Megger

Baker Instruments

Megger Baker ADX
Automated Diagnostic Test Equipment

User Guide

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User Guide

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

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. Depending on the characteristics of the equipment under test, surge testing may generate excessive interference. It is advised that surge testing is not performed near sensitive equipment.

Electrical and Calibration Standards

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

Equipment Return

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

1. Call the Megger Baker Instruments Fort Collins service department at (970) 282-1200. Give the service representative a full description of the reason for the return, including any diagnostic or troubleshooting actions taken. Please provide the specific model and serial number of the instrument, along with the software version you are using if applicable to your issue.

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

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

Megger Acquisition of Baker Instruments

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

For 60 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.

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The Android™ name and logo are Google trademarks and the property of Google LLC.

Wi-Fi® is a registered trademark of Wi-Fi Alliance.

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All other trademarks are the property of their respective owners.

EU Declaration of Conformity

Megger Baker Instruments declares that the equipment described below complies with all applicable health and safety requirements of the Low Voltage Directive 2014/35/EU, EMC Directive 2014/30/EU, and ROHS Directive 2011/65/EU.

For complete Megger Baker Instruments EU declarations of conformity visit https://megger.com/company/about-us/legal/eu-dofc

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1 — General Operating and Safety Information

> NOTE: Different regions use the terms "earth" and "ground" to describe the protective unipotential bonding connection. Both appear in text within this chapter, whereas "ground" is used throughout the guide.

Symbols and Labels used on Equipment

Table 1: *Symbols and labels used on equipment.*

Symbol/label	Description
	Protective conductor terminal. Connects to Megger Baker PPX power pack ground terminal when used with a PPX. It can also be used to ground the instrument to earth when connected to a ungrounded power supply like a portable generator or marine distribution system. Located on rear panel of instrument by the ground terminal.
	Warning about hazardous voltage and risk of injury or death from severe electrical shock. Located above the test leads on the back panel of the instrument and on the front with the Test Lead indicator lights..
	A general caution to refer to the User Guide for additional information. Located above the test leads on the back panel of the instrument.
	Warning about injury risk from potential pinching hazard. Located on each side of the unit just above the kickstand location.
	The High Voltage Danger noticed warns users about the inherent dangers of using a high-voltage testing device, and provides a reference to the User Guide for complete safety precautions. Located prominently on the top of the ADX.

Icons and Terminology Used in this Guide

	NOTE: Provides additional information that aids the reader in the use or understanding of the equipment or subject. Notes are not safety related and may be placed before or after associated text.
	NOTICE: Indicates information about product usage that can result in difficulty using product, a loss of data, or minor equipment damage if not heeded.
	CAUTION: Alerts the reader to a hazardous situation with potential for minor to moderate injury or property damage, or moderate to severe damage to the product if a specified process is not followed.
	WARNING: Alerts the reader to situations where a serious hazard to personnel can occur. Commonly used to notify users to heed safety precautions to avoid risk of injury or death from severe electrical shock.
	A specific notice to alert users about proper disposal of the unit. Commonly presented as follows: NOTICE: Do not dispose of in the normal waste stream.

Safety Precautions

Read and follow all safety precautions and safe operating practices in this manual. The precautions and warnings must be read and understood before use. Retain these warnings for future reference.

- The instrument is intended to perform measurements only on de-energized and isolated conductors. There is no connection rating to protect from accidental connection to live circuits.
- The instrument must be operated only by suitably trained and competent persons with formal operating procedures and authorization.
- Training must include a clear understanding of the risks from operating the instrument, and adequate formal operating procedures and authorization to protect personnel from harm.
- Do not exceed maximum operating capabilities of the ADX tester or power packs.
- The safe maximum limit of a measurement connection is that of the lowest rated component in the measurement circuit formed by the instrument, test leads, and accessories (if used).

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

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

General

- Local health and safety legislation requires users of this equipment and their employers to carry out valid risk assessments of all electrical work to identify potential sources of danger and risk of injury.
- Always use only the rated power cord provided by Megger Baker Instruments with this unit. Do not replace this cord with any other power cord.
- The ADX has a mass up to 19.5 kg (45 lb). Two-person lift is recommended. Disconnect the test leads and close the front cover before moving the ADX.
- This product is not intrinsically safe for use in an explosive environment. Do not use it in an explosive environment.
- Protection provided by the instrument may be impaired if it is not used in a manner specified by the manufacturer.
- Do not use the instrument if any part of it is damaged or malfunctioning. Visually inspect the unit before each use to confirm that it is in good working order.

- DO NOT open or disassemble the instrument. There are no user-serviceable parts within the instrument. Refer all servicing to Megger Support.

- Use appropriate safety equipment required by your organization including high-voltage gloves, eye protection, barriers, warnings signs, warning lights, and equipment stop devices.

- This instrument is for indoor use only. Do not use in wet conditions.

- **Ground the product:** The devices covered in this manual 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.

- The circuit under test must be switched off, de-energized, securely isolated, and proved dead before test connections are made.

- Ensure that adjacent circuits are also de-energized, protected from accidental connection, and adequately isolated from the equipment being tested.

- Do not leave the equipment unattended while in use.

- Do not use the instrument if there is evidence of oil leaking from within.

- Clean the instrument with a cloth dampened with water. Make sure the instrument is dry before use.

- Before connecting the leads, visually inspect the test lead receptacles to ensure that no foreign matter is inside.

Test Lead Safety Precautions

- Use only Megger-approved power cords, test leads, and accessories with this instrument.

- Ensure that all test leads, probes, and clips are in good order. Ensure that they are clean and have no broken or cracked insulation before use.

- Replace defective, damaged, or broken test leads with factory-authorized parts to ensure safe operation and maintain performance specifications. Use only Megger-approved test leads with this instrument.

- Ensure that hands remain behind finger guards of probes and clips.

- The safe maximum limit of a measurement connection is that of the lowest rated component in the measurement circuit formed by the instrument, test leads, and any accessories.

- Ensure that test leads, clips, or other accessories are not energized before connecting them to the device under test (DUT).

- Do not to put anything into test lead receptacles at any time other than the test lead banana clips when making connections for testing. Always inspect receptacles before each use to ensure that they are free of any foreign matter.

- After connecting the test leads to the DUT, route the cables in a safe manner between the DUT and the ADX tester so as not to pose a tripping hazard or interference with the testing process.

- Do not coil excess test lead length on or near the ADX, or near other equipment that may be affected by electromagnetic interference.

- Placing coiled test leads on top of the unit can result in damage to the ADX and could affect test results.

- The test leads provide basic insulation for the rated voltage. Do not touch the test leads, clips, or probes while the test circuit is energized.

- Do not connect the test leads to the mains supply or to live circuits.

- Protection provided by the test leads may be impaired if they are not used in a manner specified by the manufacturer.

- The test leads may be cleaned with a cloth dampened with water. Make sure the leads are dry before use.

Test Related Precautions

- When testing from the switchgear, check that all proper lockouts are in place, and that proper connection is made to the test points for the Asset being tested. Prevent connection to an adjacent live system during testing by confirming with appropriate test instruments that the Asset circuit to be tested is dead.

- Circuit connections, exposed conductive parts and other metalwork of an installation or equipment under test must not be touched during testing.

- Two-party operation is recommended only when using proper equipment (such as the remote E-Stop) and when taking appropriate precautions so both operators are aware of all conditions at all times.

- Always know what test is being performed and when. For example, do not adjust test leads when operating a footswitch. Leads will have live voltage and severe electrical shock may result.

- For capacitor-started motors or systems with surge arrestors/power factor capacitors, be sure to disconnect all capacitors from the test circuit before testing.

- The maximum capacitance that may be charged by the instrument is 1.0 μF.

- After capacitive loads are measured, ensure that the test has terminated and that the load is safely discharged (and protected from dielectric absorption if necessary) before disconnection.

- Never attempt to test a winding with both the host and power pack leads attached to the winding. Damage to the tester will occur.

- Keep unauthorized personnel out of the test area.

- Do not allow any person with a heart pacemaker—or other active implanted medical device—into the test area during testing.

- The included safety earth/ground strap must be used to connect the dedicated earth/ground terminal on the back of the equipment to protective earth/ground.

- Do not use any device to lock the footswitch or front panel test button in the ON state. Manual test controls must be physically maintained by the operator as designed.

- Connect the footswitch (if it is to be used) before selecting any TEST screen.

- In the event of complete system power loss during testing—including the backup battery—ensure that the load is completely discharged in a safe manner.

- In the event of control loss, the instrument may be safely switched off by pressing the power button for five seconds.

Ensure Proper Grounding and Discharge after Conducting DC Tests

Upon completion of any DC Test described in this document, the device under test (DUT) should not be considered safe to touch or handle until it has been completely discharged and solidly grounded.

When the DUT has been fully discharged and the tester voltage reduced to zero, the DUT should be solidly grounded.

The ground connection should be kept in place until the absorbed charge is completely dissipated. If ground connection is removed before sufficient time has elapsed, a recovery voltage may build up, presenting a danger to personnel who might touch the DUT.

For larger machines (greater than 2300 volts), a minimum grounding time of two hours or four times the DC test duration—whichever is greater—is recommended to ensure sufficient energy dissipation. For smaller machines, a shorter time may be acceptable. However, the user must be satisfied that no safety hazard exists before anyone touches or handles the DUT.

The ADX provides a sufficient grounding path for winding discharge while the test leads are connected to the winding and ground/frame. If the test leads need to be removed before the full discharge time has elapsed, secondary grounding equipment should be attached between the DUT and station ground before removing the test leads. When a proper ground connection is made, the tester can be safely disconnected from the DUT.

IEEE Std 95™-2002 provides detailed descriptions of the safety issues, along with guidelines for properly discharging and grounding the device under test. Refer to this standard to ensure that you fully understand the process and the proper steps to take to ensure safety to all personnel in the service area.

> **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, can cause an electric shock!**

Installation Category Definitions

CAT IV—Measurement category IV: Equipment connected between the origin of the low-voltage mains supply and distribution panel.

CAT III—Measurement category III: Equipment connected between the distribution panel and electrical outlets.

CAT II—Measurement category II: Equipment connected between the electrical outlets and user's equipment.

Measurement equipment may be safely connected to circuits at the marked rating or lower.

Safely Lifting the ADX

The Megger Baker ADX weighs up to 45 pounds / 19.5 kilograms. A two-person lift is recommended, with each person using one of the built-in handles on the side of the unit. Follow standard practice and safety procedures when lifting the unit.

Remove tripping hazards test leads, power cord, and all accessories before lifting. The front cover should also be in place during movement to protect the display.

Fig 1: *Safely lifting the Megger Baker ADX.*

Equipment Stop Button

The Megger Baker ADX tester is 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 unit's high-voltage circuitry during DC and Surge testing.

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

A warning icon appears on the ADX screen noting the lockout, and the user interface is disabled until the E-stop button is reset. ***ADX power will not turn off.***

⚠️ CAUTION: When engaged, the E-Stop button deactivates only the unit's high-voltage circuitry. It does not turn off or remove all power from the ADX. Pressing the E-Stop button does not stop an RLC test after it has been started. Care must be taken when handling the unit and device under test even when the E-Stop is activated.

Fig 2: *Megger Baker ADX showing Equipment Stop button.*

ADX Test Lead Receptacles

Before attaching the test leads to the back panel receptacles with each use, open the cover on each receptacle to inspect the inside to ensure that no foreign objects have gotten into the receptacles.

Inspect the cable ends as well to ensure that they are in good working order, and that no parts are missing or damaged.

