



HIGH SPEED RELEASE TESTER

MODEL HSR-2000

OPERATING INSTRUCTIONS

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CONTENTS

PRODUCT DESCRIPTION	3
SPECIFICATIONS.....	3
UNPACKING.....	4
ASSEMBLY.....	5
CONNECTING THE POWER CORD	6
KEY COMPONENTS	7
OPERATION.....	9
POWER UP.....	9
GRIP OPERATION.....	10
TOUCH SCREEN FORMAT.....	11
MACHINE SETUP	13
RUNNING A TEST	21
EZ DATA SOFTWARE SYSTEM	23
MAINTENANCE	26
TROUBLESHOOTING	26
MAINTENANCE PROCEDURES	27
CLEANING THE TOUCH SCREEN	27

PRODUCT DESCRIPTION

Congratulations on the purchase of your new ChemInstruments HSR-2000 High Speed Release Tester. This versatile, user-friendly, carefully designed instrument allows you to determine release values of adhesive laminates at various high speeds.



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:

- 2 modes of operation: constant speed and ramped speed testing.
- Selectable testing speeds.
- Separation angle of 180 degrees.
- 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 for details.

SPECIFICATIONS

Electrical	120/240 VAC, 50/60 Hz, 2 amps
Operating Temperature	32 – 150 degrees Fahrenheit (0 – 70 degrees Celsius)
Humidity	0 – 55% relative humidity
Speed	30 – 1000 feet/minute (1 foot increments) 9 – 304 Meters/minute (1 Meter increments)
Physical Dimensions	Width: 21 inches (53 centimeters) Depth: 11 inches (28 centimeters) Height: 14 inches (35 centimeters) Weight: 25 pounds (11 kilograms)

UNPACKING

ChemInstruments has made every effort to ensure that the HSR-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 HSR-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

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 HSR-2000 in an area where temperature and humidity are controlled to standard conditions of 72 ± 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 right 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.

