Megger

Baker Power Packs

PPX30, PPX30A, PPX40

User Guide

Baker Power Packs

PPX30 PPX30A PPX40

User Guide

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Megger Baker Instruments

4812 McMurry Avenue

Fort Collins, Colorado 80525 USA

Telephone: +1 970-282-1200 800-752-8272 (USA Only)

Fax: 1-970-282-1010

Email: baker.sales@megger.com baker.tech-support@megger.com

Web: https://us.megger.com/products/motor-and-generator-testing

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

Electrical and Calibration Standards

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

Megger Acquisition of Baker Instruments

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

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

Trademarks

Megger is a registered trademark of Megger Group Limited.

All other trademarks are the property of their respective owners.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference with the equipment if it is operated in its installation. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the product manual, may cause harmful interference to radio communications. If this equipment does cause harmful interference, the user is required to correct the interference.

Due to the phenomena being observed and the material properties being measured, this equipment radiates radio frequency energy while in active test mode. Care should be taken to make sure this radio frequency energy causes no harm to individuals or other nearby equipment.

Declaration of Conformity

CE

Megger Group Limited—Baker Instruments

4812 McMurry Ave. Suite 100

Fort Collins, CO 80525 USA

Equipment Description: Testers for Surge and DC Hi-Pot of electric motors.

Equipment Model Designations: PPX

Application of Council Directive DIRECTIVE 2014/35/EU on the harmonization of the laws related to Member States relating to electrical equipment designed for use within certain voltage limits and Council Directive 89/336/EEC on the approximation of the laws related to Member States relating to the electromagnetic compatibility, as amended by: Council Directive 93/68/EEC. Note: due to the phenomena being observed and the material properties being measured, this equipment does radiate radio frequency energy while in the active test mode. Directive 2011/65 / EU - RoHs standard.

Referenced Safety Standards

EN 61010-1:2010 Third Edition

Referenced EMC Standards

EN 61326-1:2013, FCC Part 15 Subpart B:2018	IEC & EN 61000-4-4: 2012
ICES-003 Issue 6:2018	IEC 61000-4-5:2005
EN 61326-1:2013	EN 61000-4-5:2006
EN 55011:2009+A1:2010	IEC & EN 61000-4-6:2013
CISPR 11:2009+A1:2010	IEC 61000-4-8:2009
IEC 61000-4-2:2008	EN 61000-4-8:2010
EN 61000-4-2:2009	IEC & EN 61000-4-11:2004
IEC & EN 61000-4-3:2006/A1:2008/A2:2010	

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directives and Standards.

Signature:

Craig S. Powers

Printed Name: Craig Powers

Title: Quality and CI Leader

Contents

1 — User Safety and General Operation

Safety Precautions

Read and follow all safety precautions and safe operating practices in your guide. Do not exceed maximum operating capabilities of the Baker Power Packs, or the Baker AWA and Baker DX testers used with these units.

The general safety information presented here is for both operating and service personnel. You will find specific warnings and cautions throughout this guide where they apply.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

WARNING: Failure to heed the following safety precautions can result in injury or death from severe electrical shock.

General Safety Warnings

- Do not remove the product covers or panels, or operate the tester without the covers and panels properly installed. Components on the inside of the tester carry voltage for operation and can render a shock if touched.
- Use appropriate safety equipment (such as high-voltage gloves, eye protection, and more) as required by your organization and governing regulatory agencies.
- The devices covered in this guide are not waterproof or sealed against water entry.
- The devices covered in this guide are intended for indoor use. If using outdoors, you must protect the device(s) from rain, snow, and other contaminants.
- Repairs and repair parts warning: Replacement or repair of parts within the unit should be conducted only by Megger Baker Instruments authorized service personnel. Opening a unit may void the warranty. Authorized service personnel will replace defective, damaged or broken test leads with factory-authorized parts to ensure safe operation and maintain performance specifications.
- Ground the product: The devices covered in this guide are grounded through the power cord's grounding conductor. To avoid electrical shock, plug the power cord into a properly wired/grounded receptacle before connecting the product test leads.
- In addition to the power supply cable ground, the power packs have a black ground test lead that serves as the motor frame return path for testing. They also have a black braided ground lead to provide a sufficiently low impedance ground path adequate to carry the current flow for the worst case internal ground fault.

WARNING: DANGER FROM LOSS OF GROUND. Upon loss of the protective ground connection, all accessible conductive parts—including knobs and controls that may appear to be insulated—could cause electrical shock!

NOTICE: The ground-fault systems on the Baker AWA-IV and Baker DX hosts require a proper ground for the tester to operate properly in all modes. When the Baker AWA-IV or Baker DX tester is used as a host to a power pack, improper grounding can also affect operation of the power pack

Safety, Hazard, and Warning Symbols on the Instrument

Table 1: *Safety and hazard icons on the instruments outer case.*

Icon	Description
	Warning about hazardous voltage and risk of injury or death from severe electrical shock. Located above Leads Energized LED and near other voltage input or output elements.
	Ground. Located on rear panel of instrument below ground terminal.
	High voltage warning label. Located on the left side panel below the on/off switch and power inlet/outlet connectors.

Test Related Warnings

- ***Before connecting test leads***, verify that circuits are not energized. Never connect the Baker Power Pack or host tester units to an energized circuit.
- ***Before connecting test leads***, disconnect all external devices (such as capacitors and surge arrestors) from the test circuit.
- Two-party operation is recommended only when using proper equipment (such as the remote E-Stop) and when taking appropriate precautions so that both operators are fully aware of all conditions at all times.
- Always know what test is being performed and when test leads are energized. For example, **do not** adjust test leads when operating a footswitch. Leads will have live voltage and severe electrical shock can result.
- Upon completion of any Megohm, dielectric absorption (DA), polarization index (PI), DC HiPot, or Step Voltage tests, be sure to short the winding to ground and allow sufficient time for discharge before disconnecting the test leads. If you do not do this, voltage can build up on the winding. Some industry standards suggest allowing a winding to discharge four times the total amount of time that DC voltage is applied to the winding. For example, IEEE 95 suggests allowing a winding to discharge four times the total amount of time that DC voltage is applied to the winding and no less than 2 hours.
- If it is necessary to remove the tester leads prior to complete discharge of the circuit under test, short and ground all leads using an appropriate jumper cable prior to removal of the test leads.
- Make sure to disconnect the tester leads before energizing or powering up the motor.
- Never attempt to test a winding with both host and power pack leads attached to the winding at the same time. Damage to the tester will occur.

Equipment Stop Button

The Baker Power Packs are equipped with a red **Equipment Stop** (E-Stop) button on the front panel of the unit. Use it to quickly discontinue a test and to shut off power to the power pack's high-voltage circuitry.

The button will remain locked in position until manually retracted by rotating the **Equipment Stop** button clockwise.

Fig 1: *Baker Power Pack showing Equipment Stop button.*

Item	Description
1	Equipment stop button
2	Front panel

Only Megger Baker Instruments supplied test leads designed for this instrument provide the full safety rating.

2 — Baker Power Pack Introduction

Instrument Notices

CAUTION: Be sure to comply with all safety and proper operating procedures when setting up the tester and power packs, and when using them in testing. Failure to do so can result in injury to personnel or damage to equipment.

General

The host testers are equipped with open ground/ground fault monitors and indicators. This circuitry should not hinder operation of GFI protected AC power circuits.

When the analyzer is plugged into the power pack as described later in this guide, it gets its AC power from the power pack; so if the power pack is unplugged, the analyzer will also turn off.

Before use:

- Do not allow the analyzer's test leads to lie anywhere near the power pack test leads. The unit's leads should coil on top of the unit or loop on the power pack handle. Otherwise, the leads could interfere with tester measurements.
- Make sure the analyzer's test leads are not connected together.
- Make sure the analyzer's (host) ground test lead is not grounded when conducting tests using a power pack.
- Make sure no printer is hooked up to the USB port.

During use:

- Do not switch the test leads or change the **Test Select** switch while a test is in progress.
- If you need to use the host unit in standalone mode, turn off the power pack, ensure that the analyzer's AC input is plugged into a properly grounded source, and disconnect the communications cable between the analyzer and the power pack. If the communications cable between the analyzer and the power pack remains connected and the power pack is turned off, the I/O lines will be influenced and will cause problems with the analyzer's operation.

NOTICE: A power pack is purchased with, and calibrated to, the Baker DX or Baker AWA-IV tester host that it is shipped with.

Power Pack Features Overview

PPX Indicator Lights

PPX power packs have six indicator lights across the top of the front panel. Their functions are listed in the table below.

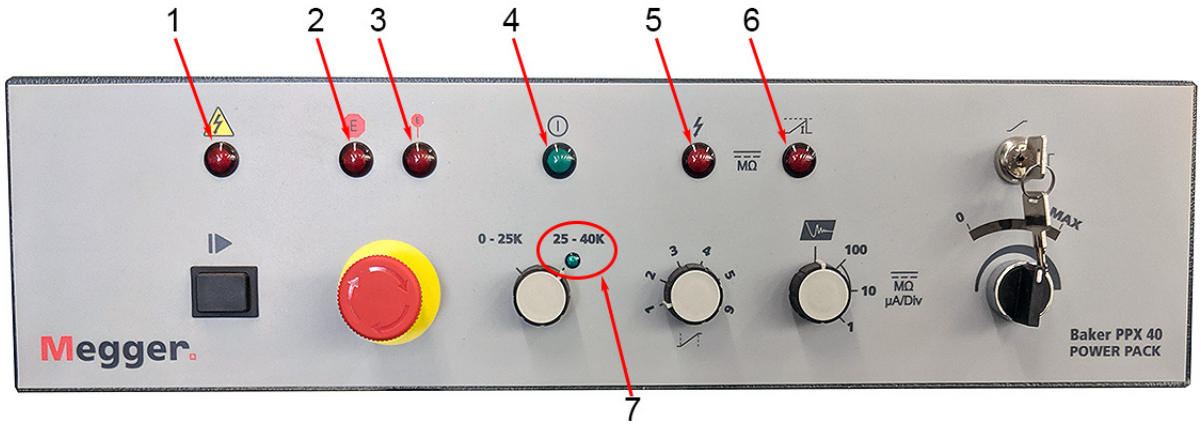

Fig 2: *PPX indicator lights; Baker PPX40 shown.*

Item	Description
1	Leads energized. Indicates that the output has been energized or that more than 45 volts is present on the output wires.
2	Equipment stop. Indicates the front panel E-STOP button has been pushed. The LED will flash once a second until the E-STOP button has been reset.
3	Remote E-Stop. Indicates the Remote E-STOP button has been pushed. The LED will flash once a second until the E-STOP button has been reset.
4	Power on. Indicates when the AC power is turned on to the unit.
5	Arc detect. Indicates an arc has occurred (HiPot failure). The LED will flash for approximately five seconds.
6	Overcurrent trip. Indicates an overcurrent (HiPot) failure – current exceeded approximately 1.2X the max for each scale (for example, 1.2 mA in the 100 uA range) during a HiPot test. The LED will flash for approximately five seconds.
7	On the PPX40, the Surge range switch has a green indicator light for the 25–40K range (circled in image). Indicates when the high range has been selected. When this LED is blinking, the range switch has been moved to the low range and the setpoint is out of the surge voltage range.

PPX40 Front Panel Controls

The PPX front panel controls are similar to their PP model counterparts. The differences include:

- A new **Ramp Rate Selector** switch that allows you to choose how quickly voltage will ramp.
- A redesigned **Surge Range** switch on the PPX40 model.
- An LED arch above the **Voltage Output Control** knob.
- E-STOP LEDs indicating when the E-Stop is engaged.
- Arc and overcurrent LEDs.

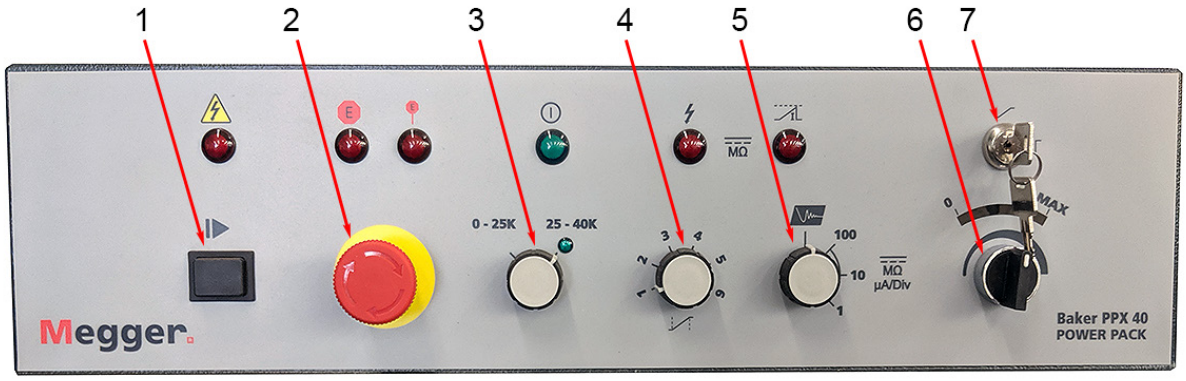

Fig 3: *PPX front panel controls; Baker PPX40 shown.*

Item	Description
1	Push to Test (PTT) button enables the output voltage when pressed.
2	E-Stop button turns off the power to the high-voltage power supply and returns the relays to the safe default position, disabling the output and shorting the output lead.
3	Surge range selector switch (PPX 40 only) selects the output voltage range for surge mode and which pulsing assembly is used.
4	Ramp rate selector switch allows you to control how quickly voltage will ramp when the Voltage Output Control Knob is turned. Refer to the table below for specifications.
5	Function Selector switch selects the operational function of the unit, Surge, HiPot (100µA/Div, 10µA/Div, 1µA/Div, Armature test (PPX 30A only).
6	Voltage Output Control knob increases or decreases the output voltage when turned and held. Turn clockwise to increase the output voltage and counter clockwise to decrease. When the Push To Test button is released, the setpoint is automatically reset to zero—with the exception of when the Zero Start override feature is used in Surge mode.
7	Zero-start override. This key switch overrides the Zero Start function and allows the unit to immediately apply the full target voltage level to the test leads. With the key in the vertical position, testing starts at zero volts and must be ramped up to the target voltage level. In the horizontal key position, zero-start override is enabled.

Table 2: *Ramp Rate Selector switch positions, voltage increments, and ramping times.*

Position	Volts/second	Time to Full Voltage (seconds)
1	2000	15
2	1000	30
3	500	60
4	250	120
5	125	240
6	63	480

PPX30/30A Front Panel

The Baker PPX30 and PPX30A front panel is similar to the PPX40 except that it does not have a **Surge Range** switch.

The **Function Selector** switch on the PPX30A includes a low-impedance test feature (signified by an armature icon) as shown in the example below.

The Baker PPX30 and PPX30A power packs also feature a **Test Select** switch just below the handle so you can select the test type or test lead needed.

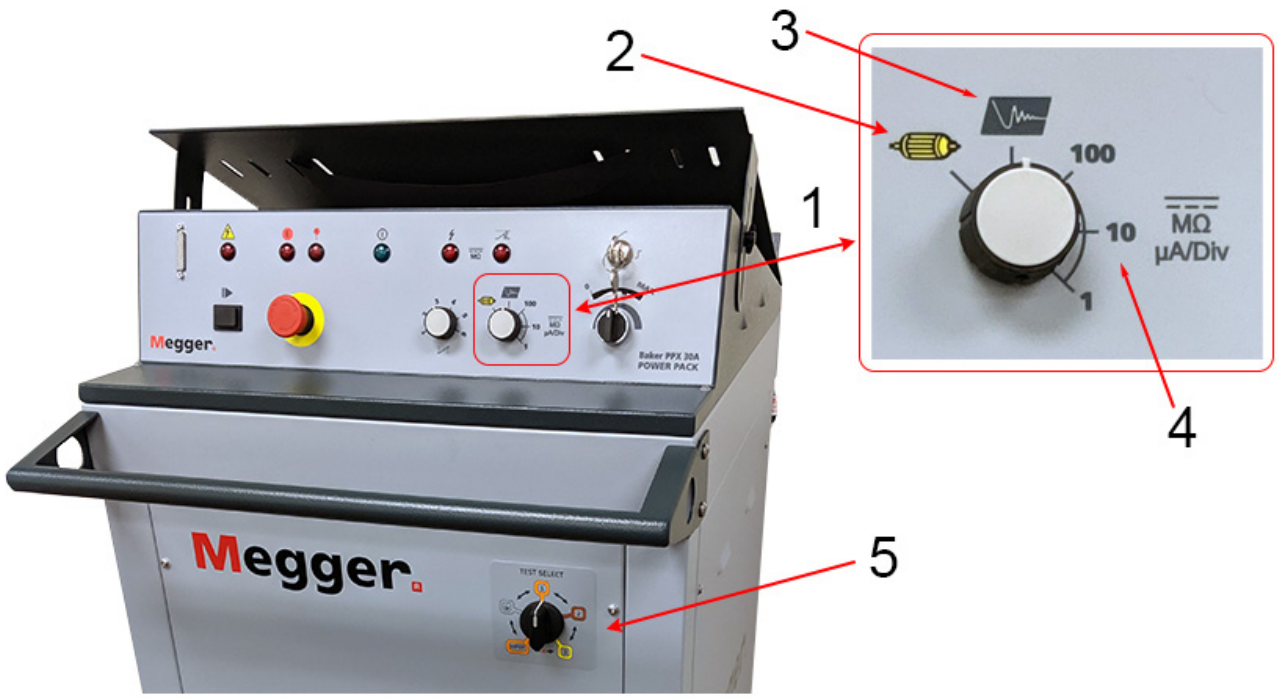

Fig 4: *PPX front panel controls; Baker PPX30A shown.*

Item	Description
1	Function Selector switch.
2	ARM test mode (Low-impedance device testing such as armatures, DC field coils, and interpoles). Employs the Baker ZTX impedance matching transformer circuitry built into the PPX30A.
3	Surge test mode.
4	DC HiPot test mode.
5	Test Select switch.

PPX30/30A Three-Phase Test Lead Selector Switch

The Baker PPX30 and PPX30A power packs are supplied with three-phase test leads. The **Test Select** switch is used to switch between the different test options **HiPot** or **Surge**, and to select the test leads (**1, 2, 3**) energized during Surge testing. The **Test Select** switch also has a **LEADS GROUND** position.

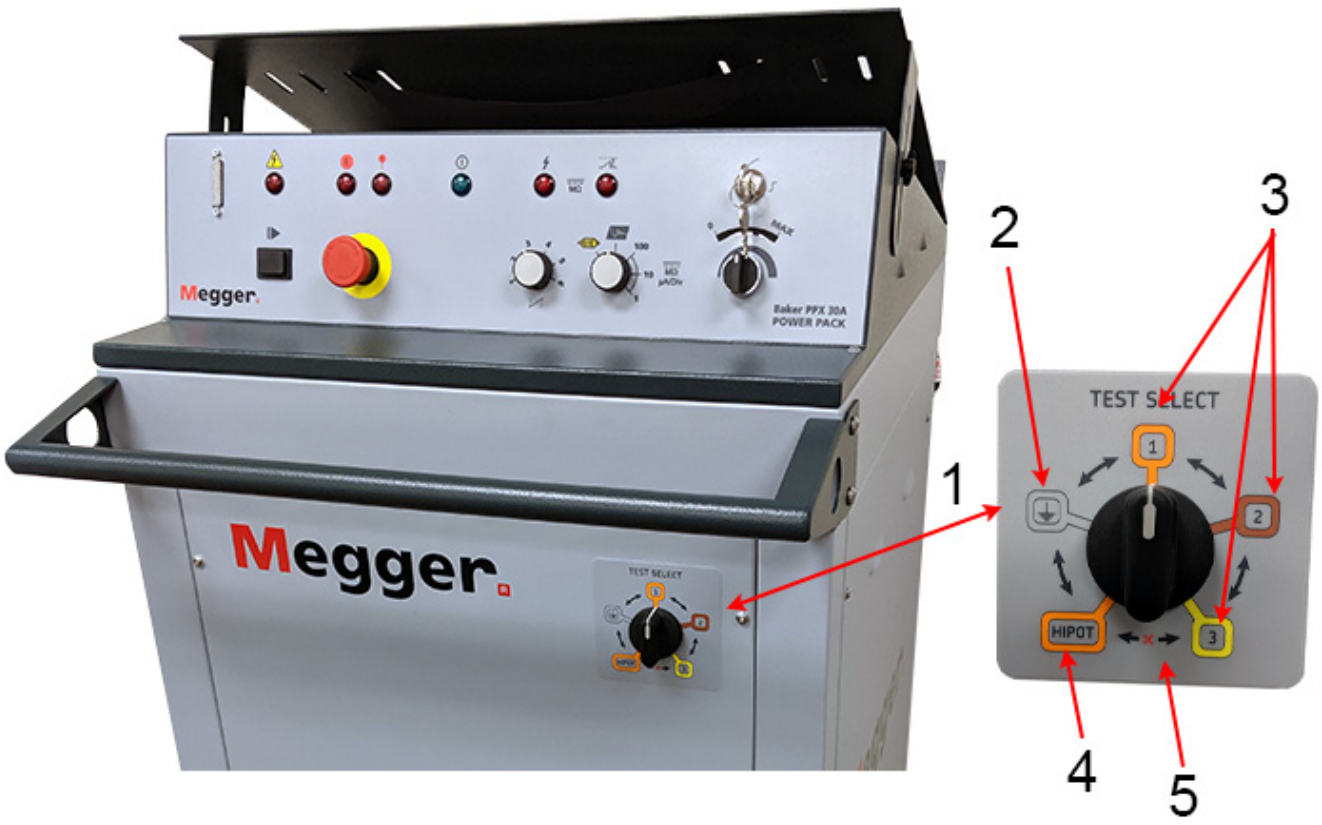

Fig 5: *Three-phase lead Test Select switch.*

Item	Description
1	Test Select switch.
2	Leads ground position. Used to discharge device under test after completing DC tests.
3	Surge test mode; select from test leads 1, 2, and 3.
4	DC HiPot test mode.
5	Do not rotate the Test Select switch from the HiPot to the Lead 3 position.

With the PPX30/30A three-phase test lead configuration, you are only required to connect the three leads once to the motor being tested.

CAUTION: Do not switch the Test Select switch while a test is in progress; this may substantially reduce the switching element's useful life.

PPX Tester Angle Adjustment

The Baker PPX model power packs feature a plate on the top that you can use to adjust the viewing angle of the attached host unit.

If you decide to use this feature, remove the host unit from the power pack then adjust both left and right sides to the same height then securely tighten the wing bolts.

Reattach the host unit, ensuring that the safety strap is used to secure the unit.

Fig 6: *PPX tester angle adjustment plate; Baker PPX30A shown.*

Item	Description
1	Right wing bolt (viewed from front).
2	Safety strap.
3	Tester adjuster angle plate.
4	Left wing bolt.

CAUTION: Ensure that both wing bolts and the safety strap are all securely tightened before using the tester in this manner. Keep all tools and body parts out of area below the adjustment plate to prevent damage or injury.

PPX30/30A Configuration

PPX30/30A Internal Leads Configuration

- Three output cables (orange, brown, and yellow cables for phases 1, 2, and 3 respectively) with insulated jacket rated at 60 kV DC, appropriately marked.
- One black ground cable with insulated jacket rated at 60 kV DC, appropriately marked.
- One black ground cable with braided jacket, appropriately marked.

Table 3: *Baker PPX30/30A internal connections during HiPot testing.*

Test Select Position	Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braid
HiPot	High Voltage	Open	Open	Ground	Ground

Table 4: *Baker PPX30/30A internal connections during Surge testing.*

Test Select Position	Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braid
Test Lead 1	High Voltage	Ground	Ground	Ground	Ground
Test Lead 2	Ground	High Voltage	Ground	Ground	
Test Lead 3	Ground	Ground	High Voltage	Ground	

NOTICE: For Baker PPX30/30A power packs, you must place the power pack control panel Function Selector switch into the HiPot position to perform a HiPot test. Be sure to switch the power pack Test Select switch to the HiPot position. Both switches must be in their correct positions when performing the test. If these switches are not set properly, the tests will not perform correctly and the data recorded will be erroneous.

PPX30/30A Configuration for DC HiPot Tests—Three-Phase Test Leads

For the Baker PPX30/30A, you need only connect the power pack's test leads to the motor leads once. The power pack's **Test Select** switch internally configures the test leads for HiPot and Surge testing.

1. Ensure that the power pack setup procedure described earlier has been followed.
2. Set the **Function Selector** switch to **100** µA/div for HiPot testing.

Fig 7: *Power pack DC HiPot test settings; Baker PPX30A shown.*

Item	Description
1	Function Selector switch.
2	Set to 100 µA/div for HiPot testing.
3	Test Select switch.
4	Set to LEADS GROUND before connecting test leads.
5	Set to HiPot for testing.

3. Set the **Test Select** switch to **LEADS GROUND** (ground icon).
4. Connect the power pack test leads to the motor leads as described in the table below.

Table 5: *Baker PPX30/30A device under test connections for HiPot and Surge testing.*

Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braided Safety Lead
Motor phase A	Motor phase B	Motor phase C	Motor frame	Station/earth ground

5. Power up the host unit and the power pack. Set the **Test Select** switch to **HiPot**. When selecting HiPot testing, you will hear a loud noise as the high-voltage relay makes contact.
6. Check that the open ground detect warning banner does not appear in the Baker DX Display Area, or that the open ground detection light on the Baker AWA is not illuminated.

PPX30/30A Configuration for Surge Tests—Three-Phase Test Leads

Because Surge testing typically follows HiPot testing (recommended), test and ground leads should already be connected, but are repeated here to ensure proper connection.

1. Ensure that the power pack setup procedure has been followed as described earlier.
2. Select the **Surge** (Surge waveform icon) setting on the power pack **Function Selector** switch. Depending on the high-voltage relay's current position, you might hear a loud noise as it makes contact.

