



# **HIGH SPEED UNWIND TESTER**

**MODEL HSU-2000**

**OPERATING INSTRUCTIONS**

**CHEMINSTRUMENTS  
510 COMMERCIAL DRIVE  
FAIRFIELD, OHIO 45014  
(513) 860-1598**

**[www.cheminstruments.com](http://www.cheminstruments.com)**

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## PRODUCT DESCRIPTION

Congratulations on the purchase of your new ChemInstruments HSU-2000 High Speed Unwind Tester. This versatile, user-friendly, carefully designed instrument allows you to perform high speed unwind tests.



**WARNING: This equipment can cause injury if not used properly. It is the operator's responsibility to observe all safety rules and warnings.**

The unit has the following features:

- 3 modes of operation: Standard, Step, and Foot Counter.
- Selectable testing speeds.
- Selectable data acquisition area on the test sample.
- Selectable units of measure: Kilograms, Grams, Newtons, Pounds, & Ounces.
- Compatible with EZ Data System software. See [www.cheminstruments.com](http://www.cheminstruments.com) for details.

## SPECIFICATIONS

<b>Electrical</b>	120/240 VAC, 50/60 Hz, 3 amps
<b>Operating Temperature</b>	32 – 150 degrees Fahrenheit (0 – 70 degrees Celsius)
<b>Humidity</b>	0 – 55% relative humidity
<b>Speed</b>	12 – 4800 inches/minute (1 inch increments) 1 - 400 feet/minute (1 foot increments) 30 - 12100 centimeter/minute (1 centimeter increments) 1 - 121 Meters/minute (1 Meter increments)
<b>Physical Dimensions</b>	Width: 25 inches (63 centimeters) Depth: 18 inches (45 centimeters) Height: 15 inches (38 centimeters) Weight: 59 pounds (26 kilograms)

## UNPACKING

ChemInstruments has made every effort to ensure that the HSU-2000 arrives at your location without damage. Carefully unpack the instrument and check for any damage that may have occurred during shipment. If any damage did occur during transit, notify the **carrier** immediately.

The ChemInstruments HSU-2000 consists of the following parts:

- The test frame, which includes the motor/drive mechanism and the data acquisition system.
- An envelope with this manual.
- Calibration wire.
- Power cord.

Make sure all of these components are present before discarding packaging material.

## ASSEMBLY



**WARNING:** Due to its weight and size, use two people to move the HSU-2000.

Carefully remove the test frame/drive/data acquisition assembly from the packaging and set them on a sturdy bench top. Check the physical dimensions listed previously for the space required for the instrument. As with any precision piece of laboratory equipment, it is preferable to locate the HSU-2000 in an area where temperature and humidity are controlled to standard conditions of  $72 \pm 2$  degrees Fahrenheit and  $50 \pm 5\%$  relative humidity.

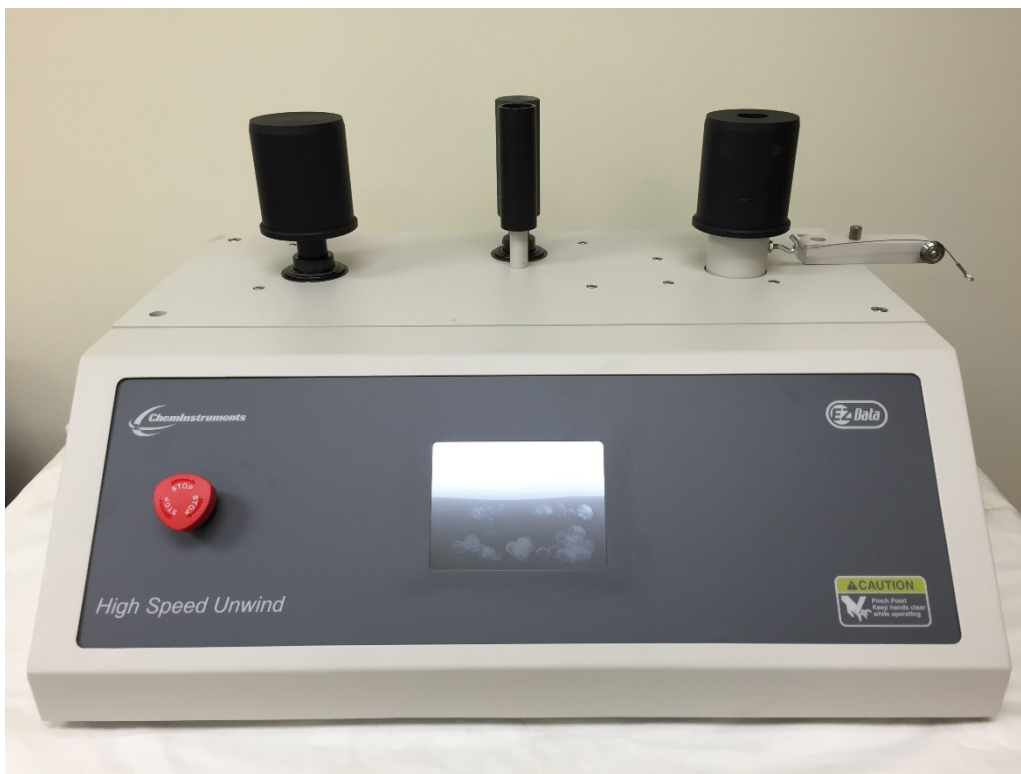


Figure 1

## CONNECTING THE POWER CORD



**WARNING:** Damage will occur if this unit is plugged into the incorrect power supply. This is a dual voltage machine. Connect either 120 or 240 VAC.

