Megger.

Baker WinTATS

Traction Armature Testing System

User Guide

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CAUTION: Please read and thoroughly understand the contents of this entire guide before performing any installation of this product. Failure to follow the instructions and safety precautions in this manual can result in serious injury, damage to the product, damage to other equipment, or a malfunctioning system. Keep this guide in a safe and ready location for future reference.

Electrical and Calibration Standards

All Megger Baker Instruments standards are either certified directly or are traceable to certification by the National Institute of Science and Technology, formerly the United States Bureau of Standards. To obtain other information concerning calibration, contact Megger Baker Instruments.

Equipment Return

Before returning any equipment or components to Megger Baker Instruments, the following steps should be taken:

1. Call the Megger Baker Instruments Fort Collins service department at (970) 282-1200. Give the service representative a full description of the reason for the return, including any diagnostic or troubleshooting actions taken. Please provide the specific model and serial number of the instrument.

2. Equipment returned to Megger Baker Instruments must be packaged in such a manner that it will reach the factory undamaged from transit.

3. For non-warranty repairs, Megger Baker Instruments service will provide a cost estimate for your approval prior to your shipping.

Megger Acquisition of Baker Instruments

Megger Group Limited, a manufacturer of electronic test equipment and measuring instruments for power applications, acquired the Baker Instruments business from SKF Group in August of 2018

For over 50 years, the Baker Instruments business has led the electrical motor testing industry and has a recognized leading brand and position in this area. As such, legacy products will carry the Baker Instruments or SKF brands, which will be supported by Megger moving forward.

Trademarks

Megger is a registered trademark of Megger Group Limited.

All other trademarks are the property of their respective owners.

Contents

1 — User Safety

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

- Ensure that the Baker WinTATS unit is properly grounded. Use a three-lead grounded supply or an extra ground lead if you are unsure of ground supply.
- For capacitor start motors or systems with surge arrestors/power factor capacitors, DISCONNECT all capacitors from the test circuit before testing.
- The Baker WinTATS is NOT APPROVED for use in an explosive environment.

A safety protection network minimizes electric shock hazard:

- The computer monitors safety switches and begins a test only when safety switches are engaged.
- The Baker WinTATS hardware overrides all computer signals and prevents application of high-voltage to an unsafe test station.
- An Equipment Stop button is mounted on the front panel of the Baker WinTATS and interrupts all high-voltage power supplies when pressed.
- A red light mounted on top of the Baker WinTATS illuminates during all test procedures.

2 — Baker WinTATS Introduction

The Baker WinTATS Traction Armature Test System is one of the most advanced electric motor test systems available for production line testing of all types of armatures. It is designed for a wide range of applications. Its software is designed for easy navigation via intuitive menus. The purpose of this manual is to provide a ready reference for how to use the Baker WinTATS features and functions.

Chapters 1 through 5 cover the basic functions and common applications of the instrument; chapters 6 through 12 provide in-depth descriptions of less frequently used features such as master programs and parameter settings.

Getting Started

Baker WinTATS software is already installed in the system.

1. Turn the menu key on the front of the control panel to the unlock position.
2. Press the main <power> switch.
3. Open the software from the Windows desktop. The following screen will appear.
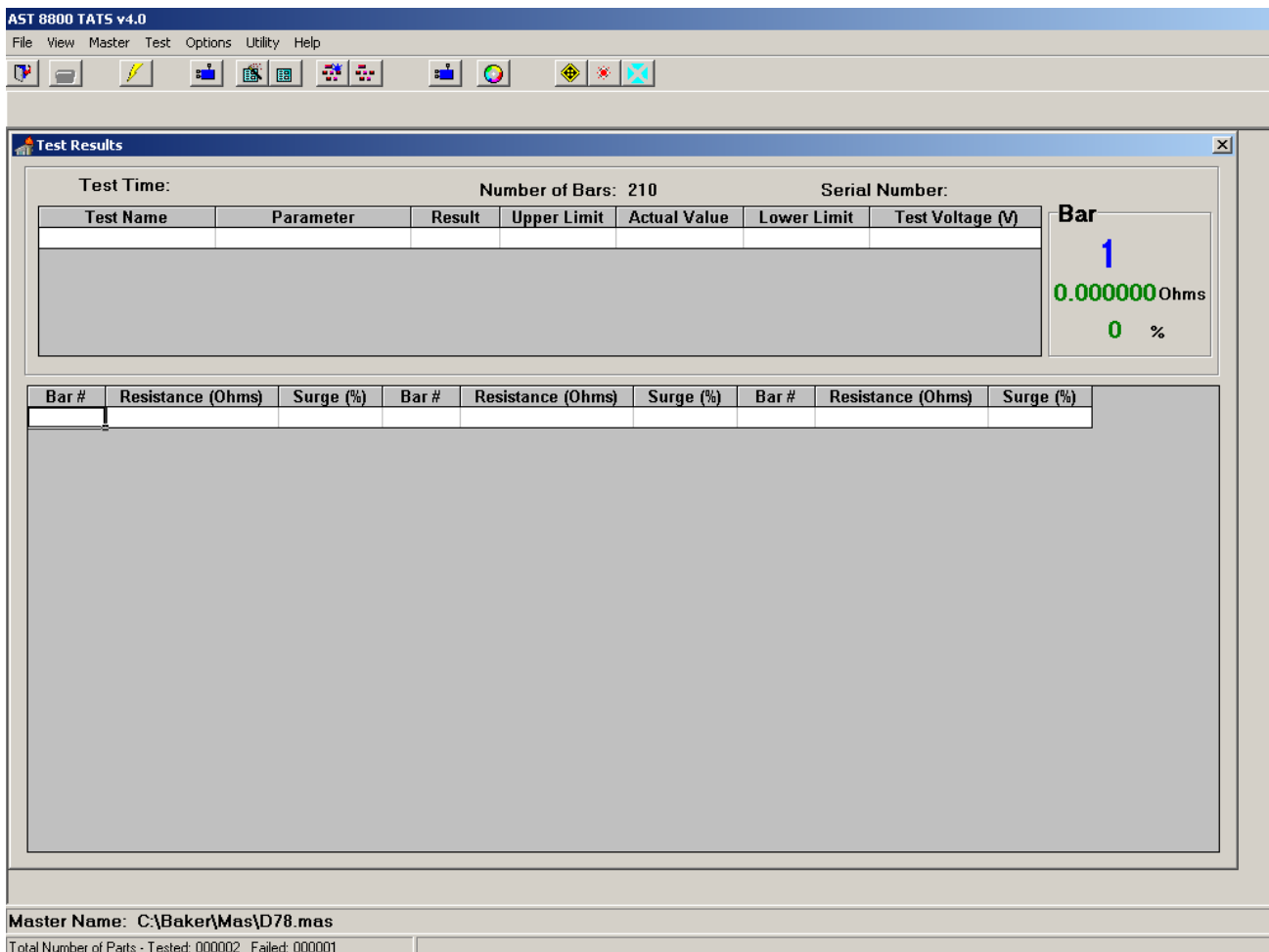
Fig 1: *Startup view.*

The flow chart on the next page describes the startup sequences.

Test Flow Chart
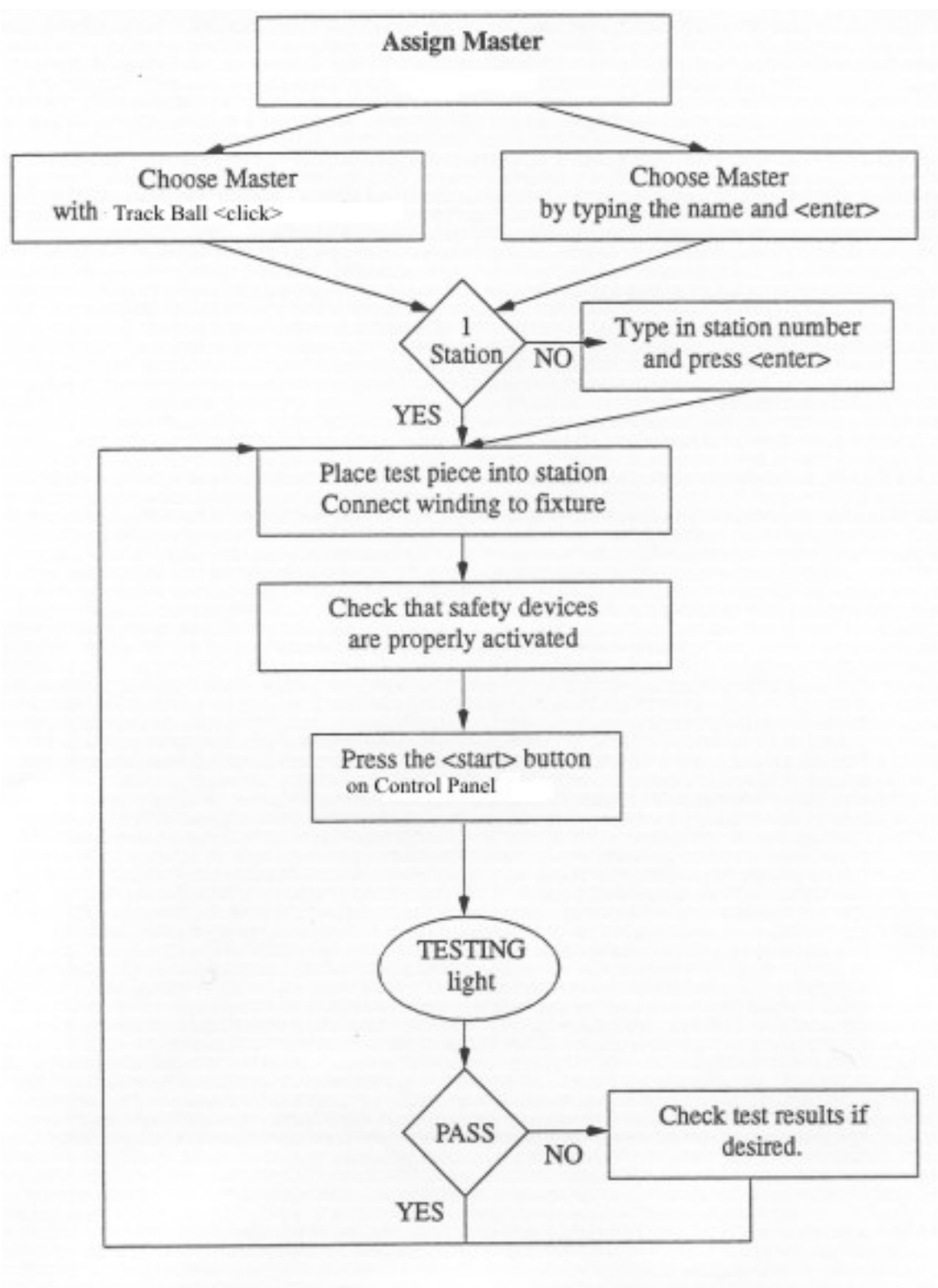
Fig 2: *Test flow chart.*

Using the Baker WinTATS
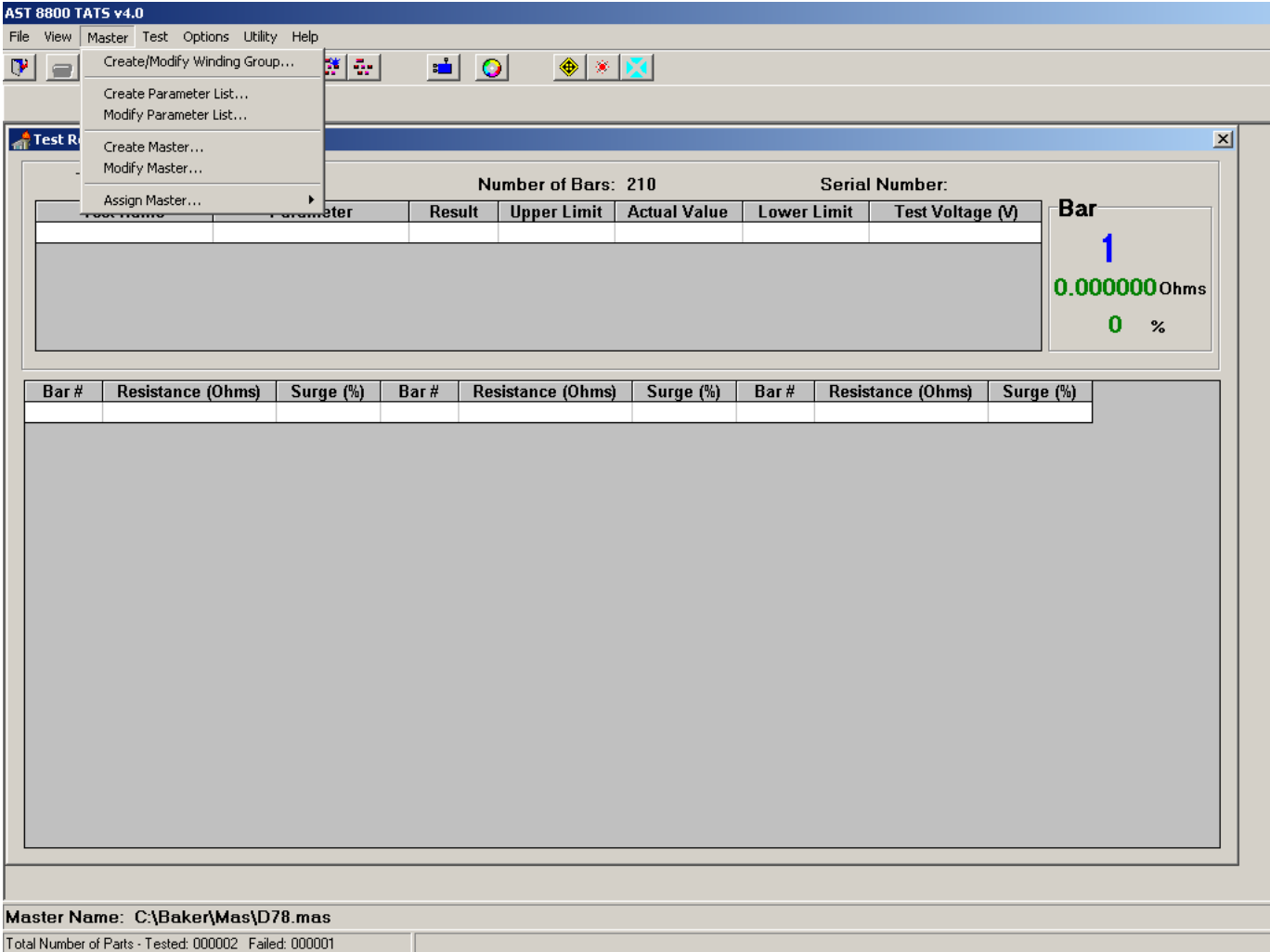
Fig 3: *Menus.*

The Baker WinTATS traction armature software is a total windows based operating system. There are task bar buttons and 'F()' hot keys to speed up the operator interface. The learned masters are created by three distinct phases. The winding group is the base level, and is descriptive of the lead structure. The parameter group is programmed with lead map, testing voltages, and characteristics. The final phase is the master group. This contains the pass/fail limits and signature waveform of the armature.

NOTE: Because this is a Windows® -based system, you must close the Microsoft Windows operating system before shutting down.

Press the Equipment Stop button as the first step when powering down.

Shortcut/Programming Keyboard Functions

To operate the Baker WinTATS program, you will use the following keys.

Table 1: *Keyboard function keys descriptions.*

Keys	Function
<F1>, <F2>, <F3>, <F4>, <F5>	Calls the corresponding drop-down menus (for example, Assign Master.)
<F1>	Assign Master to Station 1
<F2>	Assign Master to Station 2
<F3>	Assign Master to Both Stations
<F4>	Serial Number/Comment for Station 1
<F5>	Serial Number/Comment for Station 2
<Esc>	Exit the current screen or pull down menu and return to the previous screen.
Numbers	Fill in numerical values.

Assigning a Master

Assign Master recalls existing Masters and assigns a Master to a station.
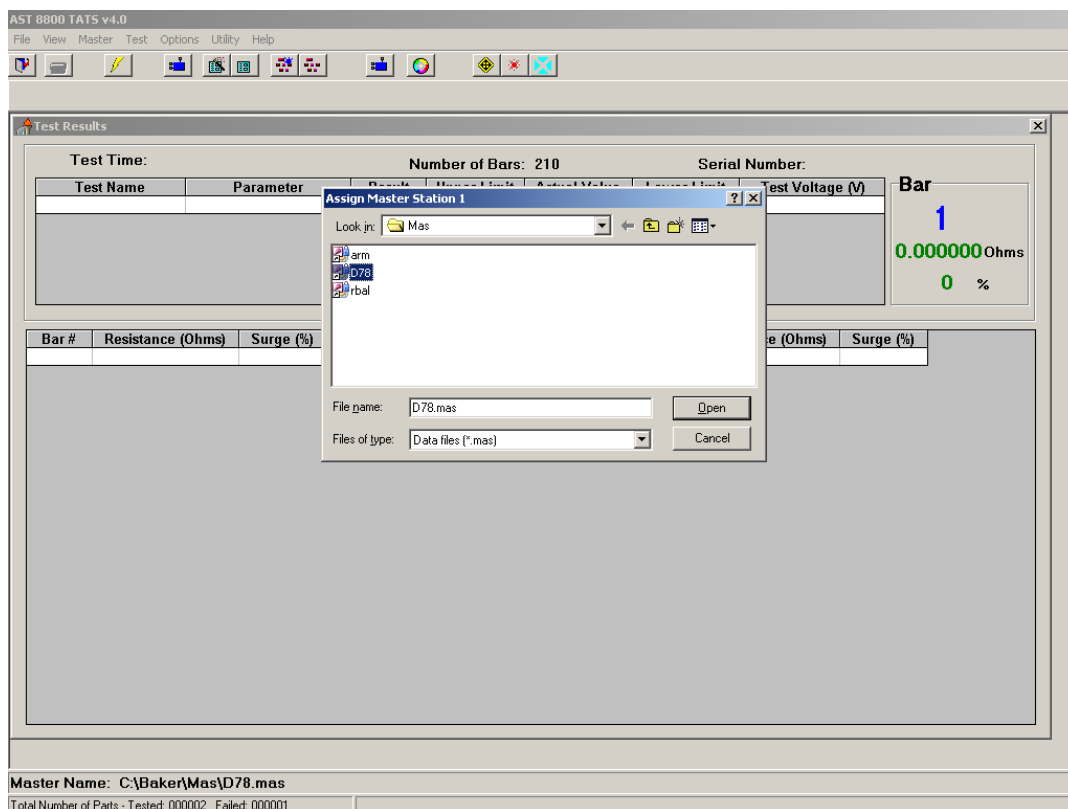
Fig 4: *Assign Master to Station 1*

1. Press the F2 key to provide a list of existing master files available for selection (F2 for station 2).

2. If the number of masters is small, click on the desired master.

3. If the list is large, type the first few characters of the master name, and a drop-down menu will appear.

4. The number of selection options decreases with additional characters; when the desired master appears, click it to open.

5. The "Master" drop-down menu can also be used to assign a master, as shown in figure 3 above.

Control Console Functions

Each test station has a control console. After the Master has been assigned, the control console becomes the user interface to the Baker WinTATS. It has a number of buttons and signal lamps, which are described in the following tables.

Table 2: *Control console buttons.*

Buttons	Description
Start	Start test.
Stop	Stop test.
Statistics Reset	Optional. Deletes the last statistics and retests the part.
Master Enable	Optional. Re-power after emergency - switches off main power in case of emergency.

Table 3: *Control console signal lamps.*

Lamp	Description
TESTING	Indicates that test is proceeding.
PASS	Test piece passed all tests.
FAIL	Test piece failed at least one test.

Optional FAIL lamps may be specified to alert when a given test has failed.

An optional FAIL buzzer emits an audible warning that the test has failed.

The following image shows an example screen displayed during a passing armature test.

AST 8800 TATS v4.0							

File View Master Test Options Utility Help

Test Results

Test Time: 01/03/2005 10:28:11   Number of Bars: 186   Serial Number:

Test Name	Parameter	Result	Upper Limit	Actual Value	Lower Limit	Test Voltage (V)
1 AC Hipot	Total Current (mA)	Pass	100.000	7.662	0.100	1000
1 AC Hipot	Arc	Pass				

PASS

186

0.001279 Ohms

7 %

Bar #	Resistance (Ohms)	Surge (%)	Bar #	Resistance (Ohms)	Surge (%)	Bar #	Resistance (Ohms)	Surge (%)
124	0.001240	10	125	0.001282	10	126	0.001256	6
127	0.001253	7	128	0.001251	10	129	0.001289	9
130	0.001271	7	131	0.001262	7	132	0.001250	12
133	0.001300	9	134	0.001282	6	135	0.001271	7
136	0.001219	9	137	0.001242	9	138	0.001241	6
139	0.001225	6	140	0.001259	9	141	0.001309	8
142	0.001277	8	143	0.001271	6	144	0.001219	9
145	0.001253	9	146	0.001238	6	147	0.001217	6
148	0.001253	11	149	0.001300	9	150	0.001291	6
151	0.001271	8	152	0.001222	9	153	0.001263	9
154	0.001255	6	155	0.001243	8	156	0.001258	10
157	0.001291	8	158	0.001287	7	159	0.001275	7
160	0.001248	11	161	0.001292	9	162	0.001275	6
163	0.001259	7	164	0.001269	11	165	0.001304	10
166	0.001295	6	167	0.001280	7	168	0.001256	8
169	0.001274	9	170	0.001262	7	171	0.001255	7
172	0.001239	7	173	0.001278	10	174	0.001270	6
175	0.001259	7	176	0.001309	12	177	0.001340	12
178	0.001337	9	179	0.001323	9	180	0.001310	12
181	0.001351	15	182	0.001328	10	183	0.001320	10
184	0.001303	12	185	0.001352	12	186	0.001279	7

Master Name: C:\Baker\Mas\ny1.mas

Total Number of Parts - Tested: 000002   Failed: 000002

Fig 5: *Passed test display.*

Safety

For user safety, the Baker WinTATS user station has a safety switch that prevents testing when the safety switch is not enabled. Tests will NOT start unless the safety is enabled. If the safety switch is opened while testing, any test in progress will be aborted immediately.

