

CAUTION

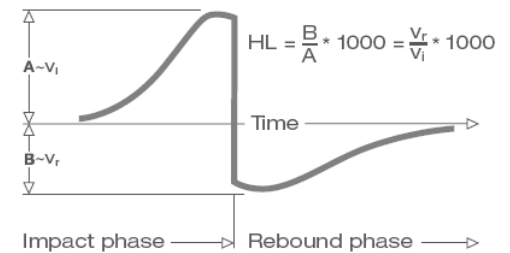
Please Carefully Read This First

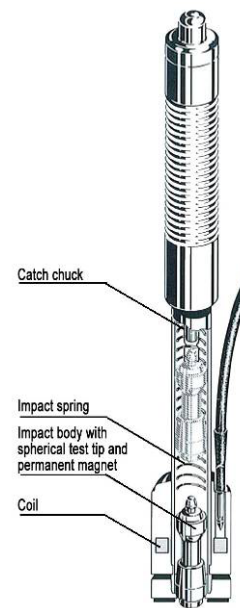
- 1. Must use the custom battery and power adapter supplied with this unit as unauthorized replacements cause damage to product, battery leakage, even fire or explosion.**
- 2. Do Not submerge in water or expose to dampness, which could cause damage to this unit**
- 3. To avoid electrical shock, do not open the cabinet. Opened units will automatically VOID warranty.**
- 4. When instrument is not used a for an extended period of time, make sure it is stored in a dry cool place for optimal battery life.**

1. SUMMARIZE

1.1 Measuring Principle Scope

PHT-3000 Hardness Tester measuring principle is physically a rather simple, dynamic hardness test. An impact body with a hard metal test tip is propelled by spring force against the surface of the test piece. Surface deformation takes place when the impact body hits the test surface, which will result in loss of kinetic energy. This energy loss is calculated by velocity measurements when the impact body is at a precise distance from the surface for both the impact and rebound phase of the test. The permanent magnet in the impact body generates an induction voltage in the single coil of the impact device. The voltage of the signal is





proportional to the velocity of the impact body, and signal processing by the electronics provides the hardness reading for display and storage. Simply put, harder materials produce higher rebound velocity than those which are less hard (higher L value). **Pht-3000 Hardness Tester** is a direct hardness measurement within any particular material group (i.e. steel, aluminum, etc.) and can be used as a final test result without conversion. However, **PHT-3000 Hardness Tester** has established conversions to other hardness scales for the convenience of our customers. These conversions to other scales (HRC, HRB, HB, HV, HSD etc.) are programmed into the electronics, and can be shown directly on the display as the test result. All data is stored in the native L scale to prevent any possible errors with multiple conversions.

1.2 The Hardness Value "L"

This term, 1978 introduced by Doctor Dietmar Leeb into measuring technology, is the quotient for the impact body's rebound and impact velocity, multiplied by 1000. Harder materials produce higher rebound velocity than those which are less hard. With reference to a particular material group (e.g. steel, aluminum etc.) the L-value represents a direct hardness measurement and is used as such. Comparison curves with standard static hardness values have been established (Brinell, Vickers, Rockwell C, B) for the most prevalent materials, enabling the L values to be converted into the relevant values for these procedures.

With **PHT-3000 Hardness Tester**, such hardness values can be directly displayed in the hardness scales HRC, HRB, HB, HV, HSD and tensile strength (MPa).

1.3 Main Features:

- 1.3.1 Highly accurate ± 6 HL
- 1.3.2 Automatic detection of impact direction
- 1.3.3 Large, easy to read display with backlight
- 1.3.4 User profiles for fast change of all settings
- 1.3.5 Touch Screen operation
- 1.3.6 Large memory with on-screen review of data
- 1.3.7 Converts to all common hardness scales (HV, HB, HRC, HRB, HSD) and tensile strength MPa.
- 1.3.8 Rechargeable Li-ion batteries
- 1.3.9 Conforms to the Standard ASTM A956-02

1.4 Application Range

- Good for all hard metals
- Ideal for production level testing
- Best suited for on-site testing of heavy, large or pre- installed parts
- Handy for difficult to access or confined test locations
- Automatic compensation for impact direction
- Excellent for material selection and acceptance tests
- Easy to use and accurate on curved test surfaces ($R > 10 \text{ mm}$)
- Metal production & processing
- Automotive & transportation
- Machinery & power plants
- Petro-chemical, refineries
- Aerospace & shipyard
- Metal constructions
- Testing services & laboratories

1.5 Technical Information

1.5.1 Display Unit

- ✧ HL Display Range: 0 ~ 1000HLD
- ✧ Accuracy: ± 6 HL
- ✧ Unit Display: large LCD with adjustable contrast ,backlight, touch screen
- ✧ Unit Material: shock resistant ABS plastic
- ✧ Internal Data Storage: ~ 800 measured value
- ✧ Resolution: 1 HL; 1 HV; 1 HB; 0.1 HRC; 0.1 HRB; 1 HSD; 1 MPa
- ✧ Battery Type: rechargeable Li-Ion
- ✧ Operating Temperature: 0°C ~ +50°C (32°F ~ 122°F)
- ✧ Storage Temperature: -10°C ~ +60°C (14°F ~ 140°F)
- ✧ Humidity: 90 % max.
- ✧ Dimension: 135 x 83 x 24 mm (5.3 x 3.2 x 0.9 inches)
- ✧ Weight: 228g

1.5.2 Impact Unit

Impact Unit D

Impact energy: 11 Nmm

Mass of the impact body: 5.5g

Test tip diameter: 3mm

Test tip material: tungsten carbide

Test tip hardness: $\geq 1600\text{HV}$

Impact length: 147mm

Impact maximum diameter: 20mm

Impact weight: 75g

Impact Unit G

Impact energy: 90 Nmm

Mass of the impact body: 20g

Test tip diameter: 5mm

Test tip material: tungsten carbide

Test tip hardness: $\geq 1600\text{HV}$

Impact length: 254mm

Impact maximum diameter: 30mm

Impact weight: 250g

1.6 Overview the Display Unit

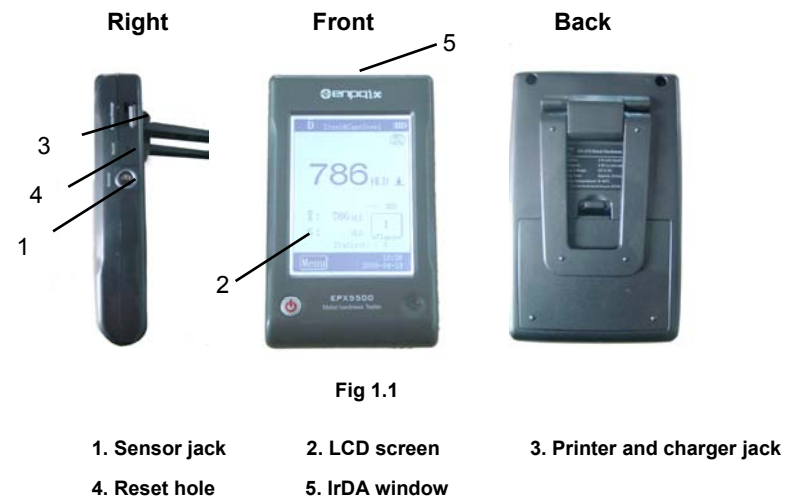


Fig 1.1

2. CHECKING SUPPLIED ACCESSORIES

Standard accessories that come supplied with your instrument. (Fig 2.1)