⚡ **WARNING: Never insert any object other than the Megger test leads provided into the receptacles. Inserting other objects into the receptacles can result in injury or death from severe electrical shock.**

Fig 3: *Inspect test lead receptacles and cables before each use.*

General Operation, Maintenance, and Service Information

Cleaning and Decontamination

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 other cleaners or solvents. To clean the screen, take a soft, water dampened cloth and gently wipe the surface.

Test Leads

Kelvin type high-voltage test leads rated for 16kV DC. The leads can be used on any ADX model.

Refer to the *Megger Baker ADX User Guide* for complete technical specifications on the unit and all accessories.

The test leads may be cleaned with a cloth dampened with water. Make sure the leads are dry before use.

Power Requirements

Using the provided AC power cord, connect the unit to a grounded AC power source.

The unit's power requirements are 90–264 VAC, 47–63 Hz, 2.5 A AC maximum current draw.

A manually-reset circuit breaker protects the unit.

Environmental Conditions

- The unit has been tested for use up to 3,000 meters (9,842 ft).
- Only operate the tester in temperatures ranging from 5–40° C (41–104° 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).
- This unit is intended for Installation Category II in a Pollution Degree II environment.

2 — Megger Baker ADX Instrument Overview

Megger Baker ADX testers provide a comprehensive, yet modular set of high-voltage motor testing tools in a compact, lightweight, easy-to-use system. These testers perform:

- Low-voltage Resistance, Inductance, and Capacitance tests.

- Low-voltage phase angle and dissipation factor/quality factor tests.

- Insulation Resistance (IR) / Megohm, Dielectric Absorption (DA), and Polarization Index (PI) tests.

- High Potential (HiPot) tests (standard, ramp, and step voltage).

- Surge tests.

- Low-impedance armature and coil tests.

- Armature and coil surge tests.

Megger Baker ADX testers are compatible with the Megger Baker PP and PPX series power packs for very high-voltage testing.

The ADX features a variety of new accessories including test lead options, and updated external LED safety lights and equipment stop boxes.

> NOTE: To ensure full compliance with IEC 61010-1:2010, the ADX uses only current accessories that meet or exceed requirements of the standard. Legacy equipment and accessories are not supported.

Fig 4: *Megger Baker ADX15A.*

Front Panel Controls

All Megger Baker ADX testers feature a large, 10.4-inch touch screen that displays the graphical user interface. The interface features a logical layout of large touch icons that improve ease of use.

The units come with a Push-to-Test (PTT) button used during manual coil tests, and a variable voltage output ramp switch to apply voltage during surge, coil, and DC tests.

In the lower right corner, an easily accessible E-Stop button quickly shuts off power to the unit's high-voltage circuitry during DC and Surge testing when needed.

Fig 5: *Front panel controls and features—ADX15.*

No	Description
1	Power On/Off button. The button has three modes of operation: ■ Screen sleep— Quick press-and-release. ■ Controlled shut-down or restart—Press one second and release then press Power Off or Restart. ■ Hard power down—Press and hold for approximately 5 seconds.
2	Push-to-test (PTT) button.
3	Indicates maximum output voltage (in kV) of the ADX. (This is not a model number.)
4	Voltage output ramp switch.
5	Test Lead active LEDs. When LEDs are lit, indicated test lead is energized.
6	USB 2.0 connectors.
7	Equipment stop (E-Stop) button. See "Equipment Stop Button" in the "General Operating and Safety Information" chapter for more information.

NOTE: The touch screen can be used with direct finger contact or using a suitable stylus. The screens are typically sensitive and require only a light touch to select user interface items. Test the sensitivity by lightly touching items for selection to get a feel for how your units responds. Pressing harder or longer on an item will not affect response.

Rear Panel Connections

The graphic below identifies the components and connections found on the rear of the ADX.
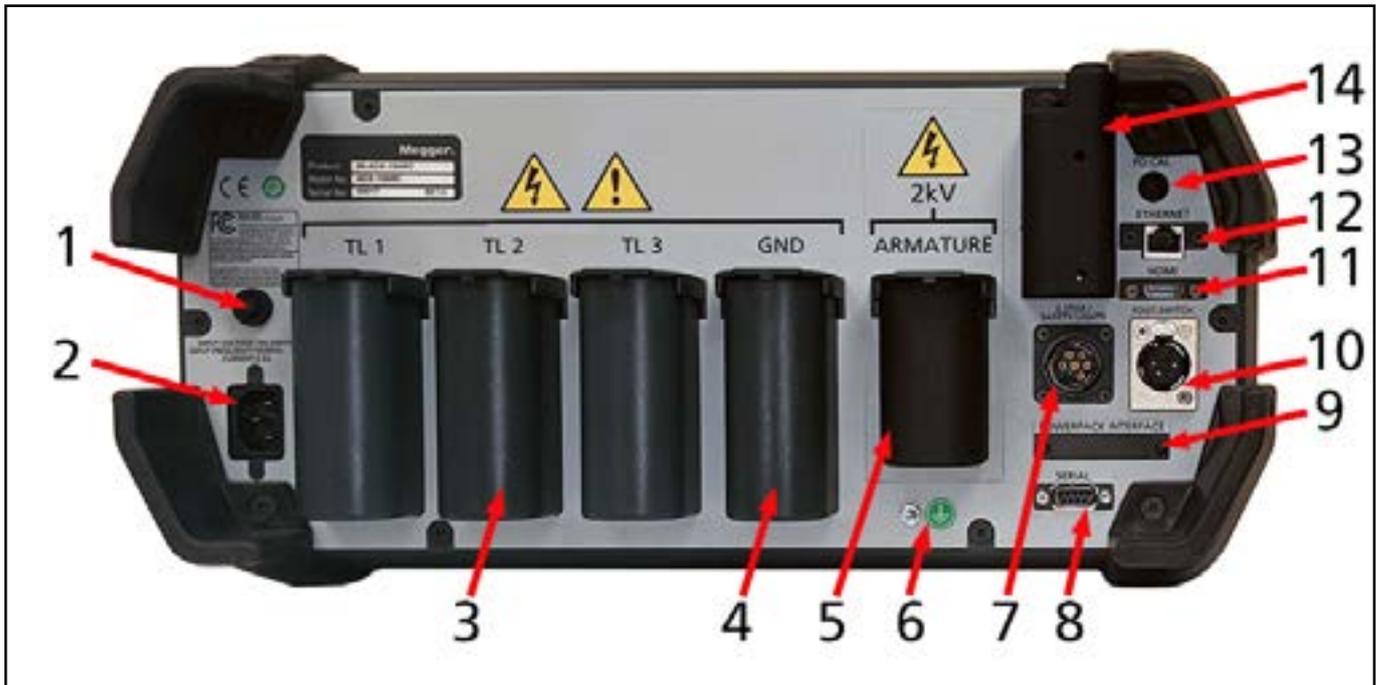
Fig 6: *Rear panel connections.*

No	Description
1	Breaker reset button.
2	A/C input power receptacle.
3	Receptacles for red test leads (3x). Test leads are labeled to facilitate match and proper attachment between receptacles and device under test.
4	Ground lead receptacle (1x).
5	Armature test receptacle (in this space for ADX15A only).
6	Safety ground/power pack ground stud.
7	Remote E-Stop/safety lights connector. See details on the next page.
8	RS-485 connection.*
9	Power pack interface connector (optional).
10	Footswitch connector.
11	HDMI output connector—display ADX screen output to an external monitor. Ensure that the external monitor being used is plugged into the HDMI connector on the back panel before starting the ADX application.
12	Ethernet connector.
13	PD calibration connector.*
14	RLC adapter—optional accessory except on ADX15 ARM.

These elements currently have no functionality and are reserved for future feature implementation.

On some units, plugs may be installed in place of optional elements.

Stop Jumper Connector and Cover

The E-Stop/Safety lights connector is covered by a Stop Jumper connector and cover when external accessories are not used. If the Stop Jumper connector is not in place, the E-Stop indicator (3) on the toolbar will light and testing will stop.

Remove or re-install the Stop Jumper connector and cover by turning the inner connector (1) and not the outer cover (2).

Fig 7: *Stop Jumper connectors and cover (left). E-stop indicator in ADX test screen toolbar (right).*

No	Description
1	Stop Jumper connector.
2	Stop Jumper cover.
3	E-Stop indicator in ADX user interface toolbar.

Configuration Options

The Megger Baker ADX series includes five models as listed in the table below.

ADX Standard models are available in 4, 6, 12, and 15 kV outputs.

The ADX15A features a built-in impedance transformer that adds low-impedance armature and coil testing capability.

 All models can be augmented with extended RLC testing options.

The output capacity of the ADX can be extended up to 40 kV by using Megger Baker power packs.

Table 2: *ADX models with available options.*

Options	ADX Standard Models				ADX Armature
	ADX4	ADX6	ADX12	ADX15	ADX15A
Partial Discharge (PD)	√	√	√	√	√
Extended RLC	√	√	√	√	√ (built-in)
Power Pack interface	√	√	√	√	√
Built-in low-impedance transformer					√

Fig 8: *ADX15A with built-in low-impedance transformer and RLC adapter for coil and armature testing.*

Megger Baker Power Packs

The Megger Baker power packs are high-powered impulse generators used to test very large, high-voltage windings. Output ranges from 2,000 volts up to a maximum of 40,000 volts (Megger Baker PPX30: 30,000V; Baker PPX40: 40,000V).

Output for PP series power packs is controlled by a variable transformer and is dependent on a stable and proper incoming line voltage. Output for PPX series is controlled by a precision regulated high-voltage power supply; output is not dependent on the incoming line voltage.

These units perform Surge and DC HiPot tests when used with the Megger Baker ADX as the host for data collection. They incorporate a supply monitor for safe operation from a well-grounded supply. In addition, 60kV rated test leads are provided.

Voltage rise time is 100–200 nanoseconds, so the power packs comply with IEEE Standard 522-2004 and IEC Standard 34-15 when testing motor windings and coils.

Fig 9: *Megger Baker ADX paired with Megger Baker PPX.*

NOTICE: For setup and test procedures using power packs, refer to the appropriate *Megger Baker Instruments Power Packs User Guide*.

Armature Test Accessories

All accessories described in this section are included with the ADX ARM15A.

Surge Test Probes and Clips

The Megger Baker ADX features accessories that facilitate surge testing including the Megger ADX Armature Surge Hand-held Probes (ADX-ASP), which are used during armature bar-to-bar testing.

Fig 10: *Megger ADX Armature Surge Hand-held Probes—1014-104.*

The ADX Armature Surge Clips (ADX-ASC) are commonly used during coil and DC motor testing. The longer middle section of the clips employ a shielded cable as shown in the image below.

Fig 11: *Megger ADX Armature Surge Clips—1014-105.*

Armature Surge Test Fixture

For armature bar-to-bar surge testing, you can use the ADX Armature Surge accessory—(ADX ARM SRG). Refer to the instructions provided with the accessory for details on using and maintaining the accessory.

> NOTICE: Armature surge test and other fixtures used with legacy equipment are not compatible with the ADX tester.

Fig 12: *ADX Armature Surge Accessory—1014-103.*

Low-voltage Test Probes and Clips

The Megger Baker ADX15A includes the RLC adapter and the following accessories for low-voltage testing using the RLC adapter.

Fig 13: *Megger low-voltage Kelvin test leads with probes—1011-929.*

Fig 14: *Megger low-voltage Kelvin test leads with clips—1011-928.*

ADX15A units also include one set of DLRO Connect system components as shown below to accommodate low-voltage RLC testing for armatures.