NOTICE: Use of the safety switch to stop a test diminishes the relay lifetime and voids the warranty on relays. Relays perform a hot switch when the safety switch is activated.

Use the safety switch only in case of emergency. Always use the Stop button to stop testing.

Basic Operation

Baker WinTATS is divided into two basic sub-racks: the PC sub-rack and the Baker WinTATS sub-rack. The computer boards provide digital and analog I/O to control and gather data from the Baker WinTATS boards. The PC platform also processes data to determine the success or failure of a test. The Baker WinTATS boards provide test signals to the winding. There are normally four or five different test signal sources:

1. Low-voltage DC power supply for winding resistance tests.
2. High-voltage DC power supply for DC HiPot tests.
3. High-voltage DC power supply/SCR stack for surge tests.
4. High-voltage AC power supply for AC HiPot tests.

Test signals are routed to the winding under test through a test bus. Any of the power supplies can be switched onto the test bus through high-voltage relays located on the Readout/MUX board. Only one supply 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. In single station TATS units, these relays are located on the Readout/MUX board. On two-station units, these relays are located on the TL/MUX boards. Each Test Lead Multiplexer (TL/MUX) board is capable of switching two test leads.

3 — Displaying and Printing Results

The Windows testing screen provides you with a constant visual of the current testing data, the current bar number, and a history of testing.

Upon the completion of the test, the data can be printed as well as saved to a hard drive in an `.xml` format.

Displaying Results

The upper box section displays the results of the AC HiPot and/or DC HiPot on the Baker WinTATS screen.

When the test completes, the display includes: the resistance balance result, the surge balance result, and the span test calculation if selected during Parameter build.

In the following example, the lower box section displays the current and historical data formatted into three bars per row. It will automatically scroll to show current bar results at the bottom while maintaining the history.

Failure results are displayed in red and are indicated with an asterisk for the 10 worst results.
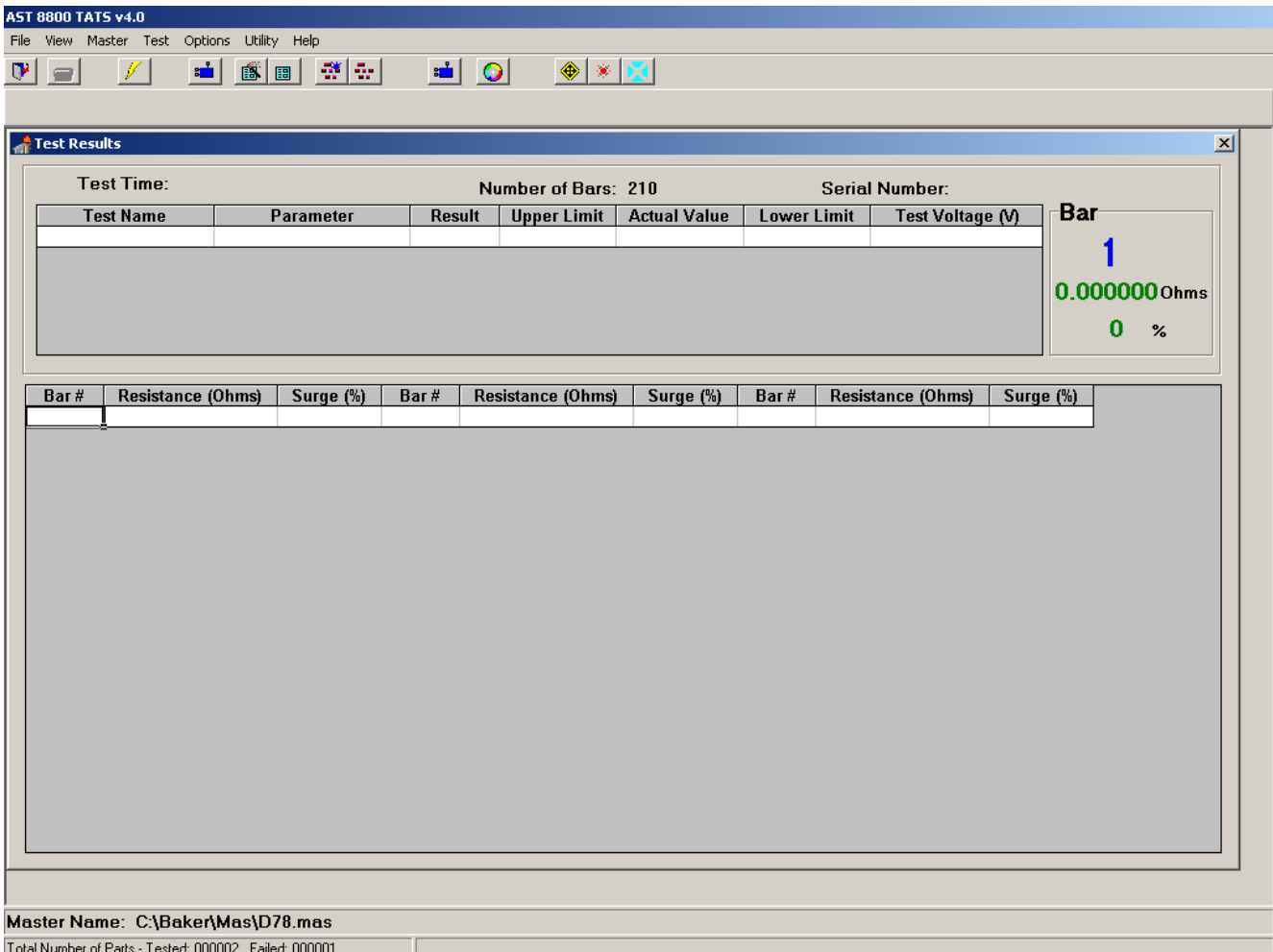
Fig 6: *Display armature results.*

The master waveform is an average of 10 learned bar-to-bar waveforms and is stored on the hard drive. During the test each bar-to-bar waveform captured is compared against the master and displayed as an Error-Area Ratio (EAR) percent value. Only the 10 worst-failed waveforms are retained for viewing and/or printing.

Printing Results

The following images provide examples of results printed for an armature test.

Fig 7: *Example armature master and failed test waveforms.*

Fig 8: *Example armature bar resistance results—Surge table.*

Armature Bar Resistance - Surge Table

Bar #	Resistance (Ohms)	Surge (%)	Bar #	Resistance (Ohms)	Surge (%)	Bar #	Resistance (Ohms)	Surge (%)
1	0.001288	11	2	0.001284	7	3	0.001271	11
4	0.001251	13	5	0.001292	11	6	0.001277	8
7	0.001263	9	8	0.001272	11	9	0.001306	10
10	0.001296	8	11	0.001279	5	12	0.001248	10
13	0.001256	11	14	0.001247	8	15	0.001241	6
16	0.001234	8	17	0.001272	10	18	0.001262	7
19	0.001249	7	20	0.001275	12	21	0.001304	9
22	0.001298	9	23	0.001323	11	24	0.001314	10
25	0.001352	12	26	0.001315	10	27	0.001310	6
28	0.001308	10	29	0.001357	14	30	0.001278	8
31	0.001263	10	32	0.001270	10	33	0.001267	9
34	0.001263	8	35	0.001241	9	36	0.001256	10
37	0.001304	9	38	0.001291	8	39	0.001271	9
40	0.001224	9	41	0.001218	8	42	0.001253	10
43	0.001241	6	44	0.001231	5	45	0.001220	9
46	0.001251	12	47	0.001241	7	48	0.001232	7
49	0.001298	12	50	0.001337	13	51	0.001324	10
52	0.001315	8	53	0.001306	14	54	0.001344	12
55	0.001328	12	56	0.001314	8	57	0.001237	12
58	0.001266	12	59	0.001222	8	60	0.001204	8
61	0.001243	11	62	0.001277	11	63	0.001267	8
64	0.001253	7	65	0.001253	13	66	0.001285	12
67	0.001276	9	68	0.001257	6	69	0.001249	12
70	0.001277	10	71	0.001271	8	72	0.001257	10
73	0.001258	12	74	0.001289	11	75	0.001280	9
76	0.001259	7	77	0.001251	12	78	0.001291	11
79	0.001285	8	80	0.001272	11	81	0.001217	10
82	0.001240	12	83	0.001233	8	84	0.001216	10
85	0.001259	11	86	0.001293	11	87	0.001280	8
88	0.001268	10	89	0.001215	9	90	0.001243	9
91	0.001234	7	92	0.001216	8	93	0.001261	10
94	0.001289	10	95	0.001273	8	96	0.001261	6
97	0.001211	9	98	0.001247	9	99	0.001249	8
100	0.001228	10	101	0.001257	12	102	0.001288	10
103	0.001278	7	104	0.001259	6	105	0.001249	13

Fig 9: *Example armature bar resistance results—Surge table continued.*

AST 8800 Test Results						
Test Date: 01/05/2005 11:53:36						
Test Temperature: 0.0						
C:\Baker\Mas\nychv.mas						
Current Serial Number: 1A2b3C4d5E6f7G Comment: 1st test						
Test Name	Parameter	Result	Upper Limit	Actual Value	Lower Limit	Test Voltage
1 AC Hipot	Total Current (mA)	Pass	170.000	23.540	0.100	3000
1 AC Hipot	Arc	Pass				
2 DC Hipot	Leakage Current (uA)	Pass	50.000	1		3000

Fig 10: *Example test results.*

Armature Print Results

The printout includes:

- Test date/time and PASS/FAIL status.
- Master parameters, including armature specific, number of bars, armature type, average resistance and ohms per slope.
- DC and AC HiPot values.
- Resistance for each bar.
- Surge error for each bar.
- The resistance balance.
- The 180 degree span resistance value (calculated by software, or by user-entered).
- The surge balance.
- The serial number of the tested part.
- Any user entered comments.
- The Master waveform and the worst 10 failed surge waveforms.

Print Results Without a Waveform

The Baker WinTATS will print test results as above, but will not include a printed waveform.

This can be selected via the Printer Icon on the task bar.

4 — Program Master

The Program Master is used to create an armature test master for a specific model using the three-level format.

Create Winding Group

Used to create a base-level winding file for master creation.
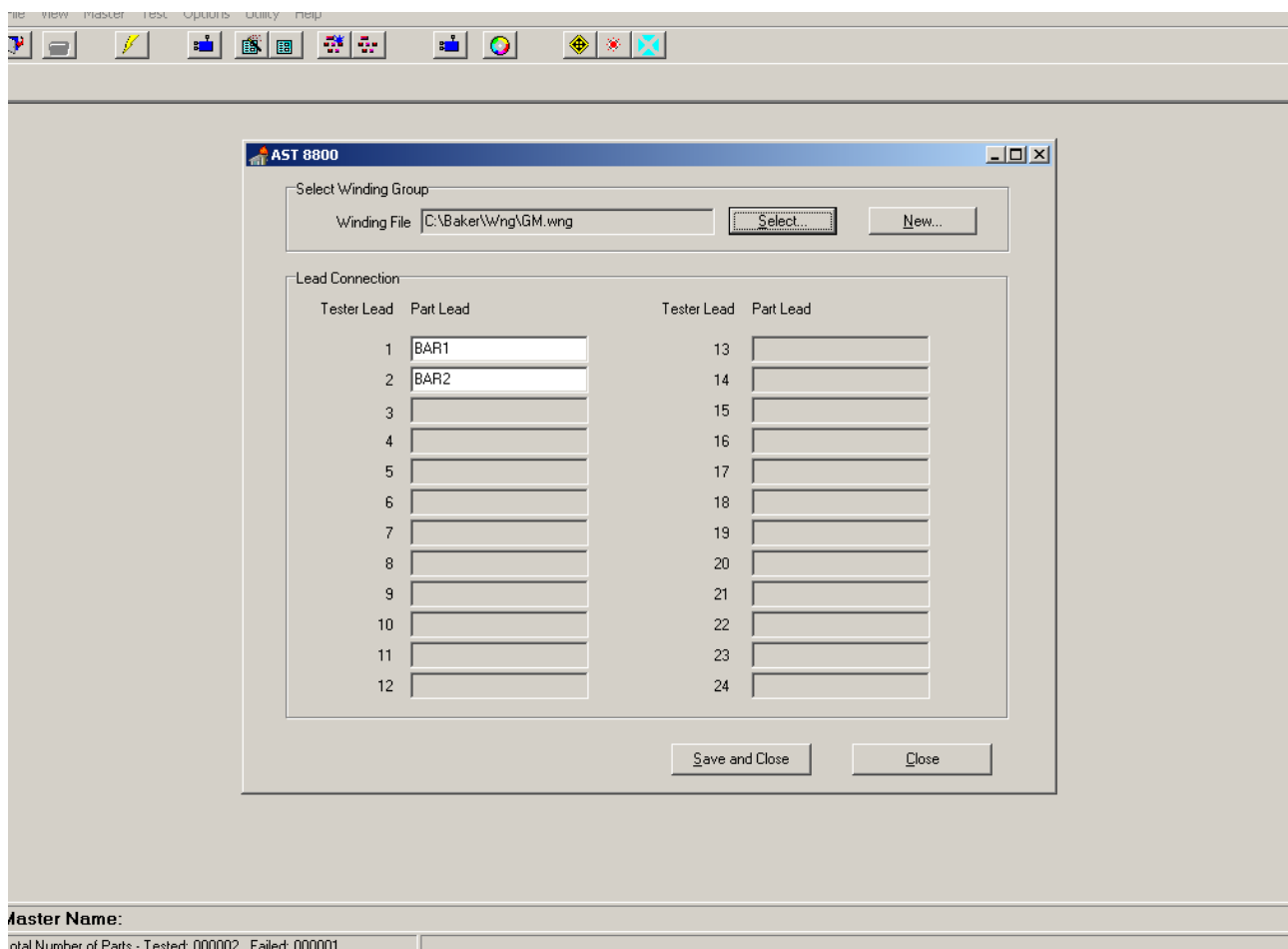
Fig 11: *Winding file.*

When selected, a field will appear to enter lead designators (Bar1, Bar2). The same winding file can be used for an unlimited number of masters.

Create Parameter Group

Used to create the mid-level parameter file containing the standardized customer parameters for a wide range of masters.
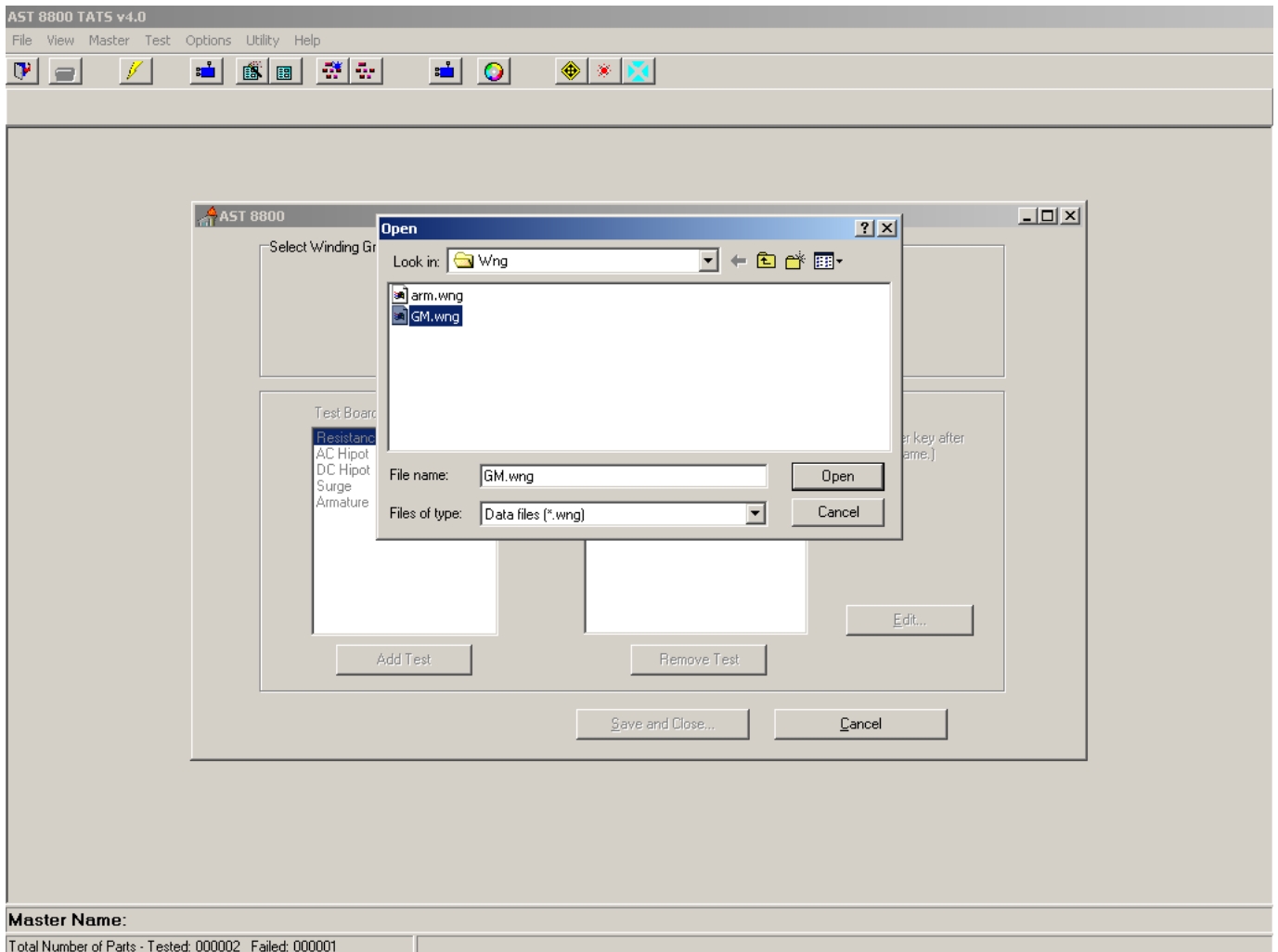
Fig 12: *Parameter Choose Winding file.*

1. When selected, a field appears requesting a Winding file. Open the file you need.
2. The Parameter field has a list of the tests available. Add the Tests in the order desired.

NOTE: For traction armatures it is necessary to choose the "armature: test as one.

Although any order of tests may be chosen Megger Baker Instruments recommends selection of the tests in the order shown in Figure 5-2-2).

