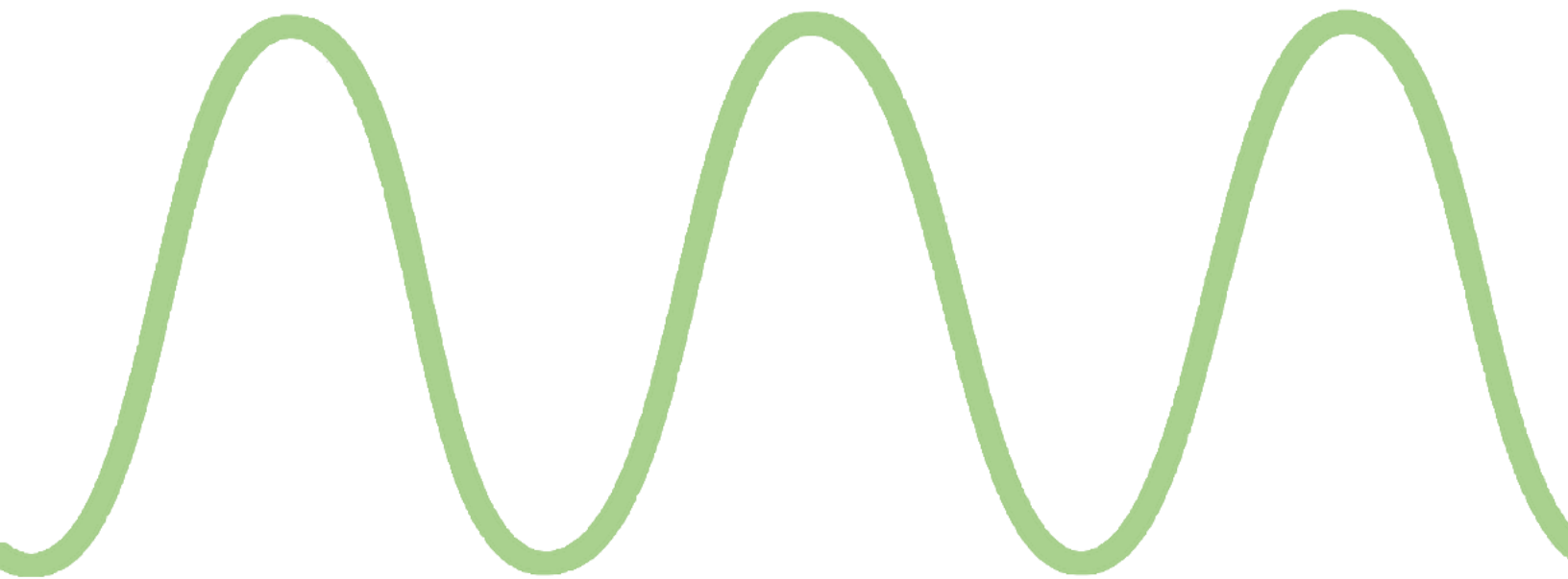


Donart Electronics
SF1 Stacking Factor Tester Manual



User's Guide

Contents

LIMITED EXPRESS WARRANTY	i
SOFTWARE LIMITED WARRANTY AND DISCLAIMER LIABILITY	i
SOFTWARE LICENSE	ii
SAFETY PRECAUTIONS	ii
AMBIENT TEMPARTURE	ii
1 Getting Started	1
Introduction	1
2 Installation	2
SF1 Overview	2
SF1 Setup	3
3 Operation	5
System Turn on	5
SF1 Software	7
Main Screen	7
Test Data Section	8
Measurements Section	9
Buttons Section	10
Settings Menu	11
Calibration Menu	13
Save Files	13
4 Maintenance	14
Test	14
5 Specifications	14
Measurable Materials	14

Test Data Reported.....	14
Repeatability.....	14
Measurement Range	14
Sample Size.....	14
Measurement time.....	14
Operating Voltage	14
Fuses.....	14
Operating temperature	14
Dimensions	14

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OTHER CONDITIONS:

This warranty allocates risks of product failure between you and DONART. DONART'S software

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In accepting this system and software, it is agreed that the purchaser will maintain the design of both hardware and software confidential except as necessary to train operators and operate the system.

