

Schleuniger 6D Hardness Tester

Operating Manual for Version 4.11



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1. INTRODUCTION AND OVERVIEW OF 4.11 FEATURES

Welcome to the Schleuniger family. We hope you will find our products are of excellent quality, and that they will provide years of faithful service. Please read this manual carefully. It will provide you with all the information you need to operate the 6D Tablet Hardness Tester.

This introduction provides a review of 6D features and capabilities. You will find it useful in becoming familiar with the 6D. Operating instructions are given in later sections.

Most words found in *italics* can be found in the Glossary at the back of the manual. These definitions are provided for your convenience.

General Information

Your 6D will allow you to measure tablet breakage in *Newtons, Kiloponds, Strong Cobbs, or Pounds Apothecary*. Up to 100 measurements can be taken and stored for statistical analysis.

The 6D computes the *Mean, Standard Deviation, Relative Standard Deviation, Minimum, Maximum, and Range* of your data. Statistical data may be printed in graphical form using the graphics option. You can define a valid range (*plausibility*) for measurements, which eliminates unacceptable values from the statistics.

The 6D has three *Input/Output (I/O)* ports for communication with the outside world. The optional keyboard or *host-terminal* allows the user to enter product information, plausibility limits, and configuration information. The printer port connects the 6D to any Epson compatible *serial* printer. A *host port* allows the 6D to be attached to any serial terminal, allowing information to be passed between the 6D and a host computer (hence, the term *host-terminal*).

Your 6D has a powerful *micro-processor* based control board. The micro-processor controls the operation of the machine, and computes the statistics for the tablet measurements. The hardness readings are taken from a *load cell*, and converted into the appropriate units. Available unit scales are newtons, kiloponds, strong cobbs, or pounds apothecary. The units are set by means of a switch on the back of the machine. Refer to appendix C for conversion factors for the scales.

Printer and Statistics

An RS232 (serial) I/O printer port is a standard feature available on all 6D testers. If a printer is connected, and configured, statistics are computed and printed for each test. Up to 100 tablets may be tested over a period of time, and included in a set of statistics. A set of statistics for up to 100 tablet readings will include:

- Product Name
- Product Number
- Batch Information
- A Comment
- Machine Calibration Date
- Date of the Test
- Time when the Test Begins
- Low Limit for Valid Measurements
- High Limit for Valid Measurements
- The Test Values (values outside the low-high limit are underlined)

When the Test is Complete, the 6D will print:

- Test-Stamp Number
- Number of Valid Measurements Taken
- Mean
- Minimum Valid Measurement
- Maximum Valid Measurement
- Difference between Minimum and Maximum Valid Measurements
- Standard Deviation
- Relative Standard Deviation

Up to 4 Graphs:

For less than 20 measurements, the 6D will plot the:

- 1) Data Graph and
- 2) Histogram

For 20 or more measurements, the 6D will plot the:

- 1) Group Data Graph,
- 2) Range Chart, and
- 3) Histogram

Optionally, for 20 or more measurements, the operator may cause the Data Graph to be plotted, in addition to the 3 normal graphs.

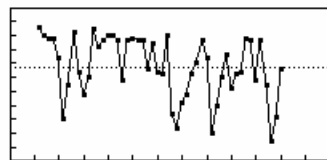
The time when the Test is Completed

The Test-Stamp Number is printed with each graph, to help correlate multiple page printouts. The Test-Stamp may be reset to 1 when necessary.

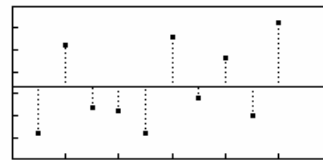
See appendix G for examples of 40 and 80 column test statistics. The following figure shows examples of the four types of plots.

6D Statistical Plots

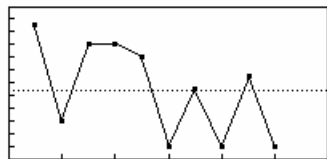
R 4.11



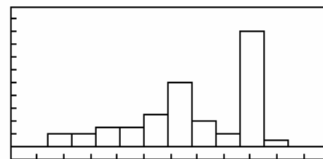
Data Graph



Range Chart



Group Data Graph



Histogram

The upper left plot is a graph of all the data in your set of samples. Each dot on the graph represents one sample. The dotted line across the graph is the average of all samples.

In the lower left plot, titled "Group Data Graph," each dot represents the average of five (5) samples. The first dot is the average of the first five samples, and so on. The line across the graph is the average of all the samples.

The Range Chart plots the difference between the highest and lowest measurement in each group of five values. The horizontal line across the graph is the average of the differences.

Finally, the Histogram shows the distribution of samples for a test. If a sample's hardness falls between two values, it falls in the bin corresponding to those two values. The bins are determined automatically depending on the highest and lowest measurements, and the maximum number of bins is ten (10).

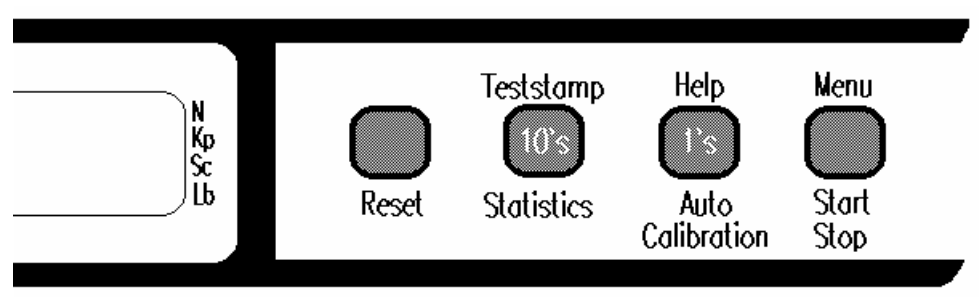
Host Terminal Port

A host/terminal RS232 (serial) port is provided to connect the 6D to a computer or *dumb terminal*. A keyboard port is also provided. The keyboard is available from Schleuniger Pharmatron as an option. Any RS232 compatible serial terminal, tty, or modem can be attached to the host-terminal port, as long as the serial parameters (baud rate, etc.) are set correctly. The host-terminal or keyboard can be used to program the 6D with configuration information.

Front Panel Buttons

Four panel buttons are provided on the front of the machine:

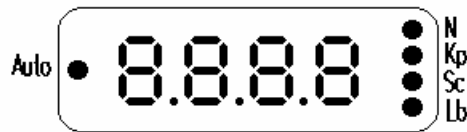
- 1 Reset
- > 2 Statistics - Time/Date - Teststamp - 10's
- > 3 Auto - Calibration - Help - 1's
- > 4 Start - Stop - User Menu



As you can see, three of the buttons have multiple functions. Read the section on **Machine Operation** to find out more about their functions. The RESET button restores the machine to power up condition, and all testing in progress is cancelled.

Front Panel Display

Measurement readings and other information are displayed on the red display panel. This display will also indicate which unit-scale the machine is configured for, and whether it is operating in Auto or Manual mode.



The 6D red numerical display, with units and mode indicators.

Pressing Jaw

Tablets are placed in the jaw in the center of the machine. The right side of the jaw holds firm (the load-cell is behind it), and the left side moves out to break the tablet. Various jaw adapters are available for specific applications.

Summary of New 4.11 Features

Operators familiar with the 3.0 version of the 6D should also read this manual, since revision 4.11 has significant changes that affect machine operating procedures.

Revision 4.11 of the Schleuniger 6D hardness tester provides a user upgrade with several new exciting features. A summary of the new features is given here.

USER MENU

This feature allows configuration of the machine using either the front panel or the keyboard-host/terminal. Holding the START button for 2 seconds accesses the menu. When using a keyboard or host/terminal, you can access the user menu and other functions from the programming mode.

BUTTON OPERATION

All operations are accessed at the touch of a button. Multiple operations are accomplished by either pressing a button momentarily, or by pressing and *holding* the button.

GRAPHS

Statistical graphs are now plotted (when selected) on either a 40 or 80 column Epson compatible printer.

CALIBRATION VERIFY

Calibration may be verified, using any of the four units scales, without re-calibrating the machine.

CALIBRATION WARNING

If the machine was calibrated more than 6 months before the present date, the message "LAST CALIBRATION WAS MORE THAN 6 MONTHS AGO" will be printed after the header on each test printout. Schleuniger Pharmatron, Inc. (SPI), recommends re-calibration of the 6D at least once every 6 months.

FASTER OPERATION

Tablets may be tested as fast as the operator can go. As many as 50 tablets in *5 minutes!* The printer baud rate has been increased to 4800 baud, allowing faster printouts. (*Baud* is the term for *bits per second*, used when discussing serial communication speed.)

ADJUSTABLE TESTING PROCEDURE

During testing, the delay between each test and the "*backoff distance*" may be adjusted. The user can set these 6D parameters for a "comfortable" testing procedure.

AUTOMATIC OPERATION

Tablet diameter is determined automatically. 999 is displayed when a test is started. The jaw moves out, and the first tablet is touched to determine the testing diameter. After that, testing proceeds normally.

TEST TRACKING

A Test-Stamp number (starting with 1) will be printed out with each test. This helps with multiple page printouts. The Test-Stamp number can be reset to 1 whenever necessary.

FACTORY DEFAULTS

Factory defaults may be restored by selecting User Menu item #10. This provides a quick method of configuring the machine quickly without setting each parameter individually.

EASY NUMBER SETTING

The 10's and 1's place of a number may be set separately, which is especially useful for large numbers. If you hold the 10's/1's buttons, the number will cycle through its possible values.

KEYBOARD FRIENDLY

All menu items may be configured from the keyboard or host computer. The current value of the entry is displayed when setting a parameter. Then, if ENTER is pressed, no change is made to the data. Thus, an operator can view the currently programmed values without modifying them.

AUTO UNIT LIMITS

When the units of measure are changed, and RESET is pressed, the lower and upper limits are set to the widest appropriate range for that unit. (For example, Strong Cobbs were chosen, the limits would be set to 0.1 and 56.7 on a 400 N machine.)

HELP

The user menu may be printed out for quick reference.

CONFIGURATION STATUS

The current machine configuration (or setup) may be printed out.

