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## *Digital Impulse Winding Tester*

D W X - 0 1

D W X - 0 5

## *Instruction Manual*



### **High Voltage**

- This machine generates high voltage.
- Read this manual carefully so as not to be in troubles.
- Do not touch an output terminal in an operation state or you get an electric shock.
- This machine must be grounded for safe use.

Reprint or copy of this manual is prohibited.

The specification and a content of this manual may be modified without an announcement.

## ***PRECAUTIONS***

Please follow the instructions below and handle the unit well for trouble-free operation.

### **CAUTION !**

#### **(1) Handling of the Main Unit**

Do not place large or heavy items on top of the unit.

On the back of the unit, a fan is installed for a smooth release of the heat radiation.

Do not obstruct the air from the fan.

#### **(2) Strictly Keep the Rated AC Voltage**

Within the unit, the switching power stabilizes high voltage power sources. Unstable power could lead to damage of the switching power. Therefore, strictly adhere to the rated AC voltage or supply regulated power source.

#### **(3) Grounding**

The power cable of the unit is used with the grounded terminal. For safety purpose, make sure to ground the cable.

#### **(4) Do Not Touch the Interior**

Do not remove the cover case. The unit inside contains high voltage. Touching any internal parts is extremely dangerous and can cause damage to the unit.

#### **(5) In Case of Carrying or Moving**

When carrying the unit, make sure to unplug the socket from the AC wall outlet and remove the high voltage cable and the external control cable.

The handle cannot bear weight beyond that of the unit. Carry the unit vertically and do not exert too much force on the handle.

#### **(6) Maintenance**

The cover and the unit use some plastic and coating. Do not wipe it with solvent like thinner, benzene, or similar chemicals. Use only a damp soft cloth with neutral detergent.

#### **(7) Installment**

To avoid an increase in temperature of the internal part and changes in the shape of the plastic cover, do not put the unit near the equipment with high temperature or places with direct sunlight or bad ventilation. As the unit produces high voltage, avoid places with a lot of dust or with high moisture. Please use the unit in a place with normal temperature (23° C) or with only slight changes in temperature.

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# 1. About the DWX Series

## 1-1. Introduction

Thank you for your selection of the DWX-05/01 Impulse Winding Tester. To fully ensure years of trouble-free operation, be sure to carefully read this manual, understand the function operations and follow the manual instructions.

## 1-2. Functions and Features

The DWX-05/01 has been developed successfully with high performance and reliability through our digital impulse coil-winding tester, DW/DWS series. With a combination of up-to-date technology, sophisticated design, and visual operation, the DWX-05 is a new overall impulse-winding tester for the next generation.

The available detection methods of the Impulse Winding Tester are as follows.

Detection by Area Size Comparison

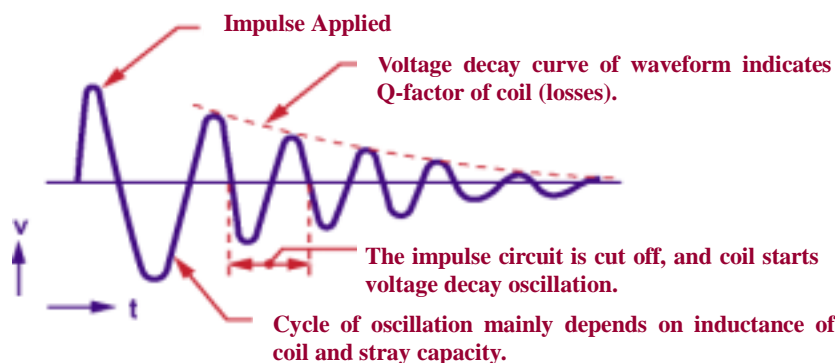
Detection by Differential Area Comparison

Detection by Corona Discharge Comparison (Flutter Value or Laplacian Value)

By choosing a combination of various detection functions, it can test various types of winding coils.

## 1-3. How Does the Impulse Winding Tester Work ?

The impulse coil-winding tester tests the electrical characteristics of coil winding without damaging the sample. The prerequisite conditions for quality of a coil can be detected at just a glance. The detection is carried out when the same electric impulse by capacitor discharge is applied to the master and the test coils. The voltage decay waveform is generated in response to the impulse, related to the Q-factor and inductance (impedance) of the coil. In this sense, the tester can detect turn & layer short, the differences in the number of turns and the material of the core. If high impulse voltage is applied, the poor insulation will appear as a corona or layer discharge.



**1-4. Specifications**

	<b>DWX-01</b>	<b>DWX-05</b>	<b>DWX-10</b>
Applied Voltage, Step, and Energy * At 1 kOhm Resistive Load	50V – 1,000V (10V Step) Max 5 milli-Joule	500V – 5,000V (100V Step) Max 0.12 Joules	1,000V – 10,000V (200V Step) Max 0.5 Joules
Inductance Test Range	More than 10uH		More than 50uH
Sampling Speed	8 bit / 10 nano-sec. (100MHz)		
Sampling Memory	8192-Byte		
Sampling Range	10 Ranges: -4, -3, -2, -1, 0, 1, 2, 3, 4, 5 (Width 0 to 5 is the Compatible Range with the DW Series)		
Input Test Circuit (Impedance)	Resistive Voltage Divider (5 MOhm)		
Screen Display Resolution	640 x 480 Dots (VGA), 8.4" TFT Color LCD, 4 Color Display		
Waveform Display Range	512 x 256 Dots		
Detection Mode	Master Waveform Comparison Detection by Area Size Comparison, Differential Area Comparison, and Corona Discharge		
Master Waveform Memory	Internal Memory: 42 Types (14 Types per Page, 3 Pages) 700-Types by Compact Flash Memory (14 Types/50 Pages)		
External Interface	Parallel I/O (Start, Reset, OK, NG, Busy, Master Numbers, etc.) RS-232C (Test Control, Test Data, etc.) Printer Port (Screen Hard Copy) Ethernet Adapter (Option)		
Accessories	A Test Cable (1.5 m)                      A Power Cable (With 3P Adaptor) A Compact Flash Memory              A Parallel I/O Connector An Instruction Manual and Inspection Record		
Environmental Conditions	0°C-40°C, AC Voltage Upon Your Request: 100V - 240V±5%		
Dimension (Excluding the Handle)	345 (W) * 185 (H) * 370 (D)		345(W)*325(H)*370(D)
Weight	Approx. 10 kg		

\* The AC voltage is adjusted according to your request. The AC voltage can be set easily by changing the internal transformer tab.

AC Voltage (V)
100/115/200/220/240

**1-5. Unpacking and Packing**

**Unpacking**

Check to make sure that the tester is in good condition (without damage during the shipping process) and that there are all the necessary accessories.

If there is any damage or deficiency, please kindly contact us.

Description	Q'ty	Check List
High Voltage Test Cable	1	
Power Cord	1	
AC Plug Adaptor (3P-2P)	1	
Parallel I/O Connector (57-30240)	1	
Compact Flash Memory Card 32Mbyte	1	
Fuse (2A)	1	
"High Voltage Danger" Sticker	1	
Instruction Manual/Inspection Record	1	

**Packing**

Make sure to use the box provided to ship the tester.

Make sure to remove the power cord and each connecting cable from the tester before packing.

Keep the accessories, instruction manual and other accessories together for your future use and reference.

**1-6. Caution in Installation**

Make sure to follow the caution instruction.

**Make sure to connect the tester to the ground for safety purpose.**

- 1) 3 pole case: Connect the power cord to the grounded 3Pole wall socket; or
- 2) 2 pole case: Connect the power cord to the 3-2Pole adaptor and plug into the wall socket.  
Then, ground the adaptor's GND line (green).

**Warning: Without connecting to the ground, it is possible that the electrical shock will occur.**

**Caution: It is possible that the external influence (noise) can disturb the operation if the tester is not grounded. As a result, the tester can possibly radiate noises or EMI (Electromagnet Interference) and the operation is disturbed.**



**1-7. Confirmation of the AC Voltage**

The AC voltage of the tester is set as seen in the table below when the tester is shipped out. Make sure to use the power at the same voltage.

Standard	Export Specification (Upon Your Request)
100V	100/115/200/220/240

The allowed input for the AC voltage range is nominal  $\pm 10\%$  of the voltage. Using the AC voltage beyond this range will cause damage.

**Therefore, make sure to use the proper AC voltage.**

**1-8. Acceptance (OK) / Rejection (NG) Detection**

**1. AREA SIZE COMPARISON**

This compares each area size of the master coil and the sample coil waveforms in the intentionally determined zone. In Fig. 1, the area size is calculated between 'a' and 'b', and OK/NG (Pass/Fail) is determined by comparing the area size (i.e. what percent (%) the sample waveform's area size differs from that of the master waveform). The detecting criterion is set by %. When the result is within the set value in %, the test coil is considered to be "OK". The area size of the wave is nearly proportional to the energy loss in the coil; therefore, the test coil is considered to be OK/NG by the amount of its energy loss. For example, when a sample coil layer has a short circuit, the short circuit area is reflected as an increase of energy loss.

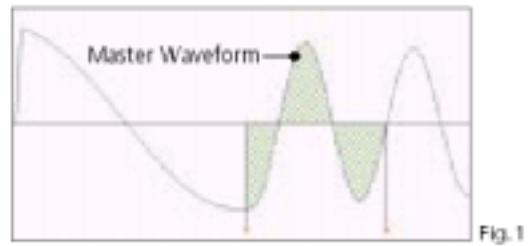


Fig. 1

**2. DIFFERENTIAL AREA COMPARISON**

This calculates the area size of differential portion between the master coil and the sample coil waveforms in the intentionally determined zone. In Fig. 2, the differential area size is calculated between 'a' and 'b', and OK/NG is judged by detecting how large the differential area size is.

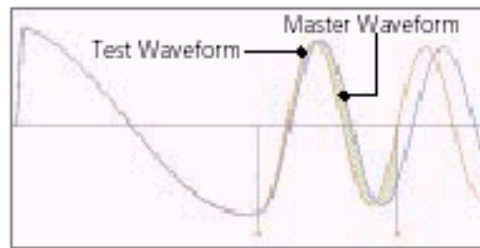


Fig. 2

The detecting criterion is set by %. When the result is within the set value in %, it is considered to be "OK". The differential area size represents the change in L value and total energy loss. This method is especially effective, for example, when the change of the L value causes major problems.

**3. CORONA DISCHARGE (FLUTTER VALUE) DETECTION**

Regardless of the difference in waveforms, this method only detects the high frequency energy of corona discharge as shown in Fig. 3. It detects the corona value in the intentionally determined zone of the waveform, and judges OK/NG by the corona evaluation value. The detecting criterion is set by an integer. The result that appears within the range is considered to be "OK". The wave is converted by derivative calculation and then its area size is calculated. In an equivalent analog circuit, the energy value of the wave that passes through a high pass filter is measured.

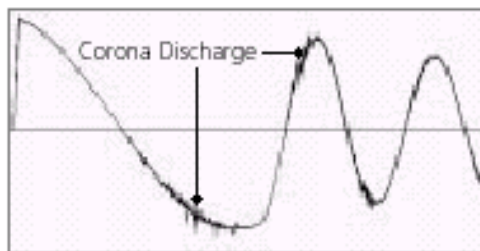
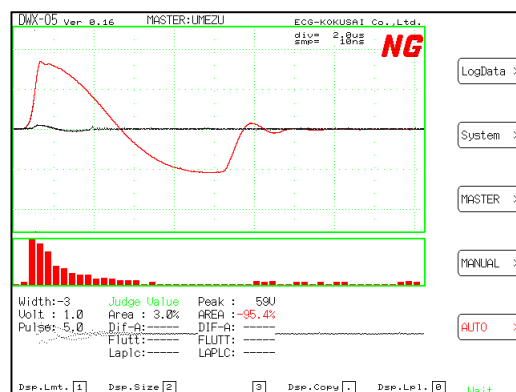


Fig. 3

**4. CORONA DISCHARGE (LAPLACIAN VALUE) DETECTION**

The Laplacian is a method in digital filter processing used for detecting the edge intensity of an image. In the application to the Flutter Value, it measures the 2<sup>nd</sup> derivative of the image to find and extract the partial discharge. The discontinuity of the value hidden in the wave data (noise) can be digitized, offering an easier detection of the partial discharge (Fig. 4).



**5. VISUAL COMPARISON**

The superimposed master and sample waves are displayed on the screen at the same time. This allows an easy observation of the differences in characteristics of the two coils.

