Baker Instrument Company
User's Manual

SW6000 Winding Test Module

Baker Instrument Company
4812 McMurry Avenue
Fort Collins, CO 80525
(800) 752-8272 (USA Only)
(970) 282-1200
(970) 282-1010 (FAX)

Warning

Part One: General Operations Manual

CHAPTER ONE: TESTING PRINCIPLES RESISTANCE, HIPOT, SURGE

Inside…..

- Principles of AC High Potential (HiPot) Testing
- Principles of DC High Potential (HiPot) Testing
- Principles of Coil Resistance Testing
- Principles of Surge Testing
- Error Area Ratio
- Rotation Direction

SW6000
Automatic Winding Test System

Principles of High-Potential (Hipot) Testing

The Hipot test is considered the mainstay of motor testing. The purpose of a Hipot test is to verify the quality of the insulation between two conductors. The most common Hipot test is conducted between a winding and a core. But, it can also be used to test the insulation between two separate windings as is the case with some two speed motors for example.

Hipot tests can be performed using either AC or DC high voltage. In both cases, the leakage current is measured in order to verify that it does not exceed a set limit. Hipot testers typically also have arc detection capability to detect intermittent faults which may not be measurable otherwise.

AC Hipot

The AC Hipot test is the standard test used by almost all winding manufacturers in a production environment. The AC Hipot test is preferred because of its faster test time. And it is specified in UL, CSA, NEMA and other test procedures.

A high voltage 50 or 60 Hz AC signal is applied to a winding. The core and/or other windings are grounded. The leakage current between the high voltage winding and ground is measured in RMS current.

The equivalent circuit of an insulation system is a very large resistor (the insulation resistance) in parallel with a capacitor (the capacitive coupling between the two conductors). The insulation resistance is very large compared to the capacitive impedance so almost all of the leakage current is capacitive. The voltage and current waveforms are almost ninety degrees out of phase. The real or resistive leakage current is measured in microamps. The capacitive leakage current is measured in milliamps.

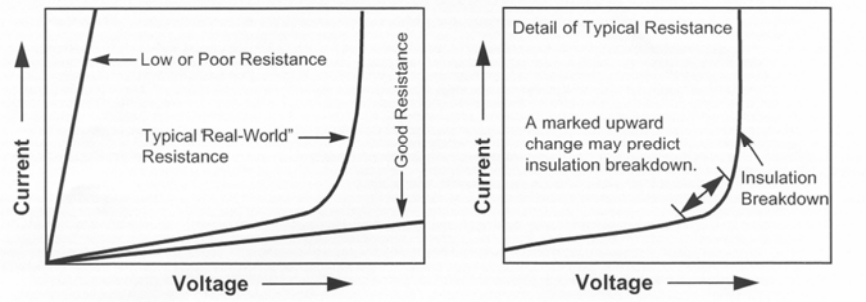
Some test specs call for a Capacitive Compensation capability when measuring leakage current. The goal is to measure the real or resistive leakage current. This very difficult to be accurate and maintain short test times since the capacitive leakage is an order of magnitude greater than the resistive leakage. The test specifications take this into account and therefore have relatively large compensated leakage current limits.

DC Hipot

Baker Instrument Company testers provide the DC Hipot test as an alternative to the AC Hipot test. The DC hipot leakage current is only affected by the quality of the insulation resistance. When a DC voltage is applied across an insulator, initially there is some capacitive charging current. But, this decays to zero leaving only the resistive current. Although it is more commonly used in predictive maintenance situations, some manufacturers, especially of larger motors, find it useful to measure insulation resistance.

The DC Hipot test takes more time to conduct because of the charging and discharging times of the windings.

Knowledge of the real behavior of resistors, not just ideal resistors, will help the operator to test the winding insulation to a point *before* the insulation is broken down.



Principle of Resistance

For an ideal resistor as the voltage is increased, the leakage current will increase proportionately (Fig 4-1). However, insulation resistance in the real world rarely behaves in this manner. Instead, the current in a typical resistor will increase proportionately with voltage until the voltage is within as little as 5% of the breakdown voltage. Just before insulation breakdown, the current will rise faster than the voltage. At still higher voltage, the insulation will completely breakdown and the current will rise extremely fast.

Principles of coil resistance testing

The coil resistance test is used to verify that there are no open connections in the winding. It also verifies that wire of the correct gauge is used and that the winder is making coils of the correct size and number of turns. The coil resistance test injects a constant current through the winding and measures the voltage drop across the winding. Resistance is calculated using Ohm's law.

The coil resistance is affected by the temperature coefficient of the copper. The conductivity of the winding decreases with increasing temperature. Therefore, the measured resistance must be "corrected" to the specification temperature, usually 20 or 25^{o}C, before applying the pass/fail limits. An ambient temperature sensor can be used if the windings are at ambient temperature. Or an infrared type sensor is used if the windings are not at ambient.

Resistance meters have resistance in the relays, test leads and connection clips. Many windings have relatively low resistances. When the winding resistance is less than about one ohm, the errors of the equipment can introduce large measurement errors. The use of a Kelvin resistance test is needed to accurately measure low resistances. Kelvin meters use a second set of high impedance test leads to sense the voltage drop directly on the

coil rather than at the current source. For very low resistance windings, the connection to the winding under test must also be Kelvin. A non-Kelvin connection typically provides about 10 milliohms of resistance even when Kelvin leads are used. This means that the test lead which carries the current and feedback lead which senses the voltage must contact the winding separately. This can be accomplished with Kelvin alligator clips or customized Kelvin connection blocks.

The most common pass/fail limits for resistance tests are upper and lower absolute resistance limits. Typically plus or minus 5 to 10 percent limits are considered acceptable. Some users also benefit from a resistance balance test. For example, a three phase stator manufacturer may want to verify that the resistances of the three phases are all within a certain percentage of each other. The balance resistance is a calculated value. Usually, the balance limit can be a smaller tolerance than the absolute limits.

The WinAST measures the resistance using Kelvin test leads, corrects the resistance for temperature, and displays both the absolute resistance value, as well as the balance resistance percentage calculation.

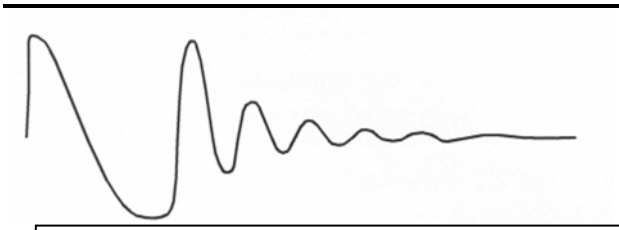
Principles of Surge Testing

Prior to the introduction of high voltage surge or impulse testing, the only common high voltage test for winding insulation was the Hipot test. This test is adequate for testing winding insulation to ground, but it does not detect insulation weakness between turns or phases.

A typical winding consists of multiple turns of insulated copper wire. Winding insulation failure often starts as a turn-to-turn or winding-to-winding fault rather than a winding to core fault. The surge test can detect these types of insulation problems.

A high voltage DC power supply charges a capacitor to the test voltage. A switch rapidly dumps the capacitor energy into the winding. A very fast rise time voltage surge or impulse is applied to one end of the coil. The other end of the coil is grounded. This creates a voltage gradient across the length of the wire in the winding. This gradient produces a voltage stress between turns.

The simple equivalent circuit for a winding is a resistor and an inductor in series. The resistive losses include the wire resistance and core losses. The load combined with the surge tester capacitor is an RLC circuit with a damped sinusoidal response. Each coil has its own unique signature ringing or wave pattern which can be displayed on the screen.



