

Technical Manual
For The
CL25
Core Loss Test Set

Manufactured By:



Reference Data

Equipment

Model Number:	CL25
Description:	Measures core loss, power output to 25kW
Serial Number:	
Options:	Laptop Computer, Clamps and Cable Fittings
Ship Date:	

Customer

Name:
Address:
City, State, Zip:

Order Number:

Manufacturer

Name:	Phenix Technologies
Address:	75 Speicher Drive
City, State	Accident, MD
Postal Code:	21520
Telephone:	(301) 746-8118
Fax:	(301) 895-5570

Quick Reference Guide

This guide provides a simplified set of instructions for obtaining core loss measurements. It is designed for the user who is already familiar with the basic operation of the CL25 Core Loss Test Set. If additional information is required for any step in the measurement process, refer to the appropriate paragraph numbers listed in parentheses.

Please note the following cautions before continuing with this procedure.

- **Before changing the position of the Output switch (L, M, H) verify that the Power Off pushbutton is pressed and that the Power On lamp is off.**
 - **Verify that the high current power cable is properly seated and that all clamps are tight before pressing the Power On pushbutton.**
1. Measure the physical dimensions of the core and enter the data into the laptop computer. (Stator: 3.4.1; Armature/Rotor: 3.4.2)
 2. **For stator core loss measurements**, loop the high current and voltmeter cables through the core and connect the cables to the appropriate jacks on the Test Set. (3.5, steps 3 and 4)
 3. Press the Voltage On pushbutton and turn the Raise Voltage control to obtain the desired test voltage. (3.5, step 5)
 4. Perform the hot spot test by responding to the computer prompts. (3.5, steps 16-18)
 5. **For armature/rotor core loss measurements**, connect the high current and voltmeter cables/clamps to the core and the appropriate jacks on the Test Set. (3.6, steps 4 and 5)
 6. Press the Voltage On pushbutton and turn the Raise Voltage control to obtain the desired test voltage. (3.6, step 6)
 7. Perform the hot spot test by responding to the computer prompts. (3.6, steps 17-19)
 8. Obtain the test results from the laptop computer. (4.4.6 and 4.4.7)
 9. Press the Power Off pushbutton and verify that the Power On lamp is off. Remove all test cables from the core under test. Set the main circuit breaker, located on the front of the Test Set, to the off position.

Table Of Contents

Paragraph	Title	Page
Chapter 1 Introduction		
1.1	About this Manual	1-1
1.2	Overall Functional Description	1-1
1.3	Physical Description	1-2
1.4	Operating Specifications	1-4
Chapter 2 Installation		
2.1	General Information	2-1
2.2	Equipment Supplied/Required	2-1
2.3	Installation Planning	2-2
2.3.1	Site Selection	2-2
2.3.2	Environmental Considerations	2-2
2.3.3	Electrical Considerations	2-2
2.4	Installation Procedures	2-2
2.5	Installation Checkout	2-3
Chapter 3 Operation		
3.1	Introduction	3-1
3.2	General Information of Rotor Testing	3-1
3.2.1	DC Armatures	3-1
3.2.2	Wound Rotors (slip ring)	3-2
3.2.3	Squirrel Cage Motors	3-2
3.3	Operating Controls and Indicators	3-2
3.3.1	Display Unit	3-2
3.3.2	Control Panel	3-3
3.4	Stator and Armature/Rotor Physical Measurements	3-4
3.4.1	Stator Measurements	3-4
3.4.2	Armature/Rotor Measurements	3-5
3.5	Stator Core Loss Measurement Procedures	3-8
3.6	Rotor/Armature Core Loss Measurement Procedures	3-10
3.7	Computerized Core Evaluation Criteria	3-12

Paragraph	Title	Page
Chapter 4 Computer Operation		
4.1	Introduction	4-1
4.2	About Core Loss for Windows	4-1
4.2.1	Working with Windows	4-2
4.2.2	Core Loss for Windows Terminology	4-2
4.3	Installation and Configuration	4-3
4.3.1	Installation	4-3
4.3.2	Minimum System Requirements	4-3
4.3.3	Recommended System Requirements	4-3
4.3.4	Additional Hardware Requirements	4-3
4.3.5	To Install Core Loss for Windows	4-3
4.3.6	System Configuration	4-4
4.4	Using Core Loss for Windows	4-5
4.4.1	Performing a Test	4-5
4.4.2	Printing a Report	4-7
4.4.3	Viewing Test Results	4-7
4.4.4	The Customers Report	4-8
4.4.5	The Motors Form	4-9
4.4.6	The Database Navigator	4-11
4.4.7	The Core Loss Test	4-11
4.4.8	The Hot Spot Test	4-12
4.5	Setup	4-13
4.5.1	Company Information	4-13
4.5.2	System Settings	4-13
4.6	Database Management	4-15
4.6.1	Data Backup	4-15
4.6.2	Data Recovery	4-16
4.6.3	Rebuild Indexes	4-16

Paragraph	Title	Page
Chapter 5 Recalibration		
5.1	Introduction	5-1
5.2	General Calibration Information	5-1
5.2.1	Safety Information	5-1
5.2.2	Recommended Recalibration Intervals	5-1
5.2.3	Required Test Equipment	5-1
5.3	Initial Calibration Setup	5-2
5.3.1	Removal of Back Panel	5-2
5.3.2	Location of Calibration Potentiometers	5-2
5.3.3	Electrical/Display Meter Check	5-4
5.4	Calibration Procedures	5-4
5.4.1	Voltmeter Calibration	5-4
5.4.2	Currentmeter Calibration	5-6
5.4.3	Kilowattmeter Calibration	5-9
5.5	Returning the Test Set to Operational Status	5-11
Chapter 6 Diagrams		
6.1	Introduction	6-1
Chapter 7 Parts List		
7.1	Introduction	7-1
Chapter 8 Recommended Spares		
8.1	Introduction	8-1
Appendix A Warranty		
Appendix B Returned Material		
Appendix C Parts Ordering Information		

List Of Illustrations

Figure	Title	Page
1-1	Simplified Block Diagram	1-2
1-2	Overall View, CL25 Test Set	1-3
3-1	Operator Controls and Indicators	3-4
3-2	Typical Stator Core Measurements	3-6
3-3	Typical Rotor/Armature Measurements	3-7
4-1	System Settings Configuration Screen	4-4
4-2	Core loss for Windows, Main Screen	4-5
4-3	Test Setup Screen	4-6
4-4	Customers Screen	4-8
4-5	Motors Screen	4-9
4-6	Stator Dimension Screen	4-10
4-7	Rotor Dimension Screen	4-10
4-8	Core Loss Test Screen	4-11
4-9	Hot Spot Test Screen	4-12
4-10	Company Information Screen	4-13
4-11	System Settings Screen	4-14
4-12	Backup Data Screen	4-15
4-13	Restore Data Screen	4-16
5-1	Location of Calibration Potentiometers	5-3
5-2	Voltmeter Calibration Setup, 12.5 Volt Tap	5-5
5-3	Voltmeter Calibration Setup, 25 Volt Tap	5-5
5-4	Currentmeter Calibration Setup, 12.5 Volt Tap	5-7
5-5	Currentmeter Calibration Setup, 25 Volt Tap	5-8
5-6	Kilowattmeter Calibration Setup, 12.5 Volt Tap	5-9
5-7	Kilowattmeter Calibration Setup, 25 Volt Tap	5-10
Section 6 - Diagrams		
	CL-25 Core Loss Test Set (Power Section)	6-2
	Coreloss Control/Metering	6-3
	PCB1055 +/- 15 VDC Power Supply	6-4
	PCB1078 TRMS/AVG Converter	6-5
	PCB1078 TRMS/AVG Converter	6-6
	BCD/RS232 Meter Interface	6-7
	BCD/RS232 Opto-Isolation	6-8
	Regulator Drive Switching Unit 600D Series	6-9
	Newport 2520 for PCB 1074 Interface	6-10

Chapter 1

Introduction

1.1 About this Manual

This manual contains general and detailed information on the installation, operation and maintenance for the Core Loss Test Set from Phenix Technologies. This manual covers only the CL25 unit. For information on the CL10, CL60 and CL125, please refer to the appropriate instruction manual.

The information in this manual is divided into 8 separate chapters. Chapter 1 contains general information on core loss measurements and on the CL25 Test Set. Chapter 2 describes the installation procedures. Detailed operating instructions are contained in Chapter 3. This includes procedures for testing both stators and rotors. Operating instructions for the software testing program are contained in Chapter 4. Chapter 5 contains calibration procedures to insure that the measurements are valid. Reference data is located in Chapters 6, 7, and 8. This includes the schematic diagrams, parts list, and instructions for ordering replacement parts.

1.2 Overall Functional Description

Core loss refers to the amount of energy lost as a result of a decrease in the core's ability to maintain the desired magnetic field. These losses occur while operating a motor or generator. The loss is typically the result of degradation in the insulation between the plates in the core. The CL25 Test Set is designed to measure these losses by calculating the effectiveness of the core, based on the physical characteristics of the core, the amount of current required to establish the magnetic field, and the voltage induced by the field. When the operating efficiency of the core is established, an informed decision may be made on rewinding the core, repairing the core, or rejecting the core.

The CL25 Test Set may also be used to perform core loss measurements of ac rotors and dc armature laminations. Any unique requirements on testing these units are covered in the appropriate sections of this manual.

Figure 1-1 is a simplified block diagram of the principal circuits contained in the CL25 Core Loss Test Set. The ac input, typically 480 Volts at 50 Amperes, is brought through the main circuit breaker to the main contactor and the control transformer. The control transformer is used to step down the input voltage to 110 Volts which is applied to the front panel controls and indicators. When the front panel Voltage switch is set to the On position, the main contactor will pass the input power to the voltage control circuit. The voltage control circuit is used to vary the

CL25

voltage applied to the output transformer. The front panel Raise Voltage control is used to adjust the voltage to the desired level. The output transformer produces the low voltage/high current required to test the core.

The high current is brought through the core under test and applied back to the tester. In a similar manner, the voltmeter loop is also brought through the core. The high current loop functions as the 'primary winding' of a toroidal core, with the voltmeter loop as the 'secondary winding'. The high current loop will induce a magnetic field in the core. The strength of the field is measured by the voltage induced in the voltmeter loop.

The voltmeter loop is brought back to the metering module where it is displayed in the digital meters along with the current level in the loop and the resulting wattage. The metering module also provides an input to the laptop computer. The computer will calculate the effectiveness of the core based on the physical characteristics of the core and the test results.

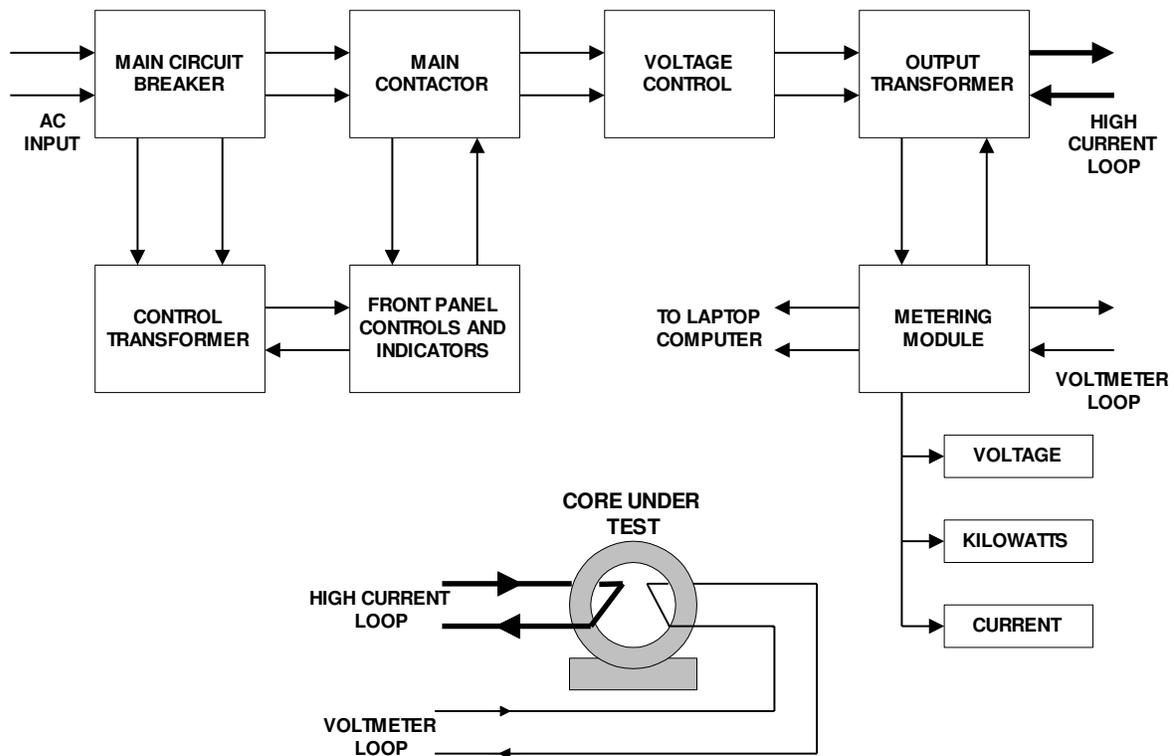


Figure 1-1. Simplified Block Diagram

1.3 Physical Description

The CL25 tester is self-contained in a metal enclosure, as shown in Figure 1-2. All operating controls for the tester are located on the top of the enclosure. These include the display

CL25

panel, chassis mounted switches, controls and indicators, and the laptop computer. The main circuit breaker is located on the front of the enclosure.

The high current output cable is attached to the interface panel on the right hand side of the test set. The cable is brought through the core under test and plugged into the appropriate tap. The security access plate is used to insure that the cable is not connected to the incorrect tap. When the plate is positioned for the alternate tap, the internal interlock switches will automatically change the range settings for the new tap. The voltmeter cable connections are also made to the interface panel.