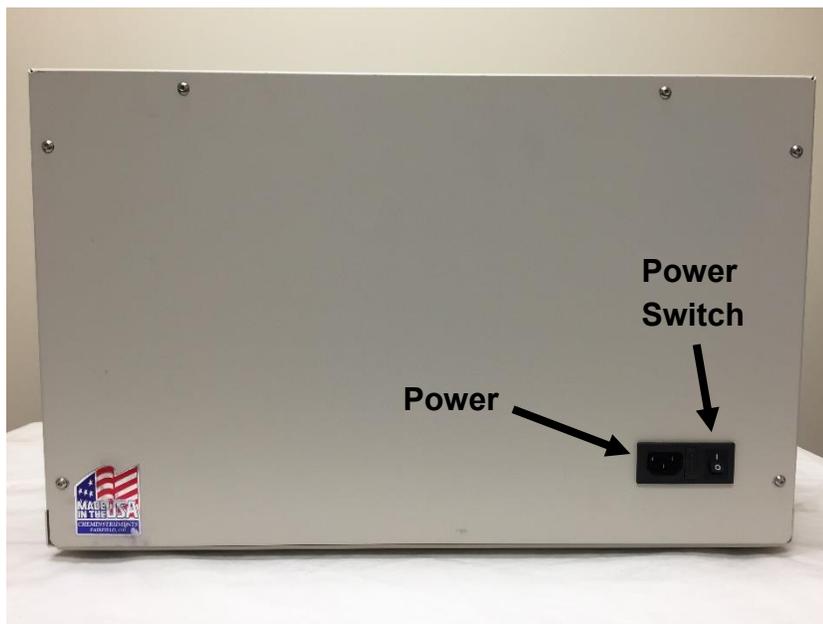


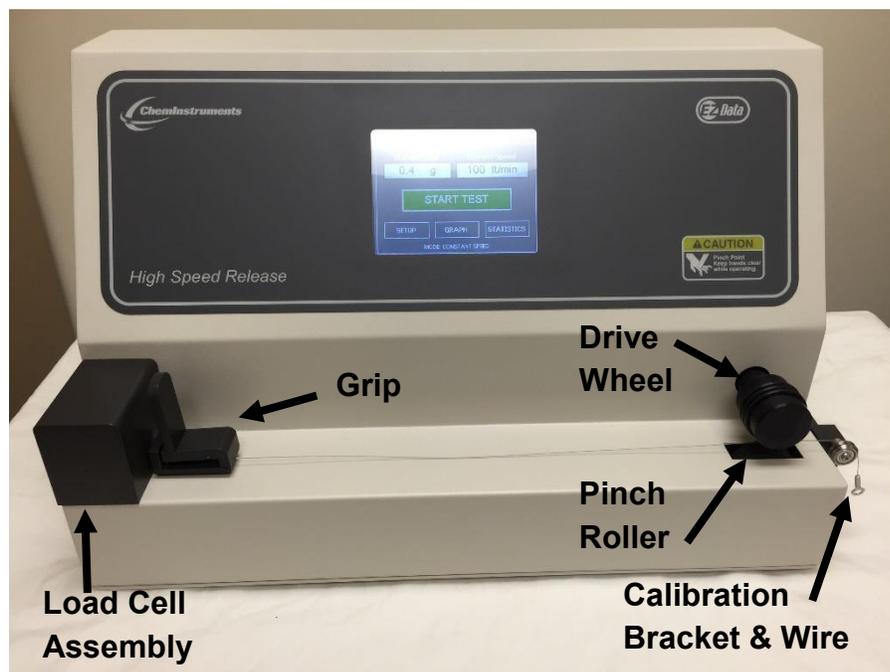
Figure 2



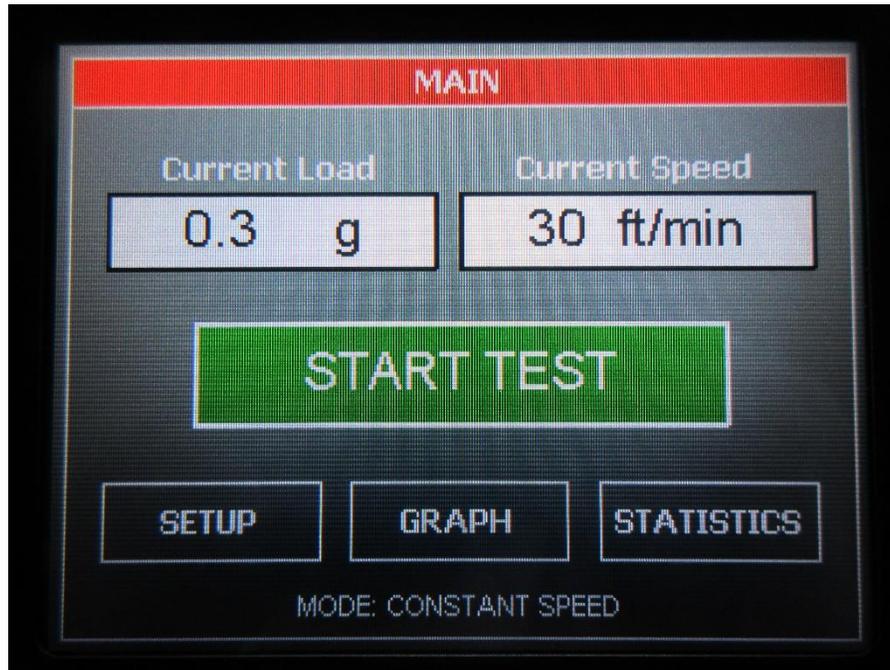
WARNING: Before proceeding with using the HSR-2000, it is advisable to become familiar with the Key Components. These Key Components and a brief description of their function follow in the next section.

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** measures the forces involved with a High Speed Release test.
- **LOAD CELL ASSEMBLY** consists of the mounting bracket for the load cell with grip.
- **GRIP** secures the free end of the test strip to the load cell.
- **CALIBRATION BRACKET and CALIBRATION WIRE** are used in the load cell calibration process.
- **DRIVE WHEEL** determines the speed of separation during the test.
- **PINCH ROLLER** pinches the test specimen against the Drive Wheel in order to separate the test specimen.



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



OPERATION

The release liner of a pressure-sensitive adhesive laminate sample is removed at high speed in order to simulate production conditions. This is accomplished by peeling the release liner or the adhesive substrate at a 180-degree angle and at a selected speed (from 30 – 1,000 feet per minute). An electronic load cell measures the release force, then feeds the information to a data acquisition unit. The data acquisition unit collects the test data from the load cell and stores this information in memory for use in calculating the maximum, minimum and average values.

The HSR-2000 is designed to regulate the speed of the load cell's sampling in accordance with the speed of the test. The rate of data sampling will be adjusted to provide 400 data samples regardless of the test speed. The setting of the speed does the adjustment of the sampling rate automatically.