Example of a "ringing" wave pattern resulting from Surge Testing

The wave pattern observed during a Surge Test is directly related to the coils inductance. The coil becomes one of two elements in what is known as a tank circuit – a **LC-type** circuit made up of the coils inductance **(L)** and the surge tester internal capacitance **(C).**

Inductance (L) of a coil is basically set by the number of turns in a winding and the type of iron core it rests in. The frequency of the wave pattern is determined by the formula:

$$Frequency = \frac{1}{2\pi\sqrt{LC}}$$

A high voltage surge test can detect a fault between turns that is due to weak insulation. If the voltage potential is greater than the dielectric strength of the turn insulation, one or more turns may be shorted out of the circuit. In effect, the number of turns in the coil is reduced. Fewer working turns reduce the inductance of the coil and increased the frequency of the resonant frequency of the surge waveform.

The voltage or amplitude of the surge wave pattern is also reduced due to the decrease in inductance of a coil with a fault between turns. It is determined by the formula:

$$Voltage = L\frac{di}{dt}$$

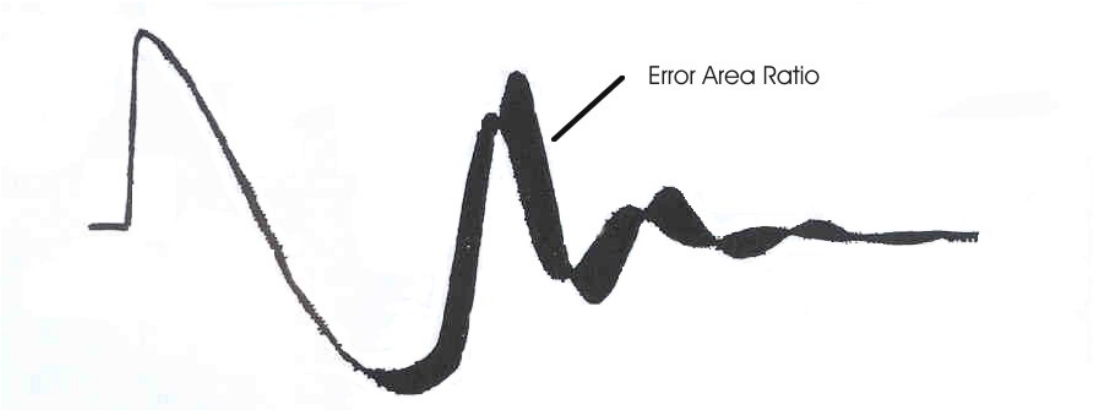
Where the current (i) varies according to pulse time (t)

When the insulation between turns is weak, the result is a low energy arc-over and a change in inductance. When this happens the wave pattern becomes unstable – it may shift rapidly to the left and right, and back to the original position.

A fast analog to digital converter is used to sample and display the surge waveform. Typically, a Master waveform is learned and stored from one or more known good windings. There is typically some variation between good windings due to things such as the magnetic properties of the core, the number turns in the coil or size of the coil. When more than one winding is used to learn a Master, the Master waveform is averaged.

Error Area Ratio

When testing subsequent windings, the test waveform is compared to the Master waveform. Baker had patented a sensitive, proprietary method for quantifying the changes in the surge waveform. It is called Error Area Ratio. The area between the test waveform and the Master waveform is calculated and divided by the total area under the Master waveform. The result is a percent error. If the two waveforms are identical the difference is zero. The greater the differences in frequency or amplitude, the greater the error becomes.



Like the resistance test, some difference between the test and Master waveforms is acceptable. Many manufacturers allow up to 15 or 20 percent deviation from the Master. Sometimes major differences in the materials or process cause the surge waveform to change significantly from the Master. It may become necessary to delete and relearn the Master waveform. For example, the magnetic properties of a laminated steel core may change the waveform substantially.

A surge balance test is also available. In this case, the waveforms from windings within a part are compared to each other rather than to a Master. The percent balance error limit is typically less than the absolute limit in comparison to the Master. It is typically used by three phase stator manufacturers who check for balance between the phases.

Rotation Direction

A rotation direction test can be added to the SW6000 with the addition of the RT 6000 Rotation Direction Test Module. The Rotation Direction test is used to sense the rotational direction of the magnetic fields in a winding. It uses a hall-effect probe placed within the stator bore or near the end turns. Power is applied to the windings and the magnetic fields rotate either clockwise or counter-clockwise. The sensor then detects the direction of rotation.

Three phase voltage is normally stepped down to approximately 90 VAC phase to phase and applied to the winding. For three phase stators, three phase power is applied. For

single phase stators with a main and start winding, two phase power is applied. Use of a start capacitor when testing a two winding, single phase stator is avoided with this method. For shaded-pole stators, single phase power is applied.

CHAPTER TWO: GETTING STARTED

Inside…..

- General Information
- Comprehensive Testing Capabilities
- Unit Front Panel Call Outs
- Getting Started

SW6000
Automatic Winding Test System

General Information

The SW6000 Winding Test Module is part of the Cobra family of Automated Test Systems, the most advanced test systems available for production line testing of all types of windings. The SW6000 is limited to 3 test leads and performs Surge, Resistance, AC and DC Hipot tests on these leads in a programmed test sequence. Also, the test leads of the SW6000 are "three-state" leads and can be set to ACTIVE, GROUND or OPEN.

Comprehensive Testing Capabilities

The SW6000 Automatic Test Systems offers a selection of three types of tests that allow a comprehensive look at winding and process quality. These tests include:

AC Hipot Test

The AC Hipot test tests the winding-to-core insulation.

DC Hipot Test

The DC Hipot test tests the strength of the winding insulation to ground.

Resistance Test

The resistance test measures the resistance between two leads.

Impulse (Surge) Test

The high-voltage impulse (or surge) test checks for insulation weakness between turns, layers, coils and phases of a winding. Surge testing also detects other faults that change the inductance or losses in a winding such as reversed coils and improperly annealed steel.

Note: Voltage Variation/220 Voltage Users

Voltage Variation

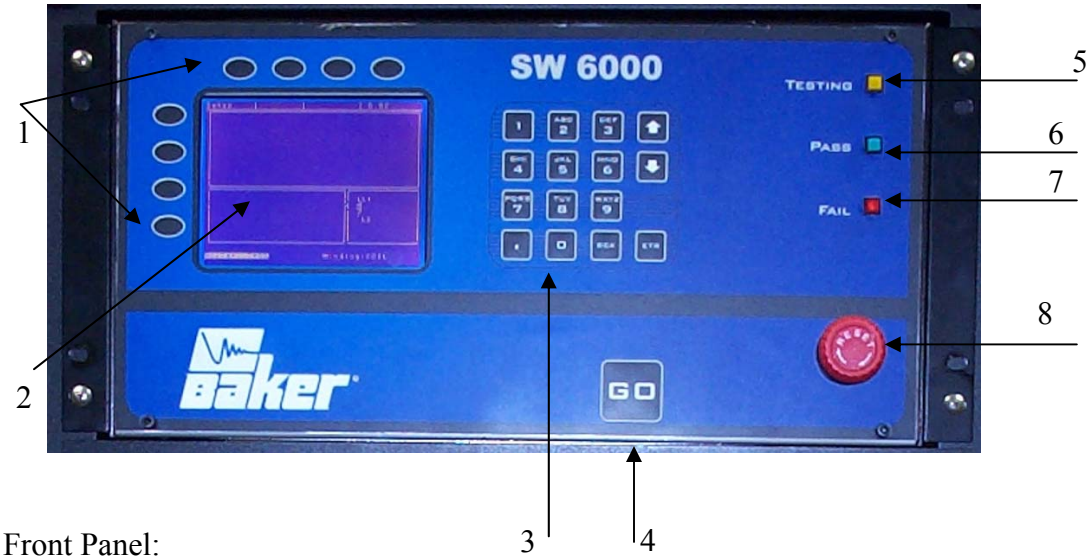
There can be an issue with the repeatability of the surge voltage of the SW6000 for users with poorly regulated supply voltage. The SW6000 uses a variac to set the voltage for the HiPot and surge tests. Changes in the input voltage directly affect the output voltage. Voltage variation does not significantly affect HiPot effectiveness. But, variations in surge voltage cause errors in the Error Area Ratio when comparing to a digitized Master. While amplitude variations have less of an effect than frequency shifts, the error can still be noticeable.