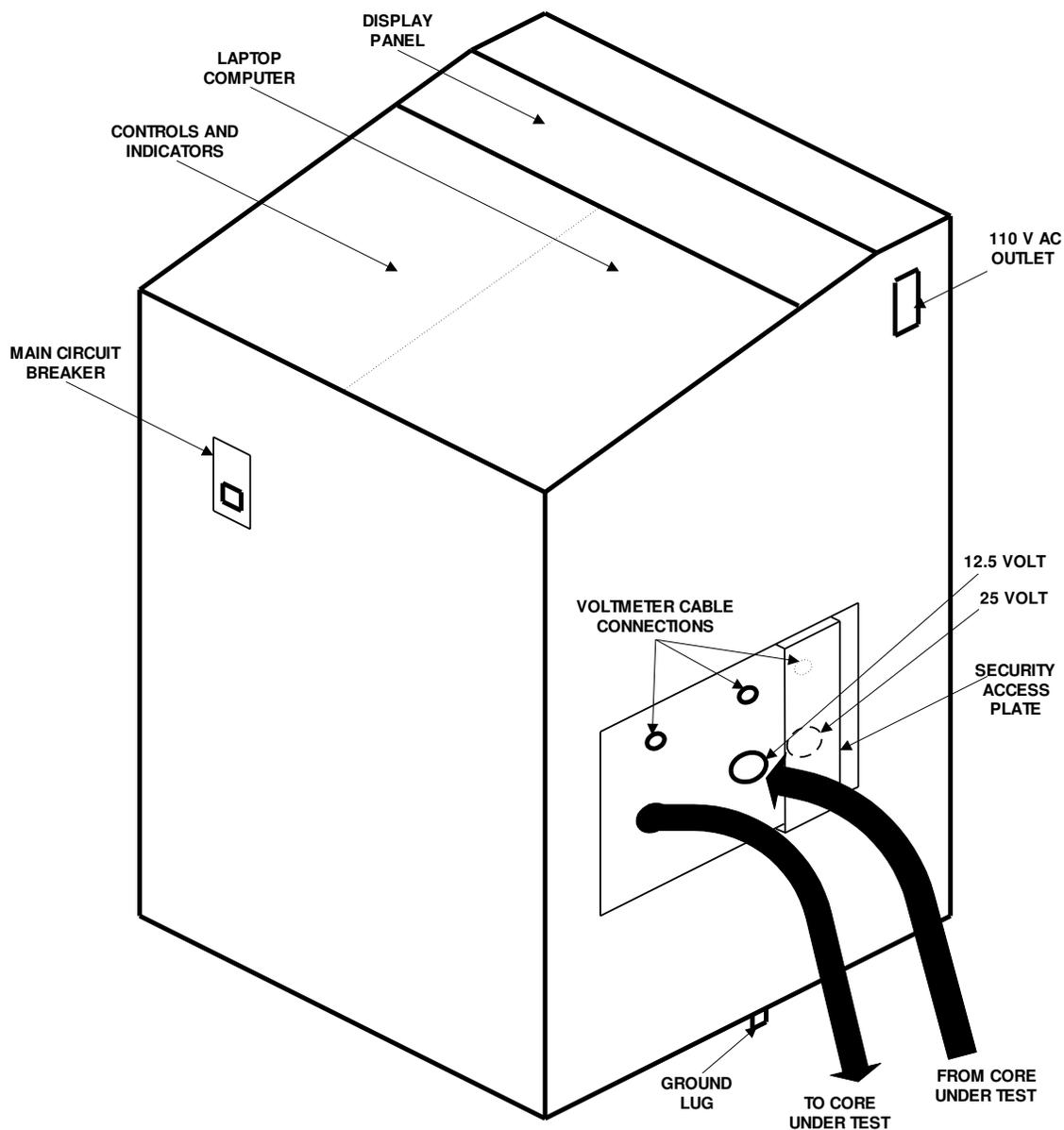


Figure 1-2. Overall View, CL25 Test Set

CL25**1.4 Operating Specifications**

The following specifications are applicable only to the CL25 test set. Refer to the appropriate instruction manual for specifications on related models.

Input Voltage: 440/480 Vac, Single Phase, 50 or 60 Hz, 60 Amperes,

Output Voltage:

12.5 Volt tap:

Low: 0 to 4.16 Volts ac at 2000 Amperes

Medium: 4.16 to 8.33 Volts ac at 2000 Amperes

High: 8.33 to 12.5 Volts ac at 2000 Amperes

25 Volt tap:

Low: 0 to 8.33 Volts ac at 1000 Amperes

Medium: 8.33 to 16.66 Volts ac at 1000 Amperes

High: 16.66 to 25.0 volts ac at 1000 Amperes

Instrumentation: Three digital LED meters each with 4-1/2 digits, 0.5 inches high.

Meters are accurate to ± 0.5 full scale.

Voltmeter Scale: Two ranges, 0 to 19.99 or 25.00 Vac, true RMS

Currentmeter Scale: Two ranges, 0 to 1000 or 1999Aac, true RMS

Kilowattmeter Scale: Two ranges, 0 to 19.99 or 25.00 kW

Physical:

Dimensions: 30 inches wide by 30 inches deep by 47 inches high
(76.2 cm by 76.2 cm by 119.4 cm)

Weight: 750 pounds (340 kg)

Additional Standard Features:

Data base software: Core Loss for Windows, version 1.1

Main power circuit breaker with indicator lamp

Fused control power circuits

On/Off pushbutton control

Meter hold switch to freeze meter readings

External interlock provision with indicator lamp

Thermal overload protection with indicator lamp

Rugged steel cabinet with castors

RS-232/BCD computer data output

Available Options:

Laptop computer and printer

Six inch clamp assembly

Extra length output leads

Chapter 2 Installation

2.1 General Information

This chapter provides detailed information on installing the CL25 tester. The Test Set is supplied as a fully assembled unit, and requires only standard tools for installation. The location of the test set is dependent on the individual site requirements. The primary considerations are the location of the ac power mains and the ability to transport a core to the test area. It should be noted that the test set is supplied with an 8 foot cable for connection to the power mains, and that the test set is equipped with castors for exact placement next to the core under test.

The information in this manual is divided into four main sections. The first section, paragraph 2.2, describes the equipment supplied and any additional items required for installation. The second section, 2.3, provides a general description of the different items that should be considered before the final Test Set installation site is selected. Paragraph 2.4 contains a detailed installation procedure. The fourth section, paragraph 2.5, provides a simplified check-out procedure designed to verify that the equipment has been properly installed.

2.2 Equipment Supplied/ Required

The CL25 Core Loss test set is supplied as a complete unit and does not require any further assembly. A typical shipment may consist of the following standard and optional items:

1. Core Loss Test Set
2. High Current cable (attached to the Test Set)
3. Voltmeter cable
4. Test Set software program
5. Laptop Computer with printer (optional)
6. Extra length High Current cable (optional)
7. Clamps for testing armatures and rotors, with voltmeter cables (optional)

After uncrating the test set, verify that all ordered items have been received. Visually inspect all items to insure that no damage has occurred during transit.

CL25

Additional items that may be required to install the test set are dependent on the individual site requirements. A typical list may include the following items:

1. Electrical hardware to extend the main electrical service to the test area
2. Installation tool kit (wrenches, screwdrivers, etc.)
3. Chassis ground wire (if a separate, visible ground wire is required)
4. Electrical hardware to connect the test set to the mains.

Note that the items required for installation, but not supplied with the Test Set, are dependent on the electrical codes applicable to a particular area; and on the location of the Test Set within the facility. Refer to Installation Planning, paragraph 2.3, for additional recommendations.

2.3 Installation Planning

Before starting the actual installation procedure, it is recommended the following items be reviewed to insure that the installed test set will perform satisfactorily. Installation planning may also be helpful to establish an orderly workflow through the testing facility.

2.3.1 Site Selection

The CL25 Core Loss Test Set does not require any special or unique considerations in regards to floor loading or doorway clearance. The test set measures 30 by 30 by 47 inches high and weighs 750 pounds. The test set is equipped with castors and may be easily moved over any flat surface. In order to maintain an efficient workflow and to insure personnel safety, it is recommended that the test set be located adjacent to the main work area but away from any high traffic lanes.

2.3.2 Environmental Considerations

The Test Set does not require any separate air or water cooling. During normal operation, however, it will act as a heat source. Therefore, the Test Set should not be located adjacent to a thermostat or other temperature sensing device. Additionally, the Test Set location should be an open area to permit the heat to dissipate. Placing the Test Set in a small confined area may result in heat buildup.

2.3.3 Electrical Considerations

It is recommended that the local electrical codes applicable to the facility be reviewed before selecting the installation site. Some codes may require a separate power shut off switch, additional grounding requirements, or other considerations to insure personnel safety.

2.4 Installation Procedures

The following steps detail the recommended procedure for installing a CL25 Test Set at a typical facility. Note that this procedure should be modified to reflect the actual requirements

CL25

at a particular site. The Installation Planning section, paragraph 2.3, should be reviewed before attempting the installation procedure.

1. Move the Test Set to the desired location.
2. Place a protective pad over the control panel on the front of the Test Set. Refer to Figure 1-2. Remove the display unit and place it on the pad. The display unit is secured with four screws through the front panel. Use the panel handles to lift the unit straight out of the Test Set and onto the pad. Verify that all circuit card assemblies are properly seated in their sockets. Replace the display unit and secure it with the four screws.
3. Verify that the power mains circuit is off and that the switch is tagged.
4. Verify that the power mains outlet box is capable of supplying 440/480 Volts ac, 60/50 Amperes, single phase, 50/60 Hz. Alternate services would be 575 Volts ac, 44 amperes, single phase, 50/60 Hz or 380 Vac at 70 Amperes.
5. Connect the main service wire with the green tag to the main power ground.
6. At some locations, a separate visible ground wire is required. This may be accomplished by connecting a ground wire from the building ground to the ground lug located at the center of the base frame at either side of the Test Set.
7. Connect the main service wires (with white and black tags) to the main power source.

This completes the basic installation procedure for the Test Set. It is recommended that the Installation Check Out procedure, described in paragraph 2.5, be performed to verify a satisfactory installation.

2.5 Installation Check Out

The following procedure is designed to verify proper installation of the Test Set. The first part of the procedure, steps 1 through 4, is designed to verify that ac operating power is present and that the power input circuits on the Test Set are operating satisfactorily. The second part of the check out procedure, steps 5 through 24, is designed to check the voltage control circuits in the Test Set. Note that the second part of the test requires a stator core to serve as a load for the Test Set. The core must be of sufficient size to adequately check the Test Set performance. The core should be from a motor with a horsepower rating of 500 to 1250. Throughout this check out procedure, refer to Figures 1-2 and 3-1 for the location of the different controls and indicators.

1. On the Test Set control panel verify that the Output switch is set to the L position and that the Raise Voltage control is set to the Zero Start (fully counterclockwise) position.

CL25

2. Set the main circuit breaker, located on the front of the Test Set, to the On position.
3. On the control panel, verify that the Main Power indicator is On and that the Control Power indicator is On. The Voltage and Interlock indicators should be off.
4. On the display panel, verify that the three digital meters display a reading of 0.00.

Note

The following steps check the high power output circuits of the Test Set. This check requires a test core to serve as a load to the Test Set. The core should be equivalent to the stator of a 500 to 1250 hp motor, and capable of running to 25 Volts without saturating.

Note

During the following steps DO NOT allow the output current to exceed 2000 Amperes on the 12.5 Volt tap or 1000 Amperes on the 25 Volt tap.

5. Set the main power circuit breaker to the off position. Verify that the Main Power and Control Power lamps on the control panel are off.
6. Loop the high current cable through the core under test and connect the end to the 12.5 Volt socket. If necessary, slide the security access plate to the right. Insert the end of the test cable into the socket as far as possible (approximately 4 inches). Twist the cable one-quarter turn clockwise. If the cable will not turn, push the cable further into the socket.

Note

The cable must be properly seated in the socket and locked in place by twisting the cable one-quarter turn clockwise. Failure to comply may result in overheating at the cable/socket connection.

7. Loop the voltmeter cable through the core under test and connect the ends of the cable to the voltmeter sockets at the side of the Test Set. The voltmeter cable should be connected to the sockets directly above the sockets used by the high current cable.

Set the main circuit breaker to the on position. Verify that the Main Power and Control Power indicators are On. The three digital meters should display a 0.00 reading.

8. Set the Output selection switch to the L position. Turn the Raise Voltage control to the zero start (full counterclockwise) position.
9. Press the Voltage On pushbutton. The Voltage On indicator to the right of the pushbutton should turn On.
10. Slowly turn the Raise Voltage control clockwise. Verify that the three digital display meters respond to the increasing voltage.
11. If the rated output current is reached, press the Voltage Off pushbutton and go to Step 19 if the 12.5 Volt tap is used or to step 23 if the 25 Volt tap is used.
12. Return the Raise Voltage control to the Zero Start (full counterclockwise) position.
13. Press the Voltage Off pushbutton and verify that the Voltage On indicator is off.
14. Set the Output switch to the M position.
15. Repeat steps 10 through 14.
16. Set the Output switch to the H position.
17. Repeat steps 10 through 14, then go to step 19.
18. Remove the high current cable from the Test Set. This is accomplished by twisting the cable one-quarter turn counterclockwise and pulling straight out. Disconnect the voltmeter cable from the socket directly above the high current socket.
19. Slide the security access plate to the left to expose the 25 Volt socket. Push the high current cable into the socket and twist the cable one-quarter turn clockwise to lock the cable in place. Connect the voltmeter cable to the socket directly above the high current socket.
20. On the display panel, press the H pushbuttons on both the Voltmeter Range and the Wattmeter Range. This will set both of the display meters to the higher operating range.
21. Repeat steps 9 through 18 to test the high voltage tap for the three different voltage ranges.
22. Verify that the Voltage On indicator is off. If the indicator is On, press the Press the Voltage Off pushbutton.

CL25

23. Remove the voltmeter cable and the high current cable from the Test Set. Slide the security access plate to the right.
24. Set the main circuit breaker to the off position. Verify that the Control Power and Main Power indicators are off.

This completes the Installation Check Out test, designed to insure that the Test Set was properly installed and that all of the power generating and measuring circuits in the Test Set are operating satisfactorily. Refer to Chapters 3 and 4 for detailed information on using the Test Set to determine the operating capabilities of a core.

Chapter 3

Operation

3.1 Introduction

This chapter contains general and detailed information on the operating procedures for the CL25 Core Loss Test Set. The Test Set may be used in conjunction with a laptop computer to simplify recording the measurements and interpreting the results. The operating procedures for the computer are described in chapter 4 of this manual.

The information in this chapter is divided into five main sections. The first section, paragraph 3.2, provides general information on rotor testing. The second section, paragraph 3.3, identifies the controls and indicators on the Test Set front panel. The third section, paragraph 3.4, provides detailed information on how to obtain the physical measurements of the core under test. The fourth section, paragraphs 3.5 and 3.6, describe how to obtain the measurements for a stator core and an armature/rotor core. The fifth section, paragraph 3.6, describes how to use the test results to determine the accept/reject status of the core.

3.2 General Information on Rotor Testing

The CL25 Core Loss Test Set is designed to operate with three different types of rotors. These include DC Armatures, Wound rotors (slip ring), and Squirrel cage Motors. The following paragraphs describe the unique characteristics for each type of rotor that should be considered before initiating the core loss test.

Most rotors are constructed from laminated steel plates. When the rotors are exposed to lines of flux, the rotors are subject to hysteresis and eddy current losses. The steel plates are insulated to reduce the eddy current effects. However, eddy current losses will increase with increased frequency and induction. Hysteresis losses are also a function of the frequency and level of induction, but are independent of the condition of the insulation between the steel plates.

3.2.1 DC Armatures

For most applications DC Armatures are subject to higher frequency fluxes. To calculate the frequency, multiply the number of poles by the revolutions per minute and divide by 120 ($F = \text{NOP} \times \text{RPM} / 120$). Core loss testing on DC Armatures is recommended since the test will provide significant information on the operating effectiveness of the armature.

CL25

3.2.2 Wound Rotors (slip ring)

The value of performing core loss testing on wound rotors is dependent on how the motor is used and the individual site requirements. If the motor is operated at a reduced RPM for long periods of time the motor is subject to higher induction. For these applications, core loss testing of the rotor is recommended.

If the motor is used in a “soft start” application where the motor is run at a reduced RPM for short time intervals, core loss testing of the rotor may not be required. For these applications, core loss testing is dependent on the individual site requirements.

3.2.3 Squirrel Cage Motors

The squirrel cage motor is normally used in applications requiring a motor to operate at full RPM all of the time. Under these conditions, the rotor induction is relatively low since the induction is a function of the slip of the motor. The losses and hot spots that may occur are usually nominal and would not normally require full core loss testing. Core loss testing, however, is recommended to check for open rotors or cracked rotor bars.