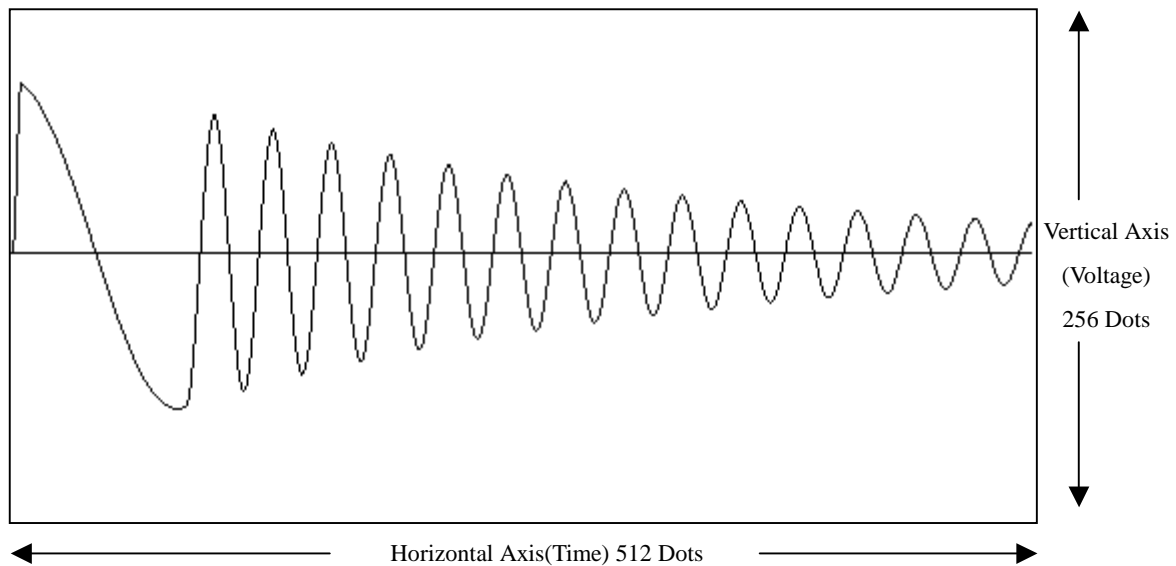
### 1-9. DWX Waveform Resolution

The transient waveform, generated by the applied impulse, is digitized by a microcomputer and the high speed A/D converter. The memory capacity available for a single transient waveform of the DWX is 8192 bytes (one sample point per one byte). In other words, a maximum of 8192 sampling points can be used to record a transient waveform. The obtained data then is used for display on the LCD, and for OK/NG detection according to the preset criteria.

In case of a coil with a fast transient waveform (a greater frequency), the levels of sampling points are much different from one another, so a slow A/D converter cannot follow the changes. For the DWX, the 10 nano-seconds speedy A/D converter is used in order to digitize the high-speed transient waveform. (Compared to the DW series, the DWX is 5 times faster.)

The above has described the sample point numbers (resolution) in the time (horizontal) axis. This basic resolution principle can also be applied to the level (vertical) axis. In the DWX, 0 to  $\pm 128$  points are available for each sampling point, that is, a total of 256 points in the voltage axis.

As seen above, the digital system has some advantages over the analog system. Each sampling point can be clearly defined in terms of values, resulting in easier and more reliable data storage, data recall, and data comparison.

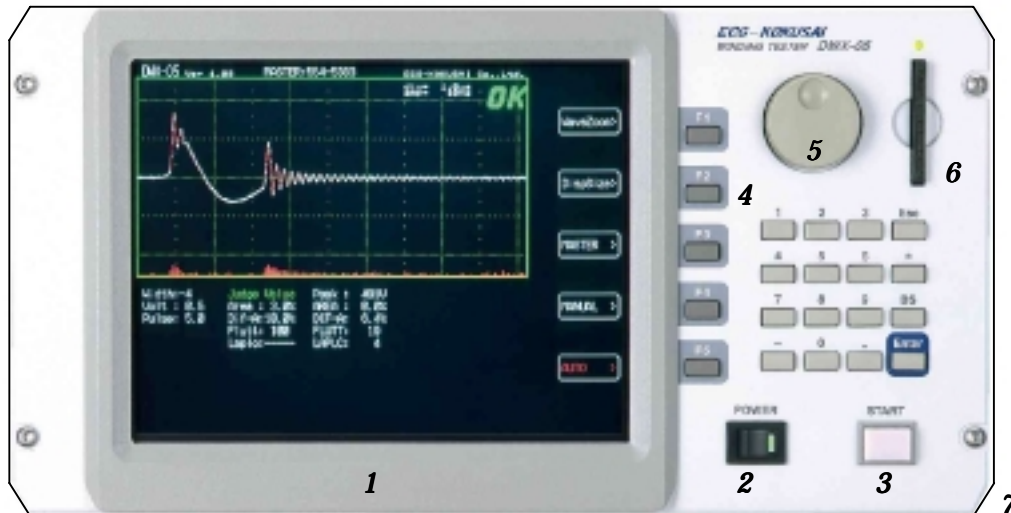


In the DWX tester, the horizontal and vertical scale appearing on the screen can give the information about the waveform temporarily. The horizontal scale is the time axis, with fine point division scale of 100 dots. The coarse division scale indicates half of it with 50 dots. The time of one scale line appearing on the right top of the wave screen is 100 dots between the time scale. The vertical scale is the voltage axis, with fine point division scale of 100 dots.

The coarse division scale indicates half of it with 50 dots. The vertical scale tells about the voltage. Please refer it to the supplement section at the end of this manual.

## 2. Names & Functions

### 2-1. Front Panel



#### 1. 8.4-Inch Color TFT Liquid Crystal Display

The master wave and test waves are displayed in color and the test result can be judged at once.

#### 2. POWER SW & LED

This is the main power switch. The green LED lamp lights up when the power switch is on.

#### 3. START Switch

Starting Test Switch

#### 4. Function Keys and Numeral Keys

Operation keys for menu changes, test setting, master model names.

#### 5. Rotary Dial

It supports many operations including menu selection, sampling range or test parameter setting, alphabet character input.

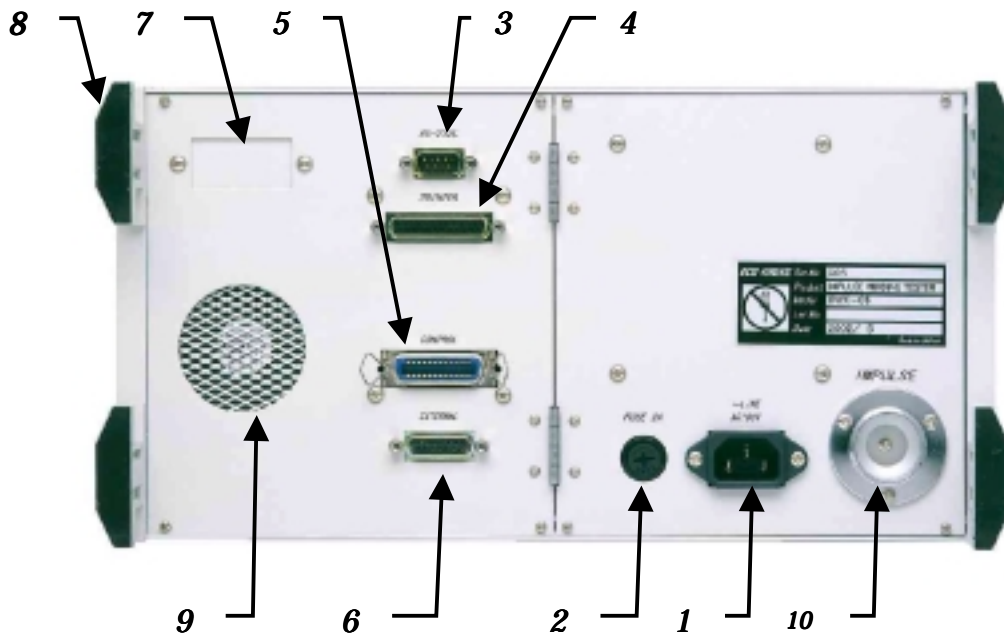
#### 6. Compact Flash Memory Card Slot

The commercially available CF memory card (32 Mbyte) can be used to expand the memory.

#### 7. Handle

The handle's angle can be adjusted. Adjust the handle while pulling the rounded knob on the left and right of the tester. To carry the tester, place the handle at the front right-angled.

## 2-2. Back Panel



### 1. AC Line-In

Connect the power cord to it. Make sure to confirm if it is a proper voltage.

### 2. Power Fuse

Use the normal fuse rating 250V 2A.

### 3. RS-232C Connector

The RS-232C enables a remote operation.

Refer the details to [11. Remote Operation By the RS-232C].

### 4. Printer Connector

With the Centronics printer port, an ESC/P printer can print a screen hard copy easily.

### 5. Control Connector

This external control connector controls the I/O signal of the tester.

Please refer to the details in [11. External Interface].

### 6. External Connector

This special connector is a functional extension port.

### 7. The Optional Ethernet Installing Slot

This TCP/IP serial convert adaptor slot provides DWX remote control operation through the Ethernet network.

### 8. Vertical Stand

The tester can be placed vertically but should not be used in that position.

### 9. Ventilating Fan

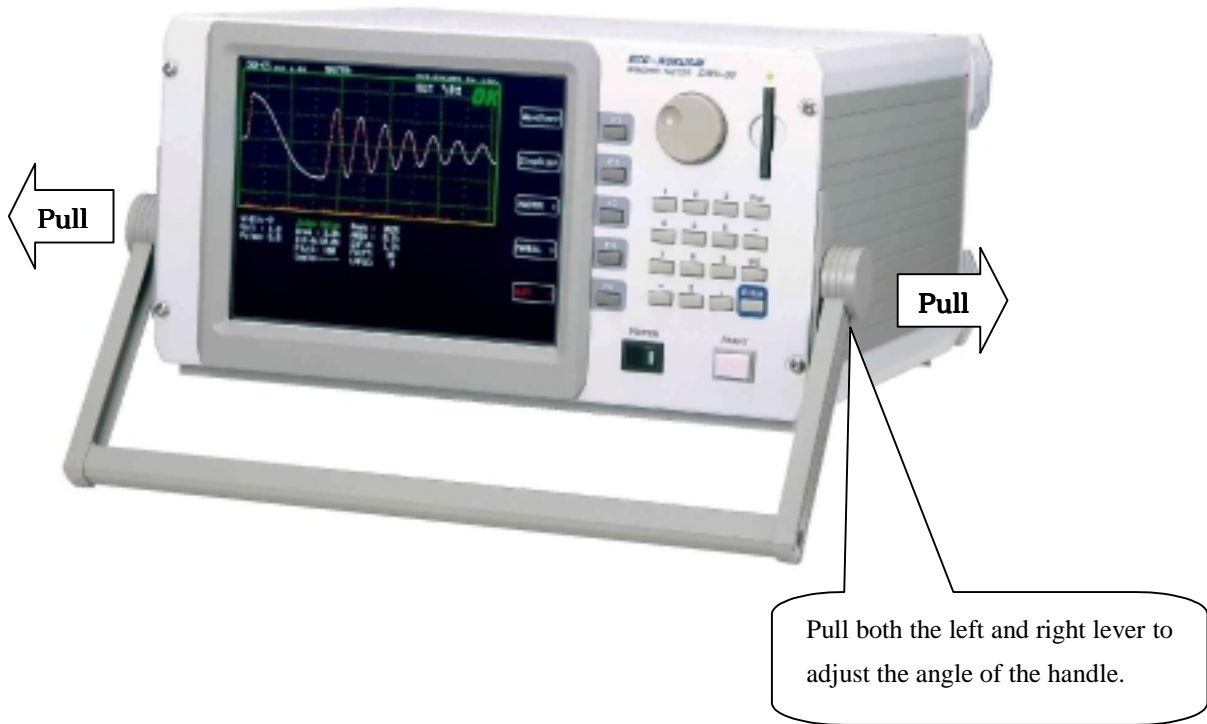
The fan helps keeping the temperature low. Do not block the flow of the air from the fan.

### 10. High Voltage Output and Test Connector

Connect this special test cable for a test. Be cautious as the connector produces high voltage output.

