MOTOR CORE LOSS TEST SET MANUAL

Model Number CL125B

Version 1.2

MOTOR CORE LOSS TEST SET

Model Number   CL125B

Serial Number

Customer

Customer Purchase Order

Manufacturing Date

CL125B

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SECTION 1: DANGER / WARNINGS

WARNING !!

DANGER

Complete Grounding of this unit is necessary for the safe operation of this equipment. Disconnect inputs before ungrounding this equipment

DANGER / WARNINGS

GENERAL SAFETY PRECAUTIONS

This equipment is capable of providing POTENTIALLY LETHAL VOLTAGES! Improper operation or test practices may result in injury or death to the operator or surrounding personnel.

The operation of High Voltage test equipment should only be performed by personnel familiar with HIGH VOLTAGE testing and safety procedures. The operator of this equipment must be aware of all hazards associated with High Voltage testing. The operator is responsible for himself and others in close proximity of the testing area.

Some General Safety Practices for working with High Voltage Test Equipment have been listed below for your reference.

- **Become familiar with your instrument before performing an actual test**
- **Know your work area, check that all circuits are de-energized and locked out.**
- **Never work alone; always work with another qualified worker.**
- **Mark off entire work area with barriers and warning tape.**
- **Make all personnel aware of your testing activities.**
- **Be aware of dangerous conditions that may arise from energizing a test specimen.**
- **Never modify test equipment; modifications to equipment could introduce an unknown hazard or hinder a designed-in safety feature.**
- **DO NOT operate damaged equipment. Remove power, and do not use the equipment until safe operation can be verified by service-trained personnel.**

Phenix Technologies, Inc. assumes no liability for unsafe or improper use of test equipment.

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SECTION 2: SPECIFICATIONS
MODEL CL125B

Motor Core Loss Test Set with continuously variable output voltage and instrumentation for measurement of motor core losses.

INPUT: 440/480 VAC, 300 A, 60 Hz, 1-phase *or* 400 VAC, 300 A, 50 Hz, 1-phase (factory configured)
AC OUTPUT: 5 minutes ON / 15 minutes OFF

				CL125B											
	TAP	STEP			50 Hz				TAP	STEP			60 Hz		
OUTPUT	25 V	1	0	-	5	VAC	@	4200 A	30 V	1	0	-	6	VAC	@	4200 A
		2	5	-	10	VAC	@	4200 A		2	6	-	12	VAC	@	4200 A
		3	10	-	15	VAC	@	4200 A		3	12	-	18	VAC	@	4200 A
		4	15	-	20	VAC	@	4200 A		4	18	-	24	VAC	@	4200 A
		5	20	-	25	VAC	@	4200 A		5	24	-	30	VAC	@	4200 A
	50 V	1	0	-	10	VAC	@	2100 A	60 V	1	0	-	12	VAC	@	2100 A
		2	10	-	20	VAC	@	2100 A		2	12	-	24	VAC	@	2100 A
		3	20	-	30	VAC	@	2100 A		3	24	-	36	VAC	@	2100 A
		4	30	-	40	VAC	@	2100 A		4	36	-	48	VAC	@	2100 A
		5	40	-	50	VAC	@	2100 A		5	48	-	60	VAC	@	2100 A
	75 V	1	0	-	15	VAC	@	1400 A	90 V	1	0	-	18	VAC	@	1400 A
		2	15	-	30	VAC	@	1400 A		2	18	-	36	VAC	@	1400 A
		3	30	-	45	VAC	@	1400 A		3	36	-	54	VAC	@	1400 A
		4	45	-	60	VAC	@	1400 A		4	54	-	72	VAC	@	1400 A
		5	60	-	75	VAC	@	1400 A		5	72	-	90	VAC	@	1400 A

INSTRUMENTATION:

AC Voltmeter: Digital, displayed on computer screen, true RMS

AC Currentmeter: Digital, displayed on computer screen, true RMS

AC Kilowattmeter: Digital, displayed on computer screen

STANDARD DESIGN AND SAFETY FEATURES:

* Main power circuit breaker with indicator lamp
* Fused control power circuits
* Emergency OFF pushbutton control
* External interlock provision
* Thermal overload protection
* Rugged steel cabinet with casters
* Separate voltmeter leads for greater meter accuracy
* 8-foot output cable
* [OPTIONAL] Computer with printer
* Control and data base software

Dimensions: 45 1/8" W x 26 3/4" D x 48 5/8" H; Weight: 1500 pounds
                  1143 mm W x 685 mm D x 1244 mm H; 680 kg.

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SECTION 3: CONTROL PANEL DESCRIPTION
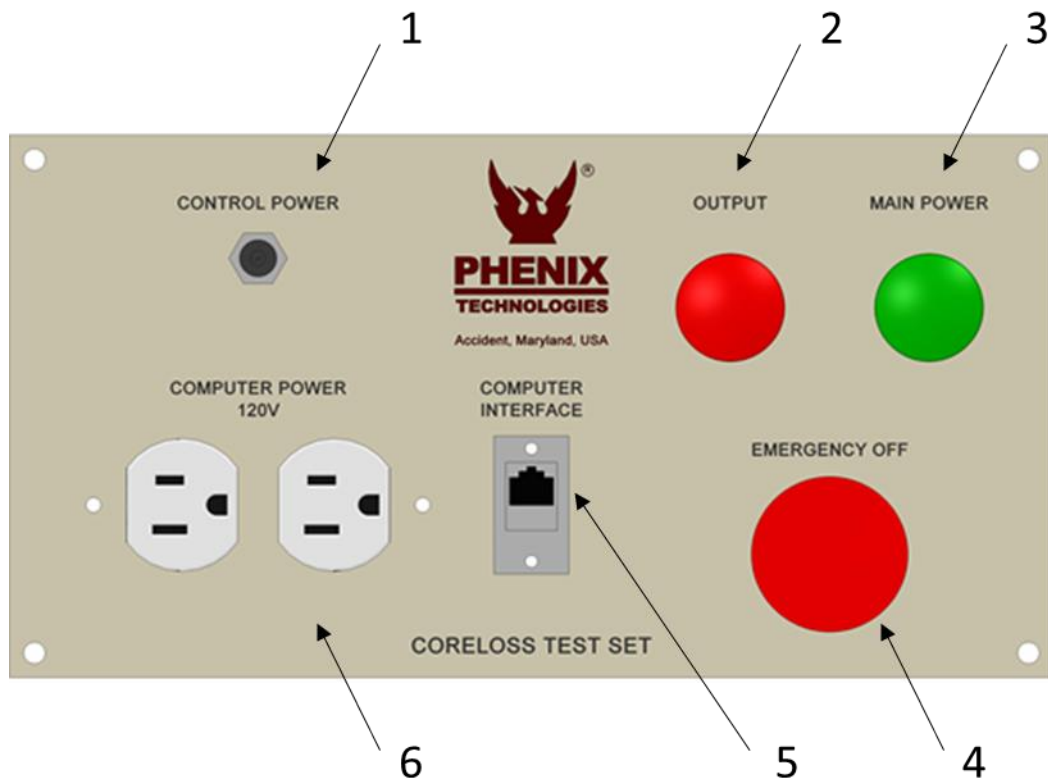
1. CONTROL POWER FUSE: Provides protection for all control and metering circuits including the 120 VAC outputs for the computer and printer

2. OUTPUT LAMP: Indicates that the test set output is energized.

3. MAIN POWER LAMP: Indicates that the main power circuit breaker is on and control power is available.

4. EMERGENCY OFF PUSHBUTTON: De-energizes the output of the test set.

5. DATA CONNECTOR (CX1): CAT5 connector used to interface the computer with the internal Programmable Logic Controller (PLC).

6. DUPLEX OUTLET: 120 VAC convenience outlet for the computer and printer. Fused at 3 Amperes.

(Not Shown: COMPUTER: Controls all functions, displays all metering, and records test results.)

SECTION 4: INSTALLATION

1.   Position the test set in the desired location.

2.   Connect the main service green lead to the main power ground.

3.   Connect the main service leads to the main power source. See the Specifications (Section 2) of this manual for the main power source requirements.

SECTION 5: INTRODUCTION

The Phenix Technologies Core Loss Test Set is a continuously variable low voltage, high current power supply for testing stators, rotors, and armature cores. The basic test set includes complete instrumentation, output and voltmeter cables, computer, and printer. The computer is used for complete control, metering, data storage, and evaluation of test results.

The test set is used to energize the motor core steel to 85 kilolines per square inch flux density while measuring the applied voltage, current, and power. The test voltage required to excite the core to 85 kilolines per square inch flux density is calculated by the computer based on the core dimensional data which is manually entered by the operator.

Actual test data (volts, amps, watts) is automatically entered into the computer during the test. The computer then takes the test data and calculates apparent power factor and the watts per pound of core weight.

A number of factors can influence the readings obtained from *good* motor cores. These factors range from manufacturers design criteria, to type of core steel, to steel stamping and assembly process. The computer bases its pass/fail criteria on the following generally accepted levels of core performance:

Apparent Power Factor: 0.1 to 0 .7 Good
        0.7 to .9   Marginal
        0.9 to 1.0   Bad

Watts per Pound: 1-6 W/lb.   Good
        6-10 W/lb.   Marginal
        >10 W/lb.   Bad

In all cases, the computer will allow you to perform a hot spot check by physically checking the core for any localized areas of heating. If areas are found, they should be marked for further inspection and possible repair.