Some industry sources recommend testing squirrel cage motors for core loss and hot spots if the motor is used in applications requiring frequent starts. Under these conditions, the heat generated by the hot spots will eventually degrade the insulation, therefore reducing the life of the motor.

3.3 Operating Controls and Indicators

Figure 3-1 illustrates the location of the different controls and indicators for the CL25 Test Set. The following paragraphs describe the function of the controls for both the display unit and the control panel.

3.3.1 Display Unit

The display unit is mounted above the control panel on the front of the Test Set. The display unit contains the three digital meters to display the output level to the test core and the resulting response from the core.

1. **VOLTAGE (V).** This meter displays the voltage induced in the voltmeter cable by the magnetic field of the core. The **VOLTMETER RANGE** pushbuttons are used to select either the low (L) or the high (H) range. The low range is 0 to 19.999; the high range is 0 to 25.00.
2. **KILOWATTS (KW).** This meter displays the output level, in kilowatts, supplied to the core under test. The **WATTMETER RANGE** pushbuttons are used to select either the Low range (0 to 19.999) or the High range (0 to 25.00).

CL25

3. CURRENT (A). This meter displays the amount of current, in Amperes, applied to the core under test.
4. HOLD. This pushbutton control is used lock the reading displayed on all three meters. Depressing the pushbutton a second time will release the meters.

3.3.2 Control Panel

The control panel, located below the display unit, contains the panel mounted switches and indicators used to operate the Test Set.

1. OUTPUT: L, M, H. This three position switch is used to select one of three different voltage ranges for each of the two output voltage taps. The following table lists the different voltage ranges for each tap. Note that the listed output voltages are typical. The actual output voltage may vary with the output load.

Switch Setting	12.5 Volt Tap	25 Volt Tap
L	0 to 4.16 Volts	0 to 8.33 Volts
M	4.16 to 8.32 Volts	8.33 to 16.66 Volts
H	8.32 to 12.5 Volts	16.66 to 25.00 Volts

2. RAISE VOLTAGE. This linear control is used in conjunction with the Output switch to adjust the voltage supplied to the core under test. For example, if the Output switch is set to the L position and the 12.5 Volt tap is used the Raise Voltage control will set the voltage level at any value from 0 to 4.16 Volts.
3. MAIN POWER. This indicator lamp will light whenever primary operating power is applied to the Test Set. The main circuit breaker is used to apply and remove the primary operating power.
4. INTERLOCK, THERMAL O/L. This indicator will light whenever an external interlock switch is opened or if the thermal limit on the high current transformer is exceeded. If either of these conditions exist the lamp will light and the Test Set will be deenergized.
5. F3. This 3 amp fuse is used to protect the front panel controls and indicators and the display unit.
6. CONTROL POWER. This indicator will light when operating power is applied to the control panel. The power to the control panel and the display unit is controlled by the main circuit breaker.
7. VOLTAGE: ON, OFF. These two pushbuttons are used to apply (On) and remove (Off) power to the high current transformer. The On indicator will light when power is applied to the transformer.

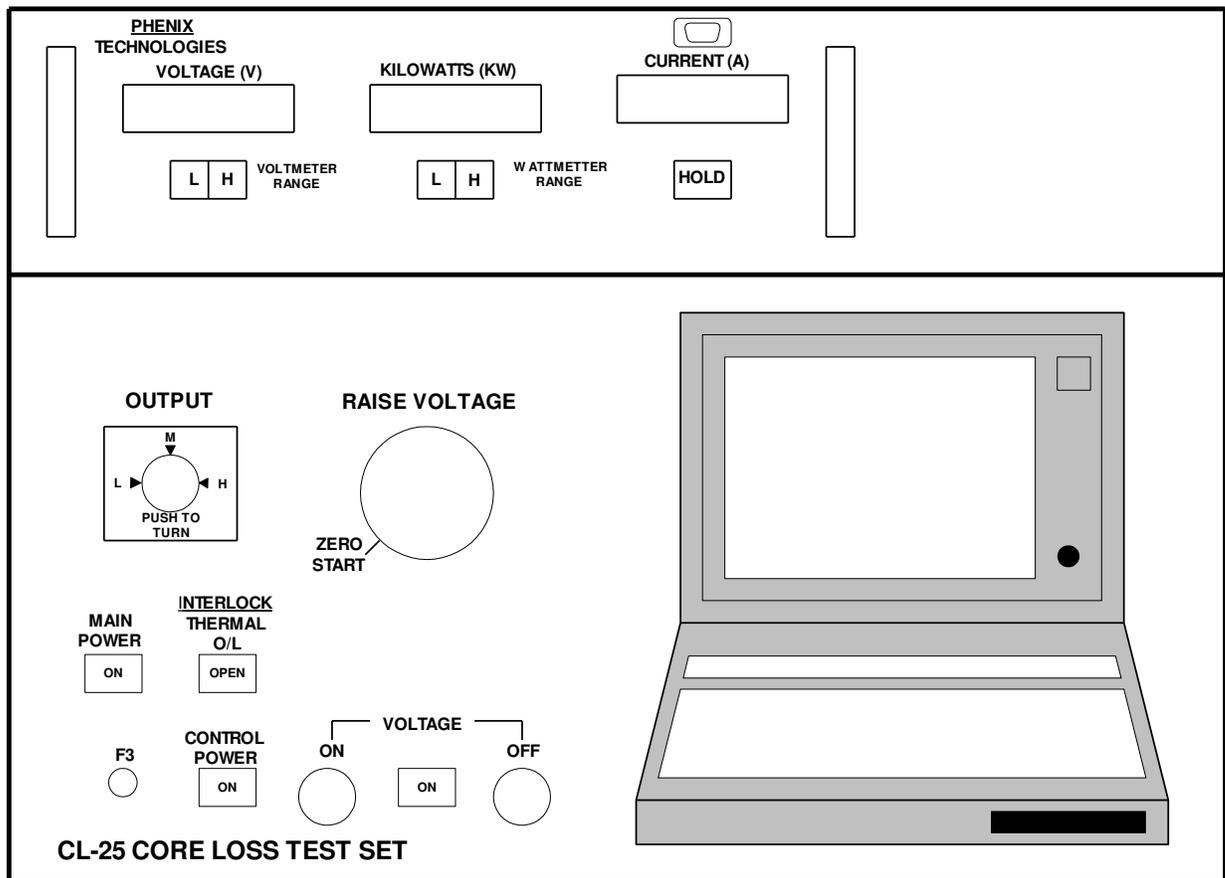


Figure 3-1. Operator Controls and Indicators.

3.4 Stator and Armature/Rotor Physical Measurements

In order to determine the operating characteristics of a core, the physical dimensions of the core must be included in the calculations. As a minimum, the measurements should be accurate to within 1/32 of an inch. For optimum test results, however, it is recommended that all measurements be accurate to within 1/64 of an inch. The following paragraphs describe the required measurements for both stators and rotors.

3.4.1 Stator Measurements

Figure 3-2 illustrates the measurements required on a typical stator core. The following items further describe each measurement.

1. Back Iron. Measure from the bottom of the tooth to the edge of the stator.
2. Core Diameter. Measure from the top of one tooth to the top of the tooth directly across the core from the first tooth.

CL25

3. Slot Depth. For this measurement it may be easier to measure the height of the tooth as shown in Figure 3-2.
4. Tooth Width. Measure the width of the tooth from side to side, just below the crown of the tooth, as shown in Figure 3-2. Do not measure the width at the top of the tooth.
5. Length of Core. Measure the entire length of the core, including the vent slots, from the first plate to the last plate.
6. Measure the width of the vent slot.
7. Vent Hole Diameter. If the core has vent holes, measure the diameter of the hole. If the core does not have vent holes, enter 0.
8. Number of Vent Holes. Enter the number of vent holes in the core. If the core does not have any vent holes, enter 0.

3.4.2 Armature/Rotor Measurements

Figure 3-3 illustrates the measurements required for a typical rotor/armature. The following items further describe each measurement.

1. Back Iron. Measure the distance from the bottom of a slot to the shaft or to the outside of the spider, if the rotor/armature is configured with a spider.
2. Core Diameter. Measure the distance from the top of one tooth to the top of the tooth directly opposite the first tooth.
3. Slot Depth. Measure the depth of the slot as shown in Figure 3-3. If it is easier, the height of a tooth may be measured as shown in Figure 3-2.
4. Tooth Width. Measure the width of the tooth at the top of the tooth, as shown in Figure 3-3.
5. Vent Hole Diameter. Measure the diameter of the vent holes. If the rotor does not have vent holes, enter 0.
6. Number of Vent Holes. Enter the number of vent holes in the rotor. If the rotor does not have vent holes, enter 0.
7. Core Length. Measure the entire length of the core, including the vent slot, from the first plate to the last plate, as shown in Figure 3-3.
8. Measure the width of the vent slot.

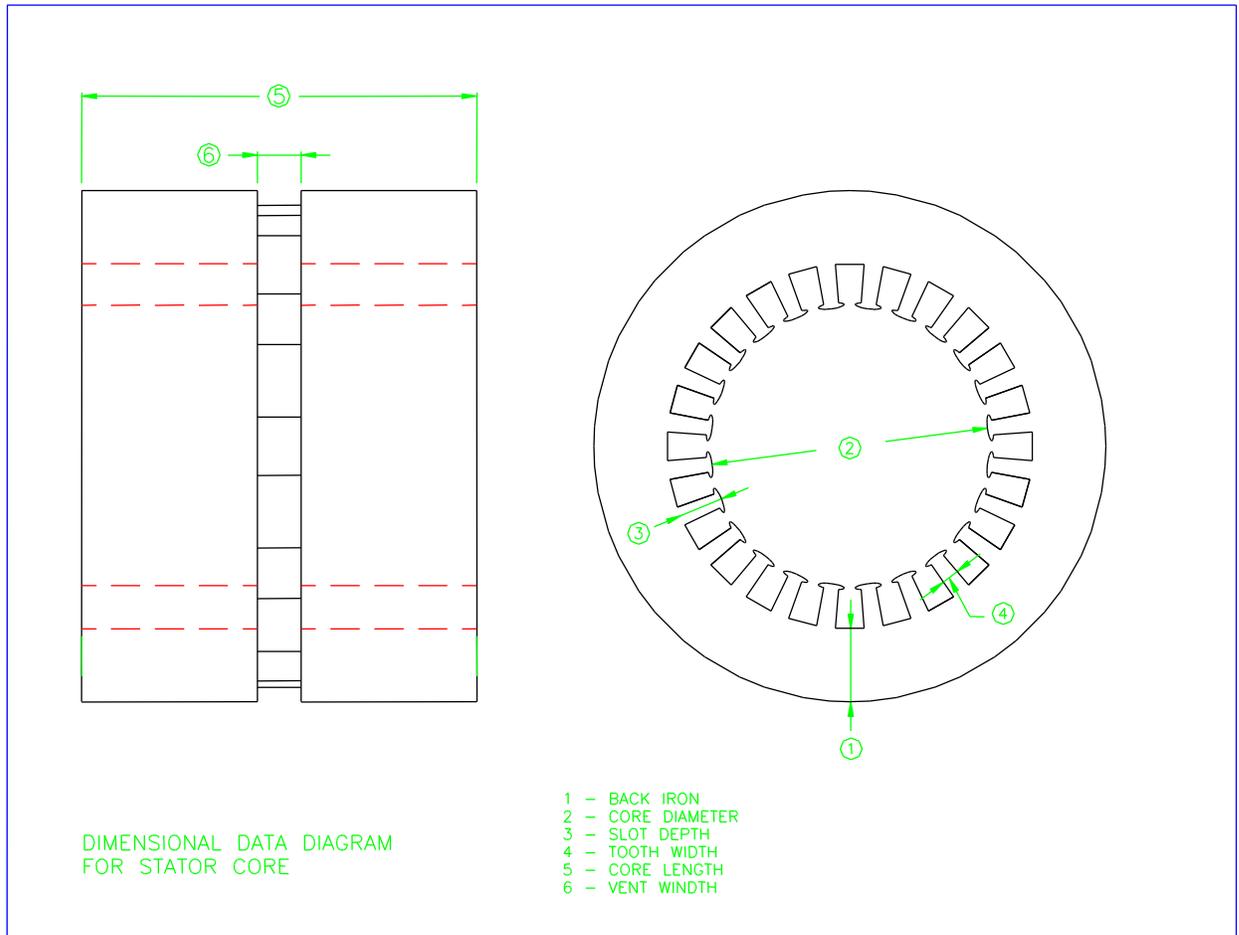


Figure 3-2. Typical Stator Core Measurements.

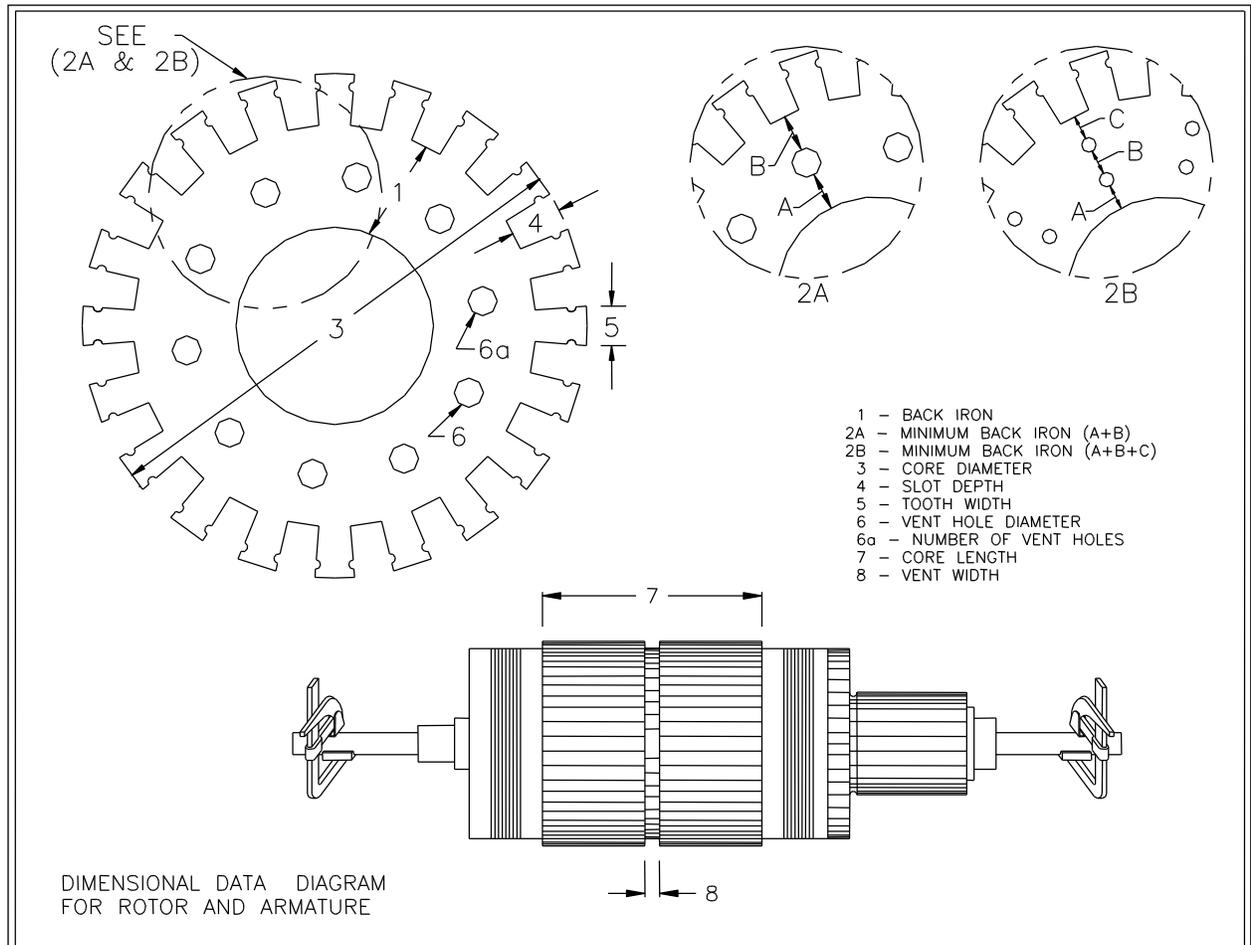


Figure 3-3. Typical Rotor/Armature Measurements.