POWER UP

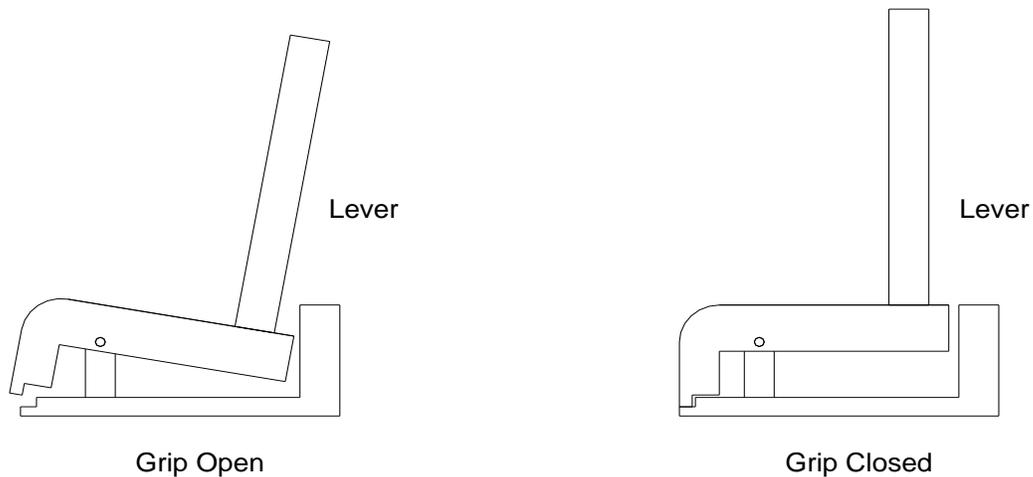


WARNING: Operating temperature for this equipment is 32 to 150 degrees Fahrenheit (0 to 70 degrees Celsius). The equipment needs to be completely free of condensation, inside and out, before applying power.

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.

GRIP OPERATION

The grip opens by pinching the top lever. Insert the free end of the sample into the open grip while pinching the top lever. The spring action of the grip will close the top jaw of the grip down to the bottom.



NOTE: The grip is attached directly to the load cell. Do not move the grip sideways or up and down. When opening and closing the grip, support it with one hand and operate the lever with the other hand to avoid damaging the load cell. For proper operation of the load cell it is necessary for the grip to be mounted with a space between the load cell housing and the grip. **DO NOT TIGHTEN THE GRIP AGAINST THE LOAD CELL HOUSING.**

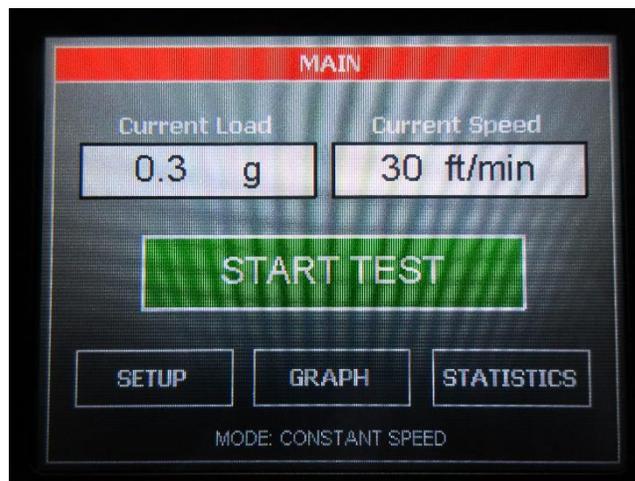


WARNING: Rotating the Grip on the threaded mounting rod, causing the Grip to come in contact with the wall of the load cell housing will damage the load cell. There must be a physical gap maintained between the Grip and the load cell housing for the load cell to function correctly.

TOUCH SCREEN FORMAT

MAIN SCREEN

- **Current Load** – displays the force currently measured by the load cell.
- **Current Speed** – displays the set speed of the drive roll.
- **Start Test** – will run a test sequence.
- **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.
- **Mode** – will indicate which mode is currently set. The mode is either Ramp Speed or Constant Speed.

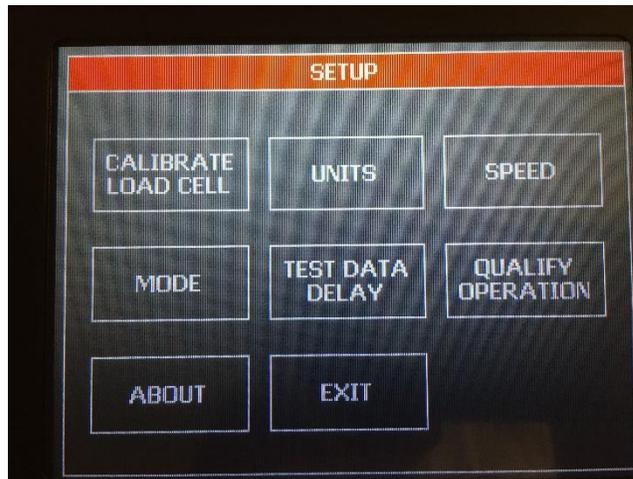


SETUP SCREEN

- **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 drive wheel speed.
- **Mode** – is used to select the constant speed mode or ramp mode.
- **Test Data Delay** – is used to add a delay to the acquisition of test data.
- **Qualify Operation** – is used to troubleshoot hardware problems with the HSR-2000.