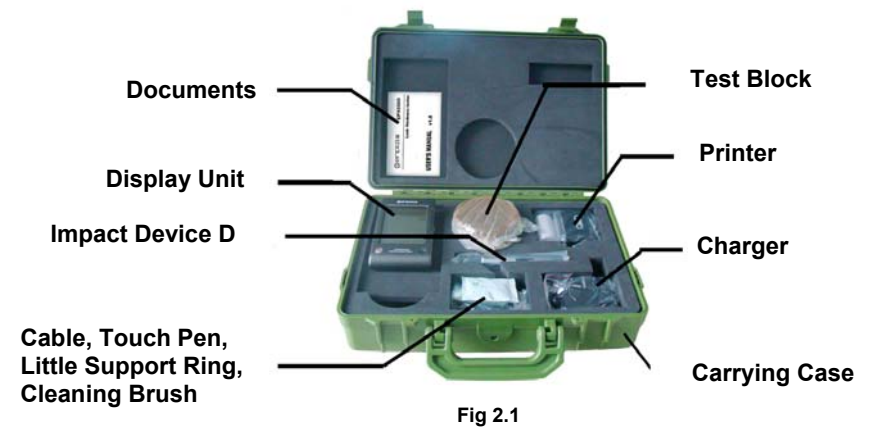


Fig 2.1

3. QUICK START GUIDE

3.1 Connect

Plug impact device cable into #1 sensor jack on right side of base instrument. (Fig 3.1)



Fig 3.1

3.2 Charge the Battery

You must Charge the battery (in display unit) before using the instrument for the first time.


3.3 Verifying the Instrument

The **PHT-3000** Hardness Tester comes supplied with a calibrated test block. Check the unit against this test block when first powering on instrument for the day. Allowable tolerance is +/- 1 HRC point.

4. OPERATING INSTRUCTIONS

4.1 Display Unit

4.1.1 Keyboard

POWER ON/OFF button  : Press it to turn on the hardness tester; Press this button again for one second to turn off the instrument.

Note:

1. When the instrument is charging, to monitor the charge state you can't turn off the instrument by press this button.

4.1.2 Measure Mode (Fig 4.1)

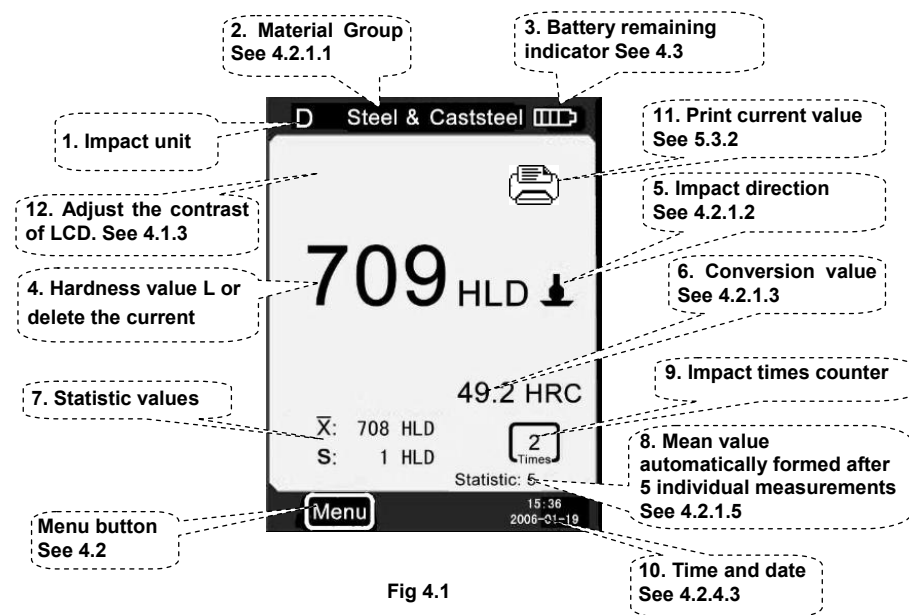


Fig 4.1

- 1. Impact device:** This is the impact device currently connected to the PHT-3000. You can click this icon to change the type of impact device.
- 2. Material group:** The material of the sample being tested.
- 3. Battery power indicator:** indicate the remaining charge of battery.
- 4. Hardness value L:** Measured hardness value L(Leeb). (Users can click this area to delete current measuring date.)
- 5. Impact direction:** Display the impact direction.
- 6. Conversion value:** The conversion value of measured value “L”.

Note:

- 1. When “---” appear at this position, indicated the conversion is out of range.**
- 2. When no message at this position, Indicated that the “Conversion” have be set to “do not conversion” in this time.**

7. Statistic values:

\bar{X} : Mean value.

S: The difference of maximum value and the minimum value

(Measured hardness value L).

8. Statistic times value: The impact times in a statistic data group

9. Impact times counter: Finished times of impact

10. Time and date: Current time and date

11.print current date:print current date

12. adjust the contrast of LCD

4.1.3 Adjusting the LCD Contrast Manually

Due to the use of different ambient temperatures and light conditions, the PHT-3000 allows you to adjust the contrast of LCD in order improve visual display.

To click “A” area can open dialog box which adjusts the contrast of LCD.
(Fig 4.2)

To click directly the following instruction of “Contrast Adjustment” can adjust the contrast of LCD on touch screen.

After the contrast adjustment to the appropriate state, users click "A" area to confirm the contrast and close this dialog box.

If there is no an operation in 3 seconds when open the dialog box which adjust the contrast of LCD, this dialog box will close automatically.

After adjusting contrast, the contrast will be restored to its original state if users will not click "A" area again to confirm the current operation.

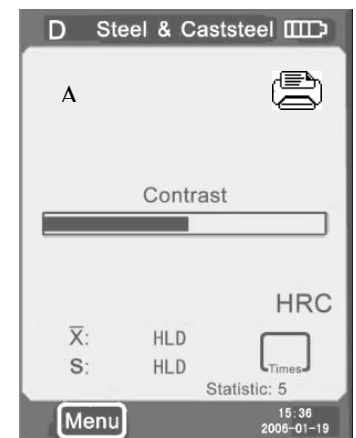


Fig 4.2

4.1.4 Select the type of Impact unit

Click the icon “D” in the upper left corner of Fig 4.1 to change the type of impact device. This instrument has two options about the impact unit: D-type impact unit, G-type impact unit. If you need other types, please contact the dealer.

Note:

- 1. Make sure the correct type of impact unit has been selected, or the test value will be incorrect.**
- 2. This operation is only in the main interface to be valid**

4.2 Using the Menu

PHT-3000 Hardness

Tester selects the Multistage menu mode,
Fig 4.3

In measure mode,
click **Menu** on
the screen to
display the menu.

Fig 4.4

It contains six options:

Testing Setup;

Printing Setup;

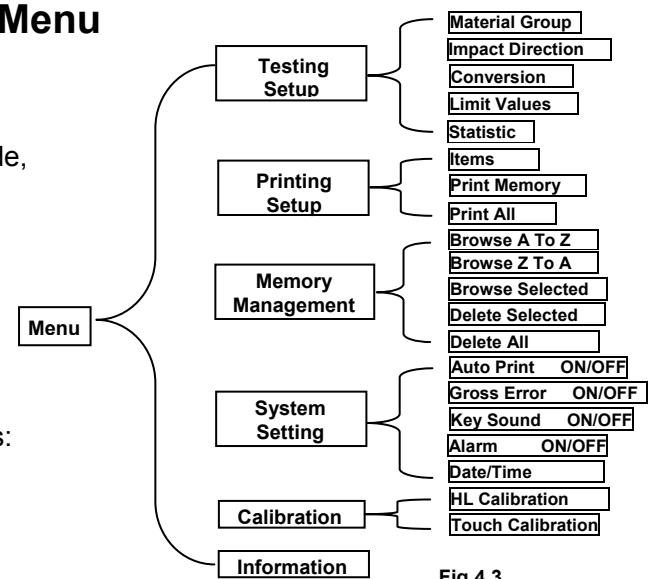


Fig 4.3

Memory Management; System Setting; Calibration and Information.