SECTION 6: SET-UP PROCEDURE

1. Connect the data cable (ETHERNET) between the computer and the CX1 connector on the Core Loss Tester control panel.

2. Connect the printer cable between the computer and the printer.

3. Connect the computer's power input/power supply cable and the printer's power cable to the 120 VAC outlets located on the Core Loss Tester control panel.

4. Place the Core Loss Tester main breaker to the ON position. Turn on the computer and printer.

5. After the computer startup is complete, click the WinCore icon to launch the system software.

6. Please see Section 8-1 SOFTWARE for a more detailed description of the WinCore software.

SECTION 7: STATOR TEST PROCEDURE

1. On the main screen of WinCore, select *Stator* as the Core Type.

2. In the Work Order Number box, click the *New…* button. Enter the Work Order Number. This number will identify the test on the test results screen. Optionally, you may then enter a Report ID. This field gives you the ability to perform and save multiple tests under the same Work Order Number.

3. In the Customer box, click *Lookup…* to browse your customer list to find the customer you are testing for; or, if it is a new customer then click *New…* to add it.

4. In the Motor box, click *Update…* to browse your motor list to find the motor configuration you wish to test; or, if it is a new motor type then click *New…* to add it. Measure the core and enter the dimensions for each of following parameters:

    Length of Core
    Core Diameter
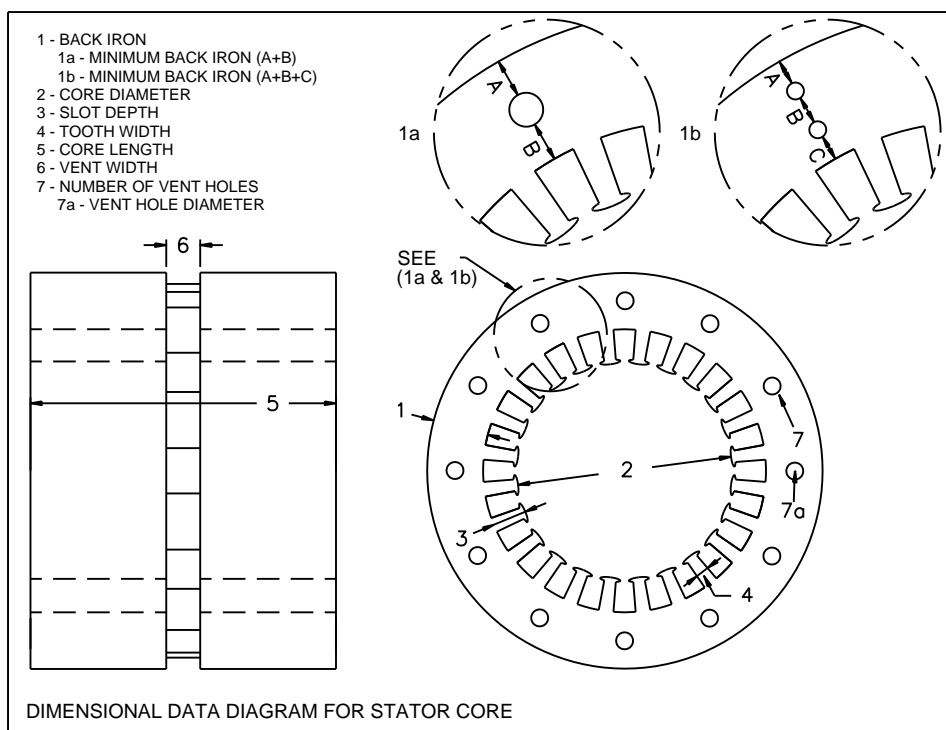   Back Iron Width
    Slot Depth
    Vent Width (If no vents exist, leave blank)
    Number of Vents (If no vents exist, leave blank)
    Number of Vent Holes (If no vent holes exist, leave blank)
    Vent Hole Diameter (If no vent holes exist, leave blank)

1 - BACK IRON
  1a - MINIMUM BACK IRON (A+B)
  1b - MINIMUM BACK IRON (A+B+C)
2 - CORE DIAMETER
3 - SLOT DEPTH
4 - TOOTH WIDTH
5 - CORE LENGTH
6 - VENT WIDTH
7 - NUMBER OF VENT HOLES
  7a - VENT HOLE DIAMETER

DIMENSIONAL DATA DIAGRAM FOR STATOR CORE

5. Click on *Automatic Core Loss* Test to proceed with the test. The computer calculates the test voltage required to produce the desired flux density in the back iron and recommends the appropriate output tap. It will then prompt the operator to connect the output power and voltmeter cables.
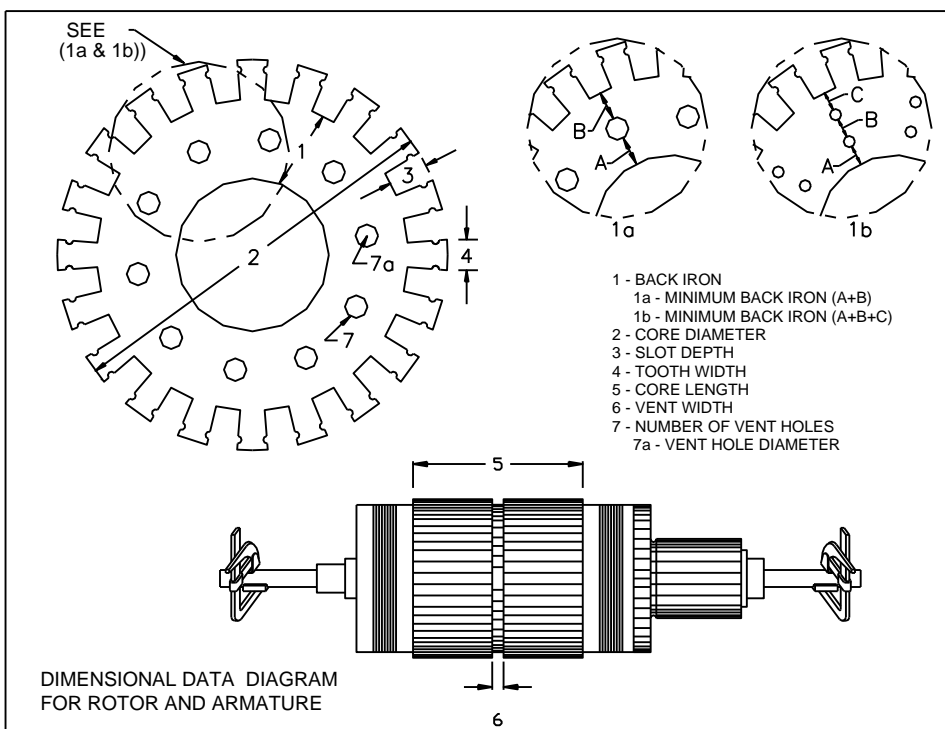
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STATOR TEST PROCEDURE

6. Place the output power cable loop through the center of the stator. Connect the free end of the power cable to the voltage tap specified by the computer.

7. Place the voltmeter cable thru the center of the stator. Plug the ends of the voltmeter cable into the common voltmeter terminal and the voltmeter terminal corresponding to the voltage tap being used.

8. Click *Begin Test* to proceed with the test. The Core Loss Tester will automatically ramp up the voltage to the calculated target value. The meter readings and calculations are continually updated in real time. When the target voltage is reached, the tester will remove the excitation voltage and ramp back down to zero. All readings and calculations on the screen will be held.

9. Click on the *Hot Spot Test* tab; the Hot Spot Test page will appear. Click *Begin Test* to proceed with the test.

10. The Test Set will automatically ramp up the output current to the target current which is between two and three times the core loss test measurement, but not exceeding the rated current of the test set.

11. Click *Test Complete* after sufficient time has elapsed to create any hot spots in the core. The test set will now remove the output and ramp back down to zero. Examine the core for hot spots then record your findings.

12. Click *Save* to save your test results.

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SECTION 8: ARMATURE / ROTOR TEST PROCEDURE

1. On the main screen of WinCore, select *Rotor* as the Core Type.

2. In the Work Order Number box, click the *New…* button. Enter the Work Order Number. This number will identify the test on the test results screen. Optionally, you may then enter a Report ID. This field gives you the ability to perform and save multiple tests under the same Work Order Number.

3. In the Customer box, click *Lookup…* to browse your customer list to find the customer you are testing for; or, if it is a new customer then click *New…* to add it.