COMMERCIAL SOFTWARE SUPPLIED WITH THIS SYSTEM

All commercially supplied software, if accepted, shall bind the user to the terms of the licensing agreement supplied by this software. Donart has purchased and supplied such software as was considered necessary or convenient for proper system operation. Such software has been supplied complete with instructions and license.

SAFETY PRECAUTIONS

The test console is a complex measuring system composed of a number of independent instruments and devices operated directly from or through appropriate transformers connected to a main AC power line source. Internal wiring as well as components and wiring internal to the various instruments represent potential electrical shock hazard to personnel. The instrument should not be installed or operated until all personnel concerned with installation, operation and maintenance are made aware of these potential hazards. In addition to the suggestions contained herein, all local electrical and mill codes should be carefully adhered to by properly trained personnel concerning the installation, operation and maintenance.

HAZARDOUS VOLTAGES

The exact reaction to an electrical shock can range from mild annoyance or discomfort to death. Effects of an electrical shock depend on the source of the shock, the physical condition of the individual encountering the shock, the length of time encountered, how good the electrical contact is and the individual's natural reaction to the shock among other variables. In addition to the hazard of the shock to the person receiving it, there is also the possibility of personal injury due to the physical reaction in attempting to quickly escape from the contact. As an example, voluntary or involuntary reaction to the shock can cause an individual to strike his head or other parts of his body against a cabinet or physical obstruction causing physical injury or death in addition to the specific damage caused by the shock.

In general, persons wearing pacemakers or other electrical or electronic life aid devices should not perform maintenance or operate equipment using line voltage as a primary power source. Since even mild electrical shocks can disrupt the bodies normal nerve messages, persons with nervous disorders or heart conditions should not maintain or operate this equipment.

ABOVE NORMAL BODY TEMPERATURES

Under normal operating conditions, only a few of the components in the instrument are hot enough to be uncomfortable to touch or possibly cause burns. Jerking away or

otherwise reacting to contact with these parts could cause injury to parts of the body coming in contact with the cabinet or other physical obstructions. Allow the instrument to cool before performing maintenance.

In general, both transformers and motors operate normally at higher than normal temperatures and contact with these without proper thermal protection should be avoided. In the event of equipment malfunctions or failure of parts, higher than normal temperatures could result in not only the above-named components, but additionally in wires, resistors and other normally cool parts. In the case of equipment malfunctions, exercise extra care to avoid the possibility of contact with above body temperature parts.

AMBIENT TEMPARTURE

The test console contains electronic circuitry; some portions of which are by nature temperature sensitive. The system will not maintain its full accuracy over a large temperature range. The ideal location for the unit is in an air-conditioned room. It is recommended that an attempt be made to maintain the ambient temperature at 72°F (22.2° C), plus or minus 2°F (1.0°C). The instrument should be turned on for at least 1 hour for stabilization prior to any measurement.

1 Getting Started

Introduction

Stacking factor indicates a core's effective volume when calculating for flux. Deficiencies such as oxides, roughness, insulating coatings and other conditions add to a core's volume when stacked and therefore can lead to incorrect flux calculations.

The Donart Electronics SF1 is an automated testing system for determining Stacking Factor. The user measures and weighs a standard Epstein pack and then inserts them into a slot on the side of the unit. The stack is compressed to a desired set of pressures and the distance between the jowls of the press are measured.

Using the measured stack height, stacking factor is calculated for each pressure point using the equation below.

