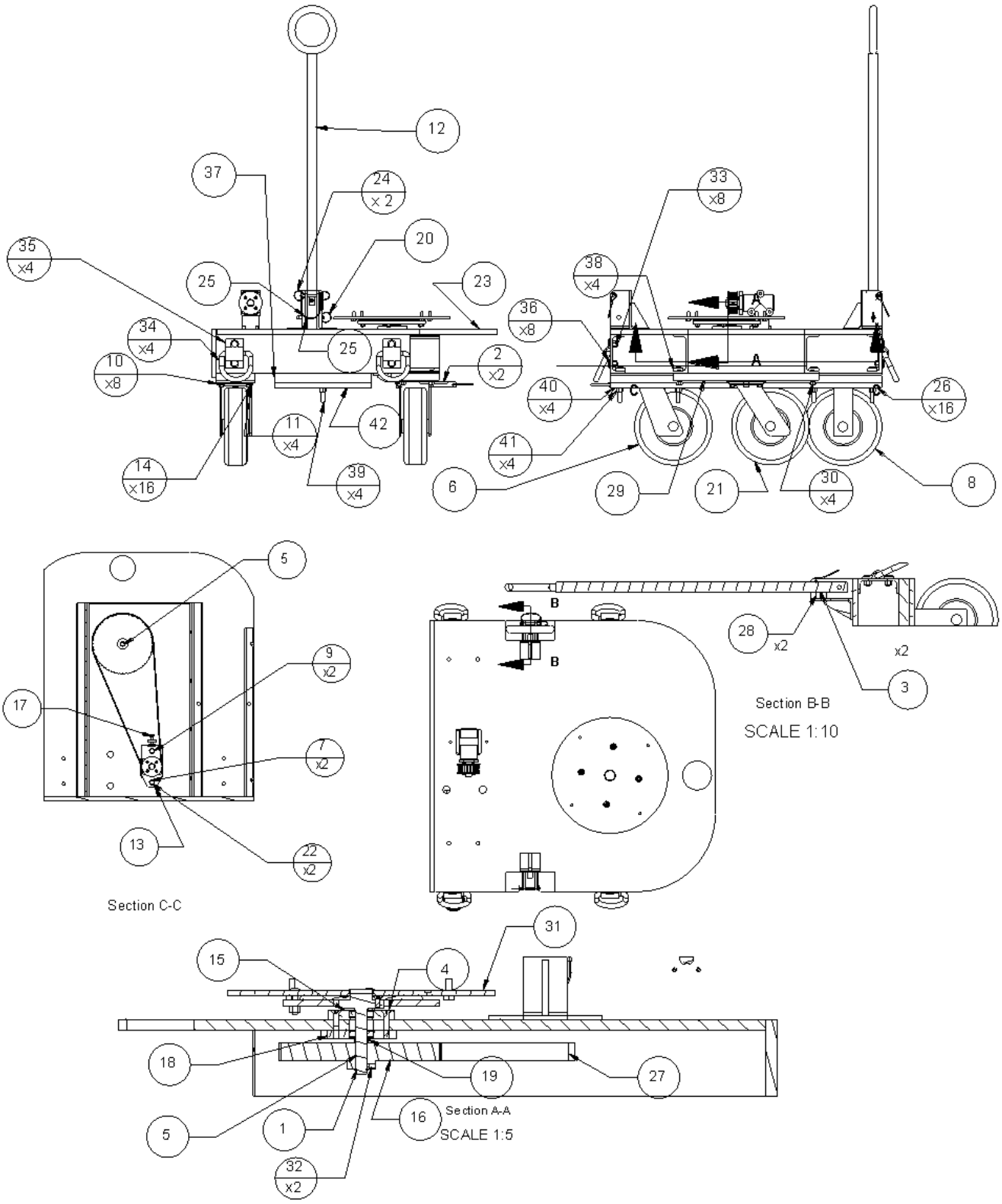
Item	Qty	Part Number	Part Name	Rev
1	1	ZGS-11056-1	Brake Pin	C
2	1	ZGS-11109-1	Load Adjuster Assy	E
3	4	8972	.25-20 x .38 cap screw	
4	1	ZGS-11240-1	Manual Hand Crank Bearing Assembly	A
5	4	129	.25 x .75 cap screw	
6	2	ZGS-11011-1	Threaded Rod	
7	2	2952	3-4 washer	
8	2	2948	.312 Flat Washer	
9	1	ZGS-11031-1	Lower head Assembly Manual Drive	B
10	1	ZGS-10085-1	Upright Bracket	M
11	1	ZGS-10045-2	Belt Guard and Cover Assembly Manual GSE	C
12	12	2589	3-4-10 nut	
13	1	ZGS-10107-1	Roller Chain	A
14	2	2554	.25 Lock nut	
15	1	ZGS-11138-1	Load Cell Assembly Manual	A
16	2	146	.312 x 1.5 Hex Bolt	
17	1	ZGS-11072-1	Upright Rear Cover	B
18	1	ZGS-11118-1	Load Indicator Holder Assy	D
19	1	464576	Drive Belt, Vertical	
20	1	ZGS-11130-1	Upper Head assy manual drive improved	B