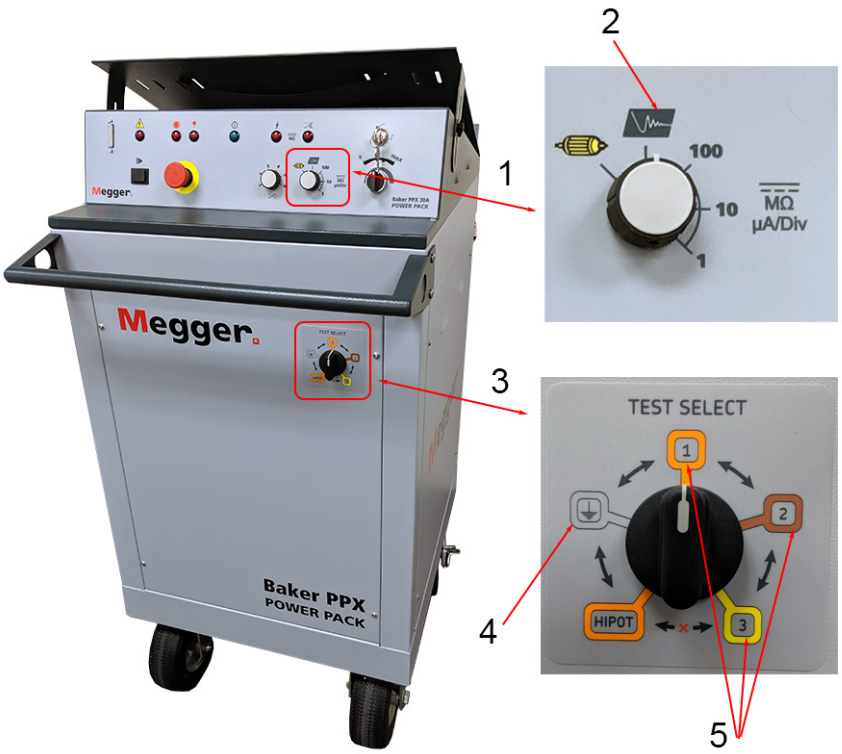

Fig 8: *Power pack Surge test settings; Baker PPX30A shown.*

Item	Description
1	Function Selector switch.
2	Surge test mode.
3	Test select switch.
4	Set to LEADS GROUND before connecting test leads.
5	Used to switch between Surge (test leads) 1, 2, and 3.

3. Set the **Test Select** switch to **LEADS GROUND** (ground icon).
4. Connect the power pack test leads to the motor leads as described in the table below.

Table 6: *Baker PPX30/30A device under test connections for Surge and HiPot testing.*

Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braided Safety Lead
Motor phase A	Motor phase B	Motor phase C	Motor frame	Station/earth ground

5. Power up the host unit and the power pack. Set the **Test Select** switch to (test lead) **1** to start testing on lead 1.
6. Check that the open ground detect warning banner does not appear in the Baker DX Display Area, or that the open ground detection light on the Baker AWA is not illuminated.

PPX40 Configuration

PPX40 Internal Leads Configuration

- One orange output cable, with insulated jacket rated at 60 kV DC, appropriately marked.
- Three black ground cables with insulated jacket rated at 60 kV DC, appropriately marked.
- One black ground cable with braided jacket, appropriately marked.

Table 7: *Baker PPX40 HiPot and Surge internal connections.*

Lead 1 Orange	Lead 2 Black	Lead 3 Black	Lead 4 Black	Black Braid
High Voltage	Ground	Ground	Ground	Ground

PPX40 Configuration for DC HiPot Tests—Single-Phase Test Leads

1. Connect test lead 4 to ground (motor frame) and test lead 1 to the winding phase connection you want to test.
2. Leave test leads 2 and 3 disconnected/open.
3. Connect the safety ground to the station/earth ground.

Table 8: *Baker PPX40 device under test connections for HiPot testing.*

Lead 1 Orange (Energized)	Lead 2 Black (Ground)	Lead 3 Black (Ground)	Lead 4 Black (Ground)	Black Braid (Ground)
Motor phase A	Not connected	Not connected	Motor frame	Station/earth ground

PPX40 Configuration for Surge Tests—Single-Phase Test Leads

The PPX40 does not have a Test Select switch. When using the Baker PPX40 for single-phase testing of three-phase windings, you must manually move the orange lead (energized during test) to test each motor phase in turn as shown in the table below.

Table 9: *Baker PPX40 device under test connections for Surge testing.*

Surge Motor Phase	Lead 1 Orange (Energized)	Lead 2 Black (Ground)	Lead 3 Black (Ground)	Lead 4 Black (Ground)	Black Braid (Ground)
A	Motor phase A	Motor phase B	Motor phase C	Motor frame	Station/earth ground
B	Motor phase B	Motor phase A	Motor phase C		
C	Motor phase C	Motor phase B	Motor phase A		

1. Power up both the tester and the power pack.
2. Check that the open ground detect warning banner does not appear in the Baker DX Display Area, or that the open ground detection light on the Baker AWA is not illuminated.

Baker PPX40 Manual Surge Range Switch

The Baker PPX40 manual **Surge Range** switch for performing Surge and HiPot tests. This switch provides positive control of the Surge test voltage and eliminates dependency on automatic range switching during a test.

During HiPot testing, set this switch in the 25-40K position. The Baker PPX does not limit the output voltage in HiPot mode. The Hi/Low is for Surge testing. The LED still follows the switch, but the limit circuit is disabled.

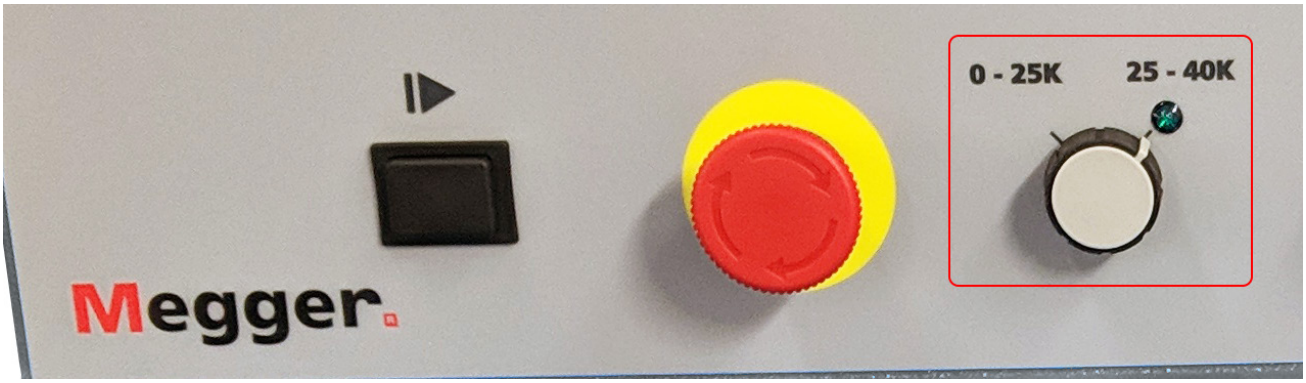

Fig 9: *Manual surge range switch on PPX40.*

Table 10: *Surge range switch positions and functions.*

Switch Position	Test Voltage Requirements	
0–25kV Surge	< 25 kV	In this position, the voltage will be limited to 25kV.
25–40kV Surge	> 25 kV	In this position, voltage is allowed to increase above 25kV, but surge pulses will not be generated if the voltage is lowered below 25kV.

3 — Baker Power Pack Setup

Baker DX to Power Pack Setup

The power pack setup procedure is relatively straightforward. The following graphics and steps walk you through the procedure.

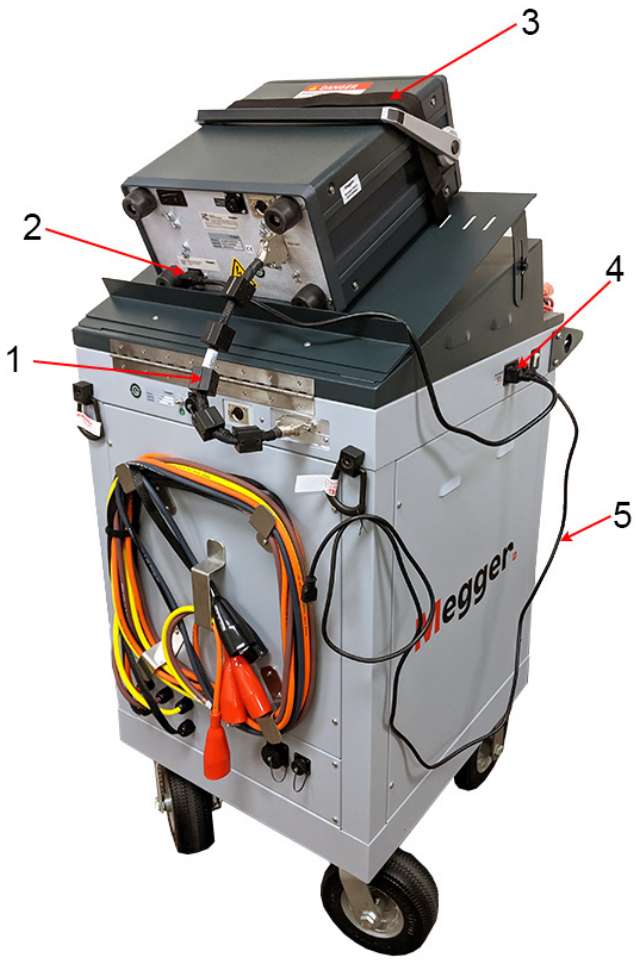

Fig 10: *Power pack to DX setup.*

Item	Description
1	25-pin interconnect cable
2	DX AC power receptacle
3	Tester security strap
4	PPX AC outlet to DX
5	PPX AC inlet to properly grounded AC source

1. Secure the Baker DX to the Baker PPX using the security strap located on top of the adjustment plate.
2. Use the short AC power cord to connect the PPX AC outlet on the side of the power pack to the DX AC receptacle.
3. Connect the 25-pin interconnect cable to the receptacles on the back of the power pack and the tester.
4. Connect the long AC power cord from the AC receptacle on the side of the power pack to a properly grounded AC source.

5. If you will use the remote E-Stop and safety lights accessory, and/or the footswitch accessory, connect them to the indicated locations on the back of the power pack as shown below.

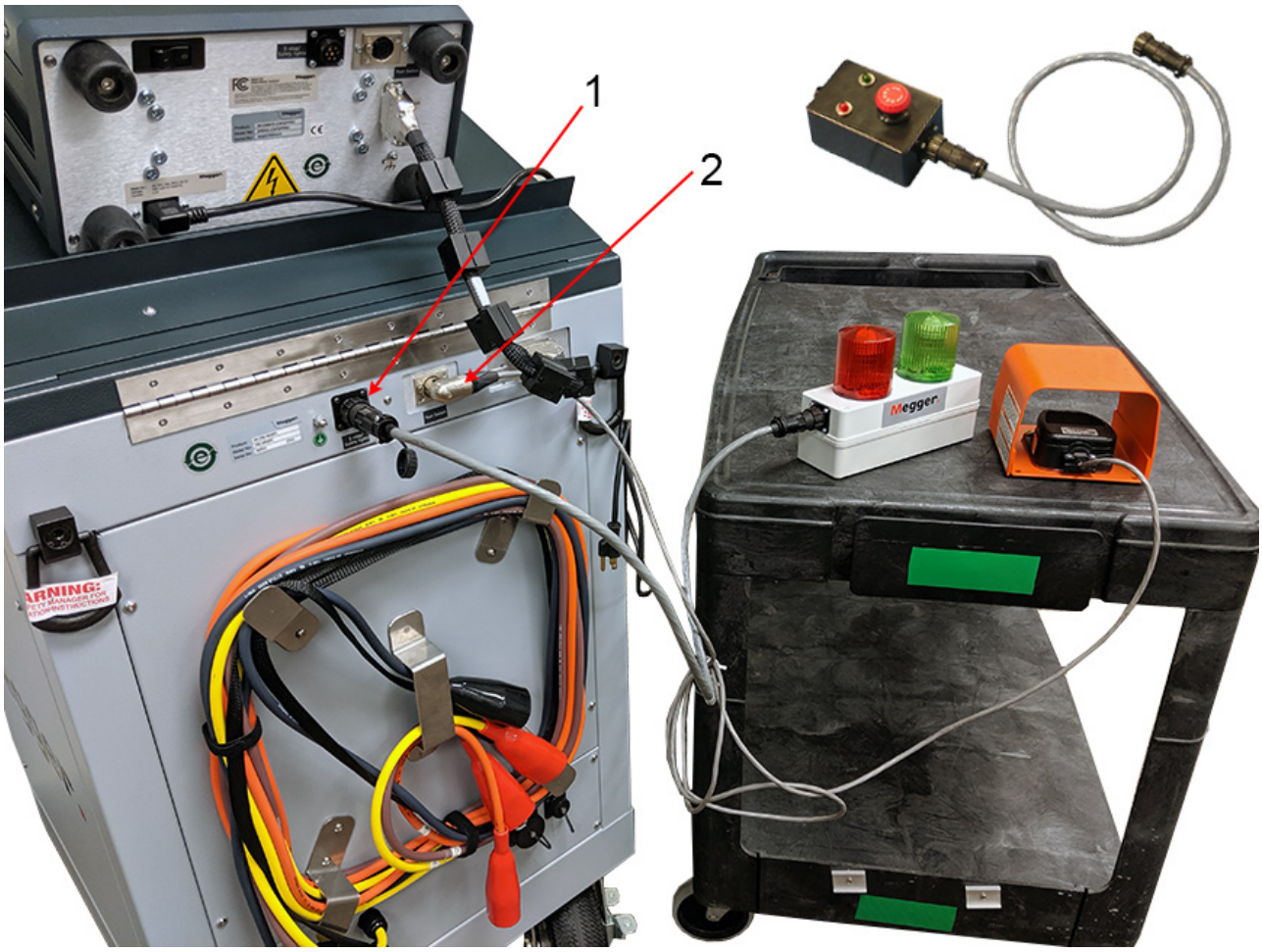

Fig 11: *Attaching accessories to the power pack.*

Item	Description
1	Remote E-stop and safety lights connector
2	Footswitch connector

Baker AWA to Power Pack Setup

1. Set the analyzer on top of the power pack and secure it with the safety strap.
2. Connect the short AC power cable between the PPX AC outlet and AWA AC inlet receptacles.
3. Connect the 25-pin interconnect cable to the two units. The cable is marked on each end. Be sure to plug in the end marked HOST into the auxiliary port (AUX /PP) on the front of the Baker AWA-IV and the end marked 30kV into the auxiliary port (AUX) on the front of the power pack.
4. Connect the long AC power cord from the AC receptacle on the side of the power pack to a properly grounded AC source.

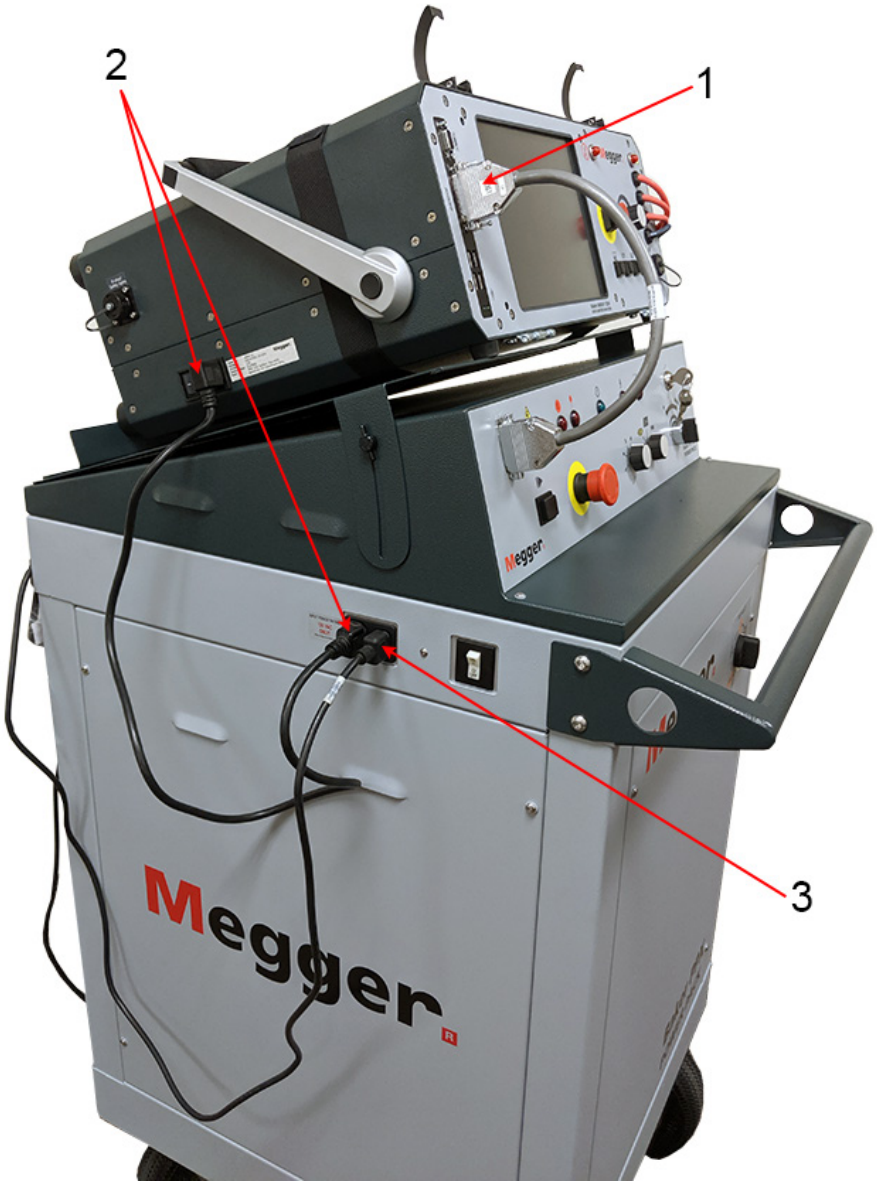

Fig 12: *Connect power pack to AC source and 25-pin interconnect cable.*

Item	Description
1	25-pin interconnect cable—AWA and PPX front panel connectors
2	PPX AC outlet to AWA AC inlet receptacle
3	PPX AC inlet to properly grounded AC source

4 — Using Power Packs with Baker AWA Testers

The Baker AWA-IV 6 kV and 12 kV analyzers can be used with the Baker PPX30 power packs to test high-voltage motors that are beyond the capabilities of the testers alone. Generally speaking, the Baker AWA-IV 12 kV analyzer can test motors up to 1000 HP, 4160 volts, 1800 RPM on its own. Power packs extend the tester's capability.

Power packs cannot be used alone to test motors; the control functions of the Baker AWA-IV are required.

Review and clearly understand the instructions for stand-alone operation of the Baker AWA-IV before attempting to operate the device with a power pack.

CAUTION: High voltage is activated when using this product. Ensure that all personnel are away from the device under test and not in contact with the load or test leads.

For user safety, ensure that the analyzer is connected to a winding load before activating the tester.

WARNING: Some test leads will be open during the test and can be at the same voltage potential as the winding! To avoid severe injury or death, all precautions should be taken to avoid touching these leads!

NOTE: The ground fault system on the Baker AWA-IV will render it inoperative without a proper ground. When the host analyzer is connected to a power pack, an inoperable condition will also affect the power pack due to loss of the surge enable signal.

Combining Baker AWA-IV Host and Power Pack Tests

To completely test a large motor, functions from both the Baker AWA-IV host and the power pack are used together. The Baker AWA-IV host is used to perform the winding Resistance, Megohm, and PI tests. The power pack is used to perform the HiPot and Surge tests. The test data collected by both instruments are then combined into a single test record in the database.

For this example, a 6600-volt 1785-RPM motor will be tested at 6000 volts for the Megohm/PI test and 14200 volts for the HiPot and surge tests. Both a new Motor ID and a new Test ID will be created.

Because this is a large slow motor, the Baker AWA-IV 12kV will not be able to reach the surge or HiPot test voltage (14200 volts) by itself, so the power pack will have to be used.

Briefly, the procedure will be to:

- Create a new Test ID (if one does not exist for the test voltages needed for the motor).
  - Enable power pack functionality. When testing with a power pack and a Baker AWA in automatic mode, the tester directs the use of appropriate leads and proper power pack operations.
- Create a new Motor ID.
- Perform the tests with the Baker AWA-IV doing the resistance, Megohm/PI tests, and the power pack doing the HiPot and Surge tests.

Creating Test and Motor IDs, and Setting Up the Tests

NOTE: The processes for creating Test IDs and Motor IDs is summarized in this guide. Their inclusion is intended only to provide context for the overall process. Refer to the *Baker AWA-IV User Guide* for more detailed information about each process and the related user interface elements.

Create a New Test ID

1. Click on the **Tests** tab then click on the **Edit Test ID** checkbox.
2. Enter the password for editing Test IDs.

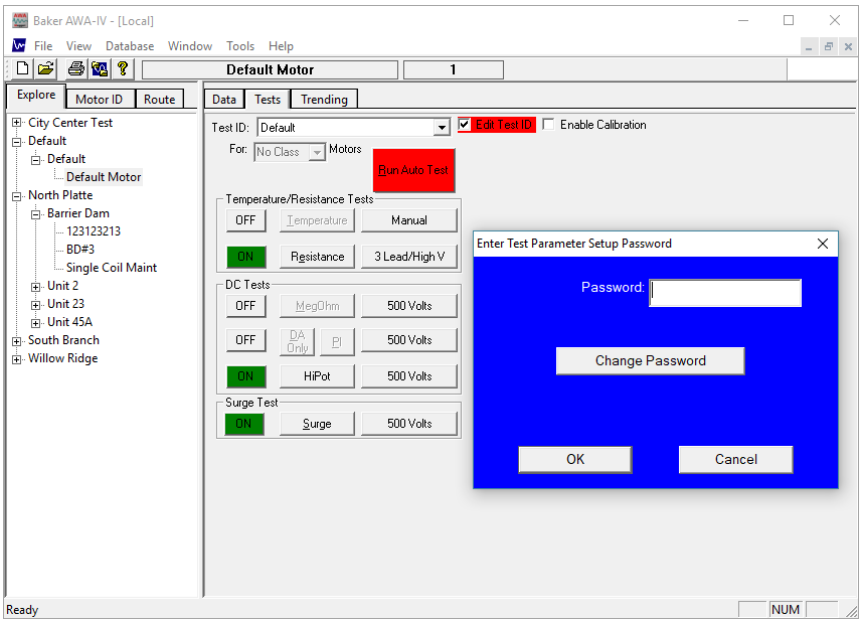

Fig 13: *Tests tab, editing Test ID to create new Test ID.*

3. Click on the **Add** button to open the *Create New Test ID* dialog box as shown below.

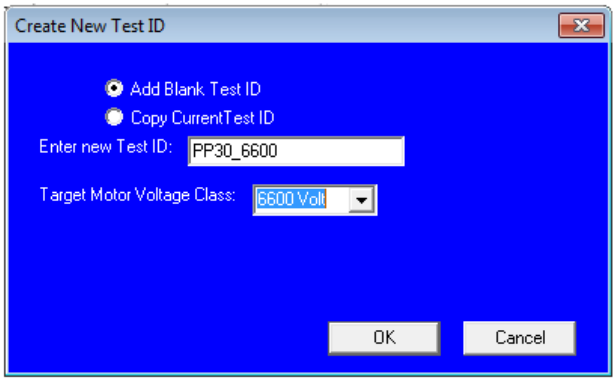

Fig 14: *Create New Test ID dialog box.*

4. Click on the **Add Blank Test ID** radio button.
5. Enter the new Test ID in the appropriate field. In this example, we use PP30_6600.
6. Use the **Target Motor Voltage Class** drop-down menu to select a voltage class. For this example, we would select a voltage class of 6600.
7. Click **OK** to continue.

Define Test Parameters for the Test ID

1. From the **Tests** tab, turn on the Resistance, Megohm, PI, HiPot, and Surge tests.
2. Open each test setup window to properly configure the tests. The *DC Tests* setup window is shown in the example below.

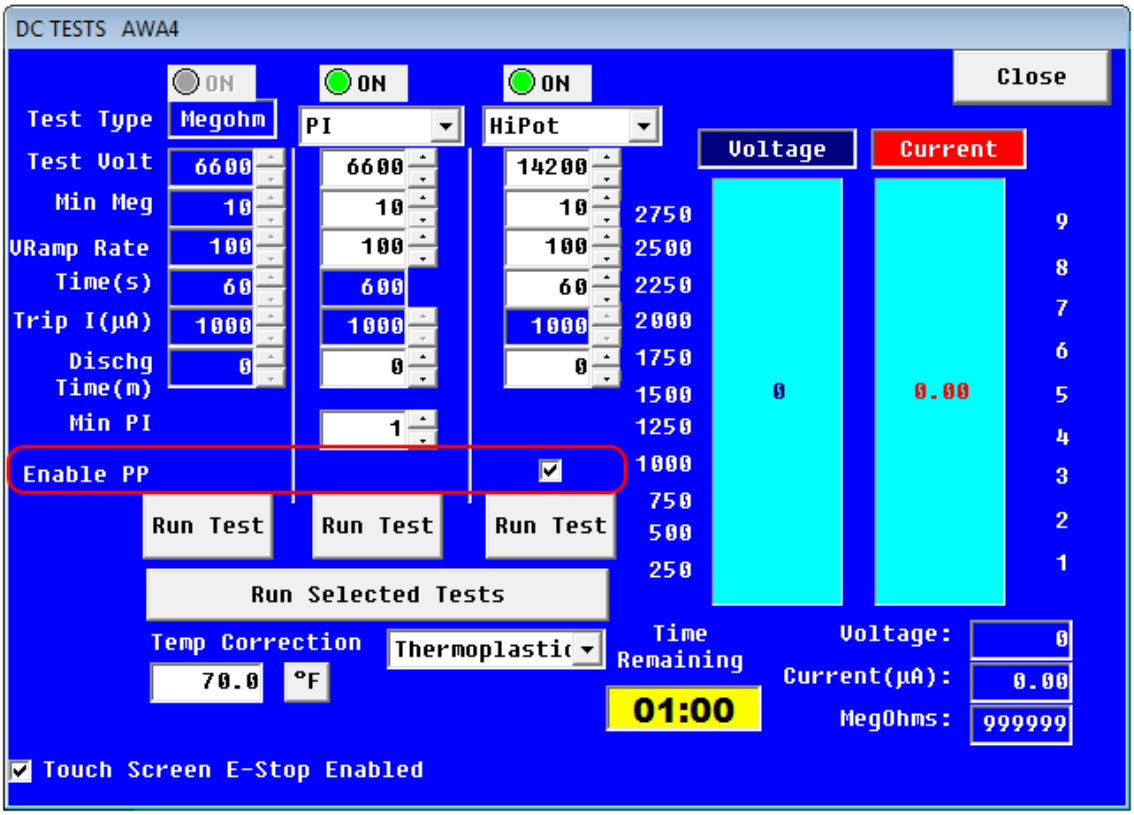

Fig 15: *Configuring DC tests for a new Test ID.*

Notice that all tests have been turned on, the desired test voltages entered, and the **Enable PP** box under the HiPot column has been checked, indicating that the power pack will be used for the HiPot test.