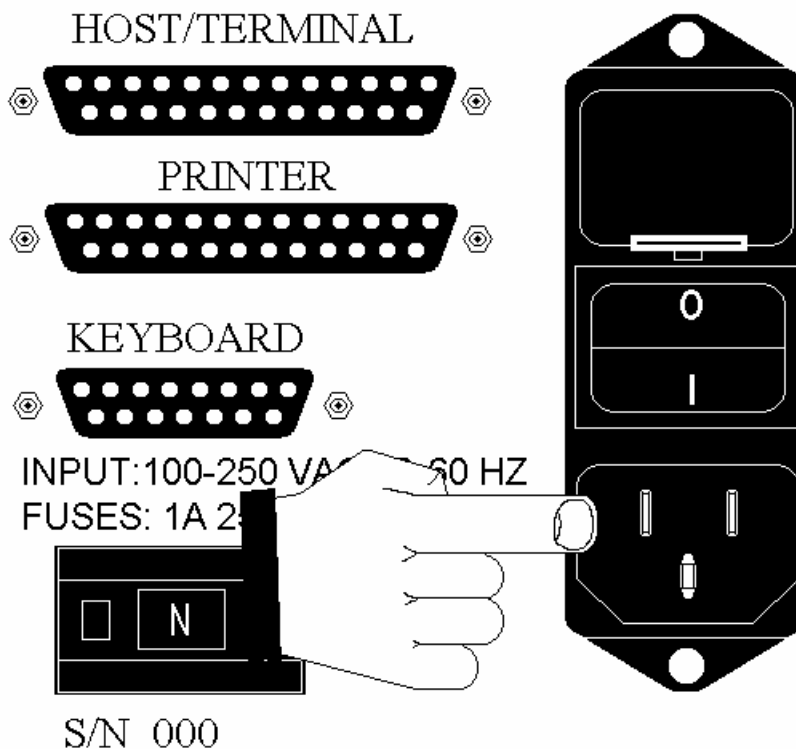
2. SETTING UP THE 6D FOR OPERATION

This section guides you through the general procedures involved in setting up the 6D tablet hardness tester, along with optional peripherals. You may need a small screwdriver or other simple tools to aid in the setup.

Power Cable Installation

The 6D must be supplied with A/C power from a 110 or 220 volt outlet. The appropriate cable for your power supply is included which also plugs into the back of the 6D.

The AC power cord socket is located as shown here:



6D A/C connector socket.

Make sure the power switch, located above the A/C socket is off. The number '0' will be displayed on the switch.

2.2

Plug the female end of the power cord into the A/C supply socket on the back of the 6D. Plug the other end of the cable into the A/C power supply.

Connecting the Serial Printer

If you purchased the serial printer option, you can connect the printer with the 6D for statistical printouts. The printer should be either a 40 or 80 column Epson compatible printer. For your convenience, several different types of printers are supplied by SPI. You will need the appropriate cable for your printer. If you purchased your printer from Schleuniger, the correct cable was included with your printer, and the printer was configured for the correct communication parameters before shipping.

Each printer has several options, which need to be set correctly for the operation to be successful. All settings were made prior to shipment, so you should only have to connect the printer and turn it on to begin using it. In the event that printer configuration is not correct, the following information will be useful.

The 6D uses the following serial parameters for the printer:

XON/XOFF protocol
4800 Baud (factory default)
8 Bits
No parity

* NOTE : The version 3.0 printer baud rate was 1200 baud, not 4800.

TM300 Factory Defaults:

The *DIP (dual in line package)* switches on the bottom of the machine allow the printer to be set to various modes. The factory default settings for the printer, as shipped from Schleuniger, are:

Switch #	1	2	3	4	5	6	7	8
	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF

These switch settings configure the printer for the following parameters:
Errors ignored, 1 Kbyte buffer, XON/XOFF, 8-bits, No parity, 4800 baud.

* If you need more information, consult the "*TM300 Operator's Manual*" included with your printer.

Shinwa Factory Defaults:

The DIP (dual in-line package) switch settings for the Shinwa printer, as shipped from Schleuniger:

- 1) On the back of the printer, next to the serial connector port:

Switch #	1	2	3	4	5	6	7	8
	ON	ON	ON	ON	OFF	OFF	OFF	OFF

- 2) On the top of the printer, on the right side: (remove the panel)

Switch #	1	2	3	4	5	6	7	8
	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF

These switches have various functions. Refer to the "*Peripheral Printer Operation Manual*" included with your Shinwa printer, or talk to someone familiar with RS232 serial communications protocol. If you need to change the baud rate for the Shinwa printer, you need to take the cover off the printer. Refer to the printer owner's manual.

2.4

Seikosha SP-2000S Factory Defaults:

If you received a Seikosha SP-2000S printer from Schleuniger, the internal DIP switches should be set as follows:

BANK 1

<u>Switch #</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
	ON	ON	ON	OFF	OFF	OFF	OFF	OFF

BANK 2

<u>Switch #</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
	OFF	ON	ON	OFF	OFF	OFF

Brother M-1109 or Centronics GLP-II Factory Defaults

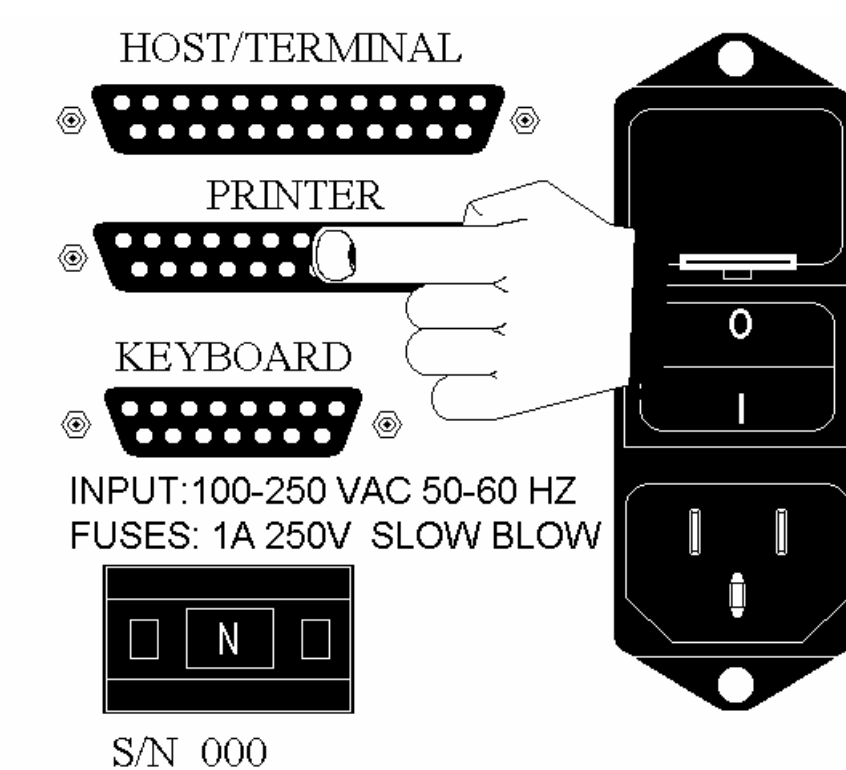
These two printers require a slower baud rate to operate correctly. The 6D printer baud rate is set to 1200 baud. See page 3.21 "Selecting Printer Setup". The switches on the printer should be set as shown here:

	<u>10</u>	<u>9</u>	<u>8</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
switch 1:	OFF	OFF	ON	ON	ON	OFF	OFF	ON	ON	OFF
switch 2:	ON	OFF	ON	ON	OFF	OFF	OFF	OFF	ON	ON

* NOTE : When changing DIP switch settings, use a ball point pen, or other pointed object. Using a pencil is not recommended, since the carbon powder may get into the switch mechanism and cause problems.

Connecting the Printer Cable

The printer port on the 6D back panel is located as shown here:



6D Serial Printer I/O port.

Connect one end of the printer cable to the 6D, and the other to the printer. Both ends of the cable should be the same, so you can connect the cable either way.

Make sure you secure the cable by tightening the screws on both ends. This will ensure that your data is not lost due to a loose connection. Plug the printer into a standard wall outlet.

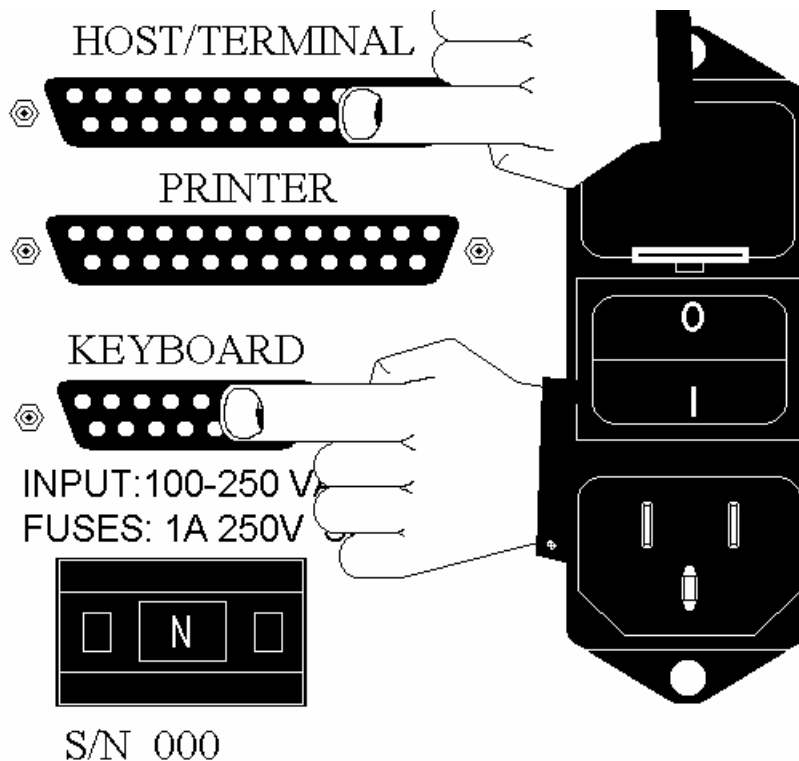
Connecting the Host/Terminal or Keyboard

If you purchased the keyboard option from Schleuniger, or you have a host/terminal, you can attach one to the 6D. You can use either a keyboard or a host/terminal, but not both. The keyboard and host/terminal allow you to enter configuration information for tests.

You can operate the 6D without a keyboard or host/terminal, and configure operating parameters with the front panel, but you can not enter high/low limits or product name, number, batch, or comment information.

Host/Terminal Connection

The Host/Terminal and Keyboard ports are located as shown here:



Host-Terminal and Keyboard Serial I/O ports.

