Hercules Sizing Tester - Rev 3.0-01 Firmware - Operation Instructions

Rev 3.0-01 firmware adds several features to the Hercules Sizing Tester.

1. Switching into Service Mode And back to Normal Mode without powering down the HST.

2. Machine History is displayed in the Service Mode.

3. Improved RS232 communications

4. Demo Mode.

5. Automatic Display Dimming.

6. ReCalibration.

1. CHANGING MODES:

The Hercules Sizing Tester (HST) by the Aderhold Firm, Inc. HST has two modes:
    Normal Mode (used for ink and paper testing), and
    Service Mode (used for machine setup).

Normal Mode is used for running sizing tests. **Normal Mode** has only one screen on the display, and the markings on the control panel around the display window indicate what the items shown on the display are.

Service Mode is used for altering the machine's setup, resetting the lamp timer when changing lamps, showing the machine's history, observing the machine's data, and for recalibrating the machine. **Service Mode** has 14 different screens on the display. Each screen shows prompts for what to do. Read the **Service Mode Screens** section for details, and some extra features there was not enough room to indicate in the on-screen prompts. The markings on the control panel around the display window do not apply.

When the HST is turned on it enters Normal Mode. Entering Service Mode was formerly done by holding the CALIBRATE button while turning on the HST. Exiting the Service Mode was done by turning off the HST, then turning it back on to get back into Normal Mode. Those methods still work.

Now it is also possible to change modes without cycling power and thus without incurring a brief warm up setting period after doing so. The preferred method is to use a sequence of button presses to change modes.

HOW TO: Turn on the HST. It is in Normal Mode. **Press and hold the CALIBRATE button.** (In Rev 3.0-01-if the CHANGE LAMPS message appears, it is no longer necessary to wait 1 second for it to go away.) **While still holding CALIBRATE press & release the SILENCE button three times, then release the CALIBRATE button after the screen changes.** The front panel lights will blink while doing that, and the buzzer will signal success with a coded beep pattern. The HST will switch to Service Mode.

Service Mode begins with a "Banner Screen". The banner screen is recognizable as the only display screen that is in ALL CAPITAL LETTERS.

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To switch from Service Mode to Normal Mode, the Service Mode banner screen must be showing. Then use exactly the same button press sequence that was used to get into Service Mode – hold CALIBRATE, press & release SILENCE 3 times.   The HST switches back to Normal mode. The front panel lights will blink while doing that, and the buzzer will signal success with a different coded beep pattern.

2. SERVICE MODE SCREENS:

The various Service Mode screens allow changing some things and displaying the machine's History.

An important function in Service Mode **is Reset the Lamp Timer**. That should be done right after changing lamps (installing new light bulbs).

In the Service Mode the various screens (there are 14) are seen one at a time by pressing the SILENCE button, as the banner screen prompts. SILENCE cycles through the screens forward (to the next higher numbered screen in the list below). To cycle through the screens in reverse, press the TEST button. SILENCE and TEST may be pressed in any order, such as going back and forth between two screens. TEST may be pressed first after switching to Service Mode to go directly to the last Service Mode screen.

New Service Mode screens show machine history. In those screens, nothing can be changed by the user. They are for information.

In all Service Mode screens where something can be changed, the CALIBRATE button is involved in making changes. For the Buzzer Mode and Verbose Mode screens, the knob can be used instead of the CALIBRATE button to make changes.   SILENCE And TEST buttons (when pressed alone) change to another Service Mode screen.

Here are all the Service Mode screens:

1. **Banner Screen** - Normally the banner screen will say SERVICE MODE. If the DEMO MODE has been selected, then it will say DEMO MODE. Whatever it says, if it is the Service Mode banner screen, **ALL THE TEXT OF THE BANNER SCREEN IN BOTH LINES WILL BE IN CAPITAL LETTERS.** All capitals happens only in the Service Mode banner screen.