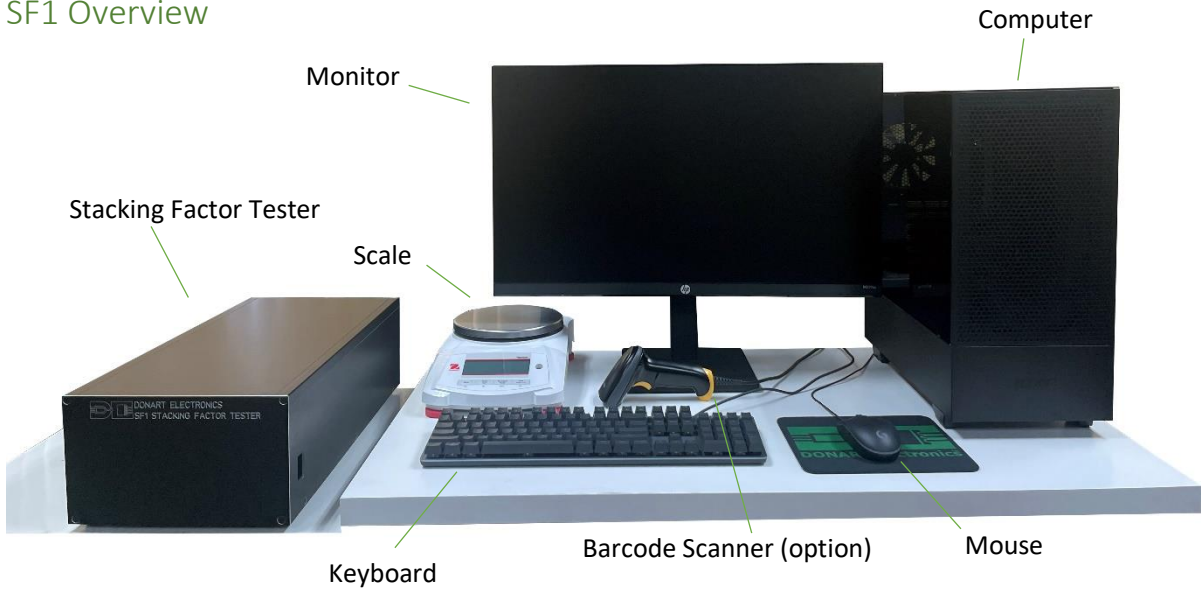
$$SF = \frac{mass}{density * height * width * length}$$

Equation 1: Stacking Factor Calculation

2 Installation

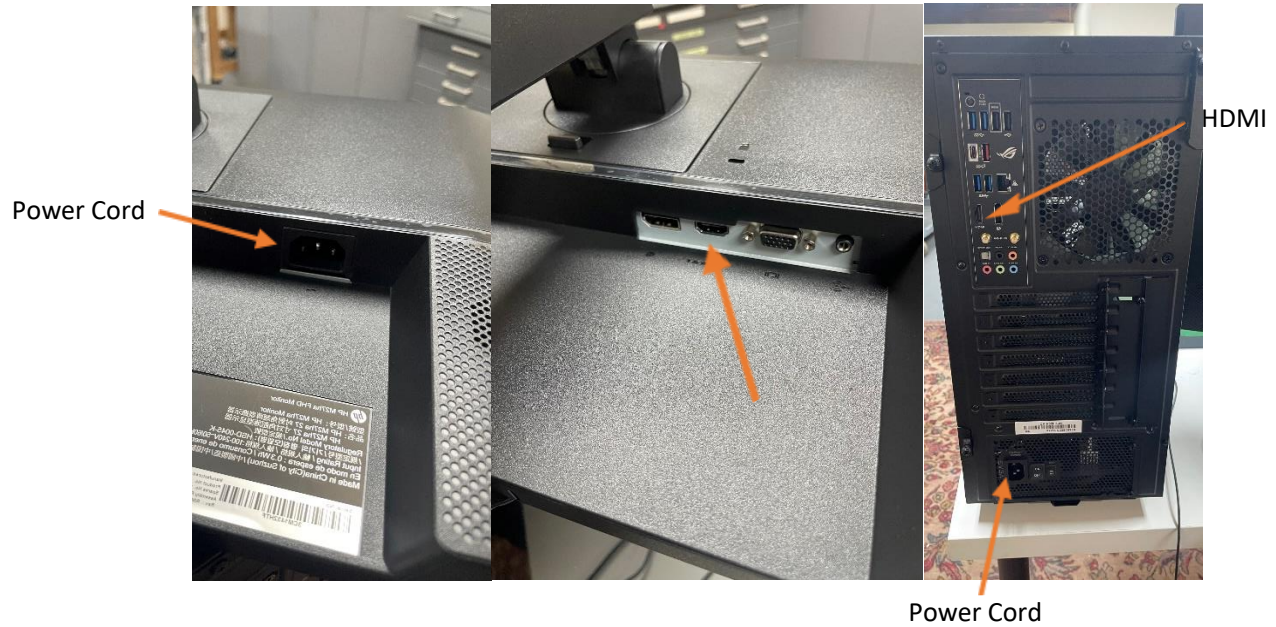
The SF1 Stacking Factor Tester comes assembled so the only installation is to install the computer system, connect testing frame and power to tester and read the following overview to identify system components.