4. In the Motor box, click *Update…* to browse your motor list to find the motor configuration you wish to test; or, if it is a new motor type then click *New…* to add it. Measure the core and enter the dimensions for each of the following parameters:

    Length of Core
    Back Iron Width
    Core Diameter
    Slot Depth
    Vent Width (If no vents exist, leave blank)
    Number of Vents (If no vents exist, leave blank)
    Number of Vent Holes (If no vent holes exist, leave blank)
    Vent Hole Diameter (If no vent holes exist, leave blank)

SEE
(1a & 1b))

1a   1b

1 - BACK IRON
  1a - MINIMUM BACK IRON (A+B)
  1b - MINIMUM BACK IRON (A+B+C)
2 - CORE DIAMETER
3 - SLOT DEPTH
4 - TOOTH WIDTH
5 - CORE LENGTH
6 - VENT WIDTH
7 - NUMBER OF VENT HOLES
  7a - VENT HOLE DIAMETER

DIMENSIONAL DATA DIAGRAM
FOR ROTOR AND ARMATURE

5. Click on *Automatic Core Loss* Test to proceed with the test. The computer calculates the test voltage required to produce the desired flux density in the back iron and recommends the appropriate output tap. It will then prompt the operator to connect the output power and voltmeter cables.

ARMATURE/ROTOR TEST PROCEDURE

6. Connect one "C" type rotor clamp to the connector on the end of the cable, which is hard-wired to the test set. Attach the clamp to the rotor shaft. Connect the other "C" clamp to the opposite end of the rotor shaft; connect the cable plug to the voltage tap specified by the computer.

7   Place the voltmeter lead through the spokes. If this is not possible, use a second set of voltmeter leads (with clips on the ends) and clip the voltmeter leads to the shaft clamps. Plug the ends of the voltmeter cable into the common voltmeter terminal and the voltmeter terminal corresponding to the voltage tap being used.

8. Click *Begin Test* to proceed with the test. The Core Loss Tester will automatically ramp up the voltage to the calculated target value. The meter readings and calculations are continually updated in real time. When the target voltage is reached, the tester will remove the excitation voltage and ramp back down to zero. All readings and calculations on the screen will be held.

9. Click on the *Hot Spot Test* tab; the Hot Spot Test page will appear. Click *Begin Test* to proceed with the test.

10. The Test Set will automatically ramp up the output current to the target current which is between two and three times the core loss test measurement, but not exceeding the rated current of the test set.

11. Click *Test Complete* after sufficient time has elapsed to create any hot spots in the core. The test set will now remove the output and ramp back down to zero. Examine the core for hot spots then record your findings.

12. Click *Save* to save the test results.

SECTION 9: SOFTWARE

WinCore was developed to be used with the Phenix Technologies' automatic core loss tester. This software was designed for maximum user flexibility. You may run fully automatic tests, operate the tester with the manual controls, or perform tests with a mixture of both approaches.

Installation

If you have purchased a new core loss test set, then WinCore will be pre-installed and tested on the accompanying notebook computer. No further software installation or setup is required. If you ever need to re-install the software, here are the system requirements and the installation procedure.

Minimum System Requirements:

- Intel Compatible Windows Computer
- 8 GB of system RAM or greater
- 50 MB available hard disk space
- Microsoft Windows 11, 10 or 7

Additional Hardware Requirements:

The computer must have one Ethernet port available.
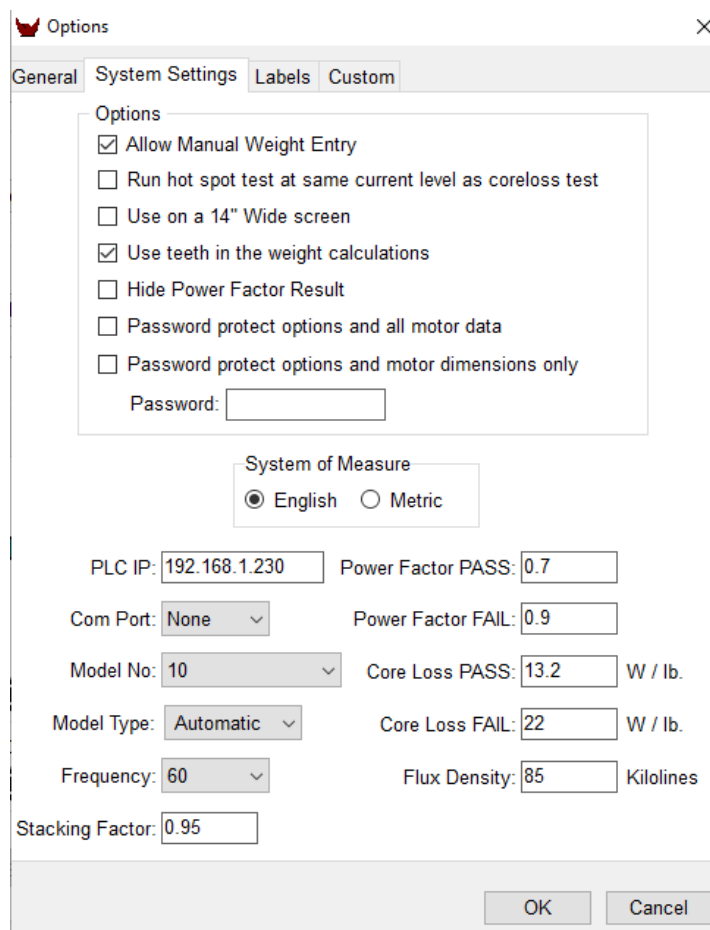
To Install WinCore:

1. Insert the WinCore program in USB drive.
2. Click Start, then choose Run.
3. Type 'd:setup' and click *Ok*. NOTE: 'd:' is the drive specification.
4.   Follow the installation instructions as they appear on the screen.
5. When the installation is complete, double-click on the "WinCore" icon to launch the software.

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System Configuration

Before you can use WinCore on a new installation, you must first configure the software to match the hardware configuration of your tester. Configure WinCore by using the setup screen *System Settings*. Access this screen from the main screen of WinCore by clicking the *Options* button, then *System Settings* tab.
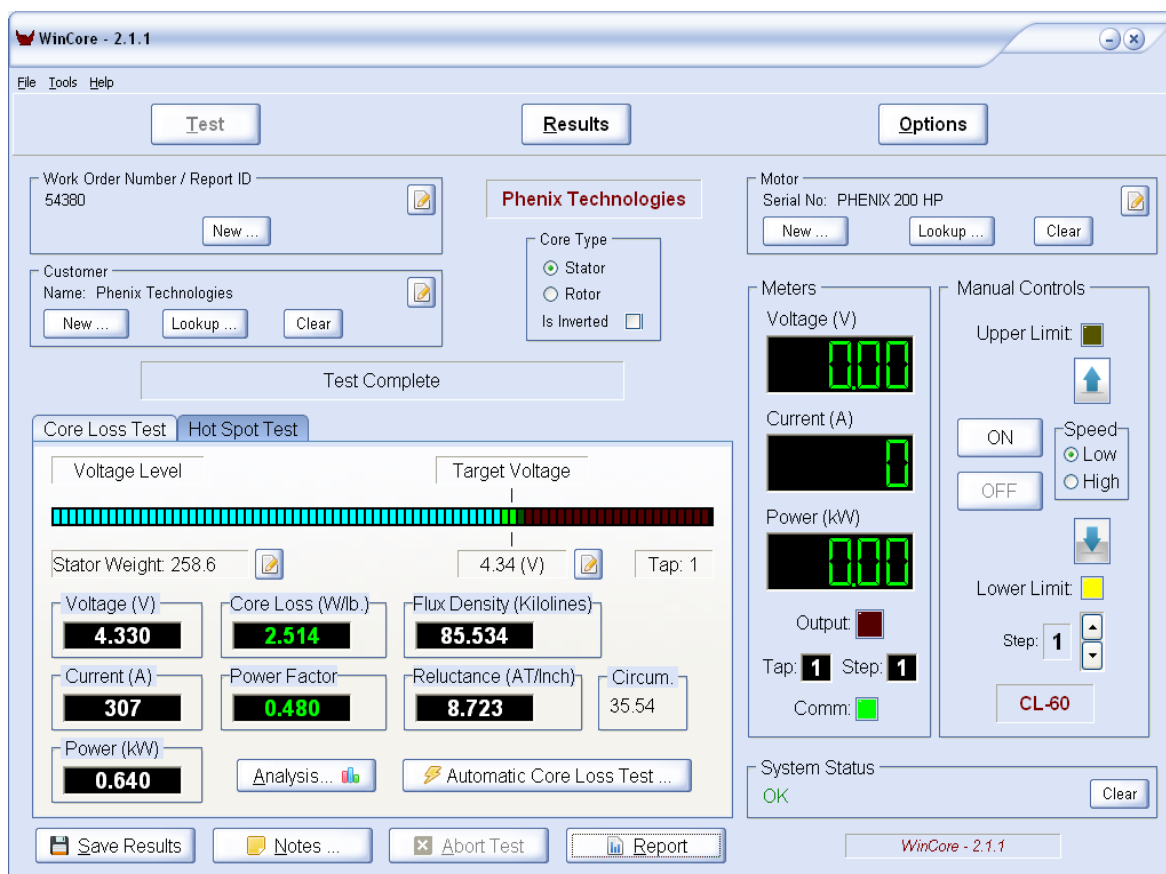

The System Settings Configuration screen

The System Settings screen contains hardware and test parameter information. The default settings are appropriate for most installations. The *Model No* setting MUST be changed to match your core loss tester.

Model No: This setting **must** match the model number of your core loss tester.

PLC IP: The IP address of the PLC inside the core loss tester. The default is shown above.

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The main screen of WinCore is shown above. The Results button will take you to the test results screen. The Test button will return you to the main test screen. The Options button will open the system settings and user options screen.