2. **Buzzer Mode** – Selects how long the buzzer beeps at the end of an ink and paper test. Has no effect on all the other short beeps. Buzzer mode may be changed by pressing the CALIBRATE button once or several times. New to Rev 3.0-01, it may also be changed by turning the % Reflectance knob. Turning the knob while in this screen will NOT alter the selected set point used in normal mode for sizing tests.

3. **Verbose Mode** - (Terse, Verbose 1, Verbose 2, and Verbose 3. See details below in the RS232 section). Verbose mode may be changed by pressing the CALIBRATE button once or several times. New to Rev 3.0-01, it may also be changed by turning the % Reflectance knob. Turning the knob while in this screen will NOT alter the selected set point used in normal mode for sizing tests.

4. **Power Up Count** – A history screen, shows how many times the HST has been turned on. No changes can be made in this screen.

5. **Machine On Time** - A history screen, shows how much total time that the HST has been powered up. In Rev 2.8-04 and later versions the storage space for this history is larger than in prior versions so the number accumulated during a normal machine lifetime will not exceed the storage space. The firmware also handles upgrade to the larger storage space automatically when installed in place of an earlier

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version. Rev 2.8-07 fixed a mistake that would occur once every 10,000+ hours of use, in the accumulated history recorded, which would make the history falsely gain an extra 10,000+ hours. No changes can be made in this screen.

6. **Lamp Changes** - A history screen, shows how many times the lamps have been replaced. This number increases by one each time the lamp timer is reset. Reset the lamp timer when lamps (light bulbs) have been replaced, To experiment with resetting the lamp timer and changing the lamp changes count without actually altering them see the Demo Mode for a way to experiment and practice with lamp timer resets without upsetting the true machine history. No changes can be made in this screen. Resetting the lamp timer is in another Service Mode screen.

7. **Lamp Time** - A history screen, shows how long the lamps have been powered up since the last lamp timer reset. No changes can be made in this screen.

NOTE: Both Machine On Time and Lamp Time are updated every ten minutes of machine operation. So, the numbers won't change for ten minutes. See the Demo Mode for a way to see the timers change with less waiting time.

8. **Lamp Changes Message** - This screen reminds a user that the lamps are good for 200 hours of use. Additionally, it tells the user that either 200 hours of lamp use has not expired yet, or that it has expired. (See the lamp time screen for how much time has expired.) No changes can be made in this screen.

9. **Reset Lamp Timer** - This screen allows a user to reset the lamp timer (or the DEMO MODE lamp timer if in Demo Mode). Press and hold the CALIBRATE button for 10 seconds to reset the lamp timer. A front panel light will blink during the 10 second wait. After the wait expires, the timer is reset and the user is prompted to push the TEST button, which takes the user back to the Service Mode banner screen. It is also possible to just turn off the power and start over after resetting the lamp timers as was done with older versions, but that method is not preferred. Lamp Timer Reset goes back to the Service Mode banner screen to enable changing back to Normal Mode from there. See CHANGING MODES, above..

10. **Detailed Version** - This screen shows the detailed firmware version, the major version with dash number and sub version. For information only, no changes can be made in this screen.   Starting with Rev 2.8-07 the full major version and subversion is shown (2.8-07) in most screens that formerly displayed just the major version (2.8), including the screen seen at power up before any buttons are pressed. It also gives the date the version was completed. For this version of Firmware it will say

```
 FIRMWARE VERSION
 3.0-01  2019-05-25
```
No changes can be made in this screen.

11. **Raw Sensor Data** - This screen shows the raw sensor data, also called raw data, Reference sensor to the left (R=), Measurement sensor to the right (M=). No changes can be made in this screen.