The Host/Terminal cable is available from Schleuniger. Connect one end of the Host/Terminal cable to the 6D, and the other end to your computer. The computer should be set up to communicate using: XON/XOFF, 1200 Baud, 8-Bits, No parity.

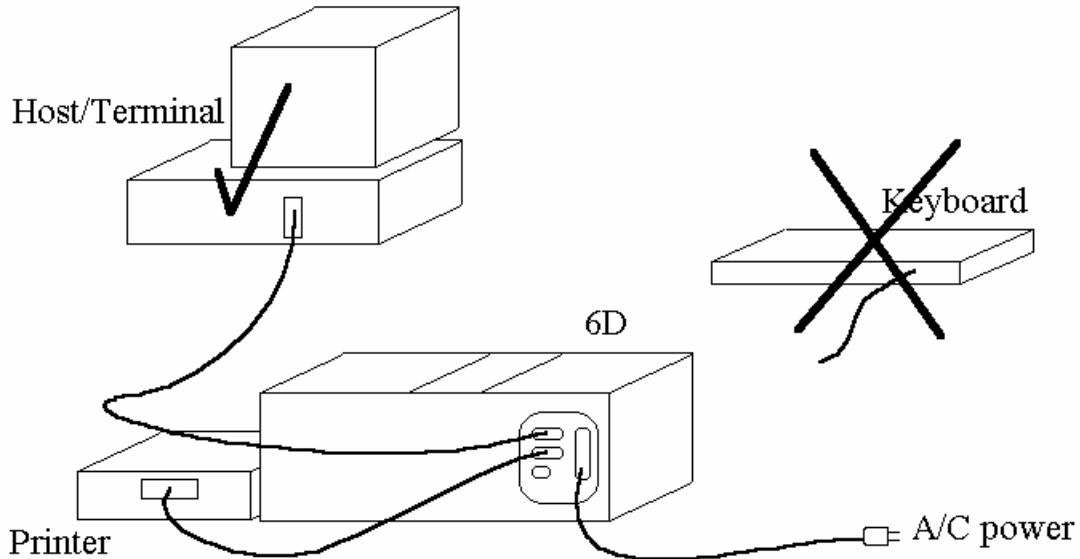
Keyboard Connection

Keyboard connection is simple. Plug the keyboard cable into the KEYBOARD port on the back of the 6D. You may refer to the diagram on the previous page for the location of the port. The port is also labelled on the back panel of the machine, for your convenience.

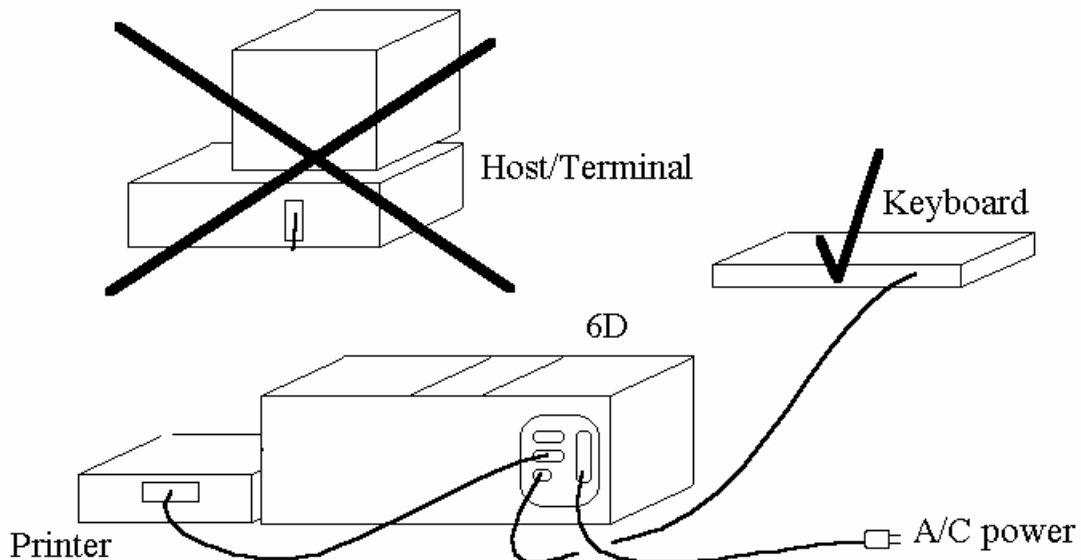
The keyboard supplied by Schleuniger uses the factory-default baud rate of 1200. The keyboard will not operate at any other rate.

CAUTION! WARNING! NOTICE!

Do NOT connect both a keyboard and host computer to the 6D at the same time! Only one or the other may be connected. If you connect both, there may be damage to BOTH the host and keyboard ports. The following diagrams depict the two possible configurations:



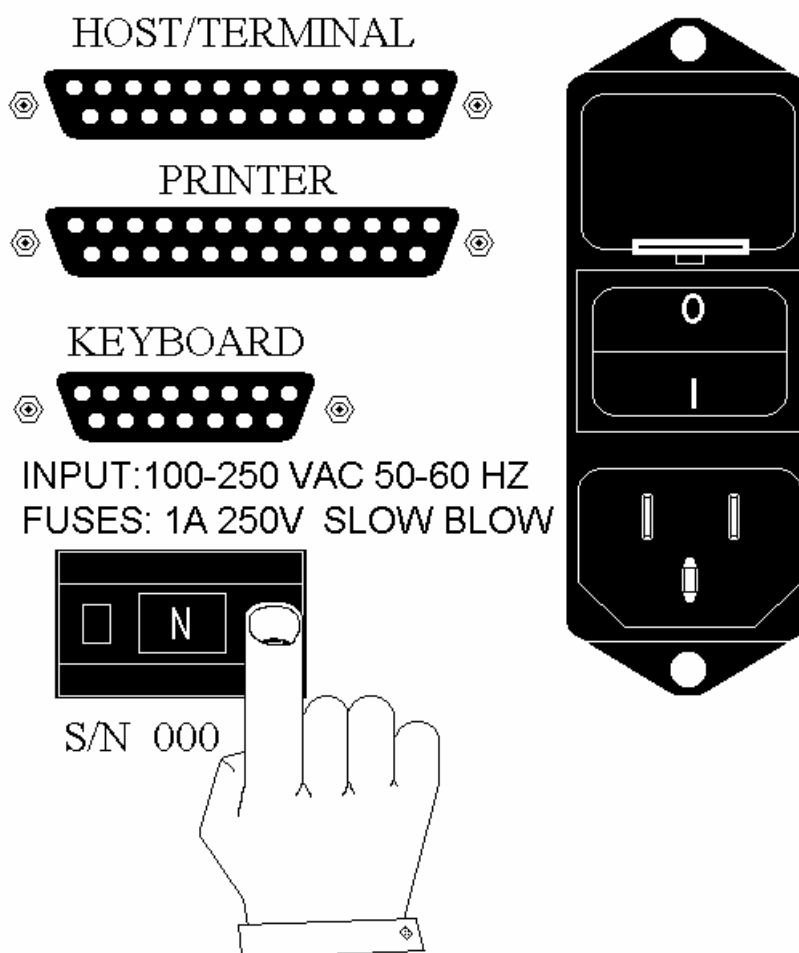
6D with Computer (host) and Printer attached.



6D with Keyboard and printer attached.

Setting the Units of Measure

The 6D can measure hardness in Newtons (N), Strong Cobbs (Sc), KiloPonds (Kp), or Pounds (Lb). While looking at the back of the 6D, you will notice a switch at the bottom of the peripheral connectors that has a little window. The window displays the present setting of the units. To change this setting, press one of the two buttons on either side of the window. You will hear a click, and the window will read a different unit.



Setting the Units of Measure on the back of the 6D.

After setting the measuring units with the switch on the back of the machine, turn the machine on. If the machine is already on, press RESET to initialize the new measuring units. The Lower and Upper Limits for valid tests will automatically be reset to the widest range. See the section

2.10

on Restoring Factory Defaults or Appendix C for the exact values. The machine is now ready to measure in the chosen units of measure.

* NOTE : The units of measure may be changed arbitrarily during calibration verification, without pressing RESET. However, after calibration verification, the user should return the units to the desired setting and press RESET to properly initialize the system.

Power ON

Your 6D is now ready to power on. Turn on the power using the power switch on the back of the 6D. The switch will read '1' when the machine is turned on. The '1' is on the bottom side of the switch, so you may have to look for it. You should also turn on all your accessory equipment at this time, if necessary.

3. MACHINE OPERATION

You can place a tablet in the jaw, and press start. The machine will work as shipped from the factory, without any user configuration. The factory defaults have been set so you can begin testing immediately.

However, in the interest of being thorough, we must provide detailed information for those who wish to understand the complete workings of the 6D hardness tester.

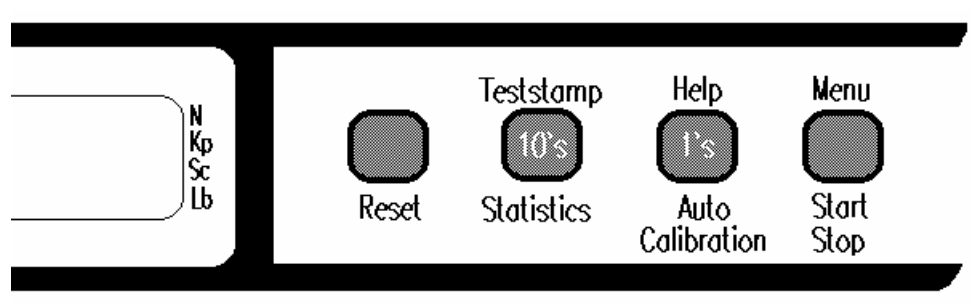
If you wish to begin operating the machine right away, you can go to the section titled "Performing a Hardness Test." There, you will be taken, step by step, through a test procedure.

The appendix has a section that shows a flow diagram of the general operating procedure of the 6D. The flow diagram shows how each aspect of the testing procedure is related.

Front Panel Operation Summary

We begin by reviewing the operation of the four panel buttons on the front of the 6D.

The 6D front panel has several functions. This picture shows the front panel buttons, with multiple labels near the 3 major function buttons. The three major functions are STATISTICS, AUTO, and START. Each of the three function buttons has other functions as well. These front panel functions are described here.



6D Front Panel buttons, with new functions.

NOTE the new functions :

"Help" is above the Auto button. This button prints the operating instructions and the user menu, allowing you to quickly reference the User Menu functions.

"Menu" above the Start/Stop button, is used to access the User Menu. The User Menu allows you to configure the 6D in various ways.