WinCore has a flexible user interface that accommodates fully automatic testing while permitting pure manual control of the output supply. You may manually enter the test set points and core weight, or have these values calculated from the motor dimensions that you enter.

If you wish, you may save the test results under a work order number and report ID combination, but this is not required. You may also enter the customer and motor nameplate information, but again this is not required. You may enter all data, perform automatic tests then save and generate a report. Or, you may simply run a manual test discarding the results.

Performing a Test

The following is the step-by-step procedure for automatically testing a core. The main screen contains all the appropriate test information.

1. In the Work Order Number box, click the *New…* button. Enter the Work Order Number. This number will identify the test on the test results screen. Optionally, you may then enter a Report ID. This field gives you the ability to perform and save multiple tests under the same Work Order Number.

2. In the Customer box, click *Lookup…* to browse your customer list to find the customer you are testing for; or, if it is a new customer then click *New…* to add it.

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3. In the Motor box, click *Update…* to browse your motor list to find the motor configuration you wish to test; or, if it is a new motor type then click *New…* to add it.

4. Click on the Core Type that identifies the type of core you will be testing; stator or rotor and whether or not it is an inverted core. An example of an inverted core is a core that is actually a stator that looks like a rotor.

5. Click on *Automatic Core Loss* Test to proceed with the test.

6. The Begin Test screen will appear. The Test Voltage Level and recommended output tap will be displayed on the top of this screen. Click *Begin Test* to initiate the automatic Core Loss test.

7. The Test Voltage Level will be displayed on the top of this screen. Click *Begin Test* to initiate the automatic Core Loss test.

5. After the test is complete, click *Analysis* to view the core loss test results.

6. Click the *Hot Spot Test* tab to perform an automatic hot spot test. Then click on *Automatic Hot Spot Test…* the Begin Test screen will appear.

7. The target current level and recommended output tap will be displayed in the top of the screen (between 2 and 3 times the core loss test current level). Click *Begin Test* to initiate the automatic hot spot test.

8. The timer will begin once the two times target level has been reached. Click *Test Complete* when you are done ; the timer will stop.

9. Check for hot spots and record your findings in the *Hot Spot Findings* box.

10. Click on *Notes...* to add any additional test notes.

11. Click *Save* to save all the test results.

12. Click *Report* to generate a test report. You may view the report on screen or send it to the printer.

Printing a Previous Report

You may generate a report from any test result that is saved in your test history.

1. On the opening screen of WinCore, click the *Results* button. The Test Results screen will appear.

2. Browse the test results to find the test result you wish to print. The most recent test will already be highlighted.

3. Click *Report* to generate the test report. Click *Edit Notes...* to view or edit the test notes. Click *Other Data …* to add / edit the winding and no-load test information.
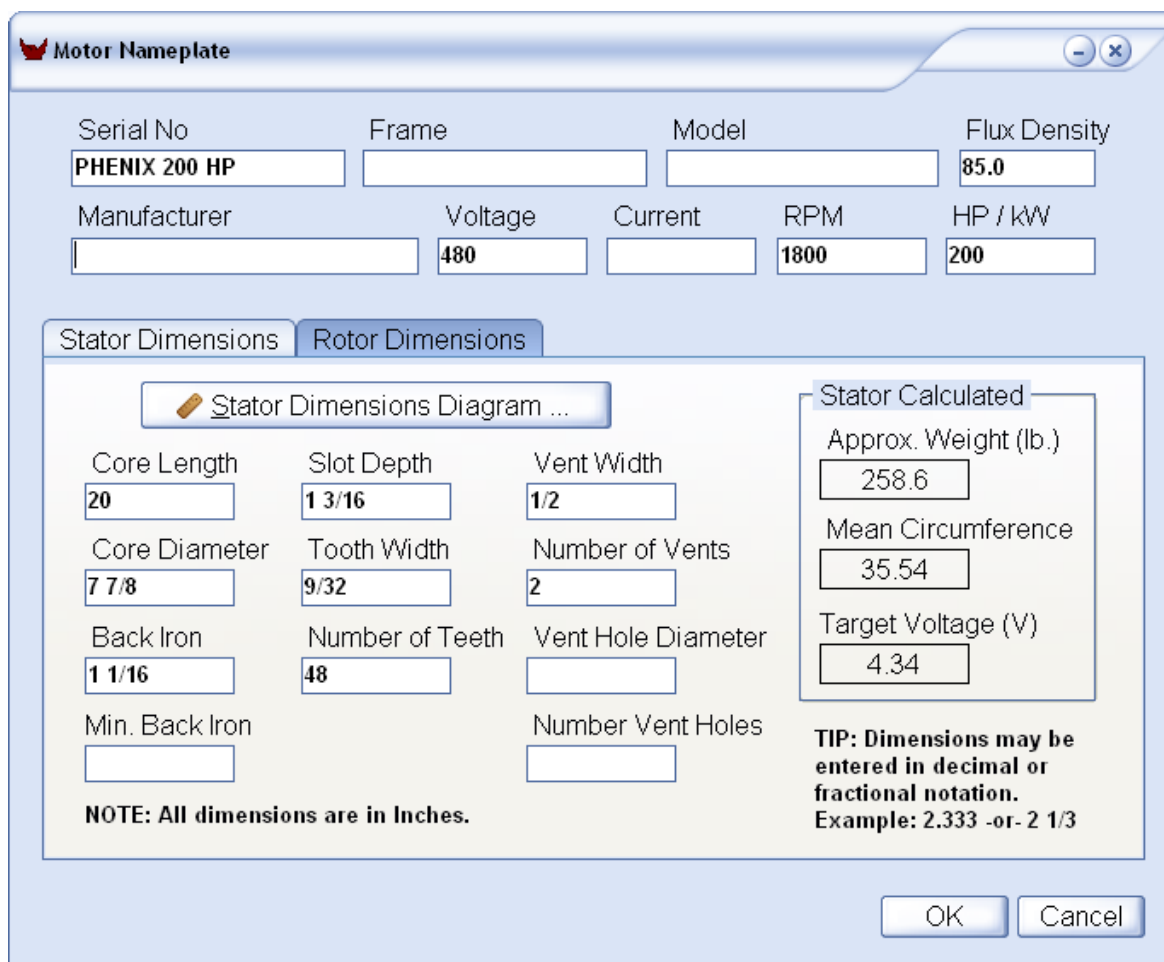
> **NOTE**
> You may change the order in which the results appear by changing the *Sorted By* control.

SOFTWARE

Motor Nameplate Data

The motor nameplate screen is where you add or modify a motor configuration.

The Motor Nameplate screen

Serial Number: This field is used as the primary identifier, it identifies a given motor configuration. A value is required here and it must be unique.

All other fields are optional. They may be used to identify the size of the motor. The Flux Density field may be used to cause this motor to be tested at a different flux density level than the system default.

Stator Dimensions: Click to display the stator dimensions page. This page contains the measurements of the stator and calculates the approximate weight, the mean circumference, and the appropriate test voltage level.

Stator Dimensions Diagram …Click to display an image that shows the location of each dimension on the stator.

Dimensions may be entered in decimal or fractional notation. For example: a measurement of 2 and one-third inches may be entered as "2.333" or "2 1/3."

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<table>
<tr><td>

NOTE
The format "2 1/3" must be strictly followed. A space is required between the whole and fractional parts. To see the decimal equivalent of a fraction, hold the cursor on the field for about one second. A yellow box containing the decimal equivalent will appear.

</td></tr>
</table>

Rotor Dimensions: Click to display the rotor dimensions page. This page contains the measurements of the rotor and calculates the approximate weight, the mean circumference, and the appropriate test voltage level.

The Core Loss Test

The core loss test page displays the test set meters, the core loss calculations, and the target voltage and voltage tap. The meter readings and calculations are continually updated in real time.
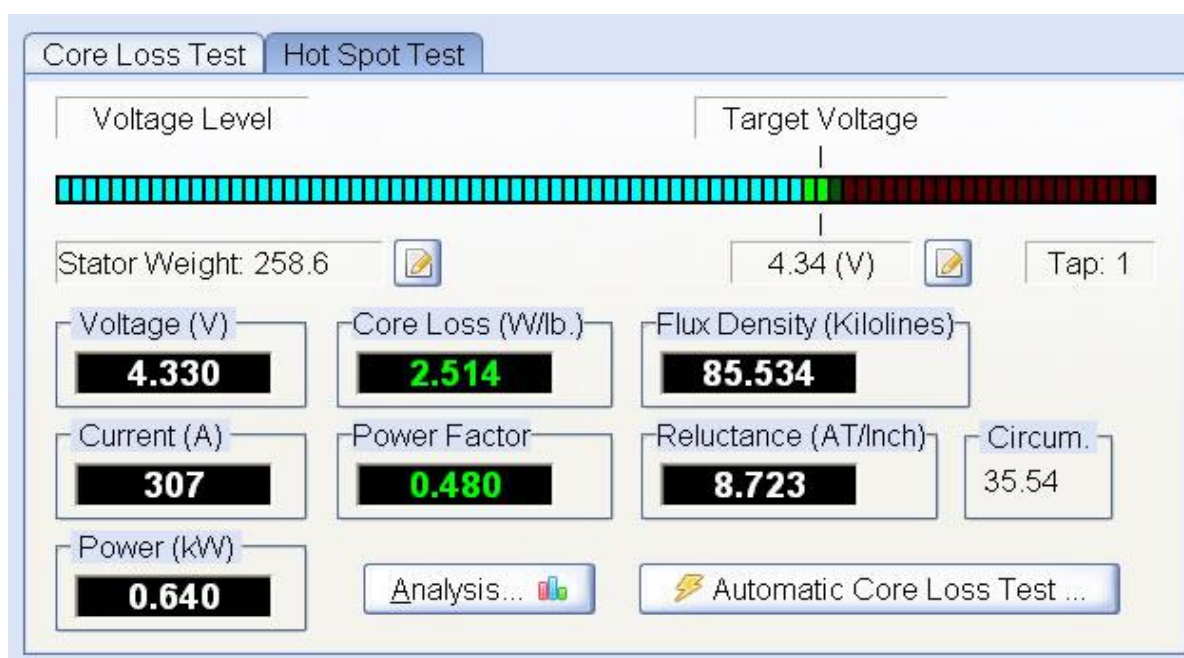
The Core Loss Test screen

Target Voltage: The voltage level that will produce the desired level of flux density in the core (usually 85 kilolines square inch / 1.32 T).