The correct range of Raw Sensor Data (Raw Data) is different with Rev 2.8 (this applies to Rev 2.7 also), compared to the range shown in the Hercules Sizing Tester manual section 6 page 2, which applied to Rev 2.5 and prior versions. With the white tile placed on the HST, raw data values should be from **0800 to 2400** for both Reference and Measurement channels.
*This specification **supersedes** the spec in older HST manuals (applying to Rev 2.5 and older versions of firmware) saying "Reference channel ... should read between 3000 and 4000, and, Measurement channel ... reads between 500 and 4000".* Circuit changes made, beginning with Rev 2.6, were made that required changing the raw data spec.

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Examples of good white tile raw data:

```
| Raw Sensor Data |   | Raw Sensor Data |   | Raw Sensor Data |
|  R=1458 M=0983  |   |  R=1634 M=1716  |   |  R=2034 M=1274  |
```

12. **Reflectance Percentage Display** - This screen is much like the Normal Mode reflectance display, with the CALIBRATE button setting whatever is on top of the HST dish window to 100.0%. It is now possible to go back and forth between raw sensor data and reflectance percentage without powering down the HST (and incurring additional warmup settling time) and without switching back and forth between Service Mode and Normal Mode. This Reflectance display in Service Mode feature is in Rev 2.7 also.

13. **Reflectance Percentage Display And Raw Sensor Data**- This screen shows both the reflectance percentage in the bottom row at the left, and shows the raw sensor data simultaneously, Reference sensor in the top row at the right (R=), Measurement sensor in the bottom row at the right (M=). The CALIBRATE button is used to set the item on the dish window to 100.0% reflectance.

This screen works together with the next ReCalibrate screen when ReCalibrating the HST .

This screen works has two History functions, added in Rev 3.0-01.

History dump: Press and hold CALIBRATE, press and release SILENCE, then release CALIBRATE. This will cause the RS232 to immediately send the history list. A solid block character will appear briefly in the middle of the display's bottom row, indicating the history dump happened.

History mode change: Press and hold CALIBRATE, press and release TEST, then release CALIBRATE. A short height capital H character will appear and stay on in the middle of the display's bottom row. The HST will stop the RS232's continuous dump of raw data readings. To resume the Service Mode continuous RS232 raw data dump just repeat the hold CALIBRATE and press TEST press button sequence, and the short height capital H character will disappear. Or switch to another Service Mode screen by pressing just SILENCE or just TEST.
When the continuous Raw Data dump is stopped, a History dump done by the above hold CALIBRATE and press SILENCE button sequence will send a modified history list. It will have at the end 11 raw data readings, covering from 0 to 1.0 second, each reading taken 0.1 second apart. This is especially useful for capturing from the RS22 a clean history list. Note that the file captured should be copied to a file with a new name and should then be edited to include the HST's serial number, and the date, and the conditions under which the history is taken. Tiles readings can be taken and added to the end of the history capture file copy also.

14. **ReCalibrate**- The RecCalibrate screen (ReCal) is a new feature in Rev 3.0-01. It enables more accurate HST operation, and improves the matching of reflectance readings of several HSTs. During Calibration and Qualification it is no longer necessary to just record what an HST reads for it tiles values. Now the HST can be adjusted to read the correct tiles value. This screen is a bit more complex to operate than can be explained in an onscreen prompt, so its upper line says
ReCal See Instructs.
meaning read these instructions.

This screen's lower line shows the % Reflectance reading, and shows a mathematical constant in the formula that calculates reflectance called CalibrationFactor, and abbreviated CF on the screen. Turning the % Reflectance Set Point knob in this screen forces the reflectance reading to change, changing it up or down depending on which way the knob was turned, by 0.1% for each click of the knob. After each change of reflectance the CF is recalculated to the value that will maintain that adjusted reflectance reading. The new CF value can then be saved.

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The full screen look similar to this:
```
ReCal See Instructs.
   45.2%  CF=+0.8633
```

After the ReCal screen, the next screen is back to the #1 Service Mode Banner screen.