SF1 Overview



SF1 Setup

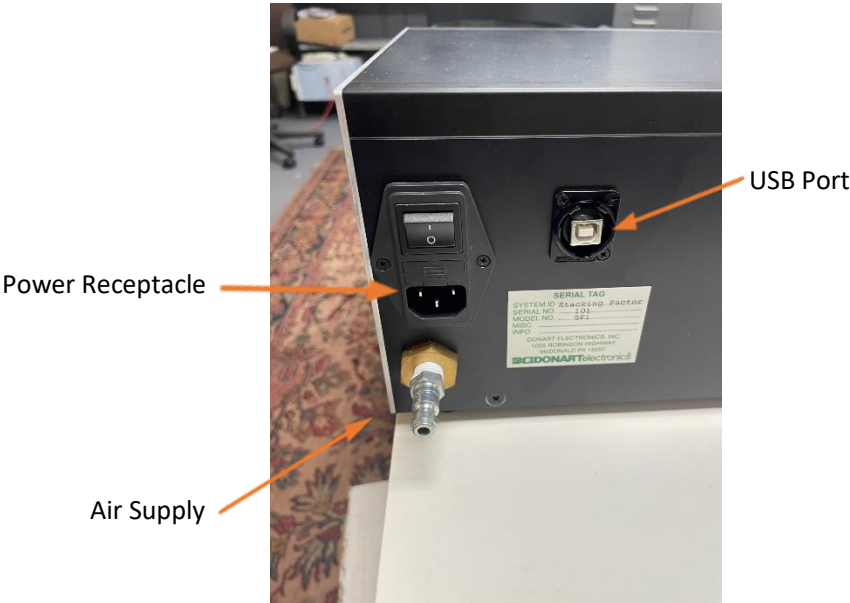
1. Set up the computer by connecting power and the HDMI cable to the monitor and then plugging the other end of the HDMI to the video card on the computer.



2. Plug the mouse/keyboard into the rear of the computer and then plug one end of the USB B cable into the rear of the computer in an open USB slot.



- 3. Plug the other end of the USB-B cable into the SF1 Tester, along with the power cable and air supply hose. Power must be 120/220 VAC and air pressure must be at least 70psi.



- 4. (optional) Plug power and USB cable into back of scale. Plug other end of power cable into wall outlet and other end of USB into an open USB port on computer.



- 5. (optional) Plug barcode scanner into an open USB port on the computer.

