7703/7713

Impulse/Surge Tester

User Manual

V1.02

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Chapter 1. Note

This instrument is not suitable for outdoor use, especially in humid or highly dusty locations. Improper use of this instrument may result in electric shocks. Please read the safety descriptions carefully before using this tester in order to avoid improper or wrong use causing accidents.

1.1 Safety Signs

The following safety signs may appear in this manual and on this instrument.

: Note, please read this manual carefully for these contents.

: Protective ground terminal: Please ground this terminal properly before using this tester in order to avoid electrical shock accidents from coming in contact with the case with power leakages.

CAUTION: Warning Sign: When the product is used improperly, it may cause improper results to this instrument or other DUT.

WARNING: Warning Sign: When the product is used improperly, it may cause injuries or even death.

1.2 Do not modify or make internal adjustments to this machine

Without authorization from our company, do not install replacement components or perform any modifications or adjustments to this machine on your own in order to avoid increasing the danger of the machine or causing damages to the machine.

1.3 Static Electricity

Do not allow objects with static electricity come in contact with this machine in order to prevent damages to the machine.

1.4 Ground

There is a ground terminal inside the power socket of this tester. Please ground this terminal properly in order to prevent electrical shock accidents from occurring when touching the case.

1.5 Power

Power cables that comply with the local country specifications must be used, and connectors applicable to IEC320 connectors must be used for the connection of this instrument. Users must ensure that the ground cable is properly grounded. If a fuse is included in the power plug, use fuses that comply with T(Time-lag)1.25 ampere safety regulations, and ensure that it is AC power supply with a voltage between 98V-264V, 50/60Hz.

1.6 Warm Up

The tester can operate normally once the power is turned on; however, in order to achieve the accuracy within specification, please turn on the machine in advance and let it warm up for 30 minutes before use.

1.7 Machine Malfunction

When the instrument malfunctions, please send the machine back to the original manufacturer to have professionals repair it for you in order to ensure the accuracy and operation safety of the meter.

1.8 Test End

Please switch the machine power off when the machine is not used for an extended amount of time.

1.9 Placement and Storage

The operating temperature and humidity range of this machine is 18 ºC - 28 ºC, 80% RH; the error in measurement data will be greater if this range is exceeded. The storage temperature and humidity range of this machine is -20 ºC - 70 ºC, 80% RH. In order to achieve accurate testing and for safety considerations, do not place this machine in environments with direct sunlight exposure, high temperature, high humidity, frequent vibrations, excessive dust, or unable power grid.

1.10 Emergency Handling

When there is an electric shock or if the DUT or machine catches on fire, please switch off the power and unplug the power cable.

Chapter 2. General description

2.1 Package and Accessories

Standard accessories included in the 7703 packages should include the following items:

- 1 * 7703/7713 Motor stator tester
- 1 * Power cable
- 1 * Test report
- 1 * User manual (CD)

2.2 Specification instruction

● Layer Short

Measuring Voltage: 0.1kV～5kV/ 0.1kV~ 10kV

Measuring Item: Waveform area, waveform area difference, waveform tremor, waveform comparison, flutter value, Harmonic noise height, Harmonic flutter value

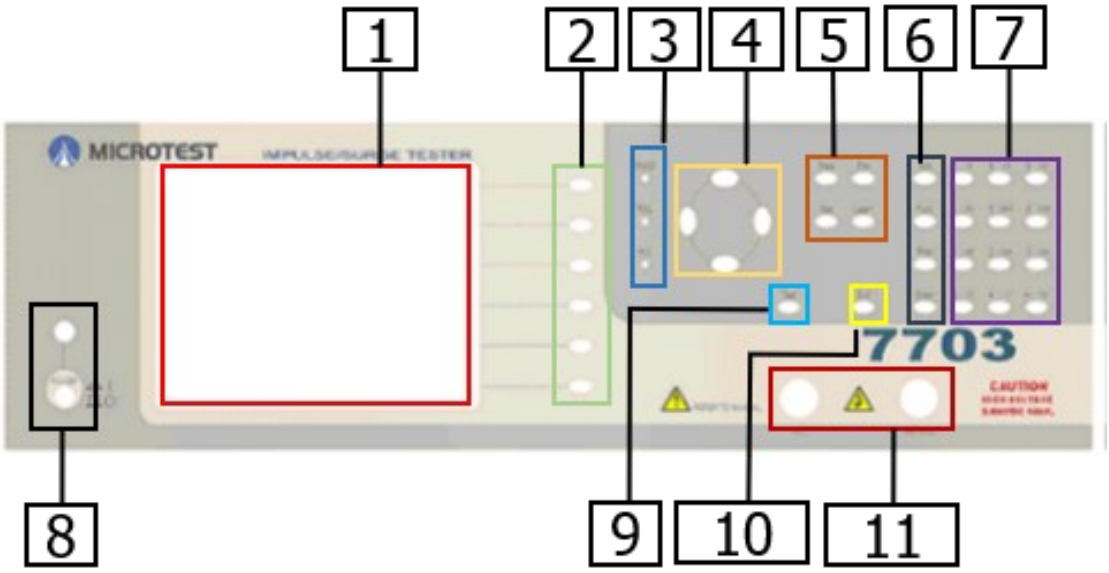
Stable Accuracy: 2%

● Other Spec

Measuring Pin:	2 Channels
Display / Sound Device:	Pass / Fail graphic display / Sound device.
Power Supply:	AC 110V / 220V ± 10% 50/60Hz
Temperature:	10℃～40℃
Humidity:	Less than 50% relative

2.3 Functions of the Front and Rear Panels

2.3.1 Front panel



(1) LCD color display: Display settings and test results S1~S6 Operation Soft Key

(2) PASS / FAIL & HV instruction light: The Pass/Fail will light up after being tested successfully; If HV lights up, there is a current output. DO NOT touch the high voltage output port when this light is on as you may get shocked.

(3) Soft Key: To select the function on the screen.

(4) Arrow key: These keys move the cursor for editing.

(5) Para, File, Stat, Learn Keys: Press these keys can setting test.

(6) Sys, Func, Print, Enter Keys: Press these keys can setting System.

(7) Numeric Keys: Press to edit numeric data.

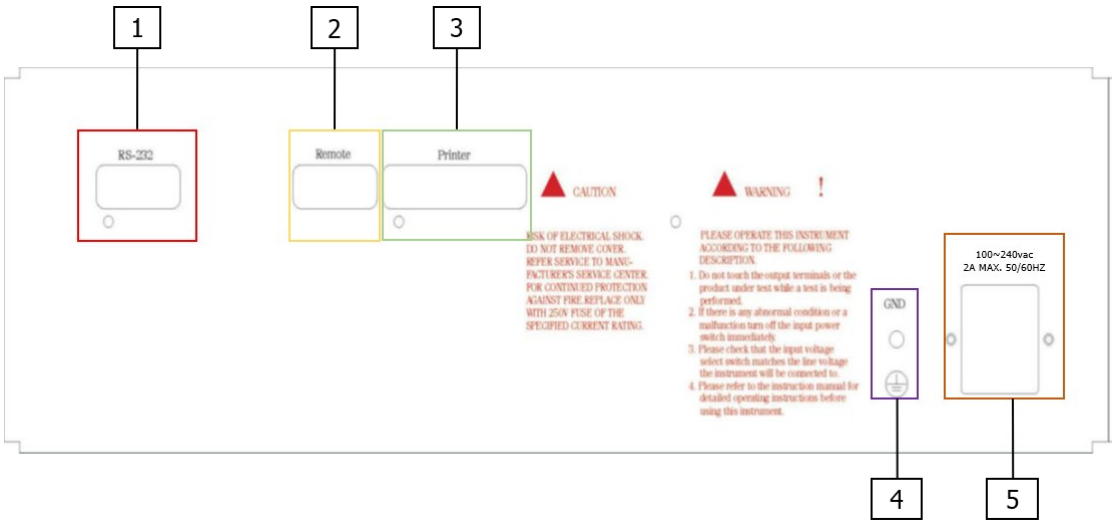
(8) Power switch: Power on or off the host.

(9) Test Key: Press to start testing the system in READY mode

(10) Exit Key: Press to back to previous page.

(11) Testing Output Terminal: Port for current output test.