ZGS-11139-1 – Upright Assembly Manual GSE (page 2)



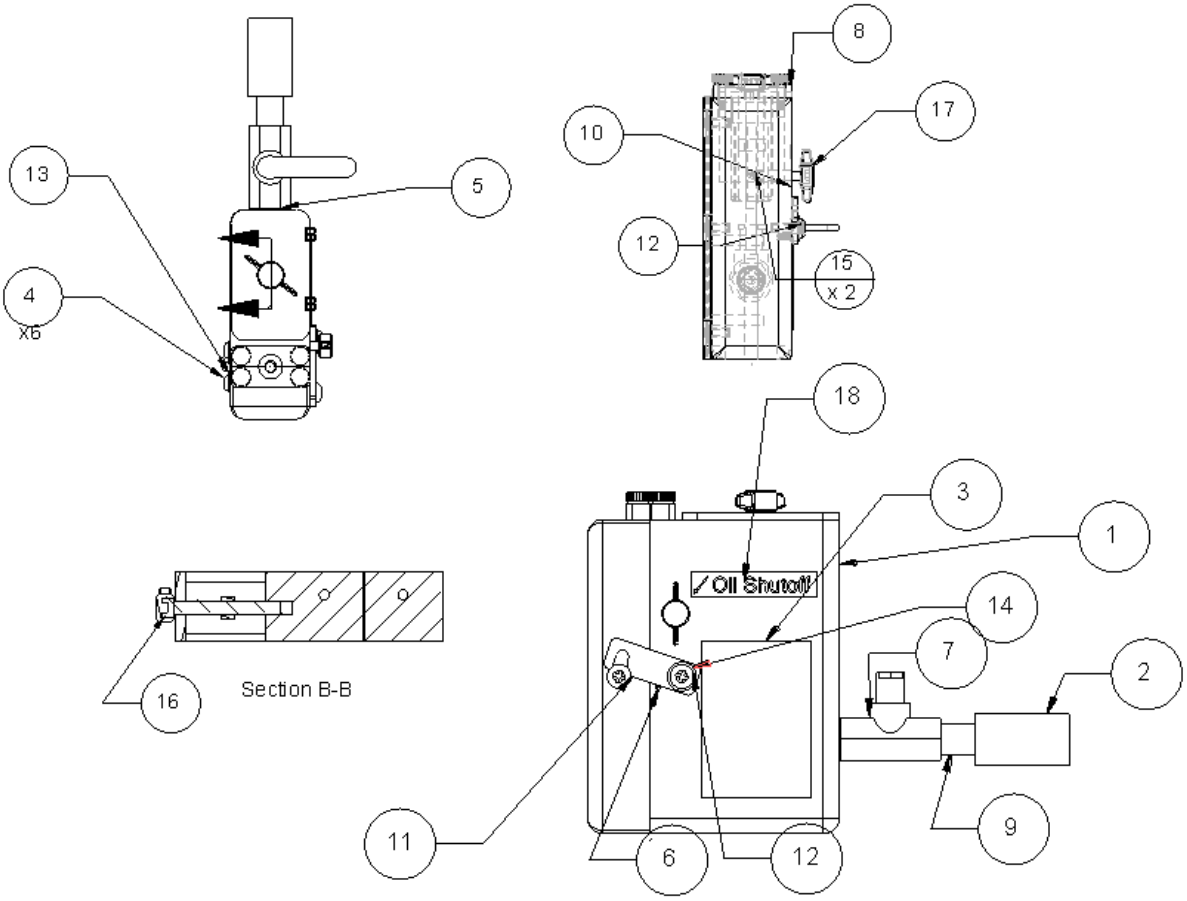
Item	Qty	Part Number	Part Name	Rev
21	2	2957	.312 Lockwasher	
22	1	06812382	Clutch Spring	
23	1	ZGS-10369-1	Brake Band	C
24	1	EH-12-SO2	es_12	
25	1	ZGS-10128-1	Tensioner Assy Lower	B
26	1	ZGS-10046-1	Latch Catch	G
27	8	1365	10-32 x .38 Pan Head Machine Screw	
28	2	ZGS-10082-1	Belt Guard Bracket	C
29	2	1247	8 32 x .38 Flat Head	
30	1	ZGS-11117-1	Load Indicator Holder Lid	D
31	1	ZGS-11100-2	Load Cell Indicator Omega	
32	2	ZGS-10030-1	Upright Tube Upper	A
33	1	ZGS-10048-2	LubriDryer Assembly Manual GSE	D
34	1	ZGS-11064-1	Chain Guard Cover Assy	B
35	2	4883	.25-20 x .75 long SHCS	
36	2	9632	6-32 Pan Head .18 long	