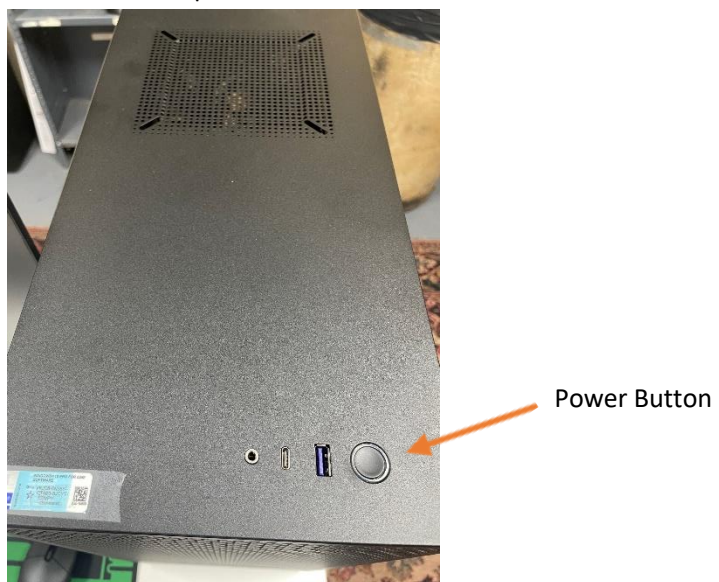
3 Operation

System Turn on

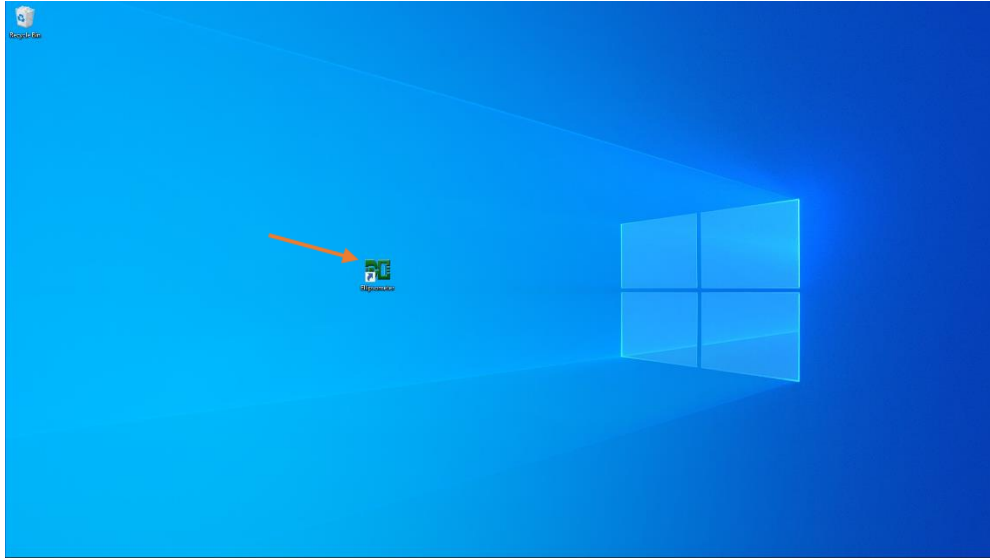
1. Flip the power switch to the on position on the back of the SF1.



2. Press the power switch on front of the computer to turn it on.



3. Select the Donart SF1 program from the desktop to load the program.



4. Insert sample by inserting sample pack into slot in side of tester



5. Testing can now begin and be initiated from the SF1 software.

SF1 Software

The SF1 software allows the user to control the tester and make stacking factor measurements from a personal computer. The software automatically calculates stacking factor as well as allows saving of data locally and over a network.

Main Screen

The screenshot shows the SF1 software interface with the following components:

- ④ File Menu:** Located at the top left, containing 'File' and 'Options'.
- ⑤ Options Menu:** A dropdown menu at the top left.
- ① Test Data:** A table for entering sample details.
- ② Measurements:** A table for recording stacking factor and stack height measurements.
- Stats:** Input fields for Average, Min, and Max values.
- ③ Buttons:** 'START', 'SAVE', and 'CLEAR' buttons on the right side.