Fig 15: *DLRO Connect system components included with ADX15A for low-voltage RLC testing.*

Additional options for armature testing and other low-voltage testing applications are available when using the DLRO Connect system (see "General Accessories" below).

Footswitch

You can connect the footswitch (optional) to the Baker ADX host or auxiliary units; it works in parallel with the Start (PTT) button. The footswitch enables hands-free use of the unit and gives you additional operating position options.

Fig 16: *Footswitch accessory.*

Remote E-Stop and Lights Accessory

The remote Test Status Indication Lights (TSIL) and Test Status Indication Lights E-Stop (TSIL-ES) accessories show operators and bystanders when power is being applied to a device under test. The remote E-Stop is used to stop high-voltage testing in the event of an emergency.

Fig 17: Remote E-stop and lights accessory.

No	Description
1	Remote Test Status Indication Lights E-Stop (TSIL-ES)
2	Remote Test Status Indication Lights (TSIL). A Stop Jumper must be installed on the open connector if a remote E-Stop (1) is not used.

General Accessories

Megger Baker ADX units feature a full line of accessories to meet your transportation, storage, and testing needs.

Carrying Case

The ADX is shipped with a soft-side pack for storing test leads and other smaller accessories.

Fig 18: *Soft-side carrying case for test leads and smaller accessories.*

A hard case that protects sensitive equipment during transport with a fully foam-lined, hard shell is also available. The case has an extendable handle and wheels for easy transport.

Megger Test Probes and Accessories Options

A variety of test probe and accessories options are available for the ADX when the RLC adapter option is used.

The image below shows the options available from the Megger DLRO Connect system. The Kelvin-type test leads are available with a wide variety of interchangeable terminals to fit a broad range of assets and test points when conducting low-voltage testing.

Single components are shown; all accessories are shipped in pairs.

Fig 19: *Megger DLRO Connect system for low-voltage testing using the RLC adapter.*

No.	Description	Part No.
1	ADX modular lead, DLRO Connect accessories. Connects to the ADX RLC adapter and extension lead.	1014-029
2	Duplex connector extension lead 3 m long. Connects to ADX modular lead and any DLRO Connect termination.	1006-460
3	Duplex connector handspike probe with spring-loaded tips.	1006-450
4	Duplex connector concentric handspike.	1006-448
5	Duplex connector handspike twist probe with spring-loaded tips.	1006-449
6	Duplex connector Kelvin clip 1. Touch-proof clip with adjustable jaws.	1006-451
7	Duplex connector Kelvin clip 1. General purpose heavy duty clip.	1006-447

For complete feature descriptions and specifications of the DLRO Connect system components, visit Megger.com or contact the Megger Baker Instruments sales team (see back page for contact information).

3 — Preparing the Megger Baker ADX for Testing

Setting up the Megger Baker ADX

Set the ADX on a flat surface with all four bottom bumpers making solid contact with the work surface.

If the area in front of the ADX is long enough, you can leave the keyboard tray attached and use the keyboard inside the tray. The keyboard tray can also be removed during use and stored aside.

Fig 20: *ADX resting on work cart; all bottom bumpers making full contact; wheels locked.*

CAUTION: If the ADX is placed on a wheeled cart, the wheels should be locked during testing.

If the ADX will be used on a flat surface similar to the application shown above, you can leave the keyboard in its tray while in use; otherwise, you should remove the tray/cover as described in the next section.

Removing the Keyboard Storage Tray

The keyboard storage tray (front cover) is commonly removed during use.

1. Remove the keyboard and set it aside for now.

2. Refer to the image below to identify the location of the hinge pins (1).

Fig 21: *Locating hinge pins before removing the keyboard tray.*

3. Remove the keyboard from the tray then remove the cover by holding it in a nearly-closed position while simultaneously pressing up on the bottom corners just below the cover hinges (image shows cover flat to reveal hinge locations—1). Lay the cover aside in a safe place.

Reinstalling the Keyboard Tray

1. Note the location of the hinge pins. Ensure that they are intact and centered in their retainers.

2. Raise the tray to a nearly-closed position with the pins aligned with their hooks.

3. Press on the lid to snap the pins into place.

4. Place the keyboard and cord into the tray, sliding one end under the retainer bracket.

5. Magnets in the top edge of the tray grasp onto screws in the unit to keep it closed.

CAUTION: Failure to properly install the keyboard tray/front cover when the unit is not in use can result in damage to the display screen.

Using the Kickstand

To adjust the screen angle of the ADX, you can raise the kickstand found below the unit.

> CAUTION: Be very careful when setting up and using the kickstand to prevent injury to hands, fingers, or other body parts. Be careful when moving the ADX to prevent damaging the unit.

1. This process is best done with test leads detached. Use the side handles to lift the ADX upright.

2. Carefully support the ADX on its back bumpers to unlock the kickstand from the bottom of the unit.

3. Press fingers into the kickstand bottom edge to release it.

Fig 22: *Place ADX upright on back bumpers.*

4. Fully unfold the kickstand towards the front face of the unit to ensure a safe resting position. Carefully lower the unit into its resting position, ensuring that the back bumpers are in full contact with the work surface.

5. Ensure that the front edge of the kickstand is fully extended and in full contact with the work surface.

Fig 23: *Kickstand raised for easier viewing at steeper angles.*

You can also use the tester in its upright position, next to an Asset being tested.

> CAUTION: Ensure that the ADX is located on a clean dry floor when using in this position to prevent injury from tripping hazards or electrical shock.
> Ensure that all test leads are properly positioned to prevent pinching while testing.

1. When using in this position, attach the test leads to their respective receptacles then lay out the cables as shown below before raising the unit vertically.

2. Check to ensure that all leads are properly positioned and not being pinched in any manner.

3. Ensure that the ADX rests on a flat level surface near the Asset being tested, and in a practical position for view the screen and operating controls.

Fig 24: *Using the ADX in its upright position.*

Remove the keyboard tray as described above when using the ADX in the upright position.

Setting Up the Android OS

You will need to ensure that the Android operating system is properly configured for your location so that correct date and time stamps are applied to your records, and to select the temperature scale (Fahrenheit or Celsius) commonly used in your area.
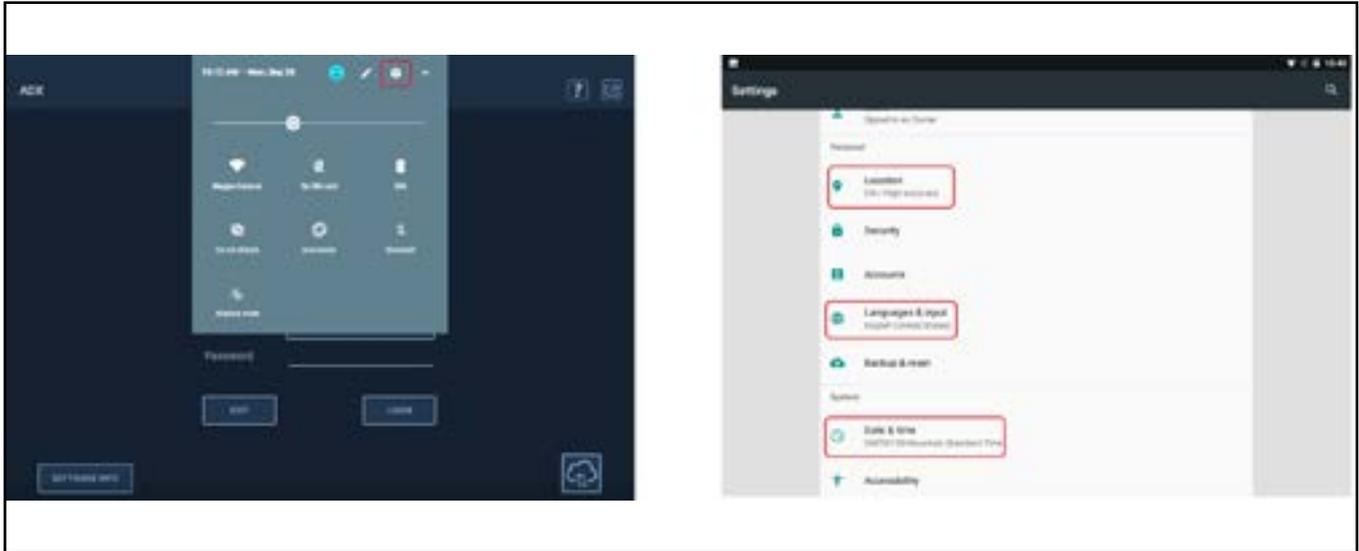
Fig 25: *Android OS setup.*

Typical setup items include:

- Location
- Language
- Date & Time
- Keyboard and Input Methods
- Wi-Fi connection

Click on the Settings icon in the Android Apps list to open the Settings screens. One example is shown below.
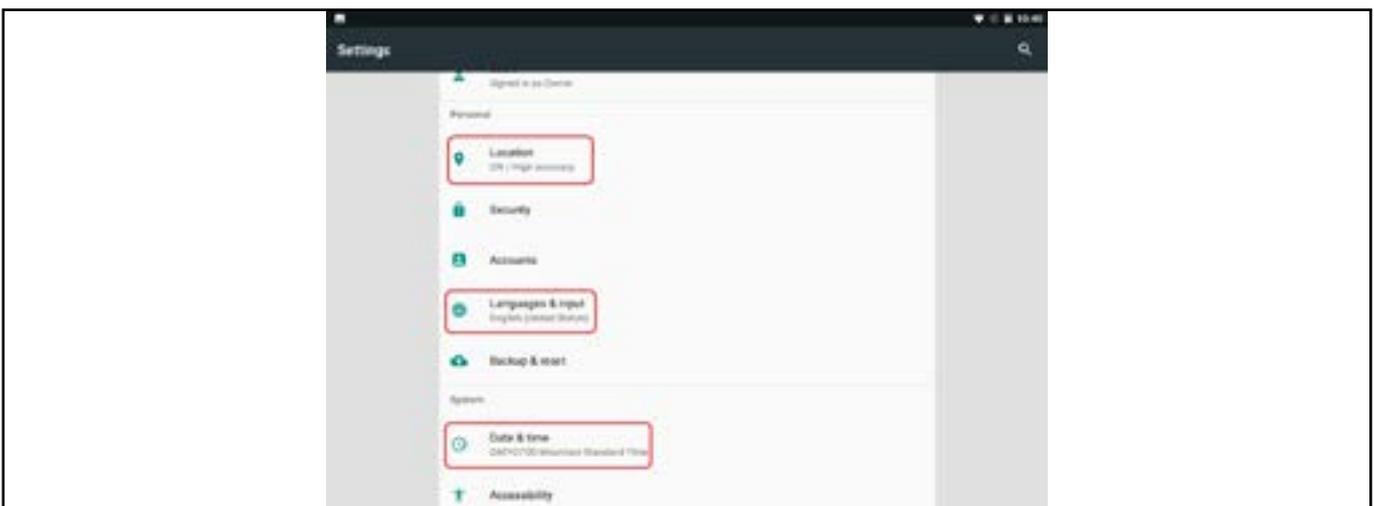
Fig 26: *Android settings screen with various applicable settings shown.*

Details on these procedures and other Android OS topics are addressed in Appendix B, "Using the Android™ Operating System."

Connecting the ADX to an Asset for Testing

Three-phase Motor Connection

⚠️ CAUTION: Ensure that the Asset being tested is de-energized before making connections.