You should also note that you can use the Dischg Time (min) fields to specify a discharge interval (in minutes) that will stop all testing for the requested time period to allow for sufficient time for the motor to discharge. The feature is more commonly used to discharge motors following DC HiPot testing.

CAUTION: If the windings are not allowed to completely discharge, a voltage can develop on the motor leads that can be high enough to present a shock hazard to personnel.

The *Surge Test* setup window is shown below. In this example, the **Surge Voltage** has been set to 14000V and the **Enable PP** (power pack) box has been checked to turn on the power pack for this test.

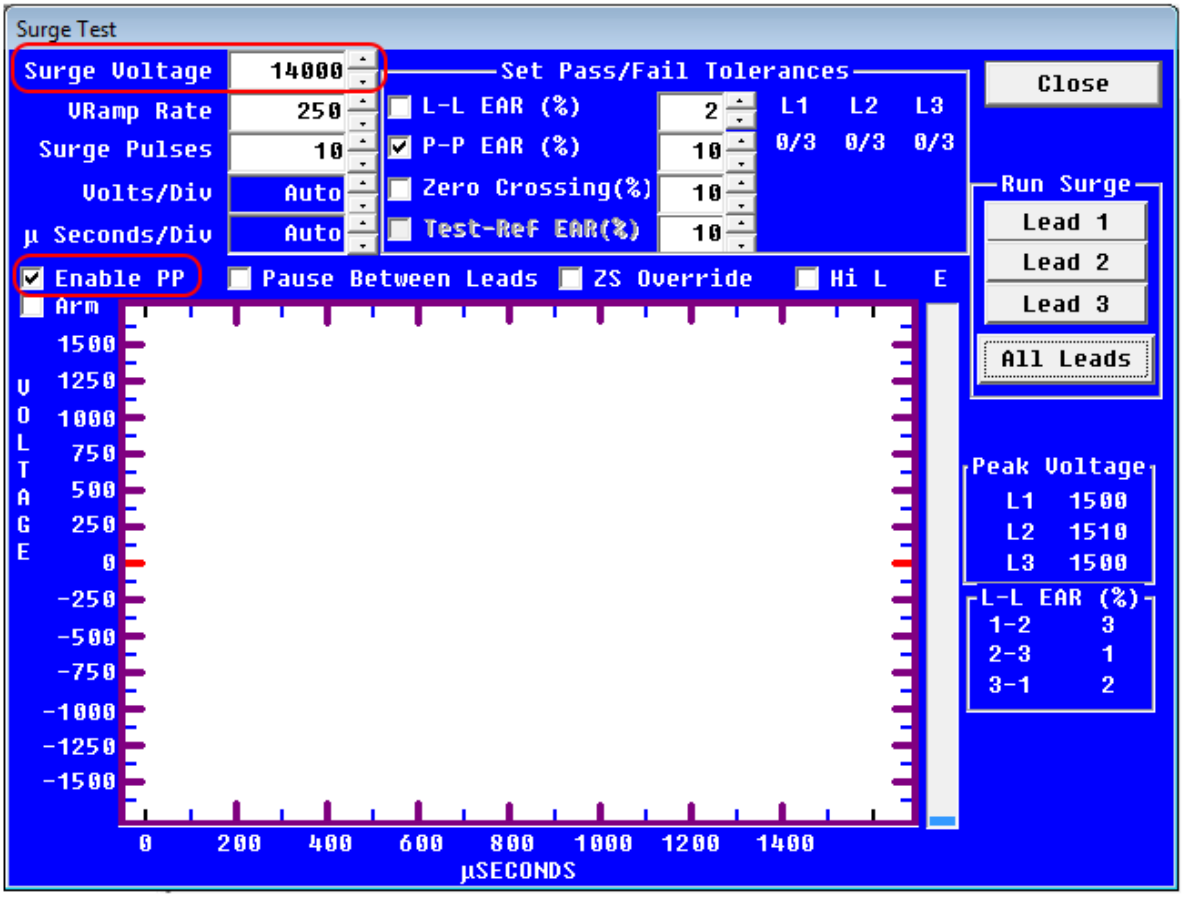

Fig 16: *Surge test setup—PPX30/30A.*

3. Click on the **Close** button to return to the *Main* window, **Tests** tab.
4. Click on the **Save** button to save the new test information for this Test ID. The Password may have to be entered again to make the **Save** button visible.

Create a New Motor ID

1. Select the **Data** tab and **Nameplate** view on the right side of the *Main* window.
2. Click on the **Add** button to add a new Motor ID.

The screen capture below shows a new motor called Main Heater Blower Motor. Using best practices, all other information available on the motor's nameplate is entered into the **Nameplate** tab.

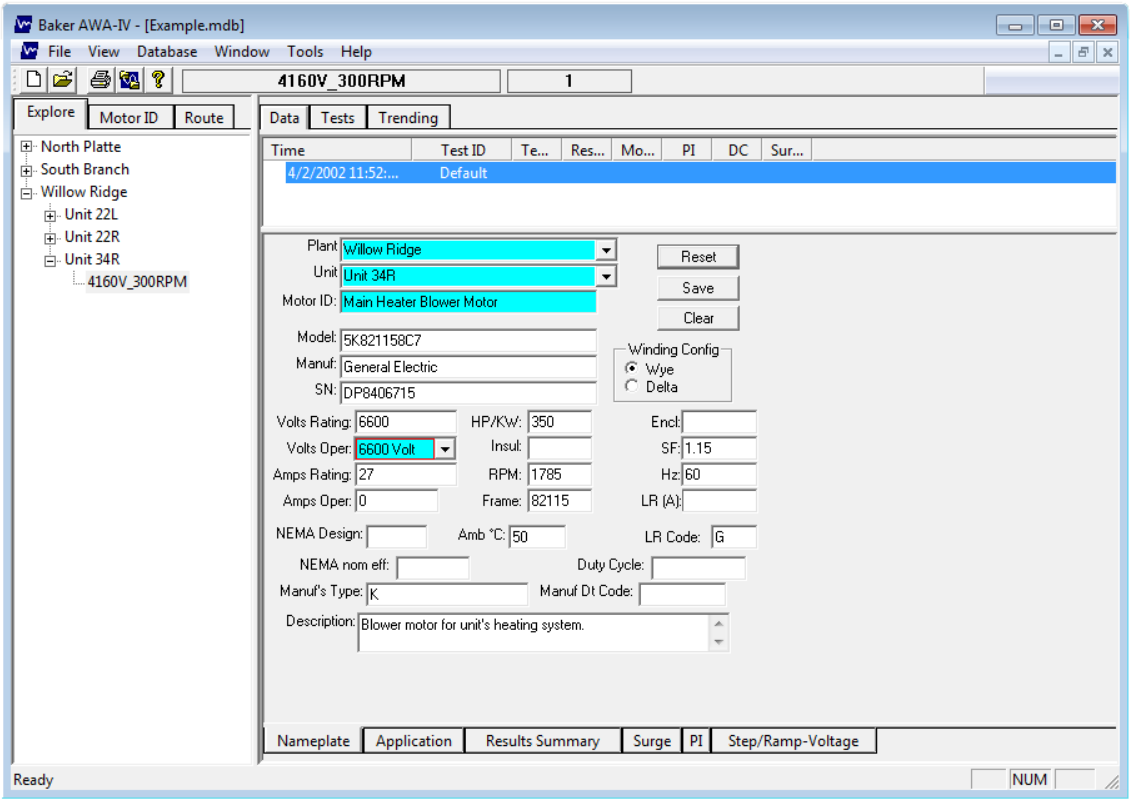

Fig 17: *Creating a new Motor ID.*

3. After entering nameplate information, click on the **Save** button. The *Select Test ID* dialog box appears so you can select the Test ID that was created for the new motor.

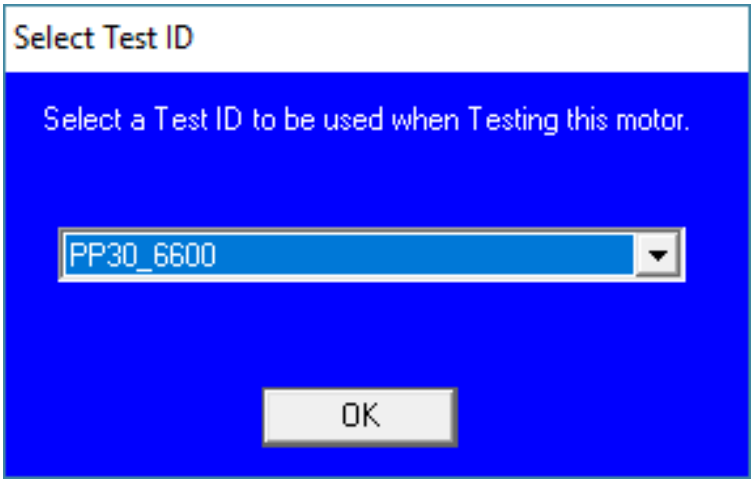

Fig 18: *Create New Test ID dialog.*

Running the Combined Baker AWA-IV and Power Pack Tests

1. After you have properly configured the Test ID, click on the **Run Auto Test** button in the **Tests** tab.
2. The Baker AWA-IV will instruct you to connect the Baker AWA-IV analyzer's test leads to the motor.
3. Press the **MΩ** and **Lead 3** buttons on the AWA front panel simultaneously to start the test. The resistance test will start and run to completion followed by the Megohm and PI test.

After the PI test is finished, testing will stop, and the dialog box shown below will appear, instructing you to disconnect the Baker AWA-IV test leads and connect the power pack test leads to the motor. The power pack will be used for the HiPot and Surge tests.

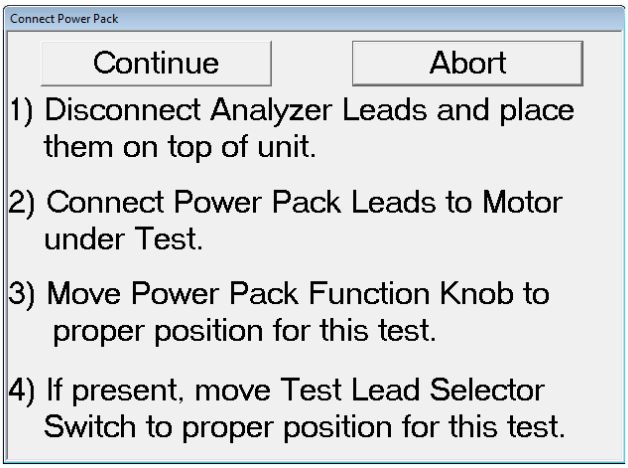

Fig 19: *Host analyzer lead disconnection and power pack lead connection message.*

4. The power pack test can be aborted at this time if needed.
5. Click on the **Abort** button to discontinue the test, or click on the **Continue** button to proceed with the test.
6. Ensure that the test area is safe and the motor leads have been properly connected before continuing.
7. The *Power Pack Push to Test* dialog appears next as shown below.

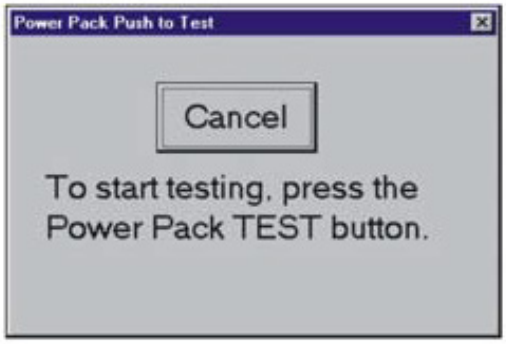

Fig 20: *Start power pack test message dialog.*

8. This dialog instructs you to press the power pack's **Test (PTT)** button (or footswitch) to begin testing. *You will have to press and hold down the button to complete all tests.* When you press this button, the Baker AWA-IV verifies the following:
   - The analyzer's test leads are checked to verify that they are open.
   - The **Function** knob is checked to verify it is in the proper position for the HiPot test.

Only after the steps above have been taken is the power pack output enabled.

9. Keep the power pack's **Test (PTT)** button (or footswitch) pressed during the above checks. After the power pack's output is enabled, a red LED on the power pack will illuminate showing that the power pack's test leads are energized.
10. On the Baker AWA-IV, the *DC Tests* configuration window is active during DC tests. Ensure that the correct test is displayed on the Baker AWA-IV screen.
11. Start testing by pressing the power pack's **Test (PTT)** button (or footswitch) and slowly raise the voltage using the power pack's **Voltage Output Control** knob until the target voltage is reached. Both the voltage and current display will be active while you ramp up the test voltage. If the voltage is ramped too quickly such that an overcurrent condition occurs, the Baker AWA-IV will shut down the power pack and end the test.

Test results should immediately be visible on the Baker AWA-IV screen. If not, recheck the test lead connections and all the switch settings. Also, ensure that the interconnect cable has been attached and is secure.

12. After the test voltage is successfully reached, the test timer on the Baker AWA-IV's screen will start counting down.
13. Continue to hold the **Test (PTT)** button (or footswitch) for the duration of the test. Have HiPot setting at **100µA/Div** to start. Change the µA per division switch as needed to increase the sensitivity of the data acquisition during test.
14. For example, if target voltage is reached and at 100µA/Div you see less than 50µA of leakage current, it is best to switch the power pack to **10µA** per division for better accuracy. If less than 5µA is leaking at 10µA per division, switch to **1µA** per division for best accuracy (this can be switched during the test).

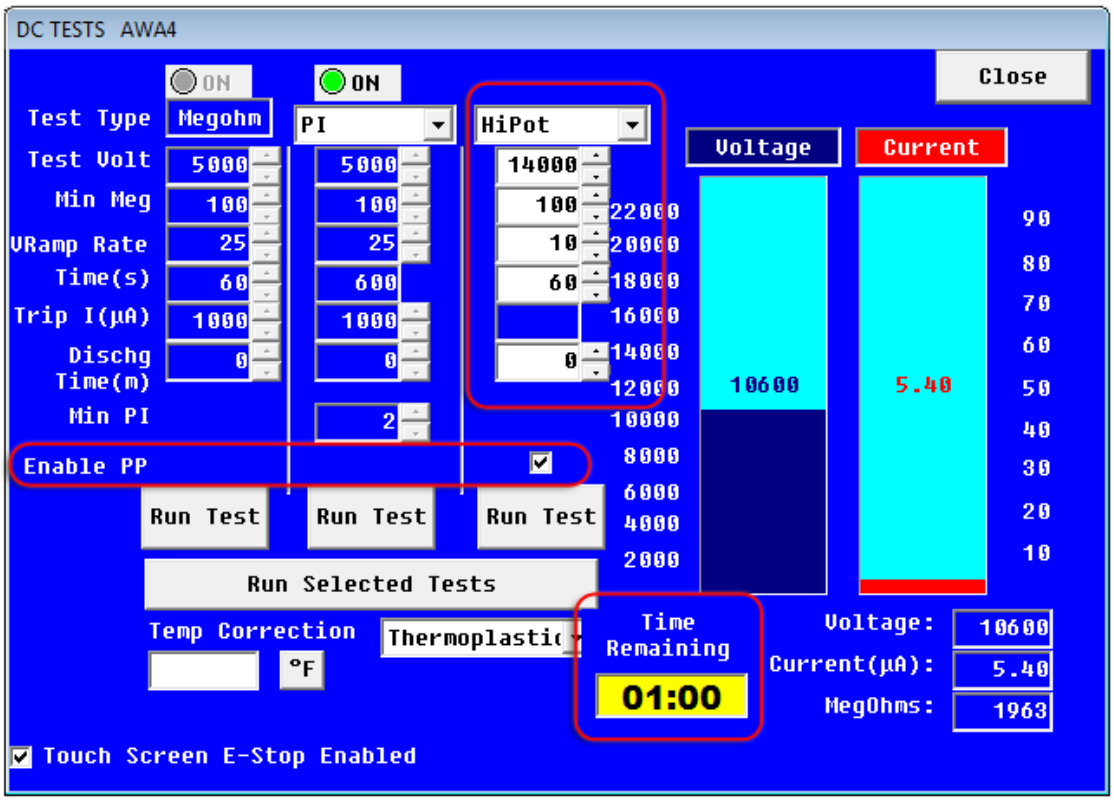

Fig 21: *Using the DC Test screen during testing.*

15. When the test **Time Remaining** clock runs down to 00:00, a message dialog appears telling you that the motor needs to be discharged. Continue to hold down the **Test (PTT)** button (or footswitch) until instructed to release it.

When the test timer counts down to zero, the analyzer will automatically stop the test, disable the power pack's test leads, and discharge the windings.

16. Continue to hold down the power pack's **Test (PTT)** button until you are instructed to release the button.

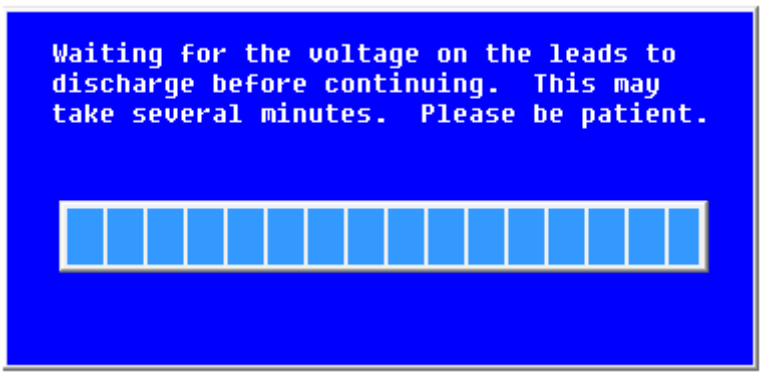

Fig 22: *Test leads discharging message dialog.*

WARNING: Due to the polarization of the insulation in high-voltage motors, a dangerous situation can develop if the motor is not completely discharged. If the windings are not allowed to completely discharge, a voltage can develop on the motor leads that can be high enough to present a shock hazard to personnel.

To completely discharge, a large motor requires that the motor's leads be held at ground potential for some time. IEEE 95 recommends a grounding interval four times the amount of time the high-voltage DC was applied to the windings, or two hours, whichever is greater. For smaller motors, a shorter time maybe be acceptable.

Refer to IEEE 95 (and/or other standards as applicable) to ensure complete understanding of proper discharge needs and recommendations, and to ensure the safety of personnel.

17. After the HiPot test successfully completes, release the power pack's **Test (PTT)** button (or footswitch).
18. Test results are automatically saved.
19. Next, the analyzer will automatically start the Surge test.

Because the Surge test for this example is being run by the power pack, the analyzer will once again present screens instructing you to connect the power pack, press the **Test (PTT)** button, and so on.

As with the power pack HiPot test, the Baker AWA-IV will automatically verify that the machine is set up properly before enabling the power pack output leads.

20. Set the power pack's **Function Selector** switch to **Surge** (Surge waveform icon).

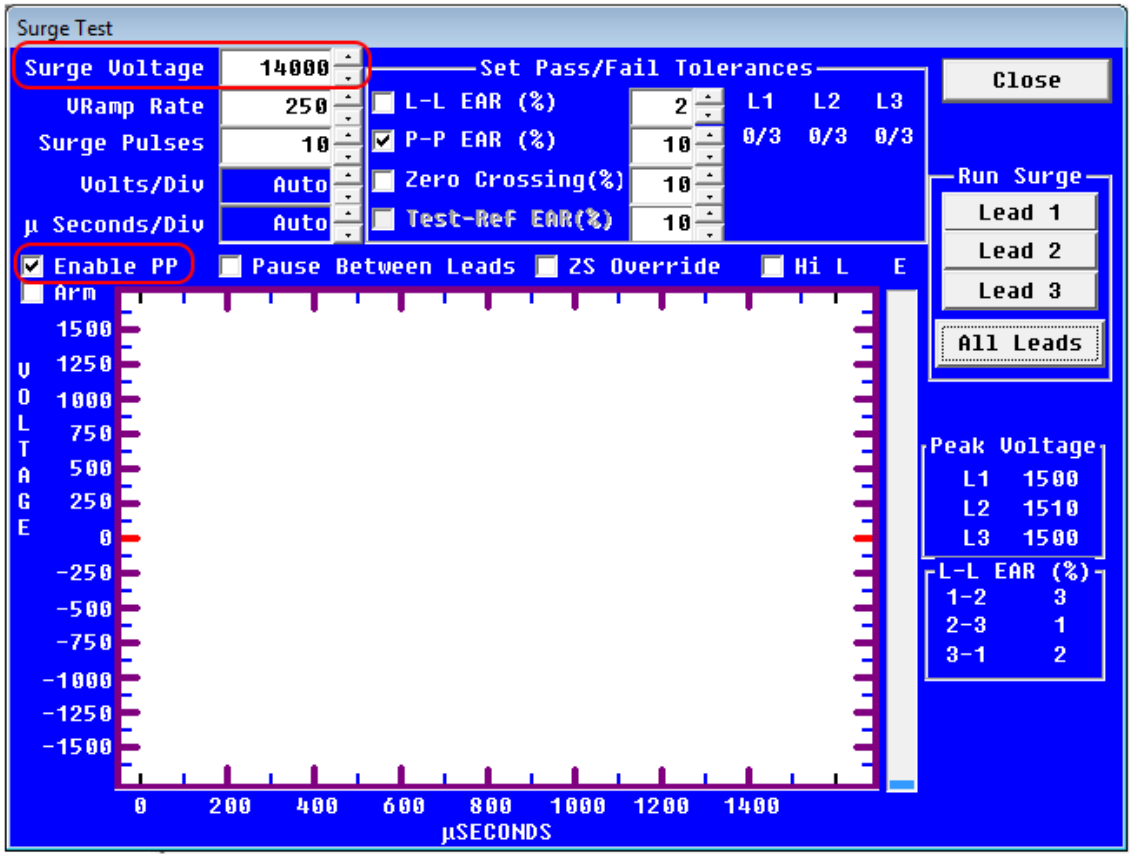

Fig 23: *Surge Test configuration window used during Surge testing.*

21. To start the Surge test, click on the **Lead 1** button in the **Run Surge** section of the *Surge Test* configuration window. If you attempt to start by using the power pack's **Test (PTT)** button, you will see a message instructing you to use the **Lead 1** button.

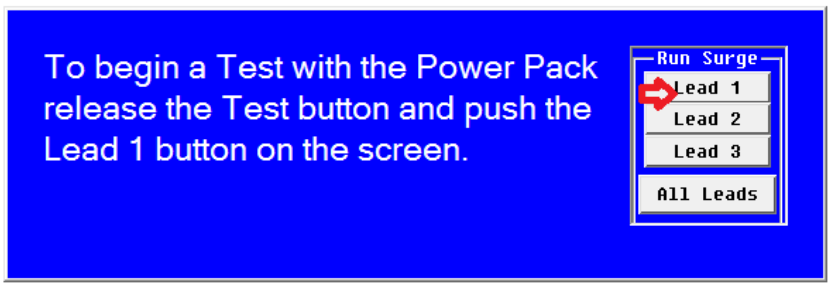

Fig 24: *Surge Test start message.*

22. After clicking on the **Lead 1** button, you will see a message instructing you to move the **Test Select** switch on the power pack to the **Lead 1** position. Adjust the switch as needed, then click on **OK** to continue.

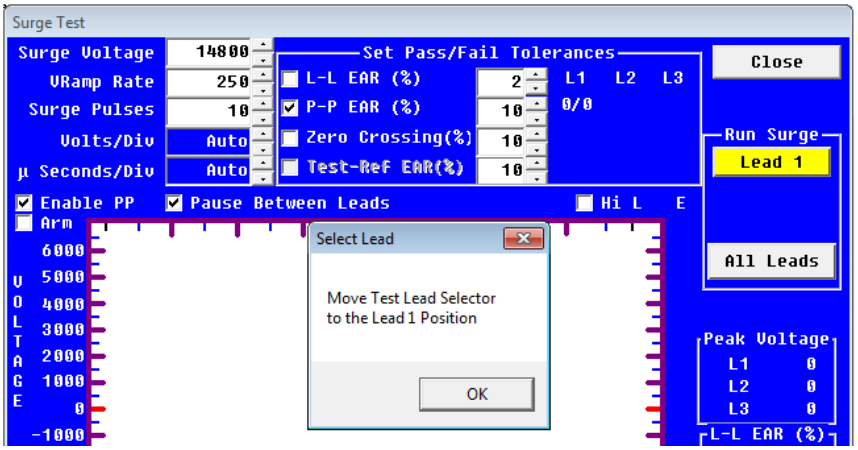

Fig 25: *Surge Test lead selection message.*

23. Next, you will see a message instructing you to press the power pack's **Test (PTT)** button (or footswitch) to begin testing lead 1.
24. Press and hold the **Test (PTT)** button and use the power pack's **Voltage Output Control** knob to set the waveform to the desired voltage level.

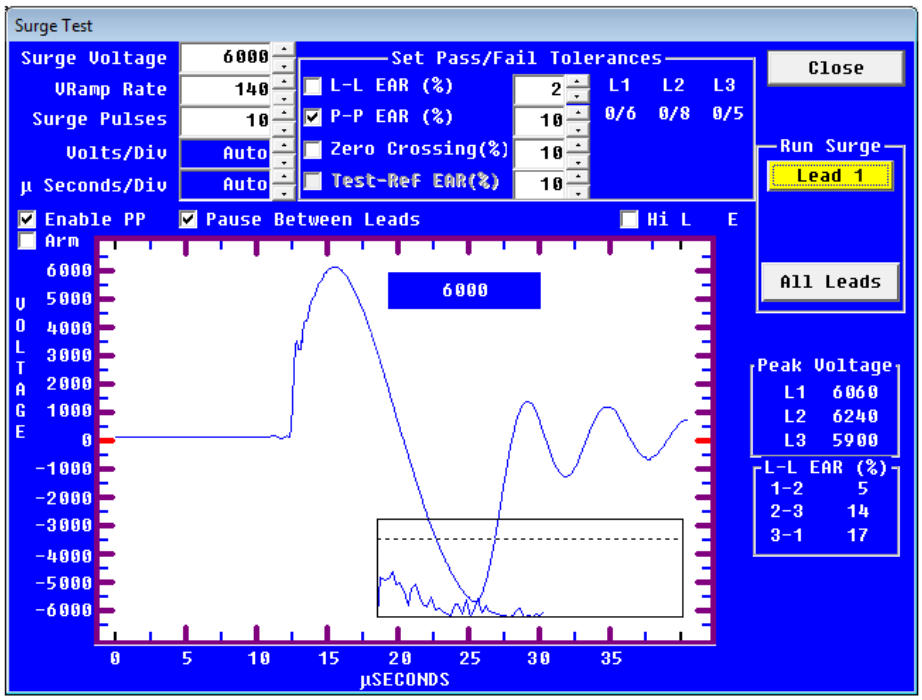

Fig 26: *Setting the voltage and waveform using the voltage output control knob.*

25. When you have reached the voltage level and the software completes its test, a message dialog will appear instructing you to release the **Test (PTT)** button.
26. Click on **Lead 2** then **Lead 3** in the **Run Surge** section to test each of those phases in turn using the process just described. The software will lead you through the process as noted.
27. When you have completed testing all three phases, click on the **Close** button to return to the *Main* window, **Tests** tab.
28. Test results should be automatically saved.