Analysis: Click to see a graphical view of the core loss test results. The power factor and core loss results are displayed in bar graphs stamped with acceptable, marginal, and unacceptable markings.

Hot Spot Test: Click to perform a hot spot test (recommended). The hot spot test page will appear.

Notes: Click to edit the test notes.

Report: Click to generate a report of the current test results. The report may be reviewed on the screen or sent to the printer.

Save Results: Click to save test results

Abort Test: Click to immediately cancel the automatic test.

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The Hot Spot Test

The hot spot test page displays the output current, the target current level, the hot spot findings, and the timer.

The Hot Spot Test Screen

Current Level: Shows the target current level for the test, between two and three times the core loss test current level, but not exceeding the rated current of the test set.

Long Duration Test: Check this if you will be running the hot spot test for an extended period of time. This will reduce the test current level down to the core loss test current level.

Timer: The duration of the test. Timer starts counting once the output current reaches the 2 times current level or when you click the Start button.

Hot Spots Findings: A text box where you may enter a description of the hot spot test findings.

None Found, Has Hot Spots: Click to add this text to the findings text box.

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Options

Use the general options screen to change the header that appears at the top of the test reports and to control various report options. Access this page by clicking *Options* then the general tab.

The General Options screen
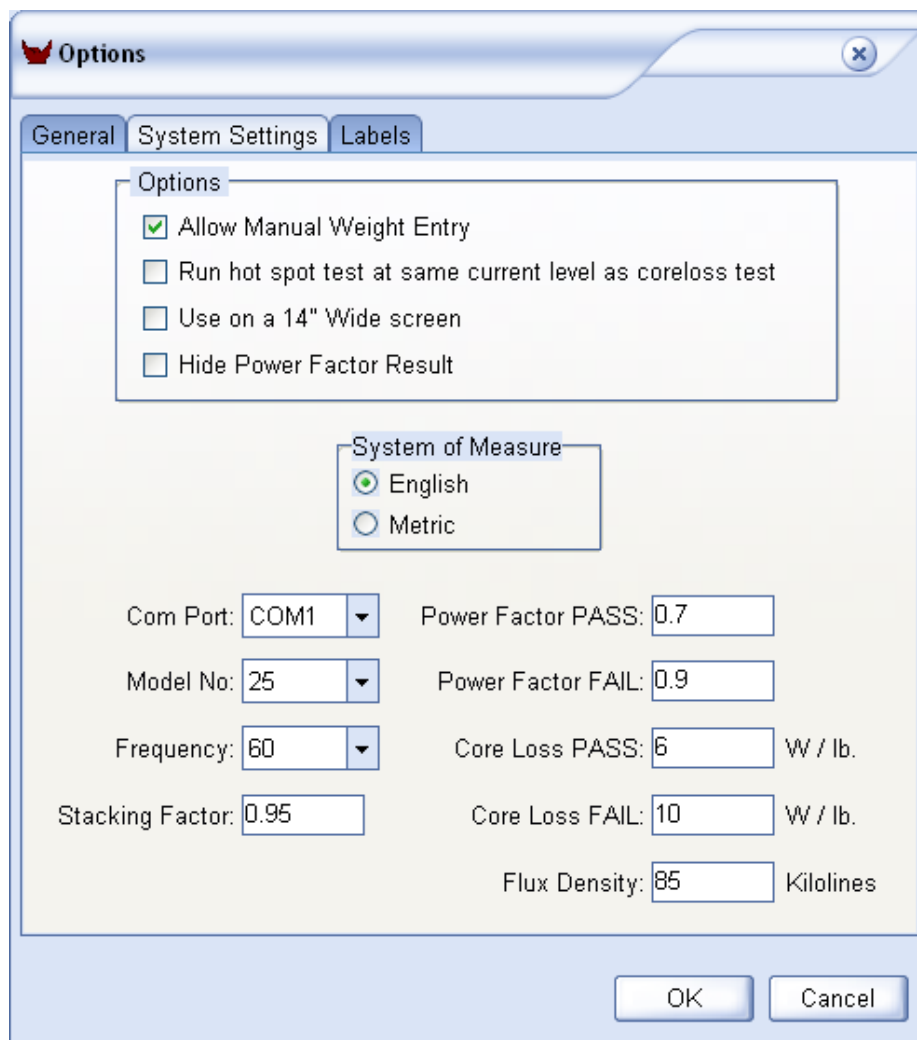
Logo File Name: **Full path to the location of a company logo bitmap file (BMP) that will be displayed in the upper left hand corner of the test report. It is your responsibility to adjust the size of the bitmap file so that it fits in the allocated space. If you place the file in the main program folder (C:\Programs Files\WinCore) than you only need to enter the filename.**

Data Path: The location of the WinCore database files. You are responsible for moving all the data files if you change this path.

SOFTWARE

System Settings

Use the System Settings page to control system functions. Access this page by selecting <u>O</u>ptions and then *System Settings.*

The System Settings page

System of Measure: The measuring system you use to measure the cores, normally set during installation.

> **NOTE**
> Changing the system of measure after motor dimensions have been entered will cause data to become invalid. Dimensions are NOT automatically converted.

Com Port: The serial port designation that the USB-to-Serial converter is configured to use. This information can be found in the Windows Device Manager under Ports.

Model No: The model number of your test set. This setting is critical to the software as it needs to know what the output capabilities of the test set are.

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Frequency: The frequency of your input line voltage (default is 60).

Stacking Factor: Factor used in the volume calculations that compensates for the "air" in the lamination steel (default is 0.95).

Allow manual Weight Entry: Normally, the software calculates the weight from the given dimensions. If checked, the user may over-write this calculated value with an actual measured value.

Run hot spot test at same current level as core loss test: Normally, the hot spot test is performed at a current level that is 2-3 times the core loss test current level. If checked, it is run at the same current level as the core loss test.

Use on a 14" Widescreen: Check this if your notebook computer has a smaller 14" widescreen display. The main screen will be resized to fit the display.

Hide Power Factor Result: Check this if you do not want to see the calculated power factor and do not want the power factor printed on the test report.

Power Factor PASS: The maximum power factor value that is considered acceptable or "good" (default is 0.7).

Power Factor FAIL: The maximum power factor value that is considered marginal (default is 0.9).

Core Loss PASS: The maximum core loss value that is considered acceptable or "good" (default is 6 W/lb, 13.2 W/kg.).

Core Loss FAIL: The maximum core loss value that is considered marginal (default is 10 W/lb., 22 W/kg.).

Flux Density: The level of flux density that is required for the core loss test. The target voltage is computed to achieve this value (default is 85 kilolines per square inch, 13.2 kilo Gauss / 1.32 T).