Test Data	
Coil ID	
Density(g/cm ³)	
Weight(g)	
Pressures(lbf)	500,1450
Length(cm)	30.5
Width(cm)	3

Measurements			
	1	2	3
Stacking Factor 500 lbf(%)			
Stacking Factor 1450 lbf(%)			
Stack Height (in)			

Stats	
Average	<input type="text"/>
Min	<input type="text"/>
Max	<input type="text"/>

① Test Data

Allows the user to enter test data for each sample being tested

② Measurements

Section for obtaining a number of stacking factor measurements for a sample

③ Buttons

Used for starting test, saving and clearing of data

④ File Menu

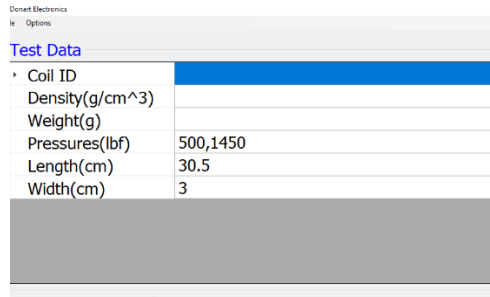
For exiting and saving

⑤ **Options Menu** Ensure the quality and efficiency of your magnetic materials with our state-of-the-art Lamination Factor Measurement Machine.

For settings and calibration menus

Test Data Section

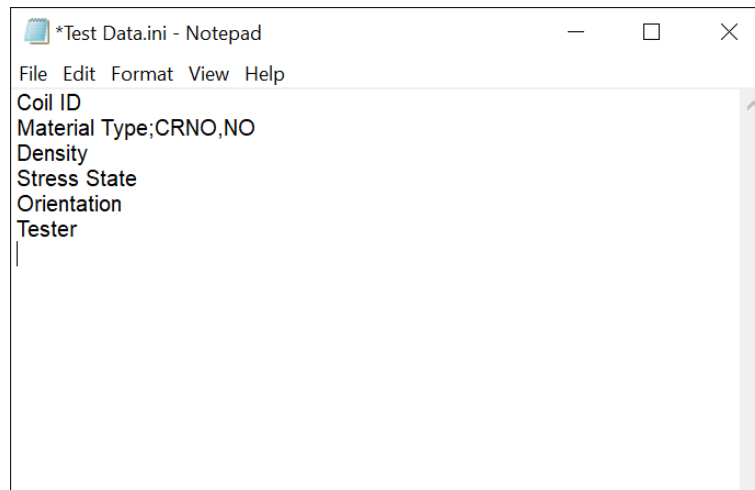
The test data section allows the user to enter informational data for the sample being tested. This test data is saved along with measurements from the current sample.



Coil ID	
Density(g/cm ³)	
Weight(g)	
Pressures(lbf)	500,1450
Length(cm)	30,5
Width(cm)	3

To enter several pressures to be tested. Enter each one separated by a comma in the order you would like them to be tested. Pressures should be in numerical order according to IEC and ASTM.

The test data can be customized by editing the testdata.ini file in the program file folder. ("C:\Stacking Factor\Test Data.ini")



```
Coil ID
Material Type;CRNO,NO
Density
Stress State
Orientation
Tester
```

For text data entries, simply enter your row name line by line.

For drop down box entries. Enter your row name followed by a semicolon and then enter each drop-down selection separated by commas. You can see an example of this in the image above for material type.


Please note that if using the barcode scanning option, you will have to set up your test data info to match your barcode or else barcode scanning will not work.

Density, weight, pressures, length, and width will always be automatically added at the end of your test data since it is required for the test.

Measurements Section

Measurements	1	2	3
Stacking Factor 500 lbf(%)			
Stacking Factor 1450 lbf(%)			
Stack Height (in)			

The measurements section allows the user to perform several stacking factor measurements for a sample. Data is automatically populated during the test in each cell.



Measurements	1	2	3
Stacking Factor 500 lbf(%)			
Stacking Factor 1450 lbf(%)			
Stack Height (in)			

To populate a cell with a measurement, click the cell to highlight it and then click the start button. The tester will begin testing and once the test is finished, the highlighted cell will be populated and then the next cell to the right will be highlighted.