Connect the power cord to its receptacle on the backside of the control cabinet at the far left side when viewed from the rear. Complete the connection by inserting the male end of the power cord into a convenient AC outlet. Notice that the on/off power switch is located directly beside the power cord receptacle on the backside of the test frame.

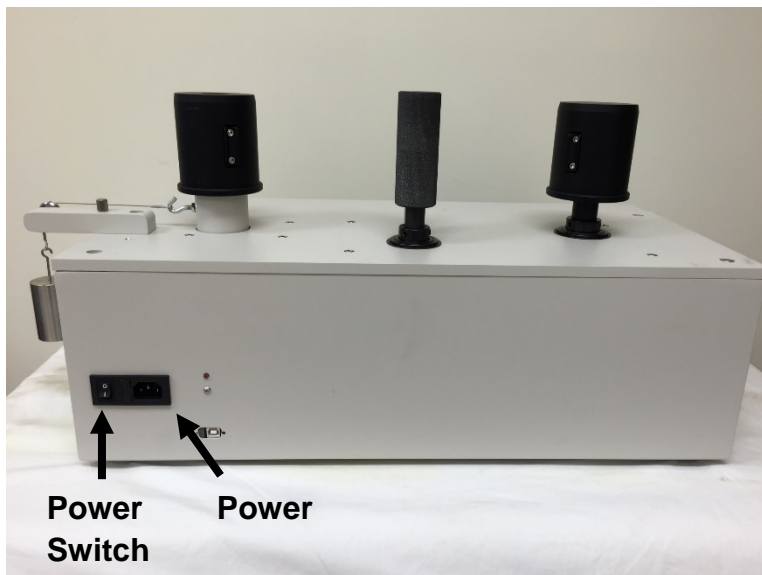


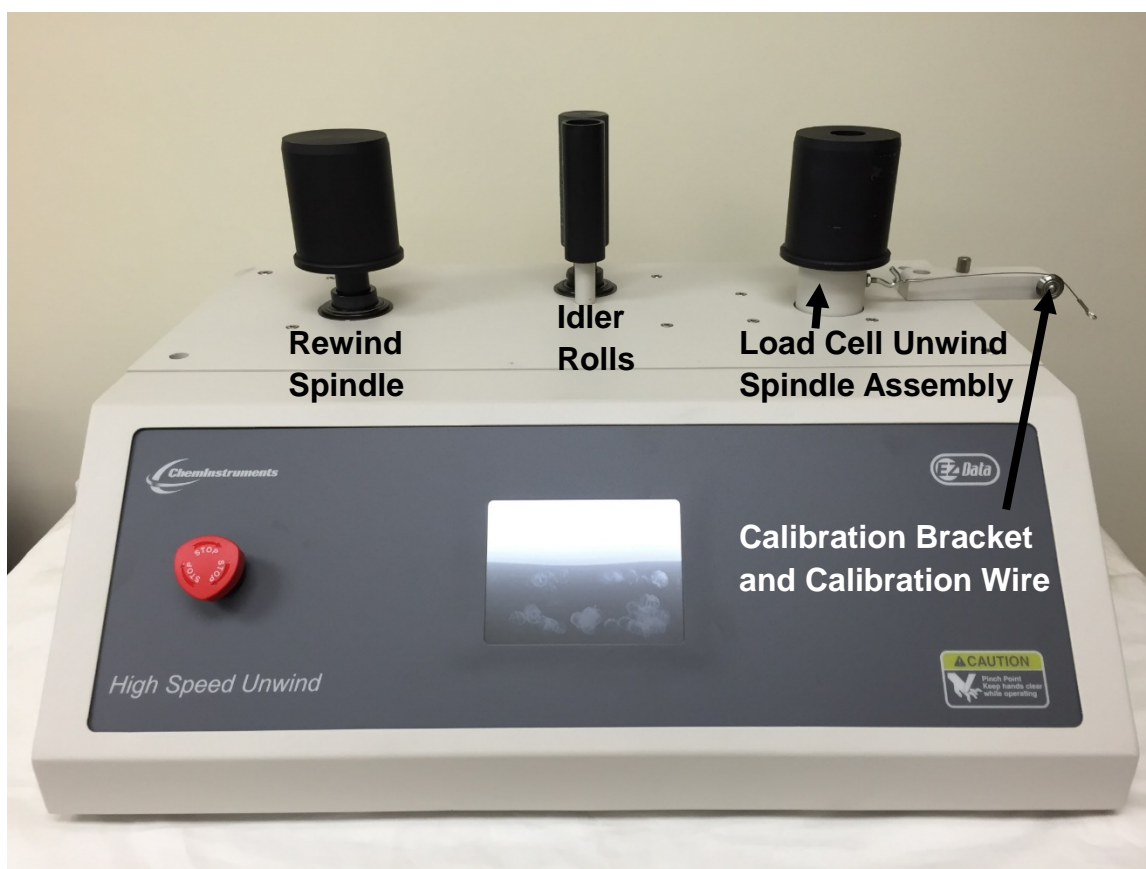
Figure 2



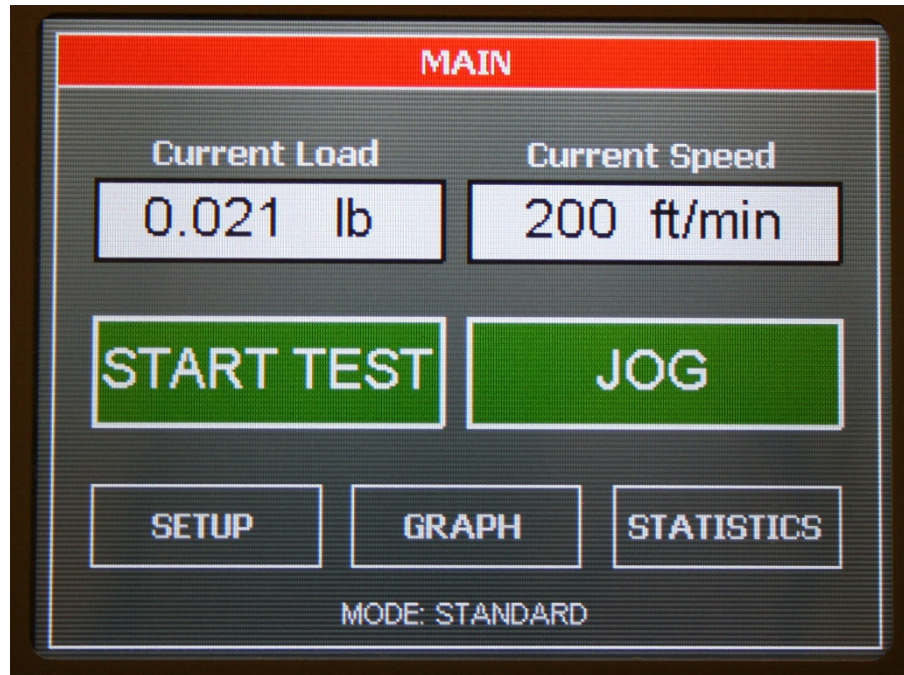
**WARNING:** Before proceeding with using the HSU-2000, it is advisable to become familiar with the Key Components. These Key Components and a brief description of their function follow in the next section.

## KEY COMPONENTS

- **POWER SWITCH** is located on the back panel of the control cabinet directly beside the power cord connection. (See Figure 2)
- **LOAD CELL UNWIND SPINDLE ASSEMBLY** consists of the unwind spindle and the internally attached load cell.
- **IDLER ROLLS** consisting of two spindles, one is a motor drive knurled roll.
- **REWIND SPINDLE** is a motor driven rewind spindle.
- **CALIBRATION BRACKET and CALIBRATION WIRE** are used in the load cell calibration process.



- **TOUCH SCREEN DISPLAY** is the control center for the HSU-2000.





## OPERATION

A roll of test material is placed on the Unwind Spindle and threaded through the Idler Rolls and finally to the Rewind Spindle. The operator programs the test speed, the distance of the test, and the area of data to be recorded. A load cell measures the force as the test material is unwound. The load cell samples at 400 times per second. Eight samples are collected, averaged, and stored as a data point. Therefore, a test will generate data points every 20 milliseconds.