3. For reference purposes, a test name may be changed by clicking on it, then retyping the name.

4. Press Enter to complete.

5. When ready, click EDIT.
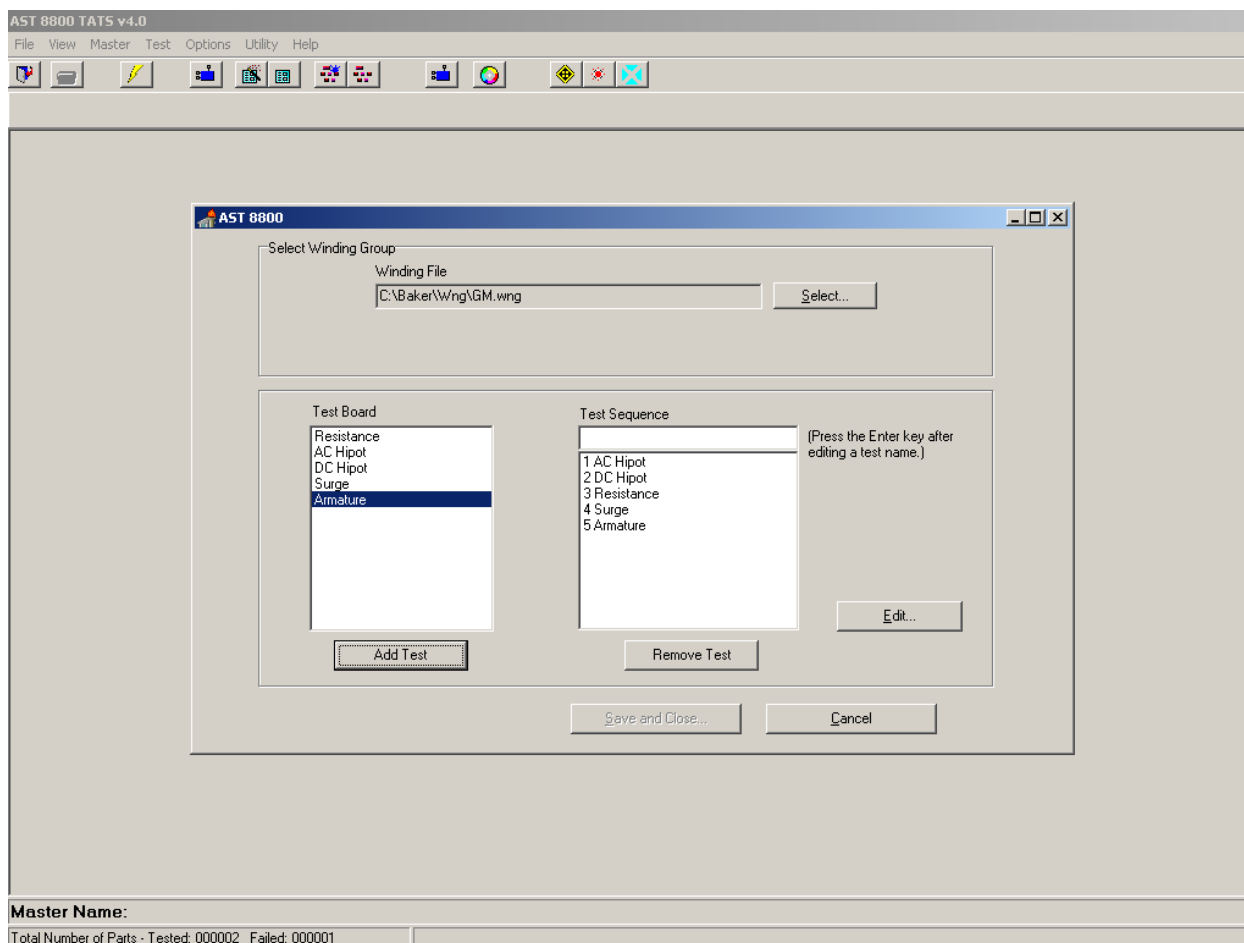
Fig 13: *Parameter folder ADD TEST.*

AC HiPot Test Folder

The AC HiPot test measures the AC leakage current of the armature and can detect arcs to sense breakdowns that can go undetected during DC HiPot testing.

There is an entry for testing voltage and one for time in seconds.

1. In the test leads block click 'BAR1' as active and 'BAR2' as active.
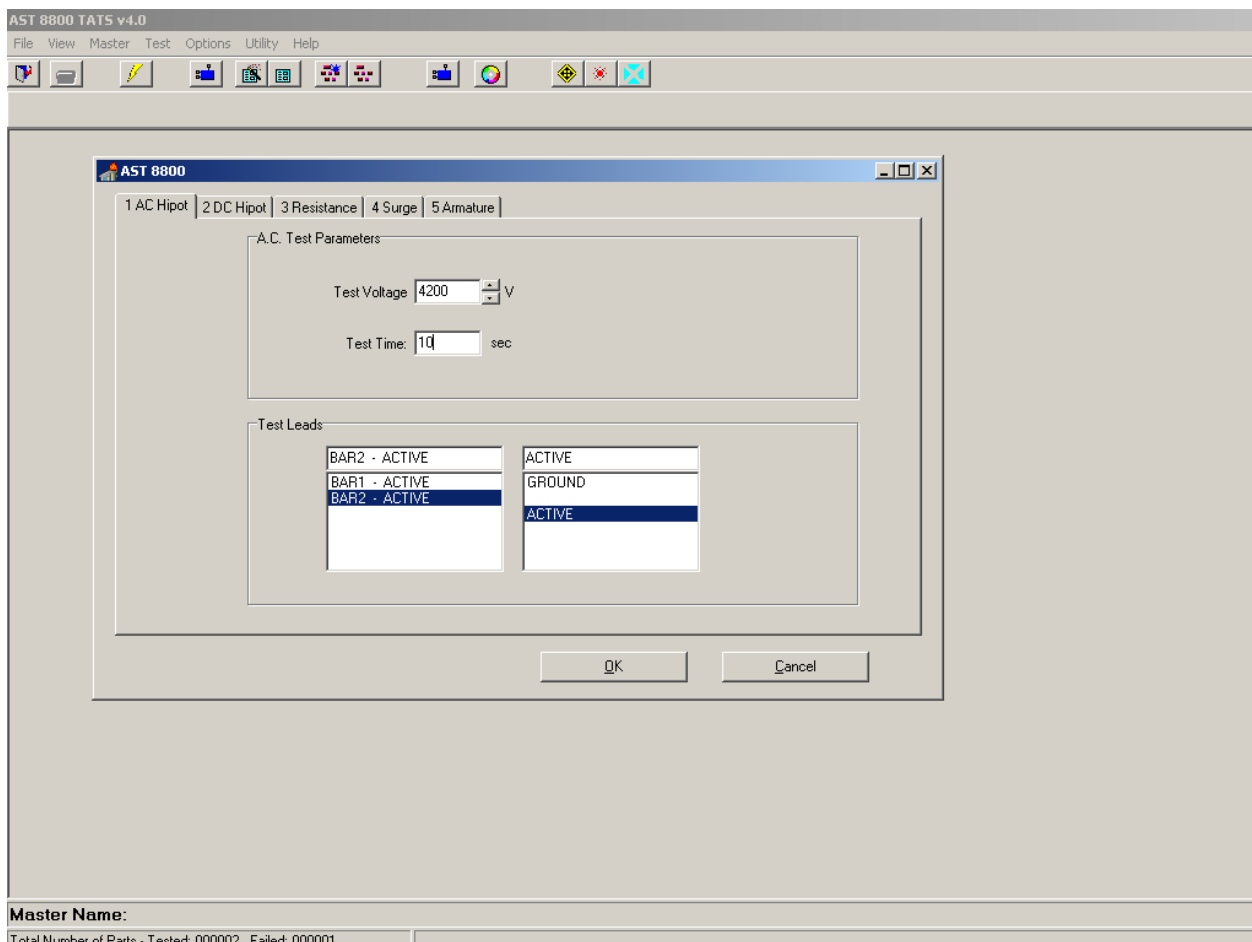
Fig 14: *Parameter AC HiPot folder.*

DC HiPot Test Folder

DC HiPot testing checks the integrity of an insulation system by measuring the leakage current between winding and ground.

The DC HiPot folder is identical to the AC HiPot folder.

Resistance Test Folder

Function: Resistance testing primarily checks for poor connection and, incorrect coil size. Kelvin connections enable low-resistance windings to be tested accurately and repeatedly. Temperature compensation is standard.

This folder is simply a lead assignment for bar–to-bar tests.
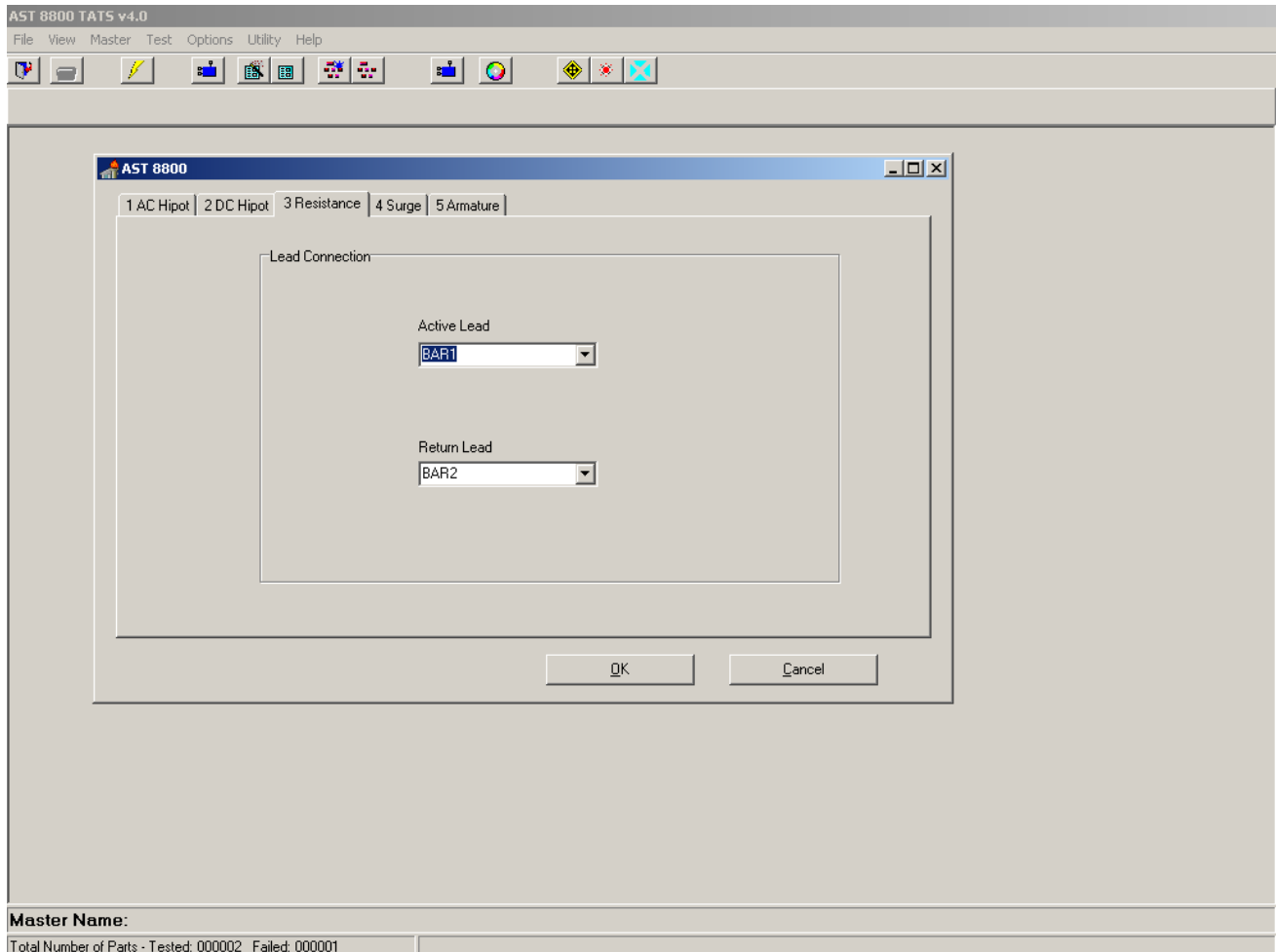
Fig 15: *Parameter Resistance folder.*

Armature Folder

While not actually a true test, the Armature folder is a module to designate the desired types of processed results.
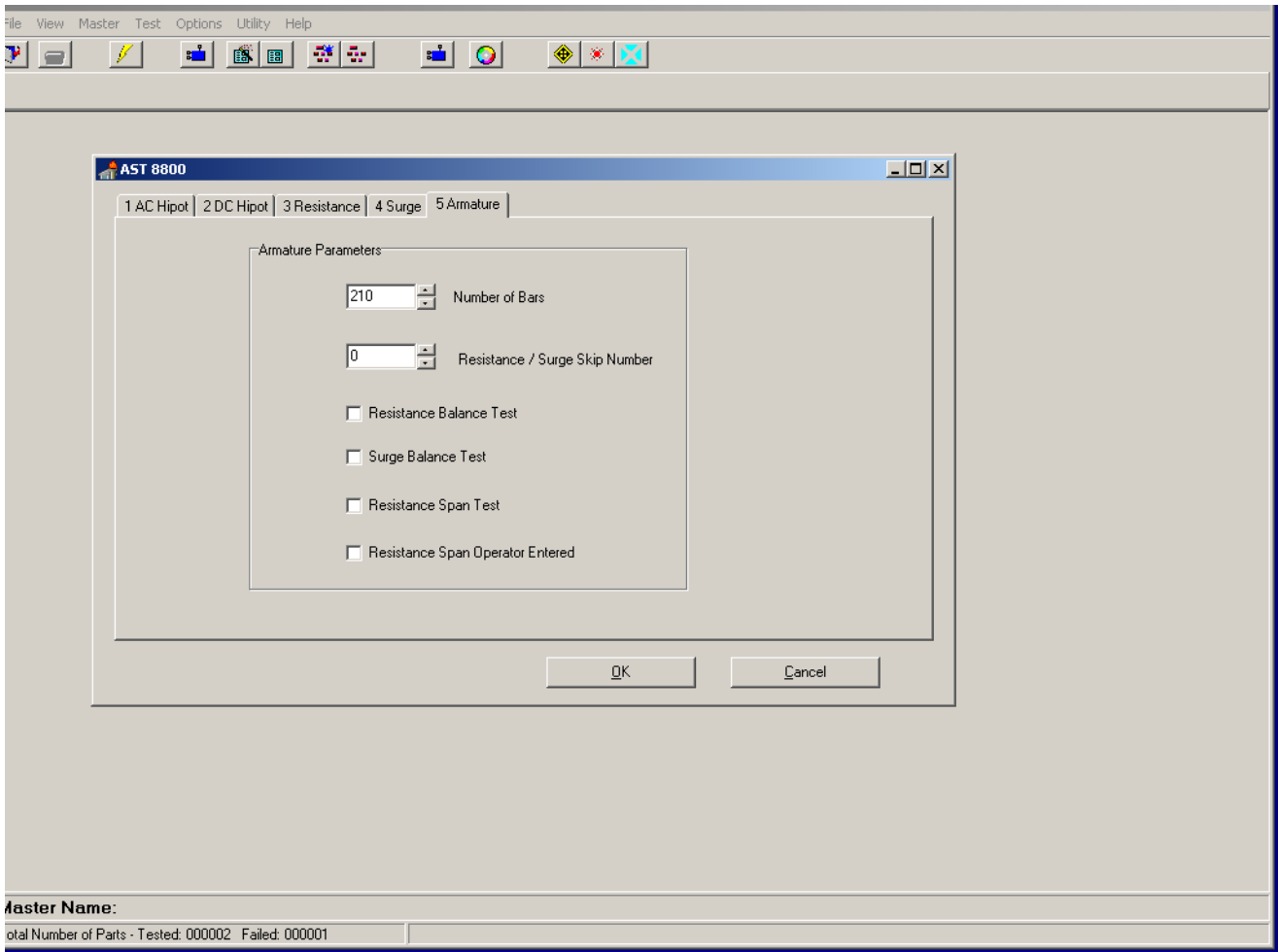
Fig 16: *Parameter Armature folder.*

Input the number of armature bars.

A Resistance/Surge skip figure may also be assigned.

The Resistance Balance test, when selected, will provide a pass/fail designation based on any deviation from average resistance (rather than from actual).

The Surge Balance test, when selected, provides a pass/fail reading based on any deviation from the average Error-Area Ratio (EAR) percentage rather than an individual EAR percent value.

The Resistance Span test is based on the summed total resistance.

NOTE: Real-time values of resistance and surge EAR will still be displayed.

Surge Test Folder

High-voltage surge or impulse tests check for insulation weaknesses between turns, layers, coils and phases of a winding. Surge tests also can detect other faults that change the inductance or losses in a winding, such as reversed coils and improperly annealed steel.

Armatures can be compared to each other and/or compared to a master armature.
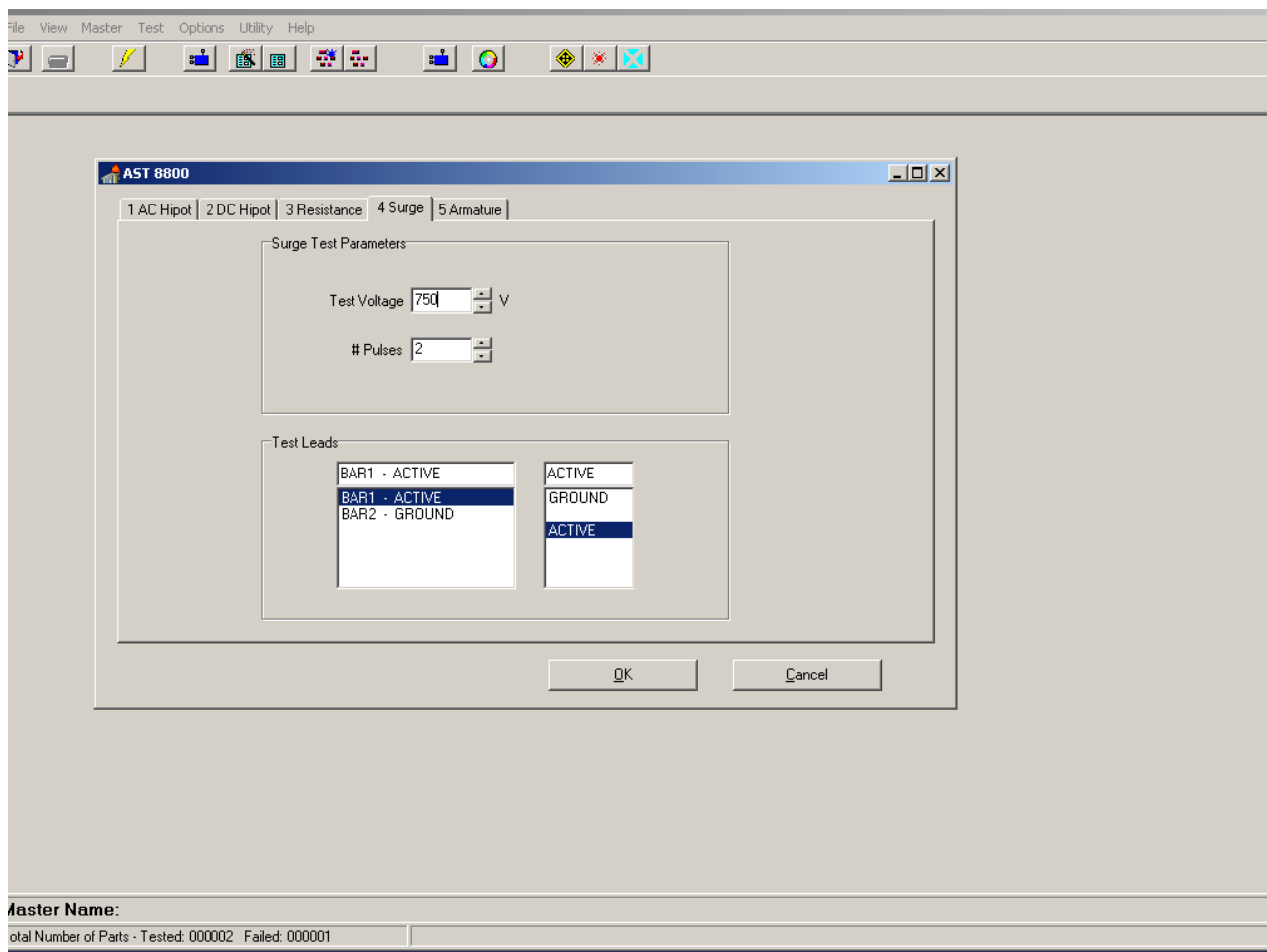
Fig 17: *Parameter Surge folder.*

The surge test voltage is entered. The number of pulses that are used is also entered. The number of pulses refers to the practice of energizing the armature steel to approach core saturation to increase surge repeatability. In this setup BAR1 is made 'Active' while BAR2 is left on 'Ground'. When finished, click <OK> and then click <Save and Close>. A query box will appear to enter the name of the completed Parameter file.

Create Master Group

Used to create the final-level master file that contains the pass/fail limits of a specific armature model.