Measurements	1	2	3
Stacking Factor 500 lbf(%)	96.7	96.7	
Stacking Factor 1450 lbf(%)	96.9	96.9	
Stack Height (in)	0.3001	0.3000	

Measurements	1	2	3
Stacking Factor 500 lbf(%)	96.7	96.8	
Stacking Factor 1450 lbf(%)	96.9	96.9	
Stack Height (in)	0.3001	0.3000	

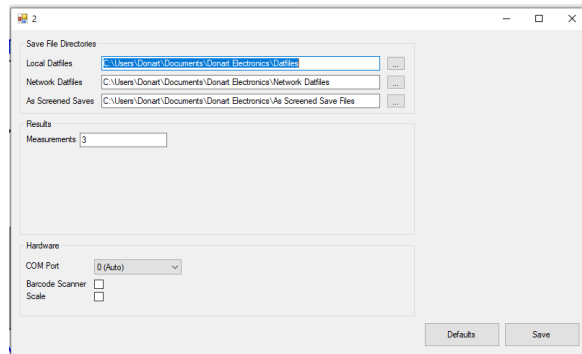
A measurement can be changed in the same manner. To retest a measurement, simply click the measurement you want to change and click start button. Once test is finished, the measurement will be updated and the next blank cell or last measurement will be highlighted.

Buttons Section



- Start/Abort
Starts test. Once clicked it will turn to an abort button to cancel test.
- Save
Saves Test data and measurements locally and over network
- Clear
Clears all entered test data, measurements and statistics

Settings Menu



The settings screen can be accessed by clicking options from the menu bar and then clicking settings.

Save File Directories

The save file directories section allows the user to change the following save file locations.

- Local Datfile Save File Location
Changes the save file location for local datfile strings
- Network Datfile Save File Location
Changes the save file location for network datfile strings
- As Screened Save File Location
Changes the save file location for as screen save files

To revert settings back to default. Click the defaults button then click save

Results

The results section allows the user to change the following results settings

- Measurements
Will change the number of measurements to be taken for each sample

Hardware

The hardware section allows the user to change settings for tester hardware

- COM Port
Changes the COM port for the Ellipsometer stepper motor. The default value (0) will automatically select the correct COM port. Only change this setting if you are experiencing problems with detecting the stepper motor.
- Barcode Scanner
Check the box if you have the barcode scanner option. This will show a scan barcode button on the main screen.
- Scale
Check the box if you have the scale option. This will show a weigh sample button on the main screen.

Calibration Menu

The calibration menu can be accessed by clicking options from the menu bar and then clicking calibration/manual controls. This menu is password protected and meant only for Donart Technicians or authorized users.

The calibration menu contains all necessary instructions and procedures for calibration of SF1.

Save Files

The SF1 Software saves two different types of files. Files are saved with the data being formatted for easy reading which are referred to as “as screened save files”. The other types are known as “dat files”. Dat files are saved as comma delimited string files that can be saved locally and over the network, so they can be parsed and entered into a database, excel, etc.

As screened Save Files

As screened save files are text files that are easily readable containing all measurements and test data. These files can be opened in any text editor program. The save file location can be edited in ERT settings

Local and Network Datfiles

Datfiles are saved in two locations which can be edited in the ERT software settings. They are comma delimited and can be parsed as follows.

X = Number of test data pieces

Y = number of measurements

1	2	...	2+x	3+x	4+x	3+x +y	4+x+y
Test Data info 1	Test Data Info 2	...	Test Data Info x	Stacking Factor Measurement 1 @ Pressure 1	Stacking Factor Measurement 1 @ Pressure 2	Stacking Factor Measurement y @ Pressure 1	Stacking Factor Measurement y @ Pressure 2

4 Maintenance

Test

Check shop air supply lines for excess water/oil. Contact Donart Electronics for yearly calibration services.

5 Specifications

Measurable Materials	Non-Oriented and Grain Oriented Electrical Steels
Test Data Reported	Stacking Factor in %
Repeatability	.1%
Measurement Range	0 – .875" (total stack thickness)
Sample Size	3cm x 30cm Epstein Strip
Measurement time	<10 Secs
Operating Voltage	120/220 VAC
Fuses	Cartridge Fuses 250 V 3A 5x20mm Fast Acting
Operating temperature	70°F±10°F
Dimensions	Control Box 6.5"x21.5"x10.25" (HxWxD)