"Teststamp" is above the Statistics button. When held for 2 seconds, the teststamp variable stored in the 6D will be reset to 1.

When setting numbers, the 10's and 1's digits of the number can be incremented independently. The 10's place is incremented by pressing the Statistics button. The 1's place is incremented by pressing the Auto button. This makes setting high numbers easy.

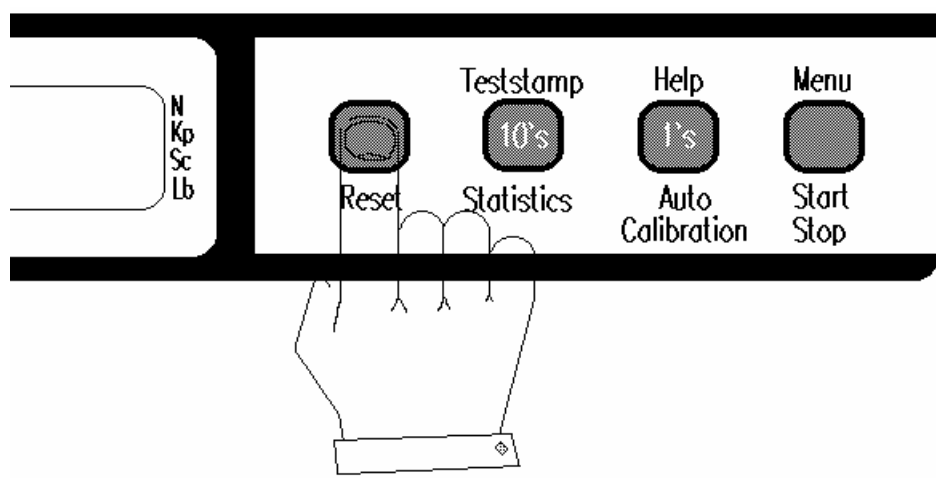
Appendix B contains a summary table of the panel functions. Here is some general information about each panel button.

RESET - 1 Function:

- 1) Return the 6D to power up condition.

The RESET button provides a hard reset. This is the same as turning the power off and back on again. When the machine is RESET, the statistical data is initialized to zero, and the jaw is retracted to the "home" position. Pressing RESET causes the message "RESET" to be printed, if a printer is connected.

When RESET is pressed, the micro-processor inside the 6D is immediately interrupted, and the control board performs some initialization functions. Then the micro-processor begins execution of the internal control software, starting at the beginning of the program.



To reset the machine at any time, simply press the RESET button. This restores the machine to the power-on condition, resets test data, and cancels any test in progress. It may also be used to immediately retract the jaw all the way back.

3.4

STATISTICS - 3 Functions:

- 1) Provides statistics during a test.
- 2) Sets 10's digits of a number being set.
- 3) Resets the Test-Stamp variable to 1.

The STATISTICS button is normally used during testing. If you have taken at least 1 valid measurement, the statistics will be printed. The data is initialized to prepare for a new test.

If no test values have been taken, the message "No Statistics Available" will be printed. If no peripherals are attached, nothing happens.

During number setting (See the section on NUMBER SETTING), it increases the 10's digit of the number being set.

If you hold this button, the Test-Stamp variable will be reset to 1.

AUTO - 3 Functions:

- 1) Toggles AUTO mode ON-OFF.
- 2) Sets 1's digit of a number being set.
- 3) Prints out the HELP menu when pressed and held for 2 seconds.

The AUTO button is used to toggle Auto and Manual modes of operation.

If you hold this button, the 6D will print out a HELP menu on the attached printer. The menu contains a list of all the options contained in the user menu. Default values have an asterisk (*) next to them. These are the values that are used when factory default settings are restored.

During number setting, the AUTO button increments the 1's place of the number being set.

START/STOP - 3 Functions:

- 1) Begin or Stop a test.
- 2) Access the User Menu.
- 3) Finish an operation.

The START button is used to begin or suspend a test. When you begin a test, you place a tablet in the jaw, and press START. The number 999 will be displayed, and the jaw will move out. When the tablet is touched, the diameter will be stored, and the slide will retract "Back-Off " a preset number of millimeters. (See the section on "Setting Backoff "

Distance" for more information.) It will then move forward slowly and break a tablet. The jaw then retracts to the *resting position*. If the machine is in Automatic mode, it will wait a preset number of seconds. (See the section on setting *Test-Delay* for more information.). The 6D will then press another tablet.

When the machine is in Automatic mode, you can press START/STOP any time, and the test will pause after the measurement is taken. You can restart the test by pressing start again, or press STATISTICS to finish the test prematurely.

Holding the START button for 2 seconds accesses the USER MENU. After you set the menu number you want, START selects the displayed menu number.

During number-setting, pressing START/STOP ends the number-setting routine.

Most operations are completed by pressing START/STOP.

* Special Note:

If you press and hold START, just as the statistics begin printing, and you have tested 20 or more samples, the data graph will be printed along with the group data, range and bar graphs. You can release start after the data graph begins printing.

Setting Numbers with the Front Panel

When a number *prompt* is displayed, the 6D will expect the user to set the number on the RED display. To increment the ones digit, press AUTO. To increment the tens digit, press STATISTICS. When you are finished setting a number, press STOP. You can hold either 10's or 1's to continuously cycle the numbers.

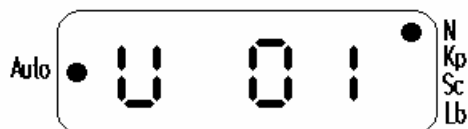
You can not exceed the allowable value for a number. For example, the maximum logical value for hours is 23, and the minimum is 0.

Example:

Here, we access the User Menu, and select menu item #1, "set number of valid measurements."

(1) Press and hold START

The display will show

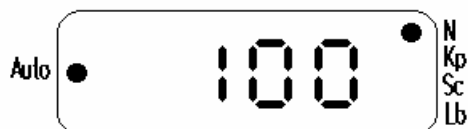


(2) Release START

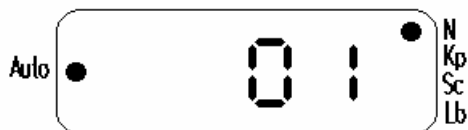
(* NOTE : The lights next to "N" and "Auto" are lit, indicating that the machine is set to Automatic Mode and Newtons Scale. Your machine may be set to another scale, or may be in Manual Mode. See the section on "Setting up the 6D for Operation" to find out how to change the units scale. See the section on "Setting Auto/Manual Mode" to find out about the Auto light.)

(3) Press START again to select "set valid number of measurements."

The factory default for the valid number of measurements is 100. Thus, the display should look like this. If your display reads something different, that's okay. Just press STAT or AUTO to see what happens:

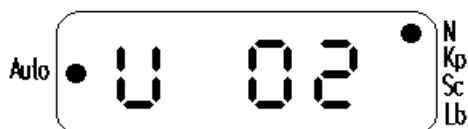


- (4) Press STATISTICS to increment the 10's digit.
The display will show:

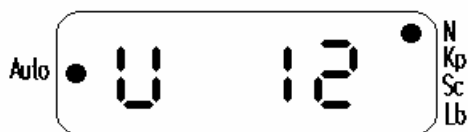


The display has "wrapped around" to the minimum allowable value, which is 1. Note that you could not have incremented the 1's digit when 100 was displayed, since the number 100 is the maximum allowable value.

- (5) Press AUTO to increase the 1's digit. The display will read



- (6) Press STATISTICS. (increase 10's) The display will read



- (7) Press STOP. (complete operation)

The machine will now display either 000 for N. or 00.0 for Kp, Sc, or Lb. This completes the number-setting operation. We have set the valid number of measurements to 12. Feel free to play around with the menu until you are comfortable using it. You can always restore the Factory Defaults later!

* NOTE : All numbers will automatically be kept within their logical ranges. Some confusion may occur at the minimum and maximum allowable values. When the value has reached its maximum, it will wrap back around to the minimum value. You may have to press either 10's or 1's to accomplish this, depending on the range of the value being set.

User Menu and Programming Mode

A User Menu is provided to allow configuration of user operating parameters. The user menu can be operated from the 6D front panel buttons, or from a keyboard or host/terminal.

Listed here are the 10 user menu items. Related items are grouped together.

The menu choices are:

- U 01. Set the Valid number of measurements.
- U 02. Set the Time and Date, which is stored in the battery powered clock chip.
- U 03. Machine Calibration.
- U 04. Calibration Verification.
- U 05. Select the Printer Type (OFF / 40 column / 80 column).
- U 06. Setup Graphs (OFF / Graphs Only / Data & Graphs).
- U 07. Set the "Backoff Distance", which is the distance that the slide moves away from the tablet after taking a hardness reading.
- U 08. Set the delay between each test in AUTO mode.
- U 09. Print the currently configured parameters.
- U 10. Restore the Factory Default Settings.

The Host-Terminal or Keyboard allows you to enter 6D programming mode. When you are in programming mode, you can access all the User Menu items, and enter test information.

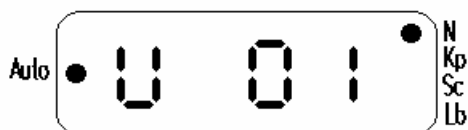
* NOTE : All parameters are stored in battery backed RAM, and are preserved when the main power is turned off.

How to Operate the User Menu and Programming Mode

If you have a keyboard or host/terminal, you can use the 6D programming mode, which also accesses the user menu. However, if you do not have a keyboard or host/terminal, you can only access the user menu from the front panel, and you can not use the programming mode.

With the Front Panel - User Menu

- 1) Press and hold START/STOP for 2 seconds.
- 2) The display will show 'U 01'



- 3) Use STATISTICS and AUTO (10's and 1's digits) to set the desired menu number.
- 4) Press START/STOP to select the menu item.
- 5) Follow the procedure in the section "How to Use Each Menu Item" for the menu item you select.

With the host/keyboard - Programming Mode

- 1) Press the ESC key to enter Programming Mode.
The Keyboard display or Computer screen will display the message:

Programming mode : <RETURN> => Exit
- 2) Press the number 1, 2, 3, 4, 5, 6, 7, 8, 9, or 0, corresponding to menu items 1 through 10, respectively.
- 3) Follow the procedure for the appropriate menu item.