ZGS-11127-1 – Base Tripod



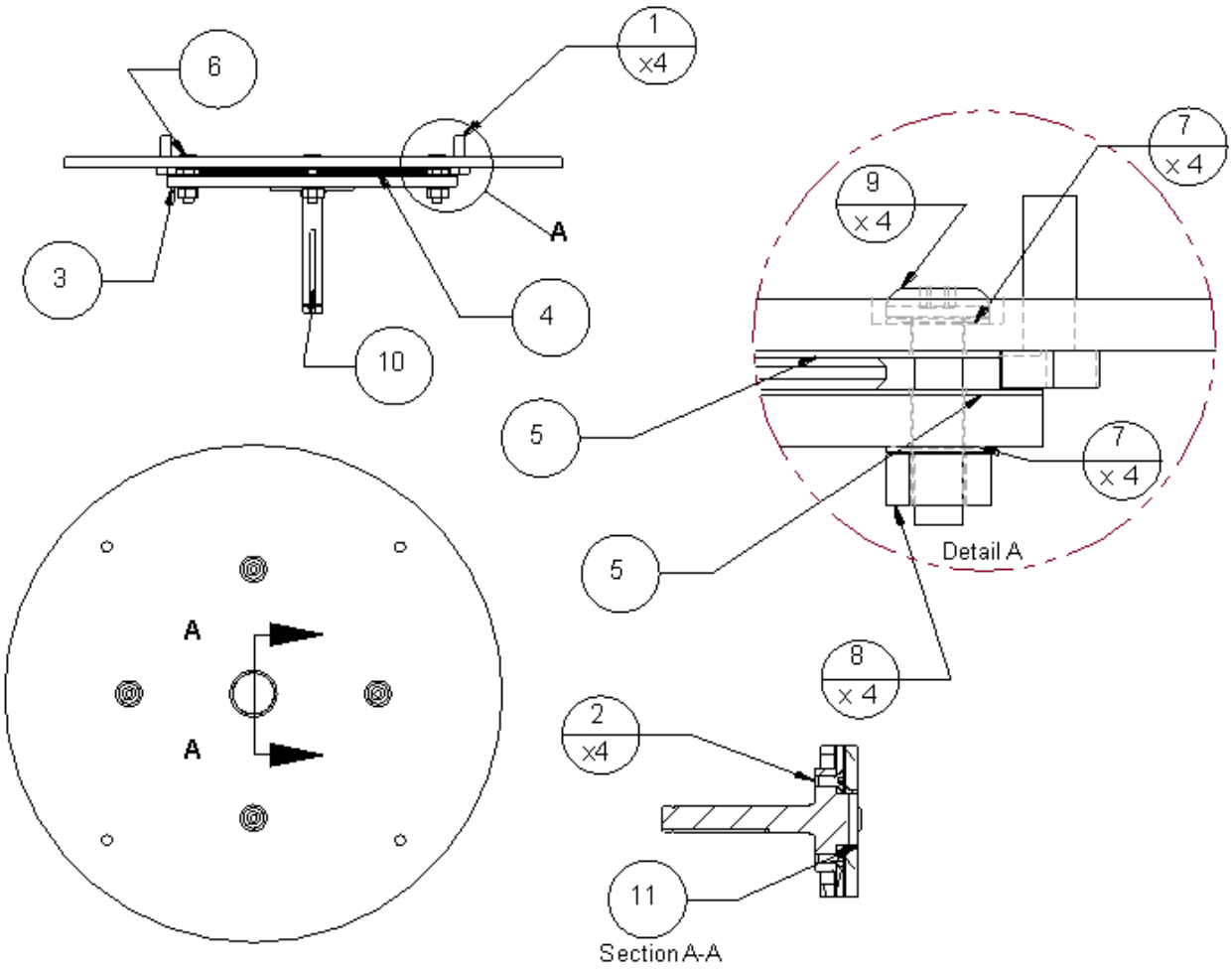
Item	Qty	Part Number	Part Name	Rev
1	1	SH-50SSMPSB100	Snap Ring	
2	2	ZGS-10314-1	Swivel Caster Lock	
3	2	7636	10-32 Flat Head .625 long	
4	4	4485	.25-20 Socket Flat Head 1.25 long	
5	1	ZGS-10122-1	Axel Key	
6	1	ZGS-10144-2	Swiveling Tornado Caster	
7	2	129	.25 x .75 cap screw	
8	1	ZGS-10143-2	Rigid Tornado Caster	
9	2	2947	.25 Flat Washer	
10	8	143	.312 x .75 Hex Bolt	
11	4	144	.312 x 1 Hex Head Cap Screw	
12	1	ZGS-10111-1	Tow Handle	
13	1	ZGS-10012-1	Angle Drive Assy	B
14	16	2948	.312 Flat Washer	
15	1	ZGS-10132-1	Upper Base Bearing Assembly	B
16	1	ZGS-10477-1	Pulley , 6 inch Aluminum	A
17	1	130	.25 x 1 cap screw	
18	1	ZGS-10132-2	Lower Base Bearing Assembly	B
19	1	A7X8-C16250	Axel Sleeve .25 inch	