SOFTWARE

Manual Controls

Manual control of the automatic core loss tester is made possible by the controls in the Manual Controls box, located on the main screen. These controls are inactive when an automatic test is in progress.
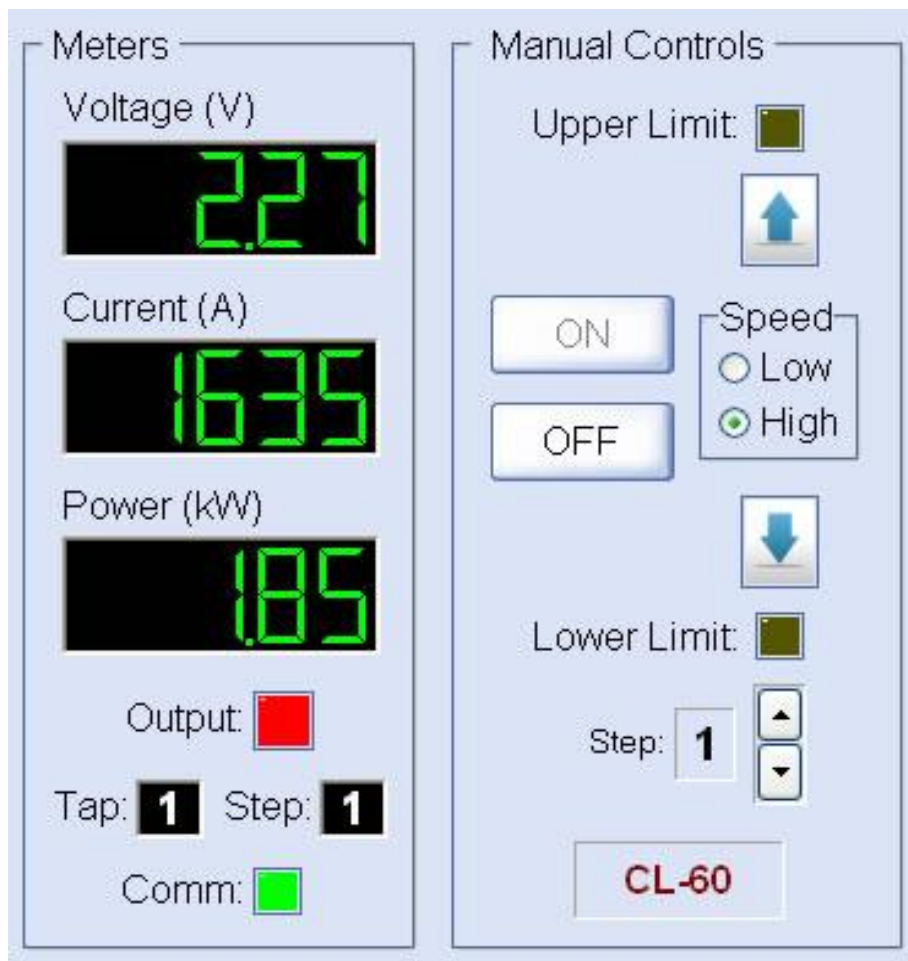
Speed: Controls the rate-of-rise of the output voltage.

Output On, Output Off: Controls the state of the output.

Step: Controls the output step position. This determines the maximum output voltage. Step 1 provides the lowest output voltage while step 5 (or whatever the max. step is) provides the highest output voltage.

Raise / Lower Buttons: Controls the output voltage level; from zero to the maximum voltage of the current step. A right-click on the button will lock the function on, then use one left mouse click to undo the lock.

System Status, Clear: Shows all error conditions and system status messages. Click Clear to clear error conditions.

Meters Box: Shows the real-time status of the output supply.

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Database Maintenance

Backup Data

WinCore data should be backed up on a regular basis. Hard disks do fail; you don't want to lose years of valuable data. We recommend that you maintain at least two separate backup archives on a USB memory stick or network drive. WinCore has backup and restore functions that make this an easy task.
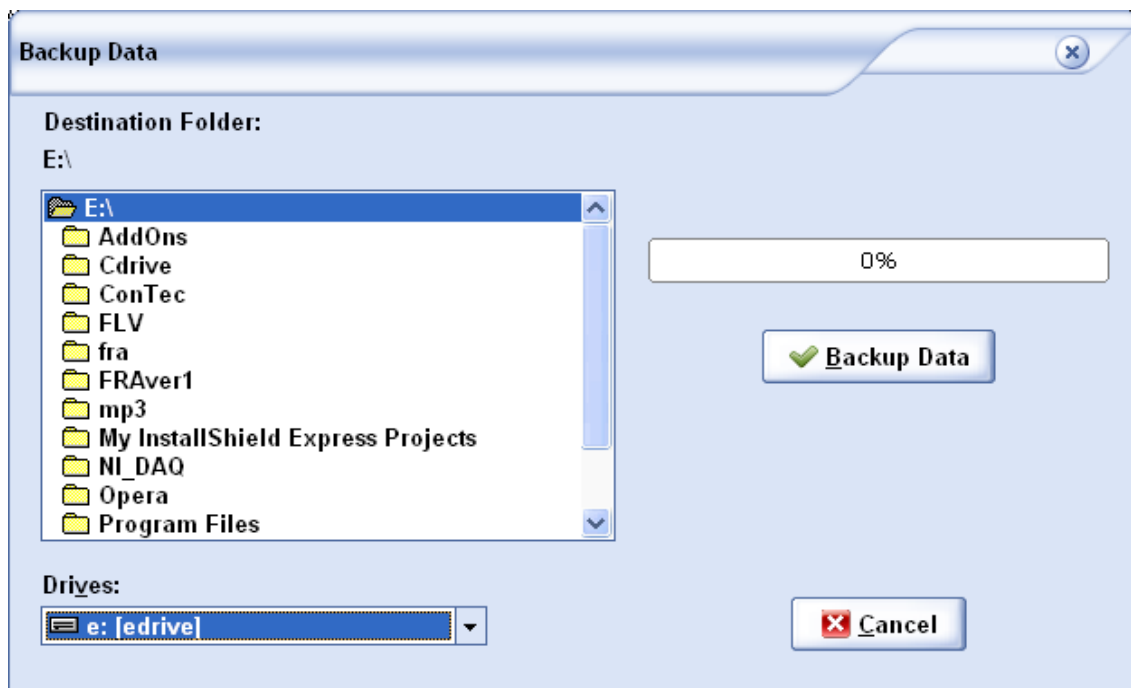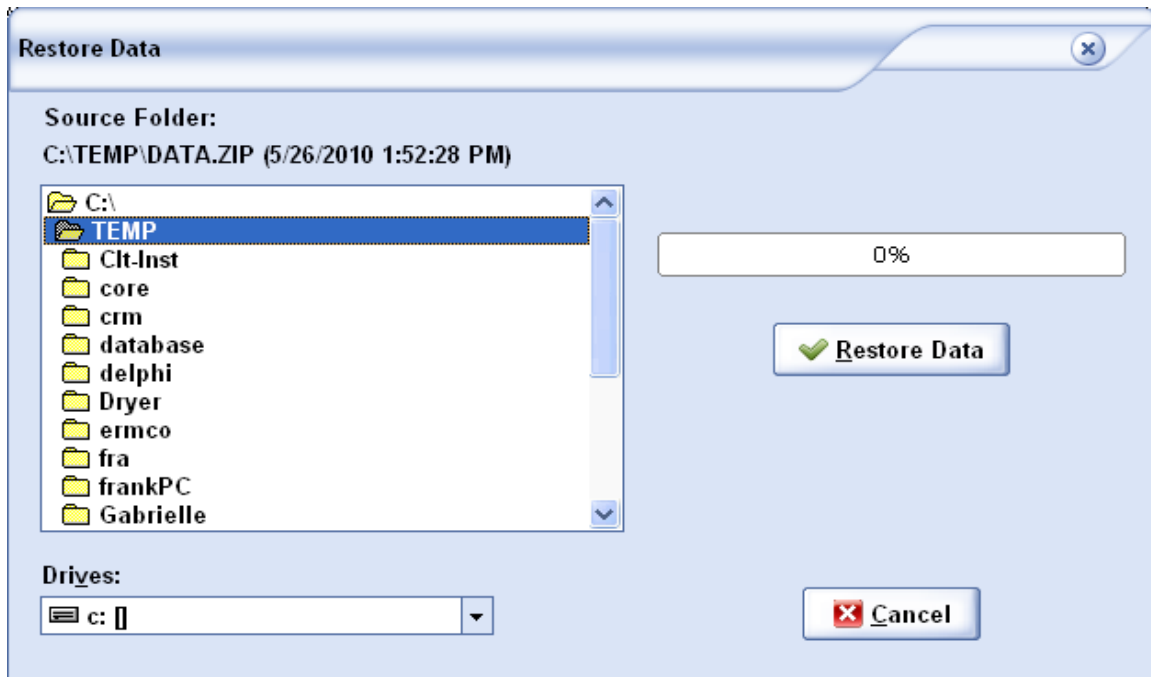

The Backup Data screen

The backup data screen allows you to easily select a drive/directory as a destination for your data backup. Access this form by selecting File and then *Backup Data…* . Select the drive/directory and Click *Backup Data* to begin the backup.

SOFTWARE

Data Recovery

The Restore Data screen

Should something serious happen and you need to restore data from a backup, WinCore provides a similar function for restoring data. The restore data screen allows you to easily select a drive/directory as a source for your data recovery. Access this form by selecting *File* and then *Restore Data…* . Select the drive/directory and Click *Restore Data* to begin the data recovery. This function should ONLY be used as a last resort. ALL existing data will be replaced by the data contained in the backup archive.

Rebuild Database Files

Occasionally, a database index file may become corrupted and unusable. WinCore has a function that will rebuild all database index files. If a database error occurs during software operation, this function should be executed. To rebuild the indexes, select *Tools* and then *Rebuild Database Files*.