CL25

3.5 Stator Core Loss Measurement Procedure.

This paragraph provides a detailed procedure for measuring the core loss in a stator. This procedure describes the use of the operator controls on the Test Set. Where applicable, the procedure refers to the actions required at the laptop computer. Refer to chapter 4 in this manual for detailed information on using the computer to perform the measurement.

Note

During the following steps DO NOT allow the output current to exceed 2000 Amperes on the 12.5 Volt tap or 1000 Amperes on the 25 Volt tap. The Test Set will shut off if these currents are exceeded.

1. Turn on the main circuit breaker, the computer and the computer printer.
2. Following the computer prompts, as described in paragraph 4.4, enter the customer, job number, and the stator measurement data obtained in paragraph 3.3.1. To obtain the stator measurement page click on Motors and then on Stator Dimensions. The computer will perform the necessary calculations and display the test voltage required to obtain the desired flux density in the back iron.
3. On the Test Set control panel verify that the Raise Voltage control is set to zero and that the Voltage ON lamp is off. Loop the high current cable through the core under test and connect the end of the cable to the socket with a voltage rating closest to the recommended test voltage obtained in step 2. Make certain that the cable is properly seated and locked in the socket.
4. Loop the voltmeter cable through the test core and connect the ends of the cable to the voltmeter cable sockets just above the high current cable connections.

Note

Some of the following steps require increasing the voltage applied to the core by turning the Raise Voltage control. When performing this procedure, monitor the Voltage (V) and the Current (C) display on the display panel. If the current continues to increase but the voltage stops increasing in proportion to the current applied, the core has reached saturation. If this occurs the test should be stopped. Review the dimensional data obtained in paragraph 3.3 and examine the core to determine the cause. The output should not be increased above this level

except to perform the hot spot tests.

3-9

CL25

5. On the Test Set control panel set the Output switch to the L position. Press the Voltage ON pushbutton and verify that the On lamp is illuminated. Turn the Raise Voltage control clockwise while monitoring the digital Voltage (V) display. Continue turning the control until the display reading matches the required test voltage (calculated by the computer). If the required test voltage is reached, jump to step 13.
6. If the required test voltage cannot be reached, deenergize the Test Set by pressing the Voltage Off pushbutton. Verify that the Voltage On indicator is switched off. Turn the Raise Voltage control fully counterclockwise to the Zero Start position.
7. Set the Output switch to the M position. Energize the Test Set by pressing the Voltage On pushbutton. The digital Voltage (V) meter will display the voltage level achieved at the end of step 5. Turn the Raise Voltage control clockwise until the required test voltage level is achieved. If the required level is reached, jump to step 13.
8. If the required test voltage level is not reached, deenergize the Test Set by pressing the Voltage Off pushbutton. Turn the Raise Voltage control fully counterclockwise.
9. Set the Output switch to the H position. Press the Voltage On pushbutton and turn the Raise Voltage control clockwise until the Voltage (V) display matches the require test voltage. If the test voltage is reached, jump to step 13.
10. If the required voltage cannot be reached, press the Voltage Off pushbutton and turn the Raise Voltage control fully counterclockwise.
11. If the low voltage tap was selected in step 3, disconnect the high current cable and the voltmeter cable from the Test Set. Slide the security access plate to the left to expose the higher voltage tap. Connect the high current cable and the voltmeter cable to the corresponding sockets. Repeat steps 5 through 9.
12. If the high voltage tap was selected in step 3, check to insure that the horsepower rating of the motor is within the testing capabilities of the Test Set. Also check to insure that the high current cable is properly seated and locked and that all stator measurements are correct and properly entered into the computer.
13. When the value shown in the Voltage (V) display matches the required test voltage, freeze all meter readings by pressing the Hold pushbutton located below the Current (A) meter on the display panel.
14. The computer should now display the digital meter values. If it does not, follow the computer prompts and enter the display meter readings into the

computer. Press the Hold pushbutton a second time to release the display meters.

3-10

CL25

15. The stator test results may be obtained by clicking on the Analysis or Report buttons on the computer. The computer generated test results are based on the evaluation criteria as described in paragraph 3.6. It is recommended that the stator test be continued by clicking on the Hot Spot Test button on the computer.
16. The computer will now initiate a test sequence to check for hot spots in the stator. This test consists of applying the test current (recorded in step 13) for a period of 5 to 10 minutes and physically checking the stator for hot spots. If any hot spots are found, mark the area for future repair.
17. To decrease the testing time, the current applied to the stator may be increased to 2 or 3 times the value recorded in step 13 for a period of 1 to 2 minutes. Note that if the 25 Volt tap is used the maximum output is 1,000 Amperes. If the 12.5 Volt tap is used the maximum output is 2,000 Amperes.
18. Follow the computer prompts to enter the location of the detected hot spots. Refer to paragraph 4.4 for additional information on obtaining the test results and on saving the results for future use.
19. On the Test Set control panel, press the voltage Off pushbutton and turn the Raise Voltage control fully counterclockwise. Set the Output switch to the L position.
20. Remove the high current cable and the voltmeter cable from the stator. Return the cables to their storage position. This completes the test procedure for the stator.

3.6 Rotor/Armature Core Loss Measurement Procedure

This paragraph describes the operating procedures for measuring the core loss in a rotor/armature. This procedure provides detailed information on operating the controls on the front panel of the Test Set. Refer to paragraph 4.4 for information on using the computer while performing the core loss measurement.

1. Turn on the main circuit breaker, the computer and the computer printer.
2. Following the computer prompts, enter the rotor measurements obtained in paragraph 3.3.2. The computer will calculate and display the required test voltage to obtain the desired flux density.
3. On the Test Set control panel verify that the Voltage On lamp is off and that the Raise Voltage control is set fully counterclockwise to the Zero Start position.

4. Connect one of the C clamp cables to the high current cable. Connect the other C clamp cable to the voltage tap closest to the required test voltage level obtained in step 2. Attach the C clamps to opposite ends of the armature or rotor shaft. Do not attach the clamps at the bearing fit points. The shaft will complete the test circuit through the core.
5. Thread the voltmeter cable through the spokes or "spider" between the core and the shaft. Do not run the cable through the vent holes in the core since this will result in erroneous readings. If it is not possible to thread the cable through the core, attach the cable to the high current clamps. Use the voltmeter jacks on the clamps or clip the cable to the clamps. Connect the ends of the voltmeter cable to the voltmeter sockets just above the high current cable connections on the Test Set.
6. On the Test Set front panel, set the Output switch to the L position. Press the Voltage On pushbutton and verify that the Voltage On lamp is illuminated. Turn the Raise Voltage clockwise while monitoring the digital Voltage (V) display. When the display voltage matches the required test voltage, jump to step 14.
7. If the required test voltage cannot be achieved, press the Voltage Off pushbutton and turn the Raise Voltage control fully counterclockwise. Set the Output switch to the M position.
8. Press the Voltage On pushbutton to energize the Test Set. Note that the Voltage On lamp is turned on and that the Voltage (V) meter will display the highest voltage reached in step 6. Turn the Raise Voltage control clockwise until the display matches the required test voltage. If the required test voltage is achieved, jump to step 14.
9. If the test voltage cannot be reached, Press the Voltage Off pushbutton and turn the Raise Voltage control fully counterclockwise.
10. Set the Output switch to the H position. Energize the Test Set by pressing the Voltage On pushbutton. Turn the Raise Voltage control clockwise until the required test voltage level is reached. If this is achieved, jump to step 14.
11. If the required test voltage level was not reached, press the Voltage Off pushbutton and turn the Raise Voltage control fully counterclockwise.
12. If the low voltage tap (12.5Volts) was selected in step 4, disconnect the high current cable and voltmeter cable from the low voltage tap. Slide the security access plate to the left to expose the high voltage tap. Connect the high current cable and voltmeter cable to the corresponding sockets. Repeat steps 6 through 10.

CL25

13. If the high voltage tap (25 Volts) was selected in step 4, check all cables to verify proper connections. Also, check the measurements entered into the computer in step 2.
14. When the value shown on the Voltage (V) meter matches the required test voltage, press the Hold pushbutton to freeze the display on all of the meters.
15. The computer should automatically display the digital meter values. If it does not, follow the prompts to enter the values into the computer. Press the Hold pushbutton a second time to release the meter display.
16. The rotor/armature test results may be obtained by clicking on the Analysis or Report buttons on the computer. Refer to paragraph 4.4 for additional information. It is recommended that the rotor/armature test be continued by clicking on the Hot Spot Test button on the computer.
17. The computer will automatically initiate the hot spot test. This test consists of applying the test current (recorded in step 15) to the core for a period of 5 to 10 minutes and physically checking the core for any hot spots. If a hot spot is located, mark the area for future repair.
18. To decrease the testing time, the current applied to the core may be increased to 2 or 3 times the value recorded in step 15 for a period of 1 or 2 minutes. Note that if the 25 Volt tap is used the maximum current output is 1,000 Amperes. If the 12.5 Volt tap is used the maximum current output is 2,000 Amperes.
19. Follow the computer prompts and enter the location of the detected hot spots. Refer to paragraph 4.4 for additional information.
20. On the Test Set, press the Voltage Off pushbutton and verify that the On lamp is switched off. Set the Raise Voltage control fully counterclockwise to the Zero Start position. Set the Output switch to the L position. Turn the main circuit breaker to the off position.
21. Remove the high current cable, voltmeter cable and the C clamps from the core under test. Return all items to their storage position. This completes the test procedure for the Rotor/Armature core loss.

3.7 Computerized Core Evaluation Criteria

The CL25 Test Set is designed to be used in conjunction with a laptop computer to determine the core loss in a stator or rotor/armature. The Test Set is used to provide a continuously variable, low voltage/high current source to the core under test to energize the core to 85 kilolines/square inch flux density. The computer is used to calculate the

voltage required to achieve the desired flux density (adjustable through the computer software), based on the physical characteristics of the core.

3-13

CL25

The computer testing program will also provide a pass/fail evaluation of the core based on the test results and on the following criteria (adjustable through the computer software):

Apparent Power Factor:	0.1 to 0.7:	Good
	0.7 to 0.9	Marginal
	0.9 to 1.0	Fail
Watts per Pound:	1 to 6 W/P	Good
	6 to 10 W/P	Marginal
	> 10 W/P	Fail

Note that the final Accept/Reject determination of a core should include the test results, the number and location of hot spots, the labor costs required to repair the core, and the projected life/operating costs of the repaired motor.

CL25

Chapter 4

Computer Operation

4.1 Introduction

This chapter provides detailed information on using the laptop computer and the Core Loss for Windows testing software, version 1.1. The testing program is designed to be used in conjunction with the operator controls on the Test Set to determine the losses in a stator, rotor or armature core. Refer to chapter 3 in this manual for information on the Test Set controls when performing a core loss test.

The information in this chapter is divided into four main sections. The first section, paragraph 4.2, provides a general description of the testing program. The second section, 4.3, provides installation and system configuration information. The third section, paragraph 4.4, contains detailed operating instructions for the core loss test. The fourth section, paragraphs 4.5 and 4.6, provides information on setting up reference data for each test and maintaining the databases.

4.2 About Core Loss for Windows

Welcome to Core Loss for Windows, the graphical data acquisition software developed by Phenix Technologies to be used in conjunction with Phenix Core Loss Test Sets. It's use of the latest database technology gives you easy access to your core test data. It is intended as a replacement for the existing DOS based Core Loss software (CORE5.EXE).

Core Loss for Windows has the following features:

- Built around three databases: customers, motors, and results. The customers database contains all the pertinent information for each of your customers. The motors database keeps a history of the motors that you test, allowing you to recall and use a configuration from a previous test. The results database keeps a historical record of every test that you perform, allowing you to browse, view, or print previous test results.
- Data acquisition capability that gives you real-time access to your core loss test set data, actively displaying the current meter readings.

CL25

This Chapter will provide you with a basic understanding of the operation of Core Loss for Windows. All information in this Chapter is also available in the on-line help. We recommend that you use this Chapter as a “getting started guide”. The on-line help provides more detailed information on each of the screens within the software. The best way to learn how to utilize all the capabilities of Core Loss for Windows is to experiment with it. Move from screen-to-screen entering data and clicking on the Help button in each screen.

4.2.1 Working with Windows

Before you begin working with the Core Loss for Windows, you should understand the basics of Microsoft® Windows (TM). Like other Windows-based products, Core Loss for Windows presents an easy-to-use graphical user interface. Because Core Loss for Windows operates in the Windows environment, it uses the standard Windows rules for selecting icons, menus, menu items, and options in dialog boxes.

Before you use Core Loss for Windows, you should know how to:

- Choose and cancel commands
- Move, move within, and cancel dialog boxes
- Work with command buttons, text boxes, list boxes, option buttons, and check boxes

Note: For more information, refer to the Microsoft Windows User's Guide or view the Windows Tutorial.

4.2.2 Core Loss for Windows terminology

The following table explains terms you need to know to follow instructions in this manual and the on-line Help.

<u>Term</u>	<u>Definition</u>
Choose	To pick an item that begins an action (applies to menu commands and command buttons in dialog boxes)
Click	To press and release the mouse button
Deselect	To unmark an item (applies to check boxes, option buttons, list boxes, and text)
Double-click	To press and release the mouse button twice in quick succession
Select	To mark an item by highlighting it (applies to option buttons, check boxes, list boxes, and text)

CL25**4.3 Installation and Configuration**

4.3.1 Installation

If you have purchased a new core loss test set, then Core Loss for Windows will be pre-installed and tested on the accompanying notebook computer. No further software installation or setup is required.

If you have received Core Loss for Windows as an upgrade or a stand alone product, then the software must be installed and configured on your computer.

Before you install Core Loss for Windows, make sure that you have a computer system capable of running the software effectively. The Core Loss for Windows computer system requirements are shown below. The recommended system provides performance that is substantially better than with the minimum system. Performance is affected most significantly by the amount of system RAM. The more the better.

4.3.2 Minimum System Requirements:

- PC Compatible 386 computer w/ mouse
- MB of system RAM
- MB available hard disk space
- Microsoft DOS version 5.0
- Microsoft Windows version 3.1

4.3.3 Recommended System Requirements:

- PC Compatible 486 computer w/ mouse
- 8 MB of system RAM
- MB available hard disk space
- Microsoft DOS version 6.2
- Microsoft Windows version 3.11 or Windows95

4.3.4 Additional Hardware Requirements:

The computer must have one serial port available (but only if you intend to read data automatically from the test set).