A maximum of 10,000 data points can be saved with any given test.

## POWER UP



**WARNING: Operating temperature for this equipment is 32 to 150 degrees Fahrenheit (0 to 70 degrees Celsius). The equipment needs to be completely free of condensation, inside and out, before applying power.**

Turn on the master power switch located on the back panel of the control cabinet next to the power line receptacle. The internal control board will go through a self-test.

## TOUCH SCREEN FORMAT

### MAIN SCREEN

- **Current Load** – displays the force currently measured by the load cell.
- **Current Speed** – displays the set speed of the idler roll.
- **Start Test** – will run a test sequence.
- **Jog** – will move the motor at 300 inches per minute until the STOP JOG button is pressed.
- **Setup** – will display all setup options.
- **Graph** – will display the graph, minimum, maximum, and average values of the last test.
- **Statistics** – will display the minimum, maximum, average, variance, standard deviation, and work of the last test. Elongation and length of roll will also be displayed.
- **Mode** – will indicate which mode is currently set. The mode is either standard, step, or foot counter.

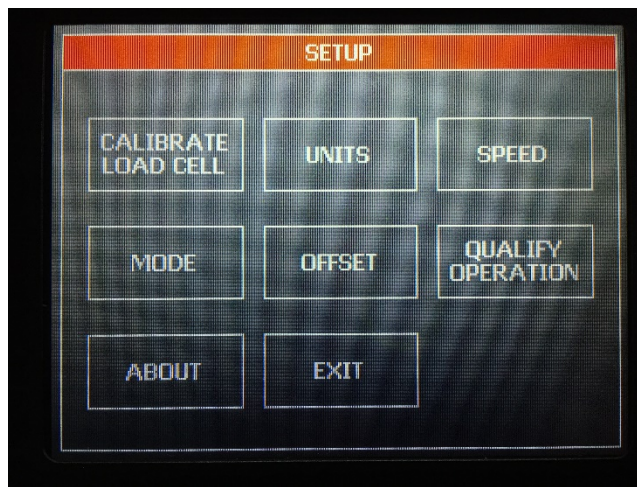


### SETUP SCREEN

- **Calibrate Load Cell** – is used to calibrate the load cell.
- **Units** – is used to change the force units and/or the speed units.
- **Speed Setup** – is used to set the idler roll speed.
- **Mode** – is used to select the standard, stop or foot counter mode.
- **Offset** – is used to add data start, data test, and test stop parameters.