7. RECALIBRATION:

The #14 **ReCalibrate** screen works together with the #13 screen **Reflectance Percentage Display And Raw Sensor Data**. The SILENCE and TEST buttons switch back and forth between the two screens.

Place the calibration tiles on the HST, white side down. Go to the #13 screen Reflectance and press the CALIBRATE button to set the white tile reading to 100.0%. The next two steps may be done in either order: Turn the tiles over to green side down, and press SILENCE to go the #14 ReCal screen. The green tile reading will show. Just ahead of the CF= there will be a centered dot illuminated. If that dot is not illuminated, then adjustment cannot be done. The likely causes of that is either the tiles did not get turned over from white to green, or the green tile inadvertently got set to read 100% by the CALIBRATE button being pressed while in screen #13, Reflectance.

The ReCalibration cannot be done while reading the white tile at 100.0%. ReCalibration does not change the white tile reading. It can change the green tile reading. To do so accurately, the white tile must be reading 100.0%. If not, repeat the change to screen #13 Reflectance by pressing TEST, and set the white tile reading to 100.0% by pressing CALIBRATE. These steps may be repeated as needed to get good readings. While in screen #14, the tile can be turned over to read both the white side and the green side reflectances. However the white side reading cannot be set to 100% by pressing CALIBRATE in screen #14 ReCal. That must be done in screen #13 Reflectance. That is why screen #14 ReCal works together with screen #13.

After getting the white tile reading 100.0%, and the green tile's reflectance reading showing in screen #14 ReCal, and the dot showing to the left of CF=, turn the knob (% Reflectance Set Point) to change the green tile reading to its correct value. For example, if the green tile is reading 45.2%, and should read 45.0%, turn the knob two clicks counterclockwise. That will reduce the green tile reading by 0.2%, and a new value for CalibrationFactor will show in the CF= section.

If just observing how screen #14 ReCal works, but not actually wanting to change the HST's calibration, the change can be abandoned by switching to another screen besides #13 or #14, by pressing SILENCE or TEST to change screens. When returning to screen #14, the prior readings including the former CF= number, will reappear.

To save the changed calibration after turning the knob in screen #14 ReCal, press the following sequence of buttons: Press and hold CALIBRATE, then press SILENCE, then release SILENCE, then release CALIBRATE. Actually, the buttons may be released in either order. They must be pressed in the correct order. Upon the release of the CALIBRATE button, the save of the new CALIBRATION factor will be done. A letter **U** (for User) will briefly flash where the dot was to the left of CF=. It will be saved to the UserCalibrationFactor (UCF) and will thus alter the Calibration of the HST's reflectance readings for future readings of both tiles and paper and ink. The HST will continue to use the CalibrationFactor thus set, even if powered down and powered up again later, until the CalibrationFactor is changed again. If the save didn't happen due to incorrect button pressing sequence, or the flashed U was missed, just repeat the button sequence to do the Save To UCF again.

CalibrationFactor can be changed at any time, but likely it will be most useful to do so after changing the lamps

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to a new set of lamps (light bulbs). Let the new lamps warm up for at least 20 minutes before ReCalibrating the HST.

There are two CalibrationFactors stored in the HST's memory. The UCF UserCalibrationFactor, set by the procedure above, and the OCF OfficialCalibrationFactor. The OCF is set by the manufacturer when the HST is new, and OCF will be set adjusted again when the HST is later returned for re-qualification to the manufacturer, or recalibrated by an authorized agent of the manufacturer.

At the time OCF is set, via a proprietary procedure, the UCF is set to the same value. The UCF is always the active value providing the CalibrationFactor used by the HST. Users may change the UCF if they deem the HST to be out of calibration with readings of their tiles.