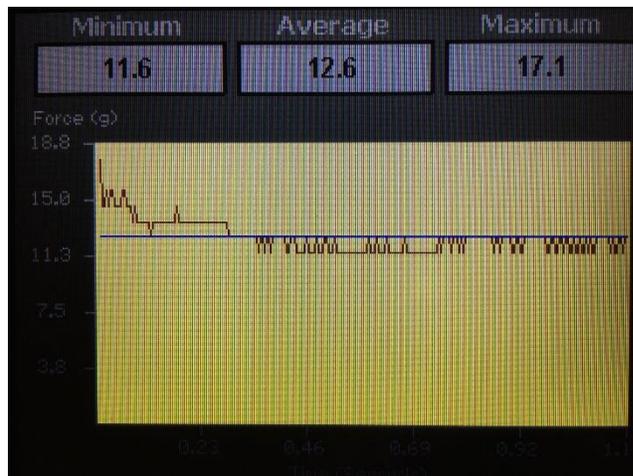
- **About** – is used to retrieve the machine’s software version and control board’s hardware revision.
- **Exit** – go back to the main screen.

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.



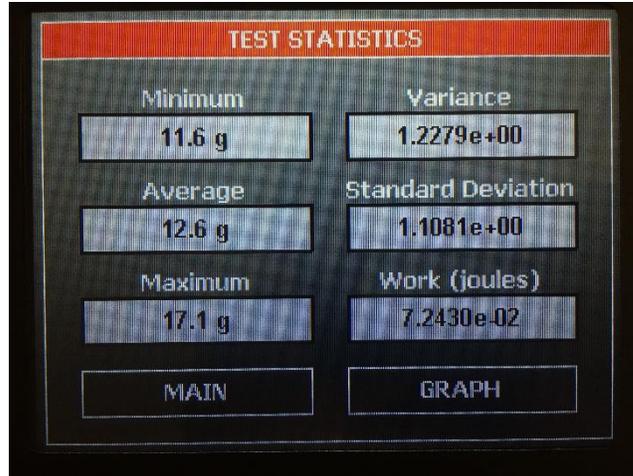
GRAPH SCREEN

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

The statistics screen will display the minimum, maximum, average, variance, standard deviation, and work of the last test.



MACHINE SETUP

LOAD CELL CALIBRATION

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 HSR-2000. This procedure should be followed upon first use of the HSR-2000 and whenever necessary thereafter. The following is the step-by-step procedure for calibrating the load cell.



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

LOAD CELL CALIBRATION PROCEDURE

1. Move the calibration bracket/pulley into the calibration position. See photo below.
2. Place the knotted end of the calibration wire in the jaw of the grip taking care to keep the wire in a straight line from the grip to the pulley. Run the wire over the pulley so that a calibration weight can be attached to the end of the wire. See photo below.
3. Select SETUP from the main screen.
4. Select CALIBRATE LOAD CELL from the setup screen.
5. The first screen in the calibration process describes the 2 point calibration process. Select OK to continue.
6. 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.
7. 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.
8. Set the high calibration value by selecting CHANGE and entering the value of the weight in grams and select ENTER.
9. Make sure that the calibration weight is completely at rest and then select OK.
10. The display will show the main screen and the current reading of force will be displayed under CURRENT LOAD.
11. Verify the calibration by hanging a different calibration weight on the calibration wire.
12. Repeat the calibration procedure if necessary.
13. Move the calibration bracket/pulley into the test position when finished with the calibration procedure. See photo below.

Pulley Bracket - Calibration Position



Calibration Setup



Test weight position during calibration



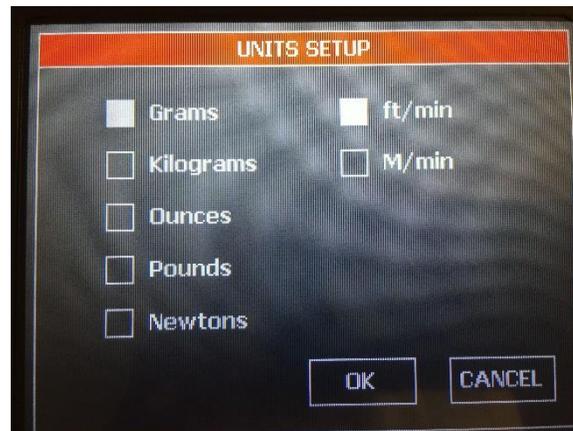
Pulley Bracket - Test Position



FORCE AND SPEED UNITS

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

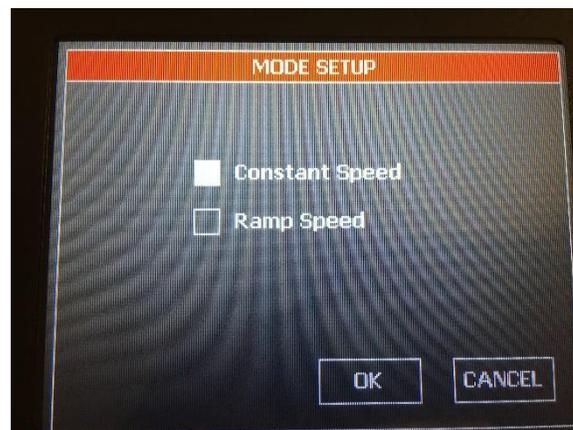
1. Select SETUP from the main screen.
2. Select UNITS from the setup screen.
3. Select the desired units. Select OK to confirm the entered units.