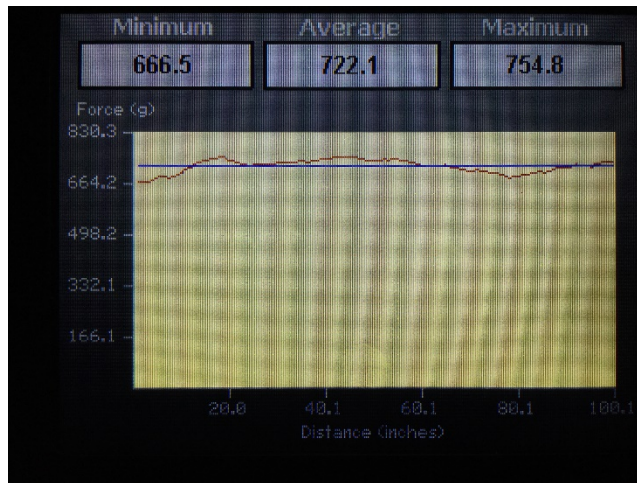
- **Qualify Operation** – is used to troubleshoot hardware problems with the HSU-2000.
- **About** – is used to retrieve the machine’s software version, control board’s hardware revision, and motor status.
- **Exit** – go back to the main screen.

If there are 30 seconds of no screen activity when in any of the setup screens except the qualify operation screen, then the machine will exit the setup screen and return to the main screen.



## GRAPH SCREEN

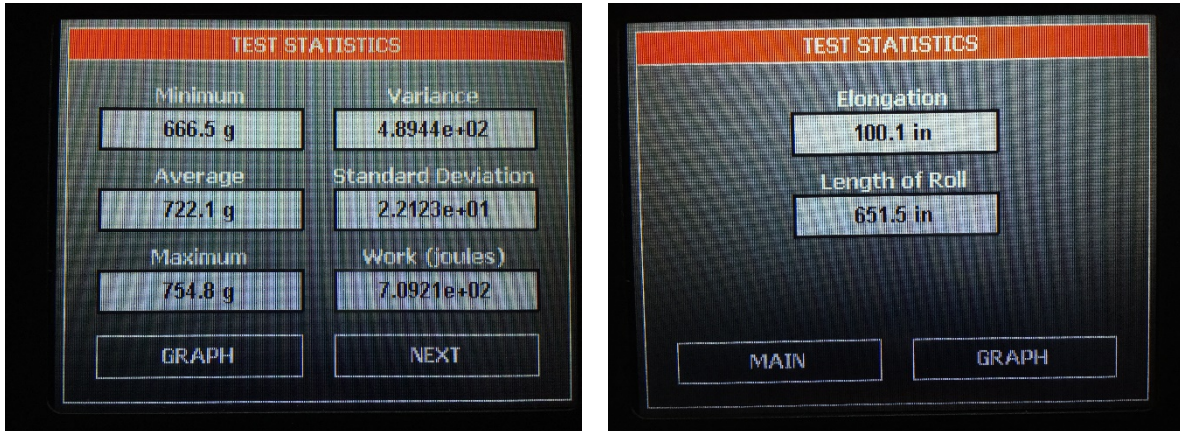
The graph screen will display the graph, minimum, maximum, and average values of the last test. Touch anywhere on the screen to exit the graph screen and return to the main screen.



## STATISTICS SCREEN

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The statistics screen will display the minimum, maximum, average, variance, standard deviation, and work of the last test. Pressing NEXT on the “Test Statistics” screen will display elongation and length of roll when available.



## SAFETY FEATURES

The HSU-2000 has a couple safety features incorporated into its design and operation. These need to be understood for proper operation. The first is the emergency “Stop”. This button when pushed stops the drive spindle of the HSU-2000. The second feature is overload protection for the load cell. If the load cell senses a force 10% greater than its maximum rating, the drive will stop and an error message is displayed.

## MACHINE SETUP

### LOAD CELL CALIBRATION

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It is important to calibrate the load cell to ensure that reliable data will be gathered. A calibration procedure is built into the software of the HSU-2000. This procedure should be followed upon first use of the HSU-2000 and whenever necessary thereafter. The following is the step-by-step procedure for calibrating the load cell.



**MAKE SURE THE HSU-2000 HAS BEEN ON FOR 30 MINUTES BEFORE PROCEEDING WITH CALIBRATION.**

## **LOAD CELL CALIBRATION PROCEDURE**

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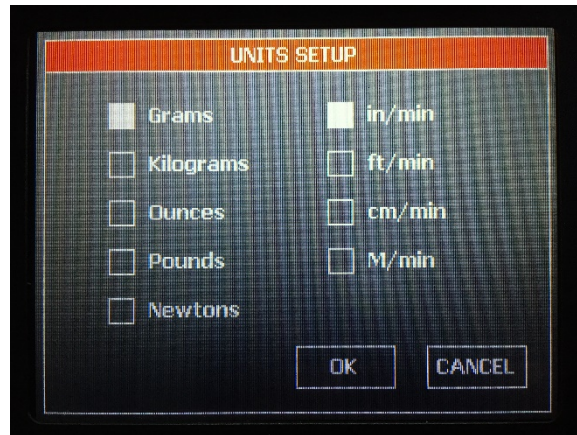
1. Locate the wire attached to the Unwind Spindle. Place the wire over the pulley so that a calibration weight can be attached to the end of the wire.
2. Select SETUP from the main screen.
3. Select CALIBRATE LOAD CELL from the setup screen.
4. The first screen in the calibration process describes the 2 point calibration process. Select OK to continue.
5. The next screen measures the low calibration value desired (typically 0). Make sure that you do not have a weight hanging from the calibration wire and select OK.
6. The next screen measures the high calibration value desired. This weight should be close to the maximum expected test value. Hang the weight on the loop end of the calibration wire making sure that the wire is able to move freely.
7. Set the high calibration value by selecting CHANGE and entering the value of the weight in grams and select ENTER.
8. Make sure that the calibration weight is completely at rest and then select OK.
9. The display will show the main screen and the current reading of force will be displayed under CURRENT LOAD.
10. Verify the calibration by hanging a different calibration weight on the calibration wire.
11. Repeat the calibration procedure if necessary.