NOTE: Before starting, you will need to align the optics to a slot.
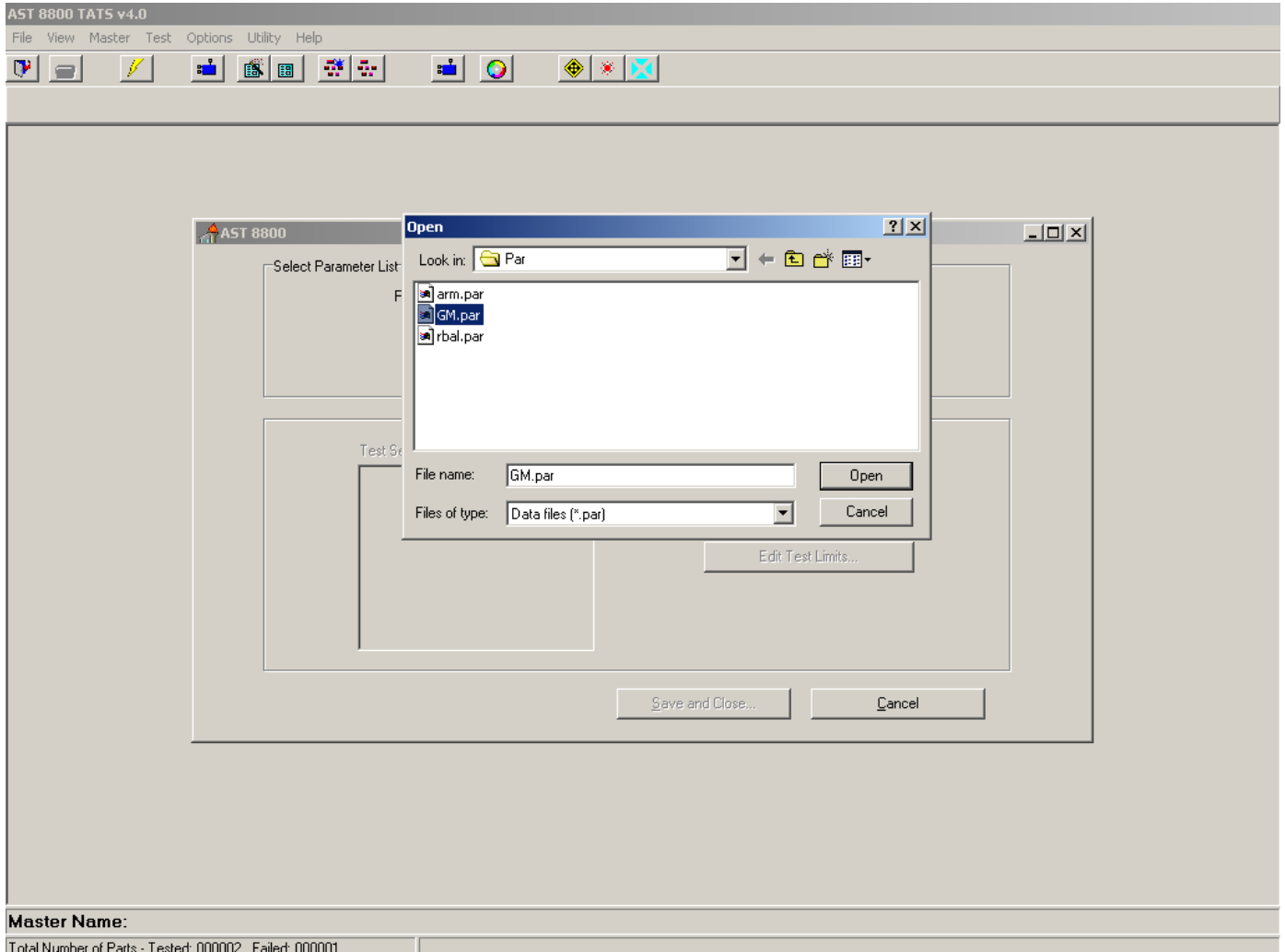
Fig 18: *Master File parameter selection screen.*

1. Select "Create Master" from the task bar icon, or with the 'Master' drop-down menu. A field appears requesting a Parameter file.

2. Select the file and click Open. Click the <Edit Test> button to begin.

AC HiPot/DC HiPot Test Folder

Used to enter pass/fail leakage current (milliamps for AC HiPot and micro amps for DC HiPot) for the part under test.

The test voltage chosen in the Parameter file is displayed here for reference, but can not be changed here. Use the Skip test button if you need to skip a specific test and complete the rest.
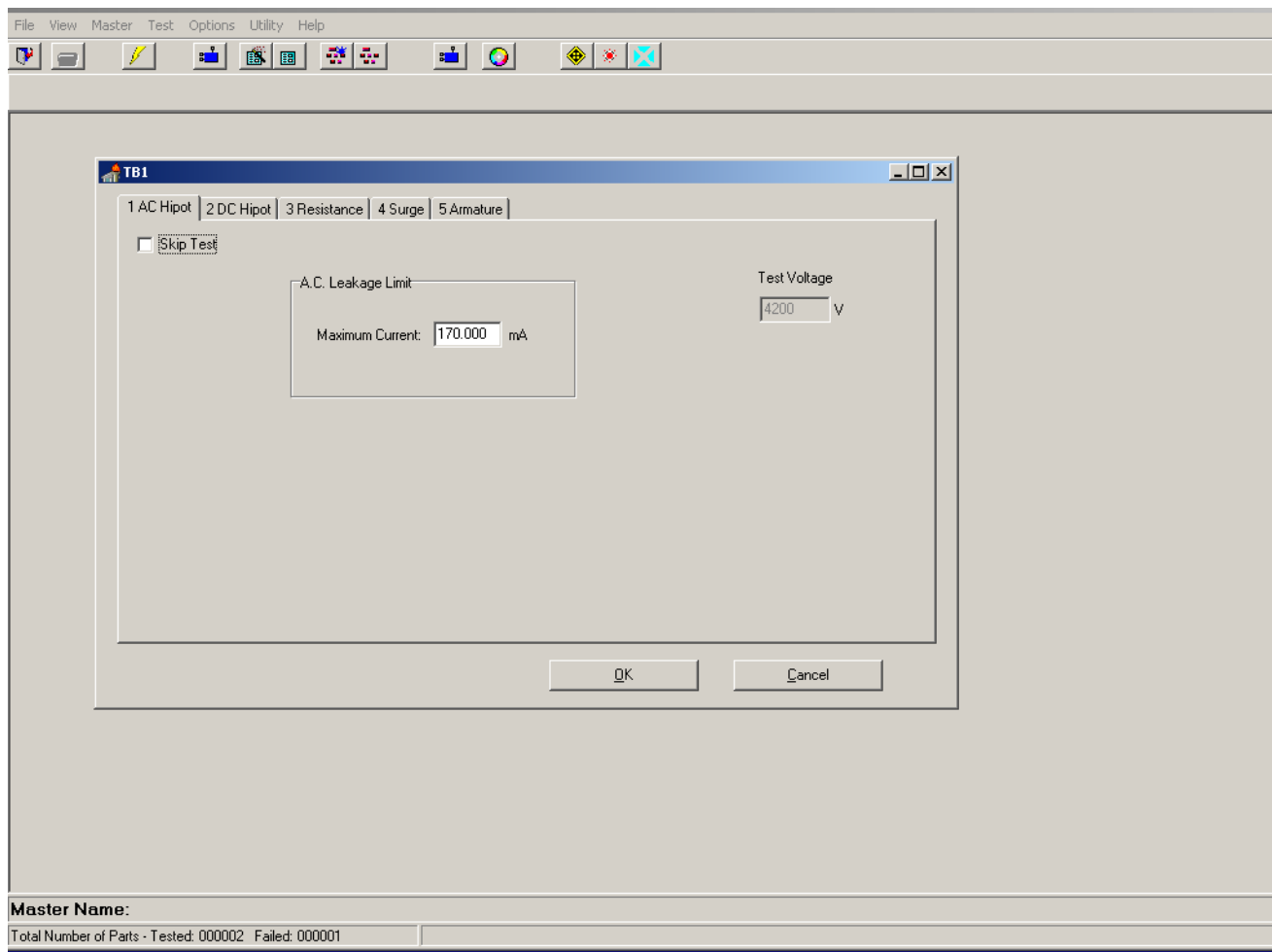
Fig 19: *Master AC HiPot folder.*

Resistance Test Folder

Used to input the bar-to-bar pass/fail limits for the armature model, the resistance folder has two types of pass/fail limits:

- Using a nominal value with a '%' limit.
- Using an actual resistance value in ohms for the upper and lower limits.

A Skip Test is also available if needed.
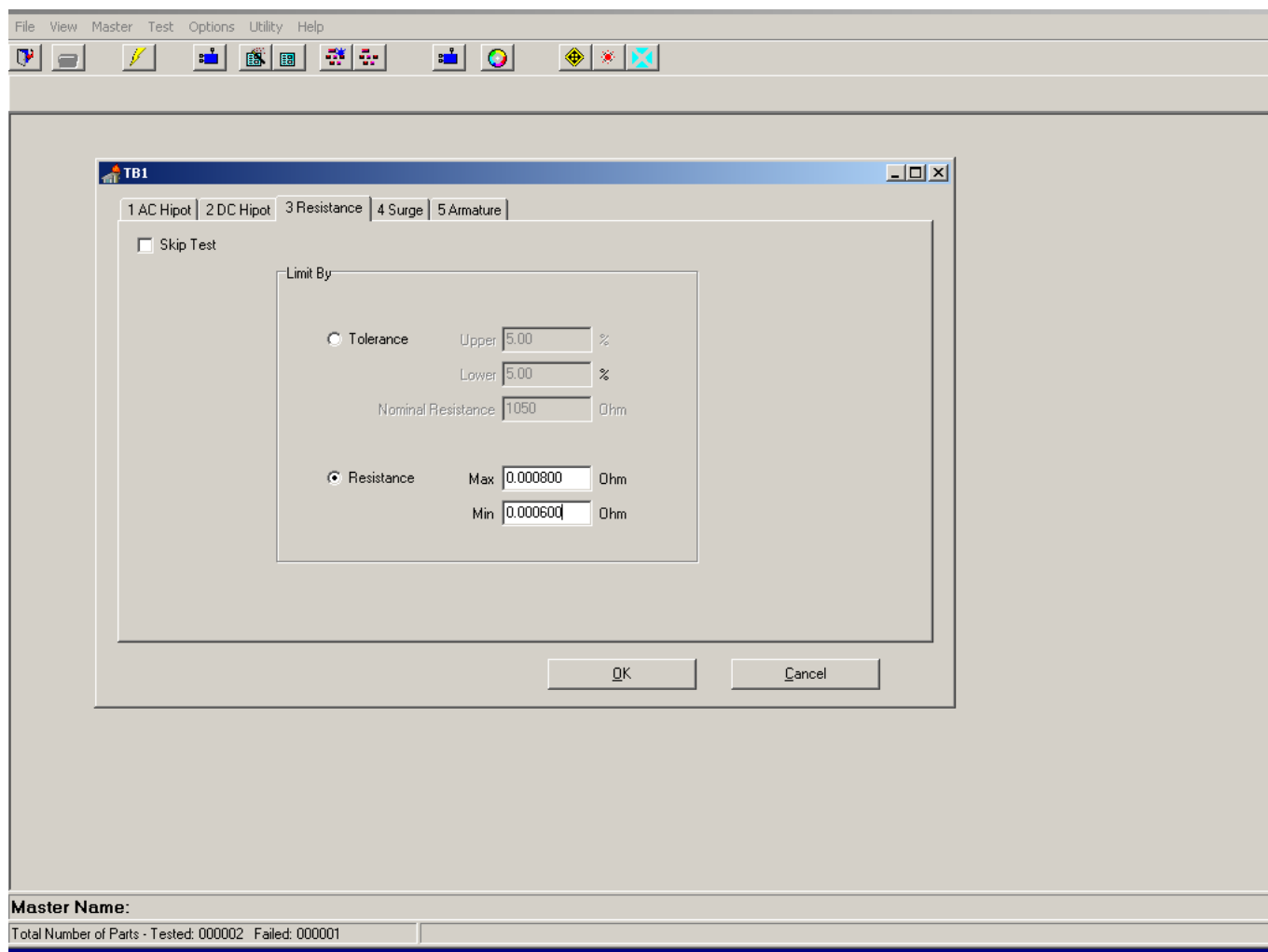
Fig 20: *Master Resistance folder.*

Armature Folder

Used to select the type of indexing and pass/fail limits.
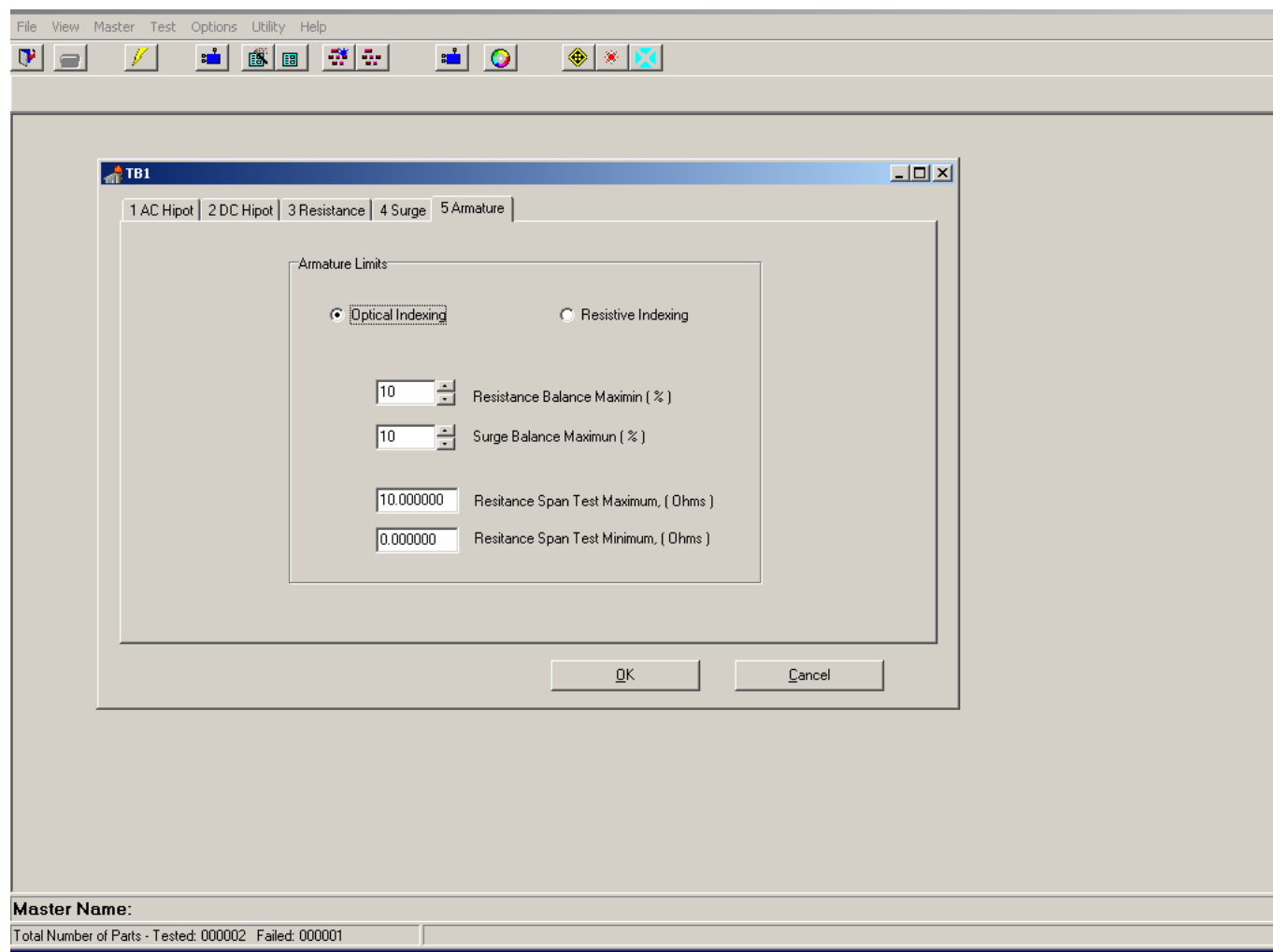
Fig 21: *Master Armature folder.*

The armature folder contains the selection for optical or resistive indexing.

> NOTE: Resistive indexing is a custom test that uses a resistance test to align the contacts. Special conditions must be met on the fixture contacts to accomplish this test. Contact Megger Baker Instruments for more details.

- If the Resistive Balance was selected in the parameter, the pass/fail '%' limit enters here.
- If the Surge Balance was selected in the parameter, the pass/fail '%'limit enters here.
- If the Span Test was selected in the parameter, the pass/fail limits in ohms enters here.

This folder in not a test, but is necessary for armature testing. Because it is not a test, Skip Test does not apply.

Surge Test Folder

Function: Baker WinTATS digitizes and stores and averages 10 Master surge waveforms from an armature during the "Acquire Waveform" process. Waveforms are displayed on the monitor while programming to ensure a Master waveform is a "good waveform." Armature index information is also acquired at this time.
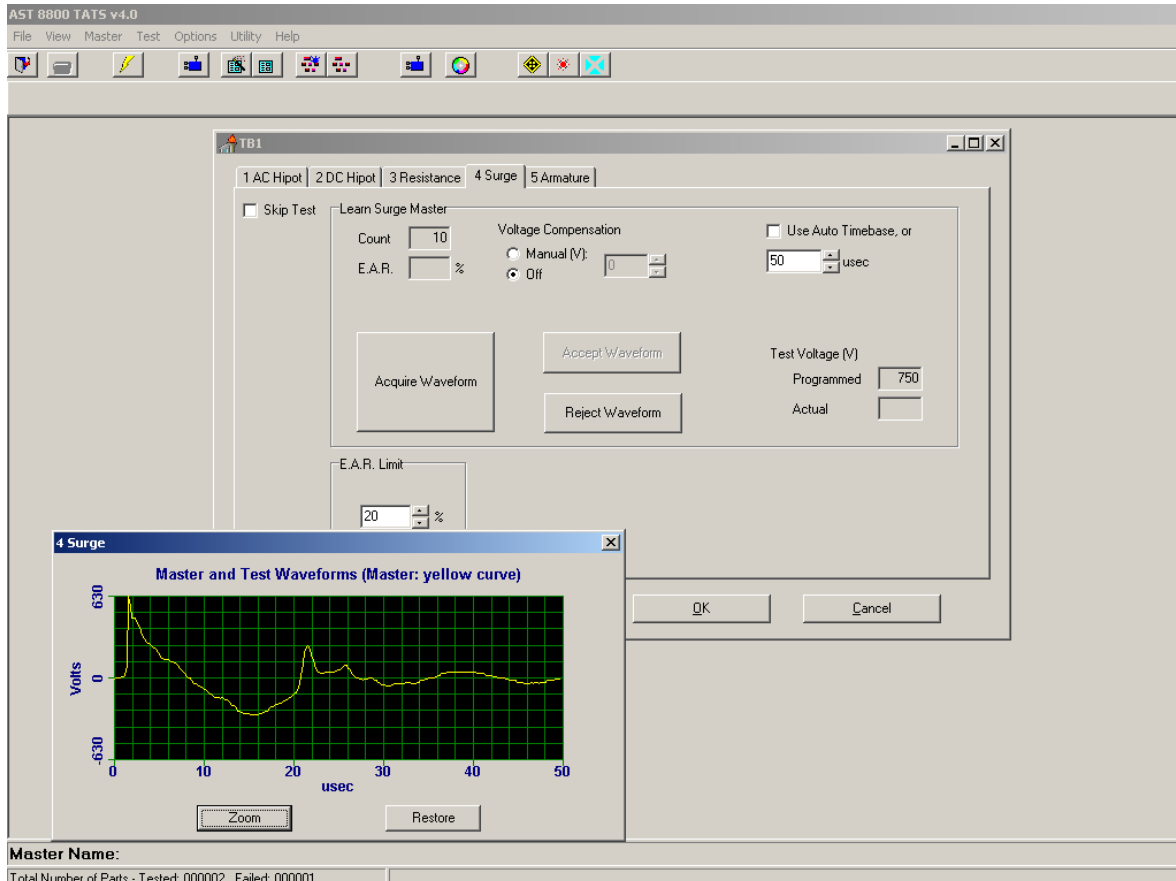
Fig 22: *Master Surge folder.*

When the Acquire Waveform button in this folder is pressed, the software performs a learn routine. The system will index to find a bar, then it will perform a resistance test.

Next, it will index again to obtain a bar width. It will surge test as "1st" bar.

It will proceed to index to the next bar and capture a waveform.

The waveform is then displayed in a graph and compared with the previous average to meet the entered EAR% requirement for pass/fail as a proper waveform to average.

A query box will appear to alert the operator to reject or accept this waveform. This will be repeated to obtain a final 10 waveform average for a master waveform.

During the learn cycle, a count will be kept of the averaged waveforms.

When finished, click the Accept Waveform button to save.

A Manual Voltage Compensation selection and box is used to add voltage values to obtain a requested peak value.

Press Reject Waveform then Acquire Waveform for the new setting.

The test voltage selected in the parameter is displayed but is not changeable here.

Press the Skip Test button if you want to skip the surge test. Even if you skip this test, you must complete the process to learn the armature to obtain the optical indexing information.