2.3.2 Real panel



(1) RS-232 connector: Connect to the computer to control your machine with computer instructions

(2) Remote controller port: Signal for external control including the determination and testing signal output or input of an external signal for test start and stop.

(3) Printer Port: Connect to printer.

(4) Iron casing terminal: Ground your machine with this terminal for steadier device operation.

(5) AC power socket: AC power input connector with a 250V/3.15A fuse

Chapter 3. Function Instruction

3.1 Function

Press FUNC key under the main menu.

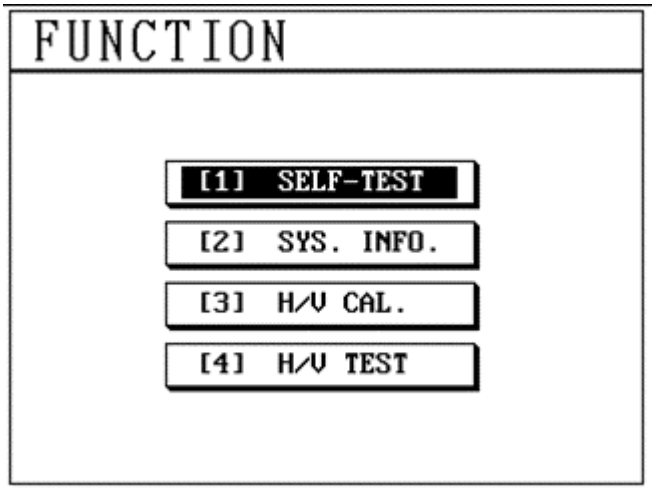


Figure 3.1.1 Function Menu

- **SELF-TEST**

Press S1 under Function Menu and enter Self-Test mode and start the self-testing. Test items are CPU, RAM, ROM, EEPROM, CLOCK. If test result is NG, power off the tester and contact your agent or Microtest Corp. to repair the instrument

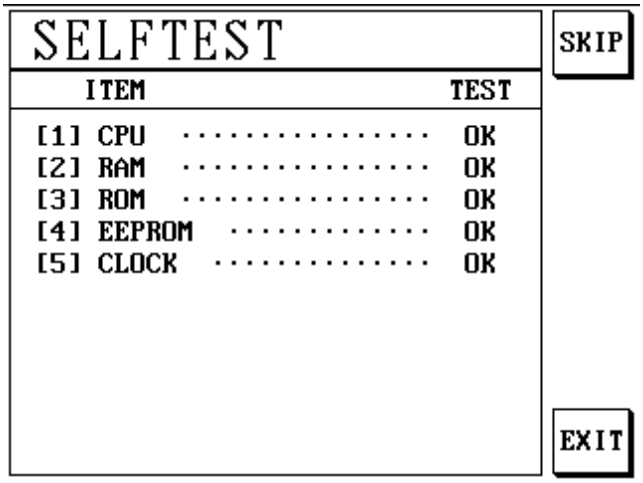


Figure 3.1.2 SELF TEST

- **SYS. INFO.**

To show the system information of machine, include model name, firmware version, firmware released date, hardware version, total file space, and free file space.

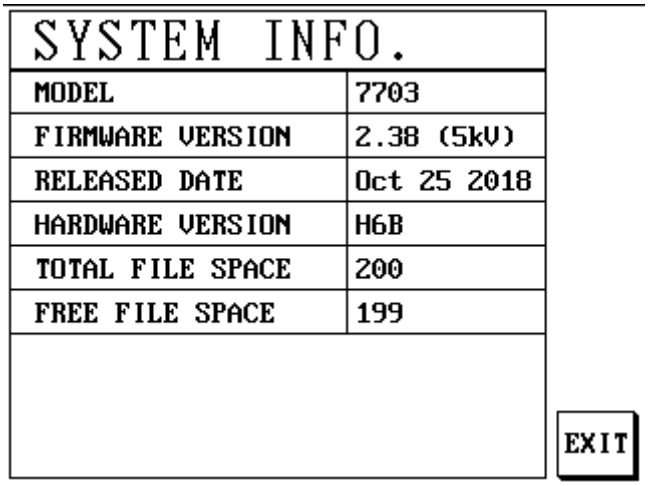


Figure 3.1.3 System information

- **H/V CAL.**

The high voltage correction is used to adjust the READING (test

value) closest to the setting value

(1) Press the Up and Down key to adjust the value of code till the Reading value is closest to the value of Voltage.
(2) After confirm the reading and voltage column are almost same then press S4 DONE to save the setting and go to next column.

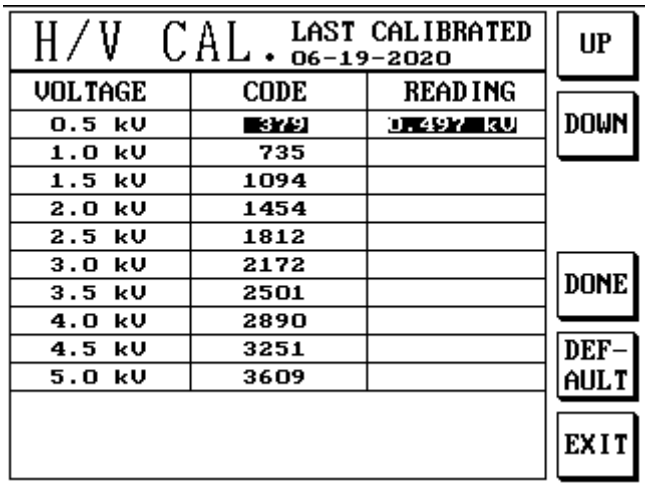


Figure 3.1.4 Surge voltage calibration

● H/V TEST

To test the voltage after calibration.

ON: Enable H/V voltage output.

OFF: Disable H/V voltage output.

UP: Increase the SET value.

DOWN: Decrease the SET value.

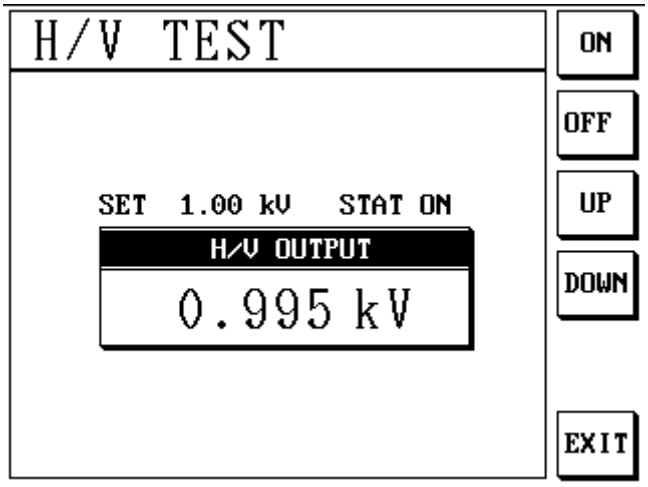


Figure 3.1.5 Surge voltage test

3.2 System

Press SYS key under the main menu.

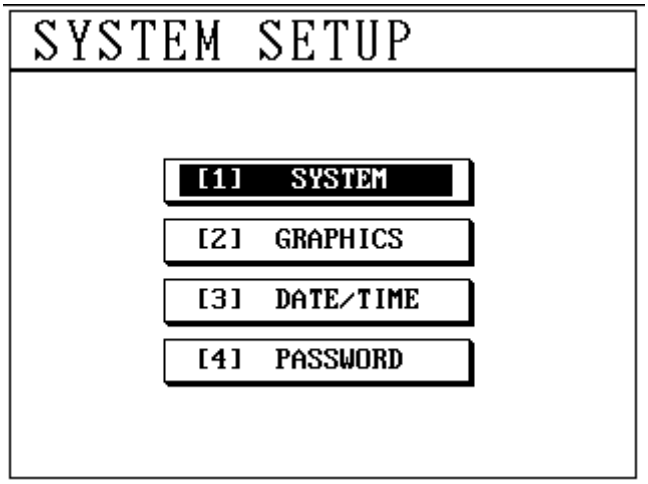


Figure 3.2.1 System Setup Menu

- **SYSTEM**

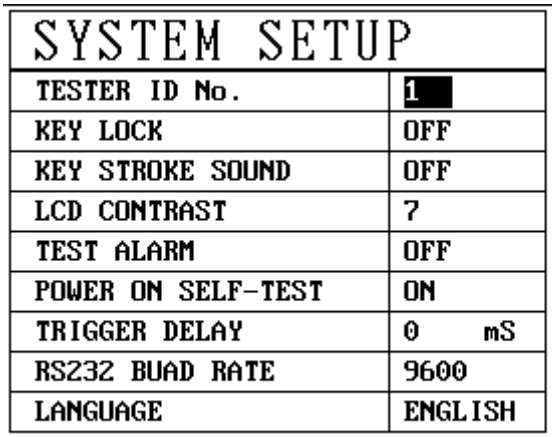


Figure 3.2.2 System config

(1) Tester ID No.: For the user who has several instruments. Default value is 1, the maximum value is 999, use numeric key to edit and press ENTER to finish setting

(2) Key lock: This machine provides key lock protection in order to prevent data from being modified randomly; please first go to system settings to change the system password and then go to key lock and select | Lock | before this function can be

used.