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Note that 6 other options are available using the keyboard during programming mode. They are:

<u>Function Key</u> (alternate character)	<u>Parameter</u>	<u>Allowable Values</u>
F1 (or n)	Product Name	Up to 23 characters
F2 (or #)	Product Number	"
F3 (or b)	Batch Information	"
F4 (or c)	Comment	"
F5 (or l)	Low Limit	Number from 0 to Max
F6 (or h)	High Limit	"

Pressing CTRL-C (hold CTRL and press C), while in programming mode, resets the product name, product number, batch information, and comment to all periods ("....."). The low and high limits are set to minimum and maximum for the selected scale (N, Kp, Sc, Lb). See the table in appendix C for information on the low and high limits.

Max is the highest value for the current units of measure that converts to 405 or 505 Newtons, whichever applies to your machine. For example, if the scale is Strong Cobbs, Max is 56.7 on a 400 Newton machine.

You can press either the function key or the alternate character (lower case) to edit the corresponding item. The alternate character method (letters n, #, b, c, l, and h) is available for host-terminals that do not transmit the correct code for the function key. The Schleuniger keyboard does transmit the correct codes, so you use the function keys with the keyboard.

* NOTE : These test parameters are printed with each set of measurements. If you don't have a keyboard or host/terminal, you cannot modify these parameters. The entries are set to periods (".....") at the factory before shipping.

Printing the Help Menu

If you have a printer connected, you can print out the help menu. To print out the help menu:

- 1) Press and HOLD the HELP button until the menu starts printing out.

That's it! The help printout is useful to remind you of the user menu functions without having to get out the manual.

How to Use Each Menu Item

U 01. Setting the Number of Valid Measurements

When you perform a test, you need to specify the number of samples you wish to include in the statistics.

The lower and upper limits (see appendix C) determine whether a sample is included in the statistics. If a sample's hardness is between the lower and upper limits, it is considered a "valid" sample, and is included in the statistics. Values outside the lower and upper limits are not included in the statistics, and are considered "invalid." Invalid values are underlined on the printout.

For example, if you wish to test 20 tablets, you set the number of valid measurements to 20. You may need to test more than 20 tablets to get 20 valid values.

Example:

Let us say you have the following low and high limits:

Low = 100 High = 150

and the number of valid measures is:

Number of valid = 5

You then take the following data samples:

125 130 155 90 149 99 100

In this case, 125, 130, 149, and 100 are valid samples, while 155, 90, and 99 are not. You still need one more valid sample to complete your test.

To set the number of valid values the 6D will accept:
(The minimum value is 1, the maximum value is 100)

With front panel

- 1) Press and HOLD Start. This accesses the User Menu.
- 2) When the display shows 'U 01', press start again. You have selected item #1.
- 3) The display will show the current number of valid measurements.
- 4) Use the 10's and 1's buttons to set the desired number, if you wish.
- 5) Press STOP. The display will read 000 or 00.0

With the keyboard

- 1) Press "ESC". The keyboard display will show the programming mode prompt:

Programming mode : <RETURN> => Exit

- 2) Type '1' (NOT the F1 key). The keyboard display will show:

Number of Valid : (X)

Here, (X) is the currently configured value.

- 3) If you do not wish to change the value, you can press "ENTER" to keep the current value. If you wish to change the value, type the desired value.
- 4) Press ENTER. This returns you to the programming mode prompt.

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- 5) If you are finished with programming mode, press ENTER again to exit programming mode. The keyboard display will show:

<DONE>

to indicate that you have finished programming.

3.14

U 02. Setting the Time and Date

The 6D has an internal clock with crystal synchronization. It should only need to be changed for daylight savings time or if the date/time are wrong. The date and time are maintained by the 6D's internal battery.

The time is stored in 24 hour format where 0 is 12 o'clock midnight, and 23 is 11 o'clock pm. The date is stored as day, month, year, and weekday. The weekdays are numbered 1 through 7, which correspond to Sunday through Saturday.

You can use this procedure to examine the 6D date and time. Just step through the values without changing them.

With front panel

* NOTE : If you don't want to change a value, just press STOP to continue to the next value.

- 1) Access the user menu (press and hold start).
- 2) Choose item #2. You do this by setting the number on the display to read "U 02". Then press START. The display shows the Minute value.
- 3) Set the Minute, Press STOP. The display will show the hour.
- 4) Set the Hour, Press STOP. The display will show the weekday.
- 5) Set the Weekday (1 = Sunday, 2 = Monday, etc...), Press STOP. The display will show the day of the month.
- 6) Set the Day of The Month, press STOP. The display will show the month.
- 7) Set the Month, press STOP. The display will show the year.
- 8) Set the Year, press STOP. The display will return to 000 or 00.0

With the keyboard

* NOTE : If a value does not need to be changed, just press 'ENTER' to continue to the next value.

- 1) Press "ESC" to enter programming mode. The keyboard or terminal will display:

Programming mode : <RETURN> => Exit

- 2) Type '2'. The keyboard or terminal will show

Minute: (X) where (x) is the current value.

- 3) Type the value, if you want to change it, or don't type anything. Press ENTER when you are done.

- 4) Go through the rest of the values:

HOUR

WEEKDAY (1= Sunday, 2 = Monday, etc...)

DAY-OF-MONTH

MONTH

and YEAR.

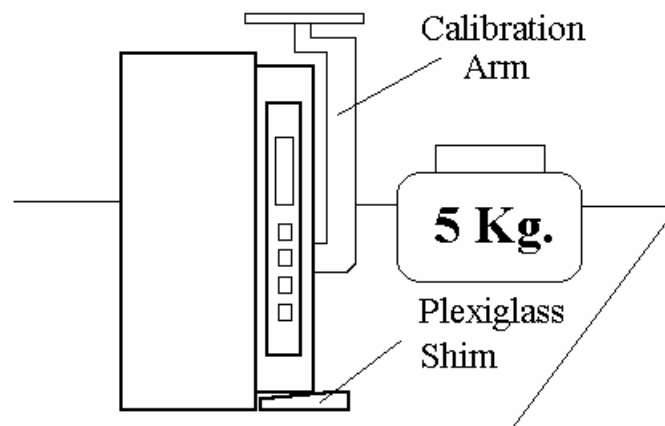
- 5) Press 'RETURN' after typing each value. The display will show the current value for each parameter.

U 03. Machine Calibration

The 6D uses a 5 kilogram weight to calibrate the load cell. Schleuniger recommends that you have the 6D calibrated at least once every 6 months. Six months after the calibration date, the message "Calibration was more that 6 months ago" will be printed with every test. If you have a calibration kit, you can proceed.

Do not attempt to calibrate the machine if you do not have a calibration kit, since it will become unusable until it is properly calibrated. Put the machine in the calibration position:

- 1) Remove the Anvil Head. This is the right-hand part of the jaw. It removes easily by pulling to the left.
- 2) Place the machine in the position show here:
 - a) Place the Plexiglass shim below the right side of the 6D.
 - b) Make sure the machine is steady.
 - c) Place the calibration arm over the load cell rod as shown.



*The 6D in calibration position.
Have the 5 Kg. weight standing by...*

* NOTE : You should avoid touching or bumping the machine or table during the calibration procedure.

With front panel

- 3) Access the User Menu.
- 4) Choose item #3. The display will flash "0000".
You have the chance to abort the calibration by pressing RESET or turning off the 6D.
If you wish to proceed, press CALIBRATION.
- 5) The display will show "7 00".
- 6) After a few seconds, the display will show '00.0' At this point, the machine is taring the calibration arm as zero.
- 7) After a few more seconds, the display will read '05.0'. This is your cue to place the 5 Kg. weight on the calibration arm. Do this now. Wait until the weight has stopped moving, and is completely stable. You may need to use your hands to stabilize the weight more quickly.
- 8) Press CALIBRATE. Try to squeeze the button, rather than press it. This helps keep the machine from vibrating while capturing the 5 kg weight value.
- 9) After you press CALIBRATE, you may remove or add weight. The display will continuously read the value in Kiloponds.
- 10) Press STOP to complete the calibration routine.

With the keyboard

- 3) Press "ESC" to enter programming mode. The keyboard or terminal will display:

Programming mode : <RETURN> => Exit

- 4) Type '3'.

- 5) Enter 'yes' to calibrate, or press any key to cancel the calibration.
- 6) The 6D display will read '7 00'. The keyboard will display "Calibrating..."
- 7) After a few seconds, the 6D display will read '00.0'
- 8) After a few more seconds, the display will read '05.0'
- 9) Place the 5 Kg. weight on the stand.
- 10) Press enter to accept calibration weight (you need not touch the machine!). Alternatively, you can press CALIBRATE on the 6D.
- 11) You may add or remove weight. The display will continuously read the weight in Kiloponds.
- 12) Press ENTER again to return to programming mode. Alternatively, you can press STOP on the 6D.

A few notes about the calibration routine:

- The calibration routine only reads kiloponds.
- During calibration verification, any units scale may be used.
- The calibration is sensitive to vibrations. Keep the machine steady.

WARNING: DO NOT drop the 5 Kg. weight onto the stand. This may damage the load cell permanently.

U 04. Calibration Verification

Since the 6D is designed to be a sensitive measuring instrument, it may be desirable to test the calibration for accuracy. You can test the calibration using any of the four unit scales.

Your company may have a procedure for testing the calibration of the 6D. Schleuniger recommends the use of precision weights to test the calibration over the range of the machine. See appendix C for conversion factors for the various unit scales.

Set up the machine in calibration position, as in the Calibration Routine.

With the front panel

- 1) Press and hold START to access the user menu.
- 2) Choose item #4.
- 3) Perform your verification routine. You can place weights on the machine, and change the units scale during this time. The 6D display will continuously show the reading from the load cell.
- 4) Press STOP. The machine will return to normal operation.

With the keyboard

- 1) Enter programming mode by pressing ESC.
- 2) Type '4'. The keyboard display will show:

<| Calibration Verify |>

- 3) Perform verification routine.
- 4) Press 'ENTER' on the keyboard or STOP on the front panel.

U 05. Selecting Printer Setup

We have provided the capability to select a printer type, or to disable printer operation. Disabling the printer is desirable, when you *do not* have a printer connected. If you have a printer, connect the printer to the 6D, and enable the appropriate printer number. There are three selections for printer type: 0 means no printer, 1 means you have a 40 column printer, and 2 means that you have an 80 column printer.

If you don't configure the correct printer, you will get errors when the 6D prints information.

If you don't have a printer, you can disable the printer routines, which saves time when starting and completing tests. The 6D will only perform printer operations, such as graph computations, when a 40 or 80 column printer is selected.