The OCF OfficialCalibrationFactor may be returned to use at any time by doing a Revert To OCF step. Press and hold CALIBRATE, then press TEST, then release TEST, then release CALIBRATE. Actually, the buttons may be released in either order. They must be pressed in the correct order. Upon the release of the CALIBRATE button, the save of the new CALIBRATION factor will be done. A letter **R** (for Revert) will briefly flash where the dot was to the left of CF=. The OCF will be copied to the UserCalibrationFactor (UCF) and will thus alter the Calibration of the HST's reflectance readings for future readings of both tiles and paper and ink. The Revert step returns the HST to factory calibration. The HST will continue to use the CalibrationFactor thus set, even if powered down and powered up again later, until the CalibrationFactor is changed again. If the Revert didn't happen due to incorrect button pressing sequence, or the flashed **R** was missed, just repeat the button sequence to do the Revert To OCF again.

The change of tiles reading and save to UCF requires the small dot to the left of CF= to be present, and use of the calibration tiles. The Revert To OCF does not require the dot, nor use of the tiles.

When doing a Revert To UCF it is normal to have the tiles present, set the white to read 100.0% in screen #13, go to screen #14, turn the knob to adjust the tiles reading, do the Save To UCF step. That can be preceded or followed by a Revert To OCF step to see how much the green tile reading changes. A lot of change might indicate an HST in need of cleaning or service. If the Revert TO OCF step does not produce a good tiles reading, just turn the knob and do the Save To UCF again. The Revert step overwrites any UCF set by the user. But a new UCF setting can be quickly done again after a Revert To OCF. Turn the knob for the right tiles reading and do Save To UCF.

Correct green tile reading: For tiles with a range of readings specified on the label on the tiles pouch, the correct reading is 0.5% higher that the lower number (and 1.5% less than the higher number). For example, if the tiles pouch label says 44.3% - 46.3% then the correct reading is 44.3% + 0.5% = 44.8%. Set the HST to read 44.8% in the above steps and Save To UCF. NOTE: That is true only if the HST has been recalibrated by the manufacturer with Rev 3.0-01 firmware installed, and the tiles returned with the HST for that recalibration. If a single reflectance percentage is marked on the tiles edge, that is the correct reading for that set of tiles.

4. RS232:

RS232 communications in the HST serves two purposes.
1. With the HST in Normal Mode it gives data from a sizing test, in one of four Verbose Modes.
2. With the HST in Service Mode it gives machine data and history

RS232 data is outward only from the HST. The HST does not do anything with RS232 data sent to the HST. The outward data from the HST has no handshaking controls. All data sent by the HST must be captured as it happens, or it will be lost.

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The RS232 data comes out at 19,200 bits per second, also called 19,200 baud (or baud rate). Its format is 8 data bits, no parity and one stop bit. These settings are not changeable. Set your data capture program to match this format and data rate.

The cable used to capture the data is a simple RS232 Extension cable. One end of the cable will be male, the other end female. The cable connectors will have 9 contacts at each end. Several such cables may be plugged together end to end to get more length. Cables up to 50 feet total length will work. Such extension cables normally have 9 wires connected, each contact of one connector wired to the same pin number at the other connector. There are no jumpers at either connector. The cable has no crossover connections going to different pin numbers at the two ends. It is not a Null Modem cable. It is an Extension Cable. Only two of the wires in the cable are used by the HST. Pins 2 and 5 are used. Pin 2 at one end connects to pin 2 at the other end, and pin 5 at one end connects pin 5 at the other end.

The RS232 data may be captured using an RS232 capture program such as RealTerm on a Microsoft Windows computer.

5. RS232 In Normal Mode, Verbose Modes:

What was called **Verbose Disabled** in Rev 2.5 is now called **Terse** in Rev 2.8-01 and later versions. It sends only the test time at the end of test – just one number.

What was called **Verbose Enabled** is now **Verbose 1.** It is fully compatible with the Rev 2.5 Verbose mode, including the minor errors like data order mixup in the second line and reversed Line Feed/Carriage Return sequences. It is still as shown in the older digital HST manual. It is there for users who already have a setup that receives data from a Rev 2.5 HST. Their setup will still work if they upgrade to Rev 2.8-01 or any later version.