4.3.5 To Install Core Loss for Windows:

1. Insert **Disk 1** into the floppy disk drive.
2. On the Windows main menu bar, choose File, and then Run.

3. Type 'a:install' and click *Ok*. NOTE: 'a:' is the floppy disk drive specification. It may be 'b:' on your system.
4. Follow the installation instructions as they appear on the screen. You may install Core Loss for Windows in the default directory 'C:\PHENIX\WINCORE', or enter a different drive/directory.
5. When the installation is complete, double-click on the Core Loss for Windows icon to start the software.

4.3.6 System Configuration

Before you can use the data acquisition capabilities of Core Loss for Windows, you first must configure the software to match the hardware configuration of your test set. Configure Core Loss for Windows by using the setup screen *System Settings*. Access this screen from the main screen of Core Loss for Windows, by clicking the File main menu item, then Setup and then System Settings.

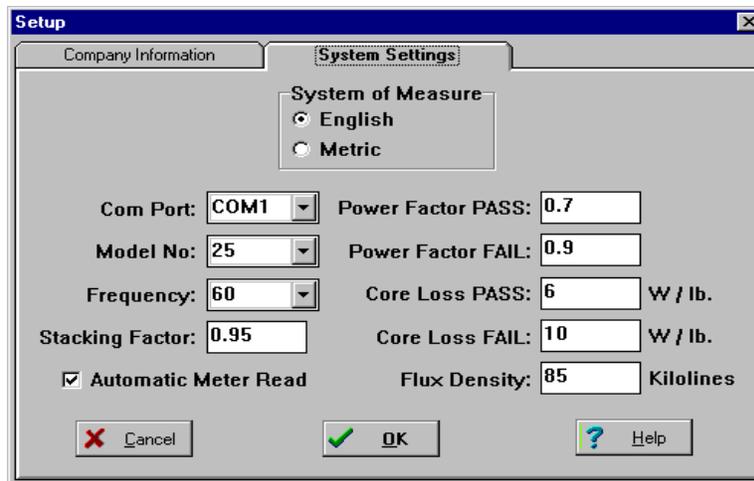


Figure 4-1. System Settings Configuration Screen

The System Settings screen contains hardware and test parameter information. The default settings are appropriate for most installations. The *Model No* and *Com Port* settings MUST be changed to match your configuration.

Model No: This setting must match the model number of your test set.

NOTE

An incorrect Model No setting may cause incorrect placement of the decimal point. The model CL10 meters have fixed decimal points while the other model decimal points are floating.

Com Port: The serial port on your computer to which the test set data cable is attached. Usually COM1.

4.4 Using Core Loss for Windows

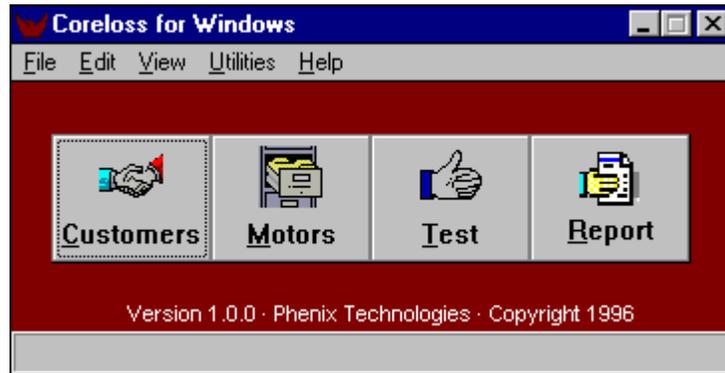


Figure 4-2. Core Loss for Windows, Main Screen

The main screen (shown above) of Core Loss for Windows contains four push buttons: Customers, Motors, Test, and Report. Customers and Motors provide direct access to your customer and motor records. Use these buttons to add, delete, or modify customer or motor data records. The Test button is the starting point for any test, click it to begin a test. Use Report to generate a report.

The menu bar (File Edit View Utilities Help) provides access to all the other functions in Core Loss for Windows. These functions are described throughout this chapter.



4.4.1 Performing a Test

The following is the step-by-step procedure for testing a core. The Test Setup screen, Figure 4-3, contains the test information.

1. On the main screen of Core Loss for Windows, Figure 4-2, click on the *Test* button. The Test Setup screen will open.
2. Browse the Customer menu to find the customer you are testing for; or, if it is a new customer then click *New Customer...* to add it. Hint: you may also use the Customers Form (click *Customers...*) to browse for a customer, the one you select there will be selected when you return to the Test Setup form.

NOTE

To view the complete Customer or Motor record, simply double-click the desired entry in the browse menu.

Figure 4-3. Test Setup Screen

3. Browse the motor menu to find the motor configuration you wish to test; or, if it is a new motor type then click *New Motor...* to add it. Hint: you may also use the Motors Form (click *Motors...*) to browse for a motor, the one you select there will be selected when you return to the Test Setup form.
4. Click on the Work Order Number field and enter a value. This number will identify the test in the results database.
5. Click on the Test Type that identifies the type of core you will be testing; stator or rotor.
6. Click on *OK* to proceed with the test. The core loss test screen will appear.
7. The target voltage will be displayed in the top-center of the screen. Raise the output voltage to this level.
8. Click *Analysis* to view the core loss test results.
9. Click *Hot Spot Test...* to perform a hot spot test. The hot spot test screen will appear.

CL25

10. The target current level will be displayed in the top-center of the screen (between 2 and 3 times the core loss test current level). Raise the output voltage until this current level is obtained.
11. The timer will begin once the times 2 target level has been reached. Click Done when the test is complete; the timer will stop.
12. Check for hot spots and click on the core diagram to mark the location of each hot spot. Hot spots will be marks with a small red square. Click Reset if you make a mistake placing the marks; all marks will be removed Click on *Notes...* to add any test notes.
13. Click Close to return to the core loss test screen.
14. Click Report to generate a test report. You may view the report on the screen or send it to the printer.
15. Click Save & *Exit* to save the results and exit the test screen.

4.4.2 Printing A Report

After you have completed a test, you may then want to generate a report.

1. On the opening screen of Core Loss for Windows, click the Report button. The Test Results menu will open.
2. Browse the results menu to find the test result you wish to print. The most recent test will already be highlighted.
3. Click *Ok* to proceed. Click *Customer...* to view the associated customer record. Click *Motor...* to view the associated motor record. Click *Notes...* to view, or edit, the test notes. Click Edit *Additional Info...* 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.

4. The Test Report screen will open. Select the destination for the report and use *Setup* to select to desired printer. Click Print to generate the report.

4.3 Viewing Test Results

1. On the opening screen of Core Loss for Windows, click the View main menu item and the Results... sub menu item. The Select a Result menu will open.

1. Browse the results menu to find the test result you wish to print.
2. Click *Ok* to view the test result. Click *Customer...* to view the associated customer record. Click *Motor...* to view the associated motor record. Click *Notes...* to view, or edit, the test notes. Click *Edit Additional Info...* to add/edit the winding and no-load test information.



4.4.4 The Customers Form

The Customers form enables you to add a customer, modify a customer, delete a customer, or browse the customers. To perform these tasks use the Database Navigator, located at the top of the form. For help on a button, position the cursor on the button and wait for the “hint” message to appear.

Figure 4-4. Customers Screen

Sorted By: Use this control to change the order. Customers may be sorted by customer name, customer number, city, state, or zip code.

Browse Menu: This menu is located on the right side of the form and is used to browse the database. Click on a customer to make it the current record.

CL25



4.4.5 The Motors Form

The Motors form enables you to add a motor configuration, modify a motor, delete a motor, or browse motors. To perform these tasks use the Database Navigator, located at the top of the form. For help on a button, position the cursor on the button and wait for the “hint” message to appear.

Figure 4-5. Motors Screen

Sorted By: Use this control to change the order. Motors may be sorted by serial number, type, make, model, frame, horsepower, voltage, current, or rpm.

Browse Menu: This menu is located on the right side of the form and is used to browse the database. Click on a motor configuration to make it the current record.

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

All other fields are optional.

Stator Dimensions >>: Click to change to the stator dimensions page. This page contains the measurements of the stator and calculates the approximate weight and the mean circumference.

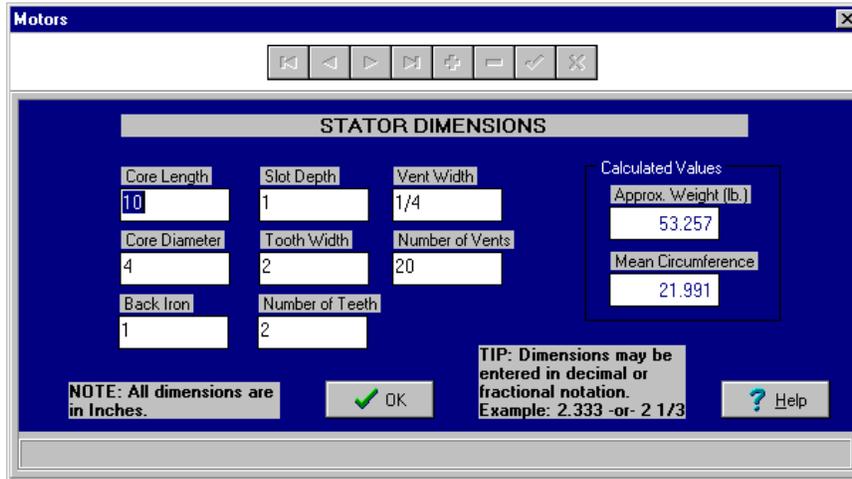


Figure 4-6. Stator Dimensions Screen

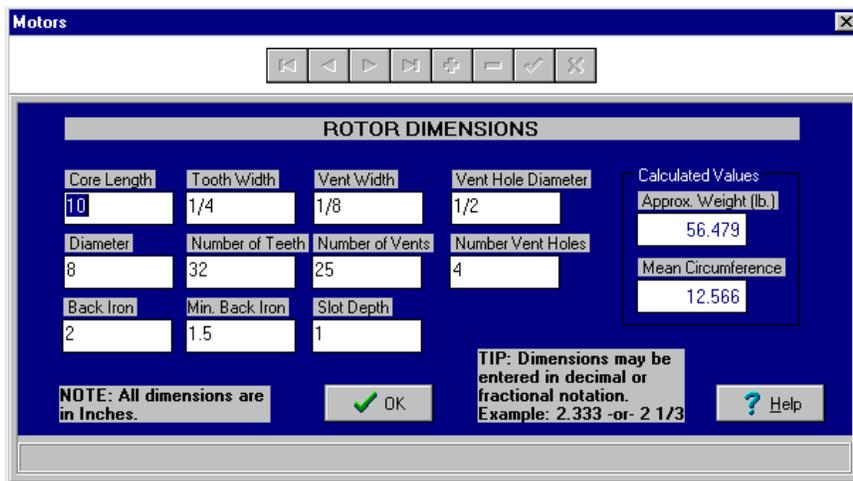
Dimensions may be entered in decimal or fractional notation. For example: a measurement of 2 and one-third inches may be entered as “2.333” or “2 1/3”.

NOTE

When using the fractional notation 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.

Rotor Dimensions >>: Click to change to the rotor dimensions page. This page contains the measurements of the rotor and calculates the approximate weight and the mean circumference. Again, dimensions may be entered as “2.333” or “2 1/3”.

Figure 4-7. Rotor Dimensions Page



CL25



4.4.6 The Database Navigator

The database navigator is a group of speed buttons located in a rectangle bar at the top of each database form. This control provides you with all of the necessary functions to navigate and maintain the database.

If you want to find out what action an individual button performs, place the cursor on the button and wait one second for the hint.

You may add, delete, or modify records by first clicking the appropriate speed button. Or, browse the database by clicking the arrow buttons. The other buttons are defined as follows:

- (+) Plus:** insert a record.
- (-) Minus:** Delete a record.
- Check mark:** Accept changes and post record.
- (X):** Ignore changes and cancel edit/insert.

4.4.7 The Core Loss Test

The core loss test screen 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.

Parameter	Value
Target Voltage	2.96 (V)
Voltage (V)	2.96
Power (kW)	0.56
Current (A)	950
Core Loss (W/lb.)	2.689
Flux Density (Kilolines)	85.061
Power Factor	0.199
Reluctance (AT/Inch)	25.200

Figure 4-8. Core Loss Test Screen

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

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 & Exit: Click when the test is complete, the results will automatically be saved.

Abort: Click to cancel the test without saving the results.

4.4.8 The Hot Spot Test

The hot spot test screen displays the test set meters, the target current level, the hot spot location map and the timer.

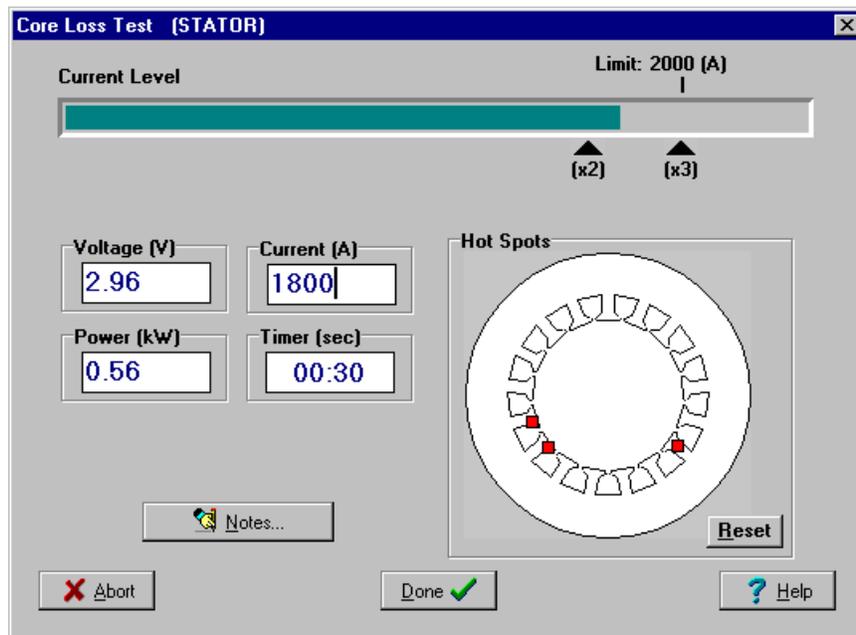


Figure 4-9. Hot Spot Test Screen

CL25

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.

Hot Spots: Image map of the stator or rotor, used to track the general location of hot spots found. To mark a spot, simply click on the location. Reset will erase all markings for a fresh start.

Notes: Click to edit the test notes.

4.5 Setup

4.5.1 Company Information

Use the company information screen to change the header that appears at the top of reports. Access this form by selecting File and then Setup and then Company Information.

Figure 4-10. Company Information Screen

4.5.2 System Settings

Use the System Settings to control system functions. Access this form by selecting File and the Setup and then System Settings.