MODE

The HSR-2000 can be operated in a constant speed mode or a ramp speed 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

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

Constant Speed Mode

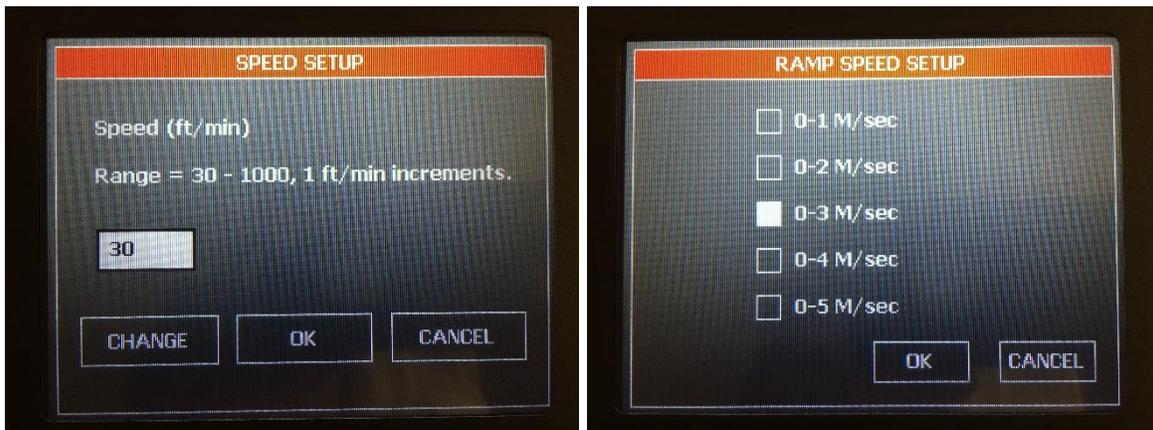
To perform a test correctly, it is necessary to set the speed of the drive roll in accordance with the selected test method. The following is a step-by-step procedure for setting the speed in constant speed mode.

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.

Ramp Speed Mode

The ramp speed is always defined in the M/sec units. The following is a step-by-step procedure for setting the ramp speed.

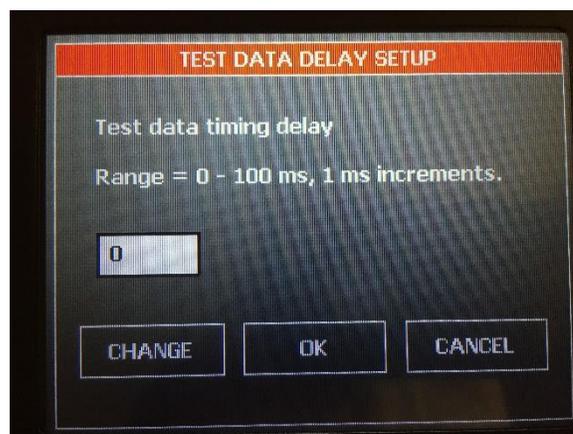
1. Select **SETUP** from the main screen.
2. Select **SPEED** from the setup screen.
3. Select the box next to the desired ramp speed. Select **OK** to confirm the ramp speed.



TEST DATA DELAY

The acquisition of test data can be delayed to accommodate the testing of different material types. The following is a step-by-step procedure for setting the test data delay.

1. Select SETUP from the main screen.
2. Select TEST DATA DELAY from the setup screen.
3. Select CHANGE and enter the desired test data delay and press ENTER. Select OK to confirm the entered value.

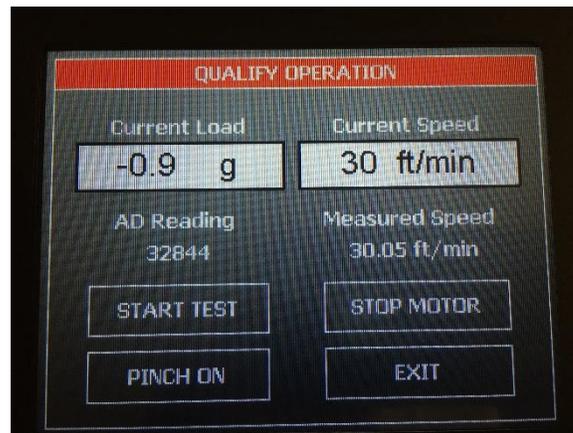


QUALIFY OPERATION

Some of the hardware functions of the HSR-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 drive roll. If measuring the speed of the drive roll with a hand tach, then the tach must be placed on one of the rubber o-rings to accurately measure the speed.
- **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 drive roll as measured by the control board.
- **Start Test** – will run a test at the set speed. The pinch roller will not engage so that a test can be simulated with a weight hanging to verify the load cell calibration if necessary.
- **Start/Stop Motor** – will start or stop the motor so that the speed can be verified with a hand tach.
- **Pinch On/Off** – will engage and disengage the pinch roller for hardware verification.