1. Plug the ADX into a properly grounded AC power outlet, but do not turn on the ADX at this time.

2. Plug the ADX test leads 1, 2, and 3 into their respective receptacles on the back of the tester.

3. Plug the ground cable into its receptacle on the back of the ADX.

4. Label the leads on the Asset 1, 2, and 3.

5. Connect corresponding numbered test leads to each numbered Asset lead.

6. Connect the black ground lead to an Asset ground terminal or other solid ground contact.
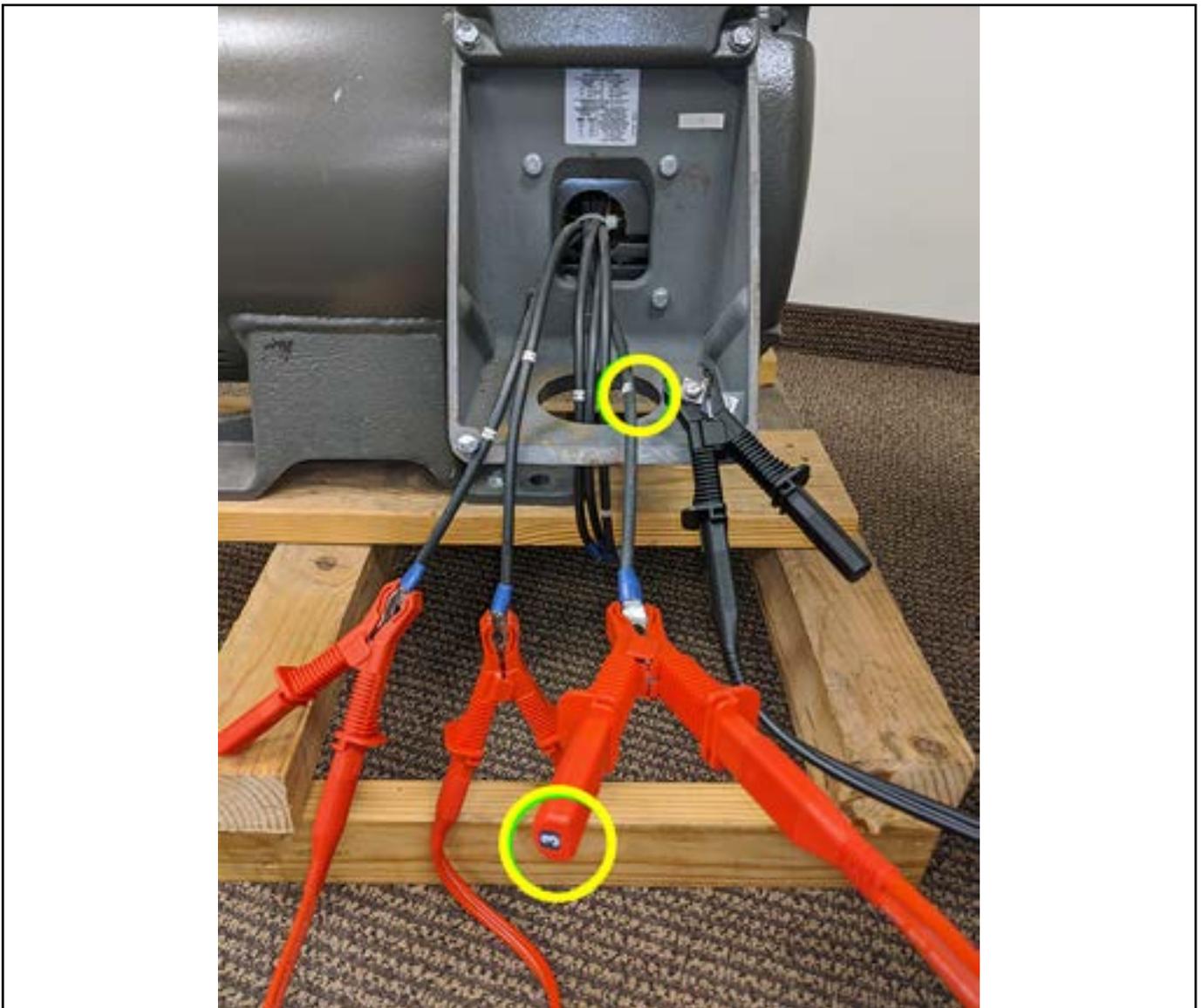
Fig 27: *Connecting ADX test leads and ground to Asset being tested.*

7. Ensure that all ADX test leads and Asset cables are properly separated from each other and safely run between the Asset and the tester.

> ⚠️ CAUTION: Ensure that the ADX test leads are NOT coiled in any manner during testing to prevent interference with test results. To avoid damaging the unit, DO NOT coil excess test leads and place them on top of the ADX. Ensure that excess test lead cables are stretched out between/behind the tester and Asset to ensure safe operation of both devices, and to reduce tripping and other hazards for personnel in the area.

8. Press the power button on the lower left corner of the ADX.

Fig 28: *Ensuring ADX test leads and Asset cables are properly separated and located.*

> 💬 NOTE: Some concrete floors can influence measurements collected by the ADX, particularly during PD testing. Ensuring that cables do not rest on the floor or using an insulated mat below cables can help with such issues.

Single-phase Motor or DC Motor Connection

> **WARNING: When performing high-voltage tests, voltage is present on all three test leads if they are plugged into their receptacles. Follow the proper connection instructions for single-phase and coil testing to avoid injury or death from severe electrical shock.**

1. Plug ADX test leads 1 and 2 into their respective receptacles on the back of the tester.

2. DO NOT plug in test lead 3.

3. Plug the ground cable into its receptacle on the back of the ADX.

4. Label the leads on the Asset 1 (positive lead) and 2 (negative lead).

5. Connect corresponding numbered test leads to each numbered Asset lead.

6. Connect the black ground lead to an Asset ground terminal or other solid ground contact.

Coil Connection

1. Plug the ADX test leads 1 and 2 into their respective receptacles on the back of the tester.

2. DO NOT plug test lead 3 or the ground cable into their receptacles on the back of the ADX.

3. Label the leads/connections on the Asset (coil) 1 and 2.

4. Connect corresponding numbered test leads to each numbered Asset lead.

4 — Setting up Users and Roles

NOTE: Only users with administrative permissions can access the User Setup features on the ADX.

The ADX software provides features to set up proper permissions and access relative to how users will serve various roles when using the ADX tester.

The SETUP mode main menu is the starting point for administrators to access the tools for setting up users and roles.

Fig 29: *SETUP mode provides administrators with access to the User Setup screen.*

Creating Roles

Examine the Roles and Users currently available in your organization to become familiar with each element and how they are currently related.

1. Click on or press the Roles tab to start the process.

2. Press the CREATE ROLE button to open a dialog box like the one shown below.

3. Enter a new Role Name in the field then press OK.
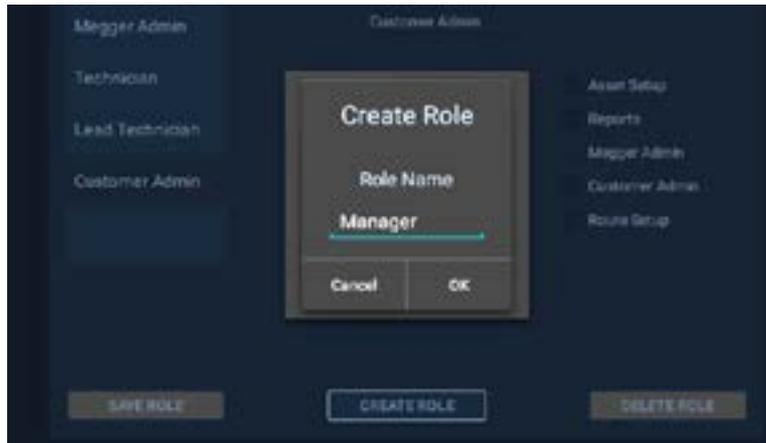
Fig 30: *Create Role dialog box.*

4. The new role is added to the Roles list as illustrated below.

5. Click on or press the new role to select it.

6. Click on or press the check boxes next to each task that you want to assign to the selected role. Checking each box grants permission to the role to perform the associated task.

7. When you have completed task assignments, click on SAVE ROLE.
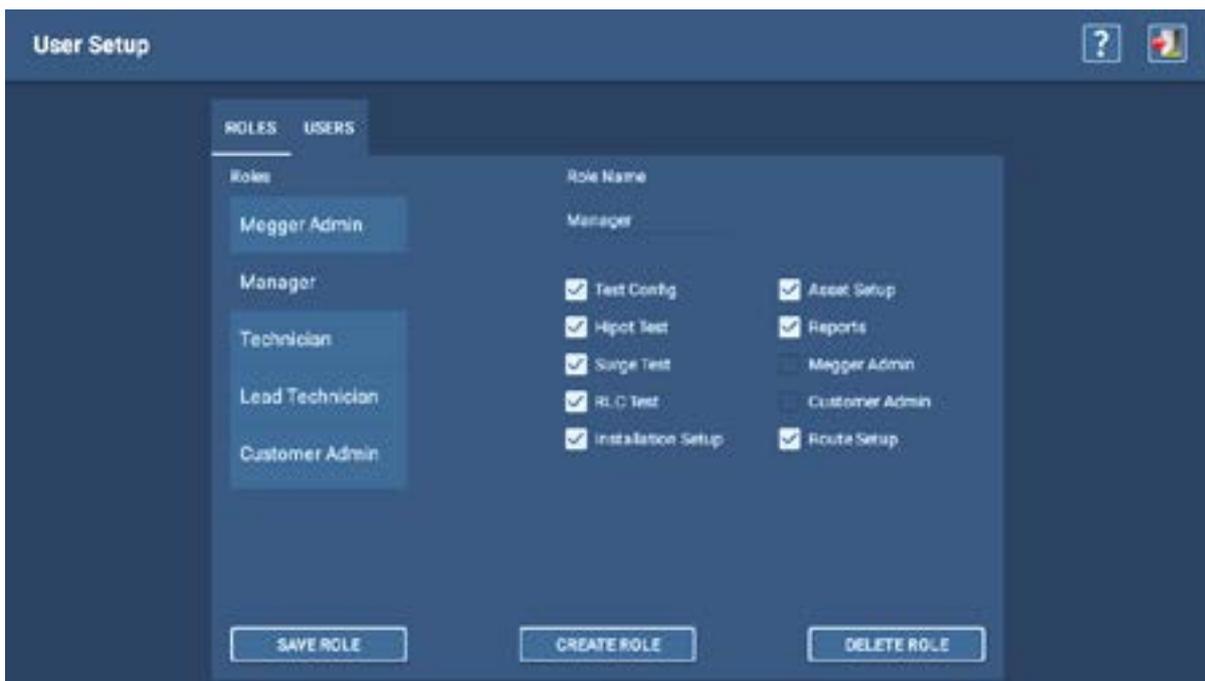
Fig 31: *Assigning task permissions to a role.*

Editing Roles

1. Click on or press the Roles tab to start the process.

2. Click on or press the role you want to edit to select it.

3. Click on or press the check boxes next to each task that you want to assign to or remove from the selected role. Checking each box grants permission to the role to perform the associated task.