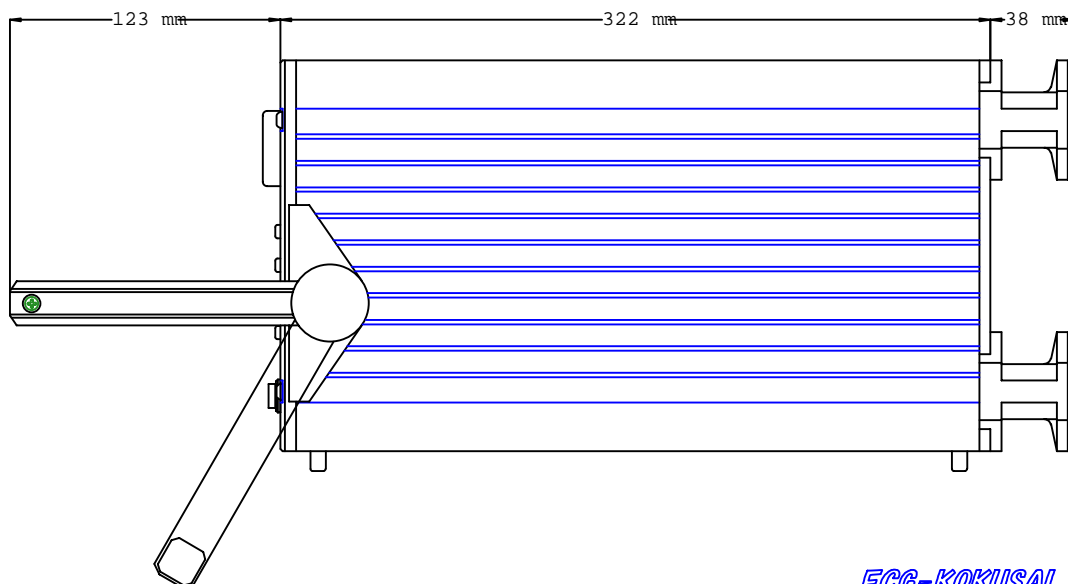
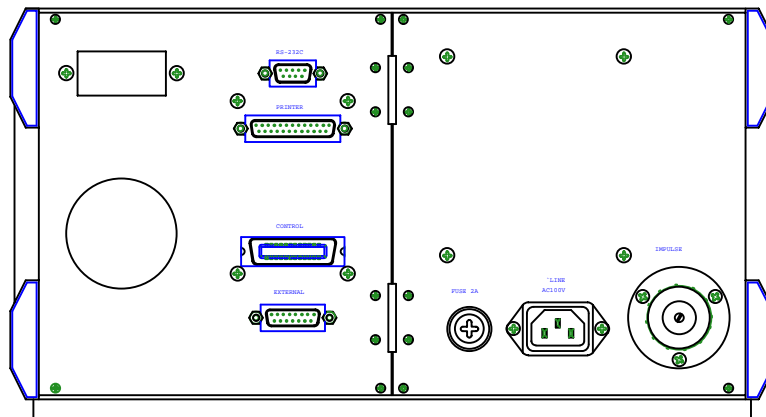
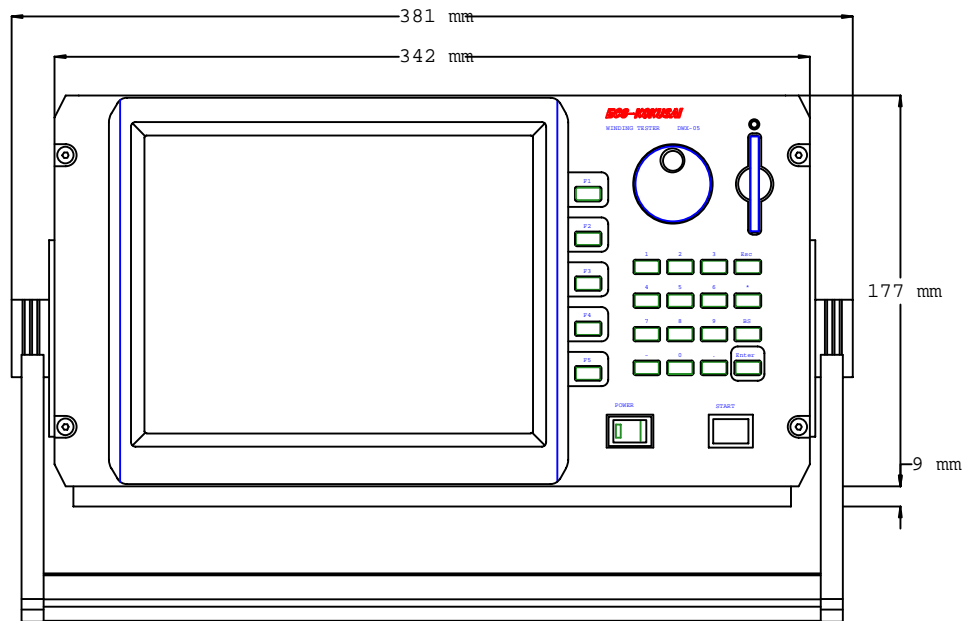
### 2-3. The Use of Handle

When the handle is adjusted as in the illustration below, the tester will be in the position where it is easily operated.





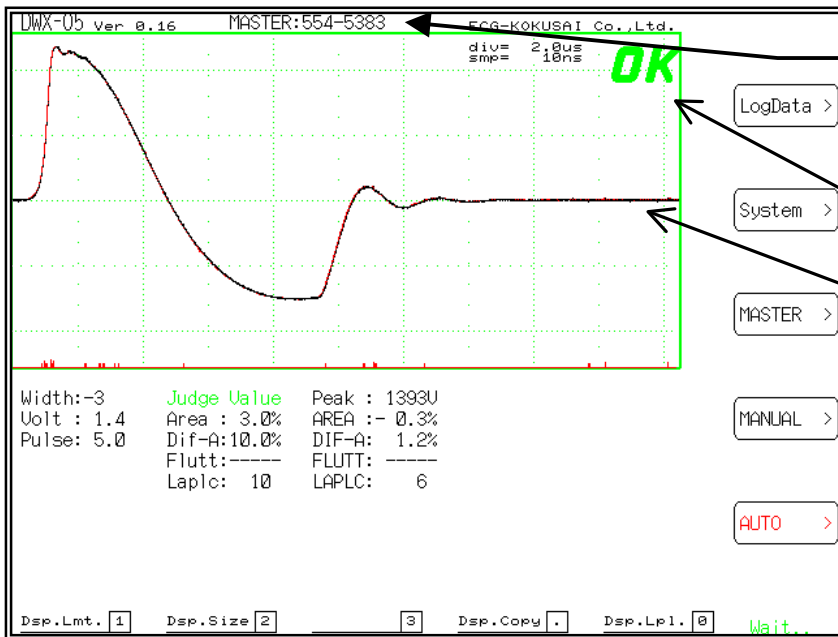
2-4. External Measurements



ECG-KOKUSAI

2-5. The LCD Display

Auto Test Screen



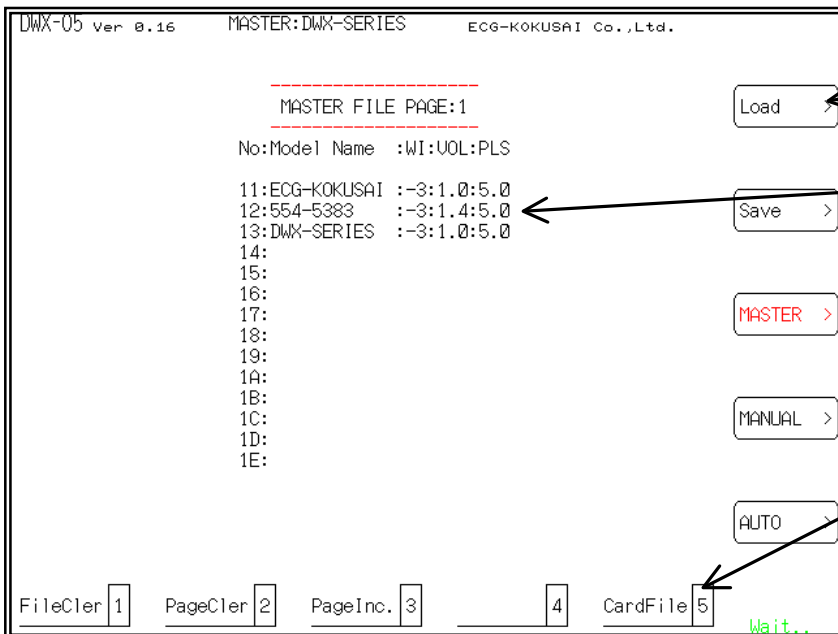
The master name displayed during the test.

The test result

The test wave

Icon mark

Master Operation Screen



Icon mark

Master list

Sub-keys



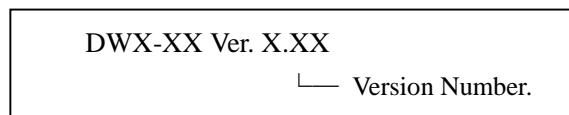
### 3. FUNCTIONS

#### 3-1. Preparation

1. Connect the high voltage cable to the marked [Impulse] connector at the back of the unit.
2. The high voltage connector is attached with the screw link. Make sure to close this screw link tightly when connecting it to the tester. If the screw is not tightened enough, the test may be inaccurate.
3. Connect the high voltage cable's alligator clip to the master coil.

#### 3-2. Main Screen

After turning the power switch on, the LCD will display the main screen. The tester will make a self-check for 2 seconds. The software version number will be displayed in the upper left corner of the LCD screen.



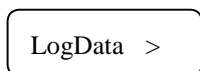
The following shows the names and functions of each icon on the main screen.

- |           |   |
|-----------|---|
| LogData > | Operating the test result (statistics). (→ Page 31)   |
| System >  | Setting the system including the setting of the internal clock, customizing the color of the screen, etc. (→ Page 32) |
| MASTER    | Managing the master wave files. (→ Page 25)   |
| MANUAL    | Operating the manual mode including the setting of the master wave, setting of the test limit value. (→ Page 18)      |
| AUTO >    | Operating the auto mode (→ Page 28)<br>Press the [START] switch to get an OK/NG result.                               |

### 3-3. Menus – A Glance

The illustration below is an overview of each menu function. For further details, please refer to the explanation of each topic.

#### Icon mark

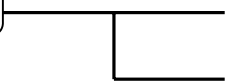


This icon indicates a function key [Fx].



This icon indicates sub-keys [x] at the lower screen.

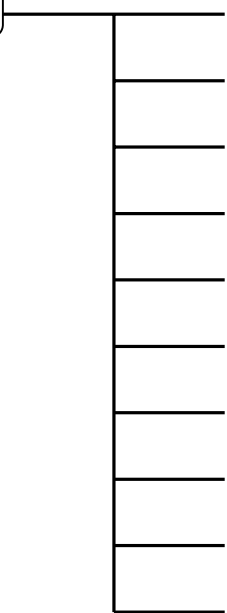
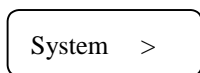
#### Menu List



FileCler [1]

Clear the statistics

\_\_\_\_\_ [2]



SetTime [1]

Setting of the internal clock

SetColor [2]

Customize the background color

HardCopy [3]

The hard-copy setting

AutoStr. [4]

Setting of the AUTO mode

Buzzer [5]

Setting of the test buzzer

I/O Test [6]

External I/O display

\_\_\_\_\_ [7]

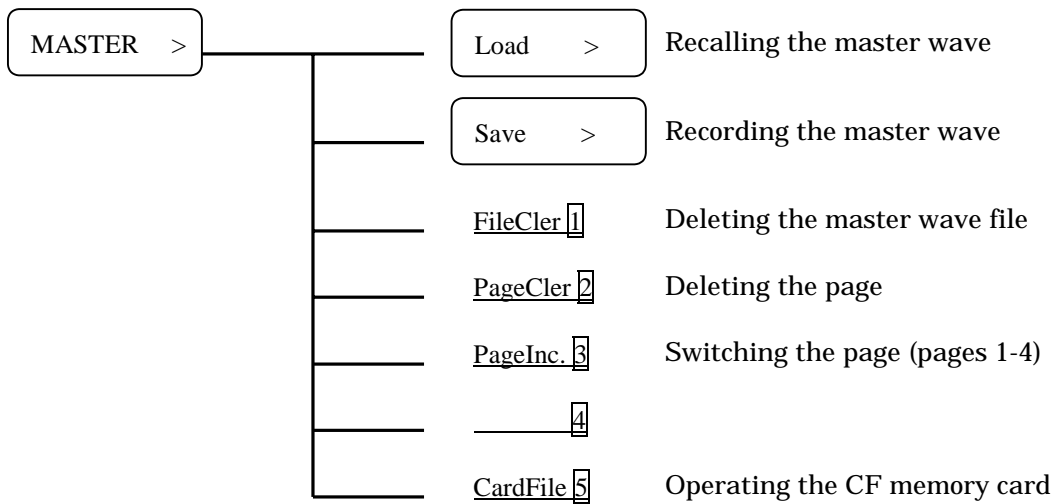
\_\_\_\_\_ [8]

CF-Init [9]