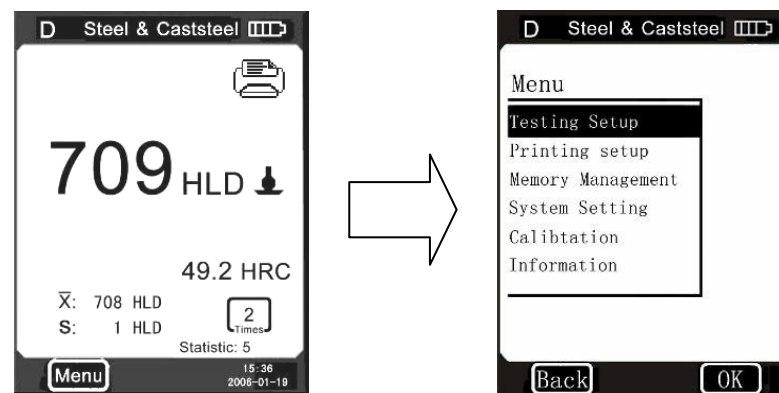


Fig 4.4

4.2.1 Testing Setup

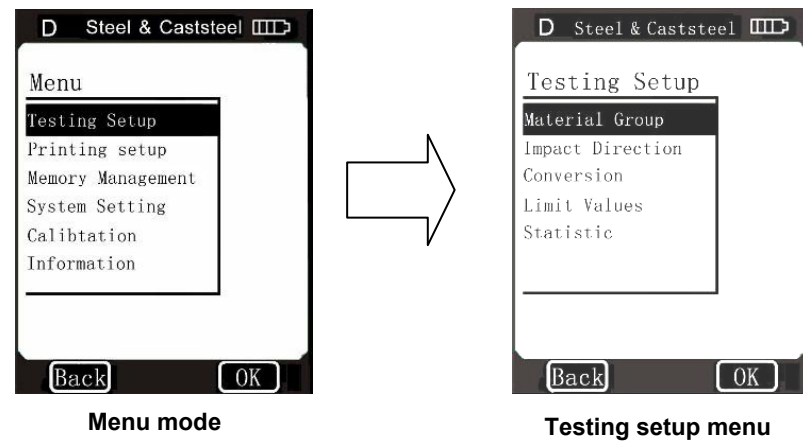


Fig 4.5

Click **Testing Setup** item on the menu mode to display the **Testing Setup** menu.

This menu item contain five selectale items: **Material Group**, **Impact Direction**, **Conversion**, **Limit Values** and **Statistic**.

4.2.1.1 Material Group

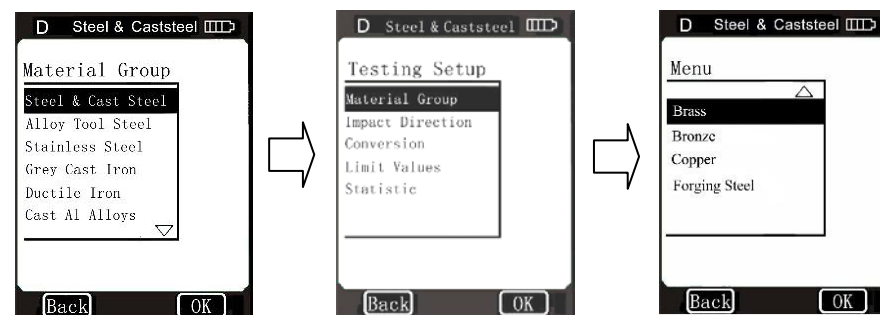


Fig 4.6

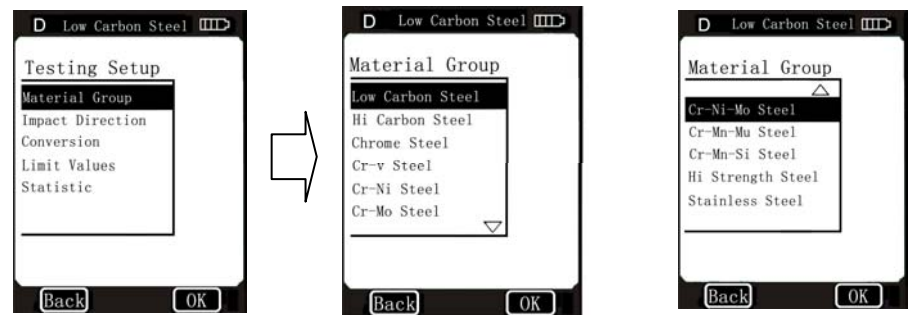


Fig 4.7

4.2.1.1.1 In measure mode, use touch pen to click the “**Material Group**” character to select the desired material.
 When the type of impact unit is set to D and “**Conversion**” is set to **hardness scale (Fig 4.6)**, click on “**Material Group**” character continuously,

the material changes according to following sequence: **Steel & Cast steel→Alloy Tool Steel→Stainless Steel→Grey Cast Iron→Ductile Iron→Cast Al Alloys→Brass→Bronze→Copper→Forging Steel→Steel & Cast steel→...**

When the type of impact unit is set to D and “**Conversion**” is set to **MPa (tensile strength) (Fig 4.7)**, click on “**Material Group**” character continuously, the material changes according to following sequence: **Low Carbon Steel→Hi Carbon Steel→Chrome Steel→Cr-V Steel→Cr-Ni Steel→Cr-Mo Steel→Cr-Ni-Mo Steel→Cr-Mn-Mo Steel→Cr-Mn-Si Steel→Hi Strength Steel→Stainless Steel→Low Carbon Steel→...**

When the type of impact unit is set to G, click on “**Material Group**” character continuously, the material changes according to following sequence: **Steel & Cast steel→Alloy Tool Steel→Stainless Steel→Grey Cast Iron→Ductile Iron→Steel & Cast steel→...**

Note:

1. When the type of impact unit is set to G, the conversion could only set to HV or HRB

4.2.1.1.2 In **Material Group** menu, use touch pen to click the desired material item to select the material.

Click “▲” or “▼” to page up or page down,

Click **Back** to the upper menu.


Note:

1. It is necessary to select the material classification. When you did not know the material type, you must be reference the related material handbook.

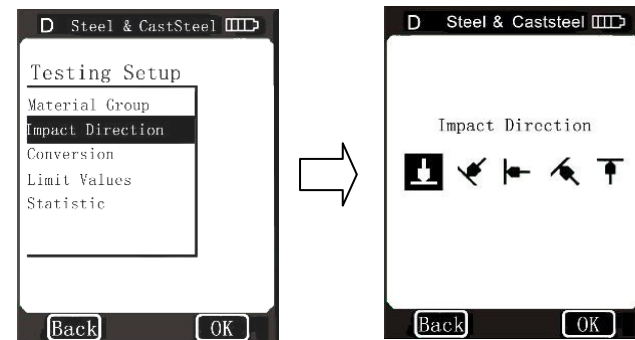
2. When you change the material group, the Impact times counter will be set to “0”.

4.2.1.2 Impact Direction (Fig 4.8)

4.2.1.2.1 In measure mode, use touch pen to click the “**Impact Direction**” logo to select the desired impact direction.

Click on “**Impact Direction**” logo continuously, the impact direction changes according to following sequence: ...