Single-phase Testing—PPX30/30A Combined with Baker AWA Tester

When performing single-phase testing (for example , on DC motors or when testing single coils) you must use the *Temperature/Resistance Test* setup window to define the parameters that instruct the tester to operate in single-phase testing mode.

NOTE: The parameters set in the Temperature/Resistance Test setup window affect only the Megohm and DA/PI tests because the AWA test leads are used for these tests when used in combination with a PPX30/30A tester. The power pack's test leads are used, in turn, for DC HiPot and Surge testing, which are not controlled by the AWA's setup windows.

The Temperature/Resistance Test setup window is the only place where you specifically define parameters to enable single-phase testing for the Baker AWA host unit.

1. Click on the test configuration button at the end of the second/Resistance row in the **Temperature/Resistance Tests** section.
2. Click on the **Temperature Enable** radio button if you will be using temperature compensation.
3. Click on the **Resistance Enable** radio button to enable the parameter options in this area.
4. Click on **2 Leads (1 phase)** and check the **Res Leads** box. Notice that the list of leads to test in the **Test Results** section changes to include only one test lead set (Lead 1–2).
5. You can leave the **Resistance Enable** radio button active if you choose to run resistance tests, or turn it off if not. However, you must ensure that the **2 Leads (1 phase)** radio button is selected and the **Res Leads** box is checked to enable single-phase testing.

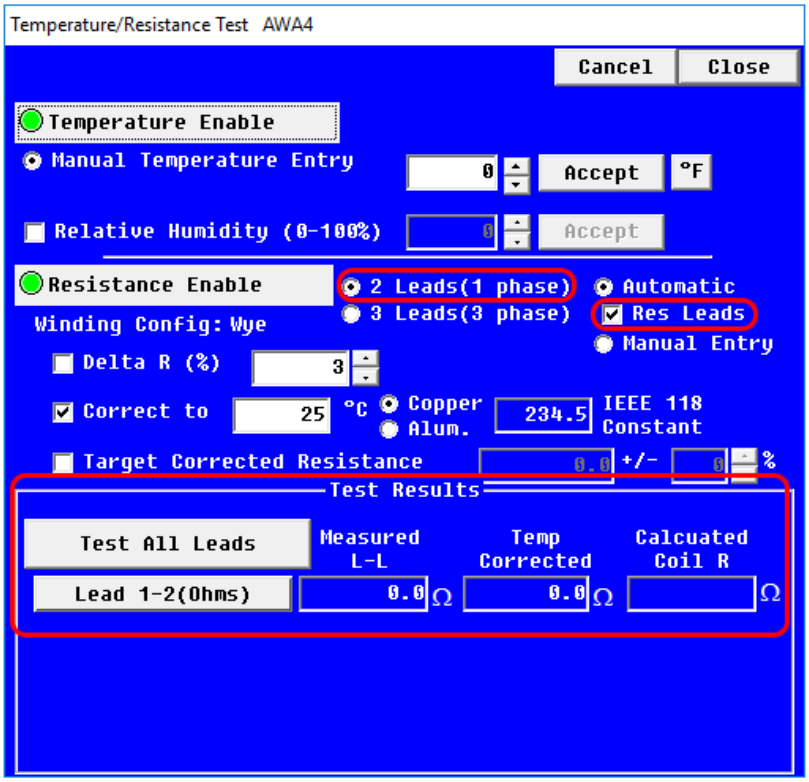

Fig 27: *Setting up the Resistance Test parameters for single-phase testing.*

CAUTION: As noted above, the PPX30/30A test leads are used during DC HiPot and Surge testing, and they are not controlled by the "2 leads" setting defined in the Temperature/Resistance Test setup window. The power pack's test leads should always be treated as energized leads when handling them.

Table 11: *Baker PPX30/30A device under test connections for single-phase HiPot testing.*

Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braided Safety Lead
Motor phase Hot	Not connected	Not connected	Motor/device Ground	Earth/station ground

Table 12: *Baker PPX30/30A device under test connections for single-phase Surge testing.*

Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braided Safety Lead
Motor lead 1	Motor lead 2	Not connected	Not connected	Earth/station ground

6. Set up parameters for DC and Surge tests as needed for the device using the respective setup windows. No specific parameter in either window will directly affect single-phase testing. The tests are set up and conducted the same as they would be for 3-phase testing, except that the power pack test leads will be connected as noted above.

Single-coil Testing

NOTE: The processes described in this section apply to testing coils with normal impedance. For testing low-impedance devices, refer to the section "Low-impedance Armature or Coil Testing Using the Baker PPX30A" found later in the guide.

Go/No Go Surge Testing

While single coils can be subjected to a full battery of tests, this example uses a common application of conducting Go/No Go surge tests on a batch/lot of coils. Only surge testing is enabled during this application.

1. Set the power pack's **Function Selector** switch to **Surge** testing (surge icon).
2. Set the **Test Select** switch to **Lead 1**.
3. Set the **Ramp Rate** switch to 3 or 4 to start. You can adjust the rate as desired when testing the first coil.
4. Turn the PPX30/30A **Zero-start Override** key switch to the horizontal position to enable zero-start override.

WARNING: When the zero-start override feature is enabled, target test voltage levels will be instantly applied to the test leads when a test begins. Ensure that no one contacts the tester leads to avoid injury during testing.

Fig 28: *PPX30A Zero-start override key switch.*

Item	Description
1	Zero-start override. This key switch overrides the Zero Start function and allows the unit to immediately apply the full target voltage level to the test leads. With the key in the vertical position, testing starts at zero volts and must be ramped up to the target voltage level.
2	In the horizontal key position, zero-start override is enabled. When the zero-start override feature is enabled, target test voltage levels will be instantly applied to the test leads when a test begins.

5. Create a separate Test ID and a Motor ID to use during the testing process to avoid inadvertently corrupting the test history of an existing Motor ID. While you typically will not collect much testing information in this type of process, you might want to consider creating a Motor ID to identify a specific manufacturing lot of coils.
6. After creating the Test ID and Motor ID, select the Motor ID then open the **Tests** tab.
7. Ensure that the proper Test ID appears in the **Test ID** field.

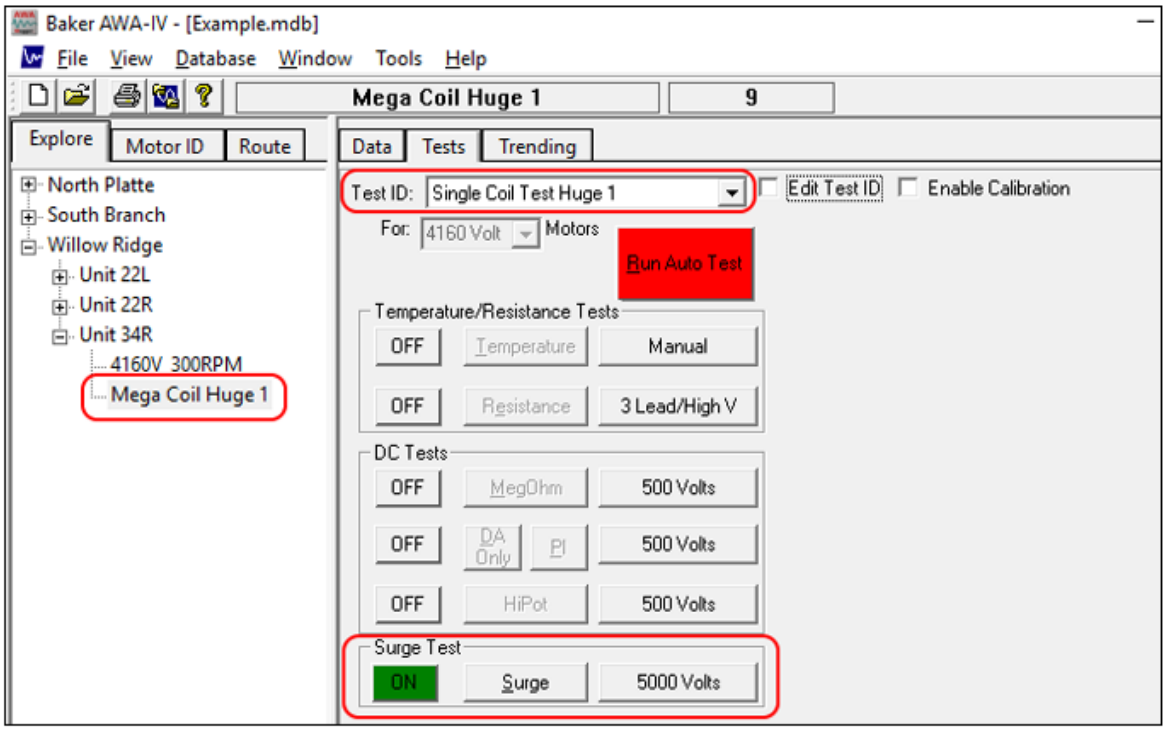

Fig 29: *Selecting single coil testing Motor ID and Test ID.*

8. Click on the test configuration button (volts) in the **Surge Test** row.

9. The *Surge Test* window opens.
10. Ensure that the test parameters are properly set up. Values should be similar to those shown in the example. If needed, edit the Test ID to ensure that the values are properly saved. For this example, we are testing 4160-volt coils, so the **Surge Voltage** level is set to 5000.
11. Also, ensure that the **Enable PP** box is checked so the software knows that the power pack (and its cables) will be used to conduct the Surge testing.

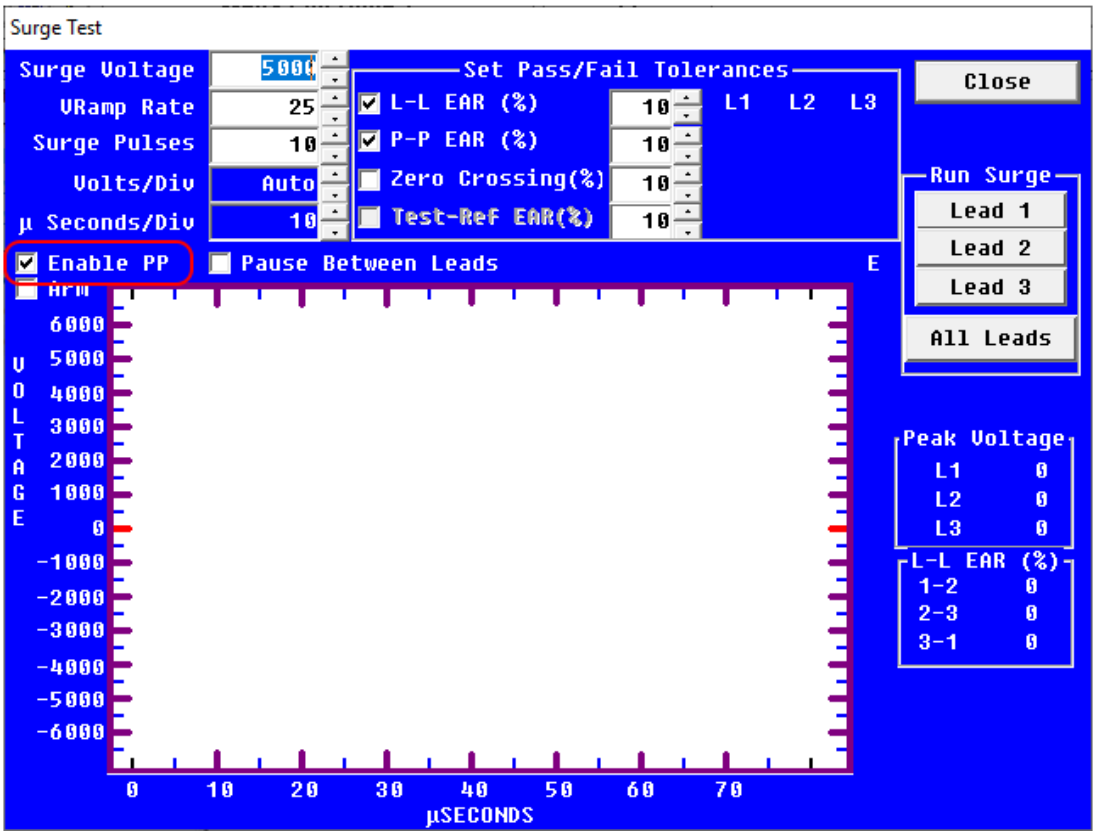

Fig 30: *Setting parameter values for Surge testing.*

12. Conduct the first test on a known good coil so that you can acquire a good baseline for all coils to be tested in the lot.

NOTE: This is not the same as using the known-good coil to set a formal test reference. That approach is covered in the next section.

13. Connect the power pack's test cables to *the first coil to be tested* as described in the table below.

Table 13: *Baker PPX30/30A device under test connections for single-coil Surge testing; first coil tested.*

Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braided Safety Lead
Coil lead 1	Coil lead 2	Not Connected	Not Connected	Earth/station ground

14. Click on **Lead 1** in the **Run Surge** section.
15. The software will instruct you to turn the power pack's **Test Select** switch to **Lead 1**. It will then instruct you to press (and hold) the **Test (PTT**) button (or footswitch) on the power pack. Continue to hold down the **Test (PTT)** button until the software instructs you to release it.
16. Turn the power pack's **Voltage Output Control** knob clockwise to ramp up the voltage to the Surge Voltage level.
17. Release the **Voltage Output Control** knob when you reach your target, but continue to hold down the **Test (PTT)** button until instructed to release it.

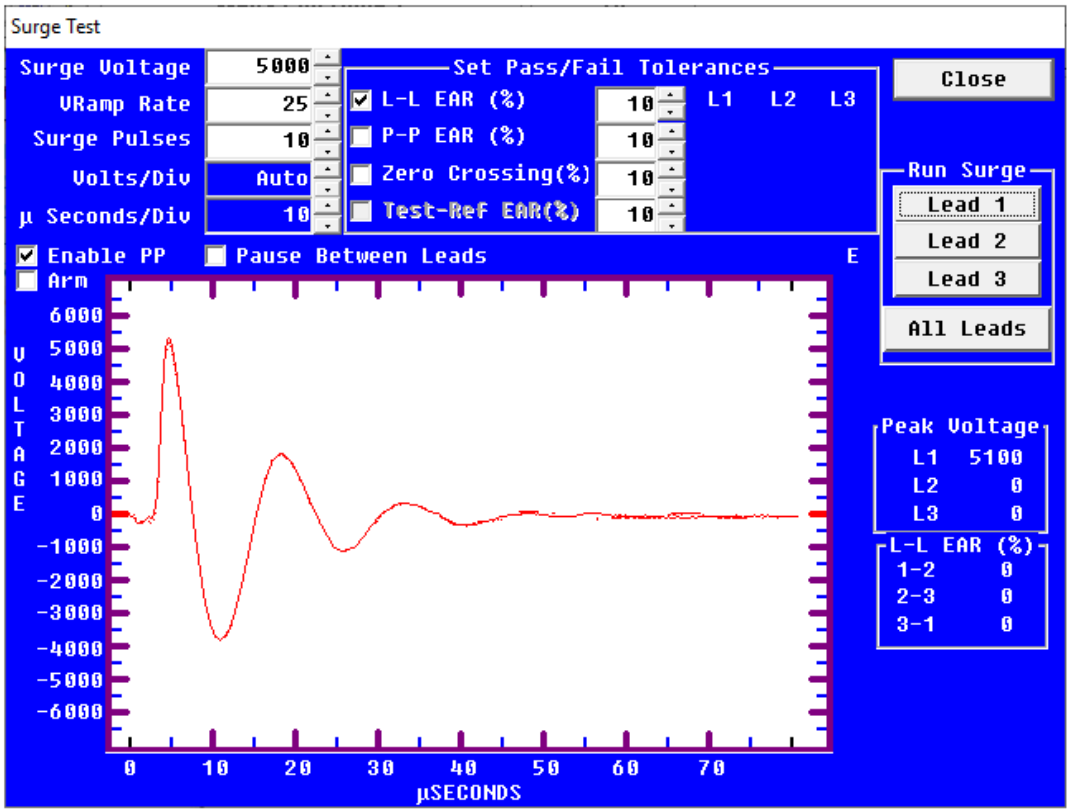

Fig 31: *Running Surge test on known-good coil, Lead 1.*

18. After the software completes its processing, it will instruct you to release the **Test (PTT)** button.
19. Inspect the waveform and value for L1 in the **Peak Voltage** area. When you are satisfied that you have a good baseline, disconnect the power pack's test leads from the coil and connect the next coil to be tested. A Surge test is not run on Lead 2 for the first coil.

CAUTION: Ensure that the Leads Energized light on the power pack turns off before removing leads from the coil.

20. Connect the power pack's test cables to *the rest of the coils to be tested (in turn)* as described in the table below.

Table 14: *Baker PPX30/30A device under test connections for single-coil Surge testing; all subsequent coils being tested.*

Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braided Safety Lead
Coil lead 2	Coil lead 1	Not Connected	Not Connected	Earth/station ground

21. Click on **Lead 2** in the **Run Surge** section.
22. The software will instruct you to turn the power pack's **Test Select** switch to **Lead 2**. It will then instruct you to press (and hold) the **Test (PTT**) button (or footswitch) on the power pack. Continue to hold down the **Test (PTT)** button until the software instructs you to release it.
23. Because the Zero-start Override function is active, the voltage will automatically start at the target Surge Voltage level.

WARNING: At this point, you will be using the zero-start override feature. When the zero-start override feature is enabled, target test voltage levels will be instantly applied to the test leads when the Test (PTT) button or footswitch is pressed. Ensure that no one contacts the device or tester leads to avoid injury during testing.

24. Continue to hold down the **Test (PTT)** button until instructed to release it.

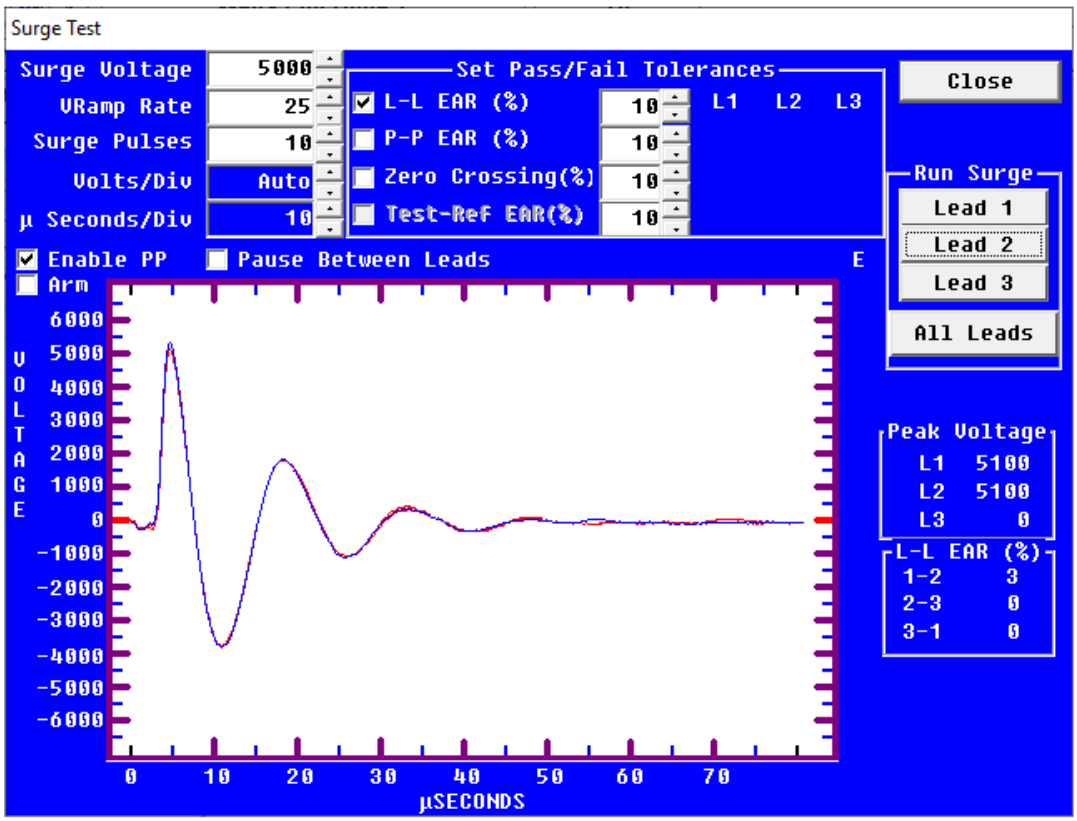

Fig 32: *Running Surge test on subsequent coils; Lead 2.*

25. After the software completes its processing, it will instruct you to release the **Test (PTT)** button.
26. Inspect the waveform and value for L2 in the **Peak Voltage** area. Inspect the **1-2** value in the **L-L EAR%** section.
27. If the coil fails, mark the coil according to your organization's testing process and record relevant information as needed. (Process is external to Baker AWA-IV testing results.)
28. If you are satisfied that you have a good test result, disconnect the power pack's test leads from the coil, connect the next coil to be tested, and repeat the testing process from step 20 for the new coil.
29. Repeat this process for each new coil until you have tested all coils.
30. Click on **Close** to leave the Surge Test window when you have completed your testing.

Single-coil Testing Using a Test Reference

This application involves setting up a new Test ID that will include a test reference to be used when testing other devices of this type.

1. Connect the power pack's test cables to a known-good coil as described in the table below.

Table 15: *Baker PPX30/30A device under test connections for single-coil Surge testing; reference coil.*

Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braided Safety Lead
Coil lead 1	Coil lead 2	Not Connected	Not Connected	Earth/station ground

Setting up the Test ID

1. Set the power pack's **Function Selector** switch to **Surge** testing (surge icon).
2. Set the **Test Select** switch to **Lead 1**.
3. Set the **Ramp Rate** switch to 3 or 4 to start. You can adjust the rate as desired when testing the first coil.
4. Ensure that the **Zero-start Override** key switch is in the **Ramp** position (vertical—ZSO off).

Fig 33: *PPX30A Zero-start override key switch.*

Item	Description
1	Zero-start override. This key switch overrides the Zero Start function and allows the unit to immediately apply the full target voltage level to the test leads. With the key in the vertical position, testing starts at zero volts and must be ramped up to the target voltage level.
2	In the horizontal key position, zero-start override is enabled. When the zero-start override feature is enabled, target test voltage levels will be instantly applied to the test leads when a test begins.

5. Create a separate Test ID and a Motor ID to use during the testing process. The Motor ID and Test ID can then be re-used when testing other devices of this type.
6. During the Test ID setup, you will define a test reference.
7. Open the **Tests** tab.
8. Click on **Edit Test ID**.
9. Enter the password as needed.
10. Click on **Add**.
11. In the *Create New Test ID* dialog box, click on **Add Blank Test ID**.
12. Give the new Test ID a name that describes its function.
13. Enter the **Target Voltage Motor Class** then click **OK**.
14. Upon returning to the **Tests** tab, you should see the new Test ID displayed in the **Test ID** field.
15. Create a new Motor ID for the devices you will be testing. Be sure to select the new Test ID during the process.

16. Select the new Motor ID you just created then open the **Tests** tab. The Motor ID and Test ID should be selected, similarly to the example shown below.
17. Ensure that the proper Test ID appears in the **Test ID** field.

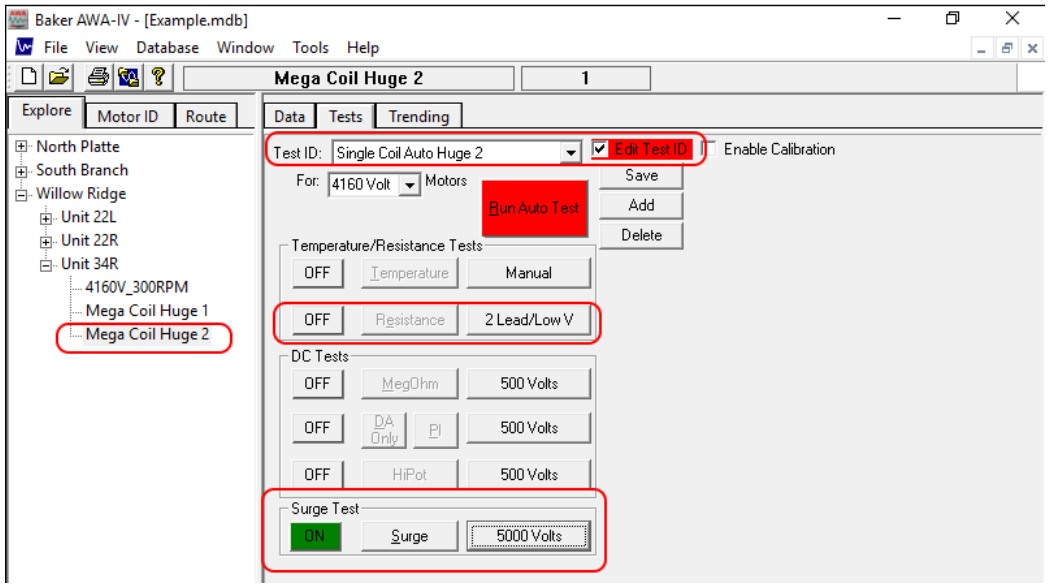

Fig 34: *Selecting single coil testing Motor ID and Test ID.*

18. Check the **Edit Test ID** box then enter the current password when requested.
19. If you will be running other tests (such as resistance test, a common application in coil testing) ensure that the parameters enabling single-phase testing have been set up in the *Temperature/Resistance Test* setup window as described earlier in this chapter, but leave the tests set to **OFF** while completing the Test ID setup process.
20. After returning to the **Tests** tab, click on the **Surge Test ON/OFF** button to activate the test.
21. Click on the **Run Auto Test (PTT)** button. The *Surge Test* window should open.