Save and Close

After completion, to name the armature model for future use.
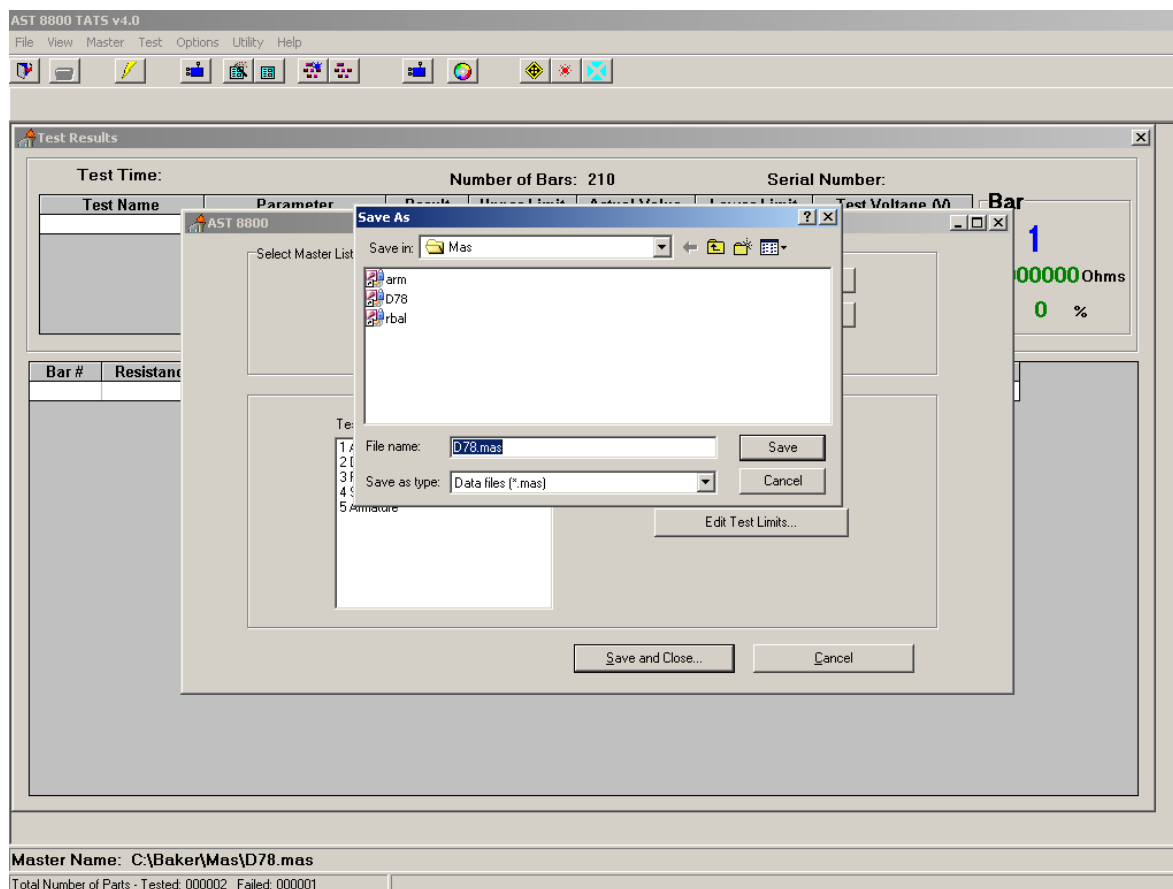
Fig 23: *Master Save and Close.*

1. When you complete the process, click the OK button to obtain a new field.

2. Click the Save and Close button.

3. A Save As box appears so you can enter the name of the armature model learned. Enter the name then click the Save button.

The new master will be saved on the hard drive, ready to be assigned when needed.

Modifying an Existing Parameter or Master File

Modifying a Parameter File

1. From the Master drop-down menu chose Modify Master. A field appears so you can choose an existing parameter file.
2. Select the parameter file then click Open.
3. Edit the selected file as needed, such as changing the testing voltages, time, and/or test names.

NOTE: The testing order cannot be edited and you cannot remove any test that has already been selected.

4. When you have completed your revisions, save and close the file as describe above.

You can save the file using the same parameter name or you can assign a new name. This type of modification is useful in situations such as when the same model may have different testing voltages for different customers.

Modifying a Master File

1. From the Master drop-down menu, select Modify Master. A field will appear so you can choose an existing Master file.
2. Select the Master file then click Open.
3. Edit the selected file as needed, such as changing the pass/fail limits of a test then to relearn an armature.

NOTE: Test voltages in any folder can not be edited.

4. Click the Skip Test button to skip a test if needed.
5. Make the needed changes to HiPot leakage currents, resistance pass/fail limits, surge EAR% limit, balance limits, and span limits.
6. In the Surge folder, click Reject Waveform to remove the existing learn information.
7. Click the Acquire Waveform button so the software will relearn the armature.
8. Save and close the file when you have completed your changes.

Deleting Master, Parameter, or Winding Files

1. From the Master drop-down menu, select Modify Master. A field will appear so you can choose an existing Master file.
2. Select the file you want to delete then right click the mouse button on the unwanted file to delete it.

NOTE: The Master is built on a three-level system. If you remove a parameter used by a specific master, that master will be unusable.

Copying/Archiving a Master

Used to create backup copies of existing files using Windows operations

5 — Option Menu Items

Use the Options menu items to specify the manner in which automatic test is performed.
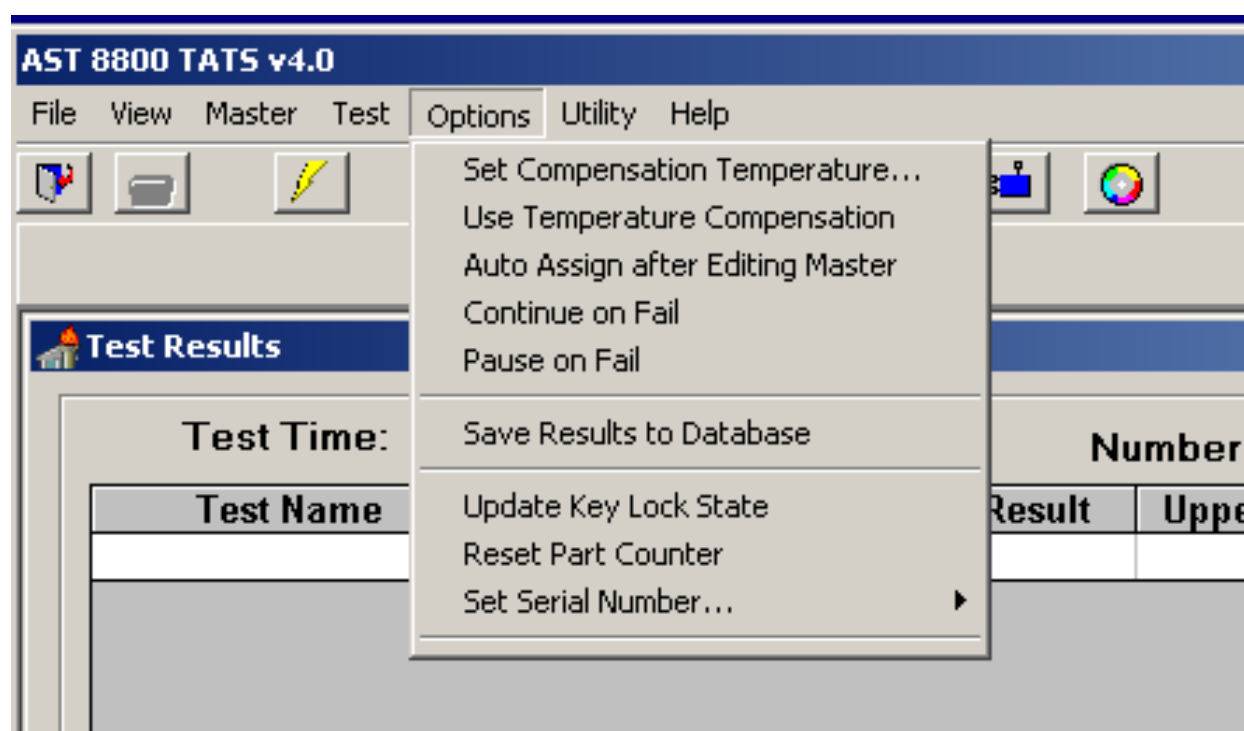
Fig 24: *Options menu.*

Table 4: *Options menu item descriptions.*

Options Menu Item	Function
Set Compensation Temperature	Define the type of temperature measurement along with the compensation value.
Use Temperature Compensation	Toggles temperature compensation on or off. When set to "on" the temperature reading appears in the bottom right side of the screen.
Auto Assign after Editing Master	Using this option tells the software to automatically assign any master that has been edited.
Continue on Fail	Allows testing to continue past a single failed test, otherwise a failure at any point in the testing will stop the total test.
Pause on Fail	Pauses testing during a failure to allow an operator to clear a slot, retest, and resume testing. Works with Continue on Fail.
Save Results to Database	Using this option enables saving test results to a DATA directory in .xml format. The results data can then be downloaded to a flash drive, CD, or network
Update Key Lock State	The Menu Access lock on the control panel will lockout an operator from changing any preset testing voltages and limits by not allowing Modify operation. The state of the key is sampled during software launch but will need to be updated here if changed while in the software program.
Reset Part Counter	Resets the total number of parts tested. The count is found at the bottom left of the screen.
Set Serial Number	Using this option causes a field to appear where the operator can add a part serial number to the results data. When entered, it will be shown on the main testing screen during testing, it will be added to the printout on the first page, and It will be added to the stored results for reference. A comments section is also provided.

Setting Temperature Compensation

When you click on Set Compensation Temperature in the Options menu, the following drop-down menu appears so you can select the hardware type available for measuring resistance temperature compensation.

This can be done via external means and manually entered, or via a sensing device and automatically entered. The compensation temperature can also be entered according to customer specifications.

The User Enter at Start of Test radio button allows an operator to enter the armature temperature value for a temperature compensation calculation rather than using a sensor (probe).
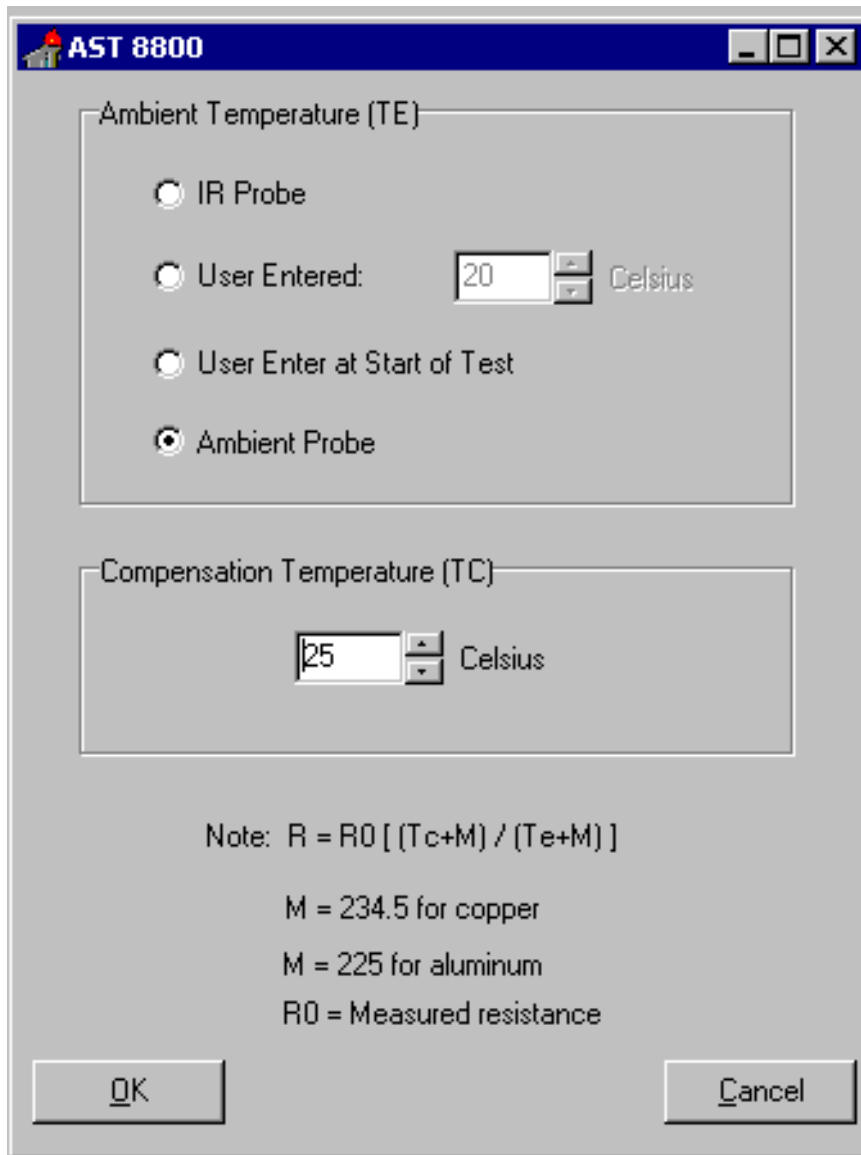
Fig 25: *Options—Set Temperature Compensation.*

The formula shown (Note: R = R0 ...) is in accordance with IEEE 1997 standard for compensation.

6 — Utilities

Offers a series of special test functions provided for the customer's convenience.

Using the Self-test Utility

The Self-Test utility is a diagnostic tool used to check the testing circuit and communication pathways. It displays the results for the operator. The utility does not test the fixture.
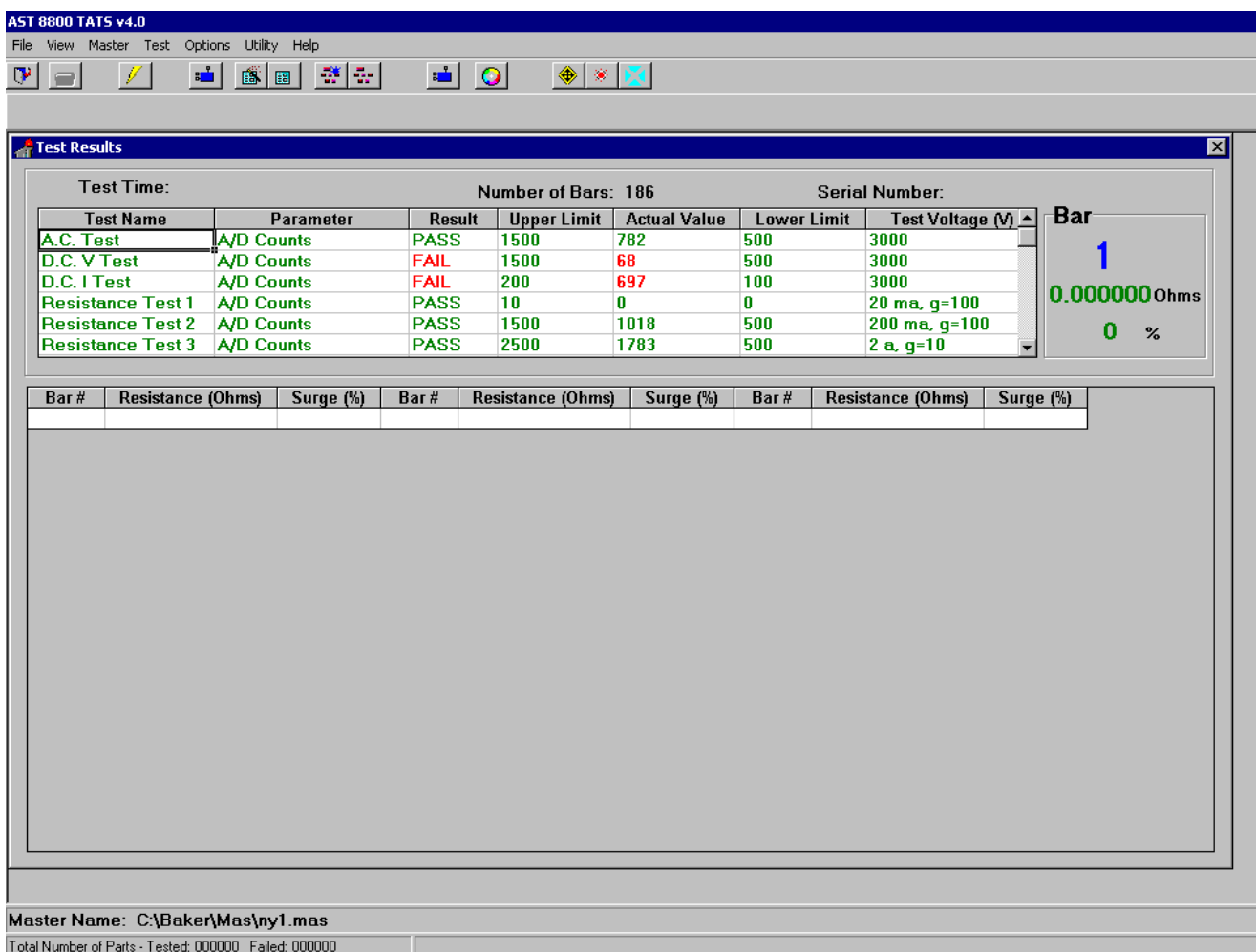
Fig 26:   *Self-test result.*

NOTE: Be sure to remove the contacts from the armature before running the self-test utility.

Manual Test Mode

The Manual Test Mode provides a process to single- or multiple-test an armature without pass/fail limits to give actual results.

1. From the Test drop-down menu, select Manual Test Mode (or press F7).

2. Each test has an enable box and editable voltages. For a waveform, enter the voltage after enabling then click the New Surge Master button.

3. Press the Start on the control panel.

> NOTE: For resistance and surge it is necessary to index the armature correctly.
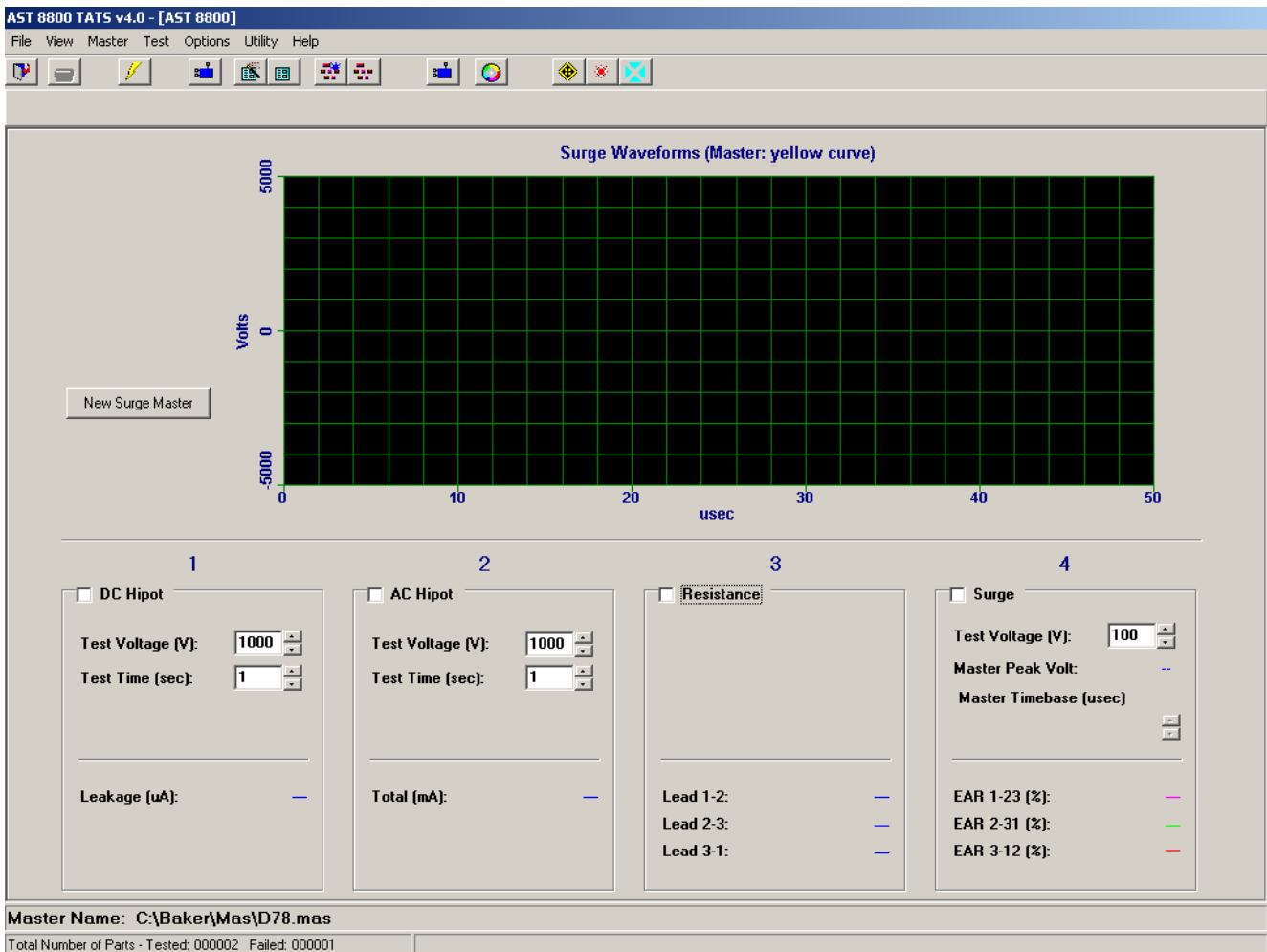
Fig 27: *Manual test mode.*

Armature Retest

The Armature Retest utility allows you to retest a specific bar after an automatic test has been completed, and replace the failed result with a passing result in the Results data.

Fig 28: *Armature re-test.*

The example above shows the results for a failed bar 94 resistance. When you see a result like this, you will have two choices:

- ■ Accept the failure and save the results to the database. (Save and print out the results by pressing the STOP button on the control panel.)

- ■ Perform an armature retest. (Press the RETEST button on the control panel then click on the Test drop-down menu and select Armature Retest).