4.2.1.2.2 In **Impact Direction** menu, click the desired impact direction logo to select the desired impact direction.



Testing Setup menu

Impact direction

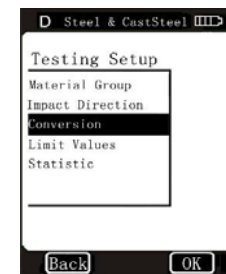
Fig 4.8

4.2.1.3 Conversion

4.2.1.3.1 In measure mode, use touch pen to click the “**Conversion**” character to select the desired hardness scale or tensile strength. When the type of impact unit is set to D, Click on “**Conversion**” character continuously, the conversion changes according to following sequence:

HB→HRB→HRC→HRA→HV→HSD→MPa→∅→HB...

HB Brinell
HRB Rockwell
HRC Rockwell
HRA Rockwell
HV Vickers
MPa Tensile strength
∅ Do not conversion



Testing setup menu



Conversion menu

Fig 4.9

When the type of impact unit is set to G, Click on “**Conversion**” character continuously, the conversion changes according to following sequence:

HB→HRB→HB...

4.2.1.3.2 In **Conversion** menu, click desired hardness scale or tensile strength on the menu to select the hardness scale or tensile strength. When the type of impact unit is set to D, it's show in Fig 4.9, When the type of impact unit is set to G, it's show in Fig 4.10.



Fig 4.10

Note:

1. Since there are differences between the different hardness scale's valid range. Some test HL value can not be converted, at this time, the " ---" will be show on the location where conversion value display.

2. When you set the conversion from hardness scale to tensile strength or from tensile strength to hardness scale, you must be reset the material group.

3. Conversion value only supplies the general reference, which may result in some offset. Precisely conversion generally needs related comparative tests.

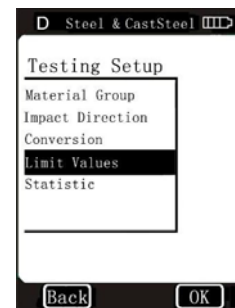
4.2.1.4 Limit Values

When the measured value “L” is out of the limit value range, the display unit will be alarm and send out a prompt.

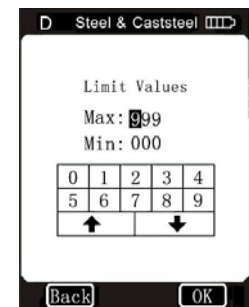
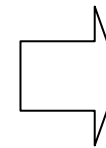
In **Testing Setup** menu, click **Limit Values** item to display the **Limit Values** setup menu. Fig 4.11

Set the limit values through click the screen keyboard.

Click **OK** confirm the limit values setup.



Testing setup menu



Limit values setup menu

Fig 4.11

Click **BACK** to cancel the limit values setup.

Click **↑↓** to select a desired bit.

4.2.1.5 Statistic

PHT-3000 Hardness Tester has automatic statistic function.



When the impact times are up to the **Statistic Times Value**, " \overline{X} " value (the Mean value of measured hardness value L) and "S" value (the difference of Maximum value and the minimum value) are automatically formed and display on the screen.

In measure mode, use touch pen to click the "**Statistic**" character to display the **Statistic Times Value** setup menu; or in **Testing Setup** menu, click **Statistic** item to display the **Statistic Times Value** setup menu. Fig 4.12

Set the **Statistic Times Value** through click the screen, and then click **OK**.

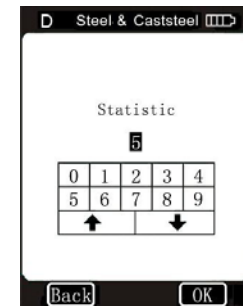
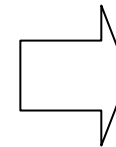
Click **OK** to confirm the **Statistic Times Value** entry.

Click **BACK** to cancel the **Statistic Times Value** entry.

Click   to select a desired bit.



Testing setup menu



Statistic times value
setup menu

Fig 4.12

Note:

1. The statistic times value range is 1 ~ 99, when you set this value to "1", the system has no Statistic process.
2. When this value has be reset, the impact times' counter will count from "0".

4.2.2 Printing Setup

When you have a micro-printer (optional), you can print out the measured values in many formats.

In menu mode, directly click **Printing Setup** on the menu mode to display the **Printing Setup** menu. Fig 4.13

There are three options in this menu: **Items**, **Print Memory** and **Print All**.

4.2.2.1 Items

A complete test result report form should include: measured values, conversion values, date, time, impact direction, statistic value, material, etc. you can choose the printing items in this menu. There are five options in this menu: **Date**, **Time**, **Direction**, **Mean Value** and **Material**. Fig 4.13

In **Items** menu, click the desired item to display its **Function Switch**.
 Then click “**ON**” or “**OFF**” to confirm you choose.
 Click **BACK** or “**X**” to back to upper menu.

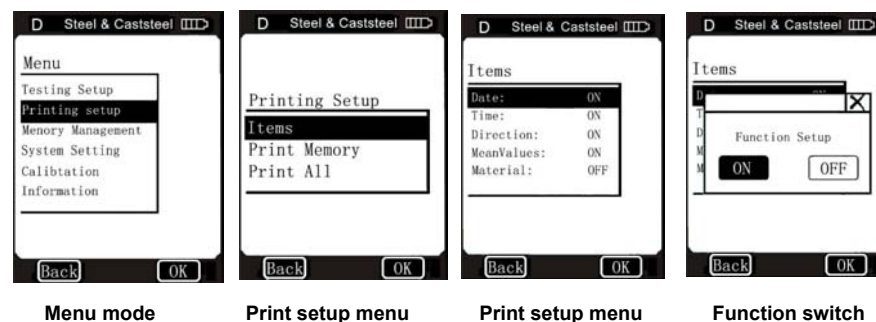


Fig 4.13

4.2.2.2 Print Memory

You can print out the measured values and related items through this menu.

In **Printing Setup** menu, use touch pen to click **Print Memory** item to display the **Serial No. Range** menu. Fig 4.14


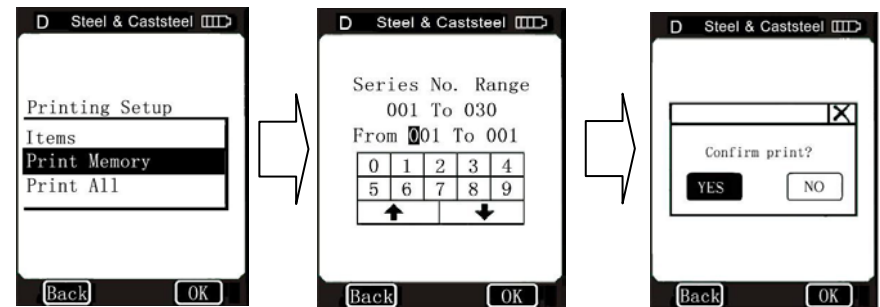
Set the printing range through click the screen keyboard (Click  to select a desired bit), and then click **OK** to display the confirm menu.

Fig 4.14, click "YES" to confirm printing, or click "NO" to cancel printing. Click **BACK** or "**X**" to cancel printing and back to upper menu.



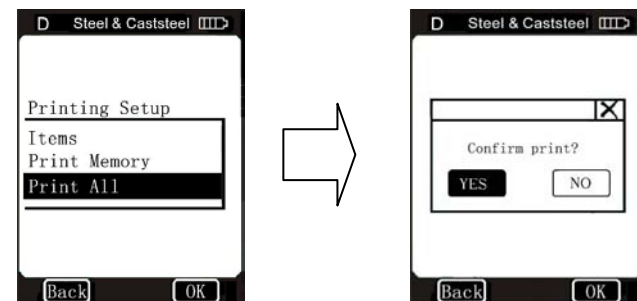
Print setup menu

Fig 4.14

Confirm menu

4.2.2.3 Print All

Use this menu you can print out all the measured data in memory.
In **Printing Setup** menu, use touch pen to click **Print All** item to display the confirm menu. Fig 4.15



Print Setup menu

Fig 4.15

Confirm menu

Use touch pen to click “YES” to confirm printing, or click “NO” to cancel

printing.