If you are not using a printer, you should definitely disable printer operations. Otherwise, the machine will compute and attempt to plot the graphs, even though no printer is connected! This will take some time, and the machine will not be useable during this time.

After you select the printer type, the 6D will prompt for the baud rate setting. This allows adjustment for slower printers.

With the front panel

- 1) Access the user menu by holding START.
- 2) Choose item #5.
- 3) Select 0 to disable the printer. This bypasses all printer routines.
Select 1 to enable a 40 column printer.
Select 2 to enable an 80 column printer.
- 4) Press START. The display will show 0, 2, or 4.
- 5) Set the baud rate:
0 = 1200 baud. 2 = 2400 baud. 4 = 4800 baud.
Other numbers are not valid, and result in a setting of 2400.
- 6) Press STOP. The 6D display will show 000 or 00.0

With the keyboard

- 1) Enter programming mode by pressing the ESC key.
- 2) Type '5'.
- 3) Type the desired value (0 = no printer, 1 = 40 column, 2 = 80 column).
- 4) Press ENTER. The display will prompt for the baud rate setting.
- 5) Type number corresponding to the desired baud rate:
0 = 1200 baud. 2 = 2400 baud. 4 = 4800 baud.
- 5) Press ENTER to return to programming mode.

To test your printer configuration, make sure the printer and 6D are turned on. Then press RESET, followed by START. You should get a properly formatted header, and some information. After the header prints, press RESET again to stop the test immediately.

If your header is not printed correctly, you should go back and make sure you have configured the correct printer.

* NOTE : The Brother M-1109 and Centronics GLP-II must be operated at 1200 baud. See the section "Connecting the Serial Printer" for more information.

U 06. Selecting Graph Style

The 6D graph plots can be disabled, set to print out graphs only, or set to print out both the graph data and the graphs.

If graph plotting is OFF, the 6D will compute and print ONLY the statistics. No graphs will be plotted.

If the graph style is set to Graphs-Only, the 6D will print the statistical summary, then print only graphs. No graph data will be printed.

When you set the 6D to print both graphs and graph-data, the points plotted in the graph will be printed out for comparison with the graphs.

Note that the 6D will always print out each individual sample during the test, if printing is turned on (see Selecting Printer Setup).

With the front panel

- 1) Access the user menu by holding START.
- 2) Choose item #6.
- 3) Select 0 to turn Graph plotting OFF.
Select 1 to turn on Graphs Only.
Select 2 to turn on Graphs & Graph Data.
- 4) Press STOP.

With the keyboard

- 1) Enter programming mode by pressing the ESC key.
- 2) Type '6'.
- 3) Enter the desired number.
(0 = Graphs OFF, 1 = Graphs only, or 2 = Graphs and Graph data)
- 4) Press ENTER to return to programming mode.

U 07. Setting Backoff Distance

When the 6D begins a test, the slide moves forward until it contacts the tablet. At this point, it stores the tablet diameter. The *backoff distance* is added to the tablet diameter to determine the *resting position* to use between each test sample.

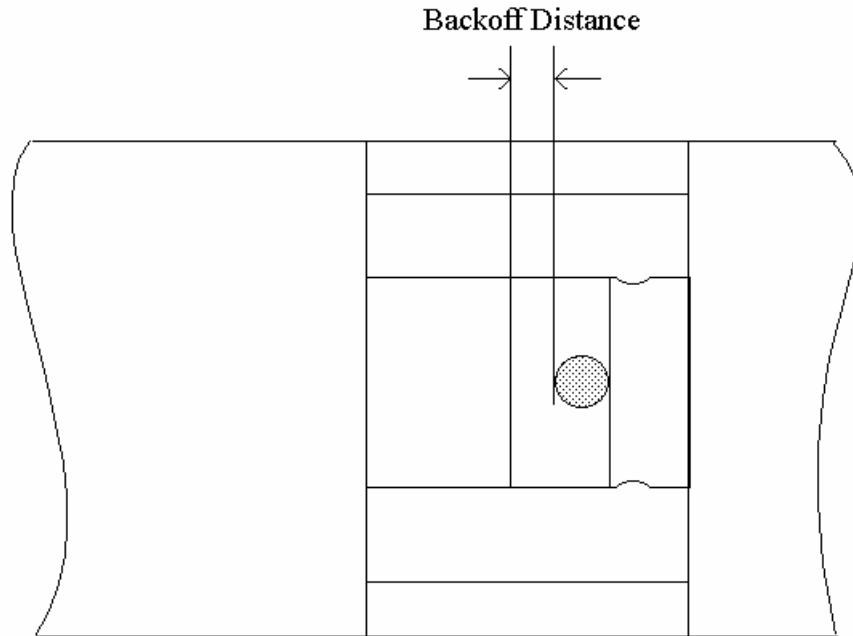
After computing the resting position for the test, the slide will move forward, at slow speed, to break the tablet. After breaking the tablet, the slide returns to the resting position.

The backoff distance may be set by the user. It is measured in 0.1 millimeter increments. The 6D has an approximate accuracy of plus or minus 0.06 mm. The displayed measurement is only intended to provide an approximate value to help the user set the backoff parameter.

Note that you can set the backoff distance without a tablet. The value is stored as a *difference* from the actual diameter, so the actual diameter is irrelevant.

If you do not wish to change the backoff distance, you can leave the setting at the factory default of 3.0 millimeters.

This parameter, along with the *test delay* parameter (see the next section), will allow you to set up a comfortable test cycle. If the operator can replace tablets quickly and accurately during testing in Auto mode, you may want to set the backoff distance to a small value. On the other hand, you may want to leave lots of room to work. The following figure gives a pictorial view of the backoff distance. The slide is in the RESTING position (not reset), where it is waiting between subsequent hardness measurements during a test.



The backoff distance is added to the pill diameter to determine the resting position.

With the front panel

- 1) Access the user menu by holding START.
- 2) Place a sample in the tester's jaw.
- 3) Select item #7.
- 4) The slide will move forward, stopping when the sample is contacted.
- 5) Press and hold the STATISTICS button to move the slide to the left. Press and hold the AUTO button to move the slide to the right. Adjust the spacing. The 6D display will read millimeters.
- 6) Press STOP when you are done.

With the keyboard

- 1) Press the ESC key to enter programming mode.

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- 2) Type '7'.
- 3) The slide will move forward and contact the sample.
- 4) Hold the STATISTICS button on the front panel to move the jaw, or the AUTO button to move the jaw right.
- 5) Press STOP on the front panel when done.

Note that if you attempt to press the tablet, while setting the backoff distance, the slide will retract a millimeter or so, and re-establish contact with the tablet. Please wait until contact is re-established before setting the distance. This prevents accidental fracture of the tablet.

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U 08. Setting the Delay Between Tests

When the 6D is in AUTO mode, it waits a fixed time between each measurement. This delay may be set, by the user, to a value between 0.5 seconds and 5.0 seconds. Users may wish to experiment with the setting to obtain an acceptable delay.

With the front panel

- 1) Access the user menu by holding START.
- 2) Select item #8.
- 3) Set the value using 10's and 1's.
- 4) Press STOP when done.

With the keyboard

- 1) Enter programming mode by pressing the ESC key.
- 2) Type '8'.
- 3) Type the desired value.
- 4) Press ENTER.

U 09. Printing the Current Setup

When the 6D is shipped from the factory, a set of default values is programmed into the machine (see Restoring Factory Defaults). The user may print out the current setup.

* NOTE : A printer must be connected, turned on, and the Printer configuration value must be set to either 40 column (1) or 80 column (2), for this selection to work.

With the front panel

- 1) Access the user menu by holding START.
- 2) Choose item #9.
- 3) Press STOP.
- 4) The configuration will be printed.

With the keyboard

- 1) Enter programming mode by pressing ESC.
- 2) Type '9'.
- 3) The configuration will be printed.

Here is an example printout:

```
-----/\//\//-----\//\//-----  
The 6D Configuration is:  
    Date: 8/20/93  
    Time: 10:40  
Cal. Date: 1/18/93  
    Printer: 80 column  
    Graphs: Graphs & Data  
    Backoff: 1.5 mm.  
    Delay: 0.5 sec.  
L. Limit: 1  
H. Limit: 405  
# Valid: 100  
    Units: N  
-----\//\//\//-----\//\//\//-----
```

U 10. Restoring Factory Defaults

When the 6D leaves the factory, a set of values has been programmed into the user configuration. The user may restore these values at any time to their default settings.

Any user parameters you have previously set will be lost!

With the front panel

- 1) Access the user menu by holding START.
- 2) Choose item #10.
- 3) Press STOP.

With the keyboard

- 1) Press the ESC key to enter programming mode.
- 2) Type '0'.
- 3) Type 'yes' to confirm, or any key to cancel the request.

The factory default settings are:

Valid #	=	100
Printer Type	=	40 column
Graphs	=	Graphs & Data
Backoff	=	3.0 millimeters
Delay	=	0.5 seconds
Low limit	=	1 N, or 0.1 Kp, Sc, or Lb.
High limit	=	405 N, 40.5 Kp, 56.7 Sc, 108.6 Lb.

* Note :

The High limit shown is for a 400 N machine. Refer to appendix C for details on 400 and 500 newton plausibility limits.

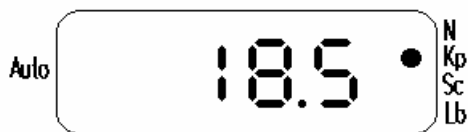
Selecting Operating Mode

The 6D may be operated in AUTO or MANUAL mode.

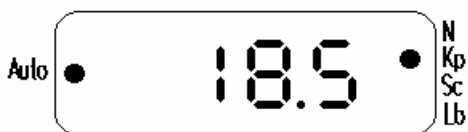
In MANUAL mode, each sample is tested individually. After a tablet is tested, the slide returns to the resting position. It will wait there indefinitely. The user must initiate the test for each sample by pressing START.

In AUTO mode, the slide returns to the resting position. It waits there for "testdelay" seconds, then the machine automatically begins another test. The operator can pause the test by pressing STOP, and resume the test by pressing START. This will not affect the accumulated results.

To toggle operating mode, press AUTO, or type 'a' on the keyboard. The RED light on the left of the display will be lit when the machine is in AUTO mode. You can toggle operating mode during a test.



Auto mode OFF (Manual Mode)



Auto mode ON (Automatic Mode)

Performing a Hardness Test

Let us go through an example of a hardness test. We will start testing in the manual mode, then switch to auto mode part way through the test.