New in Rev 2.8-01 and later versions is **Verbose 2.** It gives more complete information and is formatted so that if captured into a file, that file will be in "csv" format (comma separated values) suitable for a spreadsheet. Just load the file into Microsoft Excel or Open Office Calc as a "csv" file. Select comma (only) in the spreadsheet as the delimiter character.

Here is an example of Verbose 2 RS232 output:

```
Hercules Sizing Tester V3.0-01
www.HerculesSizingTester.com
Calibrated
Test Started
 Over ,12, Reflectance= ,100.0, %, Threshold= ,80.0, %, Time=     ,0.0, Seconds
 Over ,12, Reflectance=  ,99.6, %, Threshold= ,80.0, %, Time=     ,1.0, Seconds
 Over ,12, Reflectance=  ,95.2, %, Threshold= ,80.0, %, Time=     ,2.0, Seconds
 Over ,12, Reflectance=  ,92.7, %, Threshold= ,80.0, %, Time=     ,3.0, Seconds
 Over ,12, Reflectance=  ,91.4, %, Threshold= ,80.0, %, Time=     ,4.0, Seconds
 Trip ,11, Reflectance=  ,89.9, %, Threshold= ,80.0, %, Time=     ,4.8, Seconds
Under ,10, Reflectance=  ,88.7, %, Threshold= ,80.0, %, Time=     ,5.0, Seconds
Under ,10, Reflectance=  ,81.5, %, Threshold= ,80.0, %, Time=     ,6.0, Seconds
Under ,10, Reflectance=  ,78.2, %, Threshold= ,80.0, %, Time=     ,7.0, Seconds
Test Halted
```

Rev 3.0-01 adds a Verbose 3 mode. It is the same as Verbose 2, except that for the first ten seconds, the data comes every 0.1 second (ten readings per second). After 10 seconds of the fast 10 samples per second, it

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changes to one sample every second, just like Verbose 2, The faster data samples during the first ten seconds of a sizing test enables more accurate graphing of the ink pour reflectance changes right at the start of a sizing test, and better graphing of sizing test that run very quickly, taking just a few seconds. It can also help with determining optimum set point for translucent papers that give a large drop in reflectance when ink is poured into the sample holder.

Here is an example of Verbose 2 RS232 output, during the first 1.4 second:

```
Hercules Sizing Tester V3.0-01
www.HerculesSizingTester.com
Calibrated
Test Started
 Over ,12, Reflectance= ,100.0, %, Threshold= ,80.0, %, Time=    ,0.0, Seconds
 Over ,12, Reflectance=  ,99.6, %, Threshold= ,80.0, %, Time=    ,0.1, Seconds
 Over ,12, Reflectance=  ,99.1, %, Threshold= ,80.0, %, Time=    ,0.2, Seconds
 Over ,12, Reflectance=  ,98.4, %, Threshold= ,80.0, %, Time=    ,0.3, Seconds
 Over ,12, Reflectance=  ,97.9, %, Threshold= ,80.0, %, Time=    ,0.4, Seconds
 Over ,12, Reflectance=  ,97.8, %, Threshold= ,80.0, %, Time=    ,0.5, Seconds
 Over ,12, Reflectance=  ,97.7, %, Threshold= ,80.0, %, Time=    ,0.6, Seconds
 Over ,12, Reflectance=  ,87.6, %, Threshold= ,80.0, %, Time=    ,0.7, Seconds
 Over ,12, Reflectance=  ,87.5, %, Threshold= ,80.0, %, Time=    ,0.8, Seconds
 Over ,12, Reflectance=  ,87.4, %, Threshold= ,80.0, %, Time=    ,0.9, Seconds
 Over ,12, Reflectance=  ,87.4, %, Threshold= ,80.0, %, Time=    ,1.0, Seconds
 Over ,12, Reflectance=  ,87.3, %, Threshold= ,80.0, %, Time=    ,1.1, Seconds
 Over ,12, Reflectance=  ,87.3, %, Threshold= ,80.0, %, Time=    ,1.2, Seconds
 Over ,12, Reflectance=  ,87.2, %, Threshold= ,80.0, %, Time=    ,1.3, Seconds
 Over ,12, Reflectance=  ,87.2, %, Threshold= ,80.0, %, Time=    ,1.4, Seconds
Test Halted
```