Click **BACK** (or “X”) cancel printing and back to upper menu.

Note: PHT-3000 Hardness Tester can save about 800 data in memory, if you must print out a full memory data, it will be very time consuming.

4.2.3 Memory Management

Through this menu, you can browse and delete the memory data, simultaneously also can print out the memory data.

In menu mode, directly click **Memory Management** item to display the **Memory Management** menu. Fig 4.16

There are five options in this menu: **Browse A To Z, Browse Z To A, Browse Selected, Delete Selected and Delete All.**

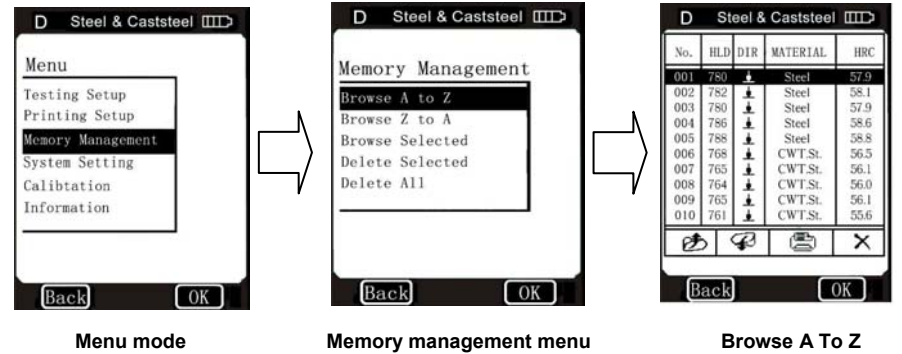


Fig 4.16

4.2.3.1 The Format of Memory Data

The data group (such as test result, conversion result, sample material and impact direction), automatically saved in memory after one individual measurement. The format of memory data is shown in Fig 4.17

After the data quantity that is saved in memory has exceeded 800 groups, the Last group of data will store the 800th position and the first group of data will be erased. The second group of data will be moved into the 002th position, simultaneously the position of other group of data, will be moved into lower position.

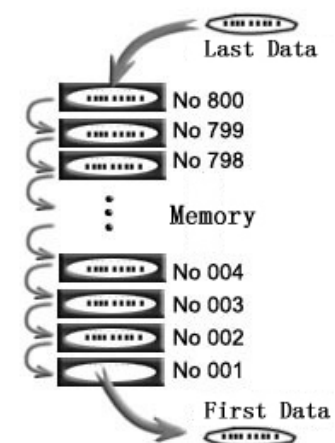


Fig 4.17







4.2.3.2 Data Browser Mode

This tester has provided three browser modes:

Browse A To Z, Browse Z To A and Browse Selected.

In **Memory Management** menu, use touch pen to click the desired item, then click **OK** on the screen to display the relevant data browse menu, or directly click desired item in **Memory Management** menu to display the relevant data browse menu.

When you select **Browse A To Z** item, the menu

is shown in Fig 4.16. In this menu, click  to page up, click  to page down, click  delete selected group of data, click  to print selected group of data, click OK to show the test time of selected group of data.







D Steel & Caststeel				
No.	HLD	DIR	MATERIAL	HRC
791	780	↓	Steel	57.9
792	782	↓	Steel	58.1
793	780	↓	Steel	57.9
794	786	↓	Steel	58.6
795	788	↓	Steel	58.8
796	768	↓	CWT.St.	56.5
797	765	↓	CWT.St.	56.1
798	764	↓	CWT.St.	56.0
799	765	↓	CWT.St.	56.1
800	761	↓	CWT.St.	55.6
   				
Back OK				


Fig 4.18

When you select **Browse Z To A** item, the menu is shown in Fig 4.18

Click  to page up.

Click  page down.

Click  to delete selected group of data.


Click  print selected group of data.


Click OK to show the test time of selected group of data.


When you select **Browse Selected** item, you can select serial No. range of that group of data stored in memory. This menu is shown in Fig 4.19.

In this menu, the input method is same as **Print Memory**, please refer to **4.2.2.2**. When the serial No. range input has finished, click OK to browse the selected group of data. Fig 4.20

Click  page up.

Click  page down.

Click  to delete selected group of data.

Click  to print selected group of data.

Click OK to show the test time of selected group of data.

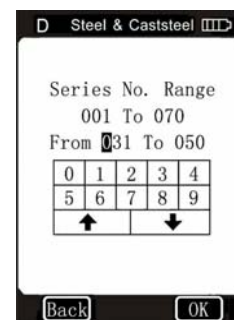


Fig 4.19



D Steel & Caststeel				
No.	HLD	DIR	MATERIAL	HRC
031	780	↓	Steel	57.9
032	782	↓	Steel	58.1
032	780	↓	Steel	57.9
033	786	↓	Steel	58.6
034	788	↓	Steel	58.8
036	768	↓	CWT.St.	56.5
037	765	↓	CWT.St.	56.1
038	764	↓	CWT.St.	56.0
039	765	↓	CWT.St.	56.1
040	761	↓	CWT.St.	55.6

Fig 4.20

4.2.3.3 Delete Memory Data

There are three ways to delete the memory data.

4.2.3.3.1 Delete Memory Data in Data Browser Menu

Please refer to 4.2.3.2 .

4.2.3.3.2 Delete Selected

In **Memory Management** menu, directly click **Delete Selected** item in

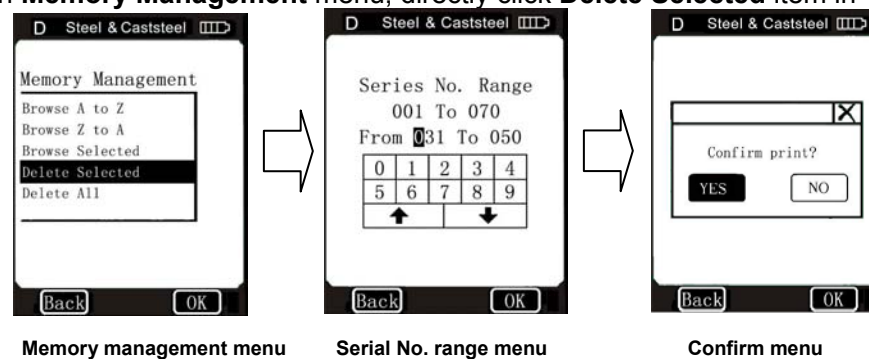


Fig 4.21

Memory Management menu to display the serial No. range menu. Fig

4.21, In serial No. range menu, input you desired range that you want to delete, and then click **OK** on the screen to display a confirm menu. use touch pen to click “YES” or click **OK** to confirm delete, or select “NO” to cancel delete. Click **Back** or “**X**” to cancel delete and back to upper menu.

Note : If the input range is out of the Serial No. range, then it will delete the actual data group in your input range and in memory data sequence number will arrange.

4.2.3.3.3 Delete All

This operation will delete all data in memory.

In **Memory Management** menu, directly click **Delete All** item in **Memory Management** menu to display a confirm menu. Fig 4.22

Click “YES” (or click **OK**) to confirm delete.

Click “NO” to cancel delete.

Click **BACK** (or “**X**”) to cancel delete and back to upper menu.