The remedy for this input power variation is to use a 600 VA UPS to power the SW6000.

Input Voltage:

The SW6000 requires a 120V supply voltage. A 220/120V step down transformer is supplied for 220V applications. **Never connect the SW6000 directly to a 220V supply.**

Unit Front Panel Call Outs



Unit Front Panel:

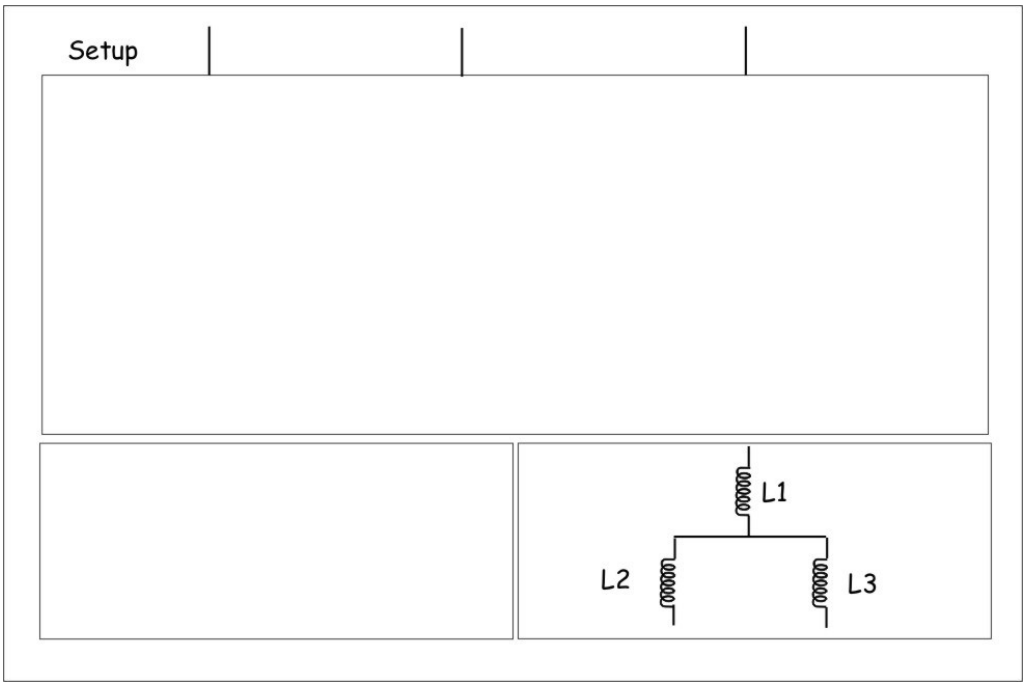
1. Setup & Programming Buttons
2. Display Screen
3. Input Keypad
4. Go Test Button
5. Testing – Yellow light that will light during a test.
6. Pass Light – Green light that will light when a test has passed.
7. Fail Light – Red light that will light when a test has failed.
8. E-Stop – Emergency stop that removes 24V+ high voltage power from the system.

Getting Started

When the SW6000 is delivered, the following items will be enclosed.

1. SW6000 Unit.
2. Power Cable
3. Safety Line Cable with connector on rear of Unit.
4. Additional options my be included, depending upon purchase.
5. Leads
6. Manual

Remove unit and set on appropriate test bench or cart and attach safety line, leads, and power cord. Plug power cord into **properly grounded 110/120V** power. Turn unit on. On/Off switch is located on rear of left side panel. Unit will power up and the screen below will appear. You are now ready to begin programming or running tests with the SW6000.



CHAPTER THREE: PROGRAMMING THE SW6000

Inside…..

- Programming the SW6000
- Master Files
- Creating a New Master

SW6000

Automatic Winding Test System

Programming the SW6000

The SW6000 allows you to program up to 64 Masters that are held in memory for you to choose from. Programming is easy with the internal software prompting you step by step through the process.

1. To begin **Setup** – Hit the black button (membrane switch) associated with **Setup**. The following screen appears.

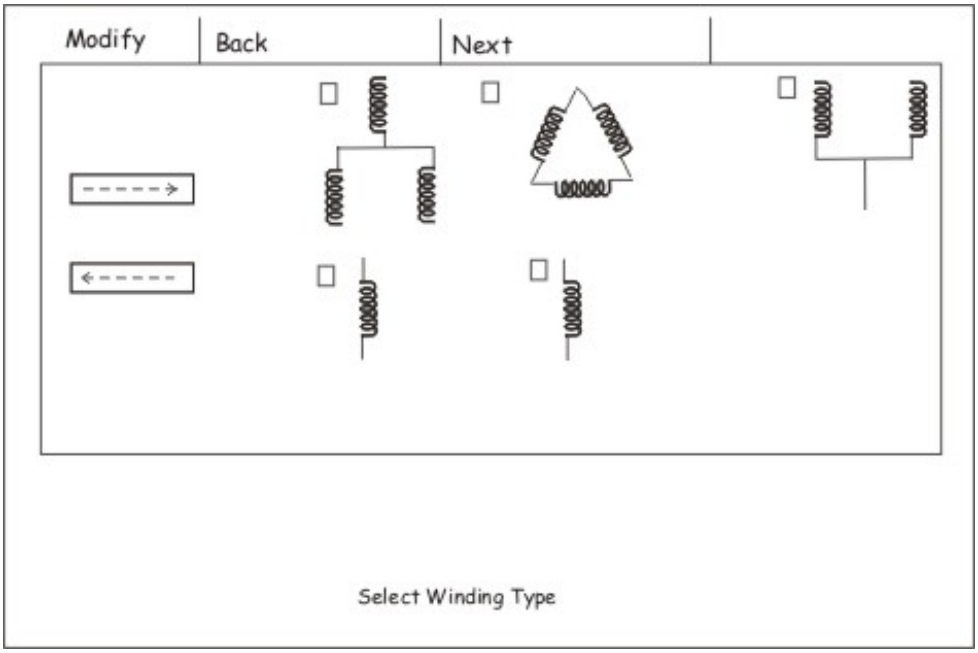
Note: The buttons on the top and left side of the display screen are used to program the SW6000. To choose which button that is associated with each command select the button that is directly above the word for menu changes and directly beside the word for command changes. For example to enter Setup select the button directly above the word Setup.

Master Files

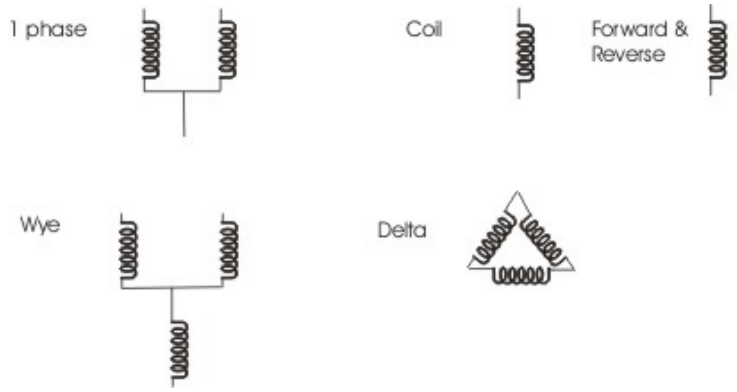
Select the Master menu by selecting the button directly to the left of the word Master. This will enable the Master window to appear. Within this menu you have three choices. You can assign an existing Master, modify an existing Master, or create a new Master.

Creating a New Master

If you have a new part or line that you want to create a new Master for, following these steps to create the new Master file to be used for testing of specific parts. When you hit the button associated with Create the following screen will appear.