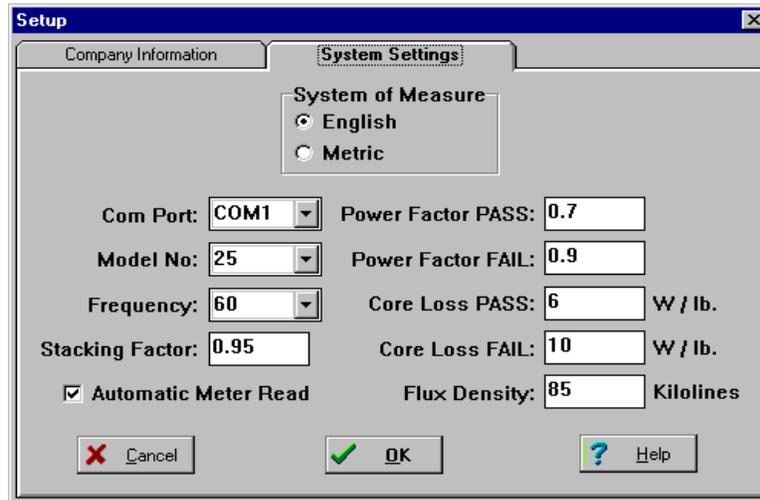


Figure 4-11. System Settings Screen

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 on your computer to which the data acquisition cable is connected. Usually COM1.

Model No: The model number of your test set. Important to the software as it needs to know how to interpret the decimal point information.

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

Stacking Factor: Factor used in the volume calculations that compensate for the “air” in the lamination steel (default is 0.95).

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.).

CL25

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

Flux Density: The level flux density that is required for the core loss test. The target voltage is computed to achieve this value (default is 85 Kilolines, 13.17 Kilogauss).

4.6 Database Management

4.6.1 Data Backup

Core Loss for Windows 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 floppy backup disks (floppy disks fail as well). Core Loss for Windows has backup and restore functions that make this an easy task.

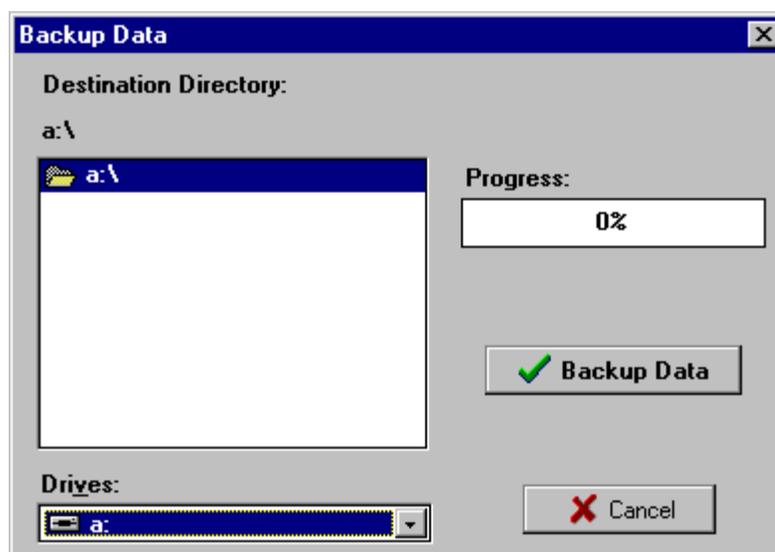


Figure 4-12. Backup Data Screen

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

CL25

4.6.2 Data Recovery

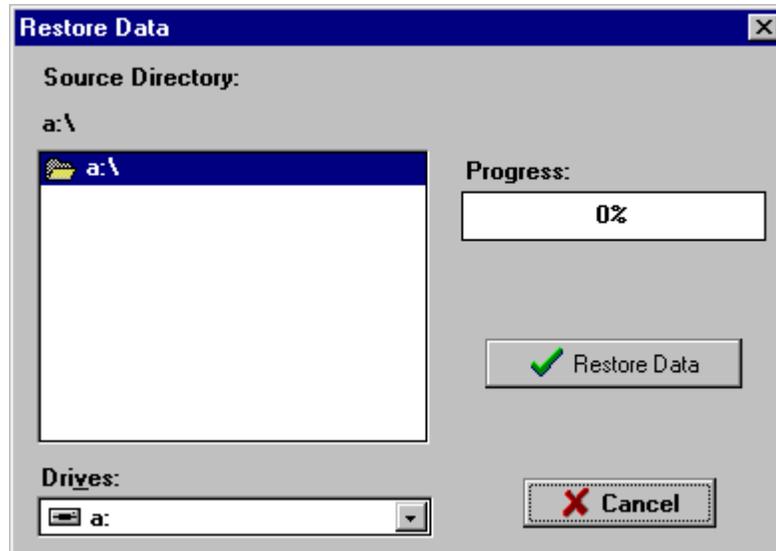


Figure 4-13. Restore Data Screen

Should something happen and you need to restore data from a backup, Core Loss for Windows 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.

4.6.3 Rebuild Indexes

Occasionally, a database index file may become corrupted and unusable. Core Loss for Windows 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 File and then Rebuild Indexes.

Chapter 5

Recalibration

5.1 Introduction

This chapter contains detailed procedures for calibrating the front panel digital meters on the CL25 Core Loss Test Set. It is divided into 3 sections. The first section, paragraph 5.2, contains general information on calibration. The second section, paragraph 5.3, describes the initial set-up procedures. The third section, paragraph 5.4, contains detailed procedures for calibrating the Voltage, Current, and Kilowatt meters on the Test Set.

5.2 General Calibration Information

5.2.1 Safety Information

Due to the electrical shock hazard, only qualified personnel should attempt to calibrate the Test Set. The safety personnel should be familiar with the proper operation of the Test Set and should review the entire Recalibration procedure before continuing.

5.2.2 Recommended Recalibration Intervals

The Test Set should be calibrated on a regular basis. The time interval between calibration depends, to a certain extent, on the age of the equipment (very old or very new), the operating environment, and the total number of hours on the Test Set.

For most applications, a time interval of every month is recommended as a starting point. If no adjustments are required, the time interval should be increased. If adjustments are required with each calibration, the time interval should be decreased. This will ensure accurate measurements with a minimum of maintenance.

5.2.3 Required Test Equipment

In order to achieve an accurate calibration, high quality test equipment must be used. This test equipment must be calibrated according to established standards. For example, in the US, the NIST standards are recommended.

CL25

The following test equipment is required to calibrate the Core Loss Test Set:

1. True RMS ac voltmeter
2. True RMS ac currentmeter
3. 2000:5 current transformer (CT)
4. Wattmeter
5. Resistor, 6.25 milliohms, 25 kilowatts, Non-inductive
6. Resistor, 25 milliohms, 25 kilowatts, Non-inductive

Note that the power in an ac circuit is equal to the Voltage x current x power factor. In order to calibrate the kilowattmeter on the Test Set a separate wattmeter is required.

5.3 Initial Calibration Setup

The following paragraphs describe the different procedures that must be performed prior to calibrating the Test Set. Note that these procedures should only be performed by qualified calibration personnel.

5.3.1 Removal of Back Panel

The back panel of the Test Set must be removed in order to gain access to the Display Panel circuit card assemblies. These circuit cards contain the potentiometers used to calibrate the display meters.

Warning

Due to the electrical shock hazard, qualified calibration personnel must demonstrate extreme caution while operating the Test Set with the back panel removed.

1. Verify that the ac operating power is removed from the Test Set. This is accomplished by setting the main circuit breaker, located on the front panel of the Test Set, to the off position.
2. Remove the screws securing the back panel of the Test Set.
3. Remove the back panel from the Test Set and place the panel some distance from the Test Set. This is recommended to prevent the back panel from falling into the open circuitry in the Test Set.

5.3.2 Location of Calibration Potentiometers

With the back panel removed from the Test Set, the calibration personnel will have direct access to the circuit cards located on the display panel assembly. The location of the calibration potentiometers located on the circuit card assemblies is shown in Figure 5-1. Table 5-1 lists the different functions of the calibration potentiometers.

CL25

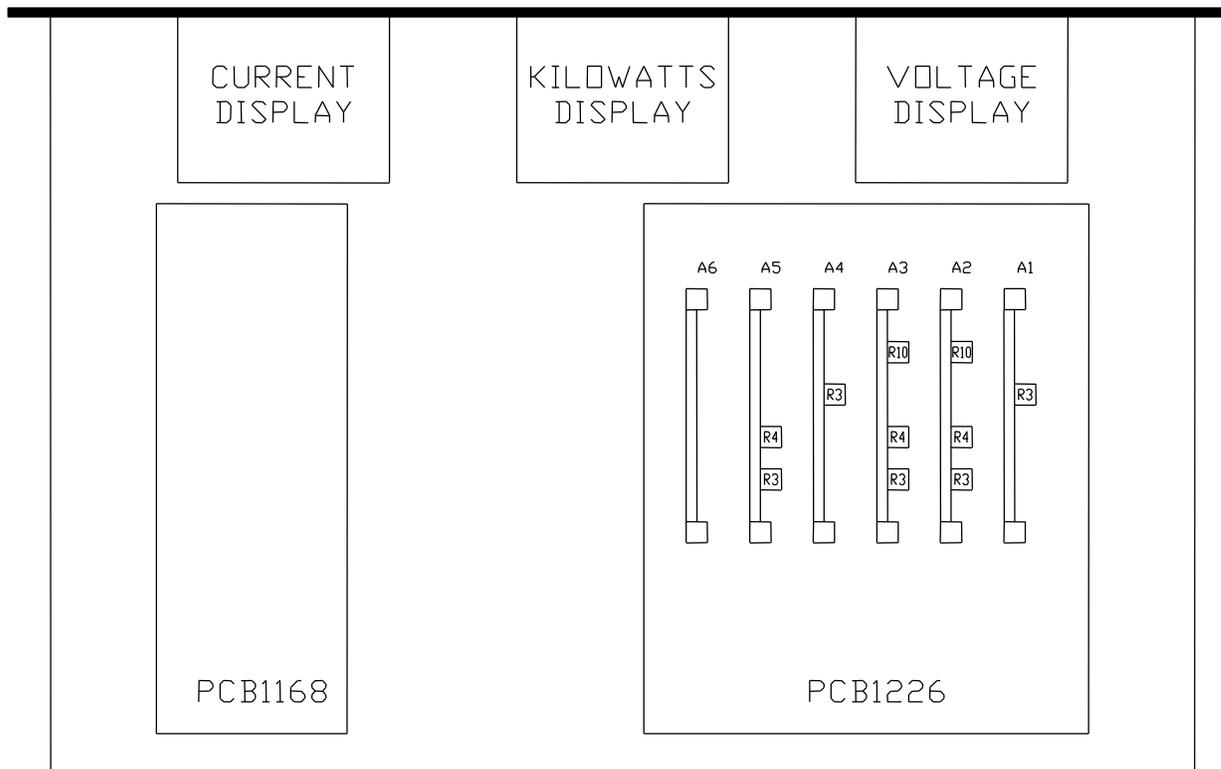


Figure 5-1. Location of Calibration Potentiometers

Table 5-1. List of Calibration Potentiometers

Circuit Card Assembly	Reference Designation	Function
A1	R3	Voltmeter Zero Adjustment
A2	R3	12.5 Volt Tap- Low Range- Voltmeter Adjustment
	R4	25 Volt Tap- Low Range- Voltmeter Adjustment
	R10	High Range Voltmeter Adjustment
A3	R3	12.5 Volt Tap- Low Range- Kilowattmeter Adjustment
	R4	25 Volt Tap- Low Range- Kilowattmeter Adjustment
	R10	High Range Kilowattmeter Adjustment
A4	R3	Currentmeter Zero Adjustment
A5	R3	12.5 Volt Tap- Currentmeter Adjustment
	R4	25 Volt Tap- Currentmeterr Adjustment

CL25

5.3.3 Electrical/ Display Meter Check

1. Verify that the input voltage to the Test Set is correct (+/- 5%) as specified on the Test Set serial tag.
2. Set the main circuit breaker, on the front of the Test Set, to the on position.
3. Press the L pushbutton on the Voltmeter Range switch on the display panel.
4. Allow a few seconds for the panel meters to stabilize.
5. Verify that the display panel Voltage (V) meter indicates a value of close to 0.000. If the value shown is not acceptable, adjust R3 on the A1 circuit card assembly to obtain an acceptable value. Refer to Figure 5-1.
6. Verify that the display panel Current (C) meter indicates a value of close to 0.000. If the value shown is not acceptable, adjust R3 on the A4 circuit card assembly to obtain an acceptable value.

5.4 Calibration Procedures

The following paragraphs provide detailed procedures for calibrating the Test Set. The calibration process consists of separate procedures for the Voltmeter, Currentmeter, and the Kilowattmeter. Refer to Figure 5-1 and to Table 5-1 for the location of the calibration potentiometers and their function. It is recommended that these procedures be performed in the listed sequence.

Note

**Throughout the following procedures,
Energizing the Test Set consists of determining the required output,
turning the Raise Voltage control to the Zero Start position,
and pressing the Voltage On pushbutton.
Deenergizing the Test Set includes pressing the Voltage Off pushbutton
and setting the Raise Voltage control to the Zero Start position.**

5.4.1 Voltmeter Calibration

1. Connect the test equipment to the Test Set as shown in Figure 5-2. Energize the Test Set.
2. Turn the Raise Voltage control to increase the output until the standard voltmeter displays a value of 10.0 Volts.

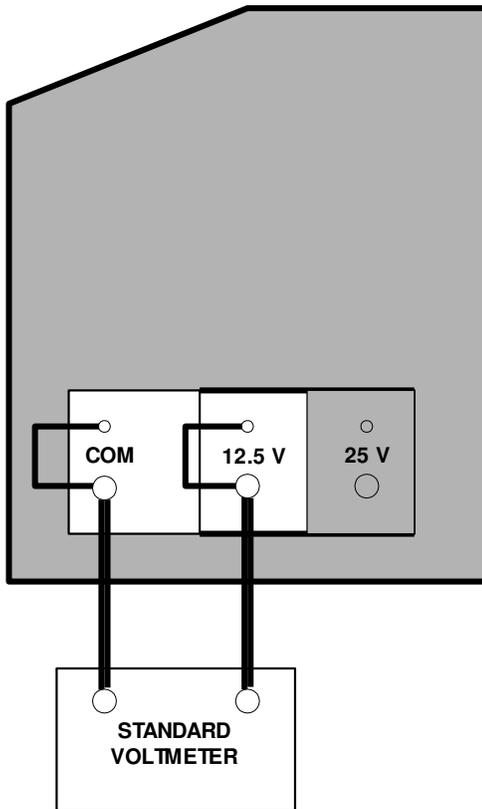


Figure 5-2. Voltmeter Calibration Set-up, 12.5 Volt Tap

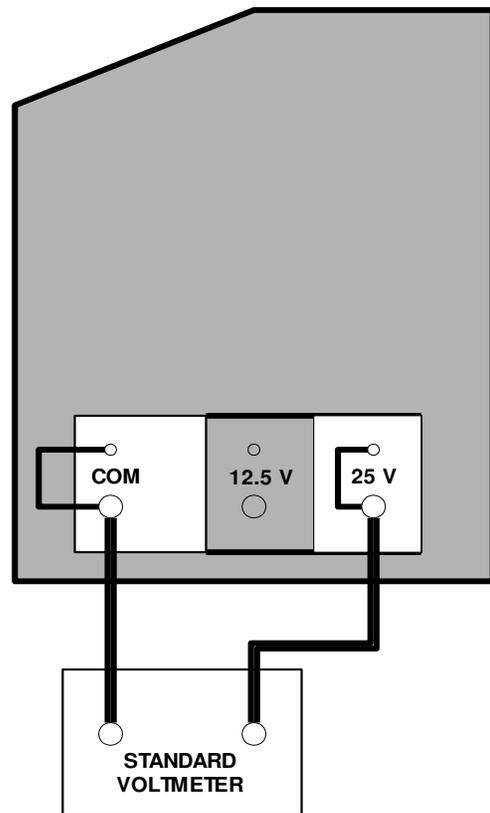


Figure 5-3. Voltmeter Calibration Set-up, 25 Volt Tap

3. Compare the Test Set Voltage (V) display with the standard voltmeter. If the two readings do not agree, adjust R3 on the A2 circuit card assembly until the Voltage (V) display matches the standard voltmeter display.
4. Repeat steps 2 and 3, adjusting the Raise Voltage control to obtain standard voltmeter readings of 2.5, 5, 7.5 and 12.5 Volts.
5. Deenergize the Test Set.
6. Connect the test equipment to the Test Set as shown in Figure 5-3. Energize the Test Set.
7. Turn the Raise Voltage control to increase the output until the standard voltmeter displays a value of 16 Volts.