(3) Keystroke sound: Enable/ disable the keystroke sound.

(4) LCD contrast: Adjust the LCD brightness level.

(5) Test alarm: **Off**: No alarm whether the result is pass or fail.
All: Alarm when the results are pass and fail.
Pass: Alarm only DUT is pass.
Fail: Alarm only DUT is fail.

(6) Power on self-test: Enable or disable the Power On Self-Test

(7) Trigger delay: Use numeric key to enter delaying time

(8) RS-232 baud rate: Select the RS-232 baud rate.

(9) Language: Select the language, Chinese or English.

● GRAPHICS SETUP

Use the arrow keys to select the required option.

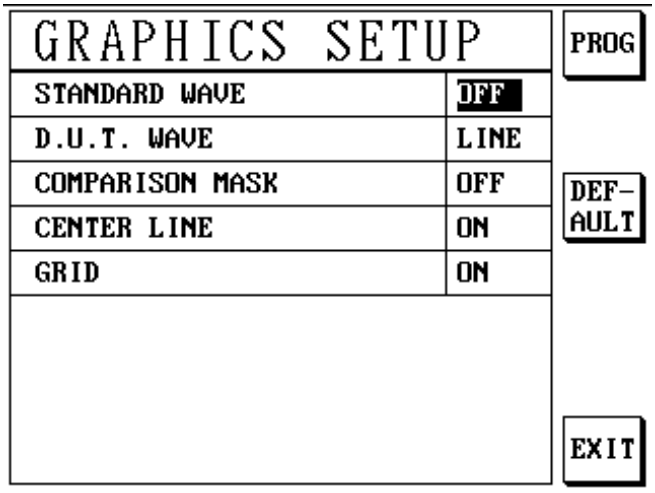


Figure 3.2.3 Test config

(1) Standard wave: It can be shown on the test screen in either line or dot format, or can be turned off.

(2) DUT wave: It can be shown on the test screen in either a line or dot format.

(3) Comparison mask: Set the upper and lower limit waveforms to be displayed.

(4) Center line: Enable or disable to display the center line.

(5) Grid: Enable or disable to display the grid.

● DATE & TIME

Set the date and time.

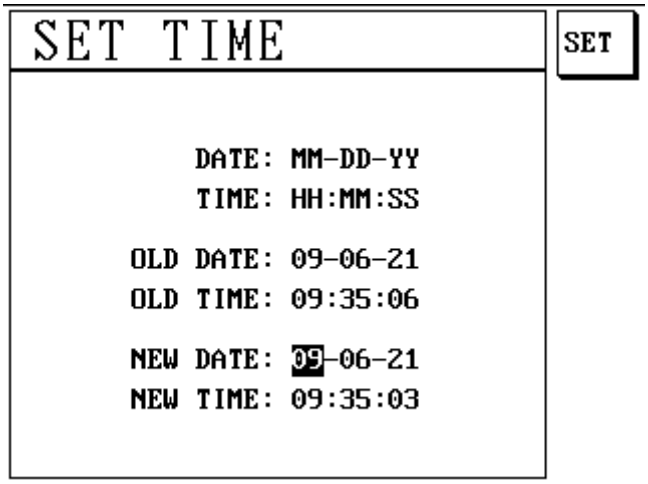


Figure 3.2.4 Date & Time

● PASSWORD

After enter the original code (7703), re-enter the new password (maximum 8 digits number) and re-enter the new numbers again to confirm the new password.

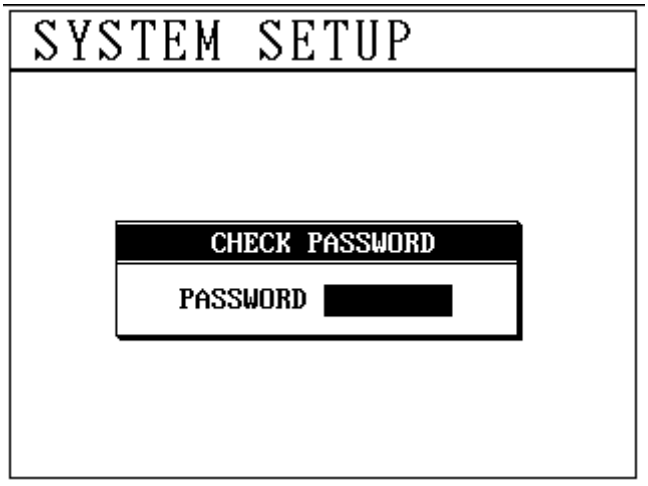


Figure 3.2.5 Password

3.3 File Management Menu

Select the file and press enter to load file.

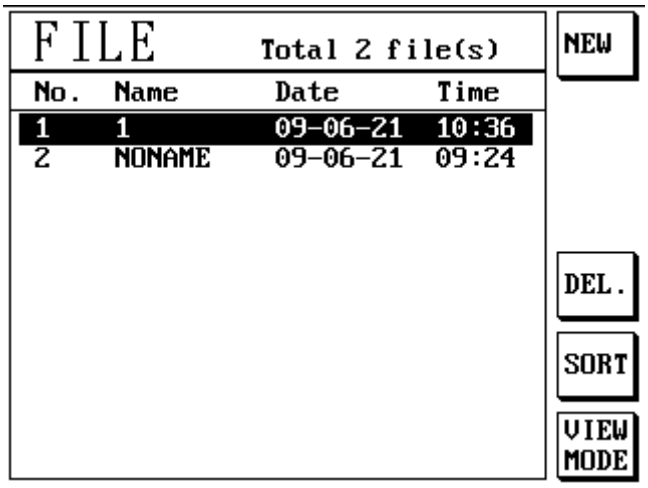


Figure 3.3.1 File menu (1/2)

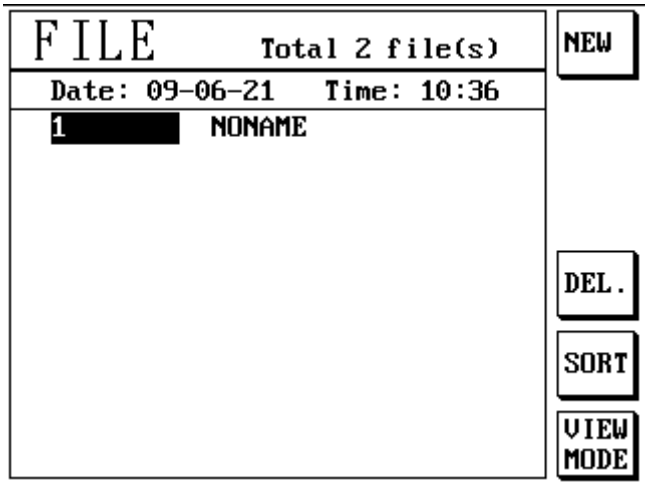


Figure 3.3.2 File menu (2/2)

(1) New: Use number keys to set the file name.