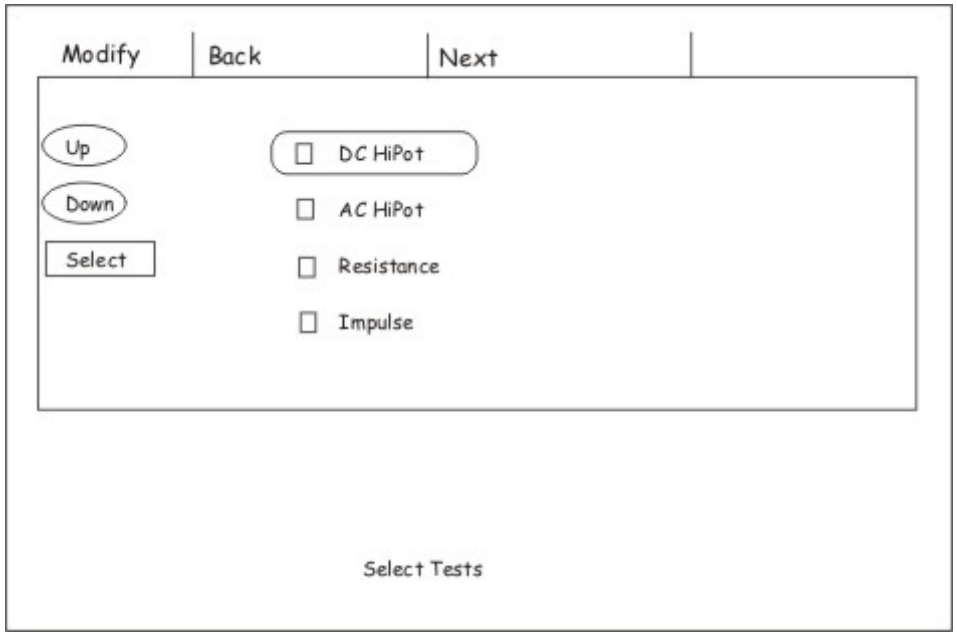
1. At the bottom of the screen Select Winding Type will be blinking. This prompts you to choose what type of winding that you are trying to test. To scroll through the available preprogrammed winding types press the direction keys. The following winding types are available.



2. When an **X** fills the box, the winding is selected.

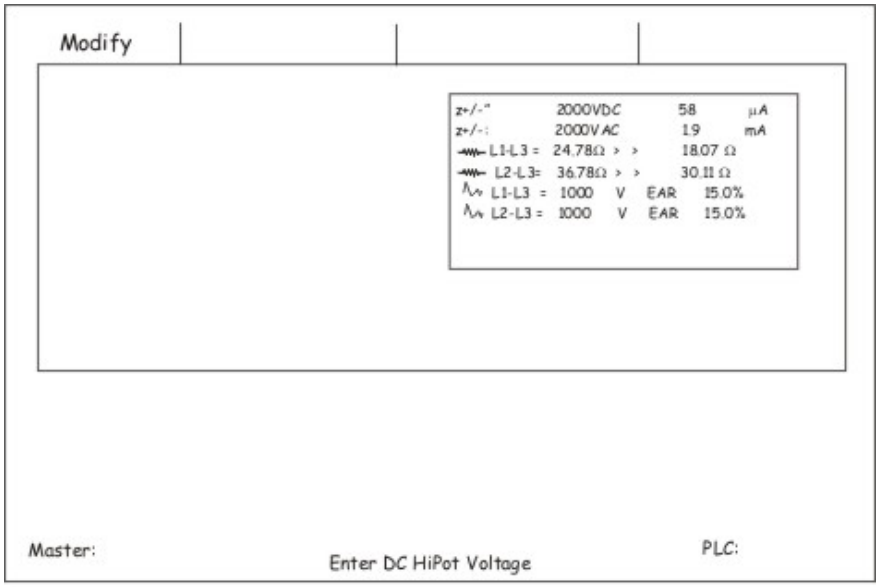
3. Press the **Next** Button.

4. Select the tests that are to be run by pushing the up and down button to scroll through the tests. Press select for each test. An **X** will appear in the box when the test has been chosen.



5. Select **Next**.

6. On this screen, set the testing voltages and apply a name to the Master.



7. Enter test parameters via the numbered keypad. At the end of each line press **Enter** to continue to the next line. For example you would type 2000 for the voltage for a 2000 voltage DC HiPot test.

8. After all voltages are set the keypad will change automatically to enable the letters to be typed into the Master name. Enter the name you wish for the Master.

NOTE: Keypad acts similar to a cell phone keypad. Continue to hit the key until the associated letter is displayed.

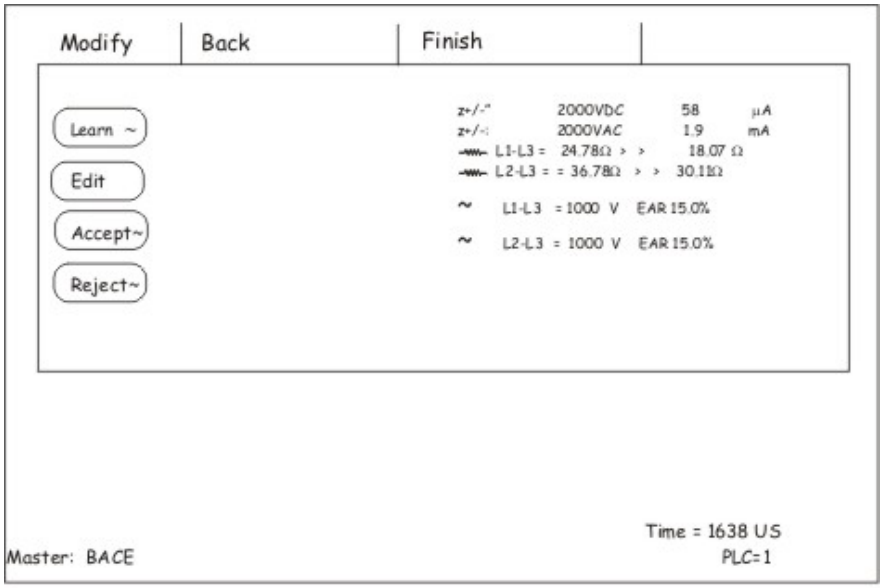
9. Press **Enter**.

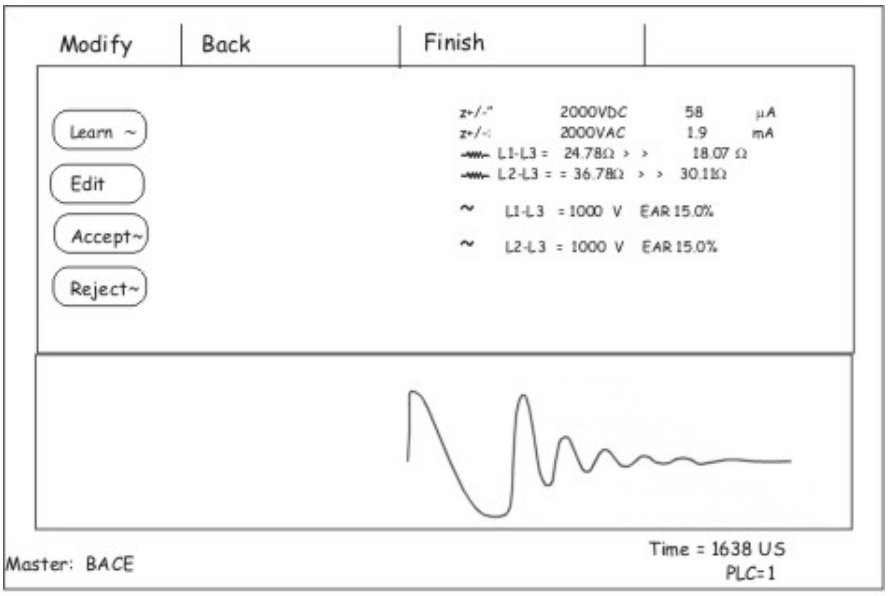
10. If all settings are correct, and if the surge test has been programmed, select **Learn ~**. If not, select edit and the set voltages screen will return for any changes that need to be made.