4. When you have completed task assignments, click on SAVE ROLE.
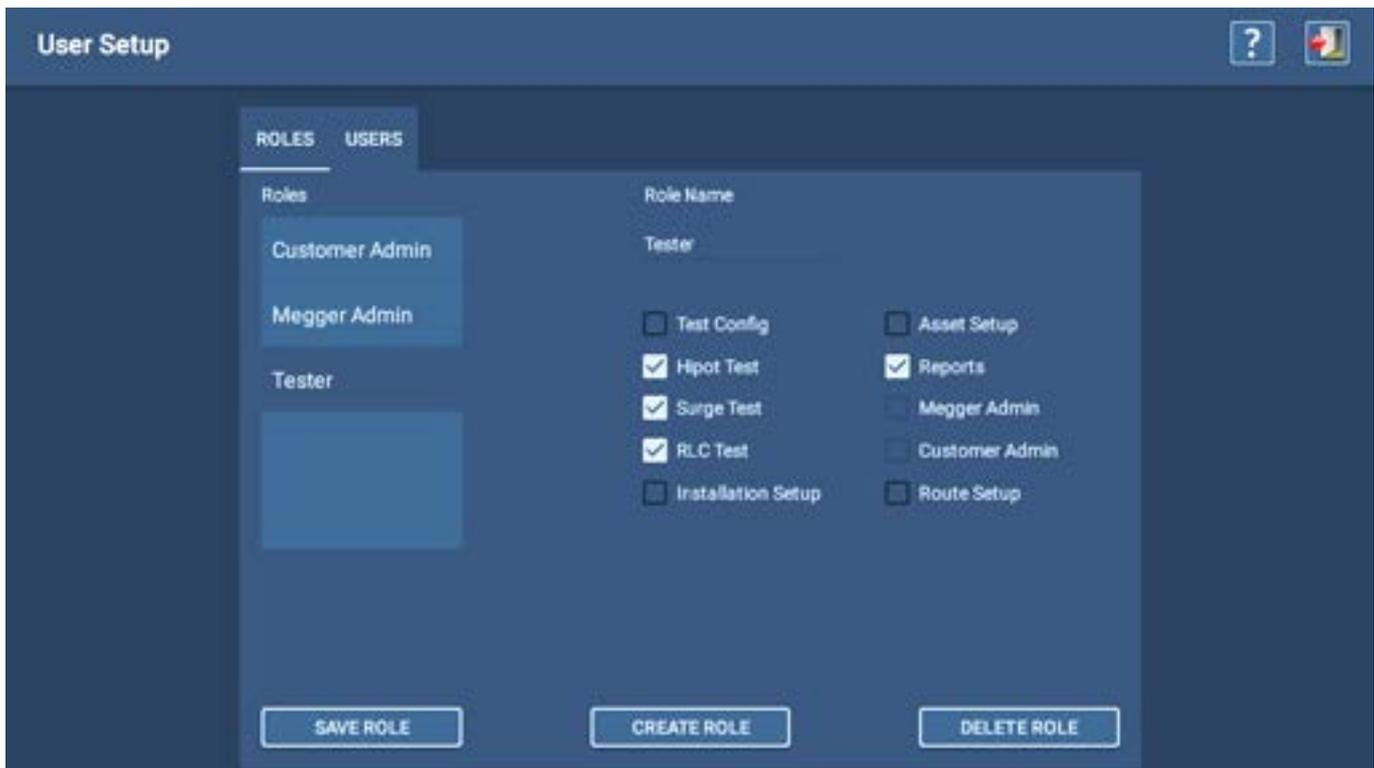
Fig 32: *Editing a role.*

NOTE: Admin roles cannot be edited or deleted.

Creating Users

1. Click on press on the Users tab to start the process.

2. Press the CREATE USER button to open a dialog like the one shown below.

3. Enter a new User Name in the field then press OK.
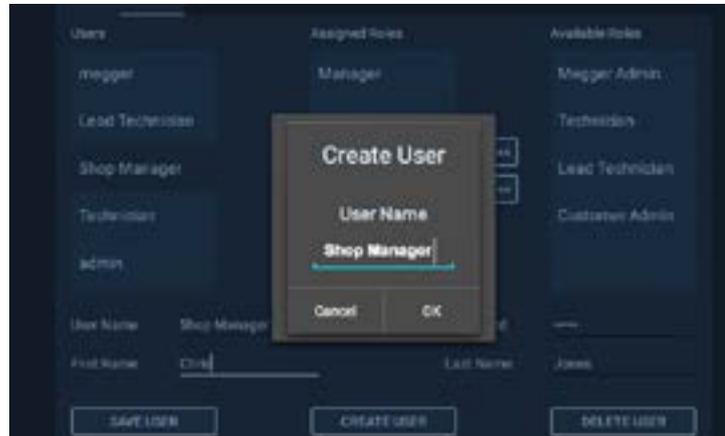
Fig 33: *Create User dialog box.*

4. The new user is added to the Users list as illustrated below.

5. Click on or touch the new user to select it.

6. Assign a specific user by entering values in the First Name and Last Name fields.

7. Assign a password if desired (not required) by entering one in the Password field.

8. In the Available Roles list, click on or press the Role(s) that you want to assign to the new user to highlight it then press on the double left arrow (<<) button to move the selected role(s) to the Assigned Roles list.

9. When you have completed role assignments for the user, click on SAVE USER.
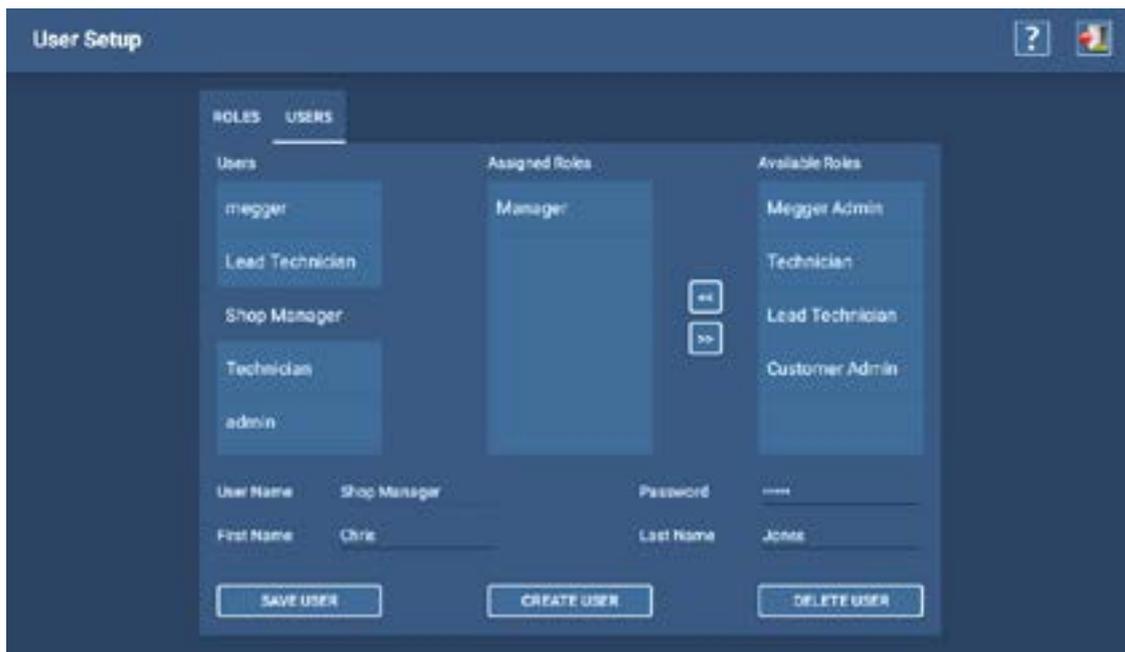
Fig 34: *Assigning Roles to a new User.*

Editing Users

1. Click on press on the Users tab to start the process.

2. Click on or touch the new user to select it.

3. Assign a different operator to the user by changing values in the First Name and Last Name fields.

4. Assign a password if desired (not required) by entering one in the Password field.

5. In the Available Roles list, click on or press the Role(s) that you want to assign to the new user to highlight it then press on the double left arrow (<<) button to move the selected role(s) to the Assigned Roles list.

6. Conversely, if you want to remove one or more roles from the user, click on the role(s) in the Assigned Roles list then click on the right arrow (>>) button to move the selected role(s) to the Available Roles list.

7. When you have completed role assignments and other changes for the user, click on SAVE USER.
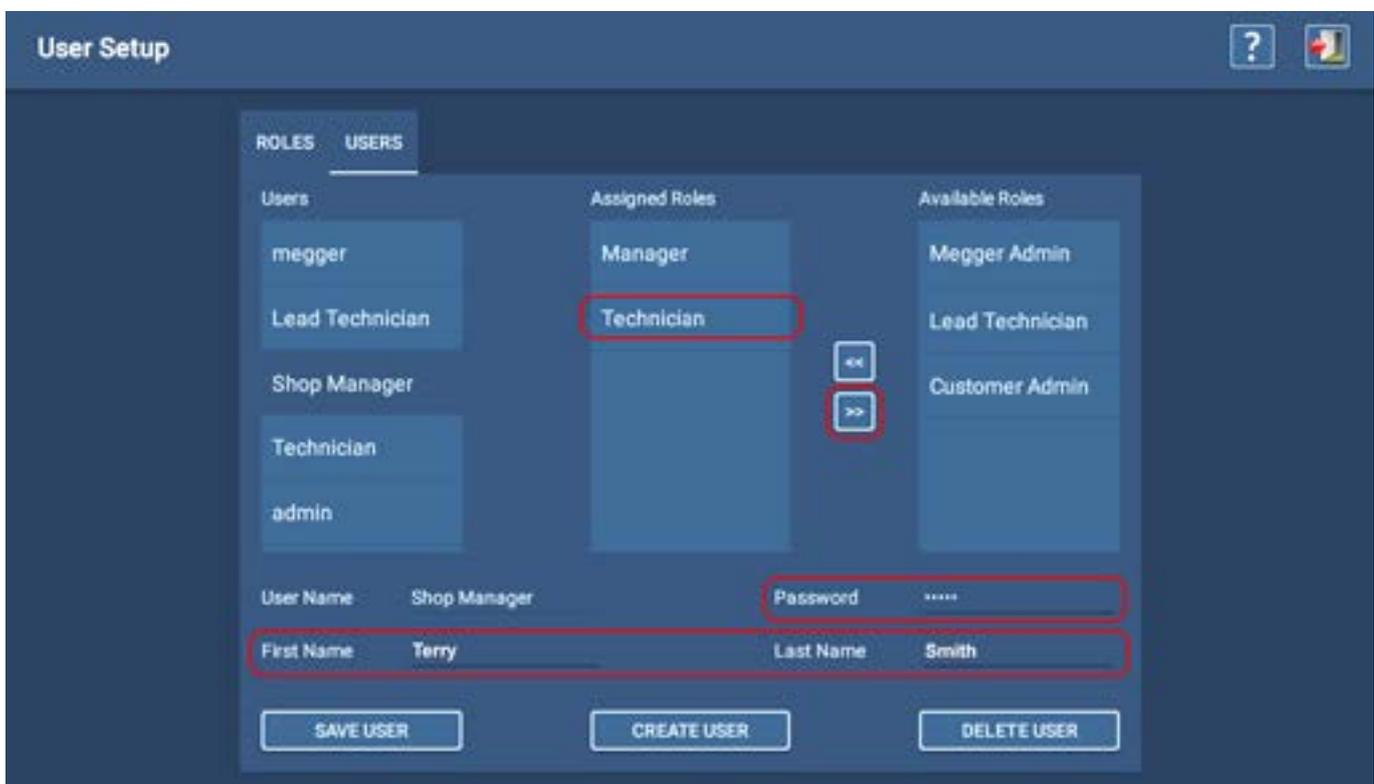
Fig 35: *Editing a user.*

NOTE: Admin roles cannot be assigned to users. Administrator roles and users are created at the factory by Megger Baker personnel according to customer-defined needs. If you need a new administrator created for your organization, contact Megger Baker customer support.