CL25

8. Compare the Test Set voltage with the value shown on the standard voltmeter. If the two readings do not agree, adjust R4 on the A2 circuit card assembly to match the Voltage (V) value with the value shown on the standard voltmeter.
9. Repeat steps 7 and 8, adjusting the Raise Voltage control to obtain standard voltmeter readings of 4, 8, 12, and 19 Volts.
10. Press the Voltmeter Range H pushbutton on the Test Set display panel.
11. Turn the Raise Voltage control to increase the output until the standard voltmeter indicates a value of 20 Volts.
12. Compare the Test Set Voltage (V) display with the standard voltmeter display. If the two values do not agree, adjust R10 on circuit card assembly A2 until the value shown on the Voltage (V) display matches the value shown on the standard voltmeter.
13. Repeat steps 11 and 12, adjusting the Raise Voltage control to obtain standard voltmeter readings of 5, 10, 15, and 25 Volts.
14. Deenergize the Test Set. This completes the calibration procedure for the Test Set voltmeter.

5.4.2 Currentmeter Calibration

1. Connect the test equipment to the Test Set as shown in Figure 5-4.
2. Place the Output selector switch to the L position and energize the Test Set.
3. Turn the Raise Voltage control to increase the output until the standard currentmeter displays a value of 4 Amperes. The Current (A) meter on the display panel should read 1600 Amperes. (The 2000:5 current transformer will result in a reading on the standard currentmeter of $1/400^{\text{th}}$ of the value shown on the Current (A) display).
4. If the correct value is not shown on the Current (A) display, adjust calibration potentiometer R3 on the A5 circuit card assembly until the proper value is reached.

CL25

- Repeat steps 3 and 4 for the values listed in table 5-2.

Table 5-2. Currentmeter Calibration Values, 12.5 Volt Tap

Standard Currentmeter Reading	Current (A) Display Reading
1 Amp	400 Amp
2 Amp	800 Amp
3 Amp	1200 Amp
5 Amp	2000 Amp

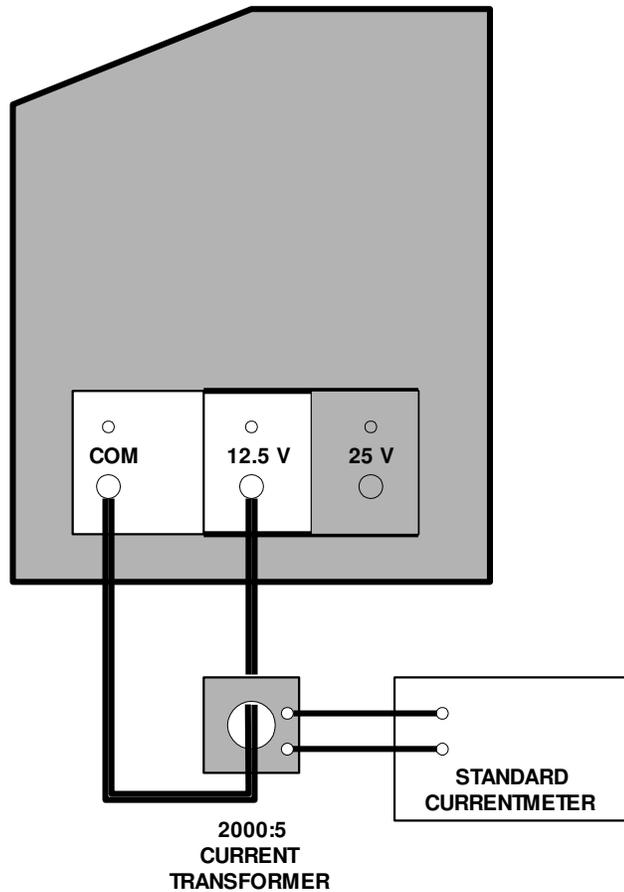


Figure 5-4. Currentmeter Calibration Set-up, 12.5 Volt Tap

- Deenergize the Test Set.
- Connect the test equipment as shown in Figure 5-5. Energize the Test Set.

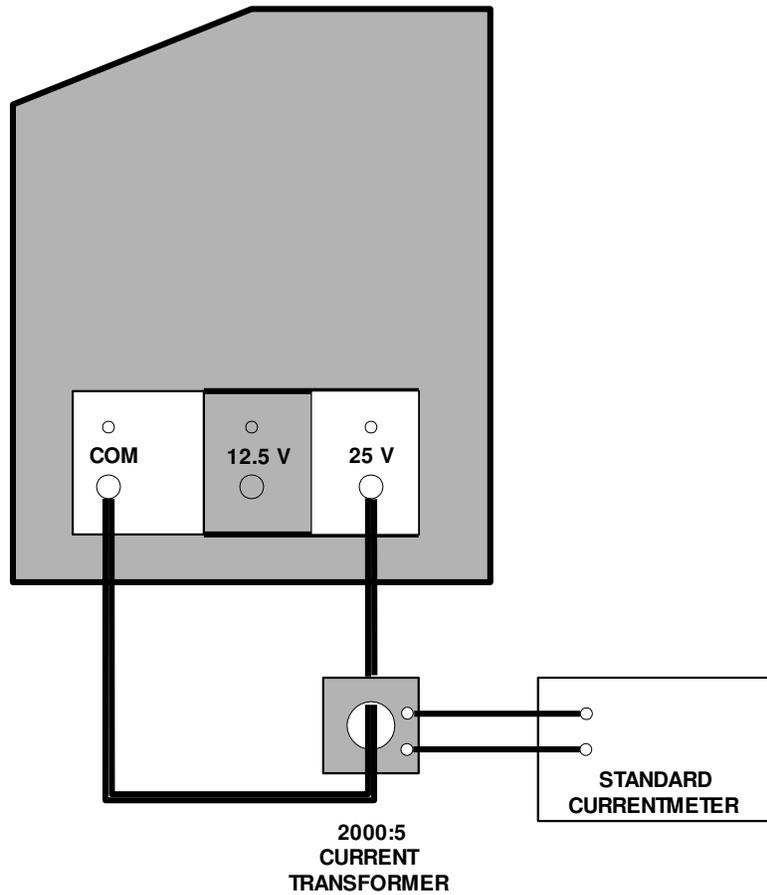


Figure 5-5. Currentmeter Calibration Set-up, 25 Volt Tap

8. Turn the Raise Voltage control until the standard currentmeter displays a value of 2 Amperes. The Current (A) display should indicate a value of 800 Amperes.
9. If the correct value is not shown on the Current (A) display, adjust calibration potentiometer R4 on the A5 circuit card assembly until the correct value is obtained.
10. Repeat steps 8 and 9 for the values shown in Table 5-3.

Table 5-3. Currentmeter Calibration Values, 25 Volt Tap

Standard Currentmeter Reading	Current (A) Display Reading
0.5 Amp	200 Amp
1 Amp	400 Amp
1.5 Amp	600 Amp
2.5 Amp	1000 Amp

11. Deenergize the Test Set. This completes the currentmeter calibration procedure.

CL25

5.4.3 Kilowattmeter Calibration

1. Connect the test equipment to the Test Set as shown in Figure 5-6.

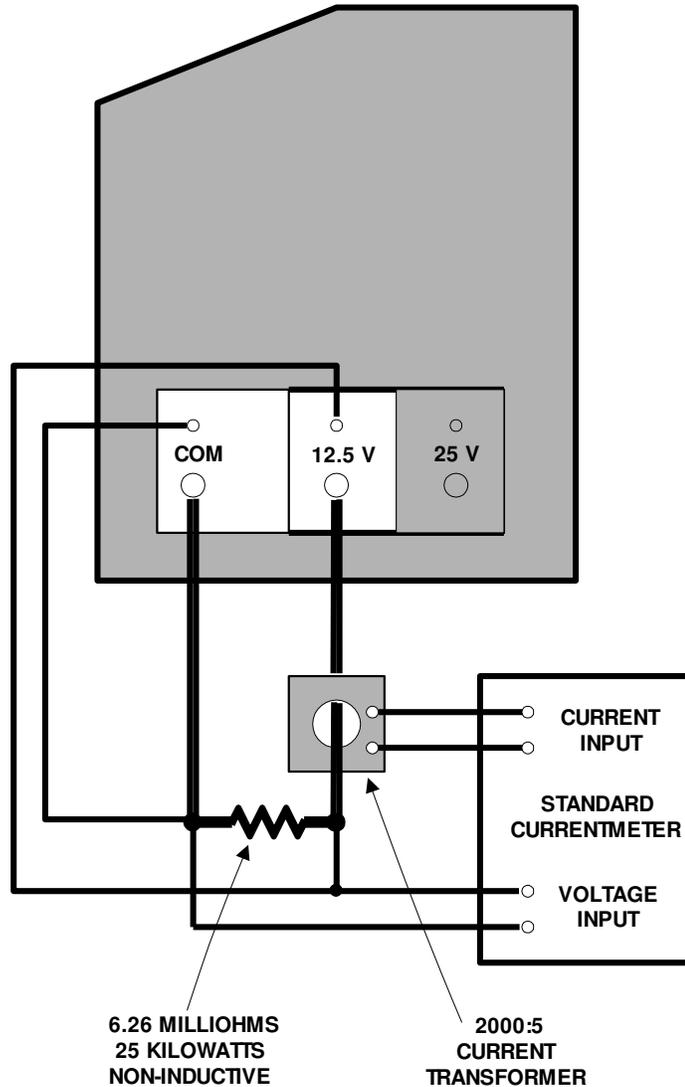


Figure 5-6. Kilowattmeter Calibration Set-up, 12.5 Volt Tap

2. Energize the Test Set. Press the L pushbutton for the desired Wattmeter Range on the Test Set.
3. Turn the Raise Voltage control until the standard wattmeter displays a value of 16 kW.
4. Compare the Test Set Kilowatts (KW) display with the standard wattmeter. If the two values do not agree, adjust calibration potentiometer R3 on circuit card assemble A3 until the two displays match.

CL25

5. Repeat steps 3 and 4, turning the Raise Voltage control to obtain standard wattmeter readings of 4, 8, 12, and 19 kW.
6. Deenergize the Test Set.
7. Connect the test equipment to the Test Set as shown in Figure 5-7. Energize the Test Set.

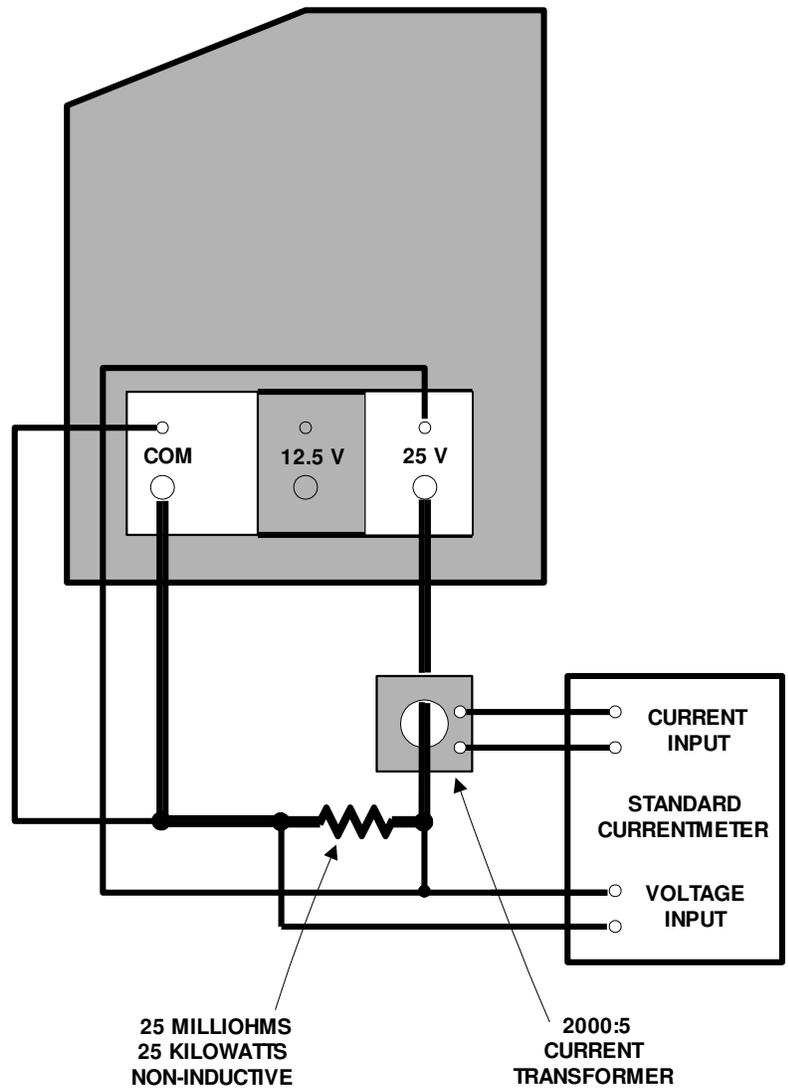


Figure 5-7. Kilowattmeter Calibration Set-up, 25 Volt Tap

CL25

8. Turn the Raise Voltage control to increase the output until the standard wattmeter displays a value of 16 kW.
9. Compare the Test Set Kilowatts (KW) display with the standard wattmeter display. If the two values do not agree, adjust calibration potentiometer R4 on circuit card assembly A3 until the two displays match.
10. Repeat steps 8 and 9 to obtain standard wattmeter readings of 4, 8, 12 and 19 kW.
11. Press the H pushbutton on the Wattmeter Range selector on the Test Set.
12. Turn the Raise Voltage control to increase the output until the standard wattmeter displays a value of 20 kW.
13. Compare the Test Set Kilowatts (KW) display with the standard wattmeter display. If the two values do not agree, adjust calibration potentiometer R10 on circuit card assembly A3 until the two displays match.
14. Repeat steps 12 and 13 to obtain standard wattmeter readings of 5, 10, 15, and 25 kW.
15. Deenergize the Test Set. Set the main circuit breaker to the off position. This completes the kilowattmeter calibration procedure.

5.5 Returning the Test Set to Operational Status

Remove all test equipment from the Test Set. Verify that all tools and related hardware have been removed from the inside of the Test Set. Reattach the rear panel to the Test Set. The Test Set is now fully operational.

Chapter 6 Diagrams

6.1 Introduction

This chapter contains the schematic and wiring diagrams applicable to the CL25 Core Loss Test Set. Refer to the parts list, contained in Chapter 7, for additional information on chassis mounted components and circuit card assemblies. The following table lists the diagrams contained in this Chapter.