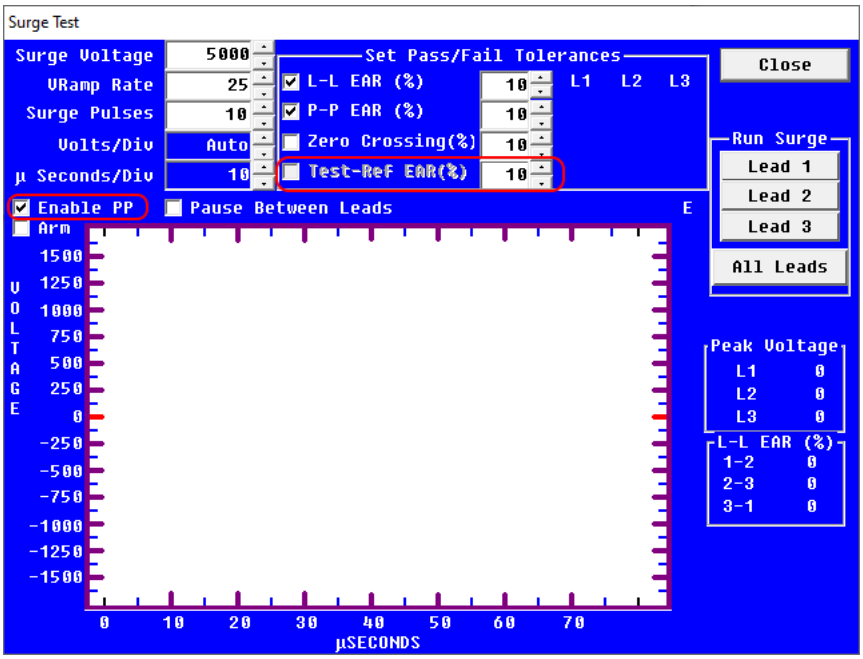

Fig 35: *Setting Surge parameters; preparing to acquire a test reference.*

22. Set your test parameters as needed (Surge Voltage according to device needs, others similar to the example shown above).

23. Check the **Enable PP** box.
24. Check the **L-L EAR** and **P-P EAR** boxes.
25. Notice that the **Test-REF** and **EAR(%)** elements are grayed out (inactive at this time).
26. Press and hold the power pack's **Test (PTT)** button (or footswitch) then ensure that the power pack's **Test Select** switch in set to **Lead 1**.
27. Press **Lead 1** in the **Run Surge** section.
28. Turn the **Voltage Output Control** knob clockwise to increase the voltage to the target level. Turn the knob counterclockwise to decrease voltage. Adjust the level as needed then release the knob when you are satisfied with the voltage level. Continue to hold down the power pack's **Test (PTT)** button (or footswitch).
29. Adjust display controls as needed to position the waveform for optimal viewing.

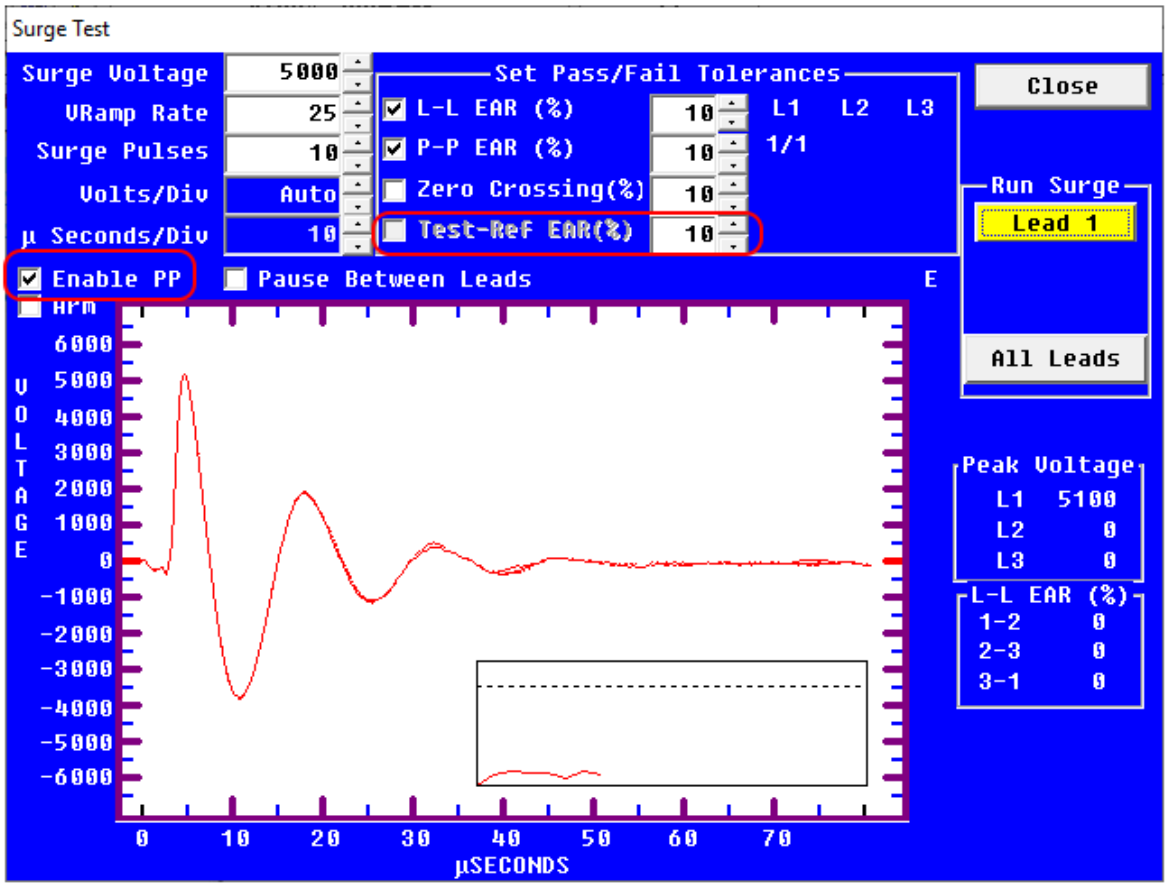

Fig 36: *Ramping voltage to acquire Lead 1 waveform.*

30. The software will alert you to release the power pack's **Test (PTT)** button button (or footswitch) when your waveform and voltage level stabilize.
31. The software will direct you to switch the power pack's **Test Select** switch to **Lead 2**.
32. Press the **Lead 2** button in the **Run Surge** section.
33. Turn the **Voltage Output Control** knob clockwise to increase the voltage to the target level. Adjust the level as needed then release the knob when you are satisfied with the voltage level. Continue to hold down the power pack's **Test (PTT)** button (or footswitch).
34. The software will alert you to release the power pack's **Test (PTT)** button (or footswitch) when your waveform and voltage level stabilize.
35. Click the **Close** button in the *Surge Tests* window.

36. You will return to the main application, **Tests** tab. The software will ask if you want to save the test result as a reference.
37. Click **Yes** if you are satisfied that you have a good reference level and waveform.
38. If you will be running other tests (such as the resistance test) with this Test ID as a normal course, continue editing the Test ID to turn on other tests.

NOTE: If other tests are run, you will use the Baker AWA-IV test leads for Resistance, Megohm, and DA/PI testing. HiPot and Surge tests use the power pack's test leads.

39. Click **Save** to save all changes.
40. Uncheck the **Edit Test ID** box if it is still highlighted (red).

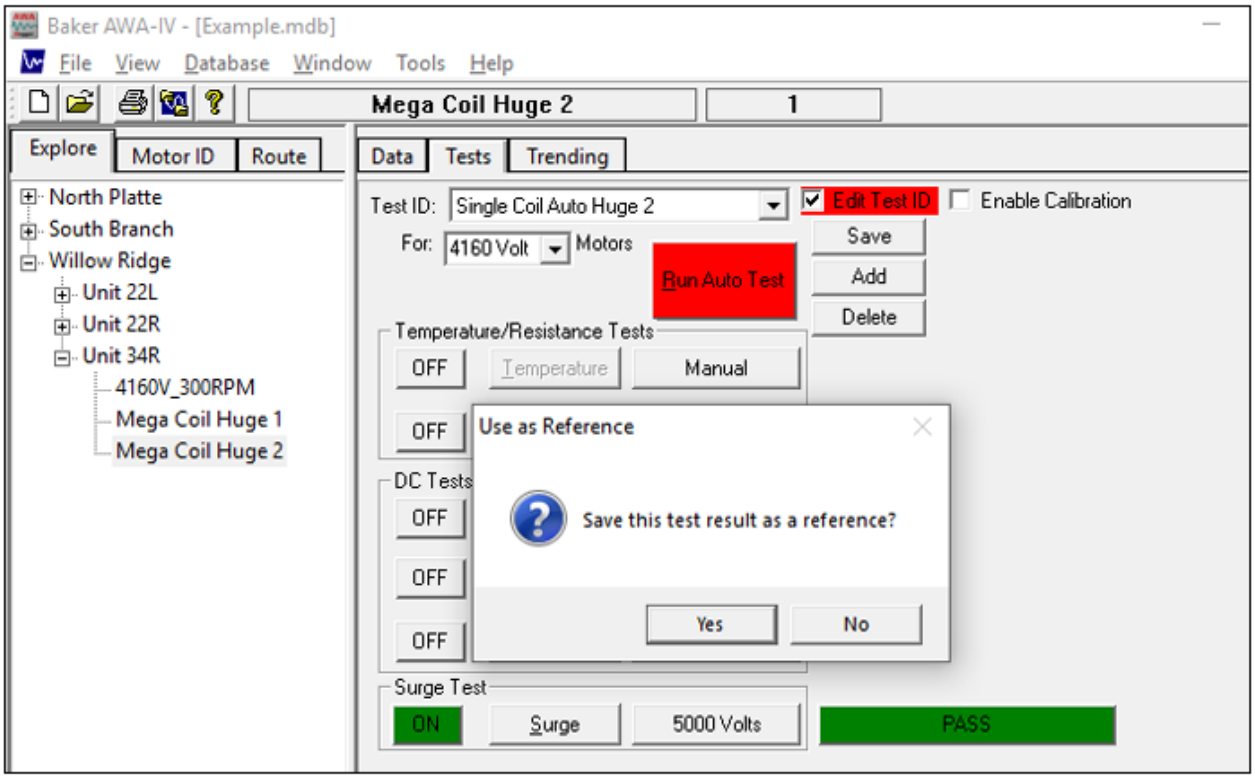

Fig 37: *Saving the test reference.*

41. You are now ready to test additional coils using the test reference acquired.
42. To continue testing additional coils, disconnect the current coil used to acquire the reference and set it aside.

CAUTION: Ensure that the Leads Energized light on the power pack turns off before removing leads from the coil.

43. If you will run other tests on the device, attach the tester's Lead 1 to the coil's Lead 1 and tester Lead 2 to coil Lead 2.
44. If you will run only Surge tests, connect the next coil to be tested to the power pack's test cables as described in the table below.

Table 16: *Baker PPX30/30A device under test connections for single-coil Surge testing.*

Test Lead 1 Orange	Test Lead 2 Brown	Test Lead 3 Yellow	Ground Lead Black	Black Braided Safety Lead
Coil lead 1	Coil lead 2	Not Connected	Not Connected	Earth/station ground

45. Switch the power pack's **Test Select** switch to **Lead 1.**

46. Click on the **Run Auto Test** button and follow the prompts provided by the tester for setting power pack controls and for testing lead 1 then lead 2 for each coil.
47. When the *Surge Test* window opens, notice that the **Test-REF** and **EAR(%)** elements are active now that a test reference has been set.

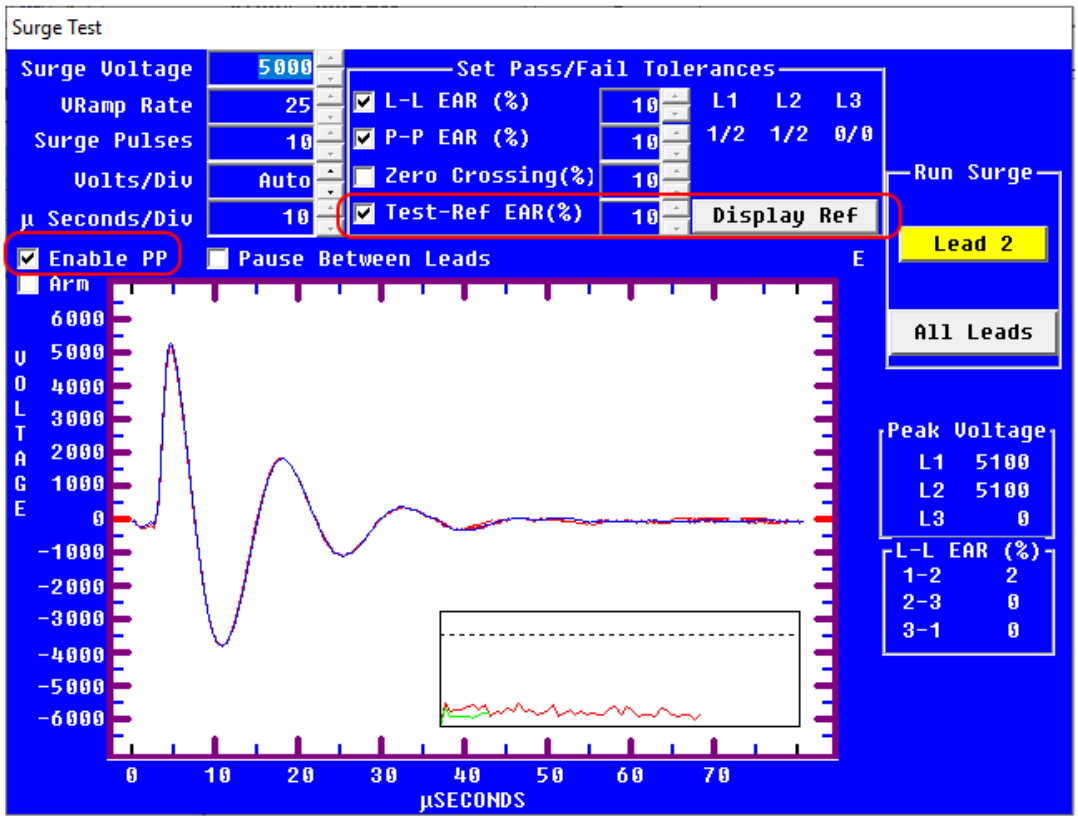

Fig 38: *Testing coils using the test reference.*

48. When you have completed testing on both leads for a coil, you can close the Surge Test window and save the test data collected.
49. Disconnect the coil from the tester.

NOTE: The software also provides features to save up to three waveforms in addition to the reference waveform for reporting and comparison needs. For additional information on single-coil testing and details on related features, refer to the *Baker AWA-IV User Guide*.

50. If you need to test another coil, connect it to the tester as described above and repeat the process starting from step 42.

Low-impedance Armature or Coil Testing Using the Baker PPX30A

Some coils or armature windings have very low impedance and cannot be tested with just the AWA host. Baker ZTX functionality is required to test these coils. DC series fields, pole face windings, and interpoles are common examples of low-impedance circuits that require the ZTX functionality for proper evaluation. When combined with a PPX30A power pack (built-in ZTX functionality), the Baker AWA accommodates testing of low-impedance coils and armatures.

PPX30A Configuration for Armature (Low-impedance Device) Tests

The low-impedance device test feature (commonly called armature testing) is built into the Baker PPX30A power pack and can be selected by placing the **Function Selector** switch on the front panel into the Armature (**armature icon**) position.

Fig 39: *Baker PPX30A armature test settings.*

Item	Description
1	Function Selector switch
2	Armature test mode (Low-impedance device testing such as armatures, DC field coils, and interpoles). Employs the Baker ZTX impedance matching transformer circuitry built into the PPX30A.
3	Test Select switch.
4	Set to LEADS GROUND (ground icon) for Armature (low-impedance device) testing.

CAUTION: Do not switch the Test Select switch or the Function Selector switch while a test is in progress. You may substantially reduce the switching element's useful life if you perform such switches in the middle of a test.

1. Ensure that the power pack setup procedure has been followed as described earlier.
2. Set the **Function Selector** switch to Armature (**armature icon**).
3. Ensure that the **Test Select** switch is set to LEADS GROUND (**ground icon**).
4. The power pack's high-voltage test leads are not used for this procedure. Ensure that they are not connected to anything and lay them safely aside. The black braided leads with circular surge and sense connectors are used instead.

Armature Testing Fixture Attachment

1. Connect the ATF 5000 Sense and Surge connectors to the Surge Adapter.
2. Connect the Surge Adapter to the Baker PPX30A Surge and Sense connectors found on the lower right rear of the power pack as shown in the image below.
3. Connect the ATF 5000 footswitch connector to the Footswitch receptacle on the rear of the power pack.

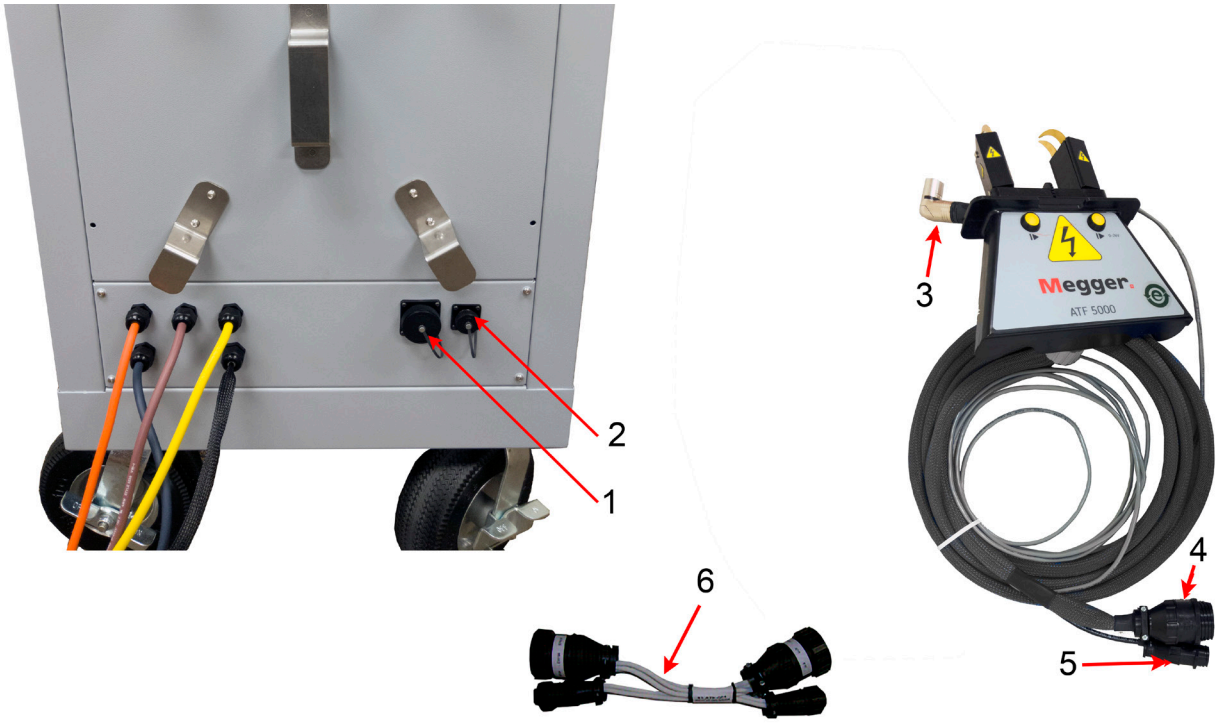

Fig 40: *Connecting the ATF-5000 armature test fixture to the PPX30A power pack.*

Item	Description
1	PPX30A Armature Surge connector.
2	PPX30A Armature Sense connector.
3	Footswitch connector; connect to Footswitch connector on back on PPX.
4	ATF 5000 Sense connector; connect to PPX Surge connector.
5	ATF 5000 Surge connector; connect to PPX Sense connector.
6	Surge Adapter 81-ATF-004RC

4. If you will use the remote E-Stop, connect it to the indicated location on the back of the power pack.
5. Ensure that the host unit and power pack setup procedures have been completed as described earlier.

Low-impedance Armature or Coil Test Procedures for PPX30A

1. Ensure that the test probes or fixture have been properly connected to the power pack, then power up the Baker AWA and the PPX30A power pack.
2. Ensure that the **Test Select** switch is set to Leads Ground (**Ground icon**) and the **Function Selector** switch is set to Armature (**Armature icon**). The power packs' high-voltage test leads are not used during this test; safely set them aside.

CAUTION: To avoid damaging the unit under test or substantially reducing the switching element's useful life, do not change the **Function Selector** switch out of the **ARM** position during the performance of any test.

3. Turn the PPX30A **Zero-start Override** key switch to the horizontal position to enable zero-start override.

WARNING: When the zero-start override feature is enabled, target test voltage levels will be instantly applied to the test leads when a test begins. Ensure that no one contacts the tester leads to avoid injury during testing.

Fig 41: *PPX30A Zero-start override key switch.*

Item	Description
1	Zero-start override. This key switch overrides the Zero Start function and allows the unit to immediately apply the full target voltage level to the test leads. With the key in the vertical position, testing starts at zero volts and must be ramped up to the target voltage level.
2	In the horizontal key position, zero-start override is enabled.

Setting up an Armature Surge Test

Create an appropriate Test ID and Motor ID for the device to be tested. Refer to the "Creating Test and Motor IDs, and Setting Up the Tests" section in this guide for a brief review. Refer to the *Baker AWA-IV User Guide* for more detailed information.

The specific settings that affect armature testing using a Baker AWA and PPX30A power pack appear within the *Surge Test* and *Armature Test* setup windows.

1. With the proper Motor ID selected, click on the **Tests** tab.
2. Ensure that the correct Test ID for the device appears in the **Test ID** field.
3. Check the **Edit Test ID** box.
4. Enter the current password for editing Test IDs in the dialog box when requested.
5. Click the far right button in the **Surge Test** row to open the *Surge Test* setup window.

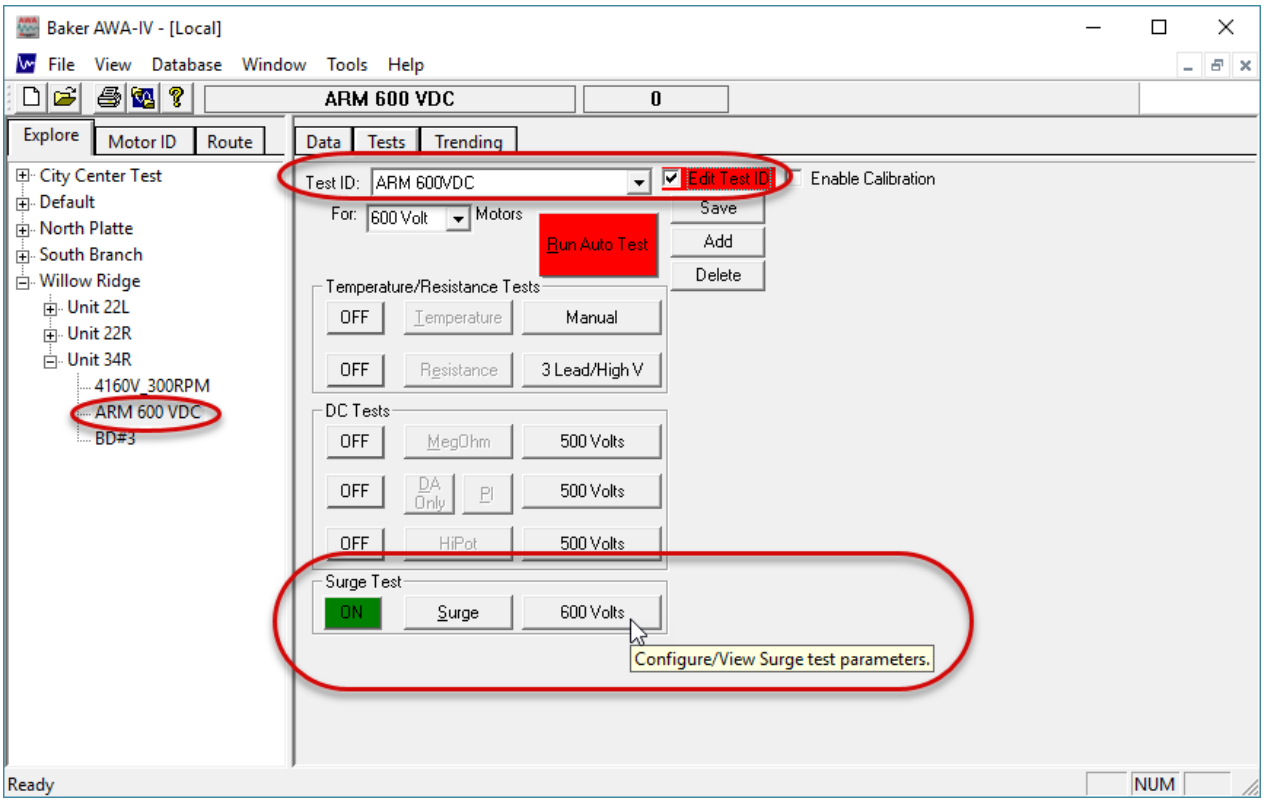

Fig 42: *Tests tab; selecting Surge Test setup to access armature testing parameters.*

6. In the *Surge Test* setup window, define the **Surge Voltage** needed for your device. For this example, we use 600 volts.
7. Check the **Enable PP** box and the box labeled **Arm**.