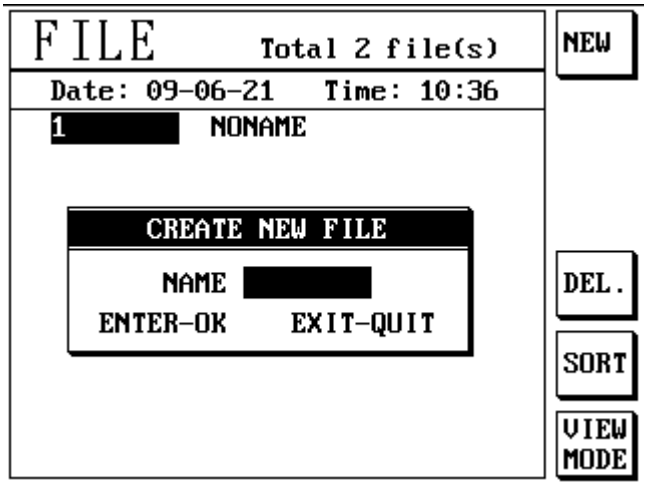


Figure File create new file

(2) Delete: Use arrow key to move the cursor to the file which is going to delete.

(3) Sort: Sort file sorts the files according to four rules

(4) View mode: Change view mode, refer to figure 3.3.1 and 3.3.2.

3.4 Parameter setting

Enable or disable the test parameter and press S4 Setup to setup the details.

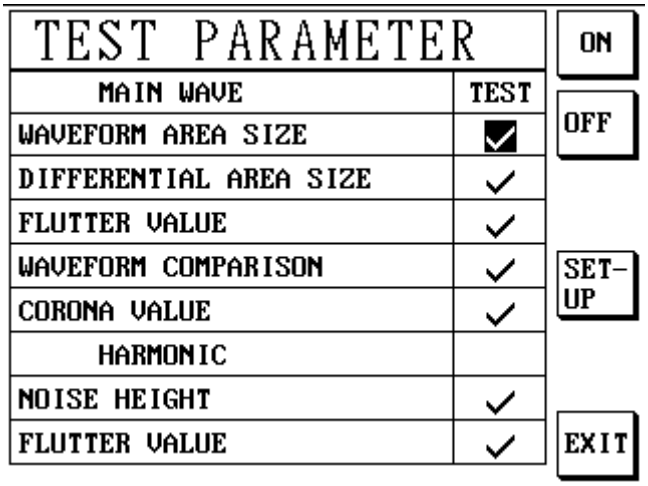


Figure 3.4.1 Parameter setting menu

(1) Waveform area size: This test item looks for a change in the area under the waveform but does not take into account any distortion or movement of the waveform.

Use S2~S5 to set up the testing range and number keys to set up a tolerance. After setting, press S1 Pre-test to start the pre-test. In the meantime, there will have a test result displayed at the right-down corner, and then press exit to back to the previous page.

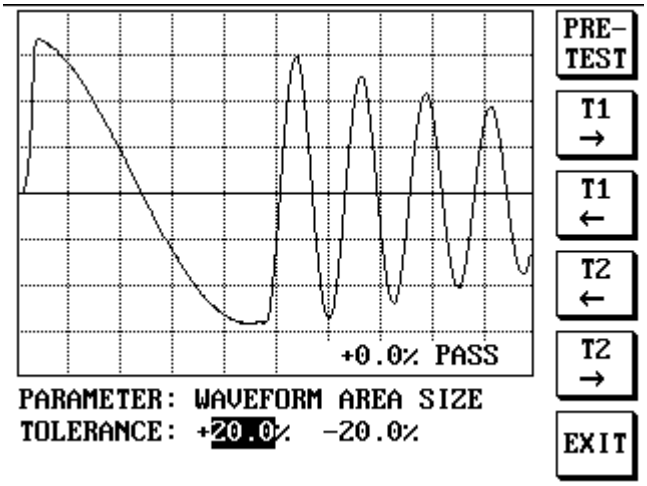


Figure waveform area size

(2) Differential area size: This test item looks for any movement or distortion outside the waveform but does not take into account any change in the area of the waveform.

Use S2~S5 to set up the testing range and number keys to set up a tolerance. After setting, press S1 Pre-test to start the pre-test. In the meantime, there will have a test result displayed at the right-down corner, and then press exit to back to the previous page.

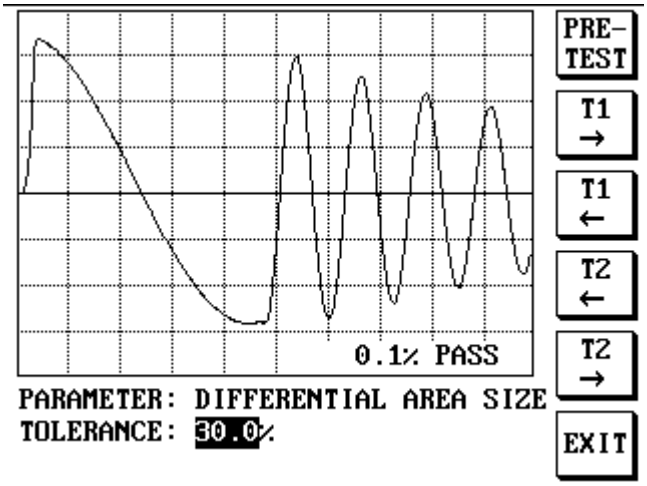


Figure differential area size:

(3) Flutter value: This test item calculates the number of level differences (corona discharges) from one waveform point to the next on a voltage waveform.

Use S2~S5 to set up the testing range and number keys to set up a tolerance. After setting, press S1 Pre-test to start the pre-test. In the meantime, there will have a test result displayed at the right-down corner, and then press exit to back to the previous page.

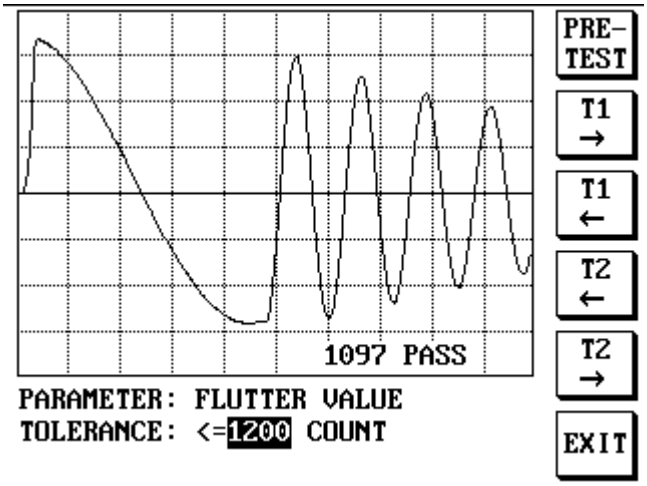


Figure flutter value

(4) Waveform comparison This test item looks for a change in the waveform voltage or frequency.

Use S2~S5 to set up the testing range and number keys to set up a tolerance. After setting, press S1 Pre-test to start the pre-test. In the meantime, there will have a test result displayed at the right-down corner, and then press exit to back to the previous page.

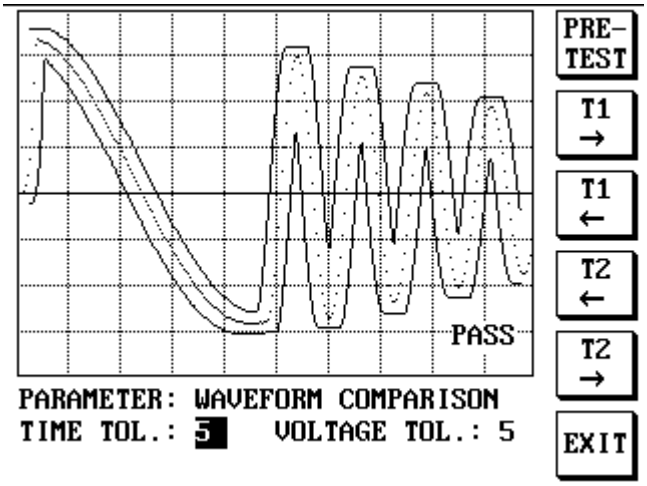


Figure Waveform comparison

(5) Corona value This test item is a number that is affected by high

frequency noise. If D.U.T. has corona inside, the **corona value** with become higher. Set appropriate **corona value** can catch out some **Layer Short** problem.