NOTE: If only a select number of parameters need to be change, you can hit the enter key to forward you faster to the associated numbers that need to be changed.

11. Select **Learn**. The Master will Learn the surge waveform to be used. Select Accept if the waveform is correct or Reject if it is incorrect.

NOTE: If reject is selected, adjust parameters or part being tested and Learn the Surge waveform again. If this is acceptable, select Accept and the Learned Surge waveform will be loaded into memory for this Master.





NOTE: The waveform that appears is the Master waveform that all associated tests will be shown against.

12. Select the **Finish** Button to complete the programming of this Master.

NOTE: The Master will load into memory and you will be able to run tests from there.

13. The main programming screen will now appear and you can assign a Master and start testing, modify an existing Master, or create another new Master.

CHAPTER FOUR: MODIFIYING EXISTING SW6000 TEST PROGRAMMING

Inside…..

- Modifying a Master

SW6000

Automatic Winding Test System

There may be a number of reasons to modify an existing programming test set with your process. For example, you may have another production line that has the same test needs, but is under another part number, or you may have to make changes within your process and the test limits and parameters need to be changed to match the process change. For these reasons, the SW6000 can be easily modified to make the necessary changes in the process.

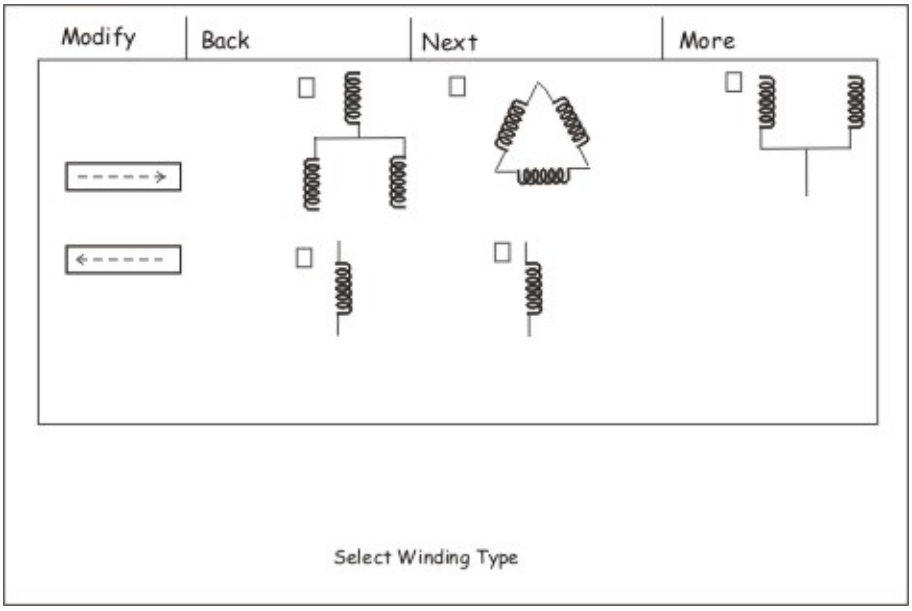
Modifying a Master

1. From the Master Setup screen select the button associated with **Modify**.

2. All Masters will appear. Hit the **More** button until you find the Master that needs to be changed and press associated button

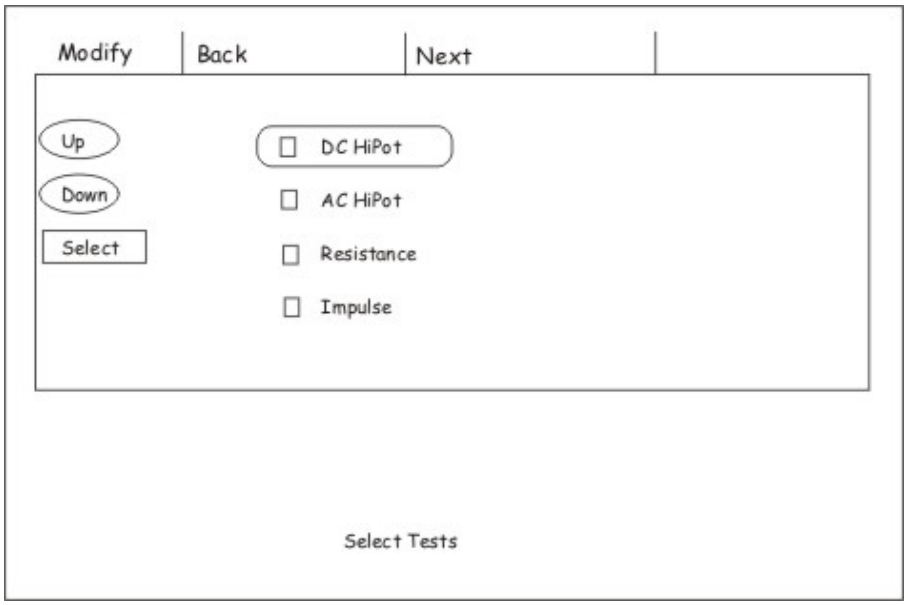
3. To modify the Master it will step you through the same screens as you did when you first created the Master.

4. Select the Winding Type.



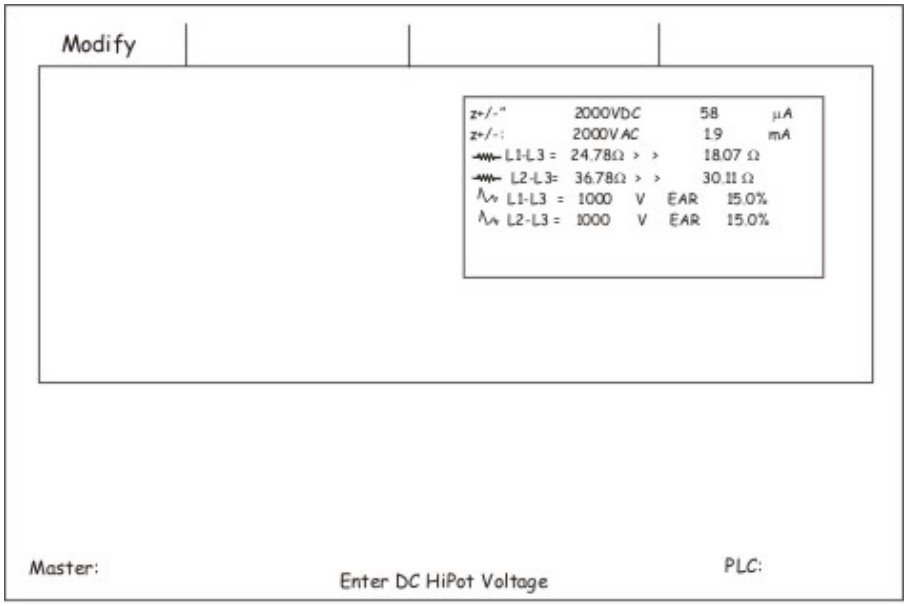
5. Hit **Next.**

6. Select or deselect tests.

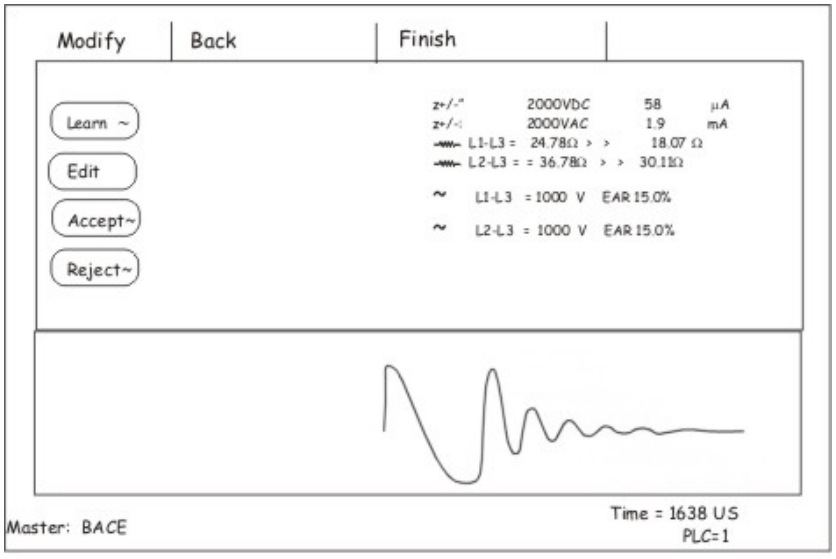


7. Hit **Next.**

8. Set Voltages as described in the previous chapter on programming a Master. Press **Enter** when finished.



9. **Learn** the waveform.