## FORCE AND SPEED UNITS

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Force and speed units can be changed with the following procedure.

1. Select SETUP from the main screen.
2. Select UNITS from the setup screen.
3. Select the desired units. Select OK to confirm the entered units.

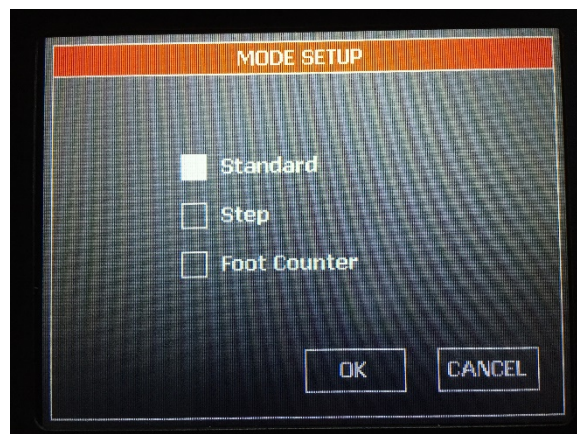


## MODE

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The HSU-2000 can be operated in standard, step, or foot counter mode. The following is a step-by-step procedure for setting the mode.

1. Select SETUP from the main screen.
2. Select MODE from the setup screen.
3. Select the desired mode. Select OK to confirm the entered mode.



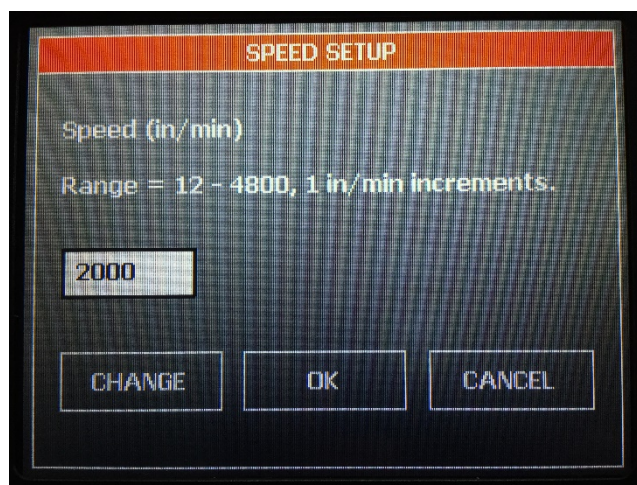
## SPEED

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**NOTE:** The unit of measure for speed can be changed by selecting **UNITS** from the setup screen.

To perform a test correctly, it is necessary to set the speed of the idler roll in accordance with the selected test method. The following is a step-by-step procedure for setting the speed.

1. Select SETUP from the main screen.
2. Select SPEED from the setup screen.
3. Select CHANGE and enter the desired speed in the selected units and press ENTER. Select OK to confirm the entered speed.



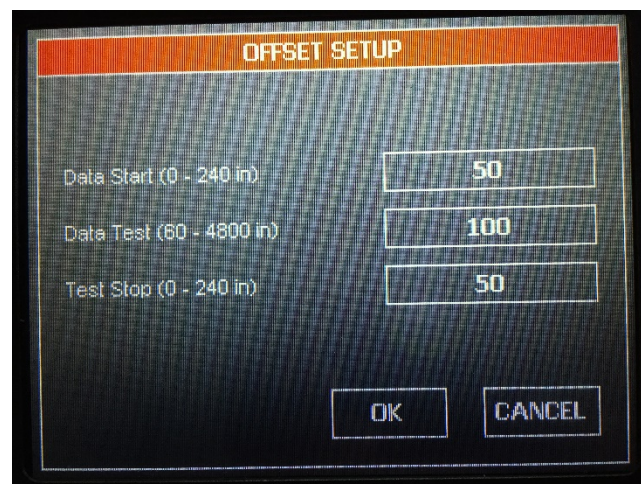
## OFFSET

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The area of data acquisition can be changed to accommodate the testing of different material types. The following is a step-by-step procedure for setting the offset parameters.

1. Select SETUP from the main screen.
2. Select OFFSET from the setup screen.
3. Select the parameter to change by touching the value field. Enter the desired value and press ENTER.
4. Select OK to confirm the entered values.

The available offset parameters for standard mode are data start, data test, and test stop. Data test is the only parameter available in step mode. There are no parameters to set in foot counter mode.



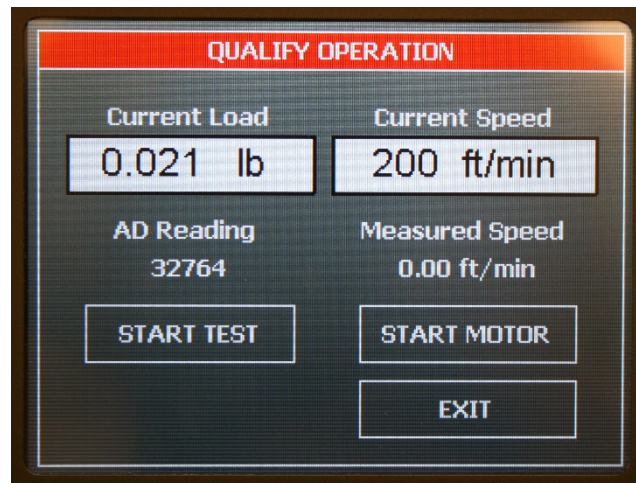


## QUALIFY OPERATION

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Some of the hardware functions of the HSU-2000 can be verified with the qualify operation screen.