20	1	FPSC6-20R	.38 Detent Pin 2 in long	
21	1	ZGS-10144-2	Swiveling Tornado Caster rotated 90	
22	2	2956	.25 Lockwasher	
23	1	ZGS-11126-1	Base Weldment 4 Tripod	
24	2	FPC4-15R	Restraining Pin	
25	2	ZGS-10330-1	Lanyard Assy	
26	16	2957	.312 Lockwasher	
27	1	464577	Drive Belt, Drum	
28	2	ZGS-10327-1	Tow Handle Stop	A
29	1	ZGS-11124-1	Pad Tripod	B
30	4	145	.312 x 1.25 Hex Bolt	
31	1	ZGS-10248-1	Infinitly adjustable platen assy	D
32	2	7003	8-32 x .25 Setscrew	
33	8	2556	.38 locknut	
34	4	MR8SS - Ring	Tie down ring	
35	4	MR8SS - Plate	Tie down plate	
36	8	945	.38 Carriage Bolt	
37	1	ZGS-11096-2	Ballast Bar 2A	A
38	4	91151A030	Bevel Washer	
39	4	622	3-8 Bolt 3.5 inch long	
40	4	3062	3-8 Flat Washer	
41	4	2677	.38 locknut grade 8	
42	1	ZGS-11536-1	Ballast Bar half inch	