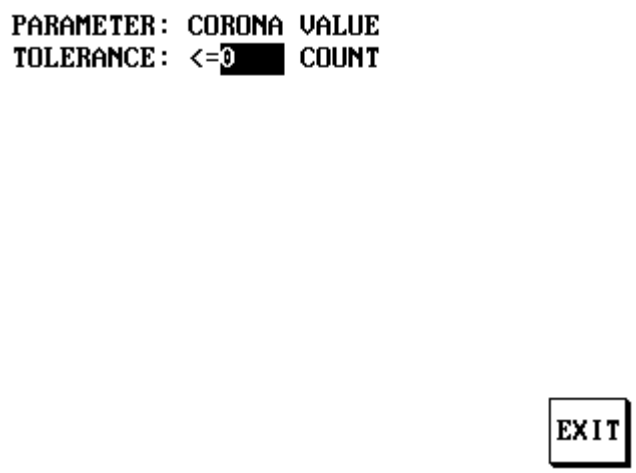


Figure Corona value

Harmonic

Waveform Harmonic Analysis is a new technology to detect a very small noise from the D.U.T. It is the best way to find out Layer Short problem. The display is showing a high-frequency harmonic waveform that is emphasized by the special technology.

(6) Harmonic Noise height: If you press S1 PRE-TEST key, the machine will generate a pulse and read the waveform from the D.U.T. Set appropriate Noise Height can find out Layer Short problem.

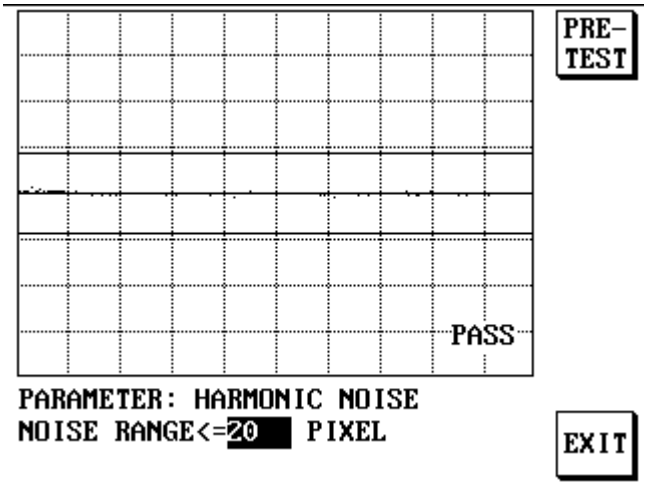


Figure Harmonic Noise height

(7) Harmonic Flutter value: Harmonic Flutter Value is a number that affects by Waveform flutter. Set appropriate Harmonic Flutter Value can find out Layer Short problem.

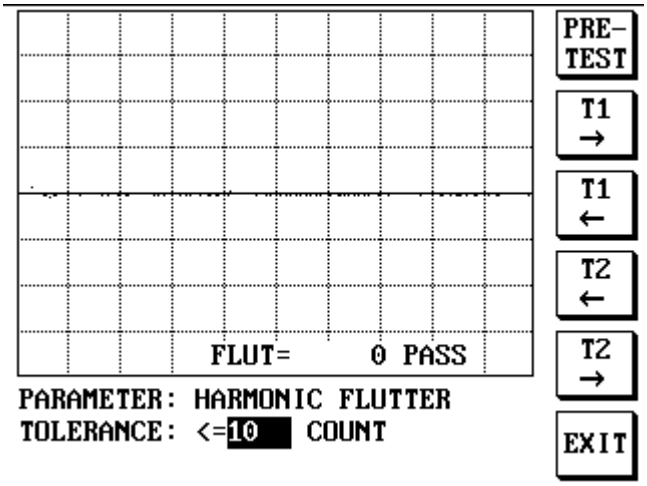


Figure Harmonic Flutter value

3.5 Learn

Impulse / Surge Testing is tested by waveform comparison, according to this, the instrument has to learn the standard waveform to compare the waveform of DUT. Before learning connected the standard sample with the Hipot output terminal and press the S1 Learn wave to learn. If the waveform is too wide or too narrow, press S2 and S3 to adjust magnification, or move the cursor to width and key the value directly. Under this mode, it can also adjust voltage and testing mode. After learning, press exit to exit.

Notice: To optimize the parameter settings a quantity of known good working golden samples will be required. It is recommended that at least five samples are used during optimization.

Test each sample and note the test differences compared to the learned waveform.

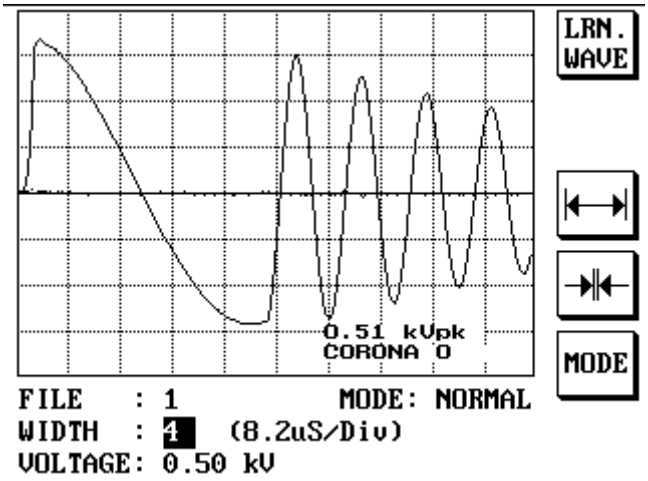


Figure 3.5.1 Learn

(1) Learn: Learn the wave from DUT.

(2) |←→|: Zoom in the wave.

(3) →||←: Zoom out the wave.

(4) Mode: Select the test mode, normal, low Q, low L.

TEST MODE	
TEST MODE	NORMAL
DUMMY PULSE	0
TESTING PULSE- MAIN	1
TESTING PULSE- HARMONIC	1
AUTO LEVEL COMPENSATION	ON
CONTINUAL TEST	OFF
CONTINUAL COUNT	0
INTERVAL TIME	0.0 S
HARMONIC ADJUST	-0

PROG

EXIT

Figure Mode setup

Normal

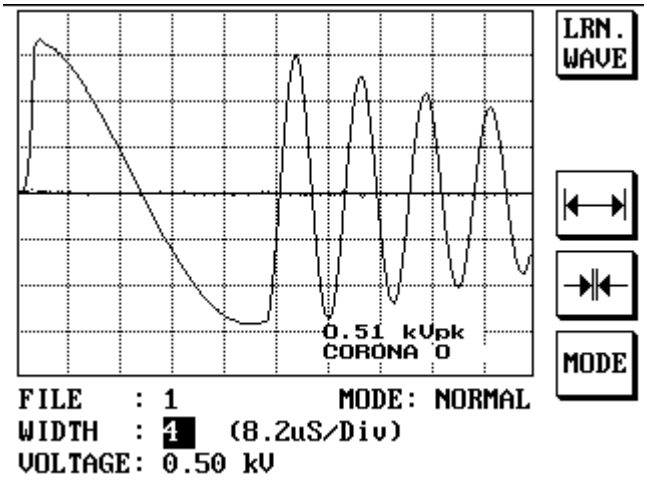


Figure Mode Normal

Low Q

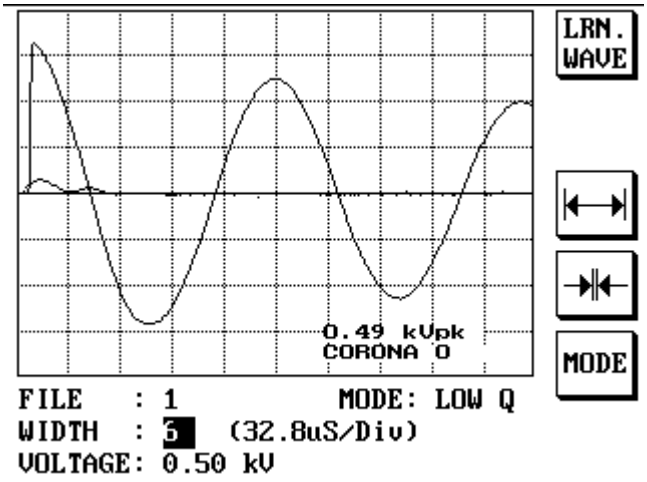


Figure Mode LOW Q

Low L

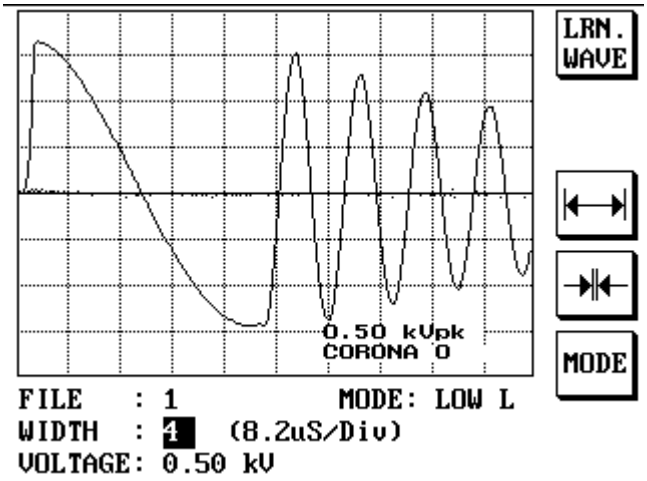


Figure Mode LOW L

3.6 Statistic

It will show the test statistics of the currently loaded file.