- **Current Load** – displays the force currently measured by the load cell. It will be displayed in the selected units.
- **Current Speed** – displays the set speed of the idler roll.
- **AD Reading** – displays the hardware counts measured on the control board from the load cell interface. Pulling on the load cell will display values greater than 32000. Pushing on the load cell will display values less than 32000.
- **Measured Speed** – displays the speed of the idler roll as measured by the control board.
- **Start Test** – will run a test at the set speed. This will allow a test to be run with a calibration weight hanging so that the load cell reading can be verified.
- **Start/Stop Motor** – will start or stop the motor so that the speed can be verified with a hand tach.

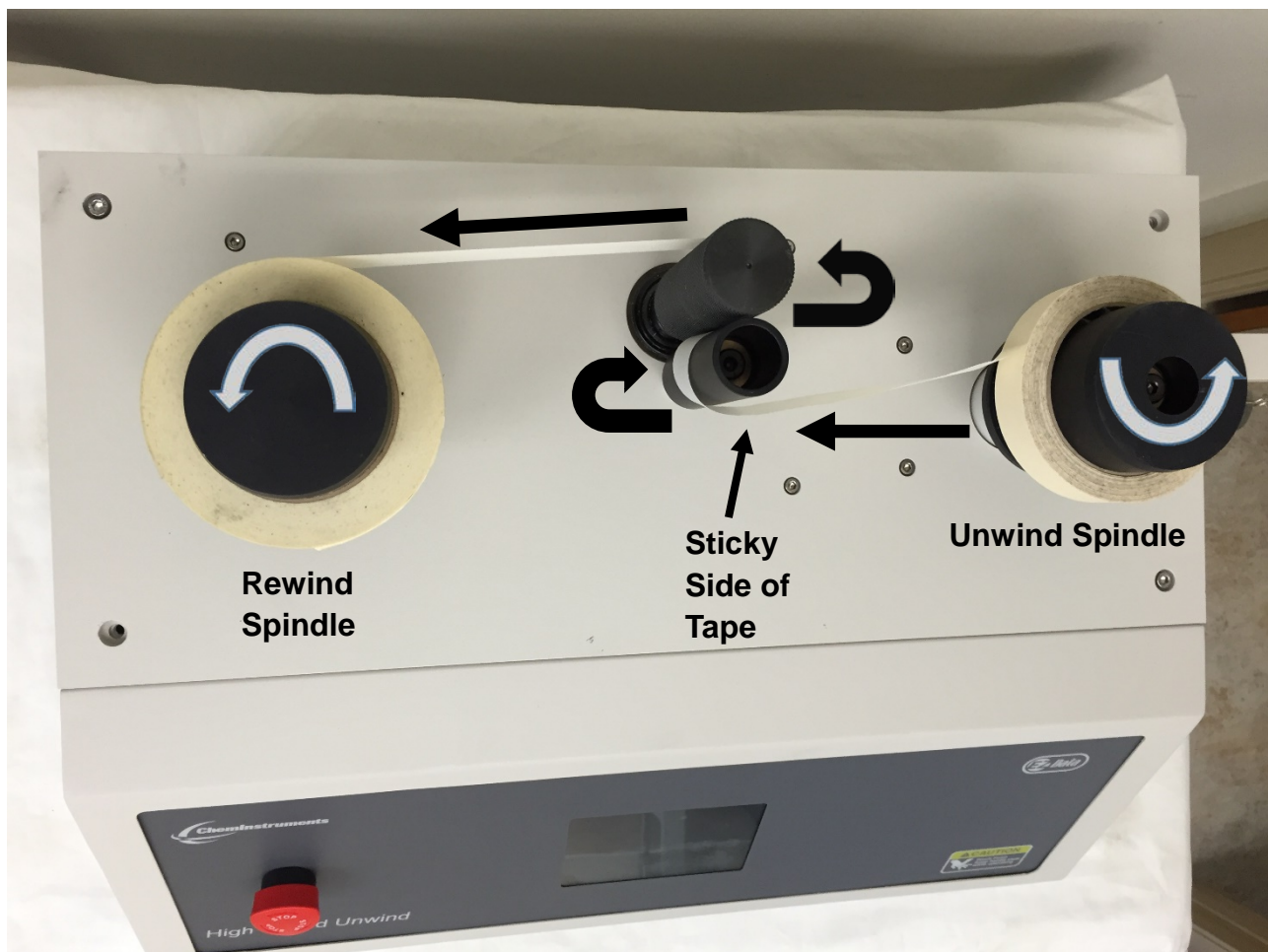


## THREADING

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Threading the roll of test material or product to be tested is a simple procedure. The following description and diagram will provide the necessary information.

1. Place the roll of material to be tested on the Unwind Spindle so that the loose end will unwrap in a clockwise direction.
2. Thread the test material through the Idler Rolls as shown in the diagram.
3. Wrap the end of the material onto an empty core that has been placed on the Rewind Spindle. Make sure the wrap is in a counter-clockwise direction.



## **RUNNING A TEST**

Various test methods written by organizations such as ASTM, PSTC, TLMI and others require a High Speed Unwind test. These tests are conducted to determine the different unwind forces needed to unwind a roll of tape.

Make sure the load cell has been calibrated and is reading correctly before running a test.

The graph screen will be displayed after the completion of a test. The average, high, and low values will be displayed in addition to the graph. The statistics screen will display standard deviation, variance, work, elongation and length of roll if it is being measured.

The load cell samples at 400 times per second. Eight samples are collected, averaged, and stored as a data point. Therefore, a test will generate data points every 20 milliseconds.

A maximum of 10,000 data points can be saved with any given test.

## **MODES**

Tests can be run in three different modes – standard, step, or foot counter.