RUNNING A TEST

High-speed release tests are performed according to the FINAT Test Method number 4. The HSR-2000 will accommodate test samples with dimensions of 2" wide and at least 32 inches in length. The sample is prepared for either a release pull or adhesive pull at 180 degrees. Approximately 18 inches of test material must be removed in order to provide a "lead" that is placed between the pinch roller and the drive roller. If you are testing the release liner removed from adhesive, then it is the adhesive and substrate that must be removed to expose the "lead" of release liner (See Figure 3 & 4). If you are testing the adhesive removed from release liner, then it is the release liner that must be removed to expose the "lead" of adhesive and substrate (See Figure 3 & 4). Samples need to be prepared according to the following drawings for proper operation of the test.

Make sure the load cell has been calibrated and is reading correctly.

The HSR-2000 is designed to regulate the speed of the load cell's sampling in accordance with the speed of the test. The rate of data sampling will be adjusted to provide 400 data samples regardless of the test speed. The setting of the speed does the adjustment of the sampling rate automatically.

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, and work.

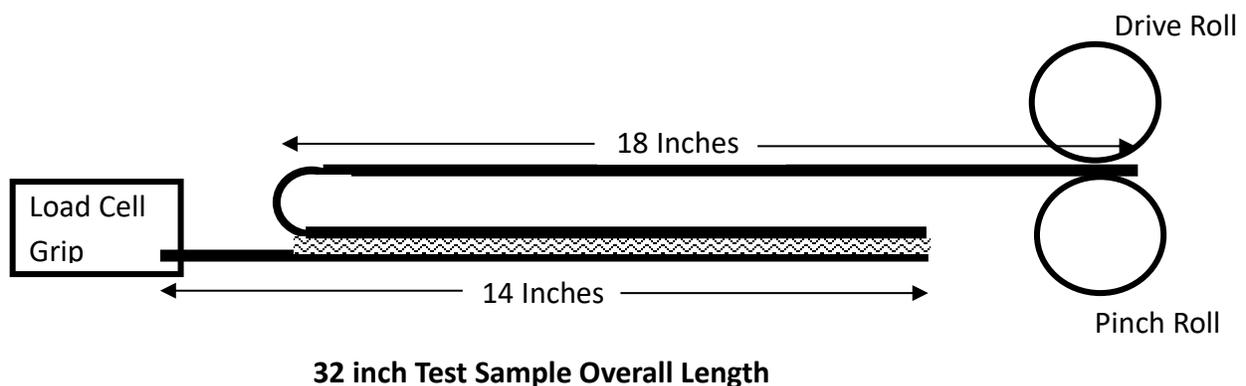


Figure 3



Figure 4

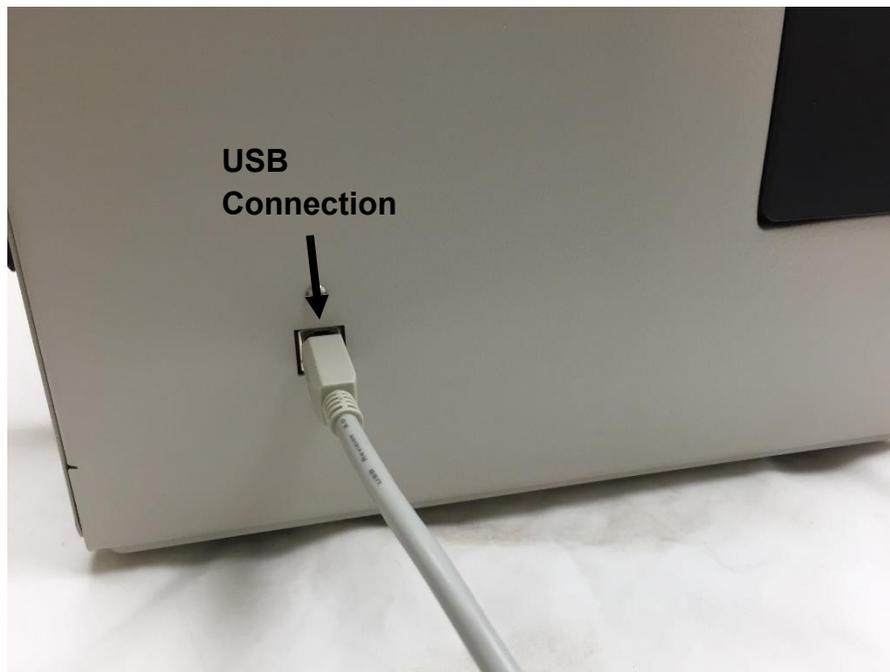
NOTES:

- Constant speed tests will start the motor, wait for the motor to get to speed, then engage the pinch roller to allow the sample to be peeled at the set speed.
- Ramp speed tests will engage the pinch roller and then start the motor at 0 and ramp the speed at the set ramp rate to allow the sample to be peeled at the ramp speed.
- The TEST DATA DELAY parameter will allow for delaying the acquisition of data the defined number of milliseconds.

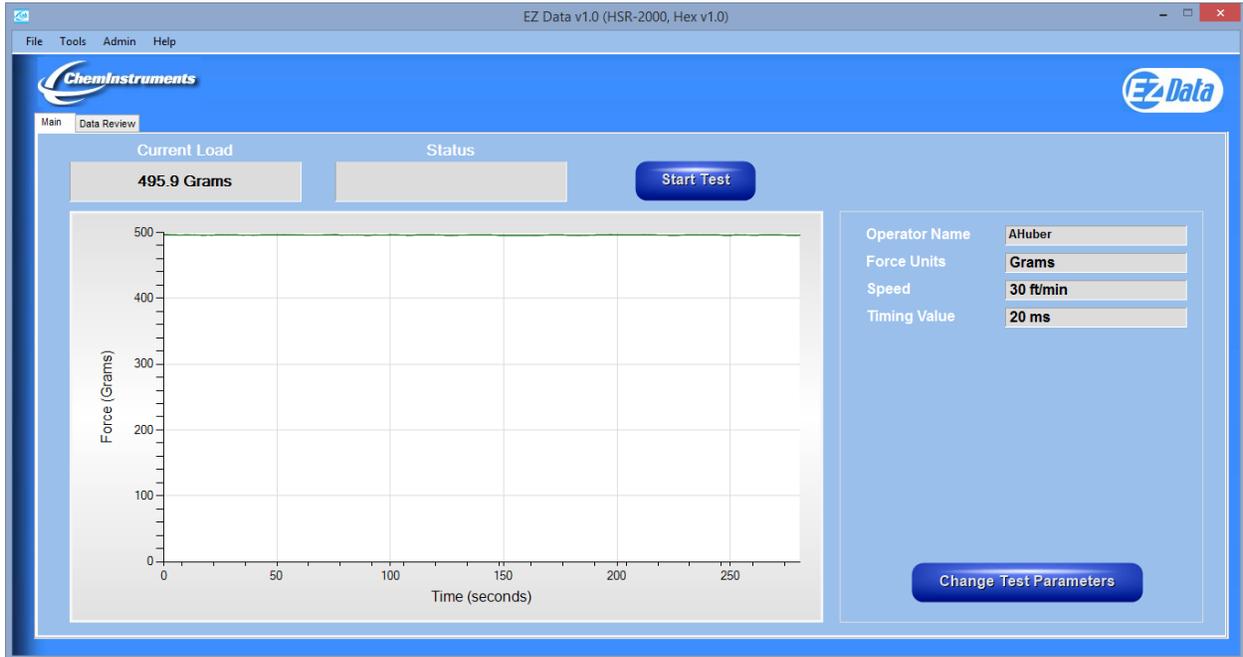
EZ DATA SOFTWARE SYSTEM

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.