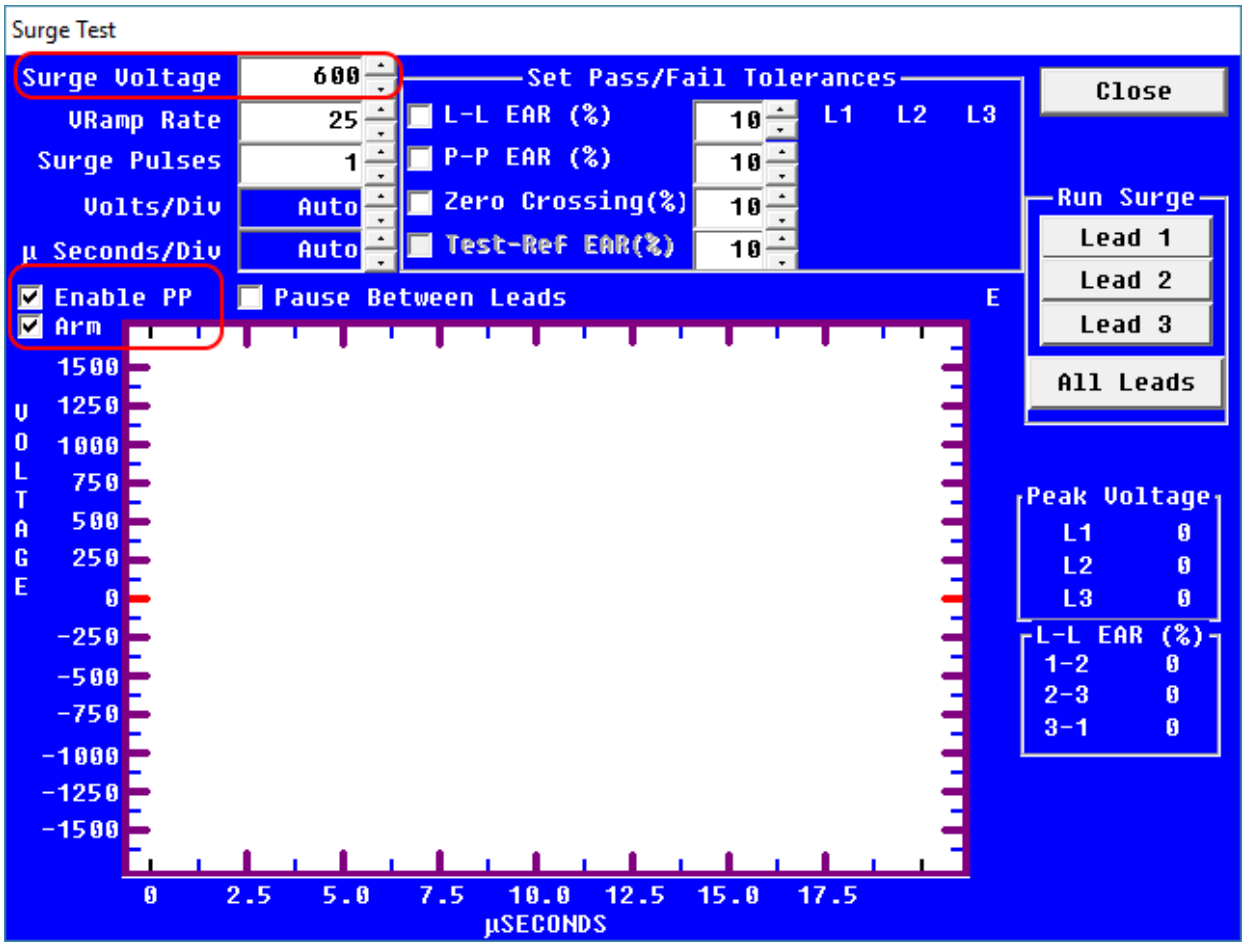

Fig 43: *Setting up Surge Test window for Armature testing using the power pack.*

8. As soon as you check the **Arm** box, the *Surge Test* window changes to the *Surge Test – Armature* window as shown in the example below.
9. Take note of a few elements in this window at this point:
   9.1. The **Arm Testing Enabled** box is checked and **PP185** (power pack) is selected in the **Hardware** section.
   9.2. The **Set Ref** button is disabled (grayed out) at this time.
   9.3. A warning appears at the bottom of the window to ensure that the power pack's **Function Selector** switch is in the correct position Armature (**armature icon**).
10. Ensure that the **Target Voltage** is set as needed for your armature.
11. Set the **Volts/Div** value to Auto. The analyzer will auto-range for the reference waveform.

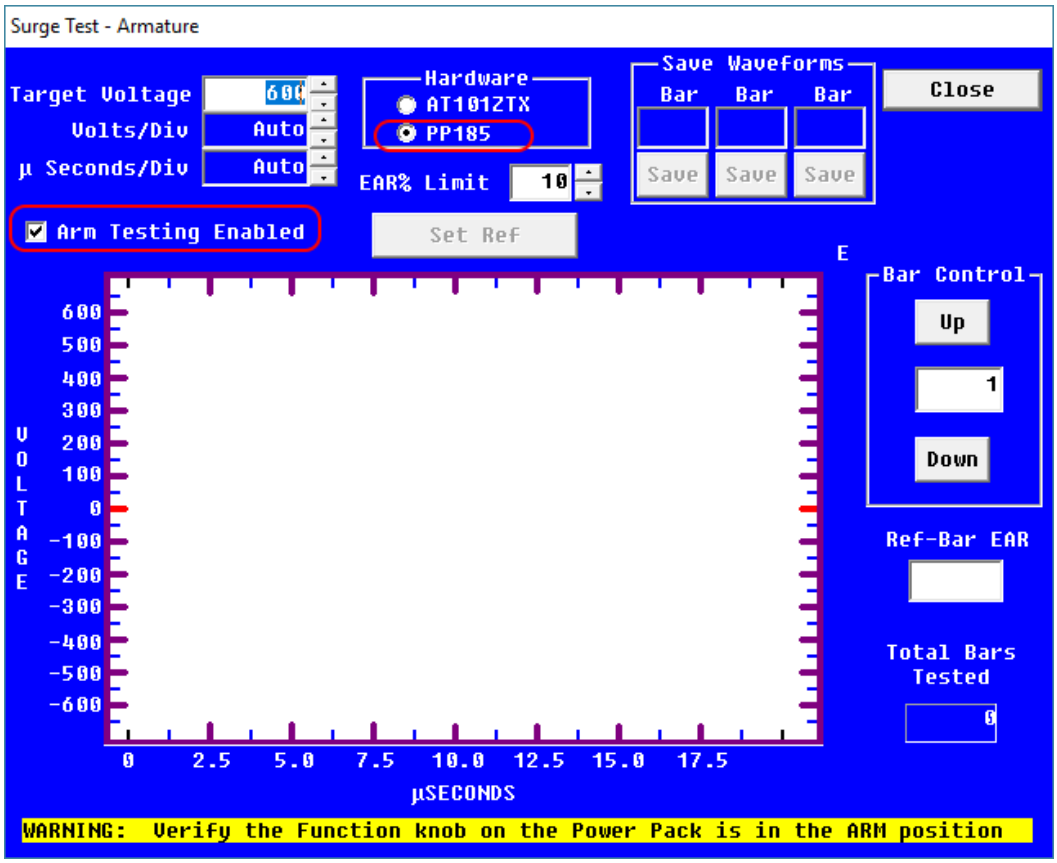

Fig 44: *Surge Test – Armature window.*

12. Change the reference-to-bar **EAR% Limit** as needed; the default is set to 10%.
13. When you have completed your settings, click on the **Close** button to return to the *Main* window, **Tests** tab.
14. Click the **Save** button to save the Test ID.
15. Uncheck the **Edit Test ID** box to turn off Test ID editing.

NOTE: The armature surge test is a manual test that cannot be performed using the automatic features of the Baker AWA-IV.

16. At this point, you can begin testing your armature (or other low-impedance device).

Running the Manual Armature Surge Test Using the Baker AWA and PPX30A

NOTE: In most applications, you will need help from another person to complete at least the first part of this test process: obtaining the reference waveform. One person will operate the fixture on the armature while the other operates the tester.

CAUTION: Ensure that both operators clearly understand the process and how to use the software. The fixture/probe operator must know how to properly use the ATF-5000 (or test probes) to avoid injury from electrical shock, or damaging the test equipment or the unit under test.

1. For this example, a new Motor ID for the armature, along with a new Test ID, have been created. For your application, ensure that you have selected the proper Motor ID and Test ID for your armature.
2. From the **Tests** tab, ensure that the selected Test ID has the Surge test turned **ON** and the section is labeled "Surge Test Using PP185."
3. Click on the test configuration button at the end of the **Surge Test** row to open the *Surge Test* setup window. Because this is a manual test, it is run from the *Surge Test - Armature* window.
4. The armature operator will position the test fixture (or probes) on the first bar and the second bar (adjacent to the right); bar 1 will be the reference bar. Bars are tested in a progressing sequence of 1–2, 2–3, 3–4, and so on.
5. When both operators are ready, the armature operator will hold down one of the test buttons on the ATF-5000 (or footswitch if using probes), then the AWA operator will ramp the voltage to the desired level.
6. After the first bar is tested and you are satisfied that you have a good reference waveform, the AWA operator will click on the **Set Ref** button. This establishes the reference for the remainder of the test and sets the power pack's target voltage level.
7. In the following example, the target waveform is acquired from bar 1, so the **Set Ref** button is pressed.

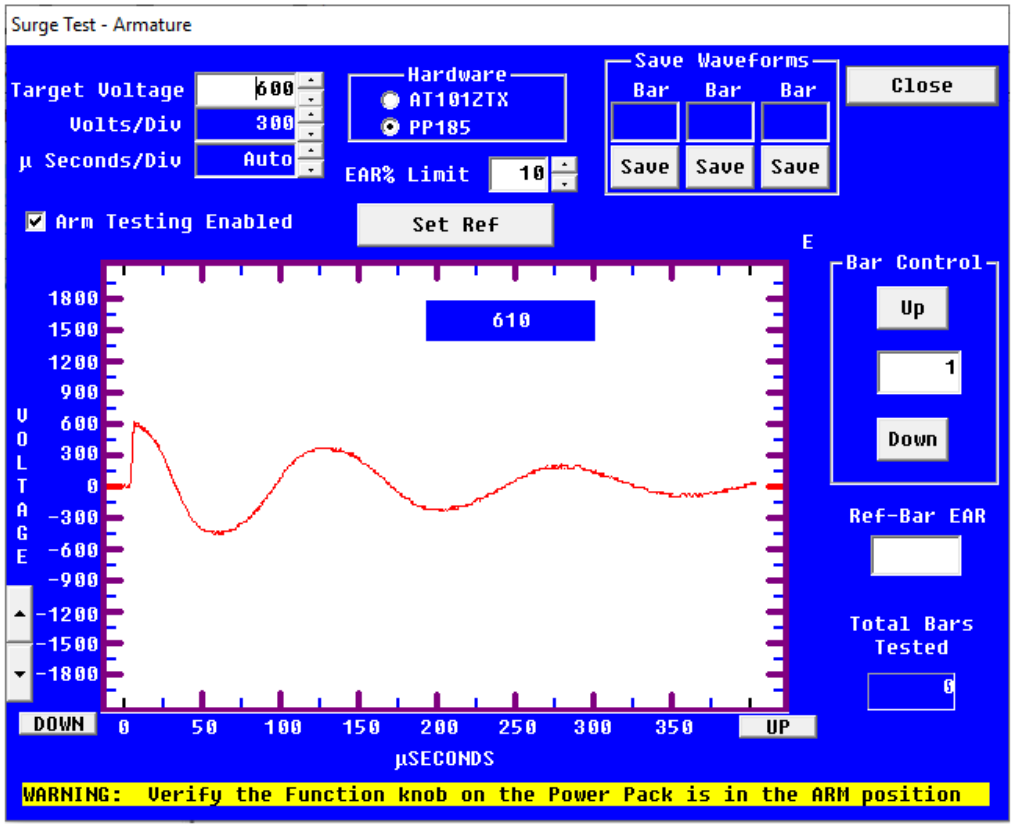

Fig 45: *Acquiring the reference waveform for armature (low-impedance coil) testing.*

8. A dialog box will appear with a warning that the voltage will lock and start at the target voltage level for all subsequent tests, overriding the zero-volt interlock feature.

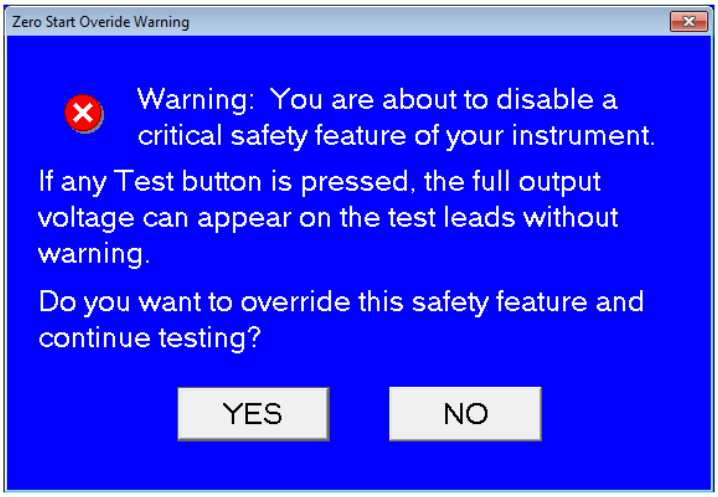

Fig 46: *Zero start override warning message.*

9. Move the test fixture (or probes) to the second bar pairing (2–3).
10. Press the **Test (PTT)** button or footswitch. The analyzer will energize Lead 1 at the preset voltage and the waveform will be displayed on the screen as the red wave. The reference is also displayed as the blue waveform. A reference-to-bar EAR value will be displayed in the **Ref Bar EAR** field.
11. If the EAR percentage is greater than the tolerance, the field background will turn red indicating a failed test. If the EAR percentage is under or equal to the tolerance, the background of the **Ref-Bar EAR** box will be white, indicating a passing test.
12. When you are satisfied with the waveform, release the fixture's test button or footswitch. The EAR percentage will be saved and an inset bar graph will be displayed depicting the EAR percentage versus the reference bar's waveform. If the bar failed, the EAR bar on the graph will be red.
13. Up to three additional waveforms can be saved during the testing process. If a bar fails or is of interest, click on one of the **Save** button in the **Save Waveforms** section at the top of the screen and that waveform will be saved along with its bar number; otherwise, only the reference-to-bar EAR percentage for the bar will be saved.
14. Continue to move the test fixture to the next bar and repeat the process from step 10 for each bar until all bars have been tested. A maximum of 1,024 bars can be tested.
15. If at any time before you save the full test results you want to retest a bar, you can enter that bar number directly into the **Bar Control** field, or use the up and down arrows to navigate to the bar number, and retest as needed. Retesting will overwrite the previous data for that bar.
16. The **Total Bars Tested** number gives you the number of the last bar tested. Add one to that number to resume testing where you left off.

17. After all bars have been tested, click the **Close** button. The software will return you to the *Main* view **Tests** tab, which will look similar to the example below.
18. Because this is not an automatic test, you must click on the yellow **Save Results** button to save the test results to the database so it can be recalled for further viewing and to print reports.

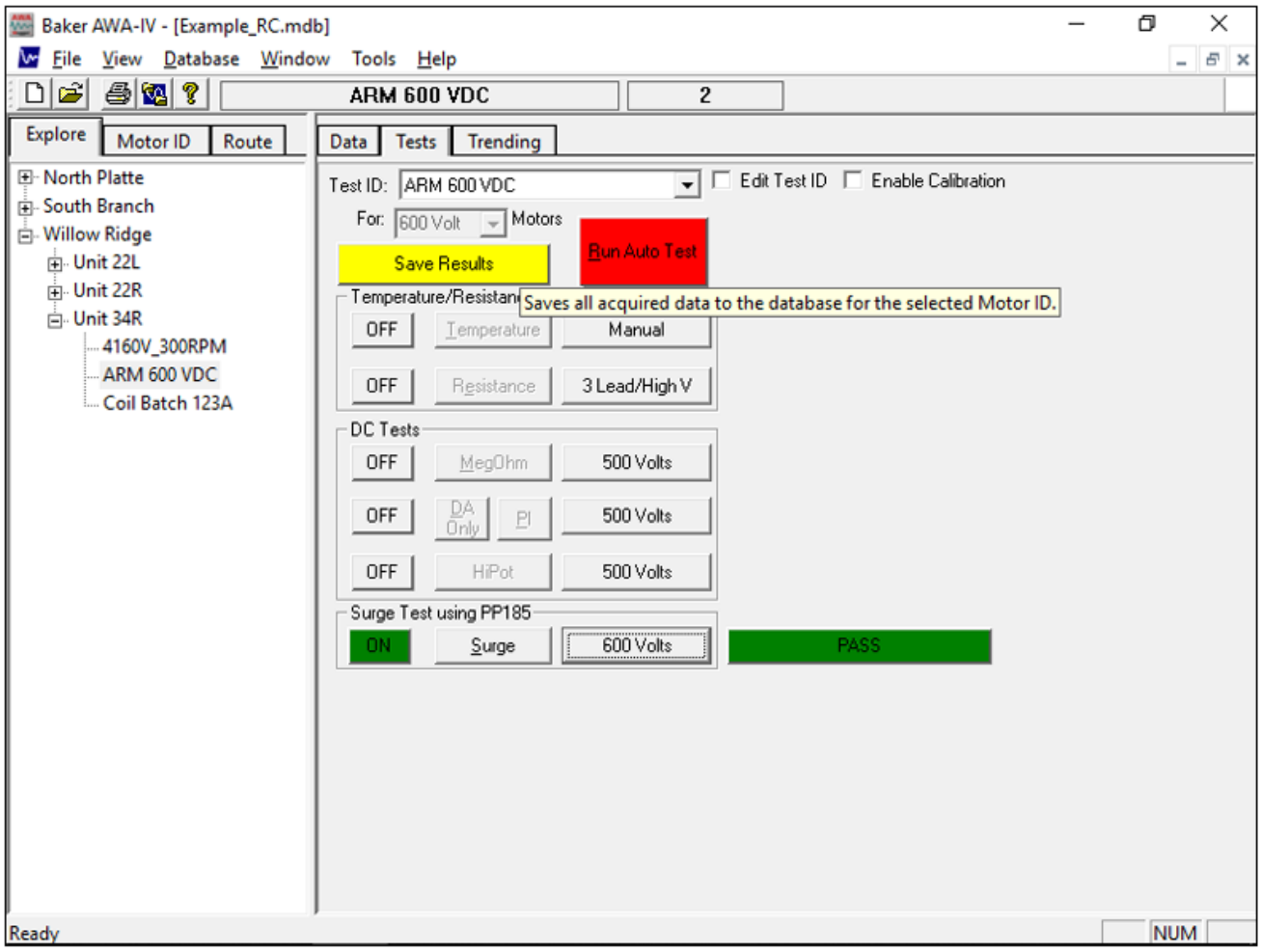

Fig 47: *Main view Tests tab after testing; Save Results.*

5 — Using Power Packs with Baker DX Testers

The Baker DX testers can test up to a 1000 HP, 4160 V, 1800 RPM machine depending on the model used. When used with a power pack, the Baker DX is able to test higher-voltage motors. The Baker DX testers work with all Baker power packs.

The Baker PPX30A power pack provides testing capability for low-impedance devices such as armatures, interpoles, and DC field coils. The Baker ZTX functionality is built into the PPX30A and is commonly used for span and bar-to-bar testing.

NOTICE: Review the instructions for stand-alone operation of the Baker DX before attempting to operate with a power pack.

Review all safety information provided with the equipment and presented in "User Safety and General Operation" before setting up or operating.

Ensure that test leads not used during a specific test are disconnected and safely stored away from the unit under test.

WARNING: For high-voltage testing, ensure that all personnel are away from the device under test, and not in contact with either the load or the test leads. Follow all testing best practices and take all precautions to avoid injury or death from electrical shock.

Some test leads will be open during the test and can be at the same voltage potential as the winding. Take all precautions to avoid touching these leads to prevent injury or death from electrical shock.

After completing high-voltage tests, ensure that the motor windings are properly discharged before removing tests leads or contacting the unit under test.

NOTE: DA start/stop and HiPot/Step Test times, ramp rates, and other test settings are specified in the System Settings mode. Refer to the *Baker DX User Guide* for more information on system settings.

Combining a Baker DX Host and Power Pack for Testing

To completely test a higher-voltage motor, functions from the Baker DX host and a power pack are used together. The test data collected by both instruments combines into a single test record in data storage.

Table 17: *Leads or fixtures used during testing.*

Tester Configuration	Test Type	Test Leads Used
DX Host	Resistance, inductance, capacitance.	Low-voltage RLC tester leads.
DX Host	DC tests: Megohm, DA/PI	High-voltage tester leads.
Power Packs	DC tests; only HiPot/Step Voltage and Surge run from Power Packs. Surge testing in three-phase mode.	High-voltage power pack leads. PPX40 leads require manual configuration for three-phase testing.
Power Packs	Surge testing in single-coil mode.	High-voltage power pack leads. Leads 1 and 2 only for single-phase testing.

Running the Combined Baker DX and Power Pack Tests

1. Run the RLC tests using the DX host only and its associated test leads. Follow procedures as described in the *Baker DX User Guide* for these tests.

Megohm and DA/PI DX tests can be run either from the DX host unit or the PPX. Depending on the motor size being tested and the DX model being used, you might find advantages such as higher resolution when running these tests on the DX host. In most cases, you will use the PPX to run these tests—this example uses the PPX.

NOTE: One advantage to running the Megohm/PI tests using the PPX is the ability to capture complete DC Test results in one report screen.

2. After completing all tests run on the DX host and saving their results to the appropriate location, disconnect the Baker DX tester leads and set them safely aside.
3. Connect the power pack's test leads as described in the "Power Pack Configuration for DC HiPot Tests" for the power pack you will be using.

DC Test Procedures When Using Power Packs

NOTICE: For DC HiPot tests using the Baker PPX40, the Surge range switch must be in the 25–40k position.

1. When performing a comprehensive test on a motor, the RLC tests are conducted using the DX host.
2. After completing those tests, you should already have the desired folder and record selected.

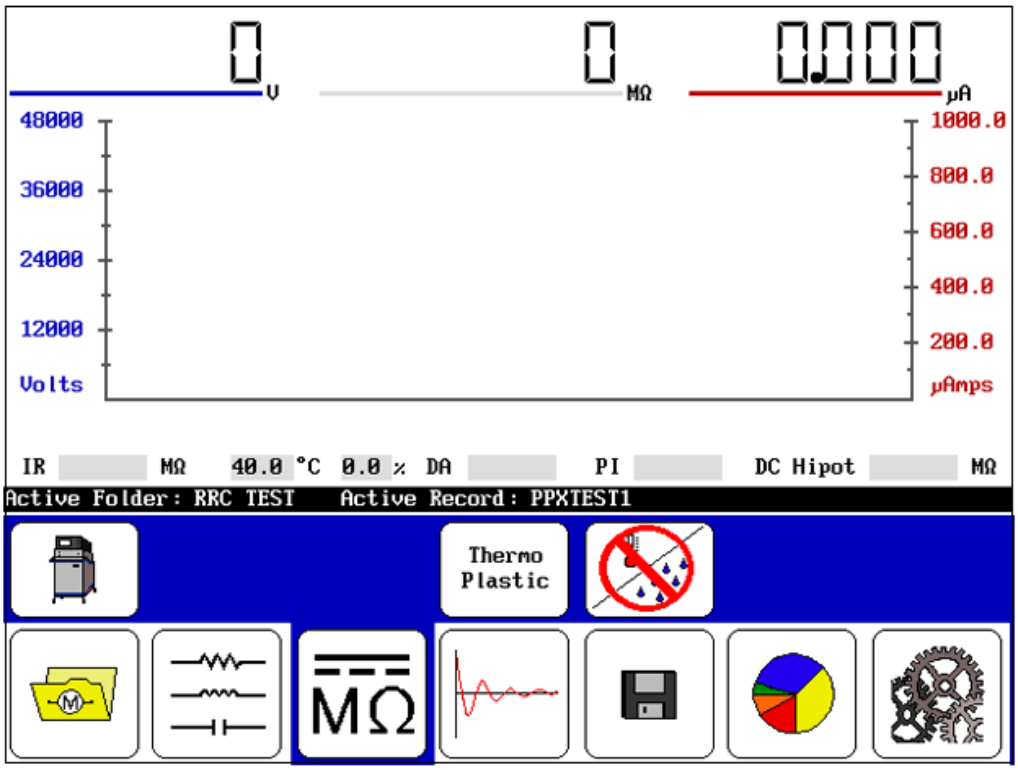

Fig 48: *DC tests start screen.*

3. To prepare to conduct Step Voltage or DC HiPot tests with the power pack, ensure that the DX host leads are disconnected and the power pack leads connected.
4. Touch the **Configuration Options** icon then the **Power Pack** icon. Your start screen should look similar to the example shown above.

NOTE: The HiPot overcurrent trip indicator detects any arc-over in the insulation and puts an immediate stop to testing. The overcurrent trip will remove the high voltage from the test leads, stop the test, and display a HIPOT TRIP message on the front panel display. If you release the Test button, it resets the trip circuitry, removes the HIPOT TRIP message, and readies the tester for a new test.

Interrupt this test by releasing the Test button any time you observe a fast and sharp rise in current.

The overcurrent trip levels that activate the HiPot trip on the power pack are 12 times the µA/division setting on the PPX. For example, on the 10 µA/division setting, overcurrent trip will occur at 120 µA.

5. If a HiPot trip occurs, a message dialog like the one shown below will also appear. Release the **Test (PTT)** button to reset the overcurrent trip

Fig 49: *Overcurrent message dialog.*

Table 18: *Overcurrent trip levels for DC HiPot testing.*

PPX Function Selector Switch Setting	Overcurrent Trip Occurs at
1 µA/div	12 µA
10 µA/div	120 µA
100 µA/div	1200 µA

6. Adjust the **Function Selector** switch on the power pack to select a practical µA/div setting for monitoring the leakage current (for example, if the signal is < 50 µA, switch to 10 µA/division; < 5 µA switch to 1 µA/division). Typically, the leakage current should rise initially then fall and remain at a constant level. This level is the measure of the leakage current.
7. Set the power pack **Test Select** switch to **HiPot**.

NOTICE: To avoid damage to the unit under test, do not change either the Function Selector switch or the Test Select switch out of HiPot mode during the performance of a HiPot test.

You must predetermine the necessary values to input during the test before the test start (refer to the "Recommended Test Voltages" section in "Appendix C— DC and Surge Tests Voltages").

For this example, let's assume that we are testing a 6600-volt motor. The value for the DC HiPot would be:

- 2 x (VLL) + 1,000 = 14,200 volts for this example. 14,000 volts is a practical level.

Typical guidelines for DC voltages applied during insulation resistance (IR) testing are 3300 volts for this example motor.

If a Step Voltage test is run, the increments for each step are based on a starting voltage of 3300 (level for running Megohm, IR, and DA/PI tests).

Two more increments of 3300 volts each will be used for each step (6600 and 9900).

The final step will increment 4100 volts (14000) and will be run as a DC HiPot test.

8. Push and hold the power pack's **Test (PTT)** button (or footswitch).

NOTE: Because the Lock PTT option is not available when testing from a power pack, consider using a footswitch to facilitate lengthy test steps that require the PPT button to be held down during testing.

The PPT button or footswitch must be held down for the entire time during DC testing if you want to obtain a complete set of results within a single record. Otherwise, releasing the PTT button between Megohm/PI testing and DC HiPot/Step testing will create two separate records.

9. Turn the power pack's **Voltage Output Control** knob clockwise to increase the voltage level and counterclockwise to decrease.
10. Increase the voltage to the IR voltage level recommended for the motor (3300 volts for this example).
11. Touch the **MOhm/PI** icon to start that series of DC Tests (continuing to hold down the **Test (PTT)** button or footswitch throughout and following the test series).