5 — Defining Assets, Test Configurations, Installations, and Routes

Focus is on the Asset

The ADX is most commonly used to test AC and DC motors; but it can also be used to test generators, transformers, coils, and other devices. For that reason, the software refers to the devices tested as ***Assets***.

> NOTE: You can use the ADX to test a device without selecting an Asset, but features are limited:
> You can run only RLC, DC, and Surge tests in Manual mode— no references or PD testing in Surge.
>
> Any saved data is not automatically associated with the Asset being testing.
>
> The software uses a default Test Configuration that cannot be viewed or edited.

For most applications, selecting an asset provides many advantages, including:

- Saving all test data to the selected asset's records for analysis and reporting.
- Building testing history and trending data for the specific asset.
- Assigning one or more test configurations that precisely define how you want to test the asset.
- Ability to use test references and perform PD testing in Surge.
- Assigning a Sequence to facilitate an automated progression through all or selected ADX tests.
- Assigning the asset to a installation.
- Assigning the Asset To One Or More Routes.

More information on these steps are provided in the next sections.

Fig 36: *A motor is the most common example of an asset.*

Setting up Assets and Related Elements

An Asset is the device being tested. Best practice is to set up an Asset with at least one Test Configuration assigned to optimize the features offered by the ADX software.

> NOTE: Proper permissions are required to create and edit assets and related elements. The Lead Technician (password: BAKER) and Customer Admin (assigned password required) users have required permissions for creating and editing assets and related elements.

The ADX software is Asset-centric: when you select an asset, you also select everything you need to test that asset. *The objective is to allow operators to select an asset so they can simply run a test.* Tests will be run using the correct configuration parameters and limits, proper test sequence, and more—everything is attached to the Asset so the system knows how to properly test it.

Test results are saved to the specific asset with all related information for analysis and reporting.

Assets have up to four related elements within the system:

- **Test Configuration**—provides the testing specifications you want to apply to the asset.
- **Installation**—defines where the asset is installed so operators know where to find the asset.
- **Route**—defines a list of assets and their Installations for scheduling periodic testing of multiple assets.
- **Sequence**—defines the types of tests to run in a specific order—along with relevant process information—when the preference is to execute a series of tests in a fully automated session.

To optimize system performance, proper setup is needed. Ideally, test configuration and asset setup are completed before an asset is tested. Defining the relationship between assets, installations, and routes ensures that operators always know where to find an asset when it requires testing.

ADX software configuration includes several tasks. Because the software is asset-centric, fully configuring a new asset requires that your test configurations and installations are set up so they can be assigned to the asset when the asset is created or edited. Based on these dependencies, the recommended order of completion is:

1. Create a new or edit an existing test configuration.

2. Create a new or edit an existing asset, including assigning test configurations and sequence.

3. Create a new or edit an existing installation, and assigning asset(s).

4. Create a new or edit an existing Route, and assigning installations and assets.

The application features a built-in set of test configurations that can be directly assigned to assets, or edited to meet your testing needs. New test configurations can also be added as needed to meet the needs of your organization.

One or more test configurations are assigned to an asset. You can choose from the defaults provided, you can copy and edit existing configurations, or you can create new test configurations from scratch.

Organizations often assign an administrator to set up assets and test configurations, leaving operators to focus on testing without dealing much with system setup issues. If they are given the proper role and permissions, any user can be allowed to make changes.

> NOTE: Assets and Test Configurations are used in all applications. Depending on your organization's structure and preference, Installations and/or Routes may or may not be used. This guide focuses on Assets and Test Configurations. Refer to the *Megger Baker ADX User Guide* for more information on all elements.

Key Concepts

- **ASSET**—Most commonly, an asset is a motor, transformer, or generator.

- **INSTALLATION**—Most commonly, an installation is a machine, a piece of equipment driven by an asset. It is the specific entity to which the asset is coupled. Common examples include a specific machine (such as a pump or compressor) located somewhere within a building, or a storage location such as a specific bin on a warehouse rack.

- **ASSETS** and **INSTALLATIONS** can be assigned *attributes* that help describe each entity.

- **ATTRIBUTES** provide the power behind search features found in the ADX application, along with expanding data collection, mining, and analysis using optional PowerDB Pro. Some examples of asset attributes include motor color, usage, and status. A few examples of installation attributes include location elements such as plant, building, city, section, and more.

- ***ASSETS and INSTALLATIONS are separate entities.*** Over time, an Installation (such as a specific mill, shredder, pump, and more) can have multiple Assets (motors) installed and removed. Separating these entities offers a broad range of data collection and analysis opportunities.

- ***SEQUENCES*** are the structure that defines which tests types will be included in the testing process, along with the order in which they are executed. Sequences also define the process flow following a test failure. Sequences are selected from a standard list and assigned to Assets when they will be tested using Sequence mode.

> NOTE: Sequences are created and managed by Megger Baker Instruments. A standard set is included with the ADX. If you need additional, custom, or modified sequences to better fit your organization's needs, please contact Megger Baker Instruments for assistance.
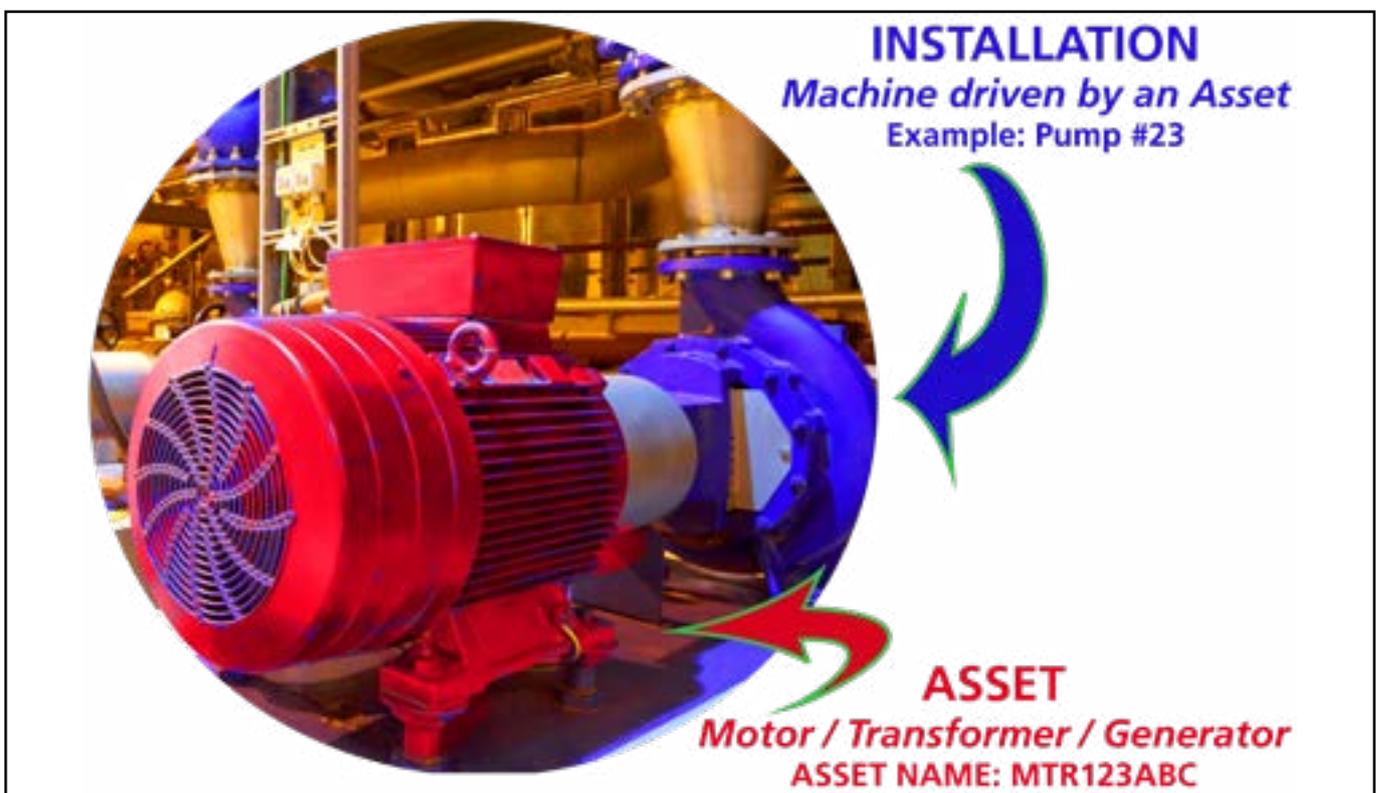
Fig 37: *Common Asset and Installation.*

Comparing AWA and ADX Data Models

AWA	ADX
■ Traditional fixed hierarchy	■ Flexible dynamic mapping
■ Data collection limits	■ Unlimited data collection options (via attributes)
■ Motor ID can be motor-focused or machine-focused	■ Asset and Installation clearly separated
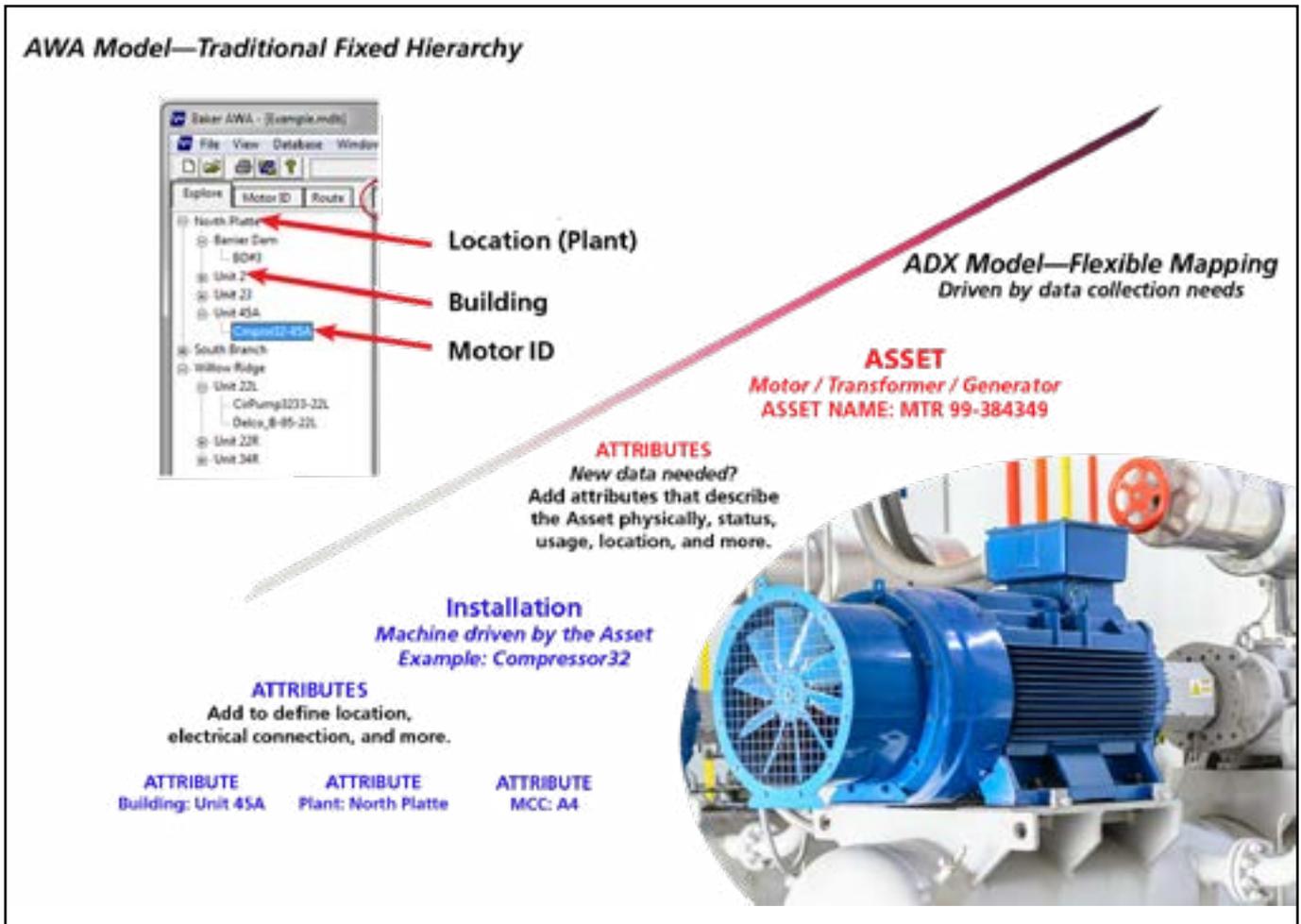
Fig 38: *Comparing AWA and ADX data models.*

Build the Strategy that Realizes Your Vision

A few examples are presented next, but your actual applications are limited only by your imagination.