Before you begin this test, you should restore the machine to its factory defaults. Configure the printer to 40 or 80 column, depending on which type you have.

Items needed for the test:

5 tablets or samples.

Dusting brush.

- 1) Turn the machine on, and have a set of 5 samples ready.
- 2) Turn on the printer, if you have one, and set the paper to the top of the page. Press RESET on the 6D. "Reset" will be printed on the printer.
- 3) Set the number of valid measurements to 5.
Refer to section 3.6, user menu item U 01.
- 4) Set the delay to 5.0 seconds.
Refer to section 3.6, user menu item U 08.
- 5) Place a tablet in the jaw.
- 6) Press 'a' on the keyboard or AUTO on the 6D until the AUTO light is NOT lit. Thus, we are operating in Manual Mode.
- 7) Press START, or 's' on the keyboard.

The display will read 999, or 99.9, and the slide will move forward at full speed, after some delay. If a printer is attached, the header information will be printed out. If a keyboard or host is attached, the information will also be shown on the display.

- 8) When the slide contacts the tablet, it will retract the set backoff distance (in this case, 3 mm.), to the resting position.
- 9) The slide will come forward at slow speed, and break the tablet. It will retract to the resting position and stop.
- 10) Clean out the jaw with the dusting brush, and place another sample in the jaw.
- 11) Press START on the 6D, or 's' on the keyboard.
- 12) The machine will test the next sample. The jaw will return to the resting position.
- 13) Now press AUTO, or 'a' on the keyboard. The AUTO light will light up. The machine is now in Auto Mode.
- 14) Replace the sample (we are on sample #3).
- 15) Press START, or 's' on the keyboard. Be ready to clean the jaw and replace the sample after this test.
- 16) After the sample is measured, clean out the jaw with the dusting brush, and replace the sample with another. After 5 seconds, the machine will automatically begin the next test.
- 17) Repeat number 16.
- 19) We have now tested all 5 samples, and the machine will stop.
- 20) The statistics will be printed. Five data points and a histogram will be plotted, along with their data.
- 21) Optionally, you can press RESET. This brings the slide all the way to the left.
You do not have to press RESET between sets of measurements. If you are testing samples of similar diameter, you can just press start. The test will commence from the resting position.

This completes the test. If you wish to stop during testing in auto mode, just press **STOP**. You can either continue the test in auto or manual mode, or press **STATISTICS** (or 't' on the keyboard) to complete the test if the number of valid samples has not been reached.

Printing the Statistics

Once you have taken at least one (1) *valid* measurement, you can print the statistical information.

There are two possible times when you can get statistics:

The first is when the number of valid measurements has been reached. In this case, the statistics will be printed automatically.

The second case occurs in the middle of a set of measurements. That is, if you have not yet tested the number of valid measurements configured in the 6D, and the machine is paused between measurements.

Once you have pressed statistics, the sample data is lost, and the 6D will prepare for a new test.

If you are in the middle of a set of measurements:

In automatic mode:

- 1) In Auto mode, press STOP to suspend the test.
- 2) Press STATISTICS.

In manual mode:

- 1) Simply press statistics.

This will force the statistics to be computed and printed, and will end the test in progress.

4. DIFFERENCES FROM VERSION 3.0

Setting the Valid Number of Measurements

(menu #1, section 3.6):

The valid number of measurements can not be set using the old method. The START/STOP button now accesses the USER MENU.

Time and Date

(menu #2, section 3.6):

The time must now be set using the user menu. Holding time/date resets Teststamp to 1.

Calibration

(menu #3, section 3.6):

Calibration must be accessed through the user menu. '0000' is flashed on the display, and the operator must press calibrate to confirm that he or she actually wants to continue with calibration. If the calibration mode was entered accidentally, press RESET to cancel the calibration. This helps prevent accidental un-calibration of the machine.

A 6-month warning is printed if the machine is not re-calibrated for 6 months. The message "Calibration was more than 6 months ago" is printed with each test.

Calibration Verification

(Menu #4):

If the user selects User Menu item # 4, he or she will be able to take direct measurements of the force (N, Kp, Sc, or lb) applied to the load cell. This feature allows the current state of machine calibration to be verified, without re-calibrating. The user may freely change the units of measurement during calibration verification, using the units switch on the back panel of the machine.

Printer Configuration

(OFF | 40 COLUMN | 80 COLUMN) (Menu #5):

If the user has a serial printer, he or she may connect it to the printer port on the 6D. An Epson compatible printer is required for proper operation, especially with graphics.

4.2

When Printer type is OFF, the startup delay is shorter. If a printer is not attached, the user should disable printer operation by setting Printer type to OFF.

Graphical Statistics

(Menu #'s 5 and 6):

The 6D now prints 4 types of graphs on either the 40 or 80 column serial printer when it is attached. If less than 20 measurements are taken, the 6D prints a graph of all the data points (DATA GRAPH) around the average, and a histogram (BAR CHART).

When more than 20 measurements are taken, the machine will print three graphs. The first shows the averages of every five points (GROUP CHART), around the average. The second plots the average of the differences for each group (RANGE CHART). Finally, the histogram (BAR CHART) is plotted.

Along with each graph, the associated data, test stamp number, and a set of GRAPH SCALING PARAMETERS are printed for reference. Note that a finite precision is available for graph plotting, so you can expect to see some rounding effects. Still, the plots will give a very good representation of the data.

Diameter Auto-Detection

(menu #7):

The user does not need to hold the START button to set the tablet diameter for auto and manual testing. In fact, holding start now accesses the user-menu.

When START is pressed and released, the slide will move forward (after some delay), and 999 (or 99.9, in kp, lb, sc) will be displayed. When the slide touches the tablet, the diameter will be stored. It will retract a certain distance (see "BACKOFF DISTANCE"), and begin testing.

Adjustable Test Delay

(Menu #8):

The delay in between each test, when the machine is in AUTO mode, can be adjusted. User Menu item #8 is used to set this delay. The minimum is 0.5 Seconds and the maximum is 5.0 seconds.

Faster Printing

The printer now communicates at 4800 bits-per-second (baud).

Test Stamp

Each test includes a TEST-STAMP number, which is printed just before the statistics and at the end of the graph printouts. This value starts at 1 at the factory, and increases by 1 every time a valid set of statistics is run. It is provided as a way to associate separate pages of the same test, and to keep track of tests. The user may reset this number to 1 by holding down the STATISTICS button for 2 seconds.

Low/High Limits

The low and high limits are automatically set, using an internal table, to the minimum and maximum if the units scale is changed. For example, let us assume that the machine is operating in Newtons, and the operator changes the units to Kp. When the machine is reset, or powered-off and on, the low limit will be set to 0.1 Kp, and the upper limit will be set to 40.5 Kp. Previously set low/high limits will be lost. The high limit is computed based on the conversion factor for the units and the maximum scale of the machine, either 405 or 505 Newtons.

Other Notes

The 4.11 6D operating system is very complex, and many subtle differences may be noted. Please call Schleuniger Pharmatron, Inc., with notes or questions about the 4.11 operating system.

GLOSSARY OF TERMS

This section gives brief descriptions of some of the terms used in this manual.

Automatic Mode:

In automatic mode, the 6D will press a sample, and the slide will retract to the *resting position*. After *test delay* seconds, the 6D will test another sample. Automatic mode may be toggled before a test, or while the machine is paused between individual samples.

Backoff Distance:

The distance in millimeters added to the true tablet diameter to determine the *resting position* between samples.

Baud, Baud Rate:

The number of bits-per-second sent, or received, on a serial line. The American National Standards Institute (ANSI) has defined several speeds for baud. For example, 300, 1200, 2400, 4800, 9600, and 19200 baud are typical. Both sides of a serial communications link need to be set to the same baud rate to ensure proper data transmission.

Bit:

A digit in the binary number system which can either be a 0 or a 1.

Byte:

A set of 8 bits, which correspond to 1 character of information. A byte can represent the decimal integers from 0 to 255.

Calibration:

A method of obtaining a relationship between two known scales. The 6D uses Kilograms as the calibration scale, and the load-cell voltage as the measuring scale. Two load cell output values are taken, one at zero (tare), and one at 5 kilograms. These values are used to calculate a scaling factor, which is later used to determine a measurement.

DIP Switch:

A dual in-line package switch. These are usually mounted on a circuit board with electronic parts. The package has an arbitrary number of small switches on it. These switches can be toggled using a small pointed object, such as a ball point pen. Using a pencil is NOT recommended, since the carbon in the pencil may cause problems in the switch mechanism.

Dumb - Terminal:

Similar to a host-terminal, a dumb-terminal is one side of a communications link. However, in contrast to a host-computer, a dumb terminal can not run programs.

Hard Reset:

This term refers to a return of the electronic system to a known state. The hard reset is not governed by software control, but depends on the electronic hardware.

Host Port:

The physical connection where a cable or wires are attached for communication to the host terminal. This is an I/O port.

Host Terminal:

A device, such as a computer, which acts as one side of a communication link between two machines. The host terminal gathers bits of information from the 6D and presents them to a person in an understandable manner.

Input/Output (I/O) Port:

The socket, wire, or other mechanical connection that allows information to be passed in and out of a machine. The information is sent and received in a pre-defined manner. See *baud rate*, *parity*, and *bits*.

Kiloponds:

The units of force associated with 1 Kilogram of mass.

Load - Cell:

An 'S' beam with attached strain gauges, whose electrical properties change depending on the force applied to it. The electrical resistances of the strain gauges vary when force is applied to the beam.

Manual Mode:

In manual mode, the 6D will press a sample, and the jaw will return to the resting position. It will pause indefinitely. The operator must press START to cause the next sample to be pressed.

Mean:

The statistical term for the sum of all samples divided by the number of samples. The mean is defined by the following equation, where X_i are the sample values, and n is the total number of samples. The 6D shows this values as "sum(X_i)/ n "

$$X_{ave} = \frac{\sum_1^n X_i}{n}$$

Micro-Processor:

A single integrated circuit "chip," which combines many complicated functions into a single device. It is designed to perform simple instructions at a very high rate. The micro-processor is the "brain" of the 6D, which controls all of the machine's operations.

Modem:

Short for modulator-demodulator, a modem converts digital signals to audio and back again. This allows digital signals to be sent over a telephone line, which is designed to transmit voice information.

Newtons:

The units of force in S.I. (system international) units corresponding to mass in kilograms times acceleration in meters per second squared.

Parity:

An error detection (not correction) technique used in serial communications, which is done by sending additional bits of information.