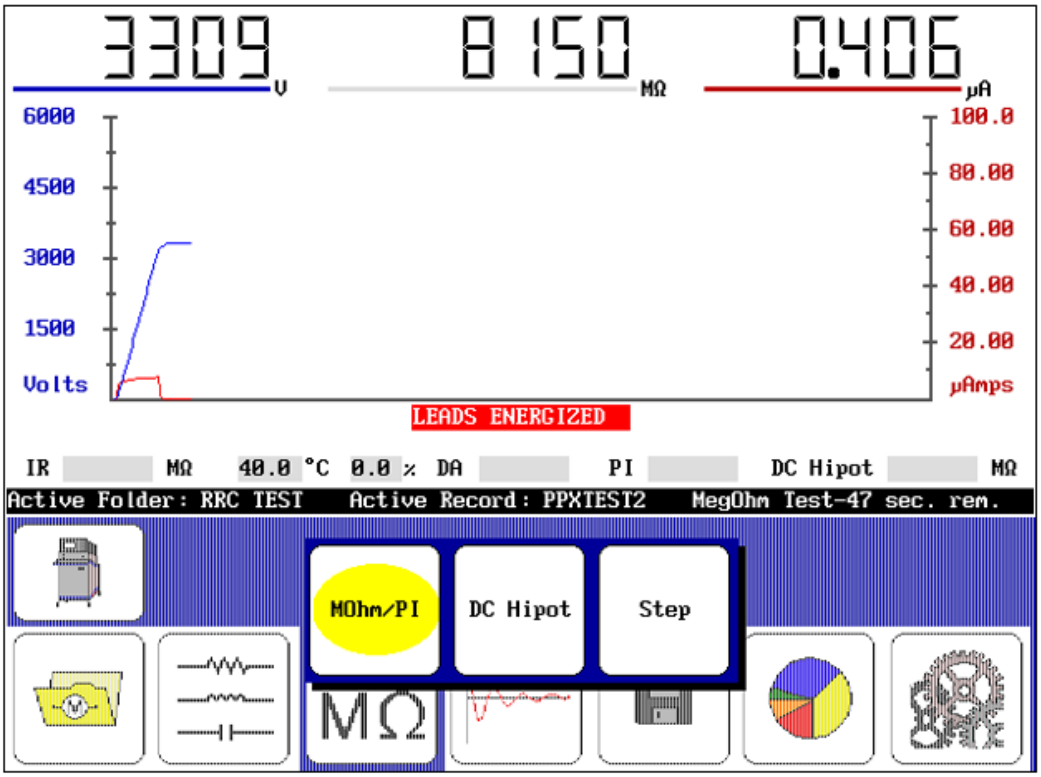

Fig 50: *DC Test submenu items; MOhm/PI test selected (yellow highlight) after ramping to IR test voltage level.*

12. If you want to conduct a Step Voltage test, after the Megohm/PI tests complete, ramp the voltage up to the next level for the first step (adding 3300 volts for this example). Touch the **Step** icon to start the test (**PTT** button or footswitch is still held down).
13. When the first step test completes, ramp the voltage to the calculated level for each subsequent step then touch the **Step** icon to start each test. Touch the **DC Hipot** icon after ramping the voltage for the final step.
14. For this example, we run two step tests with 3300-volt increments (6600 and 9900) and a final increment of 4100-volts (14000) for the HiPot test.

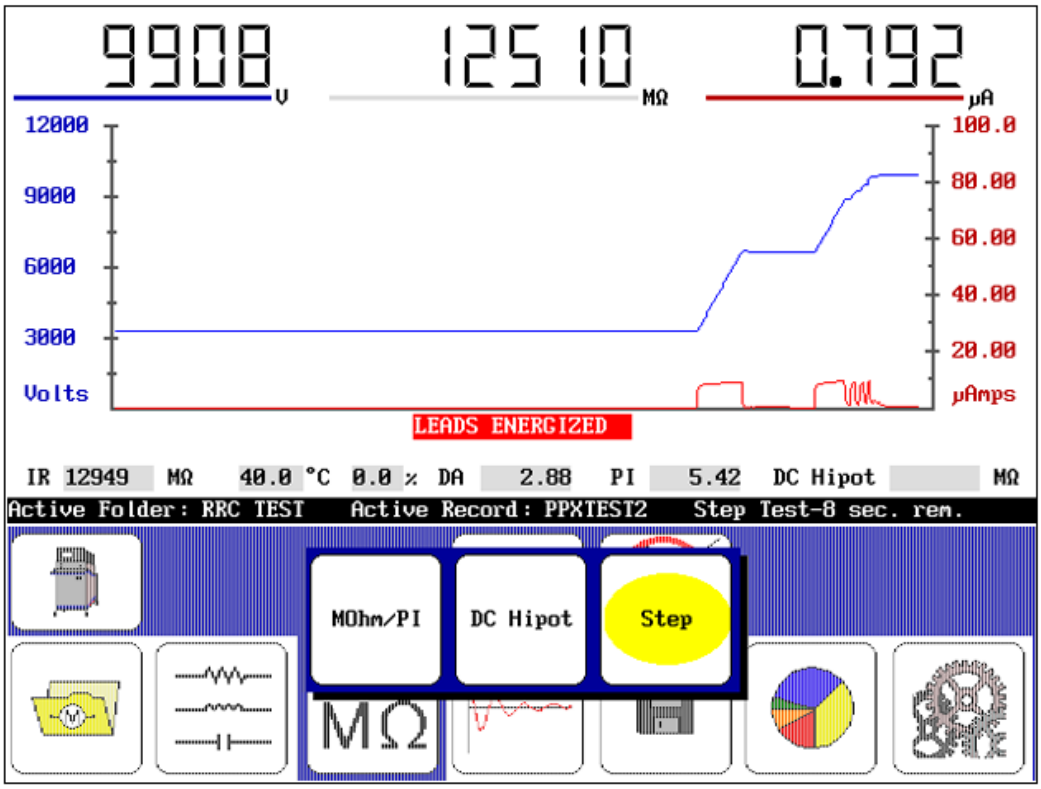

Fig 51: *DC Test submenu items;*

15. If you want to conduct just a HiPot test, when the Megohm/PI tests complete (PTT still pressed), ramp the voltage to the full level calculated for the device then touch the **DC Hipot** icon.
16. The **Status Bar** displays a countdown timer when running each Step Voltage test and the DC HiPot test.
17. After completing the entire test suite, release the **Test (PTT)** button (or footswitch).

WARNING: To prevent injury or death from electrical shock, always allow sufficient time for the test winding to completely discharge before disconnecting the test leads. IEEE 95 recommends a grounding interval four times the amount of time the high-voltage DC was applied to the windings, or two hours, whichever is greater. For smaller motors, a shorter time maybe be acceptable.

Refer to IEEE 95 (and/or other standards as applicable) to ensure complete understanding of proper discharge needs and recommendations, and to ensure the safety of personnel.

On the Baker PPX30/30A, set the Test Select switch to the LEADS GROUND position before disconnecting test leads. On the Baker PPX40, wait to disconnect test leads until you see the leads energized lights go out followed by the sound of a relay switching.

18. Save the test results in the **Active Folder / Active Record**.

NOTICE: Running another test without saving results from the previous test will overwrite the last test in memory. Shutting down the power pack prior to saving will also cause the loss of all unsaved data.

19. View the test results by clicking on the **Reports** icon then selecting the folder and record containing the desired test results.

In the following example, the entire results of the DC Tests conducted—from Megohm/PI to Step test and HiPot—are included in one record. This can only be achieved when using the Baker PPX to conduct all tests. The **Test (PTT)** button or footswitch is held down during the entire test suite and results are saved once at the end of the process.

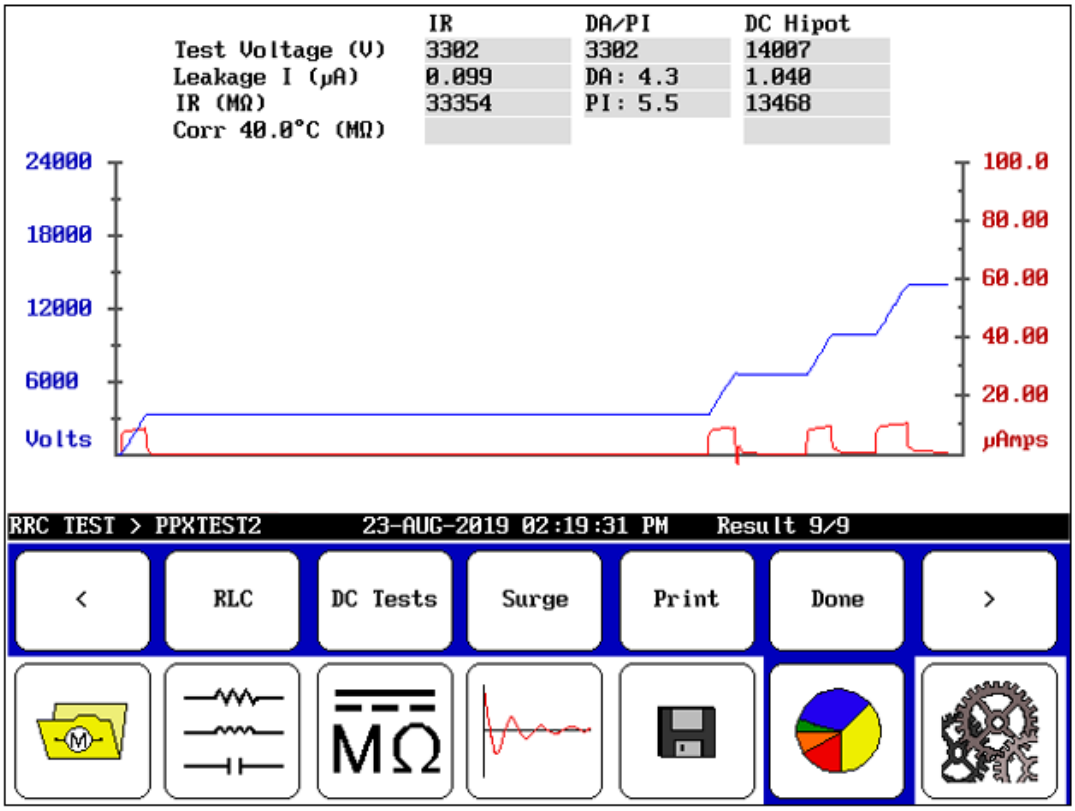

Fig 52: *Example DC HiPot test report screen.*

Surge Test Procedures When Using Power Packs

Baker PPX30/30A Three-Phase Testing

For the Baker PPX30/30A, you need only connect the power pack's test leads to the motor leads once. The position of the Baker PPX30/30A's **Test Select** switch tells the power pack how to handle the test leads for HiPot and Surge testing.

Baker PPX40 Three-Phase Testing

Because the Baker PPX40 has only a single active lead, only one phase can be tested at a time. You will need to manually move the active lead between the different motor leads for each phase tested.

NOTE: Refer to the configuration sections found earlier in this guide for test lead configuration for the power pack model being used and the test type being conducted.

Surge Test Example Process

1. Ensure the test leads are properly connected for the motor phase that you are testing.
2. Touch the **Surge** icon from the DX screen to enter Surge testing mode.
3. Ensure that the **Configuration Options** icon displays the power pack option.
4. Touch the **Coil Mode Selection** icon.
5. The **Coil Mode Selection** popup menu appears in the **Display Area** showing you the options for this test.

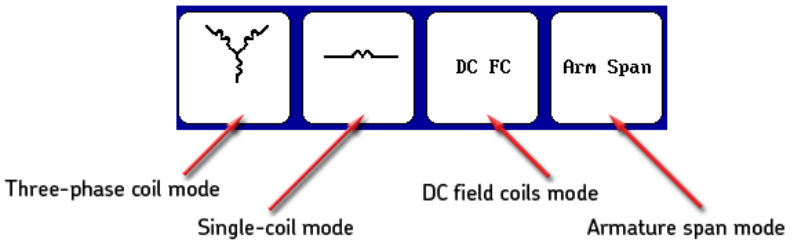

Fig 53: *Coil Mode Selection popup menu.*

6. Touch the **Three-phase coil mode** icon.
7. For the Baker PPX30/30A, ensure that the **Function Selector** switch is set to **Surge** and the **Test Select** switch is set to Lead **1.**
8. On the Baker PPX40, ensure that the **Manual Surge Range** switch is in the proper position for the voltage range that you will be using for your test.

9. With the **Lead 1** icon selected by default (identified by the yellow highlight test lead icon in the submenu), the Surge test is now ready to start from the following screen. For this example, we continue with the 6600-volt motor example, which would use a 14,000-volt surge level.

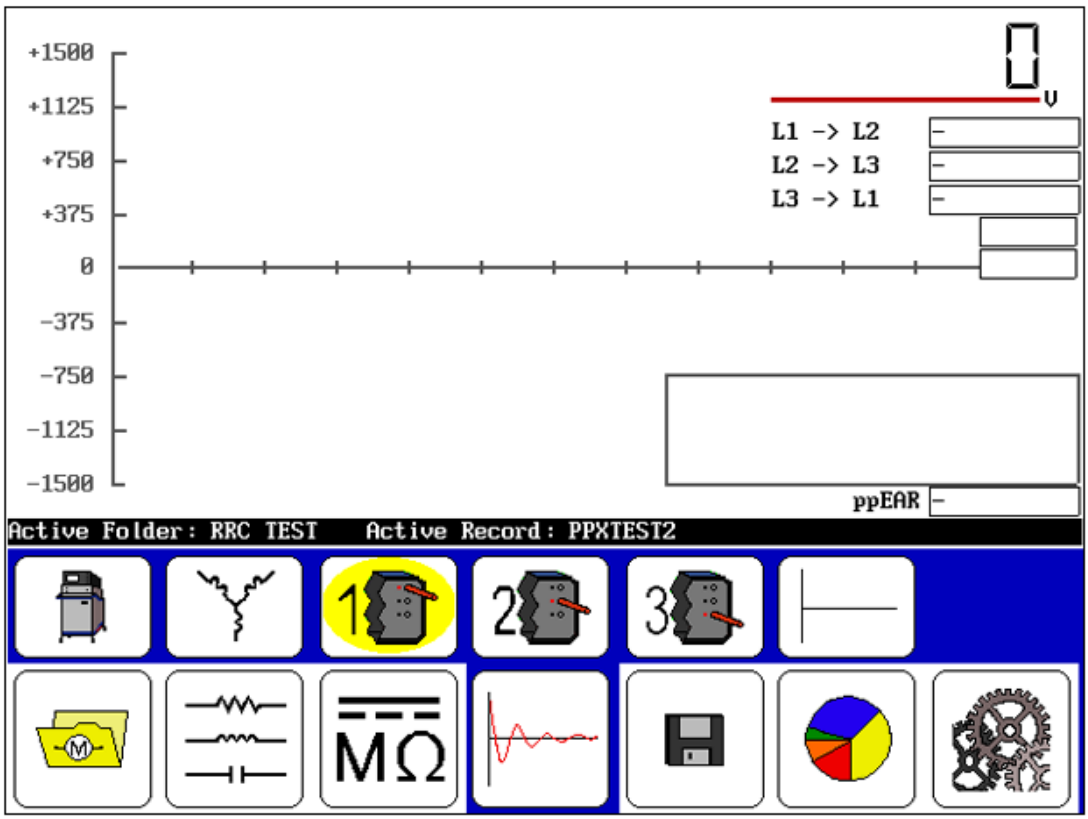

Fig 54: *Power pack Surge test start screen.*

10. Use the power pack's **Ramp Rate Selector** switch to adjust the speed at which the voltage will be increased/decreased. For this test, start with the control at the lowest rate (position 6).
11. Start the test by pressing and holding the power pack **Test (PTT)** button (or footswitch). Using the power pack's **Voltage Output Control** knob, increase the voltage. A waveform should appear immediately.

NOTE: Be sure to increase voltage in a continuous manner. Stopping and starting the voltage ramping will produce spikes in the PP EAR graph that could be misinterpreted as surge wave instability.

12. Adjust the **Ramp Rate Selector** switch as desired.

Table 19: *Ramp Rate Selector switch positions, voltage increments, and ramping times.*

Position	Volts/second	Time to Full Voltage (seconds)
1	2000	15
2	1000	30
3	500	60
4	250	120
5	125	240
6	63	480

13. When the surge voltage reaches 14,000 volts, adjust the time base such that a majority of the surge waveform is displayed along the width of the display. A minimum of two zero crossings should be visible.
14. Use the **Surge waveform zoom** icons as shown in the example below to adjust the waveform display scale.
15. When the test completes (5–10 pulses; monitor surge pulse indicator on the DX screen) release the **Test (PTT)** button (or footswitch).
16. Press the **Lead 2** icon then repeat the process to test phase 2.
17. Press the **Lead 3** icon then repeat the process to test phase 3.

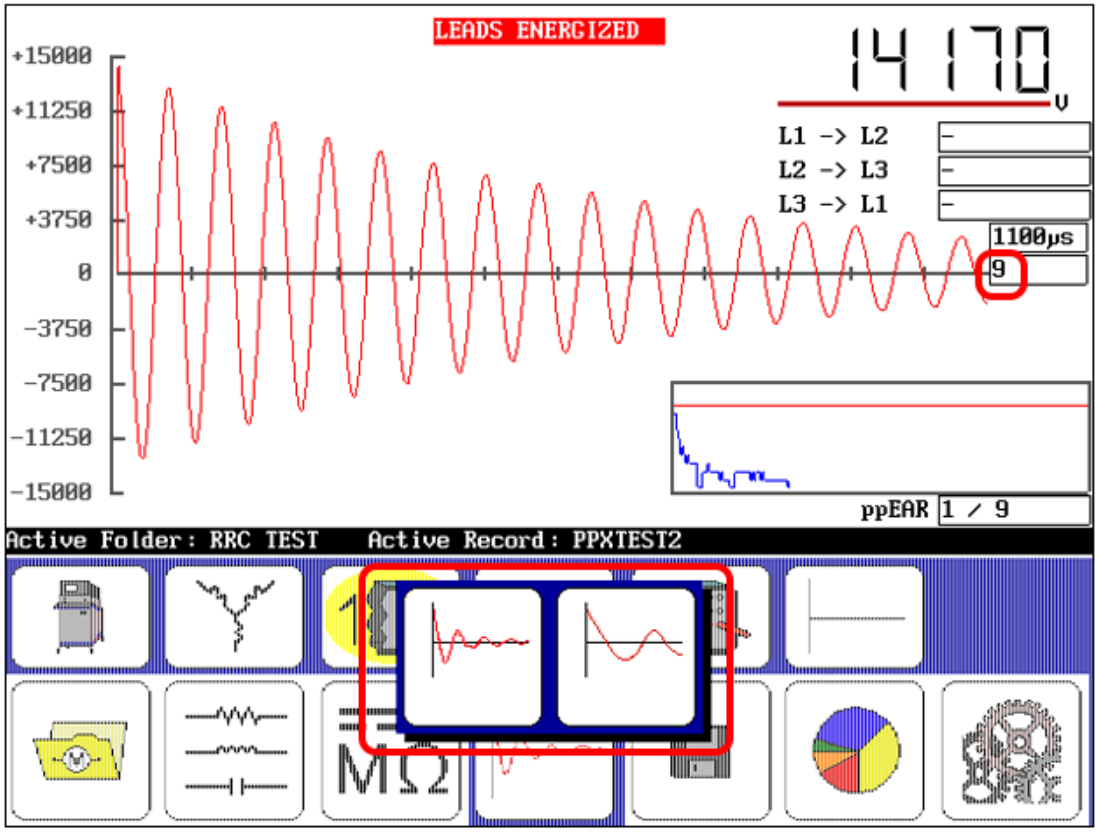

Fig 55: *Power pack Surge test in progress; adjusting waveform for optimal display.*

18. Save the test results in the **Active Folder/Active Record**.

NOTICE: Running another test without saving results from the previous test will overwrite the last test in memory. Shutting down the power pack prior to saving will also cause the loss of all unsaved data.

19. View the test results by clicking on the **Reports** icon then selecting the folder and record containing the desired test results.

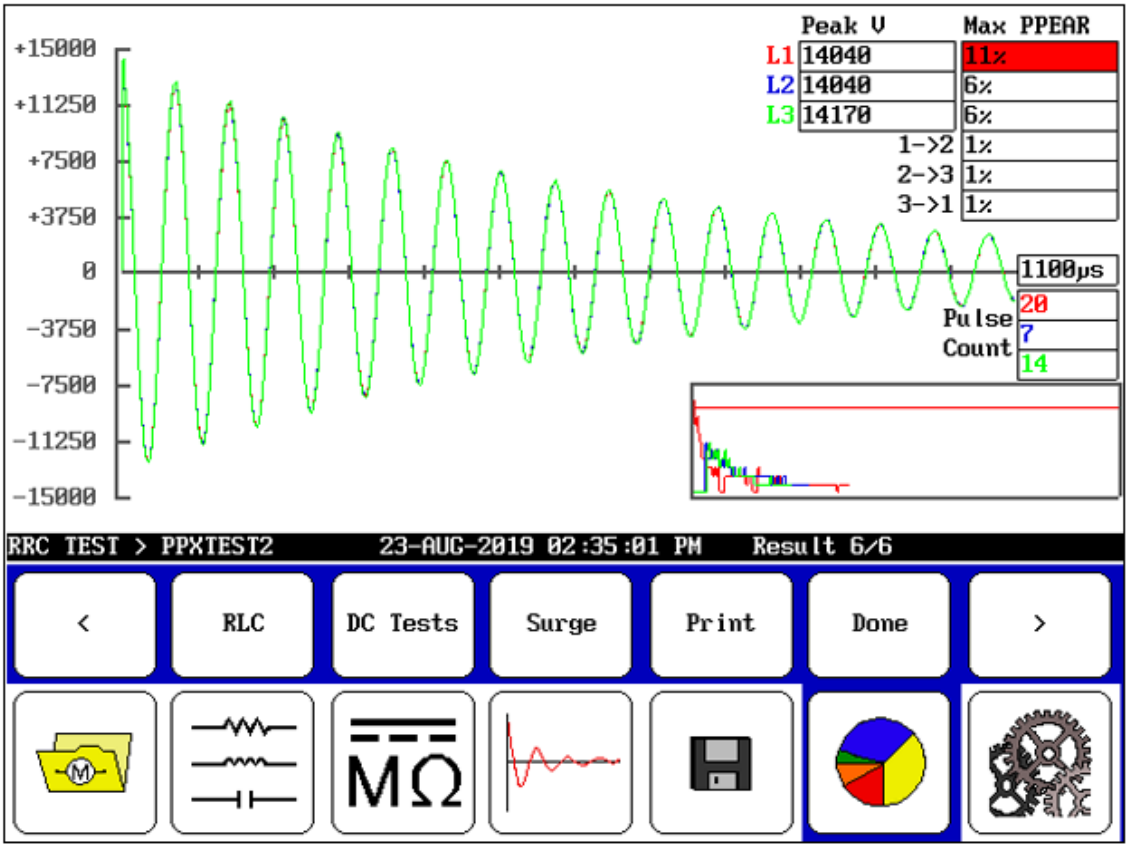

Fig 56: *Viewing Surge test results; Surge Reports screen.*

WARNING: To prevent injury or death from electrical shock, always allow sufficient time for the test winding to completely discharge before disconnecting the test leads.

On the Baker PPX30/30A, set the Test Select switch to the LEADS GROUND position before disconnecting test leads.

On the Baker PPX40, wait to disconnect test leads until you see the leads energized lights go out followed by the sound of a relay switching.

Low-impedance Armature or Coil Testing Using the Baker PPX30A

Some coils or armature windings have very low impedance and cannot be tested with just the DX host. Baker ZTX functionality is required to test these coils. DC series fields, pole face windings, and interpoles are common examples of low-impedance circuits that require the ZTX functionality for proper evaluation. When combined with a PPX30A power pack (built-in ZTX functionality), the Baker DX accommodates testing of low-impedance coils and armatures.

Low-impedance Armature or Coil Test Procedures for PPX30A

1. Ensure that the test probes or fixture have been properly connected to the power pack, then power up the Baker DX and the power pack.
2. Ensure that the **Test Select** switch is set to Leads Ground (**Ground icon**) and the **Function Selector** switch is set to Armature (**armature icon**). The power packs' high-voltage test leads are not used during this test; safely set them aside.

CAUTION: To avoid damaging the unit under test or substantially reducing the switching element's useful life, do not change the **Function Selector** switch out of the Armature position during the performance of any test.

3. Turn the PPX30A **Zero-start Override** key switch to the horizontal position to enable zero-start override.

WARNING: When the zero-start override feature is enabled, target test voltage levels will be instantly applied to the test leads when a test begins. Ensure that no one contacts the tester leads to avoid injury during testing.

Fig 57: *PPX30A Zero-start override key switch.*

Item	Description
1	Zero-start override. This key switch overrides the Zero Start function and allows the unit to immediately apply the full target voltage level to the test leads. With the key in the vertical position, testing starts at zero volts and must be ramped up to the target voltage level.
2	In the horizontal key position, zero-start override is enabled. When the zero-start override feature is enabled, target test voltage levels will be instantly applied to the test leads when a test begins.

4. Ensure that the **Active Folder** and **Active Record** in the **Status Bar** show the proper location where you want to store the test data.
5. Touch the **Surge** icon to enter Surge test mode.
6. Set the **Configuration Options** icon to display the **Power Pack with ZTX**.
7. Touch the **Coil mode** icon then touch the **Arm Bar** icon (**DC IP** icon for single -coil testing).
8. The test start screen should look similar to the example shown below.