NOTE: If the armature retest still shows the armature failed. Press the <STOP> button on the control panel to send the failed data to the database and printer.
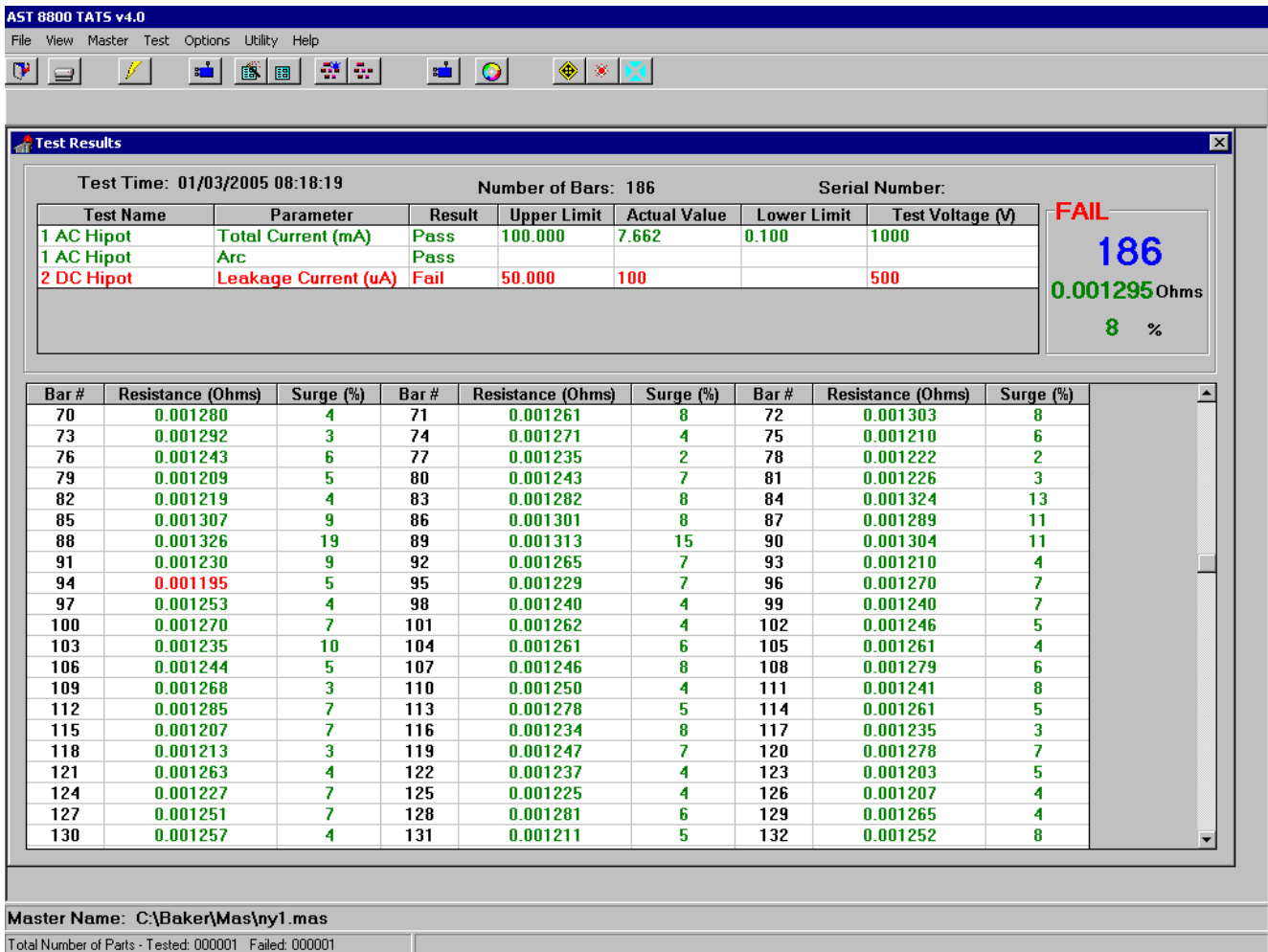
Fig 29: *Armature re-test*

1. Enter the desired bar number you want to retest.

2. Retest that bar by clicking the Perform Bar Retest button.

The tester will then index the armature without testing until the requested bar. The tester will perform a resistance and surge test.

3. If you accept the new results, replace the automatic test value with the retest value by clicking the Accept Retest Results button.

4. The current station Master Waveform is used for surge error comparison. If more than one retest is needed repeat the process.

5. Close the retest menu at any time to check progress or locate a bad bar.

6. Reopen the menu without loss of bar count location.

> NOTE: If a new START is begun, all retest is over.

When completed the red "Fail" notice shown in the upper right of the display will change to a green "Pass." Your printout will show a pass and print all green.

> NOTE: If a group of bars fails, record all bar numbers for use before retesting. Retest the bars in order from lowest to highest because the armature will index to the selected bar before retesting.

Appendix A — Principles of Operation

The Baker WinTATS is the most advanced integrated electrical winding test instrument on the market today. All common winding tests, such as HiPot, resistance and surge, are contained in one single IBM-compatible PC platform. Both manual and automatic modes of operation are available. The computer controls all individual tests and monitors results in both modes of operation. Self-test capability is a standard feature of the WinTATS.

The Baker WinTATS is divided into two sections: the PC sub-rack and the Baker WinTATS sub-rack. Certain customer-specified options ordered with the instrument may cause the Baker WinTATS-EXP sub-rack to be included. The PC sub-rack contains the computer and all low-voltage computer-to-test module interfacing. The Baker WinTATS sub-rack contains all of the high-voltage test modules and relays. It is tightly shielded to prevent interference with the PC sub-rack.

Most of the circuitry and power supplies in the Baker WinTATS are contained in plug-in circuit boards and modules for quick troubleshooting and replacement. Some heat-generating and larger components are present. These are mounted on the instrument's rear panel to quickly dissipate excess heat directly to the outside air. All circuit boards and sub-rack mounted power supplies conform to PC or Eurocard packaging standards of modular board depth and height. This provides standard two-piece pin and socket connectors for greater reliability and lower insertion force.

Power Flow

There are two separate circuits of main power flow in the Baker WinTATS; one is to the PC sub-rack and the other to the Baker WinTATS sub-rack (and Baker WinTATS-EXP sub-rack, if present). The main power switch/circuit breaker interrupts power to all circuits and is the only switch controlling power to the PC sub-rack. The Baker WinTATS sub-rack (and the Baker WinTATS-EXP sub-rack, if present) power and all fixture power is also interrupted by the Equipment Stop <switches> on the instrument. Activation of the Equipment Stop <switch> allows the operator to safely service all test modules in the Baker WinTATS sub-rack and fixture while power is still applied to the computer.

PC Sub-rack

The PC sub-rack contains the PC motherboard, disk drives, digital and analog I/O cards, peripheral cards and the computer power supply. All boards in this sub-rack conform to IBM-compatible PC standards and dimensions.

The computer and interface hardware are based on the standard 16-bit bus, which is an IBM-compatible PC standard. This system meets the requirements of small, real-time industrial systems and allows for easy component replacement. Now an industry standard, the PC bus is supported by many generic board manufacturers around the world. The PC-based computer system is ideal for the Baker WinTATS because of its high performance, ruggedness, low cost, and worldwide support.

The single-board computer used in the Baker WinTATS is a generic PC system. The Microsoft Windows 7™ operating system is used. It supplies program modules for terminal, printer and disk-drive interfacing. All operating program and system program modules are stored permanently in the hard-drive.

There are four boards located in the PC sub-rack besides the motherboards: the Fast ADC board, the AIO board, the DIO board, and the Stepper motor controller board.

The PC sub-rack also houses the low-voltage computer power supply. This +5 volt, +/- 12 volt supply is dedicated to the computer, and powers all computer boards as well as peripherals such as the hard disk drive.

TATS Sub-rack (high voltage)

The Baker WinTATS sub-rack contains safety and signal conditioning circuitry, high-voltage power supplies and high-voltage switching relays. All boards in this sub-rack are triple-height, extended-depth Eurocards that measure 366.8 by 280 millimeters in size.

There are four boards in the Baker WinTATS sub-rack: the AST-HV power and logic board, the AST-HVDC board, the

AST stack board and the AST MUX/Readout board. The Baker WinTATS -EXP sub-rack (if present) will contain one or more TL/MUX boards. All of these boards are manufactured by Megger Baker Instruments.

The Baker WinTATS Power and Logic board contains a 12-volt power supply for the Baker WinTATS sub-rack, safety interlock controls and a programmable 20 amp, constant-current power supply for the Resistance test.

The Baker WinTATS-HVDC board is a programmable (300 to 15,000 volts) DC power supply that uses off-line, resonant mode, switching power supply technology. Also located on this board is the high-voltage discharge capacitor, used for the surge test.

The AST-STACK (cap) board is a stacked-thyrister circuit, used as the surge test discharge switch. It can hold off 18,000 volts and momentarily conducts 500 amperes or more.

The AST-MUX/Readout board contains the surge test pulse-shaping circuitry, a voltage divider for the Surge Test signal, an AC HiPot voltage divider and up to seven high-voltage relays. This board serves as the test source multiplexer for all test supplies and as a test lead multiplexer for one or two test leads.

> Note: No option boards may be installed in the Baker WinTATS sub-rack. The Baker WinTATS-EXP sub-rack allows up to four high-voltage option boards.

Test Bus Concept

The single-line, test bus concept allows unlimited flexibility in the interconnection of test modules and numerous test leads. Each test module (resistance, surge, and HiPot) is isolated from the test bus by a high-voltage relay. Only one test module may be active at a time. While the active module is connected to the test bus, all others are disconnected. Each test lead is normally disconnected from the bus and grounded. Any or all test leads may be selected to be connected to the test bus for the various tests.

AC HiPot Tests

HiPot tests, either AC or DC, are used to test a motor's winding-to-core insulation. The AC HiPot test applies a high-voltage AC signal, at line frequency, to the entire winding while the core is held at zero volts. The current flowing through the winding-to-core insulation is measured to 0.5 milli-ampere resolution. The current flow during the AC HiPot test is usually dominated by reactive currents due to the winding-to-core capacitance, which varies due to winding design. The AC HiPot test simulates actual stresses on the winding-to-core insulation during use and is considered a pass/fail test.

Because of the high-voltage sine wave requirement for the AC HiPot test, it is not feasible to generate this power electronically. It is therefore transformer generated from the AC mains. Most of the AC HiPot components are bulky and are mounted to the rear panel of the WINTATS. The output voltage is adjusted by a variable autotransformer, which feeds the high-voltage step-up transformer. The variable autotransformer is controlled by a stepper motor. The actual voltage applied to the load is measured by the computer and adjusted to the program voltage. The AC HiPot voltage is thus independent of variations of the AC mains.

During the AC HiPot test, the power supplied by the high-voltage transformer is switched onto the test bus and all test leads connected to the winding are connected to the test bus. The voltage and current is conditioned on the WINTATS8800-MUX/Readout board and supplied to the AIO board.

Short-circuit AC HiPot current is limited resistively to 200 milli-amperes.

DC HiPot Tests

Like the AC HiPot test, the DC HiPot also tests the winding-to-core insulation.

The DC HiPot test applies a high voltage current to the entire winding while the winding core is held at zero volts.

The current flowing through the winding-to-core insulation is measured to one-microampere resolution. The current flow during the DC HiPot test is independent of the winding-to-core capacitance. The DC HiPot test is an accurate, quantitative measure of the bulk resistivity and contamination of the winding-to-core insulation.

The AST-HVDC board supplies the high-voltage onto the test bus. The output voltage is programmed by the analog output line of the AIO board and is regulated by the AST-HVDC board. All test leads connected to the winding are connected to the test bus. The current flow is measured on the AST-HVDC board and is supplied to the AIO board.

Short-circuit DC HiPot current is electronically limited by the AST-HVDC board to 8 milli-Amperes.

Resistance Test

The winding resistance test is used to identify faults in the winding, such as high-resistance connections, improper wire gauge and incorrect turn counts.

The resistance of a winding under test is computed from Ohm's Law (R=V/I) or the resistance of the winding is equal to the voltage across the winding divided by the current through the winding. As in most resistance measurement circuits, the current passing through the winding is forced to a constant value by the instrument. The voltage is then measured across the winding and multiplied by a scaling factor to compute the resistance. The constant current power supply in the Baker WinTATS has four current ranges: 0.03, 0.2, 2 and 20 Amperes. The current it supplies is switched onto the test bus, then through the test lead multiplexer into the winding under test. The maximum voltage produced by the constant current power supply is 5 volts.

A true differential, four-wire resistance measurement technique is used in the Baker WinTATS to eliminate errors due to test bus relay, test lead and contact resistances. The voltage across the winding is measured exactly at the winding terminals and is not affected by voltage drops across the stray resistances. There is a high-voltage isolation relay in each voltage sense line, which is used to protect the computer from high-voltage tests. These relays are normally open and only close during low-voltage resistance testing.

Surge Test

The Surge test is used to test turn-to-turn, layer-to-layer and phase-to-phase insulation within a winding. No other test procedure exists to find incipient faults in winding turn insulation. The Surge test is also capable of detecting incorrect turn counts or improper winding connections.

The Surge test is a high-voltage, direct capacitive discharge applied to a winding terminal while other winding terminals are held at zero volts. The output of the AST-HVDC board is switched to the surge pulse forming network and the output of this network is switched onto the test bus. The AST-HVDC board charges the surge capacitor to the programmed voltage. The stacked thyristor circuit is then triggered to generate the high-voltage pulse, which is applied to the winding under test. The waveform generated by the interaction of the surge pulse and the winding under test is digitized by the Fast ADC board and analyzed by the computer.

A Surge Balance or Phase Difference option is found in the "Parameter" operation. The user can specify a numerical value for surge Balance between 0 and 99 percent. The Surge Balance or Phase Difference takes the maximum surge value and subtracts the minimum surge value from it. This percentile value, which is the largest surge difference among all phases tested, establishes an acceptable range within which a surge test value is acceptable.

When the surge balance is activated (a zero value deactivates this option), all of the test armature bards are examined if comparison to the master fails. If the test armature's bar-to-bar comparison is within the user specified value (between 1 and 99 percent), the armature will pass the surge test.

Analysis of the Surge Test Waveform

Because there are so many winding elements that affect the Surge test waveform, it is difficult to predict the exact shape of the waveform from mathematical models of the winding. However, a waveform comparison technique is a very powerful tool used to detect subtle changes in a test waveform. Typically, two matched surge circuits are

connected to two identical windings. One of which is known to be "good" (the master) and the other, the winding under test. The waveforms from each winding are displayed simultaneously on a duel-trace oscilloscope. If the windings are identical and fault-free, the waveforms will superimpose on the oscilloscope. Only one trace waveform will be visible. If one winding contains a turn insulation fault or other differences from the master winding, two waveforms will be visible on the oscilloscope.

The Baker WinTATS uses the waveform comparison technique, although comparison is done digitally by the computer. A known, good master is not required at the test station since a master waveform is learned and stored in the Baker WinTATS' computer memory.

The waveform comparison algorithm used by the Baker WinTATS is the Megger Baker Instruments exclusive and patented Error-Area Ratio (EAR) method. The EAR method produces a percentage error number, which is directly proportional to the severity of the winding fault. This technique provides high noise immunity and is self-compensating to variations in waveform amplitude, frequency and Q-factor decay. The EAR method provides reliable detection of turn-to-turn insulation faults and incorrect turn counts, previously difficult to detect with peak or average DC voltage detection means used in earlier generation automatic surge test instruments.

Typically, surge test waveforms of good windings will compare to the master waveform within 0-15 percent error. Single-turn shorts will product a 10-40 percent error and multi-turn shorts will produce an error of 30-75 percent.

Armature Indexing

This description only applies to universal, rotating type armature test fixtures. The armature is rotated by means of a rubber drive wheel contacting the body of the armature. The wheel is driven by a stepper motor under computer control.

Usually, one or two optical sensors are used to sense the commutator slots as the armature rotates. The stepper motor pulse counts is used to sense that the distance between all slots are similar or an indexing error message occurs

Appendix B — Maintenance and Technical Specifications

Maintenance and Troubleshooting

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

Baker WinTATS has also been designed for easy troubleshooting and repair. The instrument has built-in self-test and diagnostic capabilities. The self-test enables the instrument to conduct tests on internal loads to verify that they are functioning properly. Failure of the Self-Test is indicated by test results highlighted in red. This troubleshooting guide will provide step-by-step information to isolate and correct problems.

Maintenance Schedule

The only scheduled maintenance, which must be performed on the WINTATS8800, is to change the lithium batteries that back up the RAM on the PC mother boards. These batteries should be replaced every five years to ensure that the instrument does not loose memory.

The filter, located on the front panel of the PC sub-rack, should be removed and cleaned at least Baker WinTATS once a week. This can be accomplished by washing with warm water and a mild detergent or by blowing the dust free.

Fixtures, such as test stands, may need routine maintenance. Test leads and contacts, for example, wear out from normal operation. The frequency of component replacement and routine scheduled maintenance will vary from customer to customer because of amount of use.

Technical Specifications

Table 5: *System component specifications:*

Component	Minimum Requirements / Description
Computer/Processor	Microsoft Windows PC-compatible
Architecture	Industrial PC Packaging
Load	Greater than 1 uH
Digitizing Rate	5 Msamples/second
Display	Standard resolutions typically greater than 1024 x 768
Hard Disk Drive	10 GB or larger, per spec
Communications	RS-232 (standard); other network interfaces are available
AC HiPot voltage	Programmable 100- to 5000 V AC in 50 V AC Increments, 50/60 Hz, 2000 V A, linear ramp-up and ramp-down
AC HiPot current	200 mA max, 0.5 mA resolution, programmable pass/fail limit in 1.0 mA increments
Duration	Programmable in one-second increments
Leakage current method installed	"Total or absolute leakage current"
DC HiPot voltage	Programmable 100 to 15000 VDC in 50 VDC increments
DC HiPot current	500 uA max, 1 uA resolution, programmable pass/fail limit in 1 uA increments
Duration	Programmable in one-second increments

Resistance

- Auto-ranging.
- Digit resolution.
- 0.4 percent of full scale accuracy in each range.
- Kelvin leads and contacts for bar-to-bar testing.
- Ambient temperature compensated to 25 °C.
- Infrared temperature sensing is optional.

Table 6: *Resistance test specifications.*

Resistance Range	Current
100 micro-ohms – 2 milli-ohms	20 A
2 milli-ohms – 20 milli-ohms	20 A
20 milli-ohms – 200 milli-ohms	2 A
200 milli-ohms – 2 ohms	200 mA
2 ohms – 20 ohms	20 mA
20 ohms – 200 ohms	200 mA

Table 7: *Surge test specifications.*

Test Component	Specifications
Voltage	Programmable 50 to 1500 volts peak bar-to-bar in 50-Volt increments.
Z Transformer	Step down 10 to 1
Pulse Energy	11.25 Joules max.
Discharge Capacitor:	0.10 uF

Programmable pass/fail percentage limit based on Megger Baker Instruments' patented Error Area Ratio technique.

Fixtures

Baker WinTATS can be configured with standard or customized heavy-duty fixtures that rotate the armature while testing. Fixtures are available for testing a wide range of armature sizes from integral horsepower DC drive and transit motors to large locomotive and utility generator armatures. Most rotation fixtures employ optical sensors to sense commutator slots for armature indexing.

Appendix C — Self-tests and Troubleshooting

Self-test Routine

The self-test routine ensures proper operation of the Baker WinTATS in AC and DC HiPot, Resistance, and Surge test modes. Self-test does not check the reliability of the AC HiPot test. All self-tests are performed on internal loads.

The test lead multiplexer (TL/MUX) boards are not thoroughly exercised during the self-test.

Test fixtures are not energized or tested during self-test.

Any errors are denoted by the individual test results being displayed in red.

No other indication of Baker WinTATS component failure is noted on screen.