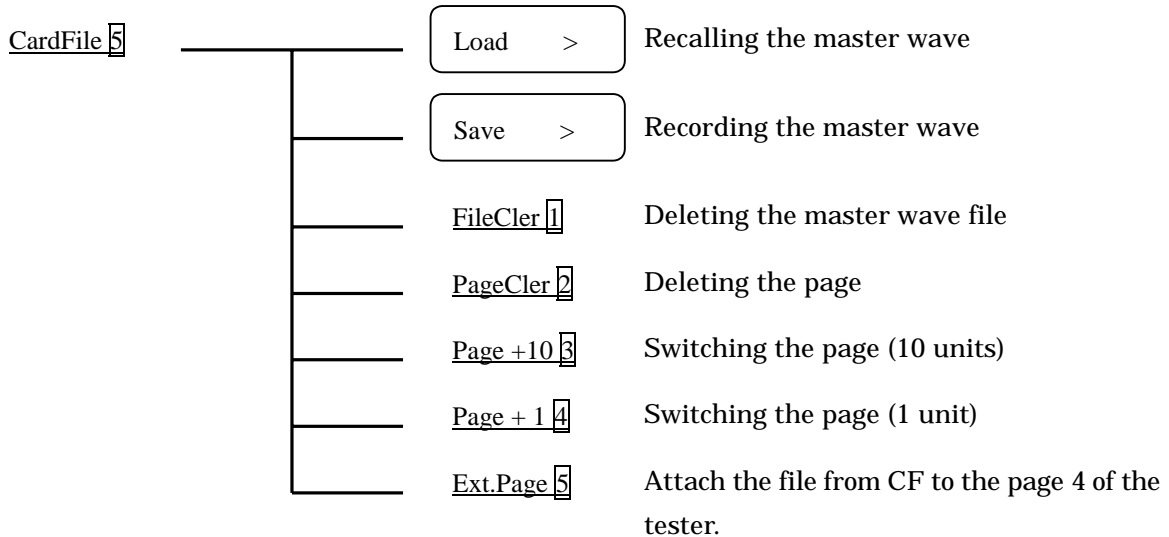
Formatting of the CF memory card

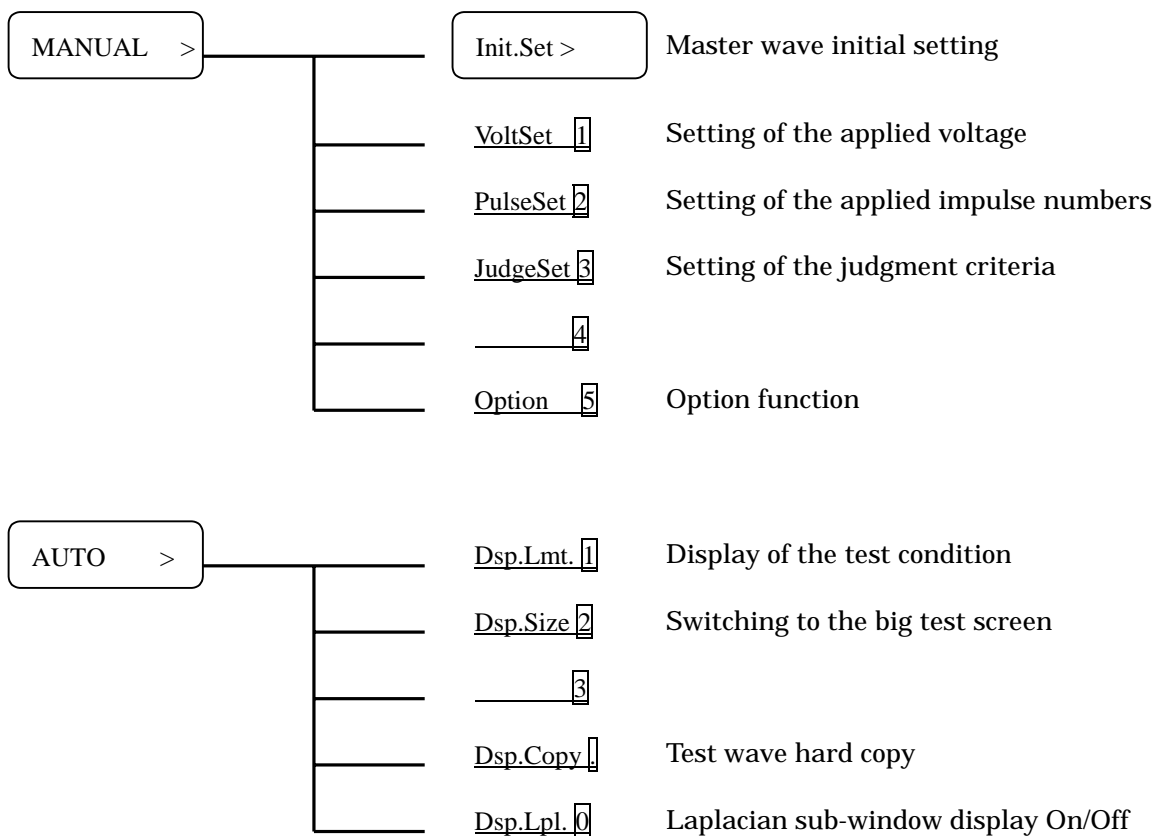
System [0]

Maintenance mode



**The CF memory card operation**





## 4. [MANUAL MODE] Operation

MANUAL >

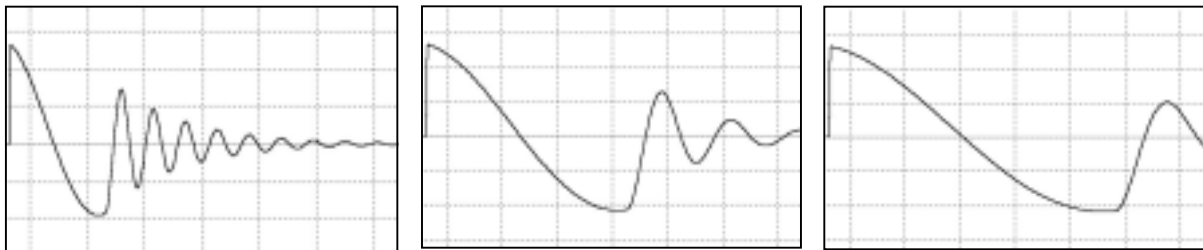
In the [MANUAL >] mode, set the master wave for the test in the [AUTO >] mode.

### 4-1. [WIDTH] Scan Speed Setting Display

Use the rotary dial to set the scan speed display. The setting can be in the range of -4 to +5.

- 4 : The displayed wave is enlarged (extended form) by the high speed scanning.
- 0 : This is the same scan speed as in the DW/DWS series (Width = 0).
- +5 : The low speed scanning condenses the displayed wave.

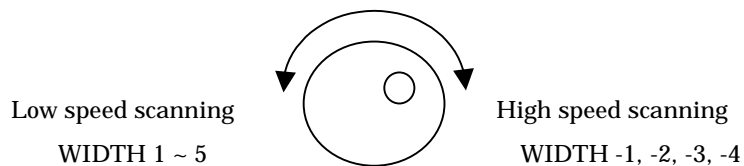
Use the rotary dial to set the scan speed and the [Init.Set >] mode to draw the waveform.



Low speed scanning  
WIDTH 1,2 ~ 5

Suitable speed scanning  
WIDTH 0

High speed scanning  
WIDTH -1,-2 ~ -4



In another way, press the [START] switch and the pulse is applied in the manual mode setting. The waveform will be displayed according to the scan speed. The suitable scan speed can then be confirmed.

Please refer to the supplement [13.5 About the WIDTH] for the [WIDTH] display and the real scan speed.



**4-2. [VoltSet [1]] Test Voltage Setting → [1] Key**

Set the applied voltage for the test. The applied voltage range is as below.

Model	Applied Voltage Range		
	The Lowest Voltage	The Highest Voltage	Step
DWX-01	50 V	990 V	10 V
DWX-05	0.5 KV	5.0 KV	0.1 KV
DWX-10	1.0 KV	9.9 KV	0.2 KV

The set voltage value is reflecting the test voltage through the [Init.Set >] mode. The wave is drawn at the set voltage.

**4-3. [PulseSet [2]] Pulse Number Setting → [2] Key**

Set the applied pulse numbers to the test coil in the AUTO mode. The possible setting numbers of the pulse is in the range of 1-30.

The set value of the pulse number is used for generating the master wave and for the AUTO mode test. After the pulse number, the dummy pulse can be set following the period mark (.).

The dummy pulse is represented by a decimal point within the range of 0~7. The dummy pulse is not applied as '0'.

Ex. Applied Pulse Number 5.3  
 | └─ Dummy Pulse  
 └── Judging Pulse

The above example applies a total number of 8 pulses: 3 pulses as dummy and 5 pulses for the judge.

\* About the dummy pulse, please refer to [4-9. Pre-magnetization].

**4-4. Init.Set > Initial Master Waveform Setting → [F1] Key**

To obtain the master wave, apply the impulse to the master coil. The initial master wave is then derived. Through the procedure above, the impulse voltage setting gives an initial master wave shown on the display. The test pulse numbers of a waveform set through the [4-3 Impulse Number Setting] function are averaged to create a master wave.

\* Depending on the setting condition, the initialization may result in [ERROR]. In this case, tr change the condition of an applied impulse, such as reducing an applied voltage.

The Case of an Initialization ERROR

- The applied voltage is not proper. The connected coils produce corona discharge internally.
- The [WIDTH] setting is not proper. The cycle of the wave on the screen is extremely short.
- The coil is easily exposed to magnetic saturation. The voltage cannot be applied up to the set value.
- The coil's inductance/impedance is low. The voltage output cannot reach up to the set value due to the limited energy of impulse source.

**4-5. [JudgeSet<sup>3</sup>] Test Condition Setting → [3] Key**

The master wave from the initial setting in the Init.Set > mode is used as an evaluation base.

*The condition setting is carried out in the following order.*

AREA (Area Size Comparison)

DIF.AREA (Differential Area Comparison)

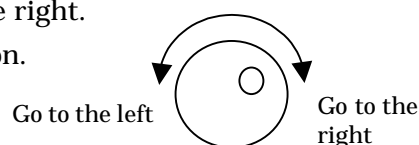
FLUTTER (Flutter Amount) or LAPLACIAN(Corona Discharge Amount)

1. Firstly, select to [detect] or [not detect].

[\*]key = detect   [-]key = not detect

2. Then set the test range or parameter by using the rotary dial.

- The line drawn on the center of the wave is expressed as a cursor line for the test range setting. The left side and right side of the line must be set separately.
- The cursor line will move according to the rotary dial direction.
- Press the rotary dial to switch the cursor to the left or the right.
- Once the set range is satisfactory, press the [Enter] button.



Press – Switching the line's side

3. Use the numeral keys to input the test peak value.

The set range is as follows.

[AREA] , [DIF.AREA] = 0.1% - 99.9%

[FLUTTER] [LAPLACIAN] = 1 - 9999

4. Press the [Enter] button every time after entering the value.

5. During the setting process, press the [ESC] button to cancel.

6. When making a mistake during the setting process, re-set to change the test conditions.

\* If selecting [not detect] in 1, the test result will not be shown on the display. The screen will appear blank [- - -].

### Further Explanation

In testing, select either the Laplacian test or the FLUTTER test. The set value will be effective accordingly. To make the Laplacian test, press the [-] key to skip the FLUTTER test. Press the [\*] in the Laplacian topic and set the test range. The setting of the Laplacian is the same as that of the FLUTTER test.

In the FLUTTER test, the threshold value can be set. Please refer to [4-7 About the Threshold Value].

**4-6. [START] Switch**

The impulse is applied independently. At this point, the wave derived from the initial setting Init.Set > mode is drawn.

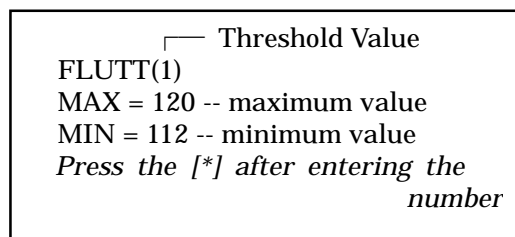
Press the MANUAL > button to delete the screen.

**4-7. About The Threshold Value**

In evaluating the flutter value, the height of corona discharge on the waveform is measured and converted by derivative calculation. The area size is then calculated. A threshold value is established for measuring the height of corona discharge and the area size is calculated from the value above the threshold. This method is especially useful to test coils that are easily exposed to corona discharge in which its distribution causes problems on a corona level (height).

To set the threshold value, enter the value for evaluating at the FLUTTER value display according to the setting method in [4-5.]

After entering the threshold value and pressing the [\*] key at this FLUTTER value display, the new FLUTTER value will be recalculated and shown. The set threshold value will be used in the test condition setting.



The range of the threshold value is 0 ~ 20.

Fig. 4.7

*\* There is no unit of the threshold value.*

Further Explanation

In setting the FLUTTER threshold value, please refer to the FLUTTER's MAX & MIN values in the Fig. 4.7.

To obtain the true values of the sample coils, bring good sample coils (about 10 pieces), apply impulses temporarily and confirm the FLUTTER's Max & MIN values. Add a 20% margin to the MAX true value and take this new value as a temporary test value. Retest the sample coils to confirm if they are good or bad ones. This test helps to determine the fault boundary.

#### **4-8. About The Impulse Numbers To Be Applied**

For an AUTO mode test by the DWX, an input of the impulse number is required. The DWX tester applies a series of impulses at 52.4 milli-second interval and the impulse numbers to be applied are proportional to the test time. The more impulses applied, the more test time is required. Please refer to the table below for the total test time needed.

Impulse numbers and the required test time (Standard)

Impulse Numbers	Time (Seconds)
1	1.0
5	1.5
10	2.0

#### **4-9. Pre-magnetization (Dummy Pulse)**

In testing the motor or solenoid coils, some magnetic field may remain in the core of the coils even after the flow of the current is cut off. In this case, the response of the wave to the first impulse will differ from that of the second one. As a result, the unstable wave could mistakenly be used to judge a good sample as a bad one. To solve the problem, the DWX automatically sends dummy pulses to remove the magnetic field to remake the initial direction of the magnetization.