You envision what data will reveal how your assets and installations perform. The ADX helps you build a strong foundation around these key elements, and attributes provide the power and flexibility to realize your vision.

Installation Not Used—Asset-centric

For many users, the asset is the only thing that really matters. Consider the case of a motor shop. Assets are in the shop for maintenance or repair. They are not installed on anything, so the installation feature is not needed.

The shops often operate primarily from job numbers. In this example, we use the *Job Number as the Asset Name* then assign other relevant attributes to the asset. Where the asset is stored within the facility is relevant, so a location-type attribute can be assigned to identify the storage room, pallet, or other elements that can help shop staff find the asset when needed.

The service ticket can contain all the information needed to track an asset while it is in the shop.

Tests can be run and data collected based only on the asset and its attributes.
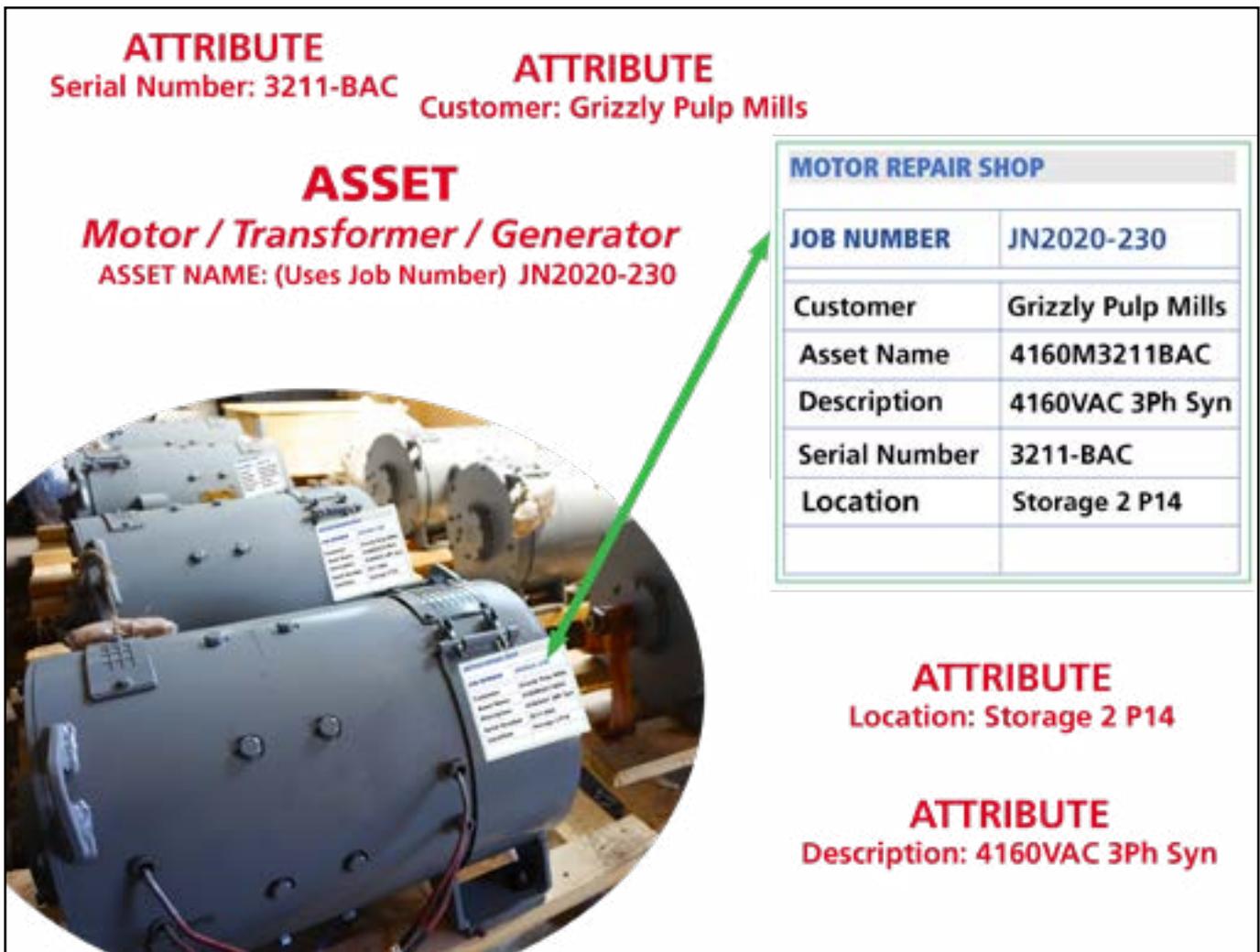
Fig 39: *Example of Asset-centric model: motor in repair shop—Installation not used.*

Using another approach, a repair shop might prefer to define a job as an installation. Incoming assets can be *installed* into the job then removed from the job when completed. Later, when that same asset returns, it would be installed into a new job (installation). This approach allows the data from the previous job to be segregated from successive jobs.

Additionally, other areas of a shop or process steps could be considered installations. Later, this data could be helpful in recognizing issues with testing, or it might provide insight when tracking down specific tests that were done at a particular stage of the process.

Installation Example with Location and Power Attributes

Companies with larger organizations can use the power of separating assets and installations to provide greater tracking and insight into how the asset performs under specific conditions along with identifying issues that might be related to where and how the asset is used.

- Identify location by plant and building.
- Identify Power Supply Bus used.
- Identify Switchgear.
- Identify Motor Control Center (MCC).
- Other attributes could be added to provide more detail such as identifying the specific MCC bucket.
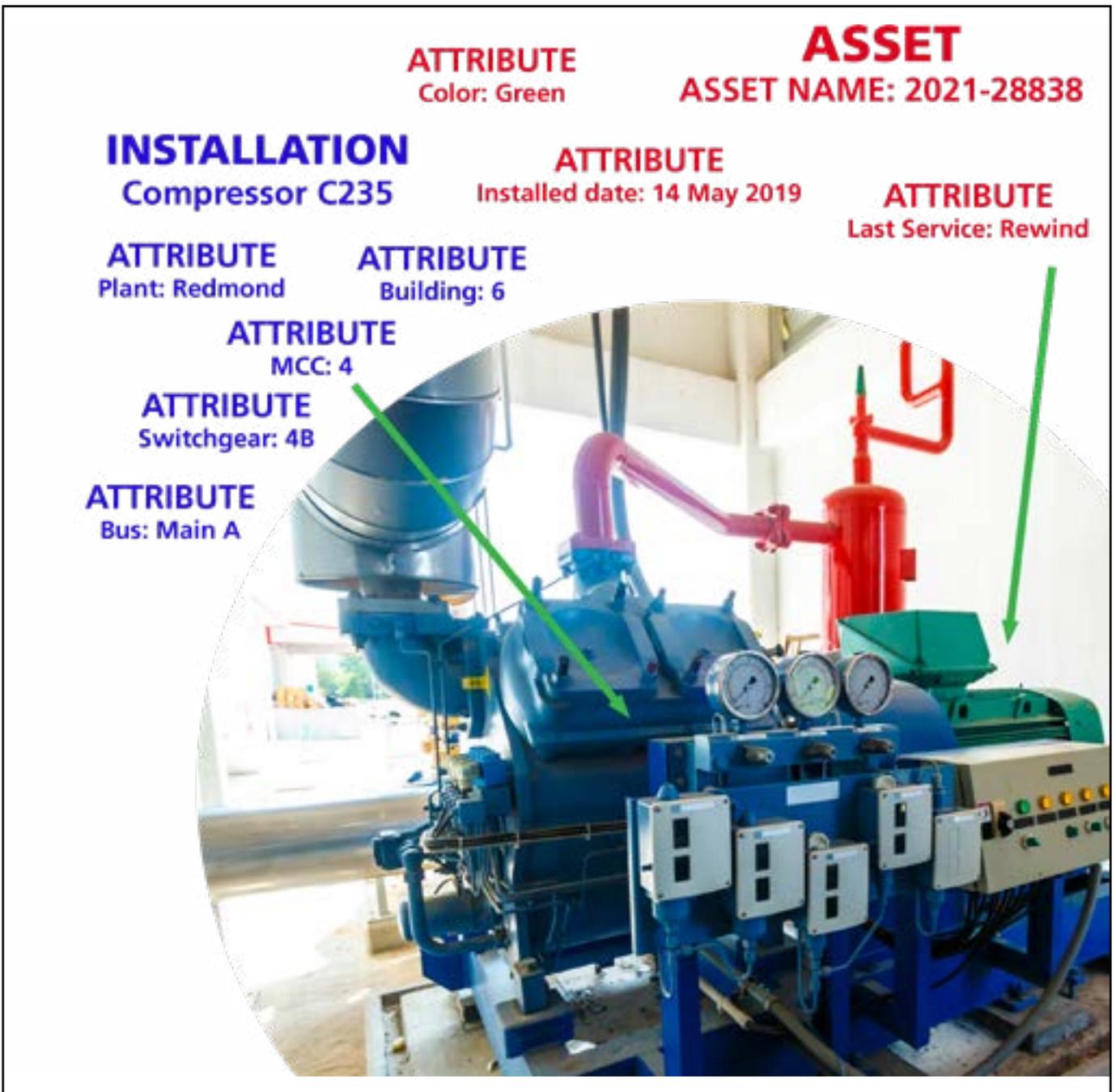
Fig 40: *Example Asset and Installation focusing on Installation power supply attributes.*

Test Configuration

New test configurations should be created before creating or editing assets because you will assign available configurations—and a active test configuration—during the asset creation or editing process.

The *Test Configuration Editor* screen appears after clicking on the Test Configuration icon in the SETUP mode main screen, or from the EDIT TEST CONFIGURATION icon in the toolbar at the top of many test screens.