Standard mode will run the entire test at the entered test speed. If the test speed is greater than 200 feet per minute then a distance of 15 feet will be run prior to the test offset parameters to allow the motor time to accelerate to the test speed. The offset parameters include data start, data test, and test stop. Force measurements are saved during the “data test” distance of the test.

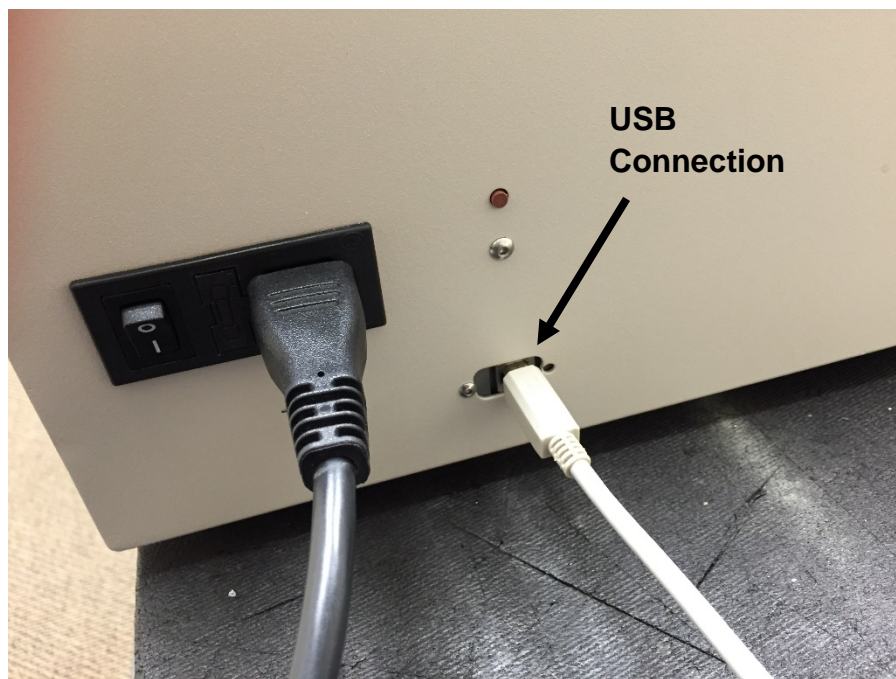
Step mode will begin by running at the entered test speed for the “data test” distance. Force measurements will be saved during this portion of the test. The remainder of the test will be run at 4800 inches per minute to measure the length of the roll.

Foot counter mode will unwind the entire roll of tape at the entered test speed. Force measurements will be saved during the entire test.

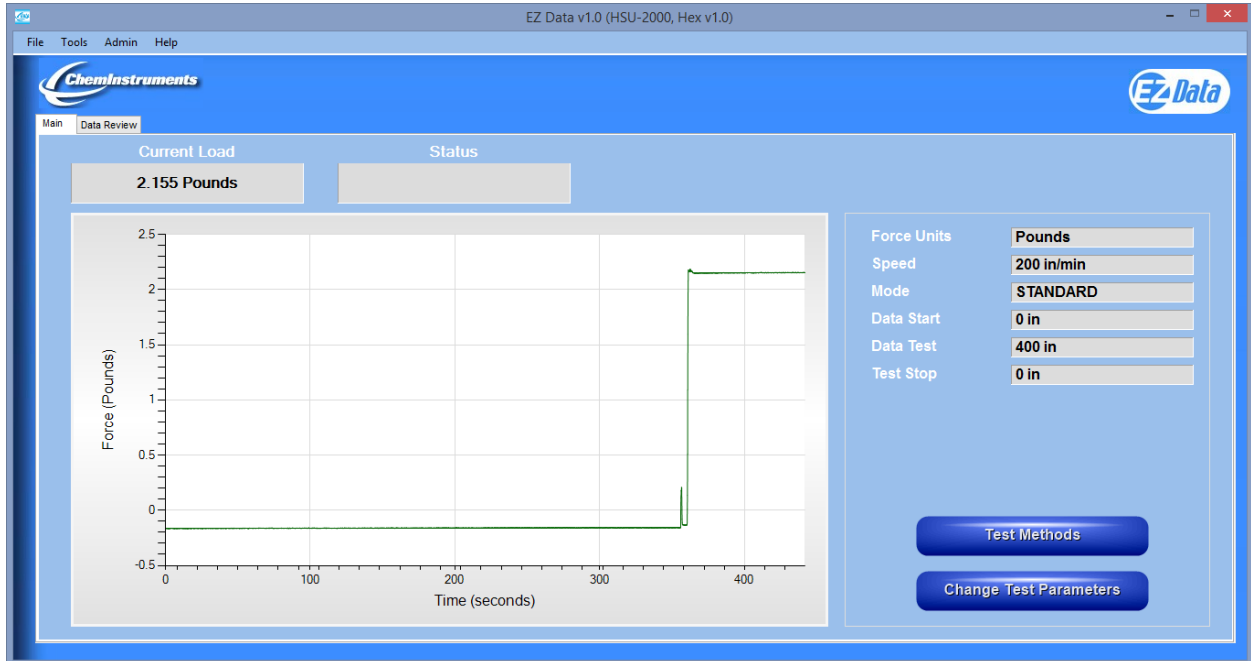
## EZ DATA SOFTWARE SYSTEM

EZ Data is a ChemInstruments program that runs on your computer and will allow you to interface to your ChemInstruments machine in order to save test data files, save raw test data to excel, graph and crop test data, tabulate test data files, and overlay test data files. Please refer to the EZ Data manual for specific information on how to use the EZ Data software system.