10. If all information is correct select **Finish**. Updates will be recorded.

CHAPTER FIVE: RUNNING TESTS

Inside…..

- Running Tests
- Choosing/Changing Masters
- Interpreting Test Results
- WFM

SW6000
Automatic Winding Test System

Running and interrupting tests is made easy with the SW6000. After a Master has been developed you can run tests and get immediate results on any number of parts. Test can be run a number of different ways. When you turn on the machine, the Master that was run from the previous session will be load automatically. Tests can be run from this screen. Also you can choose a new Master and run tests from there or finally there is a manual test that can be set up and run.

Running Tests

- Turn on the instrument from the rear left on/off switch

NOTE: The last Master that was used will automatically be loaded.

- If this is the Master that is to be used, push the **Start** Button and the tests that have been programmed will begin.

Choosing/Changing Masters

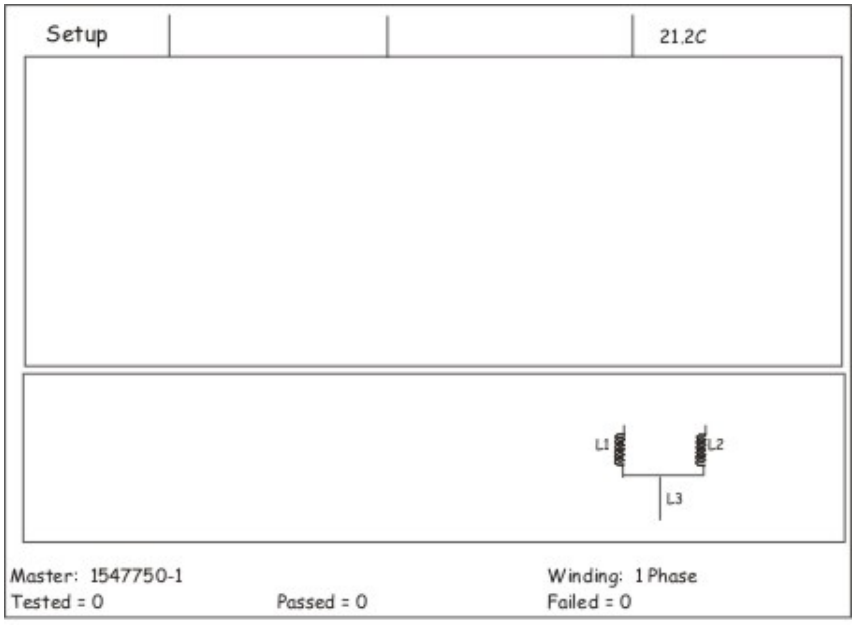
1. From the main screen, push the **Setup** Button
2. Push the **Master** Button.
3. Push the **Assign** Button.

4. The programmed Master screen will come up.

5. Press the **More** button to page through the Masters.

6. Press the button on the left side of the Master you wish to use.

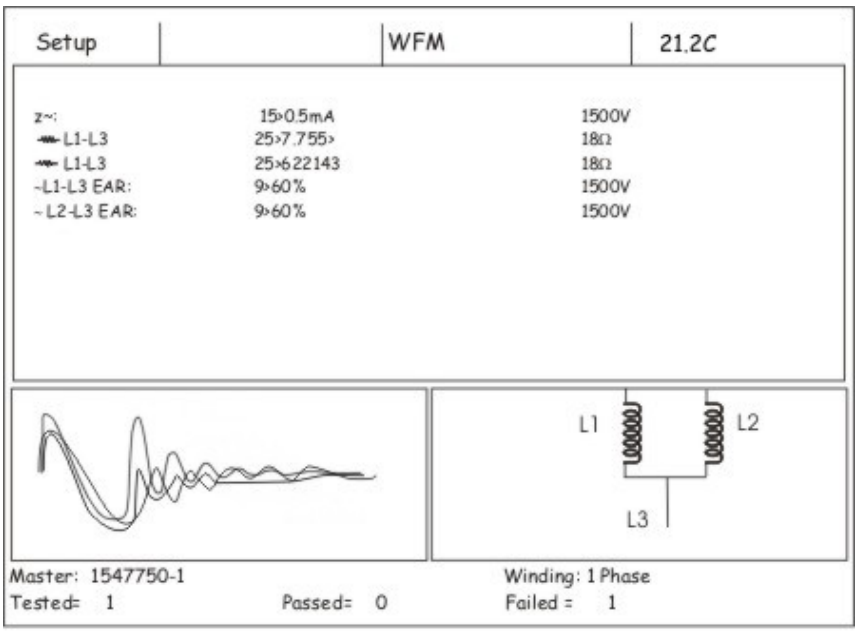
7. The Test Screen will appear with the associated Master that was chosen listed at the bottom.



8. Press **GO** to run tests.

Interpreting Test Results

After the tests have been run, the results will be displayed on the screen.



The parameters for this example were:

Winding Type: 1 Phase Winding
Tests to Run: AC HiPot, Resistance, & Impulse
Voltage Parameters:

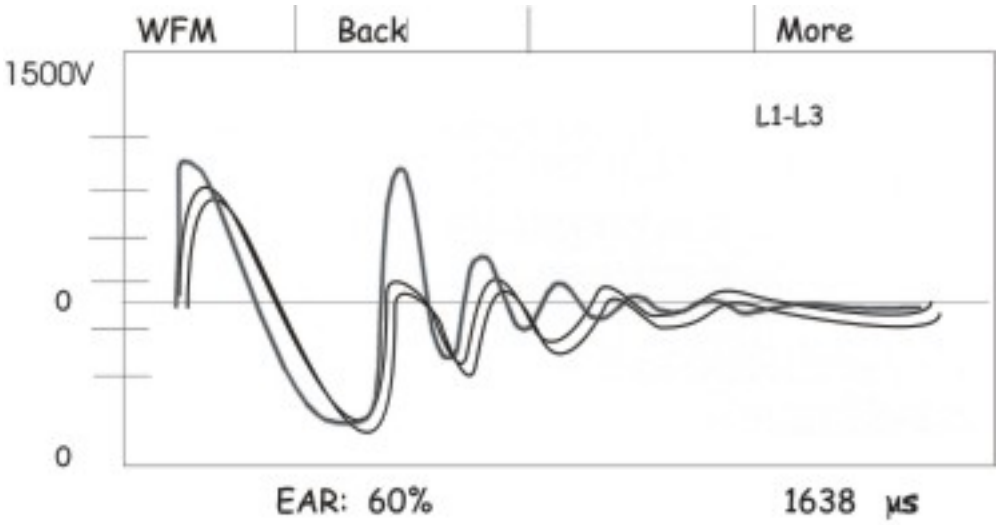
AC HiPot:	1500 VAC 15mA
Resistance:	L1-L3 = 25Ω > 18Ω
	L2-L3 = 25Ω > 18Ω
Impulse:	L1-L3 = 1500V EAR 9%
	L2-L3 = 1500V EAR 9%

As you can see this part failed. The part passed the AC HiPot but failed both the resistance and Impulse Tests. The tests that failed on the part will display on the screen by blinking. This notifies the operator that the part failed.