Ex. Applied Pulse Number 5,3

| └─ Dummy pulse  
└─ Judging pulse

#### **4-10. Caution For Set-Up**

Depending on the environmental conditions, the coils will be influenced by the magnetic field and the stray capacity. For example, the environment easily affects the air-wound coils. Therefore, a careful set-up of the tester and of the coil must be made before the test.

Similarly, a steel desk will affect the impulse testing conditions. If there is only a steel desk available, use a wooden plate or thick Bakelite as a support stand in order to avoid any influence on the coils.

When recording the master wave into the memory, use the same length of cable connecting the coil to the rear panel's connector and try to keep the same connecting route.

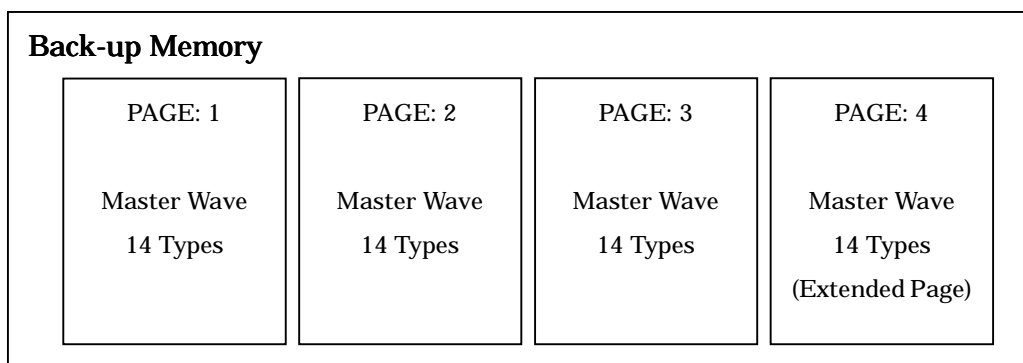
## 5. Operating The [Master] Function

MASTER >


In operating the [MASTER >] function, the preset master wave in the [MANUAL >] mode can be saved in the back-up memory (internal memory), recalled, deleted, or confirmed.

With the 14 units of model numbers per page from page 1 to 3, the main unit can record up to 42 types of the master waves. The page 4 is for extending the memory by using the compact flash memory card (memory card).

Please see the structure of the master file below.



Hence, the main unit back-up memory can save 14 types × 3 pages = 42 types of the waves.

The rotary dial or PageInc.  (in the master wave operation) function can switch the memory pages sequentially. The external control signal and RS-232C also offer this function. Once the actual page is memorized, the same page remains on the screen when the power switch is turn on again.

### Further Explanation

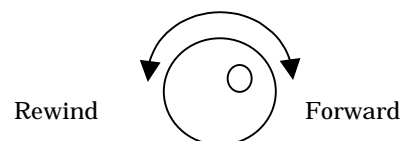
#### \* About The Page 4 (Extended Page)

With the [Extended Page] function, page 4 is the extended page for the unit's memory assigned from the memory card. This function works only when the memory card is set properly. The page 4 [Extended Page] function can retrieve the data by copying any page of 01 ~ 50 pages in the memory card. The data taken from the memory card can be handled in the same way as those in the back-up memory.

The master waves are numbered as 1 ~ E in the memory. These numbers can also be selected through the external control signals.

**5-1. Load > Recalling The Stored Master Waves → [F1] Key**

In selecting the master wave, use either a rotary dial to select the master name by moving the mark [>] to the desired master name, or keys to input the desired master name.



Press the [Esc] button to cancel the operation.

**5-2. Save > Save The Master Waves → [F2] Key**

The master wave with the condition set can be saved on the selected page. The model name can be the combination of numbers, letters, or symbols. The model name contains 8 characters of the master name and 3 characters of the extended name.

Ex.)   \*\*\*\*\*.\*\*\*  
           |       └─ Extended Name (Max. 3 characters)  
           └──────────┬─ Master Name (Max. 8 characters)

- \* When the input name is not in the range specified above, 'error' will appear on the screen.
- \* If you want to save the same master filename as an existing one in the back-up memory, confirm to overwrite the name.

To answer [Yes], select the [1] key to overwrite the existing file name.

Press the [Esc] button to cancel the operation.

**Further Explanation****\* Input of Alphabet Letters**

Press the ABC..on > button on the main menu to input the master name in alphabet letters. The input function is then effective. Use the rotary dial to input the letters.

Press the ABC..off > button again, the input function will not resume. The rotary dial will be used only for file selection.

When the input function is effective, turning the rotary dial will switch [A, B, C, ... X, Y, Z] sequentially. Press the rotary dial or use the Set > button on the main menu to confirm the input.

**5-3. [FileCler][1] Deleting the Stored Master Wave → [1] Key**

In selecting the master wave, use either the rotary dial to select the master name by moving the mark [>] to the desired master name, or input the desired master name.

\* To confirm deletion, select [Yes] by using the [1] key. Pressing other buttons will cancel the deletion.

Press the [Esc] button to cancel the operation.

**5-4. [PageCler][2] Deleting The Selected Page Of All Master Waves → [2] Key**

\* To confirm deletion, select [Yes] by using the [1] key. Pressing other buttons will cancel the deletion.

\* Only the selected page will be deleted.

Press the [Esc] button to cancel the operation.

**5-5. [PageInc][3] Switching The Stored Master Wave Pages → [3] Key**

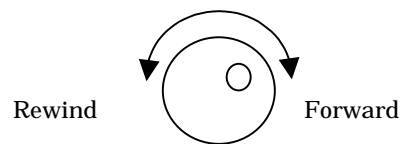
Display of the master wave pages can be switched back and forth between pages 1–4 successively. The list displays the page number and the model number in two columns for each file no.

*Example of the Display List*

No:Model Name		:WI:VOL:PLS	
01:00000001.000:	0:	1.0:	3.0
02:00000002.000:	0:	1.5:	3.2
03:00000020.000:	0:	1.8:	5.0

Page No. → (points to 03)  
 Model No. → (points to 00000020)  
 Master Name → (points to 00000020.000)  
 Test Pulse Numbers → (points to 0)  
 Dummy Pulse Numbers → (points to 1.8)  
 Test Voltage → (points to 5.0)  
 WIDTH → (points to 5.0)

The rotary dial can also be used for switching the pages back and forth.





## 6. [AUTO MODE] Operation



In the  mode, press the [START] button to test for OK or NG result according to the test condition of the preset master file.

The conditions for the test (WIDTH, VOLT, PULSE), the OK/NG result, voltage output (PEAK), and the test results (AREA, DIF-AREA, FLUTTER, LAPLACIAN) will be displayed on the AUTO test screen.

- AREA shows plus or minus value in % of the compared area size.
- DIF-AREA displays the % value of the differential area size in absolute value against the area size of the master wave. The value is an average of the calculated range of all the impulses applied.
- FLUTTER shows the maximum value of all the applied pulses, with each applied pulses expressed in integer value.
- LAPLACIAN shows the maximum value all the applied pulses, with each applied pulses expressed in peak value.

### 6-1. [Dsp.Lmt.1] Test Range Confirmation → [1] Key

This displays the test range of the master wave. The ranges are the dotted line near the zero line indicating the parameters of the AREA, DIF-AREA, FLUTTER or LAPLACIAN.

### 6-2. [Dsp.Size2] Enlarging Wave Display → [2] Key

In the AUTO test screen, the wave is enlarged 1.5 times in Y-axis (voltage axis) direction. This is especially useful in the automatic mass production line where the detailed test result display is not necessary and the wave display is sufficient.

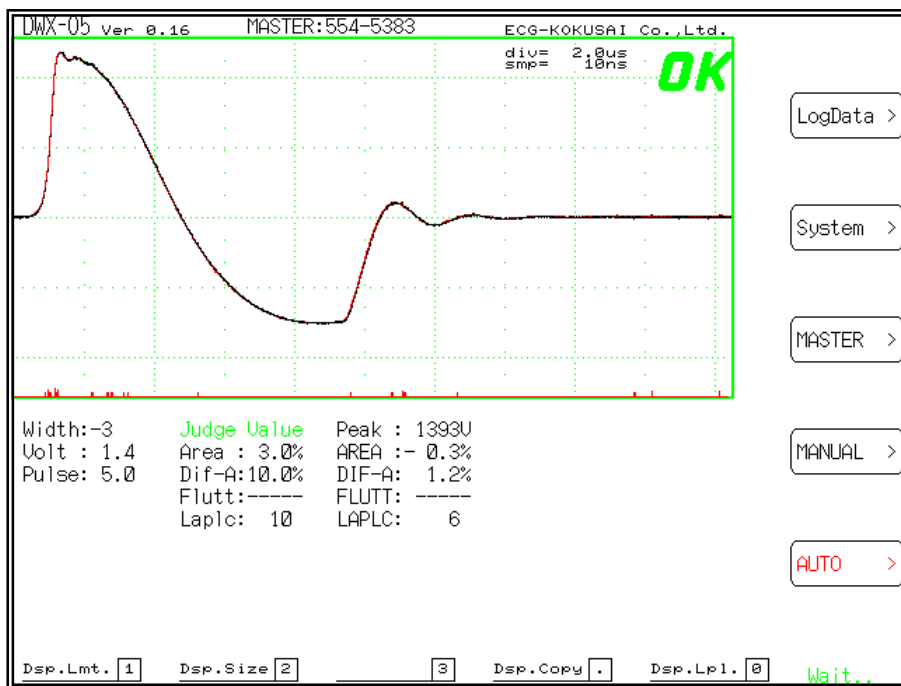
The wave image display is equivalent to that of the DW series. Enlarged wave display setting is not kept in the tester memory. Therefore, the screen will show wave forms in standard size when the power switch is on again.

**6-3. [Dsp.Copy]3 Test Screen Hard Copy → [3] Key**

The AUTO test screen's hard copy output can be obtained through printing or forwarding the image to the WINDOWS compatible BMP file through the RS-232C. To select the hard copy output, select the  button.

In case of printing through the printer, make sure to prepare the printer for the operation. In case of forwarding the image to the BMP file through the RS-232C, make sure to prepare the PC terminal software.

An example of a downloaded screen as a BMP file.



**6-4. [Dsp.Lpl.0] Laplacian Sub-Window Display Switch → [0] Key**

In the AUTO mode, a sub-window appears below the test wave screen to display a bar graph of the calculated Laplacian result. By pressing this key again, the sub-window will disappear. When the sub-window is displayed, the test speed will be slightly slower because of the tester's additional process time.

In the bar graph display, the wave screen in the X-axis (time axis) is divided into 51 segments (bars). In each segment, the corona discharge level with peak value, represented in vertical dot numbers, is displayed as a bar graph.

The bar graph has no special measured unit. When there is corona discharge phenomena, the bar value becomes higher. This helps to observe the discharge amount and level visually. The bar graph will be displayed even if the setting is not done in the Laplacian test mode.

## 7. [LogData] Test Result (Statistics)Display

LogData >

In the  test the OK/NG test result can be counted for further analysis. The statistics display the total and the OK/NG numbers.

### 7-1. [Clear ] Deleting the statistics value → [1] Key

The statistics can be cleared to zero.

## 8. [System] DWX Operation Setting

System >

The **System >** button is used to set the basic operation condition of the tester.

### 8-1. [SetTime 1] Setting The Internal Date/Clock → [1] Key

The calendar and time can be set internally. The clock should be input with 2 digits sequentially: Year (YY), Month (MM), Date (DD), Hour (HH) and Minute (MM).

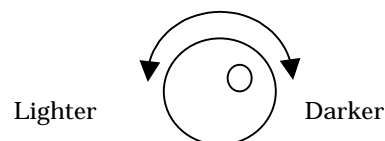
Press the [Enter] button to move to the next item.

Press the [Esc] button to cancel any operations.

### 8-2. [SetColor 2] Customizing The Screen Color → [2] Key

The LCD screen background color can be optionally set. The color has 3 shades (red, green, blue), which can be selected in any combination favor. Select the desired color and use the rotary dial to change the light and shade. The screen will display the selected shade value. In each color level, there are 15 shades – 0 is the lightest and 15 (F) is the darkest.

<b>Red &gt;</b>	[F1] Key - Red shade selection
<b>Green &gt;</b>	[F2] Key - Green shade selection
<b>Blue &gt;</b>	[F3] Key - Blue shade selection



[Esc] – Decide the Color

Press the [Esc] button to end the setting.

*The set background color is kept in the tester memory.*

*To change back color to the initial background color, press the [\*] key in the main menu.*

**8-3. [HardCopy<sup>3</sup>] Selecting The Hard Copy Screen Output → [3] Key**

The screen hard copy output can be selected.

- Printer1 > [F1] Key - The printer prints an output of the enlarged screen image.
- Printer2 > [F2] Key - The printer prints an output of the condensed image.
- Xmodem > [F3] Key - The Xmodem protocol helps to obtain the BMP data output through the RS-232C.