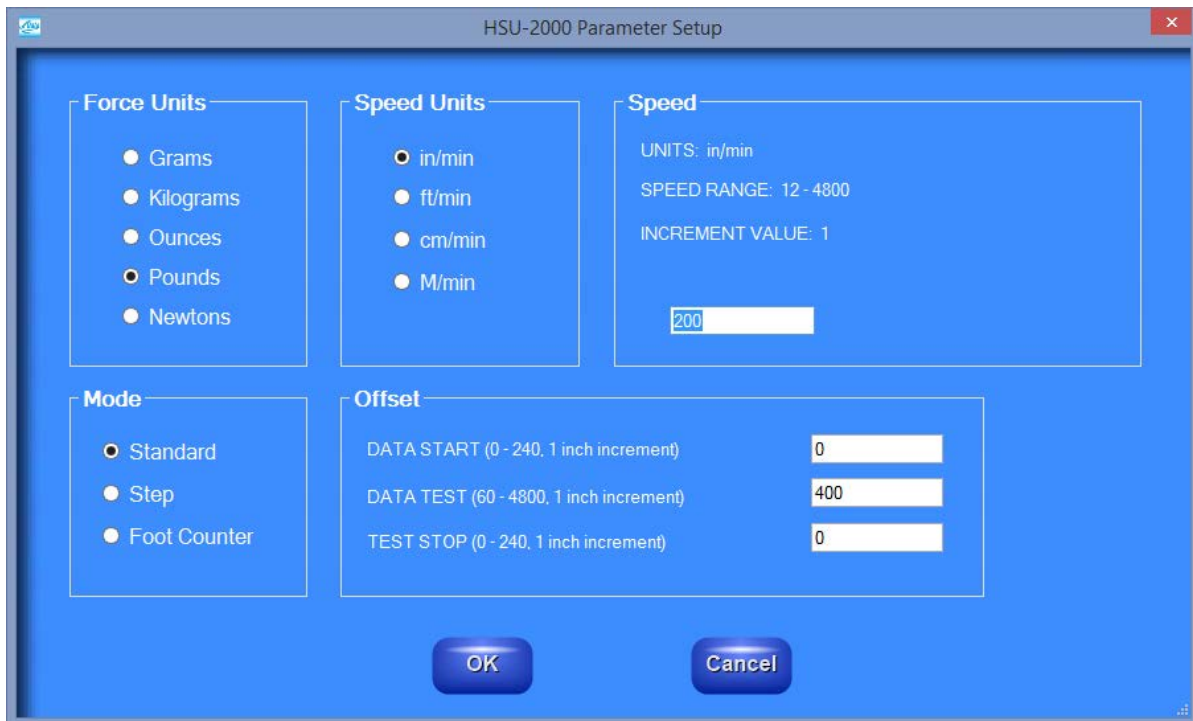
The HSU-2000 can be connected to your computer with a Type A-B, Revision 2.0 Compliant, USB cable.



The following picture is the main screen of EZ Data with a HSU-2000 connected. This screen will show the current load as a value and a real time graph as data is collected from the load cell. It shows the test setup parameters. It will also allow you to change the test parameters.



The following picture shows the HSU-2000 parameter setup.



## MAINTENANCE

### TROUBLESHOOTING

The troubleshooting chart describes some problems that may occur over time. After determining the problem, follow one of the following maintenance procedures.

#### Troubleshooting Chart

Problem	Possible Cause	Procedure
No Data collected	Display is in SETUP screen	Go to MAIN screen to run a test
Data measurement consistently low/high	Improper calibration	Check calibration and/or calibration angle
	Bad calibration	Refer to load cell calibration
Calibration drifts	Bad or damaged load cell	Replace load cell
Display is black.	Display is bad.	Replace display.
	Power switch is not ON.	Turn ON power.
	Power supply is bad.	Replace power supply.
	E-Stop is enabled.	Rotate E-Stop clockwise to disable.
Display is stuck at ChemInstruments logo.	Control board is bad.	Replace control board.

### MAINTENANCE PROCEDURES

As with any precision equipment it is important to provide care and maintenance to ensure proper performance and long life. General cleaning and care will ensure accurate test and trouble free performance.

## CLEANING THE TOUCH SCREEN

It's important to realize the touch panel is sensitive to chemicals.

**Specific Cleaning Information:** Use a soft, lint-free cloth. The 3M Microfiber Lens Cleaning Cloth is especially recommended for cleaning touch panels without requiring liquid cleaner. The cloth may be used dry or lightly dampened with a mild cleaner or Ethanol. Be sure the cloth is only lightly dampened, not wet. Never apply cleaner directly to the touch panel surface; if cleaner is spilled onto touch panel, soak it up immediately with absorbent cloth. Cleaner must be neither acid nor alkali (neutral pH). When using cleaner, avoid contact with the edges of the film or glass, and with the flex tail. Wipe the surface gently; if there is a directional surface texture, wipe in the same direction as the texture. Never use acidic or alkaline cleaners, or organic chemicals such as: paint thinner, acetone, toluene, xylene, propyl or isopropyl alcohol, or kerosene. Suitable cleaning products are commercially available pre-packaged for use; one example of such a product is **Klear Screen™** or commercially available off-the shelf retail brands such as **Glass Plus® Glass and Surface Cleaner** made by Reckitt-Benckiser. Use of incorrect cleaners can result in optical impairment of touch panel and/or damage to functionality.

**Note:** Most products contain 1-3% Isopropyl Alcohol by volume, which is within acceptable limits for Resistive Touch Panel cleaning use.

**Caution:** Many products contain Ammonia, Phosphates, and/or Ethylene Glycol, which are NOT ACCEPTABLE; check product content label carefully.