Tests can be re-ran by pressing the **Start** button.

WFM

On the top of the screen there is a menu button that reads **WFM** (waveform). This button when pushed will give you a large view of each waveform.



The **More** button will give you the other leads that were tested. The **Back** button puts you back to the run test screen.

Manual Tests

Manual tests can be run. Please see chapter discussing Utilities for directions on running manual tests.

E-Stop

The E-Stop button (Emergency Stop) is used if for some reason there is something wrong with the setup or there is a dangerous situation for a person. If this happens, press the E-Stop button. This creates a mechanical abort of all the tests.

NOTE: The SW6000 will continue to go through the software set up & results will continue to be displayed on the screen; however, no voltage will be applied to the part. The readouts will have 0 voltage readings.

To disengage the E-Stop button to continue testing, you must turn the button clockwise unit it clicks and pops out.

CHAPTER SIX: OPTIONS

Inside….

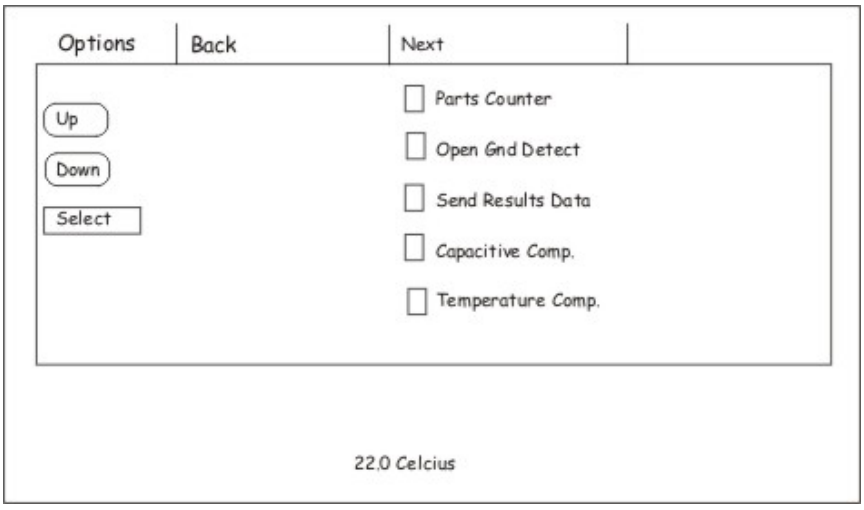
- Parts Counter
- Open Ground Detect
- Send Results Data
- Compensative Compensation
- Temperature Compensation

SW6000
Automatic Winding Test System

There are a few more options with the SW6000 to help you with testing. The options include Parts Counters, Open Gnd Detect, Send Results Data, Capacitive Comp., and Temperature Comp.

1. To get to the options menu, push the Select button.

2. Push the Options button. The following screen will be displayed.



3. Select each item by pushing the up or down button to the left that is associated with the items that are desired.

The Parts Counter will give you statistics on number of parts tested, number of parts passed, and number of parts failed. The Parts Counters will show up on the bottom of the main testing screen.

Open Gnd Detect: This verifies there is some minimal amount of leakage current detectable in the winding. This feature may not be operational for customers testing very low leakage current windings.

Send Results Data: This feature writes raw test data to the RS232 port. It can be imported to the CG6000 software if purchased for further report capabilities.

Capacitive Compensation - when selected the AC HiPot leakage results will display resistive current only, not total current.

Temperature Compensation – There is a temperature probe on the back of the SW6000 unit that will detect the ambient temperature and is used to adjust the measured resistance value to the associated temperature value needed. The most common is 25^0C, however, this can be user definable. It is displayed in Celsius on the bottom of the Options Screen. It will also be displayed throughout the other screens in the upper right corner of the screen.

CHAPTER SEVEN: UTILITIES

Inside:

- Reset Counters

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Automatic Winding Test System

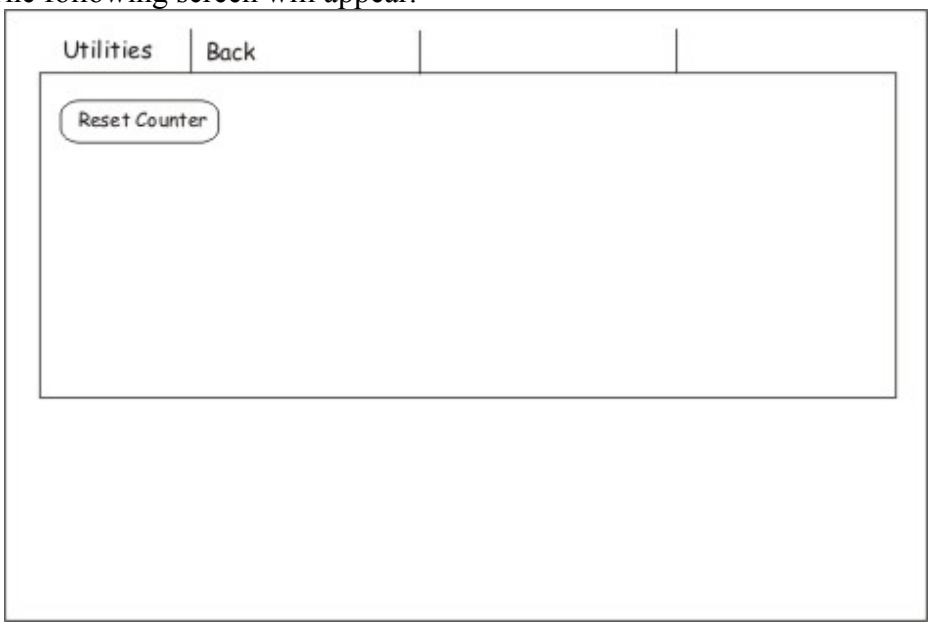
Utilities

Under this section you can do two things. You can set up and do a Manual Test and Reset the Parts Counters.

1. Push the **Setup** button.

2. Push the **Utilities** button on the Setup Screen.

3. The following screen will appear.



Reset Counters

To automatically reset the counters to zero simply hit the button associated with reset counters. This will automatically set them to zero and return you to the main setup screen.

Part Two: Maintenance Manual

CHAPTER EIGHT: STANDARDS & SAFETY

Inside…..

- Standards & Safety

SW6000
Automatic Winding Test System

Standards and Safety

Publishing and Documentation

Information furnished in this manual by Baker Instrument Company is believed to be accurate and reliable. However, Baker Instrument Company assumes no responsibility for the use of such information nor for any infringements of patents or other rights of third parties that may result from its use. No license is granted by implication or otherwise under any patent rights of Baker Instrument Company.

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Electrical and Calibration Standards

All Baker Instrument Company standards are either certified directly or are traceable to certification by the National Institute of Science and Technology (NIST), formerly the United States Bureau of Standards.

Return of Equipment

Before returning any equipment or instrument components to Baker Instrument Company, the following steps should be taken.

1. Notify Baker Instrument Company at 1-800-752-8272 (USA Only) or (970) 282-1200. Give the representative a full description of the difficulty, including troubleshooting steps that may have already been taken. Have the model and serial number of the instrument at hand.

2. Equipment returned to Baker Instrument Company must be packaged in such a manner that it will reach the factory without damage.

3. For non-warranty repairs, Baker will submit a cost estimate for your approval prior to your shipping the equipment to Baker Instrument Company.

Warning

Baker Instrument Company assumes no liability for damages consequent to the use or maintenance of this product. Refer to the general operating procedures for the SW6000.

Please read the following before servicing the SW6000

1. Contact with the test leads on this instrument can cause harmful or fatal shock. WARNING: Never touch the test leads or a winding while a test is in progress.