*The setting is kept in the tester memory.*

**8-4. [AutoStr.<sup>4</sup>] AUTO Mode Start-Up Setting → [4] Key**

If the AUTO mode start-up is effective, the tester will be in the AUTO mode automatically when the power switch is on.

- OFF 1 > [F1] Key - AUTO mode start-up is not effective (OFF).
- ON 2 > [F2] Key - AUTO mode start-up is effective (ON).

*The setting is kept in the tester memory.*

**8-5. [Buzzer<sup>5</sup>] Setting The Test Buzzer → [5] Key**

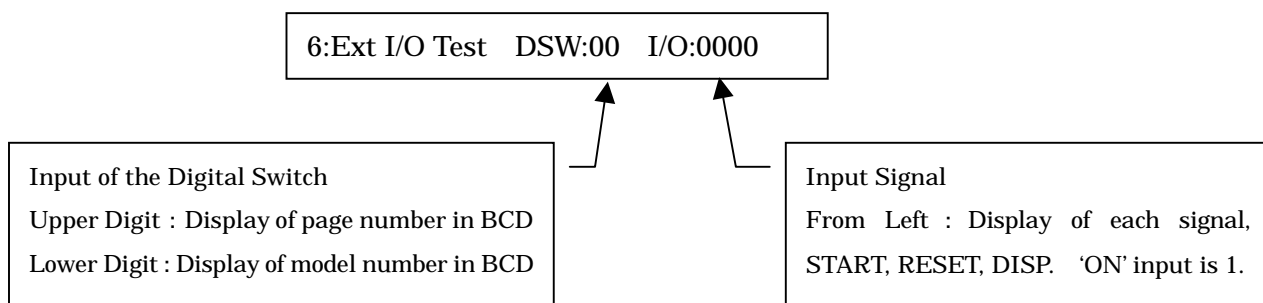
The test buzzer can be set in the AUTO mode.

- OFF 1 > [F1] Key - The buzzer is not effective (OFF).
- ON 2 > [F2] Key - The buzzer is effective (ON).

*The setting is kept in the tester memory.*

**8-6. [I/O Test] External I/O Monitor Display → [6] Key**

The external I/O signal can be displayed on the monitor and confirmed by the connecting signal.



**8-7. [ ] → [7] Key**

**8-8. [ ] → [8] Key**

**8-9. [CF-Init.] CF Memory Card Format → [9] Key**

The memory card needs to be formatted in order to be used with the DWX tester. After purchasing the CF card, make sure to format the memory card before the initial use.

Select [Yes] by the [1] key to confirm the formatting.  
Pressing other keys will cancel the operation.

**Caution!**

***\* Be cautious that the formatting will delete all the saved data***

**8-10. [System ] Maintenance Mode → [0] Key**

## 9. Compact Flash Memory Card:

### *Extended Master Wave Backup*

The master wave can be saved and recalled on a page basis by using the compact flash memory card (CF card). The memory card helps to extend memory capacity of the tester backup memory.

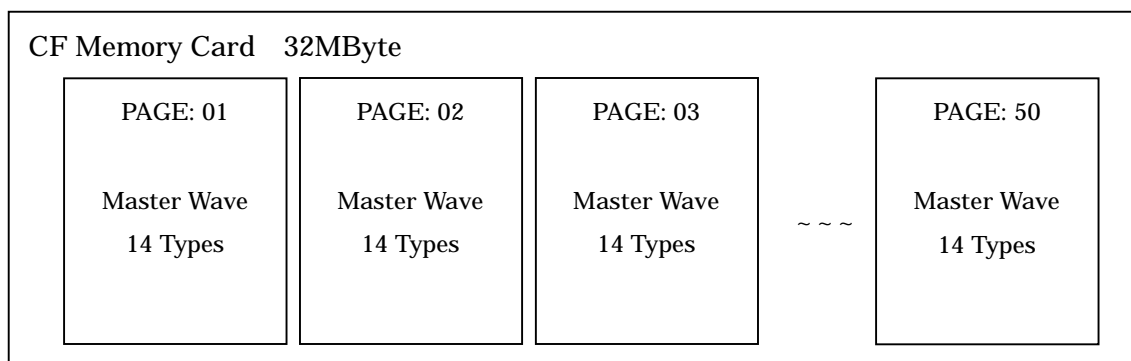
The DWX tester uses the compact flash memory card of JEIDA/PCMCIA conformity. The 32Mbyte card can manage 700 files of the wave data.

In using the CF cards for DWX, make sure to once format the CF card through the **Cf-init.** menu in the **System >** function after the purchase.

#### Memory Card Menu Operation

In the memory card menu operation, the data can be saved, recalled, deleted and confirmed. The memory card also offers page basis communication with the main backup memory to save, recall and delete the memory page.

The storage of the wave models in the memory card is the same as that of the built-in backup memory – 14 models in one page, with a total of 50 pages. Please see the memory structure below.



With this structure, the memory card can save 14 types x 50 pages = 700 models of the waveforms.



- \* The memory card format is Microsoft Windows compatible. Working as the CF card download unit, the computer can manage master wave files and manage the folder names from the memory card pages 01 ~ 50.
- \* The master waves in the memory card are in the same format as the master sent to the computer through the RS-232C. Therefore, both master files in the memory card and in the computer can be equivalently managed.

**Caution!**

- \* In operating on the PC, do not delete, copy or change the name of the folder. Otherwise the DWX will not be able to load the files properly.
- \* The memory card uses the FAT16 independent format for the DWX and this format cannot respond to the long file name that has been used since Windows 95. If the long file name file is written in the PC and rewritten to the CF, it may not be downloaded properly.

**9-1. Load > Recall the Master Wave From The Memory Card → [F1] Key**

The master wave can be recalled from the selected page of the memory card, the same as in [5-1 Recalling the Stored Master Wave]. In selecting the master wave, use the rotary dial to either select the master name by moving the mark [>] to the desired master name, or input the desired master name.

Please refer to the operating procedure in [5-1 Recalling the Stored Master Wave]

**9-2. Save > Save The Master Wave With A File Name In The Memory Card → [F2] Key**

As in the [5-2 Save The Master Wave] topic, the preset master wave can be saved in the memory card on the selected page.

The master name can be in numbers, alphabets or symbols.

Please refer the operation procedure to the [5-2 Save The Master Wave] topic.

- \* When saving the master wave on the memory card, the system does not automatically check the master saved with identical names between different pages.

Please refer to the [9-7 Caution] topic.

**9-3. [FileCler][1] Deleting The Master Wave On The Memory Card → [1] Key**

As in the [5-3 Deleting the Stored Master Wave] topic, the master wave can be deleted from the selected memory card page.

Please refer to the [5-3 Deleting the Stored Master Wave] topic for the operating procedure.

**9-4. [PageCler][2] Deleting The Selected Page Of All Master Waves → [2] Key**

\* To confirm deletion, select [Yes] by using the [1] key. Pressing other buttons will cancel the deletion.

Please refer to the [5-4 Deleting the Selected Page of All Master Waves] topic for the operating procedure.

**9-5. [PageInc.][3] Switching The Memory Card Pages → [3] Key**

The page switching function offers an easy method to locate any page of the total 50 pages of the memory card. Press the 1 page unit button or the 10-page unit button to switch back and forth sequentially.

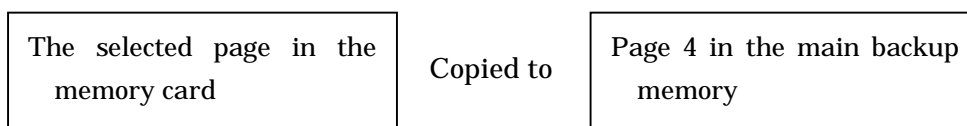
Press the page number button in order 0→1→2 ...9→0 to change the page consecutively. The rotary dial can also be used to switch pages.

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**9-6. [Ext.Page5] Copying A Master Page On The Memory Card To Page 4****In The Main Backup Memory [5] → Key**

The main memory page 4, as an extended page, works as the extended memory of the tester's backup memory. The extra memory page in the backup memory can be easily created by just selecting any page of the master files listed in the memory card and copying it to the page 4 of the tester's backup memory.



The page 4 of the main backup memory can be used for various functions in the same way as other pages (pages 1-3). It can be recalled via external interface and the RS-232C. Via this function, the data transferred from the memory card will overwrite the data on page 4 in the backup memory.

\* Why is this function necessary?

The page switching function via the external control is not possible when the number of the master wave in the backup memory exceeds 100 models. The master wave record is managed in terms of one page unit on the memory card. This transferred memory page 4 offers extra 14 models of the master waves and the selection of the master via the external control.

**9-7. Caution!**

The memory card checks identical master file names within the same page when the master file is saved. However, it does not automatically check identical names of different files across pages. Therefore, it is possible that multiple identical file names are saved in a memory card. In this case, there will be no problem with the manual test operation. However, when recalling the master data by the remote operation through the RS-232C, the program will recognize the first file name discovered as the recalled master data. The program will not recall the rest of the identical file names.

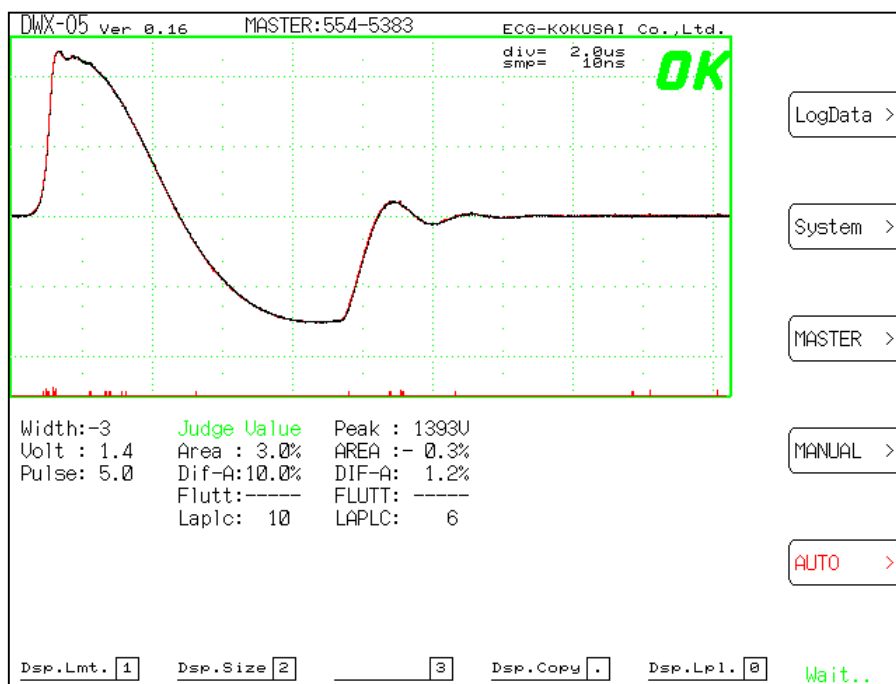
## 10. Test Wave Printout

Connect the printer with the tester to print out the screen display.

### 10-1. Test Result Printout

At all conditions, press the dot key  to print the hard copy of the screen. (When the printer is not connected, there will be an error and the printing function cannot work.)

### 10-2. Hard-Copy Output Example



## 11. External Interface

The DWX contains an interface unit for external control by using a Programmable Logic Controller (PLC) or a microcomputer.