Spreadsheets may use the "csv" format data from either Verbose 2 or Verbose 3 in exactly the same manner.

It may be desirable to copy the text file of captured data and change its file name extension from .txt to .csv. After opening the .csv file in a spreadsheet program, such as Excel or Libre Office, SaveAs the spreadsheet to a spreadsheet format such as .xlsx or .ods. Don't save it back to the .csv file, especially if creating graphs, or they may be lost by the incorrect save to .csv.

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Here is the same data in a spreadsheet with appropriate columns and with the commas removed, done by simply loading the captured file (with a **.csv** filename extension) into a spreadsheet program:

Calibrated											
Test Started											
Over	12	Reflectance=	100	%	Threshold=	90	%	Time=	0	Seconds
Over	12	Reflectance=	99.6	%	Threshold=	90	%	Time=	1	Seconds
Over	12	Reflectance=	95.2	%	Threshold=	90	%	Time=	2	Seconds
Over	12	Reflectance=	92.7	%	Threshold=	90	%	Time=	3	Seconds
Over	12	Reflectance=	91.4	%	Threshold=	90	%	Time=	4	Seconds
Trip	11	Reflectance=	89.9	%	Threshold=	90	%	Time=	4.8	Seconds
Under	10	Reflectance=	88.7	%	Threshold=	90	%	Time=	5	Seconds
Under	10	Reflectance=	81.5	%	Threshold=	90	%	Time=	6	Seconds
Under	10	Reflectance=	78.2	%	Threshold=	90	%	Time=	7	Seconds
Test Halted											

The units are included but are automatically placed in separate columns.

6. RS232 In Service Mode, History:

The service mode provides RS232 output, regardless of which Terse or Verbose mode is chosen.
Here is a typical Service Mode screen.

```
------------------------------
Hercules Sizing Tester V3.0-01
www.HerculesSizingTester.com

Times are updated every 10 minutes.

Number Of Power Ups =      398

Machine Operation Time = 43,601 Hours, 00 Minutes

Number Of Lamp Changes (= Number Of Lamp Timer Resets) =       0

Lamp Operation Time = 10,100 Hours, 10 Minutes
 Replace lamps, and reset lamp timer, when lamp time exceeds 200 hours.

Test Complete Action [Buzz Mode 35] = Flash 2 Seconds

Verbose [Mode 3] = Readable & CSV, Fast

Reflectance Setpoint = 80 %

Official Calibration Factor OCF = +1.4704  UCF can be reverted to OCF.
    User Calibration Factor UCF = +1.4704  Always Active.  UCF is adjustable.Raw

Data  R = 1442  M = 0966 ; Uncalibrated Reflectance =   96.5 %
```

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The last line repeats at a fast rate, overwriting itself.

After accomplishing CALIBRATION, the last line will look like this:

`Raw Data  R = 1442  M = 0966 ;   Calibrated Reflectance =  100.0 %`

Whenever data shown above the bottom line changes (from timers increasing, or from a user changing a selection, after a brief delay the entire Service Mode screen is re-sent. It will be sent every ten minutes due to the lamp timer advancing every ten minutes.

7. DEMO MODE:

Because lamp resets are done so seldom, and for several other reasons, Rev 2.8-01 and later versions have a DEMO MODE as part of the Service Mode, which allow practicing resetting a dummy lamp timer instead of the real lamp timer. The real timer keeps on counting time in the background correctly while the DEMO MODE showing speeded up dummy times is in effect.