2. Ensure that the SW6000 is properly grounded. Use a three-lead grounded supply or an extra ground lead if you are unsure of ground supply.

3. on the test fixture and all safety devices are engaged before testing a winding.

4. The SW6000 is NOT APPROVED for use in an explosive environment.

5. Operation of the tester by persons who are using a pacemaker may present unusual safety risks. Such persons should take special precautions!

A Safety protection network minimizes electric shock hazard.

1. An EMERGENCY STOP button is mounted on the front panel of the SW6000 that interrupts all high-voltage power supplies.

2. A yellow "Testing" light, mounted on the SW6000 is illuminated during all test procedures.

Danger

HIGH VOLTAGE TEST EQUIPMENT SHOULD BE HANDLED WITH CAUTION!!! HIGH-VOLTAGE TEST PROCEDURES SHOULD BE FOLLOWED!

CHAPTER NINE: INTRODUCTION TO GENERAL MAINTENANCE

Inside…..

- Maintenance & troubleshooting
- Basic Operation
- Power Requirements
- Protection
- Environmental
- Maintenance Schedule

SW6000
Automatic Winding Test System

Maintenance and Troubleshooting

The SW6000 has been designed for maximum long-term reliability. The SW6000 has a limited one-year warranty against defects in materials and workmanship.

Basic Operation

There are normally four different test signal sources.

1. Resistance Measurement Board for winding resistance tests.
2. High-voltage DC power supply for DC HiPot tests.
3. High-voltage DC power supply/IGBT stack for surge tests.
4. High-voltage AC power supply for AC HiPots.

Test signals are routed to the test winding through a test bus. Any of the test signal sources can be switched onto the test bus through high-voltage relays located on the various boards. Only one source at a time can be routed onto the bus. The test bus can be connected to any combination of test leads through high-voltage relays on the Test Lead Multiplexer (TL Mux) boards

Power Requirements

Input Voltage:	110 VAC +/- 5%/220 VAC +/-5%
Power Consumption:	600VA Maximum
Overcurrent Protection:	Integrated 15A fuse with power connector

Environmental

Operating temperature range is zero to forty degrees Celsius.

Maintenance Schedule

Test leads, contacts, etc… wear out from normal operation. The frequency of component replacement and routine scheduled maintenance will vary, depending of the amount of use.

Unit must be returned to Baker Instrument Company for calibration and service.

Test Status/Safety Connector

This indicates test status for wiring to PLC other device. TESTING, PASS, and FAIL and other lines output +24 VDC at 100 mA maximum. These outputs are wired parallel with the control console lamps. The TESTING line outputs 24 VDC when a test is in progress. The PASS or FAIL line is activated when the test is complete, indicating test outcome. This connector is mounted on the rear panel of the SW6000 rack.

Model No: AMP CPC

1	Safety Switch
3	+24 VDC 100mA max.
8	Testing
9	Pass
10	Fail
14	+24V Rtn
13	Start
12	Stop

APPENDIX A: TECHNICAL SPECIFICATIONS

SW6000
Automatic Winding Test System

SW6000 Automatic Winding Test System

System Specifications

Storage:
64 Part Masters
Programming: winding library simplifies master setup

Peripherals
Display: 320 x 240 QVGA LCD Monitor

DC HiPot
Voltage: Programmable 500 - 6000VDC in 50 VDC increments, +/- 5% accuracy
Current: 100mA maximum, 1mA increments, programmable pass/fail limit in 1mA increments, +/- 5 percent
Duration: 1 second

AC HiPot
Voltage Programmable 200 - 3500 VAC in 50 VAC increments, +/- 5% accuracy
Current: 20mA maximum, 1 mA or 0.5mA resolution, arc detection for improved fault detection, +/- 5%
Duration: 1 second
Leakage current installed: Total and Absolute Leakage Current

Resistance Test
Autoranging
4 digit resolution
0.4% of full scale accuracy in each range
0.2% of full scale repeatability
Kelvin leads and contacts
Surge Test voltage:
Programmable 500-6000 volts peak in 50 volt increments, +/- 12% accuracy
Pulse Energy: 0.5 joules maximum
Discharge Capacitor: 0.4 mF
Load: Greater than 100 mH
Programmable pass/fail percentage limit based on Baker Instrument Company's patented Error Area Ratio technique.

Weight: 37 lbs
Dimensions: 19 x 9 x 15 inches

Specifications:

AC HiPot - 3500 VAC 20 mA
AC HiPot Arc detection

DC HiPot - 6000 VDC 100 mA
Resistance - 2 mOhm - 20 Kohm
Surge - 6000 V 0.7 Joules Pulse Energy

Power Requirements:

Input Voltage: 115 VAC 46 - 67 Hz Single Phase
Power Consumption: 600 VA Maximum
Overcurrent Protection: Two pole magnetic circuit breaker.

APPENDIX B: INSTALLATION ACCEPTANCE FORMS

SW6000

Automatic Winding Test System

INSTALLATION ACCEPTANCE FORM

SW6000 Automatic Winding Test System

Date: _____

Customer: _____

_____

_____

Contact: _____

Purchase Order: _____

Invoice Number: _____

Serial Number: _____

Installation Site: Please Record this on the next page.

This acceptance form is composed of two sections – the Installation Check List and SW6000 training.

Please refer to your original quotation for Warranty Information. Specifically, please note that the warranty for any board with relay(s) is six months. For pricing or replacement boards contact:

Baker Instrument Company
4812 McMurry Avenue
Fort Collins, CO 80525
(970) 282-1200 - FAX (970) 282-1010 – (800) 752-8272

We would like to thank you for your business and the opportunity to meet your application needs. If you have any questions, please don't hesitate to contact Baker Instrument Company.

Installation Check List

Installation was Performed at _____

_____

_____

Installation Performed by _____

Customer Witness of Installation _____

The following items are to be checked and initialed by the customer in the presence of a Baker Instrument Company representative.

1. All boxes/crates were received in good condition with no apparent shipping damage. ☐

2. Please check to indicate that the SW6000 pass the following tests:

   AC HiPot (Arc) Test ☐
   Did tester detect an arc and terminate the HiPot Test? ☐
   Did Tester survive arcing? ☐
   DC HiPot Test ☐ Impulse Test ☐
   Resistance Test ☐

3. A manual was received with the correct documentation for your particular SW6000. ☐

   Rotation Direction ☐
   DC Hipot ☐ Surge Test ☐
   Resistance Test ☐

SW6000 Training

1. The software training was satisfactory. ☐

2. If applicable, the installer discussed the Spare Parts Kit with you. ☐

For the Installer
Please note any comments regarding this installation.

For the Customer
Please note any comments regarding this installation. Use the back of this form if necessary. We appreciate your comments.

This installation of SW6000 Serial Number: _____

Was completed _____(Date) by_____
Baker Instrument Company Representative

Customer Signature

APPENDIX C: WARRANTY INFORMATION

SW6000

Automatic Winding Test System

WARRANTY

Baker Instrument Company warrants title to this product and also warrants product on date of delivery to purchaser to be of the kind and quality described above, merchantable and free of defects in workmanship and material. There are no warranties which extend beyond those expressly stated in this contract.

If, within one year from date of shipment by company of any item of the product, purchaser discovers that such item was not as warranted and promptly notifies company in writing thereof, company shall remedy such non-conformance by, at company's option, adjustment or repair or replacement of the item and any affected part of the product. Purchaser shall assume all responsibility and expense for removal, reinstallation, freight, and on-site service in connection with the foregoing remedies. The same obligations and conditions shall extend to replacement parts furnished by company hereunder.

Company's liability to purchaser relating to the product, whether in contract or in tort arising out of warranties, representations, instructions, installations, or defects from any cause, shall be limited exclusively to correcting the product and under the conditions as aforesaid.

Any separately listed items of the product (such as tubes) which is not manufactured by the company, shall be covered only by the express warranty of the manufacturer thereof.

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SCHEMATICS

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