SOFTWARE

Database Converter Tool

If you are upgrading to WinCore from an earlier version of Core Loss for Windows, you may use this tool to convert your old test data. WinCore MUST be closed, then to launch the converter click *Start, All Programs*, *Phenix Technologies* then *Database Converter*.
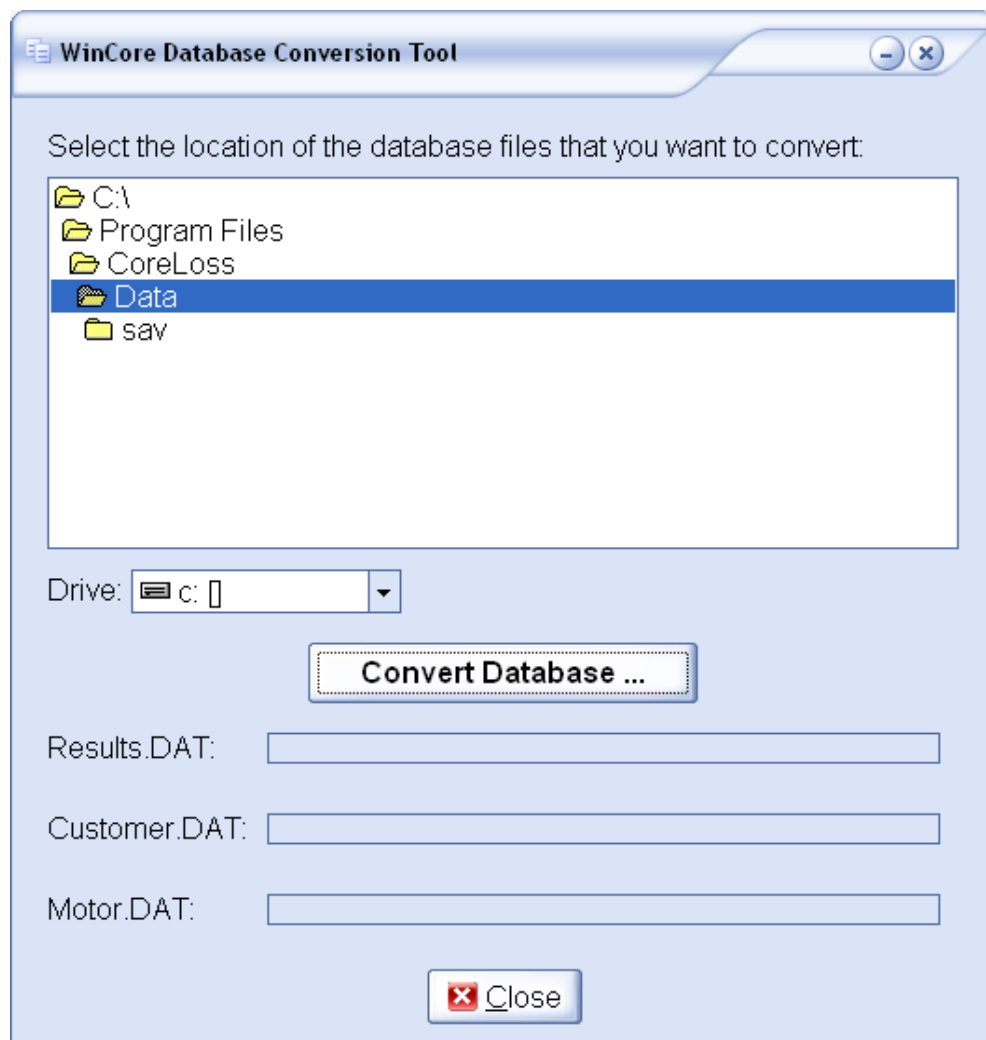
The Database Converter Tool

The converter will look for your old data in the default path. If your data is located in a different path then you will need to browse to that folder. Click Convert Database.. to perform the conversion. WARNING! Any existing WinCore data that you have will be deleted and replaced with the converted data.

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SOFTWARE

Export Database

This function will export all core loss data into a MS Access database file. To access this function, click *File* then *Export Database…* then select the destination folder
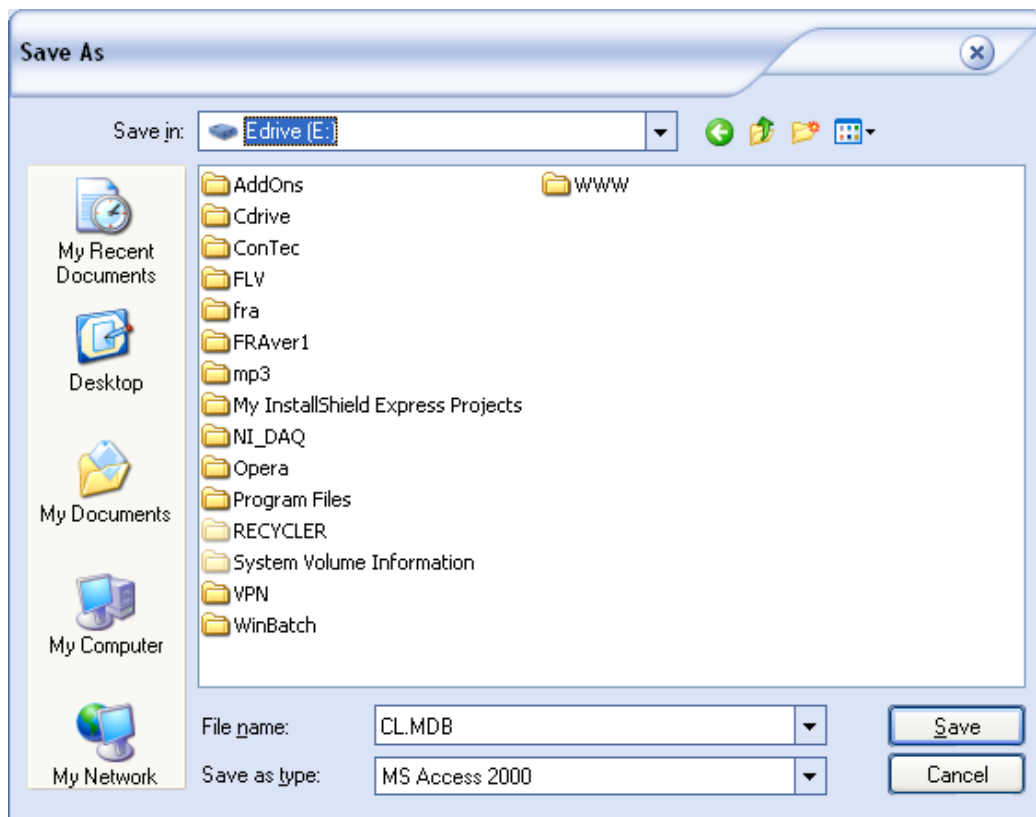
SOFTWARE

Calculations

This appendix contains all of the calculation formulas used in WinCore. These formulas were derived from conventional core loss testing theory. NOTE: The approximate core weight is determined by calculating the total volume and converting this result to a weight.

Rotor Area/Weight

Outer_Area = 0.785 * Sqr (Diameter)
Inner_Area = 0.785 * Sqr (Diameter - (Slot Depth * 2))
Tooth_Ring_Area = Outer_Area - Inner_Area
Outer_Circum = Pi * Diameter
Center _Area = 0.785 * Sqr((Diameter - (2 * (Slot_Depth + Back_Iron))))
Tooth_Area = ((Tooth_Width * Num_of_Teeth) / Outer_Circum) *
                    Tooth_Ring_Area
Vent_ Hole_Area = 0.785 * Sqr(Vent_Hole_Dia)
Cross_Section = Inner_Area + Tooth_Area - Center_Area -
                    Vent_Hole_Area * Num_of_Vent_Holes)
Volume = Cross_Section * (Core_Length -
        (Num_of_Vents * Vent_Width)) * Stacking_Factor

Rotor_Weight (English) = Volume * 0.276
Rotor_Weight (metric) = Volume * 0.0000076
Rotor_Mean_Circumference = (Diameter -
                                    ((Slot_Depth * 2) + Min_Back_Iron)) * Pi

Stator Area/Weight

Center_Area = 0.785 * Sqr(Diameter)
8-16
Outer_Area = 0.785 * Sqr((Diameter+(2*(Slot_Depth+Back_Iron)))
Inner_Area = 0.785 * Sqr(Diameter + (Slot_Depth * 2))
Tooth_Ring_Area = Inner_Area - Center_Area
Tooth_Circum = Pi * (Diameter + (Slot_Depth * 2))
Tooth_Area = ((Tooth_Width * Num_of_Teeth) / Tooth_Circum) *
                Tooth_Ring_Area
Vent_ Hole_Area = 0.785 * Sqr(Vent_Hole_Dia)
Back_Ring_Area = Outer_Area – (Inner_Area + (Vent_Hole_Area * Num_of_Vent_Holes))
Cross_Section = Back_Ring_Area + Tooth_Area
Volume = Cross_Section * (Core_Length -
        (Num_of_Vents * Vent_Width)) * Stacking_Factor

Stator_Weight (English) = Volume * 0.276
Stator_Weight (metric) = Volume * 0.0000076
Stator_Mean_Circumference = (Diameter + ((Slot_Depth * 2) +
                                    Back_Iron)) * Pi

SOFTWARE

<u>Target Voltage</u>

Target_Voltage (metric) = (4.44 * Frequency *
    (Core_Length - (Vent_Width * Num_of_Vents)) * Stacking_Factor *
    Min_Back_Iron * (Flux_Density / 645.2)) / 100000
Target_Voltage (english) = (4.44 * Frequency *
    (Core_Length - (Vent_Width * Num_Of_Vents)) * Stacking_Factor *
    Min_Back_Iron * Flux_Density) / 100000

<u>Test Results</u>

Core_Loss = Watts / Weight

Power_Factor = Watts / (Voltage * Current)

Flux_Density (english) = (100000 * Voltage) / (4.44 * Frequency *
    (Core_Length - (Vent_Width * Num_of_Vents)) *
    Stacking_Factor * Min_Back_Iron)

Flux_Density (metric) = Flux_Density * 100   { convert from mm to cm }

ATI (A.T./inch) = Current / Mean_Circumference

<u>Conversion Factors</u>

1 Lb. = 0.4536 kg.
1 in. = 25.4 mm
1 kilo Gauss = 6.452 Kilolines / inch ^{2} = 0.1 T
1 kilolines = 0.1515 Kilo Gauss inch² = 0.155 T inch²
 1 lines / inch² = 1.55 x 10^{-5} T

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SECTION 10: CALIBRATION PROCEDURE

Enter the Calibration Screen: Click *Tools*, then *Calibrate*. Your password is CL.