In the DEMO MODE, the 10 minute timer updates are done every 30 seconds (thus racking up an indicated 60 minutes in the demo timers in just 3 minutes of actual time). That makes it reasonable to watch the History screen timers change without a long wait.

In DEMO MODE, all history values shown are artificial and always start with the same numbers when entering DEMO MODE.

To enter the DEMO MODE, first enter the Service Mode and have its banner screen showing (it is the only screen having ALL CAPITAL LETTERS). Then, hold the CALIBRATE button, and press & release the TEST button three times. The banner screen will change from saying SERVICE MODE to DEMO MODE.

While in DEMO MODE, a short height capital D will appear in the upper left corner of most screens. The Banner Screen will say DEME MODE.

To Exit DEMO MODE do the same steps – Go to the Banner screen with ALL CAPITALS, hold the CALIBRATE button, and press & release the TEST button three times. Demo Mode is also exited if power is turned off. Demo mode will not be active when power is turned on.

While in DEMO MODE, try all the Service Mode screens. Try a lamp timer reset, and watch the effect of it. Try it again! Switch to Normal Mode and run tests or measure tiles. Switch back to Service Mode and DEMO MODE will still be in effect. Exit DEMO Mode and see the true machine history in the Service Mode screens.

The true history time record continues to be updated normally, once every 10 minutes, while in DEMO MODE. But the history screens show a false and faster advancing history while in DEMO MODE. After exiting DEMO MODE, the true history will be shown.

There is no harm in leaving the HST in DEMO MODE for a long time. Even if switching to Normal Mode while DEMO MODE remains in effect, the timing of ink and paper tests is not affected. That timer is not sped up by the DEMO MODE.

When in DEMO MODE, the ReCalibrate steps can be done, but the values of CF "saved" will not actually be used. The HST is not actually ReCalibrate while in DEMO MODE.

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8. DISPLAY DIMMING:

For longer display life, Rev 2.8-01 and later versions reduce the brightness of the display after a long period of inactivity. After 30 minutes of no button presses by the user, the display brightness is reduced. That enhances the display's life in those situations where the HST is left powered up for very long times. Press any button and the display immediately goes to full brightness.

In DEMO MODE within the Service Mode, due to the speeded-up demo timers, the display will go dim if no buttons are pressed for 1.5 minutes.

In the Normal Mode, the display will never go dim during a running sizing test, no matter how much time the sizing test takes. Not even if the HST was left in DEMO MODE while in Service Mode. After a sizing test is halted, the display will dim after 30 minutes of no further activity.

9. NEW BUZZER MODES:

Rev 2.8-05 and later versions has more user selectable options for the end of sizing test buzzer action than prior versions have. An option of continuous buzz (no time out of the sound) was added. For each of the available times (0.5 second, 1 second, 2 seconds, 5 seconds, 10 seconds, 20 seconds, 10 minutes, and Continuous (no time out of the sound), there are three additional choices. The original constant Beep, a new Warble sound which make the buzzer more audible in noisy environments, and a Flash mode with the same sound as the Warble mode, but after a few seconds the display flashes brightly also, to give better visual indication that a sizing test is done. While the display is flashing, the sizing test results can still be read. For short buzzer times, the flashing starts when the beeping stops. For longer buzz times, the flashing starts after 5 seconds of beeping. The flashing runs continuously, until either the SILENCE or the CALIBRATE button is pressed. It will also stop if the reflectance set point is dialed down to a lower number to get a second sizing test time from the same start of test moment with the same inked paper sample. One choice is Flash 0Sec (No Beep). It makes not sound (zero beep time) and begins flashing immediately at the end of a sizing test and like the other Flash choices continues to flash the display until stopped by the user. See Buzzer Mode under Service Mode Screens, above, for how to change the Buzzer Mode.