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Peripheral:

A device which is remotely connected to a main processor or machine.

Plausibility:

The term used to describe whether a value is reasonable. The plausibility limits are defined by the lower and upper limits for valid measurements.

Pounds Apothecary:

An English measuring unit, corresponding to 0.373 Kg.

Prompt:

An indication from a computer, or machine, that information should be entered at this time.

Range:

The difference between the minimum value and the maximum value in a set of measurements.

Resting Position:

The slide position when the machine is paused between individual samples.

Serial:

A term used in electronic communications when referring to the transmission of information one bit at a time. It allows fewer wires to be used to communicate, whereas parallel communications use many wires, and send many bits of information simultaneously.

Standard Deviation (absolute):

The statistical term giving average of the distance of the points from the mean. The 6D shows this term as "Sabs". The standard deviation is computed by the formula

$$\sigma_{abs} = \sqrt{\frac{\sum_{i=1}^n (X_i - X_{avg})^2}{(n-1)}}$$

Standard Deviation (relative):

A ratio of the absolute standard deviation to the mean. The 6D shows this term as "Srel". The formula for the relative standard deviation is

$$\sigma_{rel} = \frac{\sigma_{abs}}{X_{ave}}$$

Strong Cobbs:

The unit of force derived from the Strong - Cobb machine. It is provided, typically, for companies that wish to maintain consistent records using the Sc. units. (1.4 Sc. = 1 Kg.)

Test Delay:

The wait between tests when the 6D is in automatic operating mode.

Toggle:

To switch a value to its other state. For example, an on-off switch is *toggled* from off to on.

TTY:

Teletype. This is a holdover from the days when computer information was presented on automatic typewriters. Today, a Teletype can also be a cathode ray tube (CRT) display, like a television screen.

Appendix A - Keyboard and Host-Terminal Functions

<u>Key</u>	<u>Function</u>
ESC	Enter Programming Mode
F1 (n)	Product Name (Up to 23 characters)
F2 (#)	Product Number (Up to 23 characters)
F3 (b)	Batch (Up to 23 characters)
F4 (c)	Comment (Up to 23 characters)
F5 (l)	Low Limit range: 0 to maximum units for machine and scale
F6 (h)	High Limit range: 0 to maximum units for machine and scale

While in programming mode the user menu functions can be activated by pressing the appropriate number on the keyboard:

<u>User Menu#</u>	<u>Function</u>
1 =	Set Number of Valid Measurements
2 =	Set Date and Time
3 =	Calibrate
4 =	Verify Calibration
5 =	Set Printer Type
6 =	Set Graphs Mode
7 =	Set Backoff Distance
8 =	Set Delay
9 =	Print Configuration
0 =	Restore Factory Defaults

CTRL-C (hold Ctrl and press c): Initialize data. Sets Product Name, Product Number, Batch, and Comment to "_____", low limit to minimum and high limit to maximum.

During Normal Operation (ie. not programming mode.)

a -	Toggle AUTO/MANUAL Mode
s -	Start a Test
t -	Finish Test, Print Statistics

Appendix B - Panel Button Functions Table

BUTTON:	Action	Action	During Number Setting
	Press and Release	Press and Hold	
RESET	RESET	RESET	RESET
STATISTICS	Print Statistics	Reset Teststamp to 1	Increment 10's Digit
AUTO	Toggle Mode	Print Help	Increment 1's Digit
START	Start Test	User Menu	Done Setting

Appendix C - Unit Scales

The 6D unit scales are computed using the following factors.

Newtons:	1 Kg = 9.81 N
Kiloponds:	1 Kp = Force of 1 Kg
Strong Cobb:	1.4 Sc = 1 Kg
Pound Apothecary:	1 Lb = 0.373 Kg

Min / Max - for 400 Newton Machine:

1	/	405	Newtons
0.1	/	40.5	Kiloponds
0.1	/	56.7	Strong Cobbs
0.1	/	108.6	Pounds

Min / Max - for 500 Newton Machine:

1	/	505	Newtons
0.1	/	50.5	Kiloponds
0.1	/	70.7	Strong Cobbs
0.1	/	135.4	Pounds

Appendix D - Technical Information

General

Physical Dimensions: 150 x 420 x 185 mm.
(38-1/2" x 107-1/2" x 47-1/2")
Weight: 10 Kg (21 lb.)
Power Supply: 110/220 V, 50/60 cycles, auto-switch.
Hardness Range: 300 Newtons (+/- 1N)
400 Newtons (+/- 2N)
500 Newtons (+/- 3N)
Sample Diameter: 33 mm. (max)
Cycle Time: 25 Tablets / 3 minutes (typical)

Control System

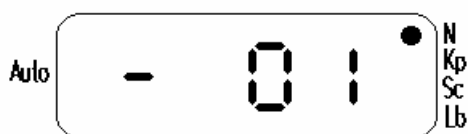
Communications: 15-pin keyboard RS232 (configurable)
1200 baud, 8 bits, No Parity
25-pin host-terminal RS232 (configurable)
1200 baud, 8 bits, No Parity
25-pin printer RS232 (not configurable)
4800 baud, 8 bits, No Parity

Appendix E - Error Conditions

The 6D system can detect the following errors or system conditions upon RESET or Power-Up. Each message is displayed for 5 seconds, along with a message on the printer and host terminal.

It is unlikely you will ever encounter these errors. However, in the event you do, this information will be useful.

Display:



Printed Message:

SYS MSG: CAL

Explanation:

The calibration factor contains a value which is not likely to be valid. This can be caused by RAM battery being low or dead, changing components on the circuit board, or by someone un-calibrating the machine.

Solution:

You must re-calibrate the machine. See section 3.6, menu item #3, for the calibration procedure.

Display:



Printed Message:

SYS MSG: #VAL

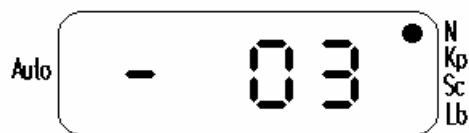
Explanation:

The variable containing the number of valid measures is less than 1 or greater than 100.

Solution:

Set the number of valid measurements to a value in the range of 1 to 100. Refer to section 3.6, menu item #1 for the procedure.

Display:



Printed Message:

SYS MSG: L.C.

Explanation:

The load cell offset, taken at machine reset, with no load applied, is a value which is not within acceptable levels.

Solution:

Call Schleuniger Pharmatron at 1-603-645-6766 for service.

Display:



Printed Message:

SYS MSG: PRNT

Explanation:

The value for printer configuration contains an invalid value.

Solution:

Select the correct value for your printer configuration:

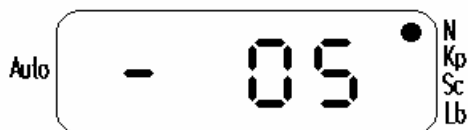
0 = no printer

1 = 40 column printer

2 = 80 column printer

User menu #5 is used to set the printer type. See section 3.6.

Display:



Printed Message:

SYS MSG: INIT

Explanation:

The system has detected that the RAM has not been correctly initialized. This usually happens when the RAM is first installed. This message is given to tell the operator that the RAM is being initialized.

Solution:

There is no need to correct this error.

The 6D automatically initializes the RAM, and resets Factory Defaults.

Display:



Printed Message:

SYS MSG: UNIT

Explanation:

The units switch on the back of the machine has been changed, and a hardware reset has occurred (ie. RESET button was pressed the 6D was Powered-OFF/ON)

Solution:

There is no need to correct this error.

The lower and upper limits are set to the minimum and maximum from the tables given in Appendix C.

If one of the above conditions is detected, the 6D will display a dash (-) followed by the error number. The message will be displayed for 5 seconds. If multiple conditions are detected, each message will be displayed in sequence. If possible, the message will be printed on the serial printer, and displayed on the host/terminal or keyboard.

The conditions above can occur for a variety of reasons. Sometimes the battery backed RAM information may be lost due to a low battery, or static discharge (from touching the circuit board, for example). The load cell circuit may become detached, or the load cell may have been damaged.

* Note:

At present, if error 1 (CAL) or error 3 (L.C.) occurs, the system will be partially disabled to prevent damage to the load cell. The display will be blanked, and tests can not be performed. In this case, the following procedures are suggested:

Error - 01:

- 1) Wait for the display to be blanked.
- 2) Press CALIBRATE.
- 3) Hold START to access the user menu.
- 4) Select item #3, calibration, to calibrate the machine. You must have a calibration kit to do this. If you don't, call SPI for service.

Error - 03:

Call SPI for service at 1-603-645-6766

Trouble Shooting

Printer is not Printing:

- a. Cable is not connected properly

Solution:

Check cable connection.

- b. Power is off on printer.

Solution:

Check printer.

- c. Printer DIP switches are not configured correctly.

Solution:

See printer setup section and printer manual.

Printer prints incorrectly:

- a. Printer DIP switches are not configured correctly.

Solution:

See printer setup section and printer manual.

- b. Printer type in the 6D configuration is incorrect.

Solution:

Set correct printer type in user menu.

- c. Printer is not Epson compatible.

6D display is blank:

- a. 6D power is off.

Solution:

Check 6D power.

- b. Power cable is not connected.

Solution:

Check power cable.

- c. A system error has occurred

Solution:

Press Reset and observe error conditions. Then, follow the procedure in the ERRORS section above.

Press CALIBRATE once to continue operation.

6D slide will not move:

- a. 6D power is off.

Solution:

Check 6D power.

- b. Peripheral printer or host is not communicating.

Solution:

Check peripheral configuration.

- c. 6D is printing or processing data.

Solution:

Wait until processing is finished, or press RESET.

- d. 6D is in programming mode.

Solution:

Exit programming mode by pressing ENTER on keyboard.

No graphs are printed:

- a. Graphs are set to OFF (0).

Solution:

Set graphs to (1) or (2). (User menu #6)

- b. Printer type is set to OFF (0).

Solution:

Set printer type to (1) or (2). (User menu #5)

- c. 6D is older version, which doesn't have graphics (not 4.11).

Solution:

Version 4.11 is available from Schleuniger.

- d. No valid measurements were taken.

Solution:

Check plausibility (low/high) limits.

Pressing panel buttons has no effect:

- a. 6D is printing or processing data.

Solution:

Wait until processing or printing is finished, or press RESET.

Appendix F - 6D Operation Flow Chart

Appendix G - Sample Statistical Printouts

40 Column printer:

G.2

G.2

80 Column printer:

G.4

G.4