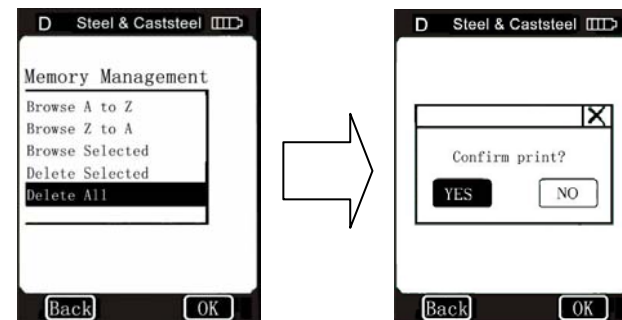


Fig 4.22

4.2.4 System Setting

System Setting contains some system function switches; users can setup various switching functions according to their requirements, such as the adjustment of system calendar and clock.

In menu mode, directly click the **System Setting** option on the screen to

display system setting menu, users can set for the corresponding switches or turn into the windows of setting system calendar and clock. Clicking **BACK**, users can turn back to the upper menu.

4.2.4.1 System Function Switch

Users can set four functions on the **system setting** menu: **Auto Print**; **Gross Error**; **Key Sound**; **Alarm**.

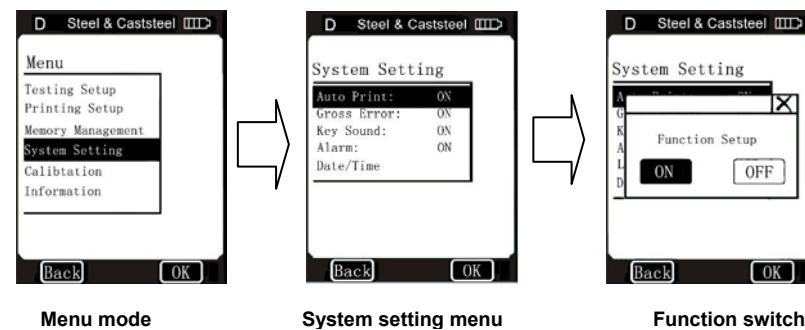


Fig 4.23

Users can open the function-setting window being selected by pressing button to choose relative operation options, and then click relative operation options to conduct function setting.

See Fig 4.23.

Users can choose if turning on this function or not by using touch pen to click, they can confirm amendment by directly clicking **ON** and **OFF**.

Users can cancel operation by clicking **BACK** and **X** on screen.

When **Auto Print** is set as **ON**, printer will automatically print the data after the data measurement is finished.

No.	HLD	DTR	MATERIAL	HRC
001	836	↓	Steel	
002	834	↓	Steel	
003	835	↓	Steel	
004	837	↓	Steel	
005	836	↓	Steel	

$\bar{X} = 835$ $S = 2$

Back OK

Fig 4.24

When **Gross Error** is set as **ON**, gross errors will be shown out according to Grubbs criteria as the **Statistic Times Value** have been completed. See Fig 4.24. Users can click **X** to conduct deletion (Please refer to 4.2.3.3). When data has been deleted without supplementary point's measure, users can click **OK** to confirm the end of the measure, and be ready for the next measure. If supplementary point's measure is needed, users can click **BACK** to back to the **Measure Mode** window, and conduct supplement.

When **Key Sound** is set as **ON**, as users operate click effective icons on the touch screen, the unit will beep once.

When **Alarm** is set as **ON**, and a measured value is out of the set limit value or gross errors appear, the unit will beep twice.

4.2.4.2 Date / Time

In **System Setting** menu, directly click **Date/Time** item to display the **Date/Time** setup menu. Fig 4.25

1. Users can choose setting contents (year/month/date/hour/second) by clicking button on the screen.
2. Input data by clicking the numbers on the touch screen.
3. Users can successfully complete setting by clicking **OK** on the screen.
4. Cancel mission by clicking **BACK** on the screen.

Sample: Steps of setting time of 10:50 am,
9th Jan. 2006 listed as follow:

1. Choose “hour” in **Date/Time** setup menu by clicking the number “1”

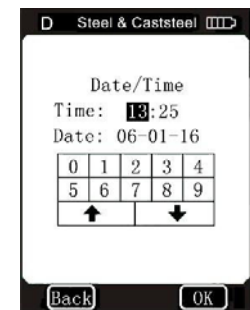


Fig 4.25

then “0” on the screen.

2. Choose “second” in **Date/Time** setup menu by clicking the number “5” and “0” on the screen.
3. Choose “year” in **Date/Time** setup menu by clicking the number “0” and “6” on the screen.
4. Choose “month” in **Date/Time** setup menu by clicking the number “0” and “1” on the screen.
5. Choose “date” in **Date/Time** setup menu by clicking the number “0” and “9” on the screen.
6. Click **OK** on the screen to confirm setting amendment; click **BACK** on the screen to cancel setting amendment.

4.2.5 Calibration

The **Calibration** contains the **HL Calibration** and **Touch Calibration**.

HL Calibration is used to calibrate the measured value (HL) of the

hardness tester, so as to farthest decrease measuring error.

The **Touch Calibration** is used to calibrate the accuracy of the touch screen position, so as to provide correct fast operation of touch screen.

In **System setting** menu, select **Calibration** by clicking on the **Calibration** option to enter the **Calibration** screen. See Fig 4.26.

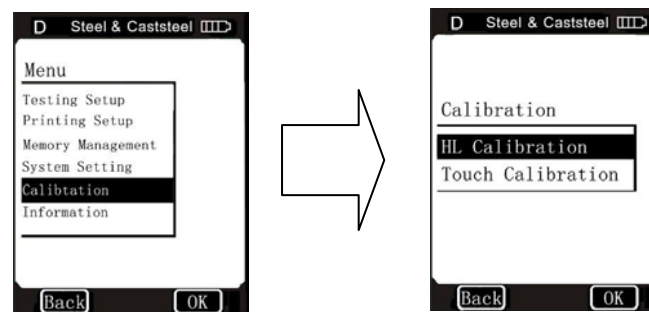


Fig 4.26

4.2.5.1 HL Calibration

In **Calibration** menu, click **OK** on the screen to display the **HL Calibration** menu, or directly click **HL Calibration** item in **Calibration** menu to display the **HL Calibration** menu. Fig 4.27

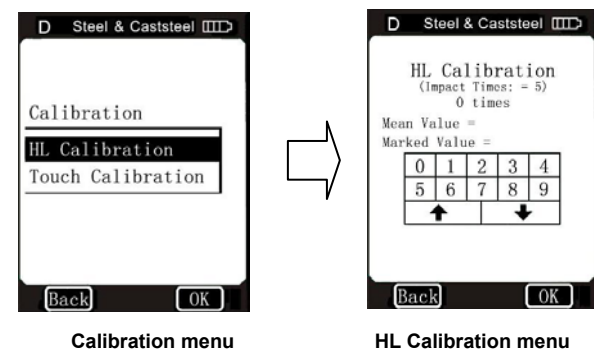


Fig 4.27

Perform 5 effective impact tests on the test block, (when the number of impact times is less than 5, clicking **OK** will display an alarm prompt indicating there are operating errors), the measured values will display on the screen, (Users can delete the wrong data and measure again), Fig 4.28, then click **BACK** on the screen to back to **HL Calibration** menu, the Mean value automatically formed. Input the **HLD** value that marked on test block by clicking the screen keyboard and then click **OK** on the screen, The **HL calibration** finished.

Note: If it's the first time to use the hardness tester or has been so long since the last time, users should calibrate the instrument by using



The screenshot shows a handheld device screen titled "D Steel & Caststeel". It displays a table with 5 rows of test data. Below the table, it shows summary statistics: $\bar{X} = 835$ and $S = 2$. At the bottom, there are "Back" and "OK" buttons.