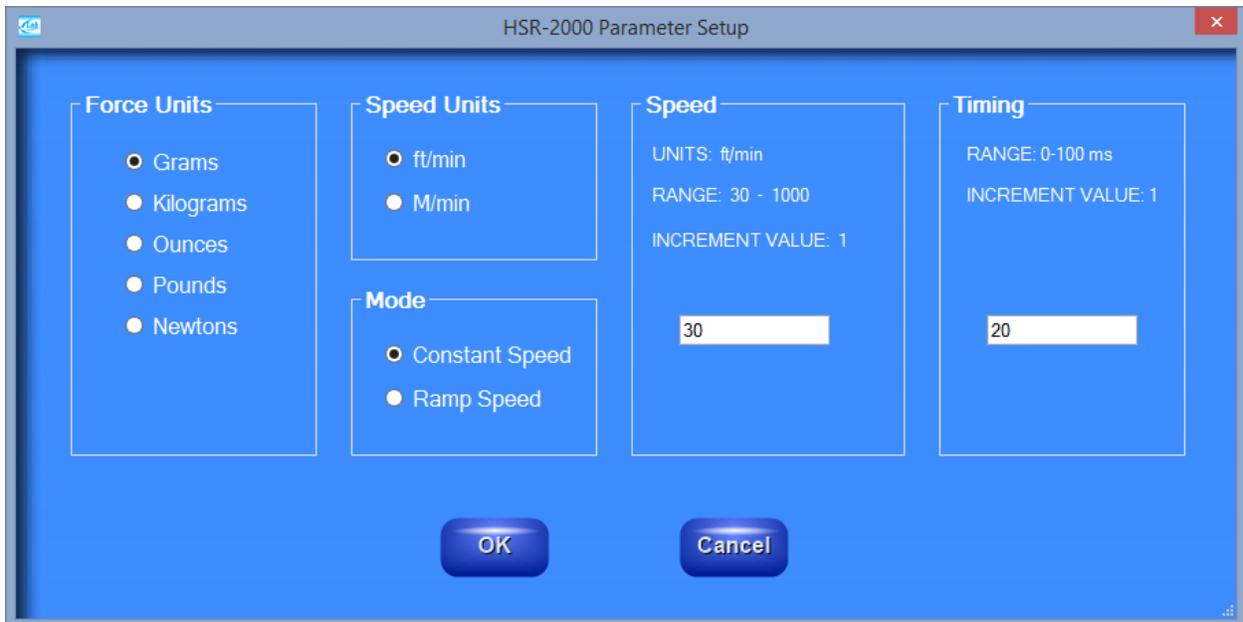
The HSR-2000 can be connected to your computer with a Type A-B, Revision 2.0 Compliant, USB cable.



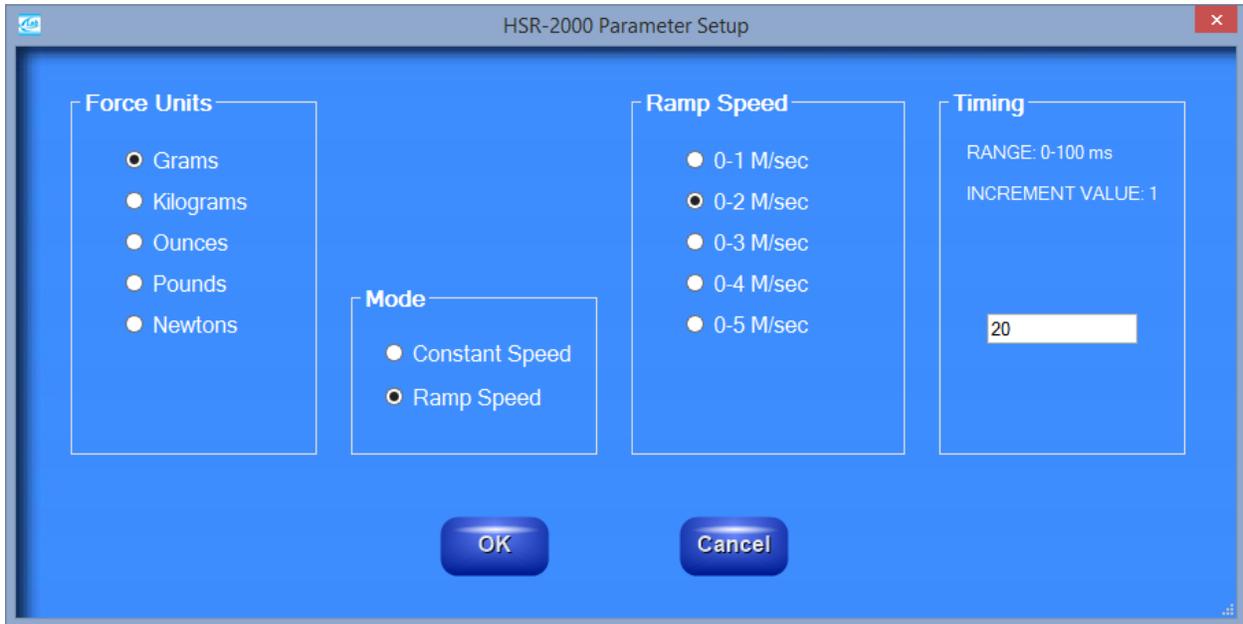
The following picture is the main screen of EZ Data with a HSR-2000 connected. This screen will show the current load as a value and a real time graph as data is collected from the load cell. It shows the test setup parameters. It will also allow you to change the test parameters.



The following picture shows the HSR-2000 parameter setup in constant speed mode.



The following picture shows the HSR-2000 parameter setup in ramp speed mode.



The graph displayed for tests run in ramp speed mode will also display the speed measured during the test.



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
	Sample is not attached to the load cell	Attach sample to load cell per drawing
Test material slips or does not move.	Sample is wrong length	Refer to test method
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.
Display is stuck at ChemInstruments logo.	Control board is bad.	Replace control board.
Pinch, drive rolls do not engage	Solenoid not working.	Replace solenoid.
	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 along with keeping the drive and pinch rolls clean 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.