Drawing Number	Description
9307100	CL-25 Core Loss Test Set (Power Section)
31122601	Coreloss Control/Metering
01-E110	PCB1055 +/- 15 VDC Power Supply
01-P071-1	PCB1078 TRMS/AVG Converter
01-P120 Sh. 1 of 2	BCD/RS232 Meter Interface
01-P120 Sh. 2 of 2	BCD/RS232 Opto-Isolation
02-E603	Regulator Drive Switching Unit 600D Series
3117431	Newport 2520 for PCB 1074 Interface

CHAPTER 7 CL25 PARTS LIST

Qty.	Phenix Stock #	Item	Description	Mfg./Part Number
	9307100		CL25 Core Loss Test Set	
	7921112		Control Assembly	
	3921203		Standard Controls	
	3921204		CL25 Controls	
	6319000		Common/RS-232	
		Assemblies		
	7319101		Meter Drawer	
	7922113		Regulator Assembly	
	3922204		Standard Electrical	
	3922206		CL25 Electrical	
	6922113		Cabinet Assembly-	
		Mechanical		
	38321008A		Transformer	
1	1603603	F3	Fuse, 3A, 3AG	Little Fuse 3AG-3A-312
1	1603920	F3	Fuse holder, 3AG	Little Fuse
1	1157345	K4	Panel Mount Socket	
1	1701300	K4	Relay	IDEC#RY4S-UAC-120V
1	1422151	PL1	Lens, Green	
1	1422153	PL2	Lens, Clear	
1	1422152	PL3	Lens, Yellow	
1	1422150	PL4	Lens, Red	
4	1420150	PL1-4	Lamp, 60V	
4	1423300	PL1-4	Lamp Socket	
4	1712086	R1-4	Resistor, 3.9K, 3W, 10%	
1	31114500	R1-4	Panel Lamp Board Assembly	
1	1862905	SW2	Switch, NC	Siemens 3SB1400-OC
1	1862124	SW2	Black Cap	Siemens 3SB1910-OAB
1	1862910	SW3	Switch, NO	Siemens 3SB1400-OB
1	1862128	SW3	Red Cap	Siemens 3SB1910-OAC
2	1862120	SW2-3	Pushbutton	Siemens 3SB02-P
1	1156006	---	Terminal Strip	Keystone #829; CJ2006
1	1863330	SW1	Rotary Switch	Kraus & Naimer US3200-608E F# US4872
1	1891930	T2 Knob	Knob, 399-0001	1010&1220
1	6310000	---	Common Hardware (Not Further Listed)	
1	6310003	---	RS-232 Assembly	
1	1001740	---	DB-9 Male/Female 6 Foot Cable	
3	1079905	---	Ribbon Cable, 26CN 76164026	

1	1152155	---	26 Pin S Connector	#CSC26T-ND; R8304ND
2	1152210	---	10 Circuit Connector	Allied 512-3245
1	1152250	---	3 Circuit Connector	640440-3
1	31116800	---	Circuit Card Assembly, 232 Interface	Phenix PCB 1168
3	3117420	---	Circuit Card Assembly, Meter Interface	Phenix PCB 2520
1	2980310	---	Panel Decal	
1	73102001	---	Front Panel Assembly	
1	7311001	---	Electrical Assembly	
1	73102000	---	Basic Panel Assembly	
2	1152270	Con 16, 20	Connector, 6 Circuit	6404406
2	1152285	Con 17, 21	Connector, 6 Circuit	Allied 512-3243
4	1422153	Lens	Lens, Clear	EAO 31-903.7
5	1420143	LP1-5	Lamp, 6.3V	EAO 31-963.0
2	1860737	SW1,2	DC MTS TAP/2 P.EAO	ITL-2278
1	3117806	A1	Circuit Card Assembly, Converter, 120V In	
1	31112805	A2	Circuit Card Assembly, Voltmeter	
1	31112807	A3	Circuit Card Assembly, Wattmeter	
1	3117807	A4	Circuit Card Assembly, Converter, 10V In	
1	31112813	A5	Circuit Card Assembly, Resistor Calibration	
1	3115510	A6	Circuit Card Assembly, 15 V Power Supply	
1	31114700	---	Common Components	
1	321147001	---	CL25 Components	
6	1152565	A1-A5, A9	Card Edge, PC Mount, 22P-156	50-22SN-5; 50-22B-10
12	1152751	A1-A5, A9	Card Hardware	50-GP-1(GR)GP-1B
3	1093150	C1-3	Capacitor, 0.22uF, 100V	81F1055
1	1095800	C6	Capacitor, 10uF, 20V (OLD 47F386)	89F514
4	1152291	Con1,3,4,6	9 Circuit 0.156	Allied 512-3457; 640445-9
3	1152211	Con18,19,2 2	10 Circuit 0.1	Allied 512-3307; 1-640454-0
2	1152266	Con 2,5	7 Circuit 0.156	Allied 512-3455; 640445-7
1	1152286	Con 28	8 Circuit	Allied 512-3306; 640454-8
1	1155040	Con 37	4 Position, Mini PCTBL	46F862
3	1151950	J 3,4,5	Jax Pins	44F7514; 929836-07-07 235
6	1158014	K 3-5,7,8,10	14 Pin IC Socket	14F2701
4	1700772	K 3,4,7,8	0-5Vdc Relay	Hamlin HE722A0530
2	1603925	Lamps	Fuse/Spare Lamp Holder	Little Fuse 102071/27F1085
1	1111470	PCB	Meter Board	PCB 1147
1	1740195	R1	Resistor, 50 Ohms, 5%, 3W	
10	1356300	TP's	T68A Minwrap Test Point	34F1218

2	1420143	Spare	LAMP 6.3V	EAO 31-963.0
2	1152271	Con 16,20	6 Circuit, 0.1	Allied 512-3304; 600454-6
2	1152286	Con, 17,21	8 Circuit, 0.1	Allied 512-3306; 640454-8
2	1700771	K 5, 10	0-5Vdc Relay	Hamlin HE721C0530
1	1151210	---	Female Screwlock	FA920
25	1151060	1X1-1X25		Harting 09 21 025 3001
2	1151110	1X1-1X25	MC425D T&B	Harting 09 15 000 6103
1	2101220	CHS	Chassis Frame	20304-112
2	1152290	Con1,3	9 Circuit, 0.156	Allied 512-3376; 640433-9
3	1152210	Con18,19,2 2	10 Circuit 0.156	Allied 512-3245; 1-640440-0
2	1152265	Con2,5	7 Circuit, 0.156	Allied 512-3374; 640433-7
1	1152285	Con28	8 Circuit, 0.1	Allied 512-3243; 640440-8
1	1151232	CX1	9 Pin Socket, Type D	83-215
2	2101710	HDL	Handle, 10501-005, 3RU	
1	1422153	Lens	Lens, Clear	EAO 31-903.7
2	2101925	STD	Stud, Lock 60300-001	
3	1152528	M1-3	Card Edge, 50-30A-30	29F961
3	1506525	MTR1-3	Meter	Newport 2520-3- F2M
2	4802100	PCB RL	PCB Mounting Rail	
1	1590110	PS1	5V-5A Power Supply	FAK5-5K
1	1860265	SW3	Latch, 2 Pole	EAO 31-262
30	1151063	---	FP,1816 T&B Female Pin	09 15 000 6201
2	1153912	---	MLX Plug	39-09-1151 15P
2	1153932	---	MLX RCT	03-09-2151 15P
8	2371100	---	Nut	P4006 1420
1	1159925	115V	5350 Duplex Receptacle	6X064
1	1150101	Ext Intlk	3106A-12S-3P 2P CBL M02-09-2103	Harting 36051 HAN7D-BU-C
1	1150105	Ext Intlk	3102A-12S-3S 2P CHS F	
1	1150922	Ext Intlk	3057-1004(12), CBL CLMP	
1	1150940	Ext Intlk	3420-4 Bushing 4(12)	9779-513-4
1	1153910	Ext Intlk	MLX PLG	03-09-1022 2P
2	1153915	Ext Intlk	Molex F Pin	02-09-1104
1	1153930	Ext Intlk	MLX Receptacle	03-09-2022 2P
2	1153935	Ext Intlk	Molex M Pin	
1	1351100	J2	Binding Post 459 Black	
2	1351102	J3,4	Binding Post 459 Red	
1	1356205	P2	Plug, Banana Jack Black	476103
1	1356200	P3	Plug, Banana Jack Red	476102
1	1742100	R1	Resistor, 2kOhms, 10W	341509
1	1156006	T4	Terminal Strip, 6 Pos.	Keystone 829
1	38111016	T4	1 Phase Transformer	CT-1016

1	1883056	XDCR	Watt Transducer	UA0806501; EWW5-1B
1	1352161	---	Klauke SS6-38 (Penn-Union)	
1ft	1358010	---	Duct, ½ X 1, Panduit	
2ft	1358110	---	Duct, 1 X 1, Panduit	
1ft	1358905	---	Duct, CVR, ½, Panduit	
2ft	1358910	---	Duct Cover, 1, Panduit	
1	4802510	---	Cam, Alum ½inch bore	
60ft	1073165	Cable	Welding, 6Ga Prestoflex	
23ft	1073341	Cable	500 MCM Welding Cable	
1	1601155	CB1	Circuit Breaker, 480V, 50A, 2pole w/Lugs	ESB42050L; ABB S3N050TW-2
1	1892001	CT1	Current Transformer,2500/5	Instrument Transformers. 100-252
1	1892200	CT2	Current Transformer 100:5A ± 2%	Instrument Transformers 5SFT101
1	2980305	Decal	CL25 Panel Decal (Large)	
1	1709991	DP1A	Dashpot PJ1-C177-XXA-1, 4A, 1Curve, Slow R	Eaton Heinemann PJ1-Z58-3
2	1603501	F1,2	Fuse, 3 Amp	Little Fuse FLK 3A; KTK 28F200
1	1603923	F1,2	2808 2-pole Holder KTK (BM6032SQ)	Little Fuse L60030M2SQ
2	1152900	J6,7	Female Recept	Cam Lok E1017- 1625
1	1152905	J6,7	Male Plug	Cam Lok E1017- 350
1	1705085	K1	Contactora, 3 Pole, B50C-1	ABB FPL3511090R011 4
1	3870958	PT1	1 Phase Transformer PT-958	
1	3860026	T1	SA 26 (3-20-85)	
2	1890239	T2	Transformer, Variable, 120/240V, 16A	Weschler 9T92A40
3	1866006	ZS, MS1,2	2HBA190-1 Roller 20A	Z-15GW22-B7-K

Chapter 8 Recommended Spare Parts

8.1 Introduction

This chapter contains a listing of the spare parts recommended for the CL25 Core Loss Test Set. The Spare Parts should be maintained at a location convenient to the Core Loss Test Set to minimize downtime and insure proper Test Set operation.

Table 8.1 Recommended Spare Parts for the CL25 Test Set

Description	Part Number	Quantity
Fuse, 3A, 3AG	1603603	6
Lamp, 60V	1420150	6
Lamp, 6.3V, (31-963-0)	1420143	6
Meter, Newport, 2520-3-F2M	1506525	1

Appendix A Warranty

Sheet 1 of 2

Phenix Technologies, Inc. warrants to the original purchaser of any new merchandise that the merchandise is free from defects in material and workmanship under normal use and service for a for a period of 18 months from the date of shipment. The obligation of Phenix Technologies, Inc. under this warranty is limited, in its exclusive option, to repair, replace, or issue credit for parts or materials which prove to be defective, and is subject to purchaser's compliance with the Phenix Technologies, Inc. warranty claim procedure as set forth below. The happening of any one or more of the following events will serve to void this warranty and defect or damage resulting therefrom is specifically excluded from warranty coverage:

- A. Defects due to accident, negligence, alteration, modification, faulty installation by purchaser or purchaser's agents or employees, abuse, or misuse.
- B. Attempted or actual dismantling, disassembling, service or repair by any person, firm, or corporation not specifically authorized in writing by Phenix Technologies, Inc.
- C. Defects caused by or due to handling by carrier, or incurred during shipment, transshipment, or other move.

This warranty covers only those parts and/or material deemed by Phenix Technologies, Inc. to be defective within the meaning of this warranty. The liability of Phenix Technologies, Inc. shall be limited to the repair, replacement, or issuance of credit for parts deemed defective within the meaning of this warranty. Costs incurred by purchaser for labor or other expenses incidental to the inspection, repair, replacement, or issuance of credit for such parts and/or material shall be the sole responsibility of purchaser. This warranty shall not apply to any accessories, parts, or material not manufactured or supplied by Phenix Technologies, Inc. and if, in the sole discretion of Phenix Technologies, Inc., purchaser's claim relates to any material or workmanship manufactured or performed by the supplier of a component part, or of the manufacturer of a device of which the defective part is a component, Phenix Technologies, Inc. reserves the right to disclaim liability under this warranty and to direct that the purchaser deal directly with such supplier or manufacturer. Phenix Technologies, Inc. agrees to assist the purchaser in processing or settling any such claims without prejudicing its position as to liability.

CL25

Sheet 2 of 2

Warranty Claims Procedure

Compliance with the following warranty claim procedure is a condition precedent to the obligation of Phenix Technologies, Inc. under this warranty.

- A. Purchaser must notify Phenix Technologies, Inc. in writing by certified or registered mail, of the defects claimed within 18 months after date of original shipment. Said notice shall describe in detail the defect, the defective parts and/or part, and the alleged cause of the defect.
- B. At the exclusive option of Phenix Technologies, Inc., purchaser shall dismantle or disassemble at purchaser's cost and expense and shall ship the defective part or material prepaid to and from Phenix Technologies, Inc., Accident, Maryland 21520, for inspection, or permit an authorized service representative of Phenix Technologies, Inc. to inspect the defective part or material at purchaser's premises. If Phenix Technologies, Inc. shall inspect the part or material at the purchaser's premises, purchaser shall provide facilities for, and at purchaser's cost and expense, dismantle, disassemble, or otherwise make accessible the subject part or material whether or not same is a component of or installed in a device other than that manufactured or supplied by Phenix Technologies, Inc. If disclosure shows that the defect is not one for which Phenix Technologies, Inc. is liable, the purchaser agrees to reimburse Phenix Technologies, Inc. for all expenses incurred.
- C. Upon receipt of the defective part or material, or after access to same, Phenix Technologies, Inc. shall inspect the part or material to determine the validity of purchaser's claim.

The validity of any warranty claim, purchaser's compliance with Phenix Technologies, Inc. warranty claim procedure, the obligation to either repair, replace, or issue credit, or direct the purchaser to deal directly with a manufacturer or supplier are to be determined solely and exclusively by Phenix Technologies, Inc. and any determination so made shall be final and binding.

This warranty is expressly in lieu of all other warranties expressed or implied on the part of Phenix Technologies, Inc., including the warranties of merchantability and fitness for use, and consequential damages arising from any breach thereof and Phenix Technologies, Inc. neither assumes nor authorizes any other person, firm, or corporation to assume any liability or obligation in connection with this sale on its behalf and purchaser acknowledges that no representations except those made herein have been made to the purchaser.

CL25

Appendix B 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 a "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.

CL25

Appendix C

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, Inc. will contact you to confirm the current price of the part being ordered. If a part you ordered has been replaced with a new or improved part, an Applications Engineer will contact you concerning any change in part number.

Your order for replacement parts should be sent to:

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