Calibration Standard: Rotek 8000 or higher

1. Calibrate Currentmeter

   - Connect Rotek to secondary of current CT
   - Zero currentmeter
   - Go to each range with slide panel and calibrate each range
   - Inject proper current for tap
   - Take injected current amount divided by computer currentmeter reading and multiply by existing calibration factor
   - Insert answer as new cal factor
   - Repeat for each tap

2. Calibrate Voltmeter

   - Connect Rotek to banana jacks on output panel for first tap
   - Inject proper voltage for tap
   - Divide the injected voltage amount by computer voltmeter reading, then multiply by existing calibration factor
   - Insert answer as new cal factor
   - Repeat for each tap

3. Calibrate Wattmeter

   - Connect Rotek current leads to secondary of CT and connect voltmeter leads to banana jacks
   - Choose tap and power factor
   - Set Rotek for chosen power factor
   - Inject proper voltage and current
   - Divide the injected wattage amount by computer wattmeter reading, then multiply by existing calibration factor
   - Insert answer as new cal factor
   - Repeat for each tap and power factor

NOTE: CL 10B, CL25B, and CL60B have 2 taps
       CL125B has 3 taps

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SECTION 11: ELECTRICAL SCHEMATIC

Drawing Number   Description

1.   9307470   CL125B Core Loss Test Set

SECTION 12: MAINTENANCE

No solution or chemical any stronger than ordinary mild soap and water solution should be applied to the cabinet area of this unit. Care must be used when cleaning the meter faces and console panel. Abrasives may remove printing and descriptive titles and scratch meter faces.

CAUTION: When cleaning, always have unit disconnected from power source. Never attempt to clean inside the unit, as the cleaning solution may cause damage to the electronic components.

In the event it becomes necessary to replace any parts, a complete description can be found with the supplied parts list. Replacement parts are available from Phenix Technologies' Service Department.

SECTION 13: PARTS LIST

Item	Part Number	Description	Qty
		CONTROLS	
	1153912	MOLEX PLUG	1
	1153935	MOLEX MALE PIN	15
CB2	1601474	10A, BREAKER	1
CX1	1001398	FEED THROUGH CAT6	1
CX1	1001491	PATCH CABLE 10' ETHERNET	1
OL1	1159925	RECEPTACLE	1
PL1	1420219	GREEN LED	1
PL1	1422320	GREEN LENS	1
PL2	1420216	RED LED	1
PL2	1422300	RED LENS	1
SW1	1862116	MUSHROOM PUSHBUTTON	1
SW1	1862905	1NC CONTACT MODULE	1
		REGULATOR	
	1153912	MOLEX PLUG	2
	1153915	MOLEX FEMALE PIN	30
	1153932	MOLEX RECEPTACLE	2
	1153935	MOLEX MALE PIN	30
	1154311	TERMINAL BLOCK	1
	1154953	MARKER STRIP	1
CB1	1600778	CIRCUIT BREAKER (400A)	1
CT1	1892105	CURRENT TRANSFORMER (5000:5)	1
CT2	1892208	CURRENT TRANSFORMER (250:5)	1
D1-2	1780025	DIODE	2
F1,2	1603664	FUSE (2.5A)	2
F1,2	1603923	FUSE HOLDER	1
J2	1356214	MULTILAM JACK, BLACK, 4MM	1
J3-5	1356215	MULTILAM JACK,-RED, 4MM	3
J6-9	1152900	FEMALE RECEPTACLE CAMLOCK (700A)	6
K1	1705120	CONTACTOR	1
K10-15	29990027	JUMPER BAR FOR AF52 CONTACTOR	12
K2-3	1157345	RELAY SOCKET	2
K2-3	1701300	RELAY	2
K4-5,10-15	1705085	CONTACTOR	8
K9	1705465	CONTACTOR	1
K9 AUX	1701500	AUX CONTACT	1

SECTION 13: PARTS LIST

Item	Part Number	Description	Qty
REGULATOR (CONTINUED)
P2	1356212	MULTILAM PLUG, BLACK, 4MM	1
P3	1356213	MULTILAM PLUG, RED, 4MM	1
P6-7	1152905	MALE PLUG, CAMLOCK (700A)	4
R6	1740116	RESISTOR (2.5 OHM)	1
SW2-8	1866005	SWITCH, ROLLER, 20A	7
SW4-7	41000003	LIMIT SWITCH CAM	4
T1	3860024C	TRANSFORMER	1
INTLK	3150105	12-3 F CONNECTOR ASSY	1
PT1	38701075	PTA-1075	1
	1153912	MOLEX PLUG	1
	1153935	MOLEX PIN	15
CB3	1601469	5A, BREAKER	1
CBL1	1077600	CROSS-OVER PATCH CABLE	1
KS1,K6	1157345	RELAY SOCKET	2
KS1,K6	1701300	RELAY	2
OVLD1	1709900	OVERLOAD RELAY	1
OVLD1	1709901	MOUNTING ADAPTER	1
PLC	1002040	BASE CONTROLLER	1
PLC	1002041	2 CHANNEL ANALOG OUTPUT MODULE	1
PLC	1002042	END CAP TERMINATOR	1
PLC	1002043	ANALOG INPUT MODULE	1
PS1	1152248	CONNECTOR	1
PS1	1152272	CONNECTOR	1
PS1	1350410	SPACER	4
PS1	1590169	POWER SUPPLY, +24V	1
R1	1722617	RESISTOR, 24.9K	2
R2	1722190	RESISTOR, 10K	1
R3-4	1156006	TERMINAL STRIP	1
R3-4	1722078	RESISTOR, 2K	2
SCRC1	1565227	MOTOR CONTROLLER	1
XDCR1	1882060	RMS VOLTAGE TRANSDUCER	1
XDCR2	1882065	CURRENT TRANSDUCER	1
XDCR3	1883056	WATT TRANSDUCER	1
MAIN TRANSFORMER
T3	38601151	IA1-1151	1

SECTION 14: PARTS ORDERING INFORMATION

Replacement parts are available from Phenix Technologies, Inc.

Changes to Phenix Technologies' products are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest technical improvements developed in our Engineering Department. It is, therefore, important when ordering parts to include the serial number of the unit as well as the part number of the replacement part.

When your purchase order is received at our office, a representative of Phenix Technologies will contact you to confirm the current price of the part being ordered. If a part you order has been replaced with a new or improved part, an Applications Engineer will contact you concerning any change in part number.

Send orders for replacement parts to:

<div align="center">

Service Department
Phenix Technologies, Inc.
75 Speicher Drive
Accident, Maryland 21520

PH: 1 (301) 746-8118
Fax: 1 (301) 895-5570
E-mail: info@phenixtech.com

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SECTION 15: RECOMMENDED SPARE PARTS

In order to maintain your set in full operating condition with a minimum of down time, the following spare parts should be kept on hand to avoid unnecessary phone calls, expensive modes of shipment, delays in repairs, etc. Current pricing is available upon request from the Service Department at Phenix Technologies.

Part Number	Description	Quantity
1603664	Fuse, 2.5A	4
1891926	Brush for Regulator	1
1420219	LED, GREEN	1
1420216	LED, RED	1

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SECTION 16: RETURNED MATERIAL

If for any reason it should become necessary to return this equipment to the factory, the Service Department of Phenix Technologies, Inc. must be given the following information:

Name Plate Information
Model Number
Serial Number
Reason for Return
Cause of Defect

If Phenix Technologies, Inc. deems return of the part appropriate, it will then issue an "Authorization for Return."

If return is not deemed advisable, other inspection arrangements will be made.

NOTE: Material received at this plant without the proper authorization shall be held as "Customer's Property" with no service until such time as the proper steps have been taken.

Your cooperation is requested in order to ensure prompt service.

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SECTION 17: CUSTOMER COMMENTS / SUGGESTIONS

SECTION 17: CUSTOMER COMMENTS / SUGGESTIONS

Phenix Technologies made significant efforts to ensure that the materials in this Operator's Manual are correct. If there are concerns or comments as you have used this information, Phenix Technologies appreciates any feedback.

Unit Serial Number:

Sect	Page(s)	Comment

Please return to Phenix Technologies, Engineering Department, 75 Speicher Drive, Accident, MD 21520 USA.

Phone: 1 (301) 746-8118, Fax: 1 (301) 895-5570, or Email: info@phenixtech.com

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