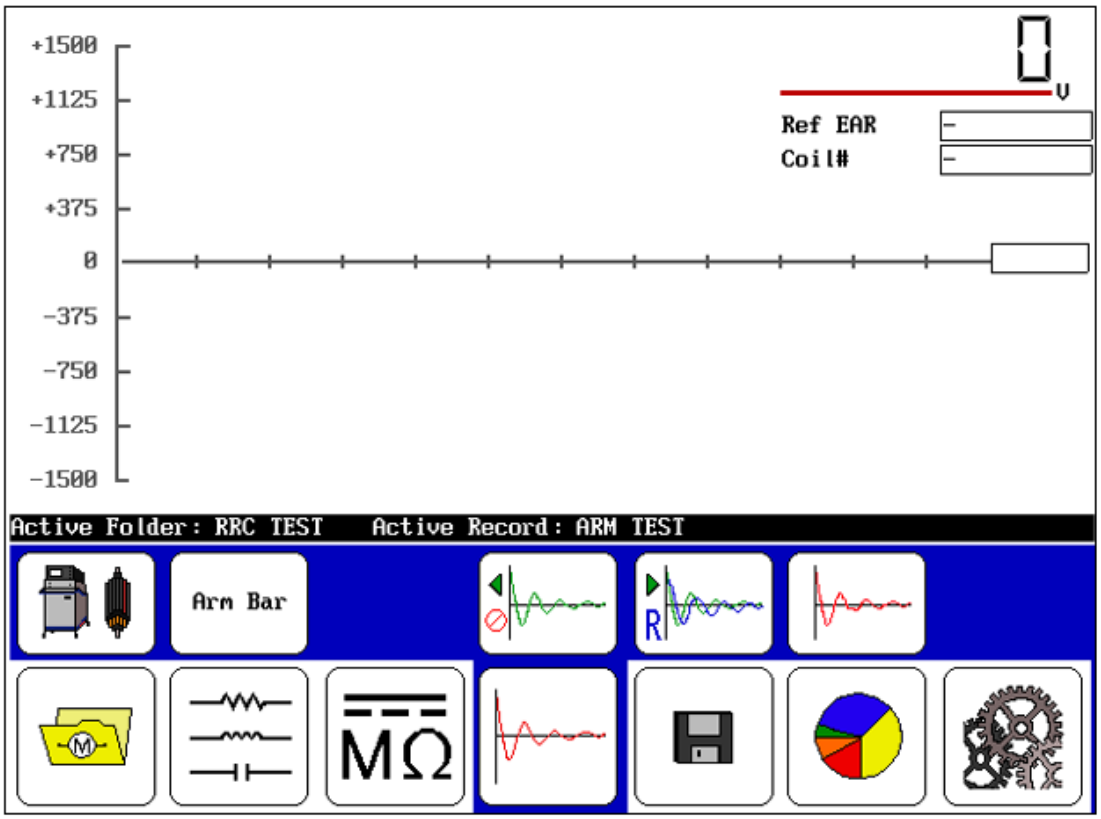

Fig 58: *Armature bar test start screen for Baker PPX30A.*

9. Select a starting point armature bar to use as a reference. Typically, this will be bar 1, so the probe or fixture contacts will be placed on bars 1 and 2.

NOTE: When testing armatures, a reference will be needed. A second operator should be available to start the process and obtain the reference waveform. When a satisfactory reference is saved and the zero-start override has been set, a single operator can complete the process.

WARNING: During this process, the zero-start override icon (ZS Override)will become available. When the zero-start override feature is enabled, target test voltage levels will be instantly applied to the test leads when a test begins. Ensure that no one contacts the tester leads to avoid injury during testing.

10. Press the power pack's **Test (PTT)** button (or footswitch or fixture Test button) and ramp up the voltage to the test level (500 volts in this example). With the waveform stable and a minimum of five pulses applied, release the **Test (PTT)** button (or footswitch, or fixture Test button).

NOTE: When testing armatures, apply the surge pulse until you see the EAR graph add the new bar information. Releasing the PTT button (or footswitch, or fixture button) too soon can result in a collapsed waveform and errant test data being collected.

11. In the example below, a satisfactory waveform is acquired for the first set of bars so it can be saved as the reference.
12. Touch the **Set Reference** icon then enter a reference name using the on-screen keyboard provided. Touch **Done** to save.

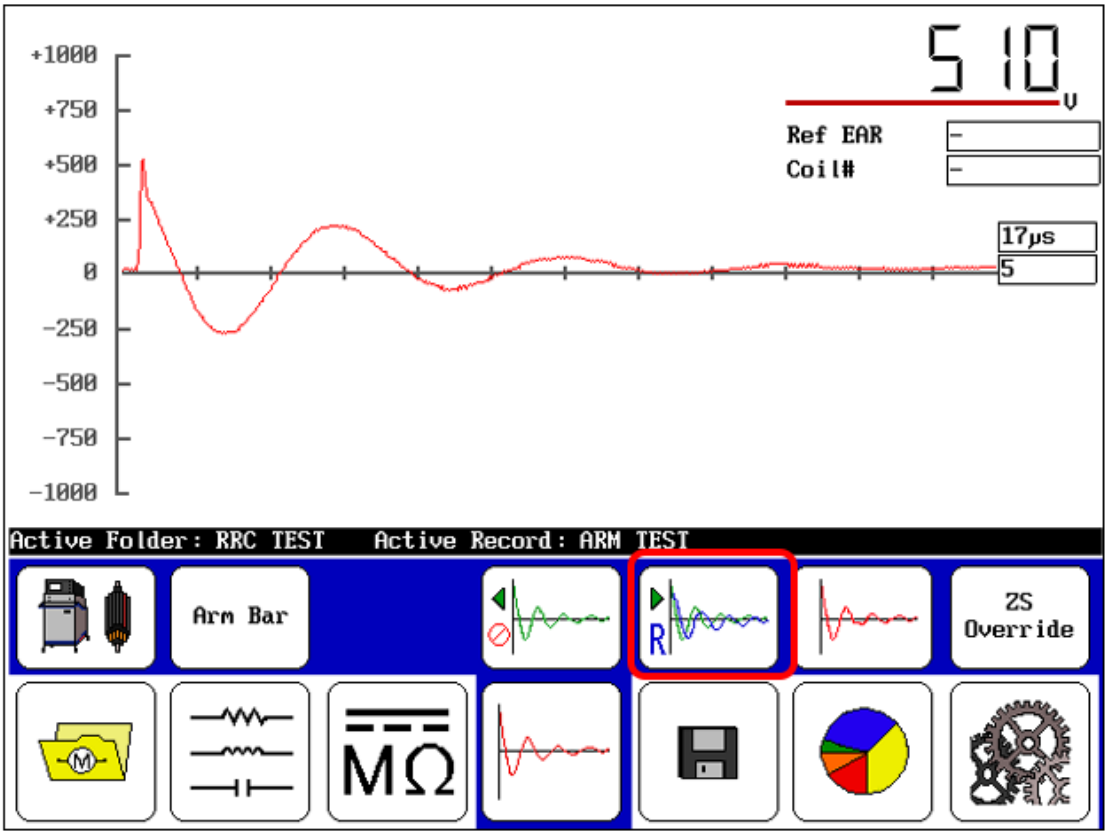

Fig 59: *Armature bar test; acquiring the test reference.*

13. From this point, the process is essentially the same as the standard process for Surge testing single coils. Refer to the "Surge Testing Procedure for Single-Coil Mode" found in the *Baker DX User Guide* for details.

14. Move the test probes to the next pair of armature bars then press the **Test (PTT)** button (or footswitch, or fixture Test button). With Zero-start Override enabled, the target voltage level is immediately applied.
15. After 5–10 pulses have been applied, release the **Test (PTT)** button (or footswitch, or fixture Test button). A new marker will be added to the EAR graph in the lower right of the DX display screen and a new waveform will be added to those being accumulated for the test.
16. To view multiple waveforms being collected, touch the **Waveform Selection** icon then the **All Waveforms** icon in the submenu.

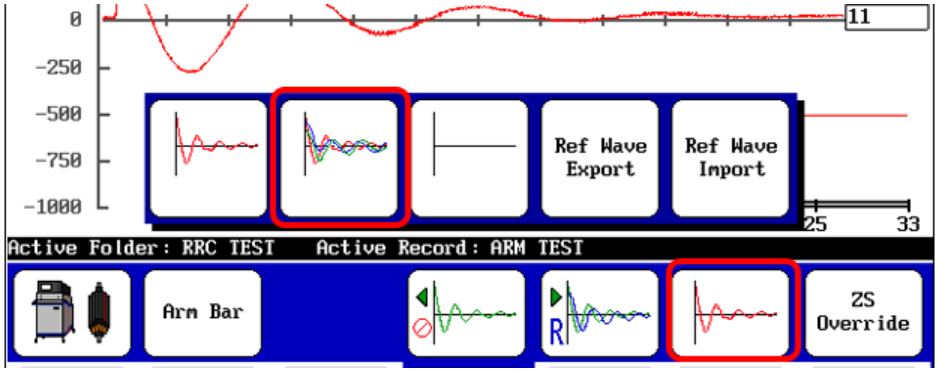

Fig 60: *Selecting waveforms to view; all waveforms.*

17. The waveform display changes similarly to the example shown below. All waveforms collected to this point will be displayed (nested) along with the reference waveform.

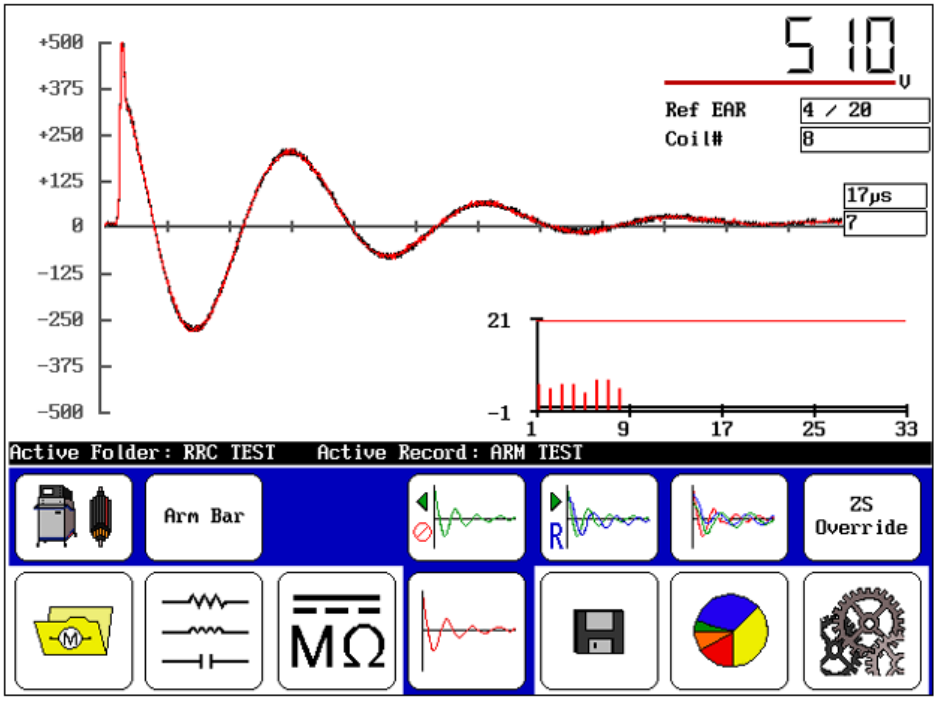

Fig 61: *All waveforms collected are displayed in a nested fashion.*

18. When all bars have been tested, touch the **Save** icon to store the test results in the **Active Folder/Active Record**. It will save as Arm Bar data and it will appear on the results as such. Running the test continues adding armature coils up to 400, after which you must create a new record for an armature with more commutator bars.

19. Touch the **Report** icon then the **Display** icon to view the armature bar/coil results as shown in the example below.

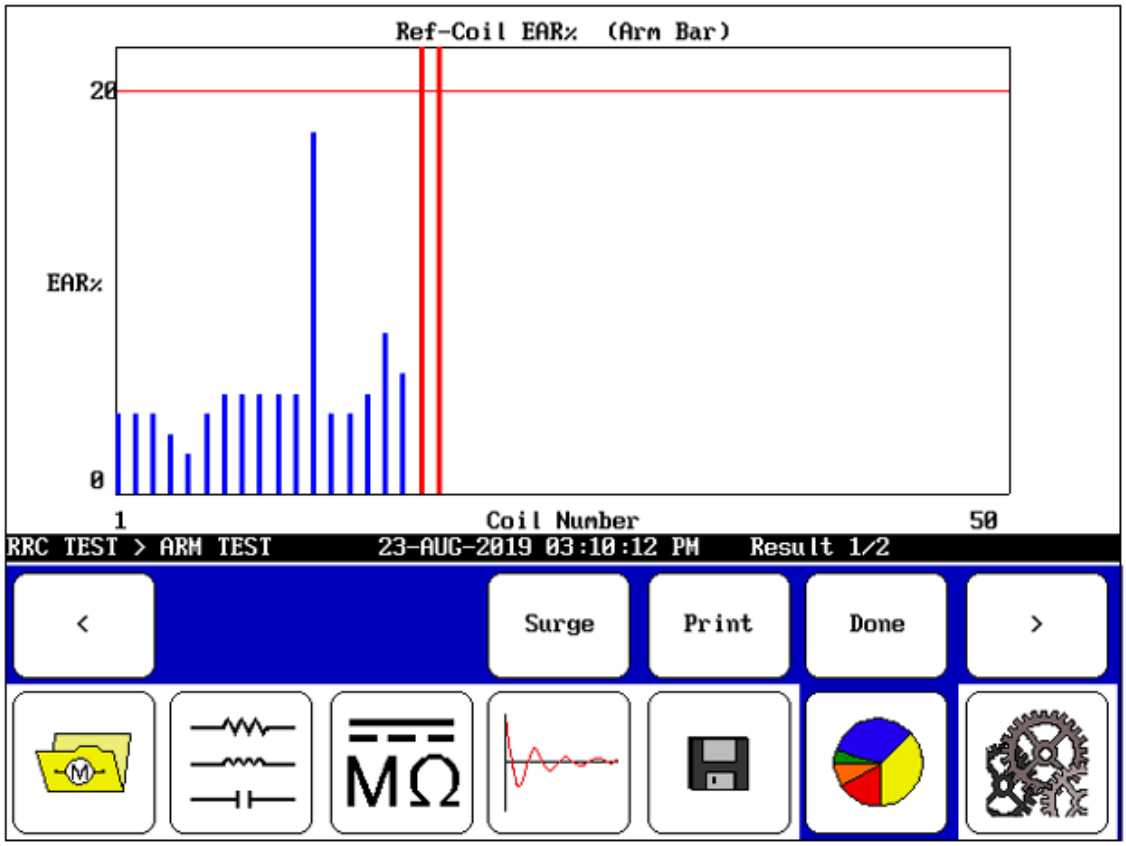

Fig 62: *Armature test report screen; simple example.*

In the simple example above, the EAR percentage for armature coil 12 is higher than most, but still within tolerance; however, armature coils 18 and 19 are out of limits.

Appendix A — Maintenance

Product Care

Routine Inspection

Look for any cracks or other damage to the enclosure, missing ports, etc.

Cleaning

Keep the unit clean and in a dry environment. To clean the unit, power down and unplug the instrument. Wipe with a clean, water dampened cloth. Do not submerge in water or use other cleaners or solvents.

Care of the Instrument

The instrument should always be handled with care and not dropped. Always make sure that the instrument is secured when being transported to prevent mechanical shock.

Test Leads

Leads are silicone insulated and work well in all weather conditions. Always keep the leads in a suitable lead bag when in storage or transportation.

Regular inspection of leads is recommended to make sure that they are not damaged in any way. Damaged leads could affect resistance readings and are a safety hazard.

Power Pack Lifting and Shipping

The power pack is shipped as indicated by the shipping labels. Inspect the unit after shipping and notify carrier immediately if damaged is found.

Operate and ship the power pack in the upright and vertical position, with all four wheels settled on a level service.

If the product must be shipped for any reason, the package containing the power pack must be properly labeled with "this side up" labels to ensure the instrument is shipped in the upright vertical position.

Lifting the instrument—PPX models

PPX model power packs have two D-ring lift points on the rear or the unit secured to a reinforced metal chassis specifically designed to allowed "top-side" lifting. The front handle of the power pack is also attached to a reinforced metal chassis and is made of a thicker metal with holes in the handle to allow for strap clip attachment.

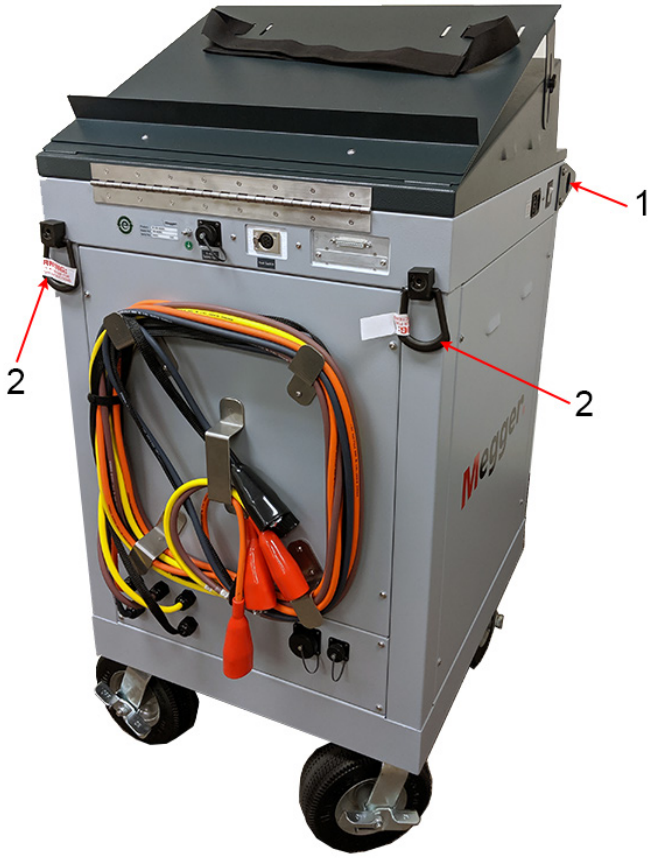

Fig 63: *Figure 5. PPX lift points.*

Item	Description
1	Front handle hole lift points
2	Rear D-ring lift points

CAUTION: Only the "PPX" model power packs have these features, allowing them to be lifted in this manner. Do not attempt to lift "PP" model power packs using this process.

Always remove and safely store the tester before lifting the power pack. Do not attempt to lift the power pack with the tester sitting on top.

Appendix B — Troubleshooting

Self-help and Diagnostics

Problems in testing may sometimes crop up. If you experience a problem and the problem might be with the tester. Please review the troubleshooting sections in the respective tester's user manual for more information before calling support or returning the power pack.

By performing these procedures and having the requested information available will help Megger Service or Applications departments analyze the situation to provide you with an appropriate response.

You can reach either department at (970) 282-1200 or toll-free at 1 (800) 752-8272 for assistance.

Basic Information

Write down all basic instrument information including the following:

- Product
- Model number
- Serial number

NOTE: This information is located on the rear panel label. If the tester has special options installed, please note the options used. Any information concerning the instrument is helpful.

Equipment Return

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

1. Call the Megger Baker Instruments Fort Collins service department at (970) 282-1200. Give the service representative a full description of the reason for the return, including any diagnostic or troubleshooting actions taken. Please provide the specific model and serial number of the instrument.
2. Complete the Return Authorization Request form found on the Megger Support site: https://us.megger.com/support/customer-support/megger-baker-return-authorization-request
3. Current instructions for the return process are also provided via the above link.
4. Equipment returned to Megger Baker Instruments must be packaged in such a manner that it will reach the factory undamaged from transit.
5. For non-warranty repairs, Megger Baker Instruments service will provide a cost estimate for your approval prior to your shipping.

Appendix C — Recommended Test Voltages

Recommended DC Voltages for Insulation Resistance Test

EASA AR100 and IEEE 43 sections 5.4 and 12.2 provide guidelines on voltage to be applied during Insulaton Resistance (IR) testing. Test voltage should be applied for one minute.

Table 20: *Recommended DC Voltages for Insulation Resistance test: EASA AR100 and IEEE 43.*

Winding Rated Voltage (V)*	Insulation Resistance Test Direct Voltage (V)
<1000	500
1000–2500	500–1000
2501–5000	1000–2500
5001–12,000	2500–5000
>12,000	5000–10,000

* Rated line-to-line voltage for three-phase AC machines, line-to-ground for single-phase machines, and rated direct voltage for DC machines or filed windings.

Recommended DC HiPot and Surge Test Voltages

Megger Baker Instruments has a recommended standard (see table) for test voltages for DC tests and Surge tests conducted on a motor, generator, or transformer. That standard is twice the AC line voltage plus 1,000 volts.

This test voltage is consistent with NEMA MG-1, IEEE 95-1977 (for test voltage greater than 5,000 volts) and IEEE 43-2000 (test voltages less than 5,000 volts).

View other standards in the tables below for a comparison of IEEE 95, EASA AR100 DC-HiPot, IEEE 522 Surge testing, IEC 34-15, and Megger recommended testing voltages.

NOTE: The tables list representations of motors, as well as the formulas to calculate voltages so that you can calculate test voltage of any size motor.

Table 21: *IEEE 95 for HiPot test.*

V Line	Per Unit	Min Test, V Line × 1.25 × 1.7	Max Test, V Line × 1.5 × 1.7
480	392	1,020	1,224
575	469	1,222	1,466
600	490	1,275	1,530
2,300	1,878	4,888	5,865
4,160	3,397	8,840	10,608
6,900	5,634	14,663	17,595
13,800	11,268	29,325	35,190

Table 22: *NEMA MG-1/EASA AR100 DC-HiPot.*

V Line	Per Unit	New, 3.4 × V Line + 1,700	In Service, 65% of New
480	392	3,332	2,165.8
575	469	3,655	2,375.75
600	490	3,740	2,431
2,300	1,878	9,520	6,188
4,160	3,397	15,844	10,298.6
6,900	5,634	25,160	16,354
13,800	11,268	48,620	31,603

Table 23: *IEEE 522 Surge testing.*

V Line	Per Unit	New, 3.5 × Per Unit	In Service, 75% of New
480	392	1,372	1,029
575	469	1,642	1,232
600	490	1,715	1,286
2,300	1,878	6,573	4,930
4,160	3,397	11,890	8,917
6,900	5,634	19,719	14,789
13,800	11,268	39,438	29,578

Table 24: *IEC 34-15.*

V Line	Per Unit	V Line × 4E + 5,000	0.2 us, 65%
480	392	6,920	4,498
575	469	7,300	4,745
600	490	7,400	4,810
2,300	1,878	14,200	9,230
4,160	3,397	21,640	14,066
6,900	5,634	32,600	21,190
13,800	11,268	60,200	39,130

Table 25: *Megger Baker Instruments recommended voltages.*

V Line	Per Unit	In Service, 2E + 1,000
480	392	1,960
575	469	2,150
600	490	2,200
2,300	1,878	5,600
4,160	3,397	9,320
6,900	5,634	14,800
13,800	11,268	28,600

NOTE: Use the "Peak Voltage" value shown on the screen to obtain the proper test voltages.

Appendix D — Specifications

Electrical Specifications

Specfication—Surge Test	Baker PPX30	Baker PPX40	Baker PPX30A
Maximum output voltage	30,000V	40,000V	30,000V
Maximum output current with leads shorted together	1400A	2600A	1400A
Maximum impulse energy	45J	120J	45J
Accuracy	12%	12%	12%

Specfication—DC HiPot Test	Baker PPX30	Baker PPX40	Baker PPX30A
Maximum output voltage	30,000V	40,000V	30,000V
Voltage accuracy	3%	3%	3%
Maximum output current	1000µA	1000µA	1000µA
Current accuracy	5%	5%	5%
Overcurrent trip	12/120/1200µA	12/120/1200µA	12/120/1200µA
Current resolution	1/10/100µA	1/10/100µA	1/10/100µA

Specfication—Armature bar-to-bar test	Baker PPX30A only
Maximum voltage	(no load) 2100V
Maximum current	7000A
Maximum pulse energy	45L
Maximum test inductance	20 µH
Minimum test inductance	0.4 µH

General Specifications

Specfication	Baker PPX30	Baker PPX40	Baker PPX30A
Weight	310 lbs (141 kg)	290 lbs (132 kg)	321 lbs (146 kg)
Dimensions	24 x 48 x 33 in (610 x 1219 x 838 mm)	24 x 48 x 33 in (610 x 1219 x 838 mm)	24 x 48 x 33 in (610 x 1219 x 838 mm)
Power requirements	100 - 120V, 5A, 60 Hz, 500W 200 - 240V, 3A, 50 Hz, 600W	100 - 120V, 5A, 60 Hz, 500W 200 - 240V, 3A, 50 Hz, 600W	100 - 120V, 5A, 60 Hz, 500W 200 - 240V, 3A, 50 Hz, 600W
Test leads	3	1	3 + 1 (armature)
Operates with	Baker AWA, DX	Baker DX	Baker AWA, DX

Environmental Specifications

Specfication	Detail
Operating temperature range and humidity	Only operate the tester in temperatures ranging from 5 to 40° C (41 to 104° F). This unit is for use at a maximum relative humidity of 80% for temperatures up to 31 °C (88 °F), decreasing linearly to 50% relative humidity at 40° C (104° F).
Maximum altitude	The unit has been tested for use up to 2,000 m (6,500 ft.).
Pollution degree II	This unit is intended for Installation Category II in a Pollution Degree II environment. (From IEC 61010-1 3.6.6.2) Only non-conductive pollution occurs. However, temporary conductivity caused by condensation is expected.

Appendix E — Accessories and Equipment

Optional Accessories

Item	Order No.
Safety lights	81-SL001RC
Foot switch	20-005
RLC adapter (for resistance testing)	81-ATF-002RC
Surge and Sense Cable adapter (connects between PPX30A Surge and Sense connectors on rear of power pack, and ATF 5000 cable Surge and Sense connectors)	81-ATF-004RC
ATF 5000 Armature Test Fixture (included with PPX30A)	84-ATF-001RC

Megger

Local Sales Office

Megger USA - Fort Collins
4812 McMurry Ave., Suite 100
Fort Collins
Colorado, 80525
USA
T. 1-970-282-1200 or 1-800-752-8272
F. 1-282-1010
E. baker.sales@megger.com

Manufacturing Sites

Megger Limited
Archcliffe Road
Dover
Kent
CT17 9EN
ENGLAND
T. +44 (0)1 304 502101
F. +44 (0)1 304 207342

Megger GmbH
Obere Zeil 2 61440
Oberursel,
GERMANY
T. 06171-92987-0
F. 06171-92987-19

Megger USA - Valley Forge
Valley Forge Corporate Center
2621 Van Buren Avenue
Norristown
Pennsylvania, 19403
USA
T. 1-610 676 8500
F. 1-610-676-8610

Megger USA - Dallas
4271 Bronze Way
Dallas TX 75237-1019
USA
T 800 723 2861 (USA only)
T. +1 214 333 3201
F. +1 214 331 7399
E: USsales@megger.com

Megger AB
Rinkebyvägen 19, Box 724,
SE-182 17
DANDERYD
T. 08 510 195 00
E. seinfo@megger.com

Megger USA - Fort Collins
4812 McMurry Ave., Suite 100
Fort Collins
Colorado, 80525
USA
T. 1-970-282-1200 or 1-800-752-8272
F. 1-282-1010
E. baker.tech-support@megger.com

This instrument is manufactured in the United States.

The company reserves the right to change the specification or design without prior notice.

Megger is a registered trademark.

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