### 11-1. Control Connector Signal Explanation

Adapt Connector: Amphenol 24 Pin 57-30240 (DDK)

Pin No.	Function	I/O	Explanation
1	Output GND		Input-Output Signal GROUND (0V)
2	Output GND		
3	BUSY	O	
4	NG	O	
5	OK	O	
6	START	I	
7	SEL - 1	I	
8	SEL - 2	I	
9	SEL - 3	I	
10	SEL - 4	I	
11	RESET	I	
12	DISPLAY OFF	I	
13	ERROR	O	
14	Input Power Supply		
15	Service Power Source Output+	O	DC 24V 200mA Internal Insulation Voltage Output
16	Service Power Source Output+		
17	BUZZ		
18			
19	SEL - 5		
20	SEL - 6		
21	SEL - 7		
22	SEL - 8		
23	Service Power Source 0 V		
24	Service Power Source 0 V		

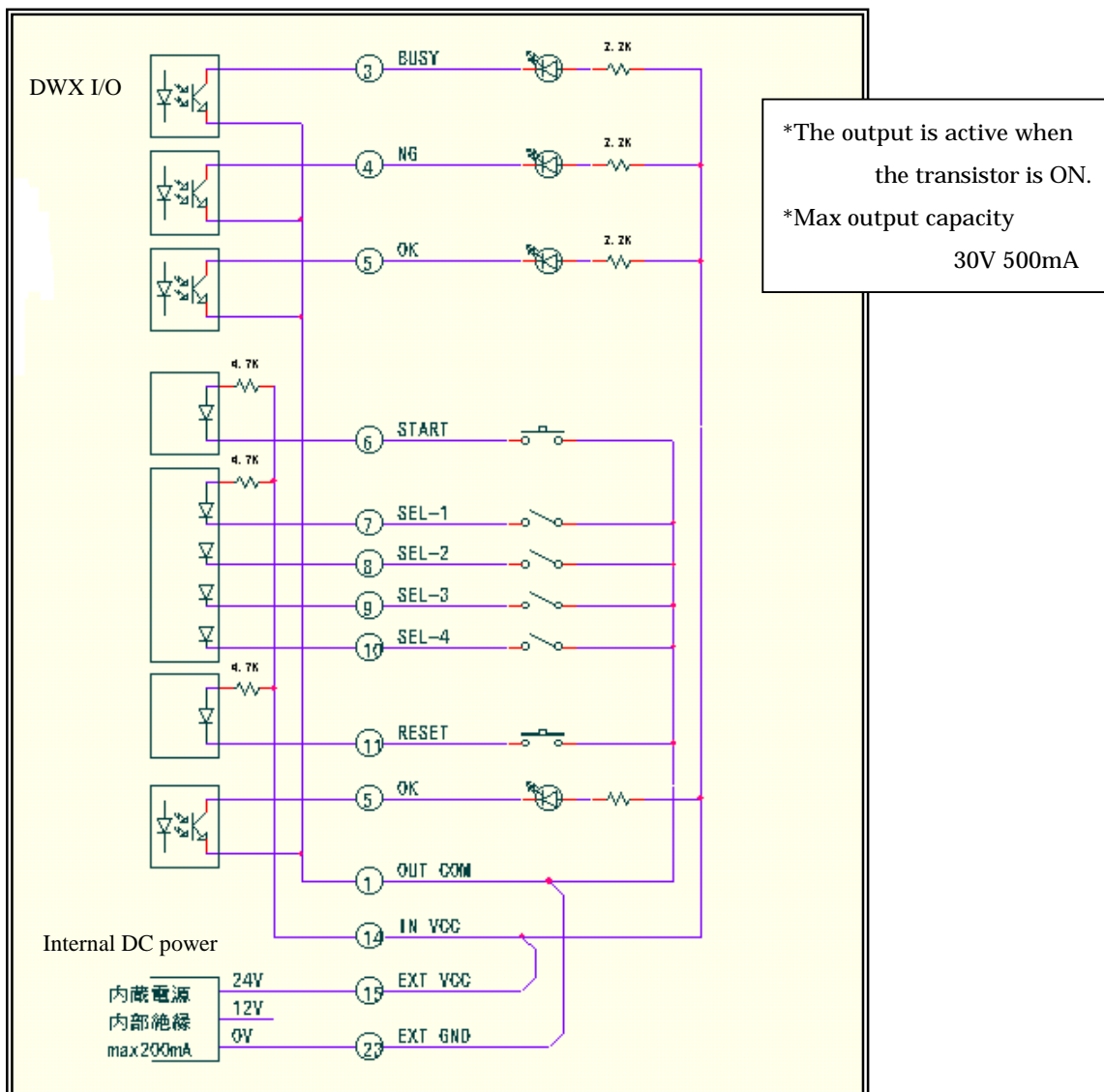
Pin signals 1~14 are compatible with our DW and DWS series. Therefore, the DWX 24 pin connector and the DW 14 pin connector can be used alternatively and compatibly.

**11-2. SEL Signal Selection Chart**

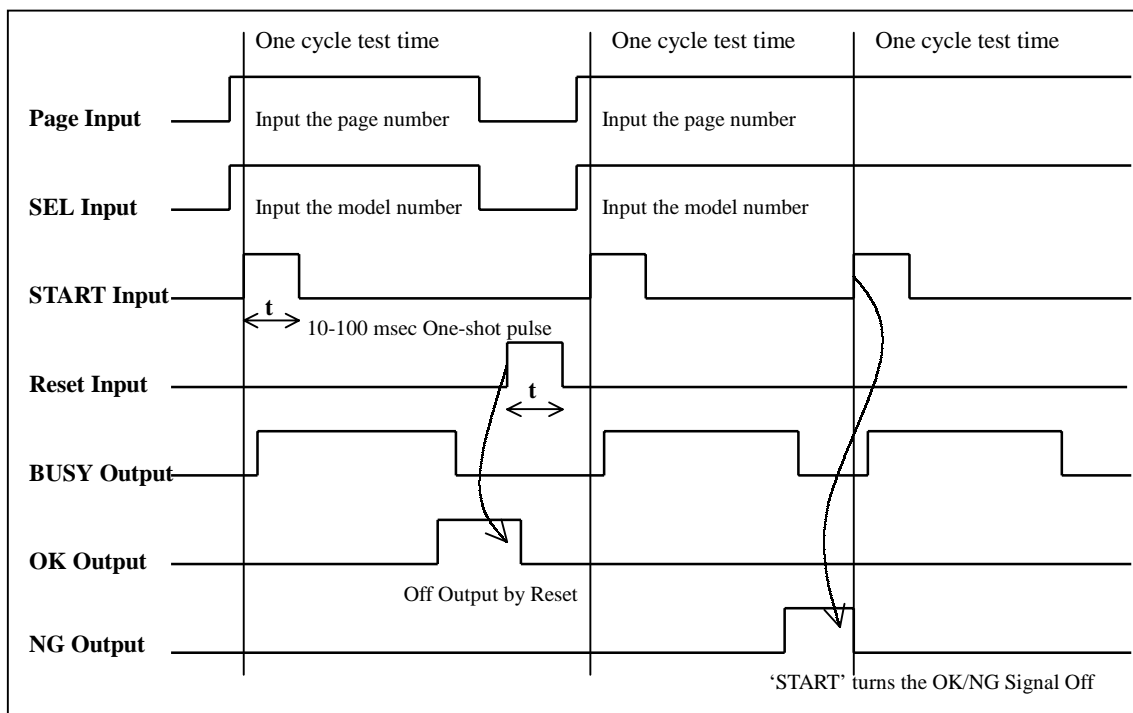
SEL Signal 4 3 2 1	Selection Number	SEL Signal 4 3 2 1	Selection Number	SEL Signal 4 3 2 1	Selection Number	SEL Signal 4 3 2 1	Selection Number
0 0 0 0	No witching	0 1 0 0	4	1 0 0 0	8	1 1 0 0	C (12)
0 0 0 1	1	0 1 0 1	5	1 0 0 1	9	1 1 0 1	D (13)
0 0 1 0	2	0 1 1 0	6	1 0 1 0	A (10)	1 1 1 0	E (14)
0 0 1 1	3	0 1 1 1	7	1 0 1 1	B (11)	1 1 1 1	No witching

SEL signals are used for changing the master waves and switching pages by setting the 4-bit binary code input.

**11-3. An Example Of The External Control Circuit**



#### 11-4. External Control Signal Time Chart



\* The Master Switching Signal SEL 1-4

- Inputting the codes beyond the selected number 1-E will be ignored and does not enable maser file switching. In other words, inputting 0 or F will allow testing without having to search for the model.
- Inputting the non-programmed model number of the master waveform will result in an "error". The [ERROR] will display. In this case, please input the correct number again.

\* The Page Switching Signal SEL 5-8

- Inputting the page number beyond page 1-4 will cause the signal to be ignored and does not enable page switching.

- \* The START signal can be an indicated one-shot impulse on the time chart. To improve the reliability of the signal control, turn 'OFF' the output signal after confirming the start-up BUSY signal during the test.

## 12. Remote Operation Through the RS-232C

### 12-1. Interface Background

The RS-232C interface enables remote operation through a computer or any communicating equipment. For the serial interface, use the RS-232C cable (straight cable) to interface with the computer.

9 Pin Receptacle (Female) < -- > 9 Pin Receptacle (Female)

Commands listed below can be executed through the RS232C interface.

- ★Auto Mode/ Manual Mode Switching
- ★Start testing(In the auto-mode, the master file number can be specified together with this command.)
- ★Initialization
- ★Test range setting
- ★Recall the master file
- ★Save the master file
- ★Delete the master file
- ★Set the impulse number
- ★Display the evaluation range
- ★Transmit/receive the master data
- ★Transmit the test data
- ★Recall the test result
- ★Recall the master file name
- ★Operate the memory page

All the commands through the RS-232C interface are effective both in the manual mode and the auto mode.

\* However, the received command cannot work in the input state to enter the alphabet characters and the numbers. Therefore, please leave the input mode.

Please refer to the details described for the commands and transmitting code specifications (RS-232C serial interface communication format).

The command terminator (delimiter) marked [CR] + [LF] is expressed by the combination of the Carriage Return and the Line Feed code. Only the carriage return or the combination of both is effective as the terminator.



## 12-2. Transmission Protocol

Baud rate : 9600 bps  
 Character Length : 8 bits  
 Stop bit : 1 bit  
 Parity : Non-parity  
 Character : ASCII character, only capital letters are used for the alphabet characters.

## 12-3. RS-232C Serial Interface Communication Format

The command system of DWX is composed of one command character and parameters. Nevertheless, some commands have no parameters. The delimiter character used between the command characters and the parameters is [ , ] while the used terminators are [CR] + [LF] or [CR] codes.

The DWX responds to all the commands by a return code to show the result.

*Note: In the main text body, [CR] means [CR] + [LF] code.*

### \* Turn to the Auto mode

Command: U [CR]  
 Return code: O [CR] (success)  
                   ? [CR] (non-existing command)

### \* Turn to the Manual mode

Command: L [CR]  
 Return code: O [CR] (success)  
                   ? [CR] (non-existing command)

### \* Display the evaluation range

Command: D [CR]  
 Return code: O [CR] (success)  
                   ? [CR] (non-existing command)

### \* Recall the master data from the back-up memory

Command: B, ccccccc.ccc [CR]  
 Return code: O [CR] (success)  
                   ? [CR] (non-existing command)  
                   2 [CR] (error: the specified master name is not in the memory.)  
 Note: ccccccc.ccc is the master name.

\* Initial set

Command: E, n1, n2 [CR]  
Return code: O [CR] (success)  
? [CR] (non-existing command)  
E [CR] (error in the parameter value)  
1 [CR] (error in setting the applied voltage)  
Note: n1 = the value of WIDTH (-4 ,,,, +5)  
n2 = applied voltage(unit is V)

\* Set the evaluation range

Command: C, n1, n2, n3, n4, n5, n6, n7, n8, n9, [CR]  
Return code: O [CR] (success)  
? [CR] (non-existing command)  
E [CR] (error in the parameter value)  
Note: n1 = evaluation range of AREA detection in %(MAX100%)  
n2 = left side blank (MAX 512)  
n3 = right side blank (MAX 512)  
n4 = DIF AREA evaluation value in % (MAX 100%)  
n5 = left side blank (MAX 512)  
n6 = right side blank (MAX 512)  
n7 = FLUTTER critical value  
(MAX value indicates 100%, normally set at 110-120)  
n8 = left side blank (MAX 512)  
n9 = right side blank (MAX 512)  
Please set 0 as the critical value for the non-programmed detection item.

\* Create the master file memory in the backup memory

Command: A, cccccccccc, n1, n2 [CR]  
Return code: O [CR] (success)  
? [CR] (non-existing command)  
1 [CR] (the same master name is already saved )  
3 [CR] (memory capacity shortage)  
Note: cccccccc is the master name.  
n1 = the number of pulses (1-19)  
n2 = dummy impulses (1-9) for the pre-magnetization.  
Please set n2 to 0 when dummy impulse is not necessary.

\* Set the impulse numbers

Command: F, n1, n2 [CR]

Return code: O [CR] (success)

? [CR] (non-existing command)

E [CR] (error in the parameter value)

Note: n1 = the impulse numbers (1-19)

n2 = dummy impulses (1-9) for the pre-magnetization.

Please set n2 to 0 when dummy impulse is not necessary.

\* Start testing in the Manual mode

Command: S [CR]

Return code: O [CR] (success)

? [CR] (non-existing command)

E [CR] (command format error)

\* Start testing in the AUTO mode

Command: S [CR] (starting a test with the recalled master file)

S, ccccccc.ccc [CR] (starting a test with the specified master file)

S, #n [CR] (starting with the specified master by the memory number)

T [CR] (starting with NO DISPLAY mode, others are same as S)

T, ccccccc.ccc [CR]

T, #n [CR]

Note: ccccccc.ccc is the master name.

#n is one character of the hexadecimal (1 - E)

Return code: G [CR] (the test result is 'OK)

N, NG list [CR] (the test result is NG)

? [CR] (non-existing command)

E [CR] (command format error, or the specified master name is not in the memory)

Note: NG list is a row of characters delimited by the comma.

The characters indicate the test item detected NG.

'A' is the area comparison (AREA)

'D' is the differential waveform area comparison (DIF-AREA)

'F' is the corona value (FLUTTER)

e.g. : N, A, F [CR] indicates that the area comparison and flutter value test are detected NG.

\* Delete the master data

Command: M, \$ [CR] (delete all the data)  
M, ccccccc.ccc [CR] (delete the specified master name)  
Return code: O [CR] (success)  
? [CR] (non-existing command)  
2 [CR] (the specified master name is not in the memory)  
Note: ccccccc.ccc is the master name.