ZGS-10048-2- Lubridryer Assembly Manual GSE



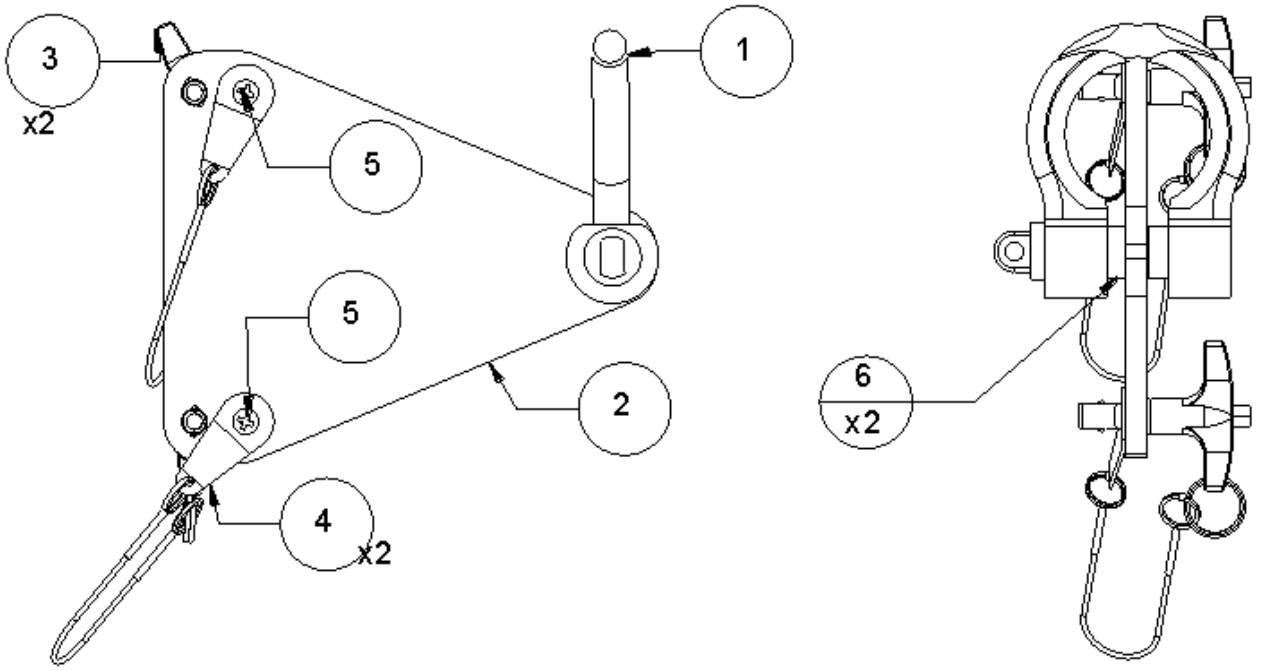
Item	Qty	Part Number	Part Name	Rev	FSCM
1	1	ZGS-10055-1	Oiler Tank Air Housing	K	3CAT3
2	1	COL-150	QD Female Coupler		5EM82
3	1	J6411-FF	Label, Safety Instructions		54699
4	6	1345	8 32 x .38		7HEQ0
5	1	02204352	.25 close nipple		4J007
6	1	3408A66	Ball Plunger		39428
7	1	107-401NL	Drain Valve	A	1KXF2
8	2	ZGS-10739-1	Lubridyer Bushing Assembly		3CAT3
9	1	COL-1501	QD Male Coupler		5EM82
10	1	ZGS-10049-1	Oiler Dryer Front	G	3CAT3
11	1	ZGS-10051-1	Oiler Latch	A	3CAT3
12	2	1366	10 32 x .5		7HEQ0
13	1	ZGS-10050-1	Lubridryer Hinge		3CAT3
14	1	91545A240	#10 NylatronWasher		39428
15	2	ZGS-10104-1	Lubridryer Pad	A	3CAT3
16	1	ZGS-10831-1	Lubridryer Resevoir Cover		3CAT3
17	1	ZGS-10361-2	Oil Shutoff Thumbscrew		3CAT3
18	1	ZGS-10898-1	Label, Oil Shutoff		3CAT3

ZGS-10248-1- Infinitely Adjustable Platen Assembly



Item	Qty	Part Number	Part Name	Rev
1	4	129	.25 x .75 cap screw	
2	4	4475	10-32 Flat Head .5 long	
3	1	ZGS-10176-2	Infinitly adjustable Lower plate	A
4	1	ZGS-10175-2	Infinitly Adjustable Platen Plate	C
5	2	ZGS-10737-1	Infinitly adjustable Slip Pad	B
6	1	ZGS-10180-2	Infinitly Adjustable Platen Top Plate	C
7	8	87779237	Belleville Washer	
8	4	4108	.25-28 Lock nut	
9	4	5725	1-4 x 28 x 1 machine screw	
10	1	ZGS-10020-1	Axel	F
11	1	ZGS-10886-1	Platen Plate Bushing	

ZGS-11443-1- Manual GSE Lifting Assembly



Item Number	Quantity	Part Number	Part Name	Revision
1	1	ZGS-11421-1	Shackle	
2	1	ZGS-11442-1	Manual GSE Lifting Plate	B
3	2	90293A122	Quick Release Pin	
4	2	ZGS-11437-1	SB Lanyard Assy	A
5	2	5317	8 32 x . 25 Screw	
6	2	ZGS-11529-1	Manual GSE Lifting Spacer	

10.0 Technical Assistance

Please contact Zephyr International LLC with any questions 1-843-365-2675.

Send comments or suggestions to: info@zephyrintl.com

11.0 Document Revision History

	Rev	Date	Location	Description	By
1	A-H	5-24-24	All pages	Standardized manual. Changed Rotatub Slip Clutch values from 3-5 lbs. to 2-3 lbs. Added new load meter. Changed spooler description and pics to reflect new white material. Updated drawings. Added Document Revision History.	J. Cloutier