To troubleshoot any component failure in the Baker WinTATS, maintenance must first eliminate certain possibilities as found in the self-test results.
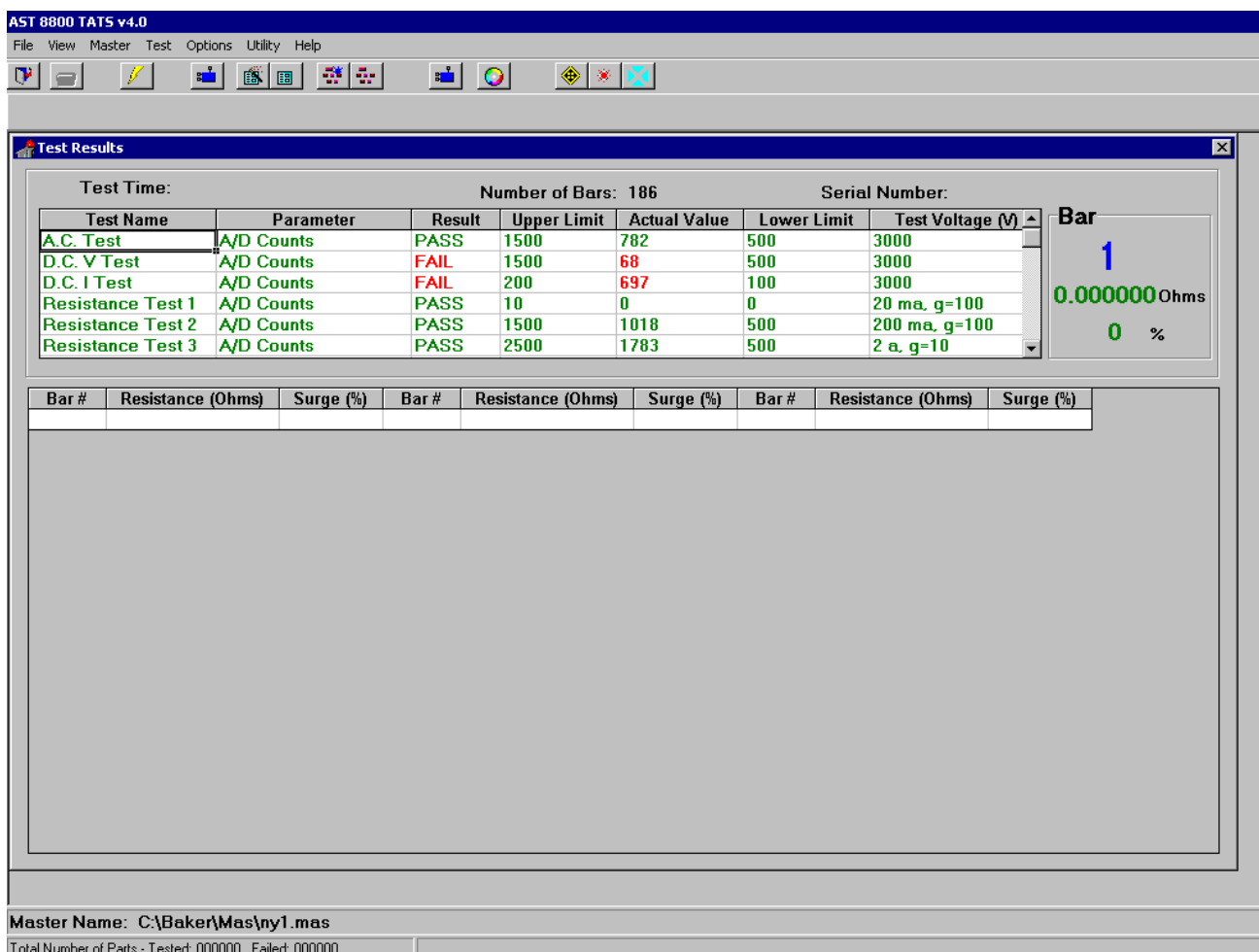
Fig 30: *Self-test results screen.*

The Baker WinTATS must be powered during the self-test. The Equipment Stop switches must be deactivated to energize the Baker WinTATS sub-rack to accomplish this test.

AC HiPot Test

During the test, the user should be able to see and hear the 4023-820 stepper motor rotate the variac. The stepper motor and variac are mounted on brackets on the rear panel. If the stepper motor does not rotate, the failure is either the stepper motor itself, the 230T stepper motor driver or the +24 VDC power supply.

> **WARNING: Dangerous voltages are used in AC HiPot tests. Use extreme care when conducting this procedure.**

If the stepper motor rotates, but there is no high-voltage output signal, use the Baker WinTATS Harness Wiring Diagram to verify with a volt meter that the AC line signals are present.   The signal should be traceable through the SSR-240D80 and PRD-WAGO240 relays.

Also check the choke resistors, variac, high-voltage transformer and associated wiring. A high-voltage probe might be needed to check signals on the HVAC line.

Trace the HVAC signal to the MUX/readout board. If the HVAC signal is present, but the test bus signal is not, the failure might be on the KC-2 relay on the MUX/readout board. If the signal is present on the test bus, the problem is most likely a failed TL-MUX board (if present).

An open circuit AC HiPot test should produce a leakage current close to zero milliamps. A large open circuit leakage current is indicative of a failed high-voltage relay. A failed high-voltage relay can also produce high leakage current during the DC HiPot test.

The micro-switch on the variac tells the computer that the variac is zeroed. If the variac repeatedly bangs against its stops, the switch is probably faulty.

Resistance Power Supply Test

The Resistance Power Supply Test is first function in the Self-test routine. This function verifies the operation of the Resistance Test and the analog I/O (AIO) board.

The low-voltage DC constant current power supply used in this test is contained on the Baker WinTATS Power and logic board.

The high-voltage relay, which switches this supply onto the Test Bus, is located on the MUX/Readout board. The MUX/Readout board contains a 0.1 ohm resistor used as the Self-test internal load.

A value is displayed for each of the four supply current ranges. If the value is outside of an acceptable range, the Resistance test result in Self-test will be displayed in red. The normally accepted values for each of the four current ranges are listed in the table below.

A failure commonly indicates a problem with the Baker WinTATS Power and Logic board or the AIO board. Sometimes, the first and second ranges will indicate a failure, while the third and fourth ranges pass. This typically suggests that the problem is not in the power supply.

Table 8: *Resistance self-test expected values.*

Range	Expected Values
100 x R0	0
100 x R1	1000
10 X R2	1780
1 x R3	1750

Troubleshooting

During the resistance test, the yellow LED on the two larger 5 VDC power supplies should illuminate. If the self-test fails and the yellow LEDs does not illuminate, test voltage input pins on those power supplies for 24-30 VDC. If the voltage input power is present, replace the Power and Logic board.

If the yellow LEDs do not illuminate during the self-test, replace the AIO board in the computer. Also ensure that the voltage drops across the R1 0.1 ohm resistor on the MUX/readout board. During the fourth range, there should be a 2 VDC signal on the resistor.

DC HiPot (High-voltage DC Power Supply) Test

The second self-test that the Baker WinTATS performs is the high-voltage DC power supply test. This test is necessary for DC HiPot tests and for charging the capacitor, which is discharged to generate the surge pulse. The power supply uses witching technology to reduce size and weight within the instrument. It is entirely contained on the HVDC board.

The power supply is tested in the DC HiPot test mode. A voltage divider network and a current sensing resistor measures the output voltage and current. The supply is set to 4000 Volts. The measured output voltage and current are displayed. If the output voltage is low and the output current is low, there may be a failure of the HVDC board.

If the output voltage is low and the output current is high, there is a short circuit. The failure may be on the HVDC board or a high-voltage relay failure on one of the other boards. To identify the problem, the boards must be removed one at a time and replaced until the failed board is isolated. The front panel of the Baker WinTATS sub-rack must be removed to reach the Baker WinTATS boards. Power to the Baker WinTATS sub-rack is removed by depressing the Equipment Stop switch. This avoids removing power to the PC sub-rack when removing each board.

> **WARNING: Dangerous voltages are present on boards in the Baker WinTATS sub-rack. Use extreme caution when conducting this procedure.**

Remove the boards, listed in the table below, one at a time and repeat the self-test each time. Ensure that the Baker WinTATS sub-rack is not energized when removing boards.

Table 9: *Boards with potential short-circuit failures.*

Tester/Rack	Slot Number	Board Type
Baker WinTATS-HV	44	Baker WinTATS – Stack
Sub-rack	64	WINTATS8800-MUX Readout
Baker WinTATS-HV-EXP	24	Baker WinTATS-TL MUX
Sub-rack	49	Baker WinTATS-TL MUX

The resistance test will fail if the MUX/readout board is removed. The surge test will fail when the stack board is removed. The faulty board has been isolated when the DC HiPot test passes. If removing all other boards does not eliminate the problem, the fault is located on the HVDC board.

Surge Test

The last test that the Baker WinTATS performs in the self-test mode is the surge test. The high-voltage DC power supply is switched to the SCR stack located on the AST stack board. The voltage is set to 3000 volts and the voltage and current are measured. If the voltage is low and the current is high, there is a possible short circuit on the stack board.

If the leakage current is low and the voltage is normal, the voltage is reduced to 3000 volts. The SCR stack is triggered by the PC fast ADC board. The surge pulse is routed to the surge readout board. The PC F Baker WinTATS ADC board senses the signal from the surge readout board and digitizes the waveform. If the waveform peak value is not close to the expected value, the surge test result will be displayed in red. This failure is indicative of a short circuit on the Stack board or on the PC Fast ADC board. Several tests are necessary to isolate the failed board.

Connect an oscilloscope with a high-voltage probe to test lead one. The black lead(s) are ground. Enter the "Manual Test" mode on the Baker WinTATS and initiate a single-phase test. Use the oscilloscope trigger to capture the surge waveform. The waveform will be a fast-rise time pulse with an exponential decay of a millisecond or less. Tests of windings will result in a sinusoidal, exponentially decaying waveform. If a surge waveform is present on the scope, but not on the Baker WinTATS screen, the failure is probably on the PC Fast ADC board digitizing circuit.

If the surge pulse is not present on the test leads and you can hear the high frequency signal indicating that the HVDC power supply is charged, replace the PC Fast ADC board to determine if it is sending the trigger pulse to the Stack board. Also check the coaxial cables labeled "trigger" and "signal."

Test Lead Multiplexer Board Troubleshooting

Test Lead Multiplexer Board troubleshooting verifies that the Test Lead Multiplexer (TL/MUX) board high-voltage relays do not breakdown when high-voltage is applied to the Test Bus. Place the Baker WinTATS into the Automatic Test mode of operation. Connect a known "good" coil to the test leads. Program the instrument, initiate an Automatic Test (with the appropriate master and all tests specified) and observe the results on the screen. Irregular (non-sinusoidal) surge waveforms or incorrect resistance readings indicate a failed TL/MUX board. Replace the suspect board and perform the test again.

Armature Rotation (Index) Troubleshooting

If the instrument is configured for armature testing and the armature does not rotate during the automatic test, attempt to rotate it using the jog buttons. If the armature still does not rotate, check the stepper motor, gearbox and drive wheels for mechanical failure. Also check the stepper motor translator/drive located on the fixture.

 Verify all connections to the stepper motor drive. Check the 48 VDC power supply. Another potential cause of a failure to rotate is the stepper motor driver board in the computer. In some cases, the stepper motor driver can reset. The Baker WinTATS power must be cycled to reactivate the stepper motor driver.

Baker WinTATS and Baker WinTATS-EXP Sub-rack Power Supply Troubleshooting

These sub-racks require +12 and +24 volt power supplies. Some units may also require a +48 volt power supply. Power is delivered through quick connect terminals on the rear of the back-planes. Voltage levels can be easily checked at these terminals using a voltmeter. The terminals are labeled on the front side of the back-planes. The wires are color-coded as shown in the table below.

Table 10: *Baker WinTATS sub-rack power supply wiring.*

Supply Voltage	Wire Color
+12 V RTN	Green
+12 V	Yellow
+ 24 V	Orange
+ 48 V	Orange

Twelve-volt power for the Baker WinTATS Sub-rack is supplied by the Melcher PSR 124 power supply, located on the AST Power and Logic board. It requires a +24 Volt input. If the output voltage is not present, ensure that the Equipment Stop Switch on the front panel is pressed. Check the wiring or replace the power supply as required.

Twenty-four and 48 Volt power for the sub-rack is supplied by the power supply located on the rear panel. The supply is shown on the Baker WinTATS harness wiring diagram. If the output voltage is not present, check the wiring or replace the power supply as required.

Baker MANTEST Diagnostic Procedures

CAUTION: This procedure is provided as a tool for diagnostics and troubleshooting of the Baker WinTATS tester. It is software that manually controls relays and power supplies **without the safeguards** of the Baker WinTATS testing software. Only qualified personnel should use this procedure with guidance from Megger Baker Instruments (1-800-752-8272). Improper use of the software can cause injury to the personnel using it and/or damage to the equipment. Megger Baker Instruments is not to be held responsible for improper use of this software.

The testing screen is divided into several areas. The upper section is used for digital inputs such as switch closures, power supply status, rotation direction, and so on. These are active lows indicated by a check mark in the box. A generalized description of each digital input (DI) line is given below.

The large center area is a list of the available digital outputs. These are user interfaced to turn on relays, lamps, power supplies, and so on. They can initiate tests on specific leads, connect relay matrix, isolate trouble areas, and more. They are also an active low, indicated by a mouse click in the adjacent box with a check mark. Clicking on the Reset All button at the bottom will reset all lines together.
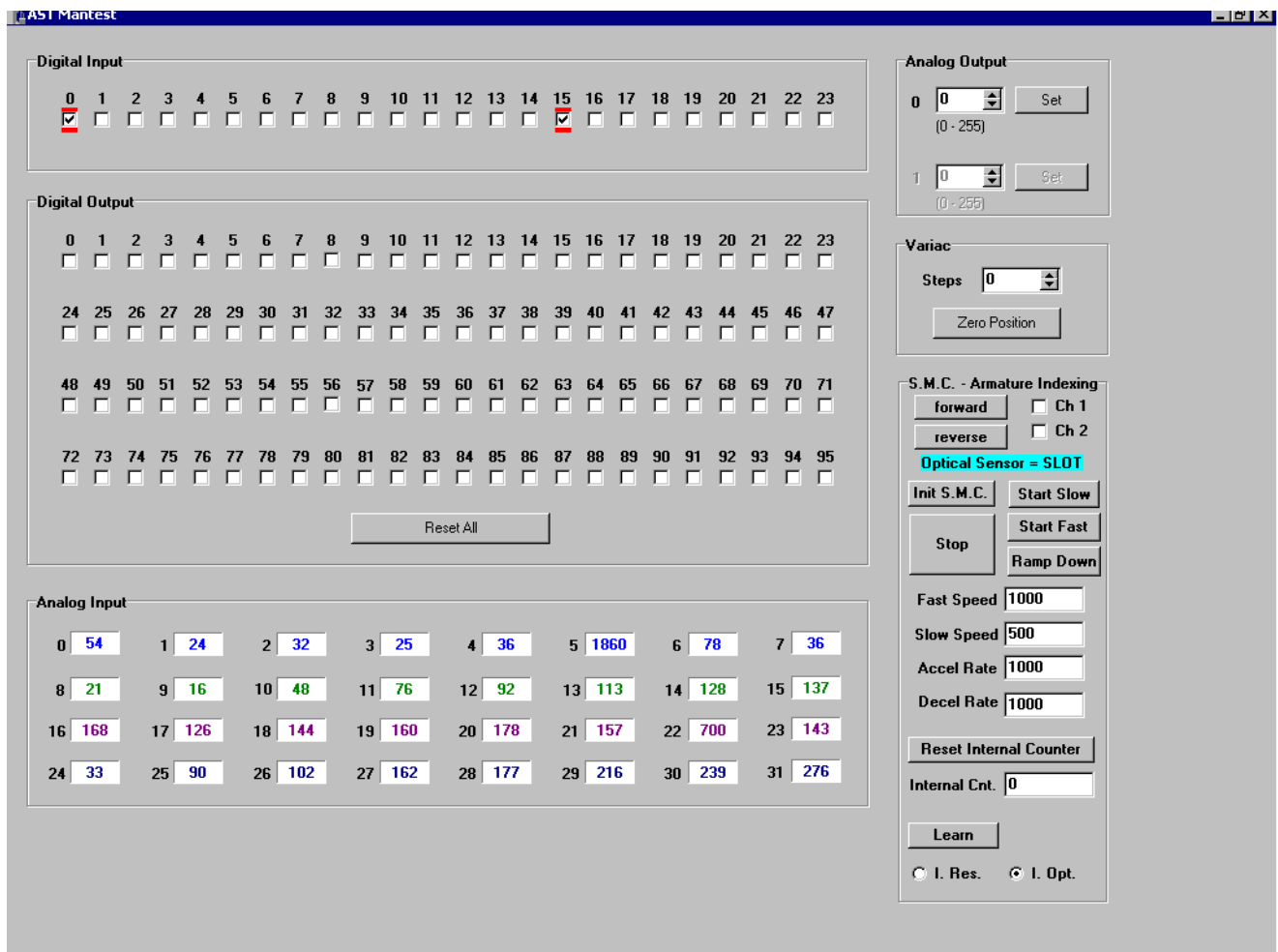

Fig 31: *Baker WinTATS Mantest.*

NOTE: Be sure to power down all power supplies before resetting.

Table 11: *Digital Inputs.*

Input #	Description	Input #	Description	Input #	Description
0	Power	8	Spare	16	Spare
1	Keylock	9	Station 2 stop	17	Spare
2	Supply status	10	Jog forward	18	Station 1 autostart
3	Master enable	11	Jog reverse	19	Station 2 autostart
4	Station 1 safety switch	12	Jog speed	20	Unused
5	Station 1 start	13	Station 1 retest	21	Unused
6	Station 1 stop	14	Station 2 retest	22	Unused
7	Spare	15	ACHiPot variac zero	23	Unused

A generic list of the digital outputs is given below. The lower area is used to display the analog values. The system uses 0–5 vdc/vac analog values from the testing boards to the Baker AIO board in the computer. The analog values of voltage and current are converted into digital values to be used by the software for analysis. They are values that ride on a noise level that is evident. The maximum count is 4095 (hexidecimal for 8-bit processor) that represents 5 volts or greater input. They should never be at hard '0' or '4095' as this condition indicates a fault.

Table 12: *Digital outputs.*

Output #	Description	Output #	Description	Output #	Description
0	Resistance Open Lead	16	TL-4/ROT-1/	32	TL-7/TL-4/
1	HVDC Relay	17	TL-5/ROT-2/	33	TL-8/TL-5/
2	Surge Relay	18	TL-6/ROT-3/	34	TL-9/TL-6/
3	Resistance P/S Enable	19	Test in Progress	35	FB-7/FB-4/
4	Resistance Scale 0	20	FB-5	36	FB-8/FB-5/
5	Resistance Scale 1	21	FB-6/Enable Rotation P/S	37	FB-9/FB-6/
6	HVDC P/S Enable	22	Station 2 Testing	38	Enable Rotation Sensor
7	Enable Test Lead 1	23	Station 2 Pass	39	Enable Rotation Sensor Station SW
8	Enable Test Lead 2	24	ACHiPot Relay	40	TL-10/TL-7/ROT-4
9	Enable Test Lead 3	25	Enable ACHiPot P/S	41	TL-11/TL-8/ROT-5
10	Enable Feedback 1	26	ACHiPt AC Relay	42	TL-12/TL-9/ROT-6
11	Enable Feedback 2	27	ACHiPot Variac Step	43	FB-10/FB-7/
12	Enable Feedback 3	28	ACHiPot Variac Direction	44	FB-11/FB-8/
13	Station 1 Testing	29	ACHiPot Variac	45	FB-12/FB-9/
14	Station 1 Pass	30	Station 2 Fail	46	Station Switch
15	Station 1 Fail	31	Motor Pulse Scale	47	Relay Matrix

A generic list of the analog inputs is given below. The AIO board generates a 0-5 vdc signal to set the HVDC power supply to requested voltage. The area in the upper right is for this purpose with '255' representing maximum output of the supply. The last area on the right is used to control the AC HiPot stepper motor which drives the variac. You can drive the variac up, down, or reset it back to its zero position. (Indicated by a check in the digital input box #15.)

Table 13: *Analog inputs.*

Input #	Description	Input #	Description	Input #	Description
0	Noise Level	8	FB-1 Analog	16	Temperature Sta-2
1	Resistance Feedback	9	FB-2 Analog	17	FB-10 Analog
2	Program Output	10	FB-3 Analog	18	FB-11 Analog
3	DC-V Analog	11	FB-4 Analog	19	FB-12 Analog
4	DC-I Analog	12	FB-5 Analog	20	FB-13 Analog
5	Temperature Sta-1	13	FB-6 Analog	21	FB-14 Analog
6	AC-V Analog	14	FB-7 Analog	22	FB-15 Analog
7	AC-I Analog	15	FB-8 Analog	23	FB-16 Analog

NOTE: The section in the lower right operates and communicates with the indexing function of the Baker WinTATS system fixture and the computer.

1. To operate the indexing function, select Ch 1 (Ch 2 for station 2). The direction desired.
2. Click the Init S.M.C button to initialize the board.
3. Click the Start Slow button to begin the jogging function.
4. The Optical Sensor = will show recognition of the bar or slot by the optics.
5. To witness an index operation, click the Learn button to index one bar. The number of steps it took to achieve the index will be displayed in the box. This verifies proper operation of the 80-539 Stepper Motor Controller, Stepper Motor circuit, and the optics. The I. Res button is for future use.

Table 14: *Comprehensive spare parts list (high-voltage).*

Quantity	Description	Manufacturer	Megger Baker Part Number
1	HV Power and Logic Board	Megger Baker	80-518
1	HV HVDC Board	Megger Baker	80-519
1	HV Stack Board	Megger Baker	80-520
1	MUX/Readout Board	Megger Baker	80-521
1	HV TL/MUX	Megger Baker	80-527
1	Miscellaneous lamps, fuses, relays, belts, etc…	Various	
1	Commutator Contact Brushes	Megger Baker	40-612-001
1	Stepper Motor Controller Board, Dual Channel	Megger Baker	80-539
1	Stepper Motor Driver Module, CNO162	Centent	28-508
1	Opto Sensor, PS-49	Keyence	20-525
1	Opto Sensor Amplifier, PS-X28	Keyence	20-526
1	Baker WinTATS A/D Board	Megger Baker	80-535
1	24 VDC Power Supply	Sola	28-500
1	48 VDC Power Supply	Elpac	28-501

Appendix D — Test Fixture Interface

Keyance Optical Sensor Alignment and Checkout Procedure

If your TATS head on the test fixture is fitted with two Keyence PS-49 optical sensors, the sensors are located near the front part of the head next to the TATS contact. The optical sensor amplifiers are located on the rear of the TATS testhead.