\* Recall the waveform data

The waveform data is expressed by 512-voltage values for one frame. Two characters of hexadecimal show one voltage value. "00" indicates 'minus full scale'. "FF" indicates 'plus full scale'. "7F" indicates 'voltage level of the waveform = 0'

Command: Y [CR] (Recalling the master wave form, 1 frame)  
Command: X [CR] (Recalling the examined wave form data, the frame number is equivalent to the number of the impulse applied)

Data Format

Thirty-two of the hexadecimal ASCII characters make one line. The end of the line uses [CR] + [LF] to make 32 lines as 1 frame. An empty line is put between frames in case of more than 2 frames ([CR] + [LF] is transmitted twice at the end of the last line of the frame.) "04H" (EOT) is transmitted to end the data.

\* Transmit the master file to the host (i.e. personal computer)

Command: R, ccccccc.ccc [CR]  
Return code: O [CR] (transmission possible)  
? [CR] (non-existing command)  
2 [CR] (no specified master data)  
Note: ccccccc.ccc is the master name.  
"04H" [EOT] is transmitted to end the data.

\* Receive the master file from the host (i.e. personal computer)

Command: W, ccccccc.ccc [CR]  
Return code: O [CR] (transmission possible)  
? [CR] (non-existing command)  
3 [CR] (If the backup memory capacity is not enough)  
The host shall transmit the data to be received by the R command.  
"04H" [EOT] shall be transmitted to end the data.  
Return code: O [CR] (If receiving is properly completed.)  
E [CR] (The received format is error. Here, the received data is abandoned.)

---

---

\* Recall the master file list

Command: K [CR] (Recall 14 files names within the current page.)  
K, A [CR] (Recall the file from the whole memory)

Return code: ccccccc.ccc [CR]  
ccccccc.ccc [CR]

:

:

ccccccc.ccc [CR]

[EOT]

Note: [EOT] is "04H" Code.

Note: ccccccc.ccc is the master name.

\* Recall the memory page

Command: QC [CR]

Return code: n [CR]

Note: n is the page number 0 - 4.

\* Change the memory page

Command: QP, n [CR]

Note: n is the changing page number 0 - 4.

Return code: O [CR] (success)

E [CR] (command format error)

\* Recall the test result by the numeral value

Command: J [CR]

Return code: A = -n. n%, D = n. n%, F = n, [CR]

Note: 'A' is Area Comparison, 'D' is Differential Area Comparison, and  
'F' is Corona Value. When the result for the Area Comparison  
'A' is minus, the sign will be shown.

\* Recall of the D/A converter value for the high voltage power source setting

Command: P [CR]

Return code: nnnn [CR]

Note: nnnn is 4 digits of hexadecimal.

Please run this command after executing the E command for the  
initial set.

## ***Memory Card Expanding order***

### \* Specify and down load an optional file name from the memory card.

1 file in the memory card → Set the master wave

Command: VB, ccccccc.ccc [CR]  
Return Code: O [CR] (LOAD finishes)  
? [CR] (non existing command)  
2 [CR] (no specified master wave)  
Note: ccccccc.ccc is the master name.

- \* Recalling from the 32 Mbyte memory card takes a maximum 1-minute for search time. If there is no indicated master file name, it will send return code 2 [CR] after this maximum search time.

### \* Downloading a page unit from the memory card

A page within memory card → backup memory page4 (copy to the extended page)

Command: VE, nn [CR]  
Return code: O [CR] (download finishes)  
? [CR] (non-existing command)  
2 [CR] (specified page is not effective)  
Note: nn is the memory card page number.  
Pages 00 – 50 are effective.

- \* In page unit download, the 14 master waves can be copied and saved at once to the built-in backup memory page 4. After downloading, the data on page 4 can be handled in the same way as those in the backup memory.

### \* Master name list in the memory card

Master name within the memory card → All output at the RS232C end terminal

Command: VK [CR]  
Return code: ? [CR] (non-existing command)

- \* Through this command, the program will transmit all the file names from page 00-50 consecutively. The page number will be shown on the top of each page.
- \* If the master name does not exist, the return code [EOF] output will appear at the end of the list.
- \* The list contains total 700 master file output.

## 12.4. RS-232C Serial Interface Signal

The RS-232C interface uses the established serial interface standard of EIA (Electronic Industries Association), compatible with JISC6361. The DWX uses the D-SUB 9 pin. The computer connection can use the commercially available straight cable through the serial interface.

9 pin Receptacle (Female) < -- > 9 pin Receptacle (Female)

The RS-232C interface of the DWX uses the signals according to the table below. The connector pin not shown in the table is not connected in the DWX (N.C.).

Item	Code	Pin No.	Signal Direction
Transmitted Data	TXD	3	→ DWX
Received Data	RXD	2	← DWX
Clear to Send	CTS	8	← DWX
Data Set Ready	DSR	6	← DWX
Signal GND	SG	5	
Carrier Detected	DCD	1	← DWX
Data Terminal Ready	DTR	4	→ DWX

\* The symbols listed in the code column indicate the signal name when observing from the HOST PC.

## 13. Supplement

### 13-1. Message

- |                       |   |
|-----------------------|---|
| 1. MASTER SAVE OK     | Indicates that the master data has been saved.    |
| 2. == MEMORY FULL ==  | Backup memory is full.                            |
| 3. = OVER WRITE OK? = | Overwrites the already saved master file.         |
| 4. = FILE CLEAR OK? = | Confirms before deleting the file.                |
| 5. CARD FORMAT OK? =  | Confirms for formatting the card memory.          |
| 6. FILE NOT FOUND     | Indicates that the specified file is not found.   |
| 7. FILE NAME DOUBLED  | Indicates that the same file name already exists. |
| 8. FILE NAME ERROR    | The input file name format is wrong.              |
| 9. == TEST OK ==      | The memory test completes.                        |
| 10. xx TEST NG xx     | The memory test detects a fault.                  |
| 11. <IMPULSE>         | Impulse applied state.                            |
| 12. - Error -         | Specified master model error.                     |

### 13-2. Maintenance

The battery backup uses the built-in type rechargeable ion battery. The life of the battery is approximately 3 – 5 years (at the temperature 23°C). The battery of the main unit is charged while the power is on. If the power switch is 'OFF' for approximately 1 to 2 months (the time period differs from case to case), the backup memory will be deleted.

In this case, please reset the system menu operation.

Please contact our customer service section to replace the battery.



### **13-3. All-System Reset**

Compared to the reset of the backup memory in the menu function, all-system reset completely deletes the system memory and all the settings.

#### The process

Press the [START] switch for at least 3 seconds while turning on the power switch.

System Reset

Sure ?

Press [START] IF Yes      [START] is starting test switch

To confirm the operation, press [START] switch. Pressing other switches will cancel the operation.

#### **Caution!**

The all-system reset function deletes all the internal memory. Therefore, be cautious before operating this function.

### **13-4. Functional Faults Of The Operating Unit**

The DWX makes a self-check when the power is on. If the checking when the power is on results in normal condition, the display will show the version. If there is a fault, it will display the error.

Function is normal:              CPU PLD Ver. X.XX OK

Function is not normal:        CPU PLD Ver. X.XX NG

The "error" display can possibly mean the malfunction of the internal parts of the main unit (i.e. CPU, A/D boards, etc.). In this case, please contact our service department.

**13-5. About the WIDTH**

The [WIDTH] function of the DWX has extended WIDTH compared to the DW/DWS series. The WIDTH of 0 – 5 has the same waveform as that of the DW/DWS. The WIDTH -1, -2, -3, -4 represents the new function for testing low inductances test. The DWX and DW/DWS sample ranges are as below.

WIDTH		A/D sampling time (sec)		DWX display dot step	
DWX	DW	DWX	DW		
-4		10n		1/1	The fastest
-3		10n		1/2	
-2		10n		1/3	
-1		10n		1/4	
0	0	10n	50n	1/5	Same as DW/DWS
1	1	20n	100n	1/5	
2	2	20n	200n	1/10	
3	3	50n	400n	1/8	
4	4	100n	800n	1/8	
5	5	160n	1600n	1/10	Slow

Explanation

The DWX has 10 ranges of width from -4 to 5. The width 0 has the same waveform as the DW/DWS width 0. For low inductance test, it is particularly effective to set the width below 0 to -1, -2, ...-4.

Though the DWX width is compatible with that of the DW, it does not mean it has the same test performance as that of the DW. As seen in the table above, the DWX has, in any range, a higher A/D sampling speed performance.

The RAM buffer of the A/D (8192 byte) downloads the wave and includes all data to the test. The data is displayed on the screen by the “display dot step”. For example, the DW at WIDTH 1 has 100n sampling, which could miss a small discharge of electricity. On the other hand, the DWX at 20n sampling speed may miss less electric discharge. However, the screen is drawn at 5 data-step dots, the displayed image, therefore, is the same as that of the DW.

Further, the RS-232C data through the DWX internal management has the same 512-byte output as that of the DW tester. Its compatibility offers the display through the DW AssisWin software.

### **13-6. The Time Scale Display Screen**

The time scales are divided by 100 dot vertical line. This helps to understand about the time information. With the same normal wave scope, we can easily obtain the time information from the displayed wave.

### **13-7. Laplacian**

The Laplacian display contains 512-dot time axis, divided into 51 sections with 10 dots in each section on the histogram. The bar graph indicates the accumulated peak level in this 10-dot section. The test is also in this peak level.

This displaying method may possibly be changed in the future.

## 14. Operating Procedure

This explains how to set the master wave and make the test. First, connect the test cable to the master coil.

### **14-1. Master Wave Setting**

0. Select the MANUAL [F4] key.
1. Use the VoltSet [1] key to set the test voltage.  
Input the test voltage X.X kV (DWX-05), or XXX V(DWX-01).
2. Set the test pulse numbers by the PulseSet [2] key. Input around 3 – 5.
3. Set the scan speed from –4 to 0 and 5 by the Width [JOG dial].
4. Press the Init.Set [F1] key to initialize the master wave and the wave is drawn on the screen.
5. Adjust the shape of the wave drawn on the screen to obtain 3-4 cycles. If the wave is too big or too small, readjust by repeating the step 3.
6. Set the evaluation criteria by the JudgeSet [3] key.
7. To set the AREA comparison test; press the [\*] key. To skip the test, press the [-] key.
8. If selecting the [\*] key, set the evaluation range by using the [JOG dial], and press the [Enter] key to confirm.  
Adjust the cursor line to left or right to set the test range. Use the [JOG dial] to switch between left and right.  
(The test range setting can also be done by using the keys; left cursor (L) :-[-1] [2]->, right cursor (R): <-[4] [5]->).
9. After the test range is decided, press the [Enter] key and input the limit value.
10. Input test value in “%”; usually 10-20%.
11. Press the [Enter] key. Then follow the same setting procedure for DIF-AREA test.
12. Do the same for the FLUTTER detection.
13. In setting the FLUTTER, use the [JOG dial] to set the evaluation range. The tester will show the calculated value range of the flutter value. For the master wave, input a flutter value about 20% above the max. value.
14. Either the Laplacian test or the FLUTTER test can be selected individually. The set values would be effective only to the selected test. To evaluate Laplacian, set the [-] key to make the FLUTTER setting not effective. Press the [\*] key in the Laplacian setting to make the evaluation range.

The setting method is the same as the one for FLUTTER.

**14-2. Store The Master Wave Data**

15. The master wave setting is described above. Next, store the master wave data in the memory.
16. Select the MASTER [F3] key.
17. Press the Save [F2] key and input the master name (up to 8 characters).
18. After saving the data, recall the data for the test operation.
19. Press the Load [F1] key. Select the desired master file name by using the [JOG dial].
20. Press the [Enter] key to complete the process.

**14-3. The Test Operation**

21. The stored master wave data has been recalled. Next, operate the test in the AUTO mode.
22. Select the AUTO [F5] key.
23. Press the [START] switch to begin the test. The test result will be displayed.
24. Select the [1] key to confirm the evaluation ranges.

## 15. Easy To Use Method

### 15-1. Change The Test Conditions Of The Already Saved Master Wave

Recall the already saved master wave. Select the JudgeSet  key in the  mode to reset (change) the test criteria. After the setting is finished, select the  key in the  mode to overwrite the master wave. With this method, the test criteria can be modified.

### 15-2. To Enlarge The Wave Display During The Test

Use the Dsp.Size  key in the  mode to select either the standard or enlarged wave display.

### 15-3. Manage The Master Wave In The Memory Card By The External Control

Any pages in the memory card can be copied to the backup memory page 4 through the [Extended Page Set] function of the memory card. The selected memory card page can be used and selected as the backup page 4 by the external control.

\* If there are any questions about other usage method, please contact our sales department.

## ***16. Guarantee***

Free of charge repairs are provided for any damages within one year after delivery. In case of a machine failure with incorrect use, user's carelessness and an improper conversion, our guarantee shall be void. The accident of disaster is also out of the guarantee. In using this product, please concern about avoiding injury. Even though you injure, we cannot take any responsibility for it.

***DWX-01/DWX-05***

***Instruction Manual***

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