No.	HLD	DTR	MATERIAL	HRC
001	836	↓	Steel	
002	834	↓	Steel	
003	835	↓	Steel	
004	837	↓	Steel	
005	836	↓	Steel	

$\bar{X} = 835$ $S = 2$

Back OK

Fig 4.28

Test Block.

The default impact direction is downwards. (See Appendix 1 in details)

4.2.5.2 Touch Calibration

The **Touch Calibration** is actually used to calibrate the consistency between touch screen sensor and LCD coordinates. If there is a deviation existing between the actual position of touch screen presses and the position of presses figures displayed by LCD, users should conduct Touch Calibration.

PHT-3000 Hardness display coordinates has been carefully calibrated when it's launched. Due to the difference of environmental conditions (especially notable changes in temperature and humidity), coordinates errors may arise during the process of use. It is normal for



Fig 4.29

small errors that can be corrected well on this function.

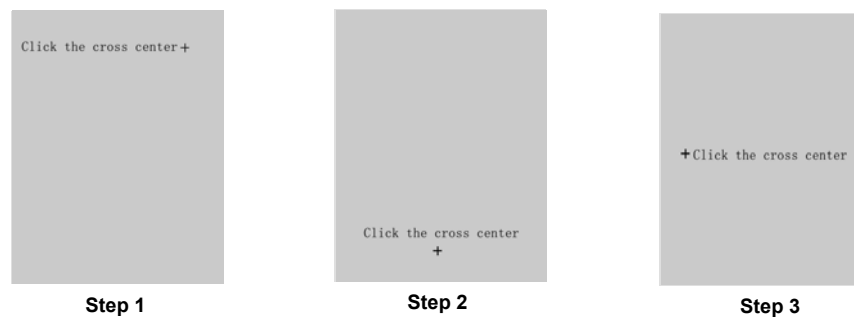


Fig 4.30

In **Calibration** menu, directly click **Touch Calibration** item in **Calibration** menu to display the **Touch Calibration** menu. See the Fig 4.29.

According to the prompt shown on the screen:

Users can click the cross center by using touch pen under the steps of Fig 4.30. After completing the above three steps, a rectangular frame will be automatically displayed in the middle of the window, see Fig 4.31. Then users can click the core of rectangular frame by using touch pen, and system may automatically return to the window of the **Calibration**, and now, **Touch Calibration** has been completed.

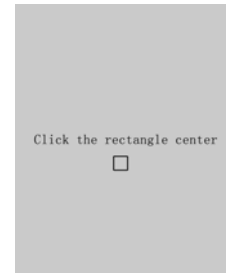


Fig 4.31

If it can't be return to the window of **Calibration**, it means the operation was inefficient, users should re-click the core of rectangular frame again (3 times at most); If it's still inefficient after 3 times, it will automatically return to the window shown as Fig 4.30(**Step 1**). Users should re-start all the steps of **Touch Calibration** till it's successfully done.

4.2.6 Information

Information includes developers and version information of the software and the serial number of the unit. Products manufactured in different periods, the software will be different because of version upgrade. Therefore in use, if users ask service engineer or agent for advice of technical problems related to software, they may be required to provide such information. In menu mode, users can directly click **Information** on the screen to get in the window of **Information**. See Fig 4.32.

Note: Version number may be changed with software upgrade, which will not be re-notified.



Fig 4.32

4.3 Charging

Users need to recharge batteries when batteries are used for the first time and again after each full discharge. The capacity of battery will show as empty after long use (3 columns as full), and show a word "Power Shortage!" Besides, the buzzer will beep once in two seconds to tell the user it's time to charge.

First, users should insert the USB plug of charger into the USB



Fig 4.33

jack of display unit, see Fig 4.33, and then connect the charger with AC socket (220V/50Hz) to start charging. Meanwhile, the screen of display unit will display “charging...”. See Fig 4.34.

When instrument is at the turn-off model, charging instrument will be automatically switched on, and the battery symbols will be shown consecutively.

At the end of charging, users can see "charging complete" on the screen. If users press **ON/OFF** button at this time, the instrument won't be turned off, because it is on a supervision mode.



Fig 4.34

Note: Please use the exclusive charger for the display unit.

4.4 Backlight

The LED backlight of the LCD is used for poor light conditions. It can automatically open backlight when turn on the instrument. If there is no measure, and no touch screen operation, instrument will close backlight itself for saving power. It won't reboot until the status above happens. If the backlight is off, when users click touch screen or have measurement, then the backlight will light up again.

4.5 Reset

If the display unit isn't in order or halt during the usage, users can click the reset button by insert a slender rod into the **Reset** hole at the right side of display unit, and then the instrument will restart.

4.6 Automatic Shutdown

Display unit will automatically shutdown in the following case in order to save battery power. Display unit will store all the parameters

automatically before turning-off.

1. If there is no measurement, and no touch operation in 3 minutes, display unit will automatically switch off. And it will beep continuously in 10 seconds before shutdown.
2. When battery power is too low, the display unit will display “power shortage”, and unit will beep once/ second, and the display unit will automatically switch off after 10 seconds.

5. DATA PRINTING

PHT-3000 Hardness Tester can be linked with exclusive micro printer, so printer can print out the measured values. Micro printer is an optional device. If necessary, please contact the dealer.

5.1 Printer Link

Switching off the power of the display unit, users can then insert the USB plugs of printer cable (optional) into the USB jack for printer at the right side of display unit, and insert the other side of cable into the socket at the left side of printer, connecting the printer with display unit, see Fig 5.1.



Fig 5.1

Users can now start the printer by pressing **POWER** button on the printer, and turn on the display unit next. Other printer operations involving printer power connecting or power recharging is attached in printer user manual.

5.2 Infrared Printing

Put the display unit's infrared launch window at the level of printer's in infrared receive window, see Fig 5.2. At this time, users can use infrared print like serial print.

Note: When using serial cable to print, users cannot put the hardness tester's infrared launch window at the



Fig 5.2

Level of printer's infrared receive window; similarly, when using infrared print, users should pull down the serial cable. Otherwise, the printer will print unrecognizable code; even the paper will be non-stop output from printer.

5.3 Test Report Format

A complete test report is shown at Fig 5.3

Note:

- 1. The specific contents of the report may be setup in Items menu. (See§4.2.2.1 Items)
- 2. The date and time printed are the print date and time.

5.4 Test Report Printing

Test Report			

Impact Unit Type: D			
Material : Steel&Caststeel			
1	808 HLD	61.2 HRC	
Date: 06/07/31 Time:18:21:27			
2	808 HLD	61.2 HRC	
Date: 06/07/31 Time:18:21:27			
3	805 HLD	60.8 HRC	
Date: 06/07/31 Time:18:21:27			
4	808 HLD	61.2 HRC	
Date: 06/07/31 Time:18:21:27			
5	805 HLD	60.8 HRC	
Date: 06/07/31 Time:18:21:27			

s = 3	HLD	00.4 HRC	
\bar{x} = 806	HLD	61.0 HRC	
Printed: 06/07/31 18:21:27			

Fig 5.3

PHT-3000 Hardness Tester offers various printing options. Users can flexibly choose the method of printing according to actual use.

5.4.1 Automatic Printing


If **Auto Print** has been set to **ON**, printer can print automatically during the measure process. Display unit will sent out the data to printer after the completion of a group of test data. The printer will print the title of report before the beginning of each group of data. When the **Statistic Times Values** is set as 1, the printer can't print automatically. When the **Statistic Times Values** is set as 2 to 99, the printer will print automatically by the statistic group.

5.4.2 Manual Printing

When **Auto Print** has been set to **OFF**, users can operate printer


manually. And manual printing can be divided in two types.



1. **Statistic Times Values** is set as 1

After every time of impact, the uses can print out the measured value by clicking the  on the measure mode.