(1) QTY. Rate: To change the display mode.

By number

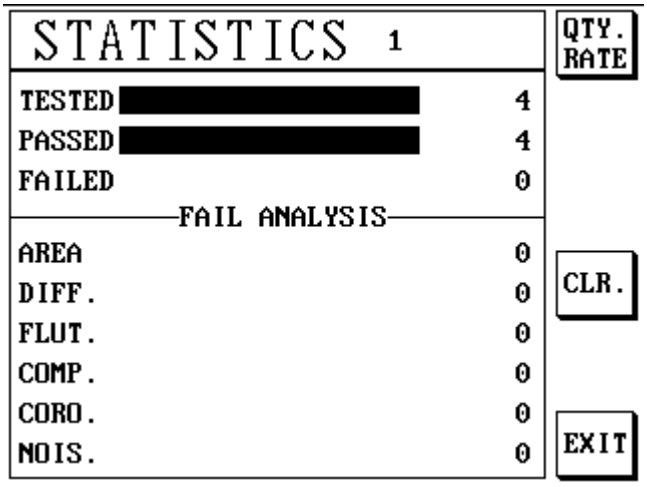


Figure Statistic number

By Percent

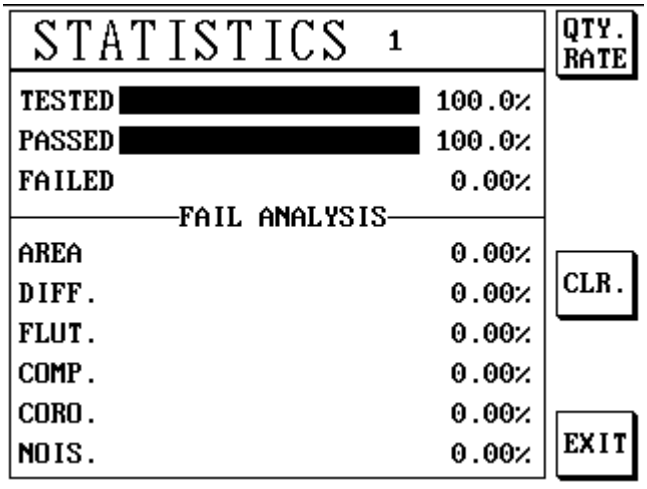


Figure Statistic percent

(2) CLR.: Clean up the data.

(3) Exit: Back to the previous page.

Chapter 4. Start To Test

4.1 Test Mode

Press the test button on the main screen to enter the test mode.

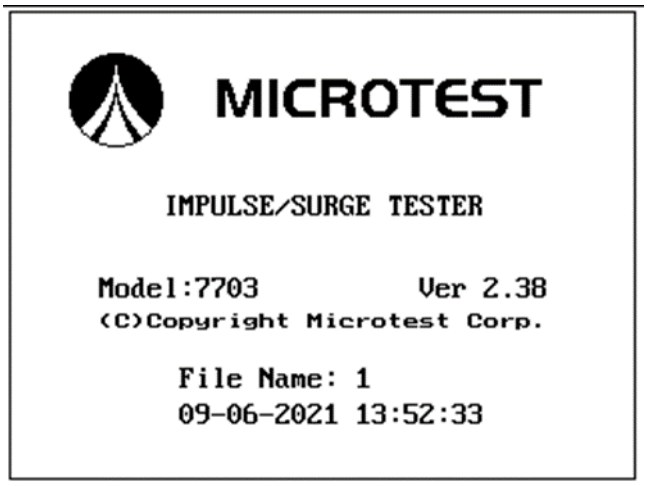


Figure 4.1.1 Main screen

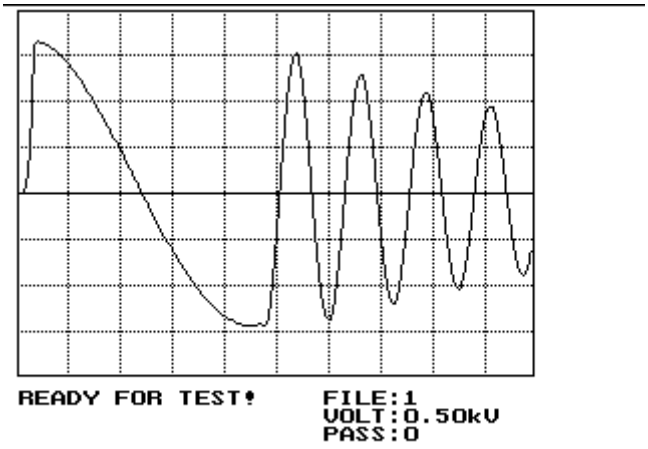


Figure 4.1.2 Test mode

Press the Test button to start the test. After test, we can get the test result as follows,

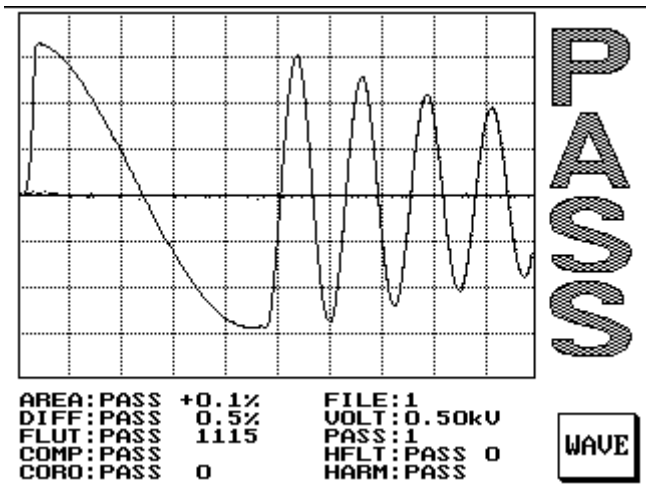


Figure 4.1.3 Test result

Press S6 Wave to change display wave for main, harmonic, main + harmonic.

Main:

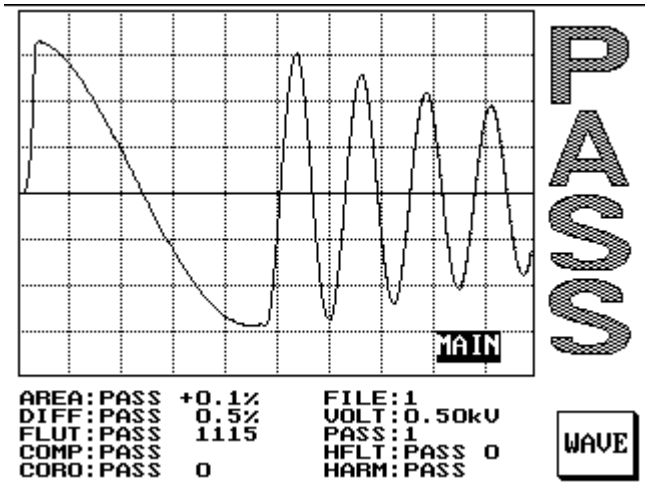


Figure Wave Main

Harmonic

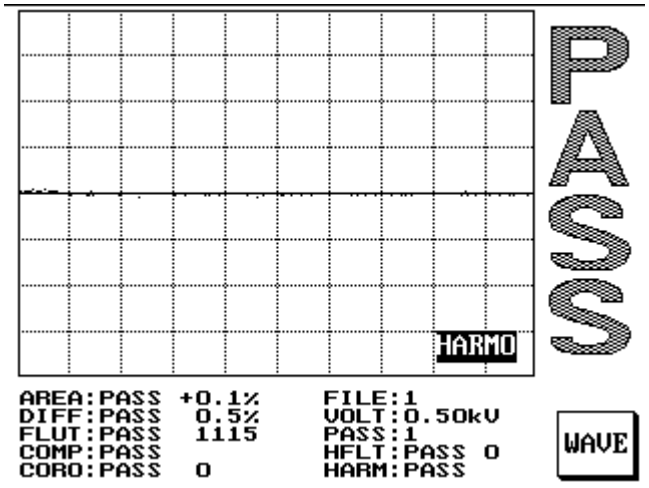


Figure Wave harmonic

Main + Harmonic

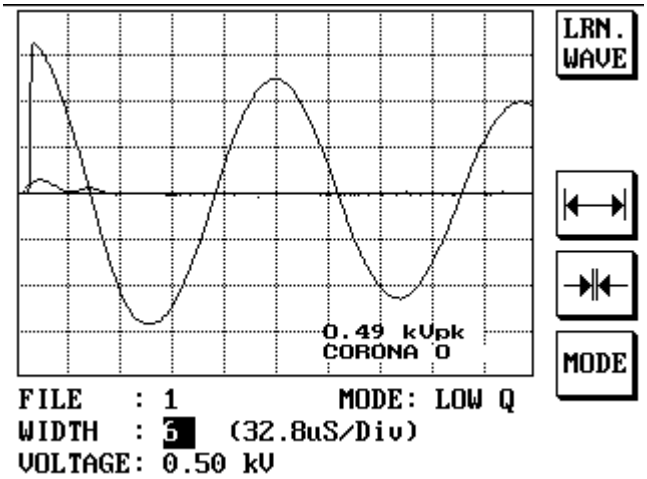


Figure Wave Main + Harmonic

Chapter 5.Remote Control

Remote control; use the 25 Pins communication port on the rear panel of the machine to use an external signal to control the tests of this machine.

5.1 Remote Drive Ability

Power Output Spec: DC5V, 40mA

Signal Output Spec: Exterior power DC3V~36V, 100mA

PIN	SIGNAL	OUT/IN	DESCRIPTION
1	CTRL 1	OUT	Pass, output is LOW
2	CTRL 2	OUT	Fail, output is LOW
3	CTRL 3	OUT	H.V. ON, output is LOW.
4	CTRL 4	OUT	Testing, output is LOW.
5	CTRL 5	OUT	Reserved
6	CTRL 6	OUT	Reserved
7	CTRL 7	OUT	Reserved
8	CTRL 8	OUT	Reserved
9	+12V		12V DC output for user applications
10	IPC 0	IN	Test is performed whenever IPC 0 and GND are shorted.
11	IPC 1	IN	Reserved
12	Reset	IN	System is reset whenever RESET and GND are shorted.
13	+5V		5V DC output for user applications

14	+12V		Same as Pin 9
15	GND		Ground

Notice: CTRL0 – CTRL3 are photo-coupled, they are grounded when active, floating when inactive.

5.2 Command

Commands are terminated by LF (line feed, ASCII code 10 (decimal), 0xA (hexadecimal); only the LF is effective as the terminator.

Download (D)

D – reference file is sent from the computer to 7703

512 bytes in length 2 port instruments

The command "D" should be sent followed by LF. A delay of 100ms may be required before the file data is sent.

Upload (U)

U – reference file is sent from 7703 to the computer

521 bytes in length 2 port instrument

Trigger (T)

Trigger the 7703 and query the test result with waveform data returned.

Trigger (t)

Trigger the 7703 and query the test result without waveform data being returned.

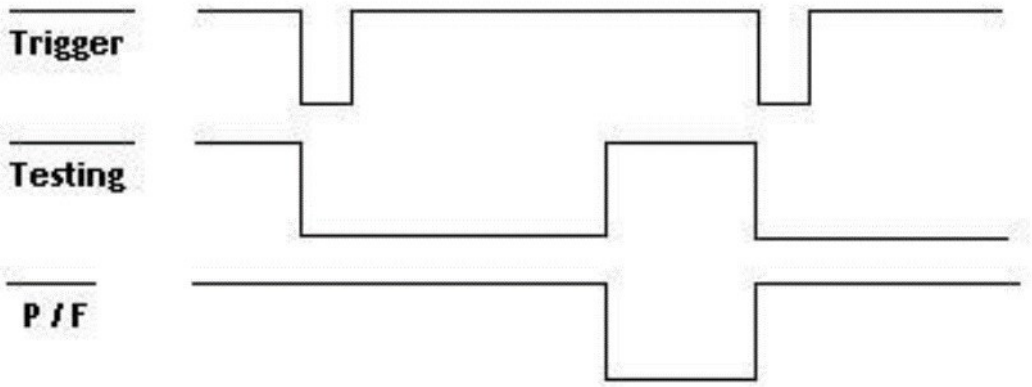
System Key (Kn)

Kn - simulates the pressing of a specified front-panel key. User must make sure the 7703 is in the desired state before executing this command and essential delay time generated to ensure the key command is executed without loss of information prior to sending a further command.

Where n =	1	Number key 1
	2	Number key 2
	3	Number key 3
	4	Number key 4
	5	Number key 5
	6	Number key 6
	7	Number key 7
	8	Number key 8
	9	Number key 9

	0	Number key 0
	.	Dot key
	B	Backspace
	U	Up arrow
	D	Down arrow
	l	Left arrow
	R	Right arrow
	E	Enter
	T	Test
	X	Exit
	N	Func
	Y	Sys
	L	Learn
	P	Para
	a	Function key 1
	b	Function key 2
	c	Function key 3
	d	Function key 4
	e	Function key 5
	f	Function key 6

5.3 Timing Diagram



1. Trigger signal duration greater than 10mS.
2. PASS or FAIL is issued when all tests are finished and is not cleared until the next trigger pulse is received.

Chapter 6. Calibration Procedure

DC calibration available, please ensure to warm up the instrument for at least 30

minutes in order to make the testing value correct.

6.1 Enter Configuration Procedure

Press FUNC key under main menu and then select [3] H/V CAL. to enter H/V CAL page. The default password is 7703.

※ **Warning:** When using the function, please do not touch output terminal or connect any load into the output terminal.

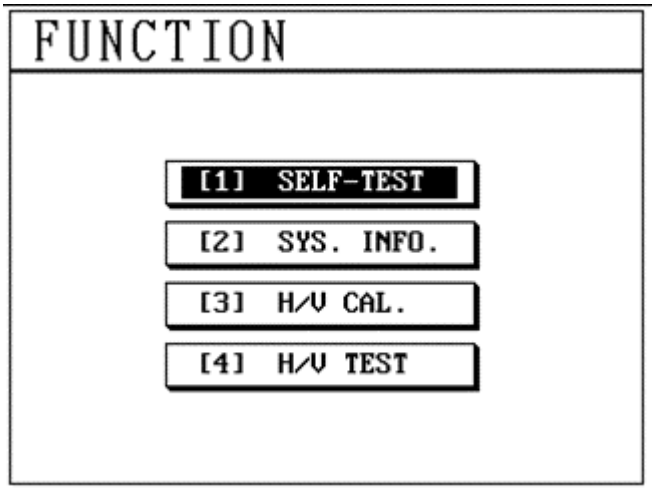


Figure 6.1.1 Function Menu

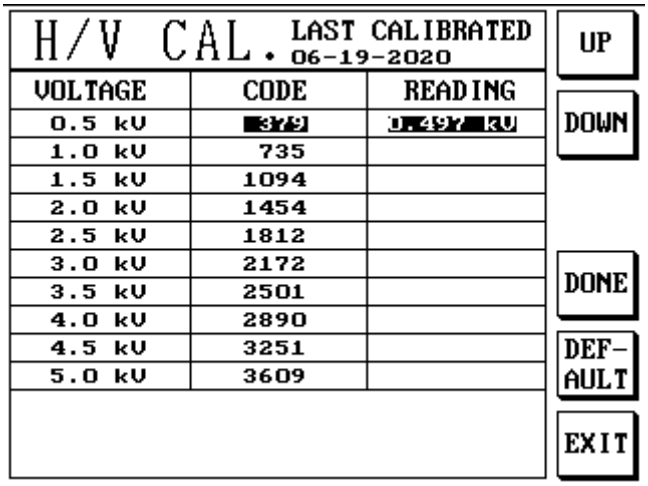


Figure H/V CAL. page

6.2 High Voltage Output Calibration

Press S1 UP and S2 DOWN to adjust the voltage, the value for CODE and READING should be the same. After that, press ENTER to move next column.