Proper settings on the amplifiers are:

- Dark: on
- Timer: off

Optical Sensor Adjustment

Typically, the horizontal (in/out) movement of the optical sensor bracket will not need adjustment. This adjustment is set at the factory and controls the focus of the optical sensor light beam on the armature bars. Proper focus is achieved when the sensor light beam is a small red dot with an even smaller black dot in its center.

The vertical (up/down) adjustment of the optical sensors is extremely critical and may require adjustment due to differences in reflectivity of armature bars and/or separators. The ideal situation for adjusting the sensors is to move the Baker WinTATS head in place and adjust the vertical height until optics align slightly below armature shaft center.

1. Using the Jog button with the slow jog speed selected, rotate the armature a slot and then a bar.

While doing this, observe that the red indicator light on the optical sensor amplifier is lit on a slot and off on a bar. Likewise, observe that the green light on the amplifier is lit on a bar and off on a slot.

2. If this is not the case, adjust the sensitivity screw on the amplifier to achieve the desired effect, the sensor angle may need to be adjusted.

Sensor Angle Adjustment

1. To adjust the sensor angle, loosen the nut on the side of the optical sensor bracket.

2. Slightly rotate both optical sensors until the sensor light beam is perpendicular with the commutator bar directly in front of the optical sensors. This angle is difficult to determine. Look at the optical sensor mounting bracket itself; the light source part of the sensor should be parallel with the side of the mounting sensor for proper adjustment as illustrated by the drawing below.
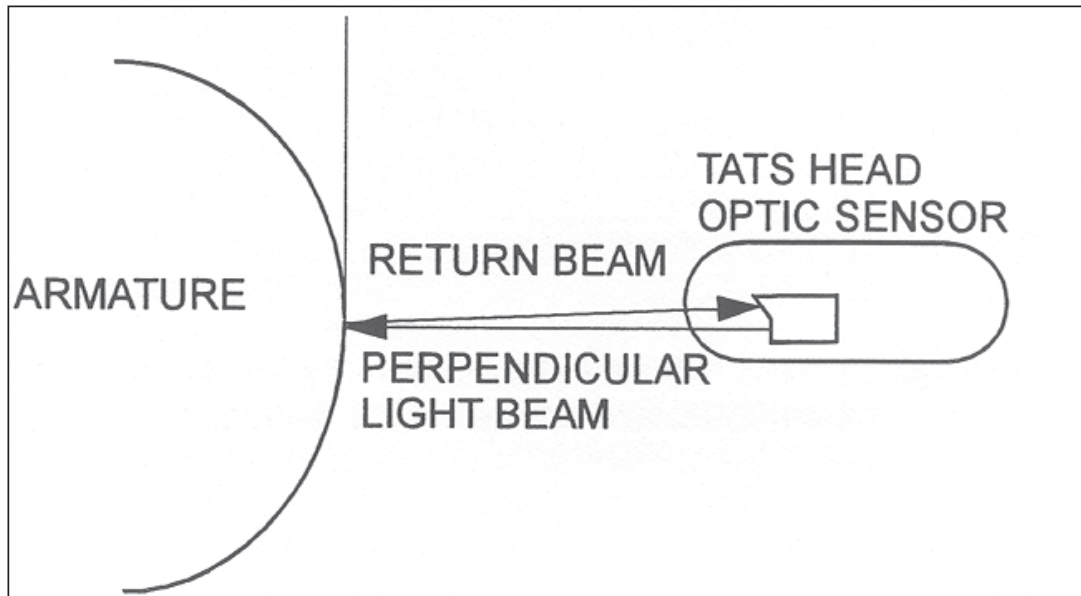
Fig 32: *Proper adjustment: light source parallel with side of mounting sensor.*

3. When the adjustment has been made, tighten the nuts on the optical sensor mounting bracket and jog the armature while observing the status of the red and green indicator lights on the optical sensor amplifiers.

4. Repeat the above adjustment procedure until the desired effect of sensing on a slot (red light lit, green light off) and not sensing on a bar (green light on, red light off) is achieved.

5. Re-assemble all components and make sure that all optical sensor bracket screws and nuts are tight.

Appendix E — Maintaining Baker WinTATS Software

The Baker WinTATS operating software is PC compatible and uses the Windows operating system.

As with any computer, software files should be backed-up periodically in the event of inadvertent deletion. The following steps are provided to assist you in creating a back-up for all operations. Megger Baker Instruments recommends backing up your Baker WinTATS files as new masters are needed.

Table 15: *Directories and files necessary for proper operation of the WINTATS8800.*

Item	File/directory Pathname	Description
1	baker	This directory is the root of all Baker WinTATS functions.
2	baker\	This contains all of the Baker WinTATS program files, which include AST. EXE, I/O CONFIG0.CFG, and SYSCONFIG0.CFG
3	baker\MAS	The masters are stored in this sub-directory.
4	baker\config	This sub-directory contains all of the Baker WinTATS configuration files; FLD_CAL.TXT, CAL.TXT, MASTER.TXT and ATO.TXT
5	baker\data	This sub-directory is where the results are stored in a "TestResults.XML" file.
6	baker\WNG	The winding files are stored in the sub directory.
7	baker\par	The parameter files are stored in this sub directory.
8	baker\doc	This sub-directory holds the related documents for customer use.

Creating a Back-up File

There are numerous ways to create back-up files for the Baker WinTATS. Megger Baker Instruments recommends the following method. Files should be backed up periodically.

1. Close the testing program.
2. Have a practical-sized back-up media readily available.
3. Open Windows Explorer.
4. Right-click the file you want to save to select the file.
5. Select. Send to Media.
6. Ensure that all of the files and sub-directories listed on the previous page are present in the directory.

Reinitializing the Baker WinTATS

Using the provided Compact Disk, reinstall all necessary directories to files.

Baker WinTATS/Windows 7 Software Installation

Installing Windows 7

1. Boot up the computer with the Windows 7 setup disk installed. When prompted press <enter>.

2. Do not have any support disks, press <enter>. Disk larger than support, press <enter>.

3. Scroll through licensing agreement using 'page down' and press 'F8'.

4. Create partition in unpartitioned space, press 'C'.

5. Create partition, use default setting, press <enter>.

6. Install Windows on highlighted partition, press <enter>.

7. Format using the FAT32 file system, press <enter>.

8. Setup will format the partition and choose location for files, '\WINNT', press <enter>.

9. Skip the exhaustive examination, press <esc>.

10. Setup copies needed files to hard disk, when finished remove disk (CD) press <enter>.

11. Install default files. Gathering information, click <next>.

12. Enter name as BAKER, organization as BAKER, the click <next>.

13. Enter OEM number from the original booklet and click <next>.

14. Enter computer name as BAKER, administrator password as baker, confirms with baker, <next>.

15. Do not create an emergency disk. Install most common components. <next>

16. Do not connect to network at this time if no network card is installed. Finish setup. <Finish>

17. Remove any disks and restart Windows.

18. Install the display drivers from the software provided for the display card used. From the display properties dialog select the settings tab. Set the display properties to 1024X768 pixels, 256 or better color mode, refresh at 70 HZ.

19. Set the virtual memory for 600 MB (both initial and maximum) from Control Panel>System>Performance. (Set).

20. Restart the computer for all settings to take effect.

Installing Baker WinTATS' Windows 7 software and support programs

1. Insert the Baker WinTATS Windows installation device into the computer. Open Windows Explorer.

2. Select all folders and drag into the `C:  root` directory.

3. In the Baker directory make the following files writeable (Acctfile.cfg, Part.ctr, Stsconfig0.cfg, I/Oconfig0.cfg, ASTClient.log, AST.log, Statistics.log) by right-clicking them and select the Properties menu and unchecking the Read-only box.

4. Click the C:\Accessories\Aguage directory. Run the Setup.exe program and follow the default selections until it finishes installing the Angular Gauge Active X controls.

5. Right-click the C:\Accessories\System32 folder and select the Copy menu option. Right-click C\winnt and select the Paste menu option. If it asks to Overwrite confirmation, select <Yes for All>.

6. Run the C:\Accessories\oledb\setup.exe and finish the rest of its setup using default settings.

7. Click the Start>Programs>Command Prompt menu to bring up the Command Prompt window. Type the following, cd c:\winnt\system32 in the Command Prompt window. Then type regsvr32 vcf132.ocx in the window and <enter>. A dialog should come up with message "DLLRegisterServer in vcf132.ocx succeeded." (If step 5 was successful.)

8. Run the winzip95.exe program in the C:\Accessories\Winzip directory and agree with all default choices.

9. Double-click the file BCB3_360c.zip in the C:\Accessories\Slgraph directory. Winzip will start up displaying contents of the zip file. In WinZip's content window, double-click the setup.exe program to run it. Agree with all default choices and when prompted for a password, type 1342-crhf-4681.

10. Create a WinTATS icon on the desktop by creating a shortcut to the `C:\BAKER\AST.exe` program.

11. Create a MANTEST icon on the desktop by creating a shortcut to the `C:\BAKER\MANTEST.exe` program.

12. Restart Windows 7.

13. Change the Windows desktop wallpaper to C:\BAKER\LogoBaker2.bmp by right clicking the desktop and selecting Properties>Background Wallpaper. Locate .bmp by using Browse button. Also choose Baker Blue for background.

14. Restart Windows again to have changes made selectable.

Baker WinTATS User Selections for a Specific Unit

1. The proper operation of the Baker WinTATS unit depends on the correct programming of the configuration file. When completing this section a copy should be made of the Sysconfig.cfg and I/Oconfig.cfg files into the C:\BAKER\TEMP directory. It is also important to 'write protect' these files to avoid corruption by accidental use.

2. Double click the C:\BAKER\Dalconfig.exe to open the I/Oconfig0.cfg file. Set the 'Number of Stations' box and the 'Number of TL Mux Boards' box. Then select the tests that the unit will be running. (This is dependent upon the hardware build of the Baker WinTATS unit.) If a plc is to be used, select the Master box and enter the correct digital lines as per the hardware build. Next enter the correct digital input and output lines for Station 1 and if used, Station 2. (These also are based upon the hardware build of the Baker WinTATS unit.) In the System I/O area enter the station switch and keylock digital lines is used. (Hardware builds). Again if a plc is to be used there is a box for Miscellaneous I/O digital lines again dependent upon hardware build. When complete click the close file in the upper right corner. Click the save option. Right click the file I/Oconfig0.cfg and select properties. Select Read-Only to protect.
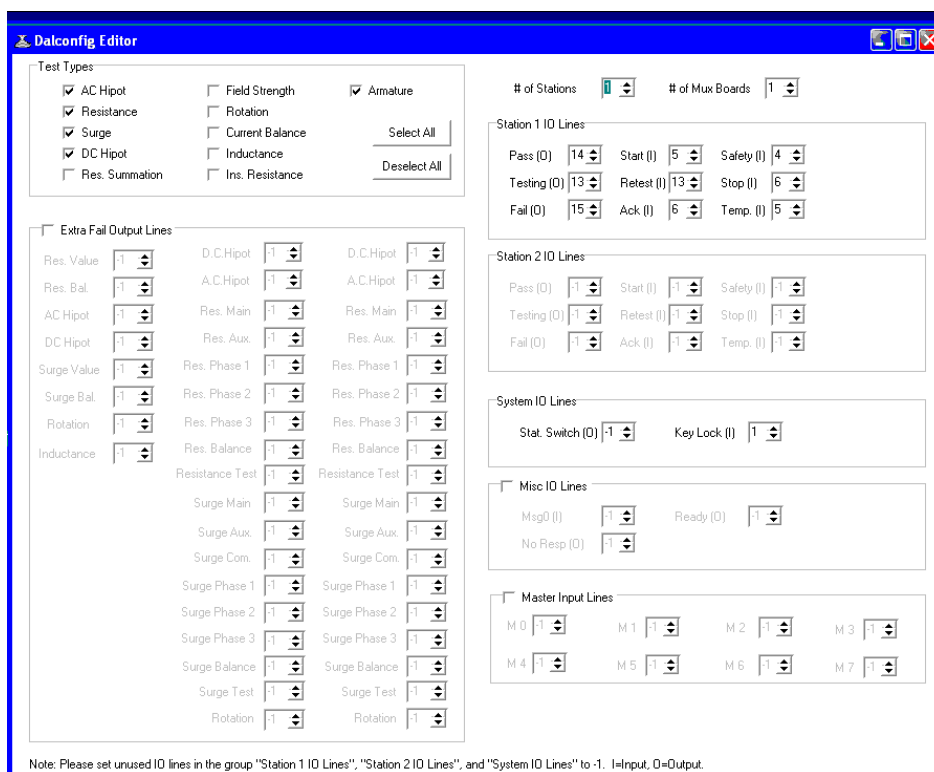

Fig 33: *Dalconfig0.cfg file.*

3. Double-click the C:\BAKER\Sysconfig.exe program to open the Sysconfig0.cfg file. Set the '# of Stations' box, the '# of Leads per Station' box (hardware build), the 'Language' of choice, and the 'Baker WinTATS SN' which may be software dependent. The Options area is used for optional hardware used on this specific unit. The IR probe is checked if Exergen Infared probes are used. If left unchecked the unit will default to the Solid State temp probe of most units. The Fail Printer is checked only if fail printer software is installed in Windows. The Barcode/Serial Interface is selected when a serial barcode scanner is to be used. (It must be set up according to manufacturers spec's.) The Station 2 Cal Temp Gain is to be checked only if a Station 2 temperature sensor us used. Along the bottom is the Test Bus area. Select the tests that will be used on this Baker WinTATS unit (hardware dependent). (The Armature test must be selected!)

4. This section will deal with the Lead Map and testing parameters. A copy can be obtained from Megger Baker Instruments (1-800-752-8272) if not available. Enter the correct digital output line for the lead map of the Baker WinTATS unit under program. The AST unit will not operate correctly if these numbers are not correct. In the AC HiPot block select the Max AC Current that is hardware built for this WINTATS. Consult Baker about these settings. When complete, close the folder by clicking the close folder button at the upper right corner. Select save to save the entries made to the Sysconfig0.cfg file.
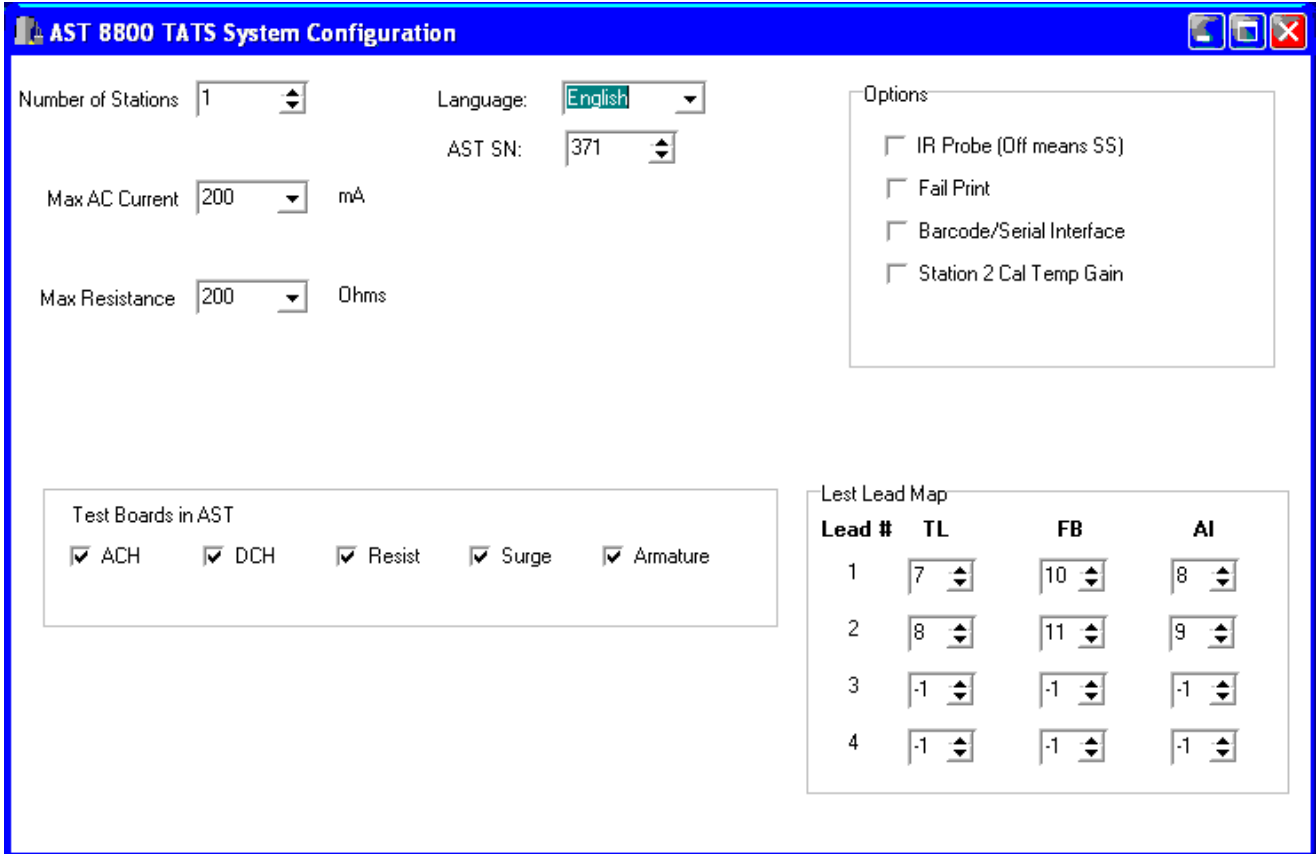

Fig 34: *SysConfig0.cfg file.*

5. Complete the programming by copying the I/Oconfig.cfg and the Sysconfig0.cfg files to the C:\Baker\Temp directory.

6. If a modem or network card is to be installed it can be done now. Power down the computer and install the hardware. Power up the computer and install the software. Set up the network as customer designs.

7. If any problems are encountered following this routine contact Megger Baker Instruments for assistance at 1-800-752-8272. Baker encourages the customer to limit the personnel allowed to access this procedure as an improper set up can render the Baker WinTATS unit unusable and possibly could damage the unit.

NOTE: For software builds that do not use a Menu lockout key it is necessary to perform this routine. Type regedit in the Start>Run box. Go to Registry\Hkey_Current_User\Software\Cobra5000\Options and right click options to ADD string value. Type CheckKeyLock and set the value to 0.

Baker WinTATS Driver Installation

1. The Baker WinTATS unit has Megger Baker Instruments computer boards used to control and analyze the tests. These boards need to communicate with the new Baker WinTATS Windows 7 software. The drivers for these boards need to be loaded.

2. Select the Start>Control Panel>Add/Remove Hardware. Launch the Hardware Wizard. Select the 'Add\ Troubleshoot New Device'. Then select 'Add New Device'. Next, choose 'No, I want to select from list' option. Select 'Other Device'. Select the 'Have Disk' option and choose the <Browse> button. Locate the .inf file in the C:\AST Driver\AST\AIO directory. Open it and select OK. The .inf is loaded but not the actual driver. Choose the <next> button and get a warning message. Click OK to see property screen, click OK. Now select <next> to Files Needed screen. Select Browse and locate the .sys file in the C:\AST Driver\AST\AIO\sys\objfre\i386 directory. Click open then click OK. Select finish. The driver is loaded. You do not have to restart the computer yet.

3. Continue to 'Add\Troubleshoot New Device', then Add New Device. Select 'No, I want to select from list' option. Now you have a new option called Baker Drivers, select this option. Select 'Have Disk' and Browse for a new .inf file located in the C:\AST Drivers\AST\DIO1 directory called Dio1_0X300.inf. Open it and click OK. Click <next> to get the warning message again. Click OK then click OK again. After clicking <next> at the files needed screen click Browse. Locate the .sys file in the C:\AST Driver\AST\DIO1\Sys\objfre\i386 directory called dio1_0X300.sys. Click open and OK to load this driver. Select finish. Do not restart computer at this time, there are more to load.

4. Continue to 'Add\Troubleshoot New Device', then Add New Device. Select 'No, I want to select from list' option. Select Baker Drivers, select 'Have Disk' and browse for a new .inf file located in C:\AST Drivers\AST\Fastatodio directory called fastatodio2000.inf. Open it and click OK. Click <next> and get warning. Click OK twice to get to Files Needed screen. Select browse to get to C:\AST Drivers\AST\Fastatodio\Sys\objfre\i386 directory and open the file fastatodio.sys. Click OK and finish.

5. Continue to 'Add\Troubleshoot New Device', then Add New Device. Select 'No, I want to select from list' option. Select Baker Drivers, select 'Have Disk' and browse for a new .inf file located in C:\AST Drivers\AST\Baker_SMC directory called Baker_SMC .inf. Open it and click OK. Click <next> and get warning. Click OK twice to get to Files Needed screen. Select browse to get to C:\AST Drivers\AST\Baker_SMC\Sys\objfre\i386 directory and open the file Baker_SMC. Click OK and finish. It is now time to restart the computer. The loaded drivers will now be linked to the Windows upon reboot.

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