The printer will automatically print the information in the title part when printing starts.

2. **Statistic Times Values** is set as 2 to 99

When the impact times is up to users **Statistic Times Values**, click the , the printer will print out all the measured values and statistics results in the group, and form a complete test report.


If users click the  before the impact times up to the **Statistic Times Values**, the printer will print out all the finished test values. When the impact times is up to users **Statistic Times Values**, users can click  again to print out the rest data and statistics results, by then, report printing completed.

5.4.3 Assemble Printing

Users may not print the report during the test; instead, they can print the measured values in **Printing Setup** menu. See§4.2.2.2 **Print Memory** and§4.2.2.3 **Print All**.

5.4.4 The Other Printing Ways

Users can print when browsing some data management pages (See 4.2.3.2 **Data Browser Mode**); Users can also execute printing in the window of statistic list (See 4.2.4.1).

When these printing ways are available,  will show on screen.

Users can conduct operation according to relevant functions.

Note:

1 Statistic results in testing report would arise at the ending part of testing report only when automatic and manual printing ways of that the **Statistic Times Values** is set as 2 to 99.

2. The dates and time in testing reports are the ones when the testing reports are being printed, not the actual test dates and time.
3. Thermal printing paper should be stored in an environment without high temperature, high humidity and strong light. Store in dark dry place.

6. HARDNESS TEST

6.1 Test Preparation

- 1) Make sure the system connection is safe and reliable.
- 2) Press **ON/OFF** button to switch on the power, and check if it's need to be charged. Confirm every setting on display unit is correct for application, particularly the materials and impact direction. An incorrect setting for the actual condition may cause erroneous measurements.

6.2 Sample Preparation

Incorrect sample preparation may cause erroneous measurements.

Therefore, users should make the sure the part being tested meets the actual standards for leeb hardness testing

Preparation of the sample and the surface being tested should follow these basic instructions.

- 1) During the process of sample surface preparation, users should avoid the impacts of cold processing and thermal processing.

- 2) The sample surface should be smooth and flat with no visible coatings.(ie; oxide, anodize, oils, water, rust, dirt metal chips, etc)
- 3) Roughness of the test surface $R_a \leq 1.6$
- 4) Sample must be close to 1" thick of solid material (steel). Anything below this thickness most likely can't be tested using the leeb hardness method or would have to be demonstrated first.
- 5) When testing a curved surface with a radius of curvature **R** less than 1.2 in (30mm), a special small support ring washer should be used to compensate the curvature. Please use part no. PHT1500-300 for 12pc support ring set
- 6) A sample should not be magnetic. Electromagnetism will greatly affect the impact device and cause tremendous errors.

7. TEST STEPS

Performing of Hardness Test

Easy to use – simple operating elements allow for accurate measurements even by occasional users.

1) Loading

Simply load the impact device by sliding the loading tube forward.



Step 1



Step 2

2) Place

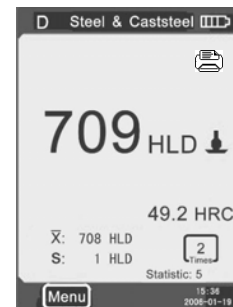
Then place and hold the impact device on the surface of the test piece at the desired test point.

3) Measure

Trigger the impact by pressing the trigger button. The hardness value will be instantaneously displayed.



Step 3



Step 4

4) Read the test result

Modern electronics with power saving features provide for long operating life. The large LCD display always shows how **EPX5500 Metal Hardness Tester** is configured to test. Variable function touch screen allow for quick change of common test parameters, and the on screen hint line shows the other active control keys. No

subjective measuring errors are possible, giving highly repeatable results. Internal self diagnostics with error messages assure reliable test results. Readings can be stored automatically in the internal memory or sent directly to a printer. Repeating the above steps, users can carry out tests in more points.

Note: Generally, each measurement location of sample is conducted for the five tests. The “S” value (difference of maximum value and the minimum value) values must be less than 15HL. The distance between any two impact positions should be ≥ 3 mm; the distance between impact position and the edge of the sample should be ≥ 3 mm.

8. TROUBLESHOOTING

No.	Problem	Reason	Solution
1	No response on display	Lack of power	Recharge battery
2	Touch Screen no response	System halt	Reset
3	Touch Screen inaccurate	Parameters change	Touch Calibration (See 4.2.5.2)
4	Abnormally high results	Carbide ball wear	Replace Impact Body
5	No test results	Sensor cables loose	Remove/re-attach
6	Printer no response	Printer cable loose	Remove/re-attach
* Other problems, please contact Phase II Directly (201) 933-6300			

9. MAINTENANCE AND SERVICE

9.1 Impact Device Maintenance

After using 1000-2000 times, users should clean the inside of impact device and impact body with supplied nylon brush by unscrewing the support ring, remove impact body and rotate the nylon brush into the tube in an anti-clockwise direction, and pull out when touching the bottom. Repeat several times to assure the tube is clean
NEVER USE LUBRICANTS INSIDE THIS DEVICE!

9.2 Store the Report

Because printing paper is thermal paper, it should be preserved BY avoiding heat and direct light. If the print records are to be kept in long-term preservation, please copy to normal paper.

9.3 Normal Maintenance Procedures


In calibration of the hardness tester, if finding that error is larger than 12HLD, users should replace the impact body. After very prolonged usage, these bodies lose their magnetic charge causing large erroneous values.

9.4 Service

- 1) All service is performed by Phase II exclusively.
Please contact technical support at (201) 933-6300.

Appendix1 . DAILY VERIFICATION

Test block is mainly used to verify the hardness tester. The error and the repeatability of the hardness tester should be in the scope defined by the following table.

Impact Device	Impact direction	Hardness of Test block (HL)	Error Allowed	Repeatability Allowed
D		750 ~ 830	$\pm 12\text{HLD}$	12HLD
		490 ~ 570	$\pm 12\text{HLD}$	12HLD

Note:

1. $\text{Error} = \text{HLD} - \text{HLD}$

HLD is the mean value of 5 Leeb hardness values measured on the test block.

HLD is the value that marked on test block.

2. $\text{Repeatability} = \text{HLD}_{\text{max}} - \text{HLD}_{\text{min}}$

HLD_{max} is the maximum value in 5 Leeb hardness values that measured on the test block.

HLD_{min} is the minimum value in 5 Leeb hardness value measured on the test block.

Appendix3. MEASURING AND CONVERSION RANGE

Materials	HV	HB	HRC	HRB	HSD	Tensile strength (MPa)
Steel & cast steel	83-976	140-651	19.8-68.5	59.6-99.6	26.4-99.5	375-2639
Cold work tool steel	80-900		21-67			
Stainless steel	85-802	85-655	20-62	47-102		
Cast iron		140-387				
Cast aluminum alloys		30-159				
Copper/zinc alloys (brass)		40-173		13.5-95.3		
CuAl/CuSn alloys (bronze)		60-290				
Wrought copper alloys, low alloyed		45-315				

Appendix4. MATERIAL CODE

Code	Material	Code	Material
01	Steel & Cast Steel	11	Low Carbon Steel
02	Alloy Tool Steel	12	Hi Carbon Steel
03	Stainless Steel	13	Chrome Steel
04	Grey Cast Iron	14	Cr-V Steel
05	Ductile Iron	15	Cr-Ni Steel
06	Cast Al Alloys	16	Cr-Mo Steel
07	Cu-Zn Alloys	17	Cr-Ni-Mo Steel
08	Cu-Sn Alloys	18	Cr-Mn-Mo Steel
09	Copper	19	Cr-Mn-Si Steel
10	Forging Steel	20	Hi Strength Steel