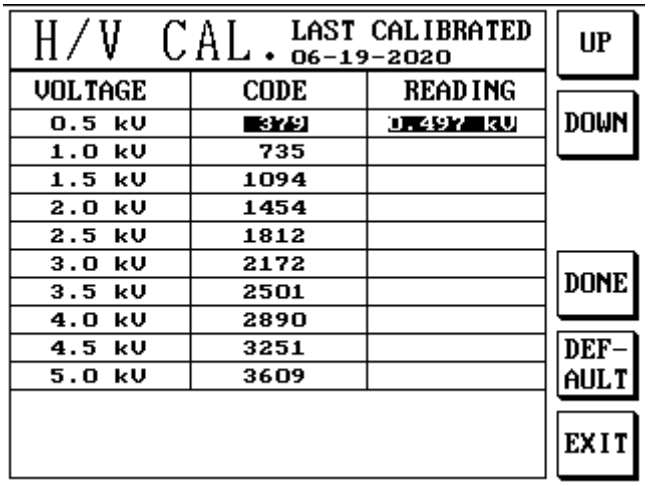


Figure 6.2.1 H/V CAL. page

Up:	To increase CODE value.
Down:	To decrease CODE value
Done:	To save the code.
Default:	To reset the code value to default value.
Exit:	Back to previous page.

6.3 High Voltage Output Testing

Connect the positive terminal of DC meter to CH1 of the instrument and negative terminal to CH2. The result should be minus value due to the voltage is negative while testing

● High Voltage Output Setting

Press FUNC under the main menu to enter Function Menu, and then press S3 Surge voltage test to enter H/V Test page.

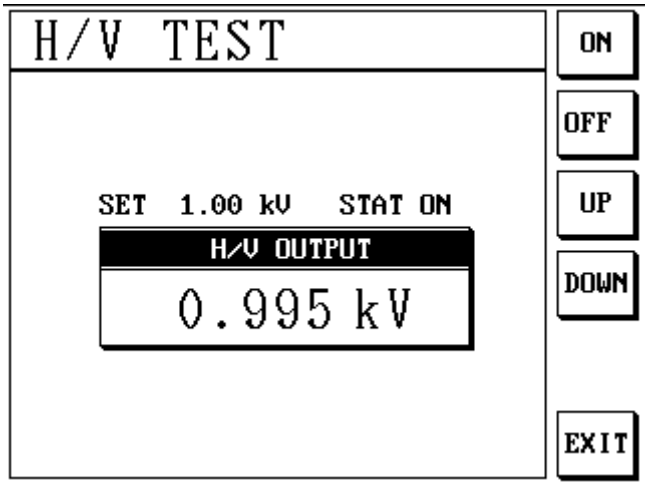


Figure 6.3.1 H/V Test page

- **High Voltage Value Setting**

Use numeric key to setup high voltage value. High voltage range is 0.2kV~5KV. If the setting value smaller than 0.2kV, the instrument will insert 0.2kV and larger than 5KV, the instrument will insert 5KV automatically.

On:	Turn on the H/V output.
Off:	Turn off the H/V output.
Up:	To increase the setting value, resolution is 0.1 kV.
Down:	To decrease the setting value, resolution is 0.1 kV.
Exit:	Back to previous page.

Chapter 7. Theory of Operation

7.1 Applied Pulse

When a short high voltage pulse is applied to a perfect unloaded inductor a sine wave would be seen that continued to infinity without changing amplitude.
However, the perfect inductor does not exist and making a measurement will always apply a small load to the device under test. So what is actually seen is a sine wave with decaying amplitude.

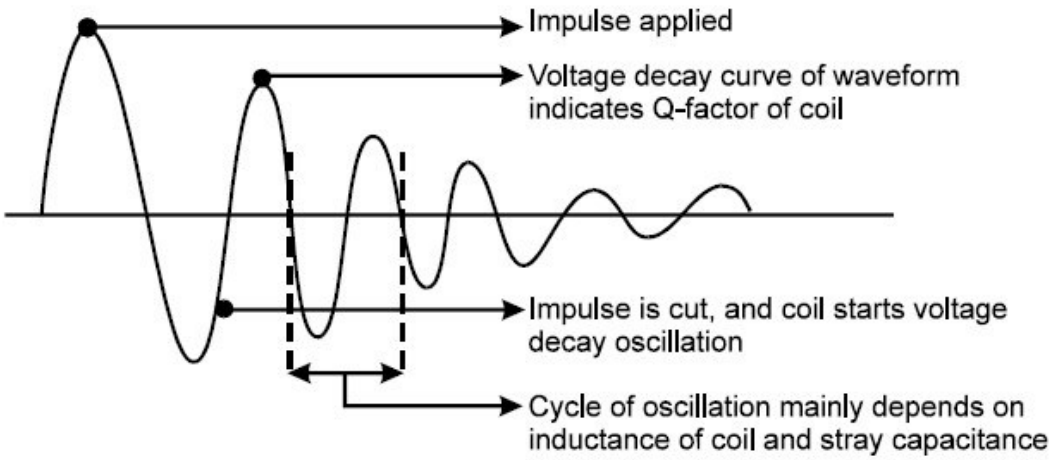


Figure 7.1.1 Theory of Operation

The waveform decay is related to the Q-factor of the coil: the higher the Q, the slower the rate of decay. The frequency of the waveform is related to the inductance and stray capacitance of the coil.

The Impulse Winding Tester 7703 allows the user to store a standard waveform produced from a known good „golden" component sample. It will then compare this waveform against the waveform of the device under test.

7.2 Why Use Impulse Testing?

- Impulse testing characterizes a winding in a way not possible on a conventional LCR meter.

- The short high voltage pulse will cause no damage to the device under test.

- Comparing the waveform from a good device to that of the device under test will show differences in the number of turns, changes in the core material, shorted turns, and corona discharge (damage to the winding).

- The differences are shown as a waveform that decays at a different rate, which would be indicated by the area under the curve. A waveform that is out of phase with the standard waveform would be indicated by differential area size, or a combination of both indicated by waveform comparison.

- Corona discharge, indicated by a spike on the waveform, is normally present when a high voltage charge is applied across a wire (winding) that has some damage to the insulation.

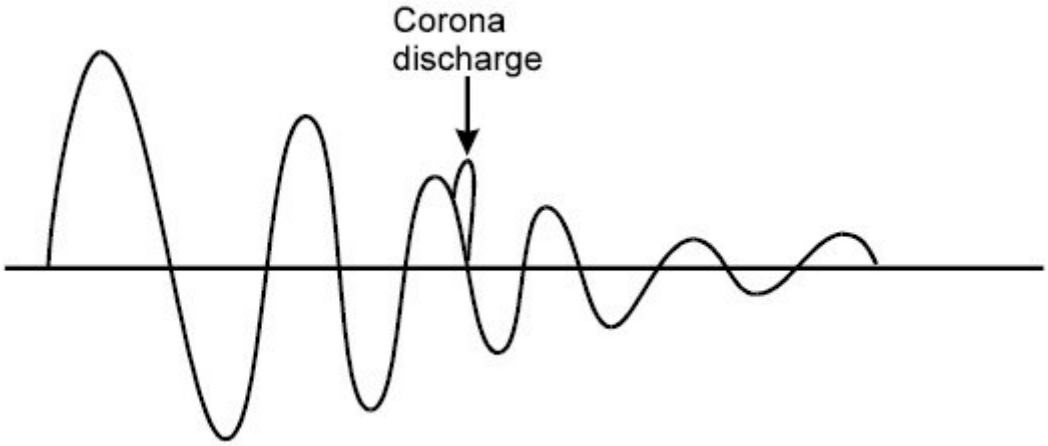


Figure 7.2.1 Corona Discharge