You can also get to the Test Configuration Editor screen from the Asset Editor screen by clicking on EDIT for the selected active test configuration.
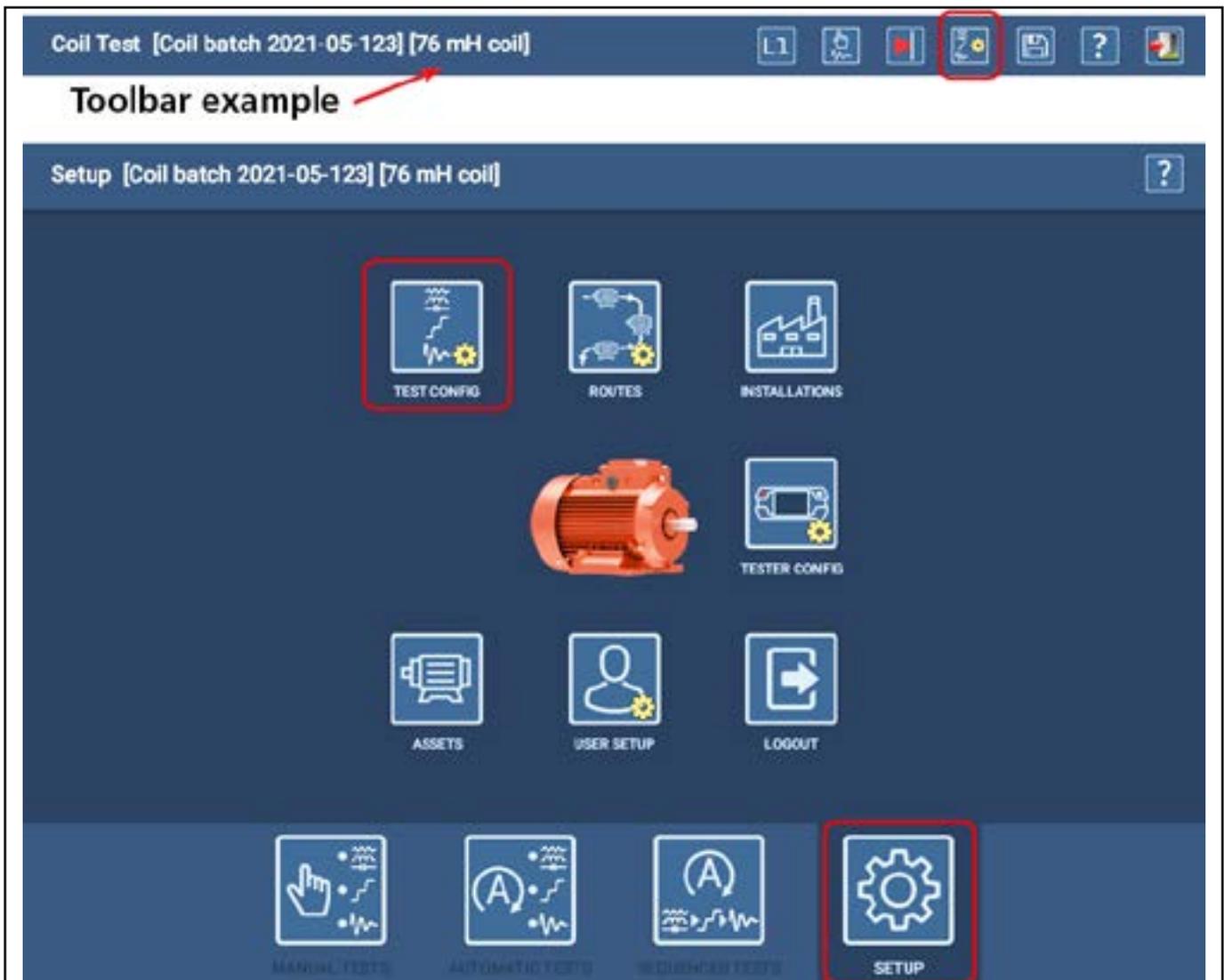
Fig 41: *Access Test Configuration Editor from Setup Main or icon at top of many test screens.*

Use the Test Configuration screen to edit or copy existing test configurations, or to create new ones.

Icons at the top right of the screen (left to right) are used to: delete, copy, add new, or save test configurations. The last icon is used to exit the Test Configuration screen and return to the previous screen.

When the Test Configuration screen opens, it displays the first test configuration found in the overall list. To change the view to another test configuration, touch the arrow to the right of the Test Configuration field then select the configuration you want to view.
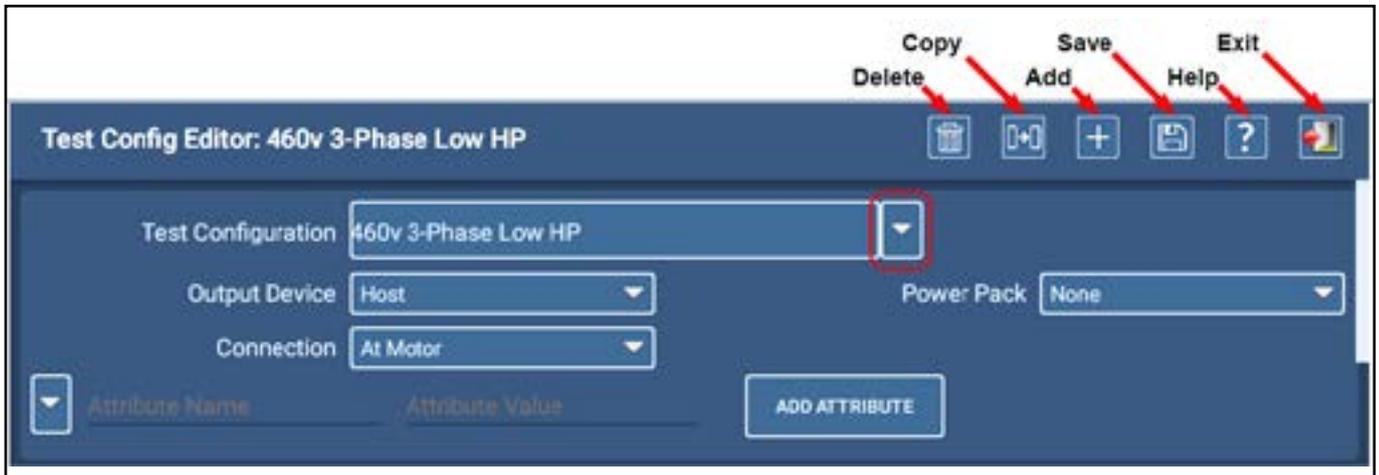
Fig 42: *Test Configuration screen; general information section.*

Naming Conventions

Use a naming convention that is consistent across your organization.

Ideally, the name should provide some insight into what the test configuration is intended to do. An example such as "400V Std HiPot Surge PD" suggests that the test is for a 400V motor and will include a standard HiPot DC Test with a Surge test that includes partial discharge. Some organizations might have a process in place the uses a code such as AC400DCH1S2 that means the same thing.

In any case, because users will need to become familiar with the approach, *ensuring that names are used consistently is most important.*

Top Section

The top section of the screen provides fields for locating and selecting a test configuration, specifying the device that will perform testing on the asset, the type of power pack used (if Output Device is Power Pack), and where the tester will connect to the asset.

Fig 43: *Test Configuration screen; general information section.*

When you touch the Connection drop-down list, select whether the ADX will be connected directly to the asset (At Motor) or to a remote testing junction (At Switchgear). Values entered into the test fields will differ depending on the connection chosen due to factors such as cable run lengths and other components connected to the circuit.

If desired, define general attributes for the Test Configuration by selecting an attribute using the arrow to the left of the Attribute Name field or entering a name and value directly in the fields. For example, you could add an attribute called Standards Compliance to identify that the test configuration is used as part of a compliance process for a particular standard.

Press the ADD ATTRIBUTE button to complete the assignment when you have made your entries.

The Test Configuration screen contains three other sections for specifying RLC, DC, and Surge test parameters. Tests are enabled when their associated toggle buttons are moved to right.

Copying Test Configurations

1. If you need to create a new test configuration that is similar to an existing one, select the source configuration then touch the COPY icon in the top right section.

2. The software will create a new configuration with the name "New Test Configuration" shown in the Test Configuration field.

3. Edit the name directly in the field, providing a new name that complies with your organization's established conventions. (See "Naming Conventions" on the preceding page.)

4. Make changes to configuration values where needed then touch the SAVE icon at top right.

RLC Tests Section

In the RLC Tests section, define the target values for each test type along with the allowed variations. When the test is run, the software will indicate a test failure when the collected measurement is outside of the specified limits for that particular test.

1. Start by selecting which tests leads to enable during the test. All three leads are selected when testing three-phase systems as a complete circuit. Other assets—such as DC motors or coils—use only two leads.

2. Select which tests to include by moving the associated test toggle to the right (green).

3. Check boxes to select individual test elements if you know the proper Target and Variation values for the Asset.

4. Enter values directly into the specification fields.

The software allows you to specify different target and variation values for each test lead for resistance and inductance test parameters.

For resistance testing, you can enable Imbalance Limit testing, select the method to use, and specify the limit percentage for the test.

You can enable Temperature Compensation and specify the winding conductor material to ensure the proper compensation parameters are applied to the test. Then, you can specify a default value for the Correct To temperature field.

Temperature Compensation

Temperature compensation is used to make the reference temperature thresholds meaningful. Without compensation, the value could not be compared to the threshold because the value of the threshold for individual resistance is defined at a specific temperature (for example, 0.123 Ω at 25° C). So, whatever temperature the winding is will likely need to be corrected to make the comparison meaningful.

Three-phase imbalance is not affected by temperature correction.

The analyzer will correct the coil resistance tests to the value entered in the Correct To field. By default (when creating a new Test Configuration), this value is 77° F (25° C) in compliance with IEEE 118.

> NOTE: Depending on the installation in which the tester is used, the Temperature Compensation fields will be displayed in the scale (Fahrenheit or Celsius) commonly used in the region.

> NOTICE: Because the information collected during testing is commonly used for identifying trends, it is crucial to ensure that values specified in testing are used consistently.

Setting Individual Lead Limits

Values entered into the Target and Variation fields for individual lead limits come from the asset manufacturer's specifications. Refer to those specifications when defining test parameters. If you do not know or do not have access to these specifications, leave the fields blank and the Lead Limit boxes unchecked.

Another approach would be running a test on a known-good asset then using the results collected to establish base values that can then be used to define the target values and set tolerances.

Limits should only be used when an accurate Corrected To temperature is used; at an expected temperature, target resistance values can be established, along with limits. These values change with different temperatures.

Inductance test provides a Frequency drop-down list so you can select the desired frequency for testing. 120 Hz is

recommended for most assets because it provides the widest measurement range for accurate readings. For assets with very low inductance, you can consider using 1000 Hz.

> NOTE: Keep in mind that rotor position can affect inductance values.

Because capacitance values in industrial motors are typically low, capacitance testing is always performed at 4000 Hz to ensure that adequate signals can be measured.

Fig 44: *Test Configuration screen; RLC section.*

DC Tests Section

1. Use the Temp Compensation drop-down list to select the winding insulation material type. The selection adjusts the algorithm used by the software to properly calculate temperature compensation values for the Asset under test. Most Assets (built after 1975) will use Thermosetting in this field.

2. Specify a default Correct To value for the Asset. (Most standards use 40° C.)

3. The Test Options drop-down list helps you select the combination of IR/DA/PI Tests you want to execute.

4. Choose the type of tests that you want to enable for the selected test configuration by sliding the IR/PI Test and/or Hipot Test toggles to the right.

5. Define parameters for each test according to your local motor testing program specifications, or those defined by your customer.
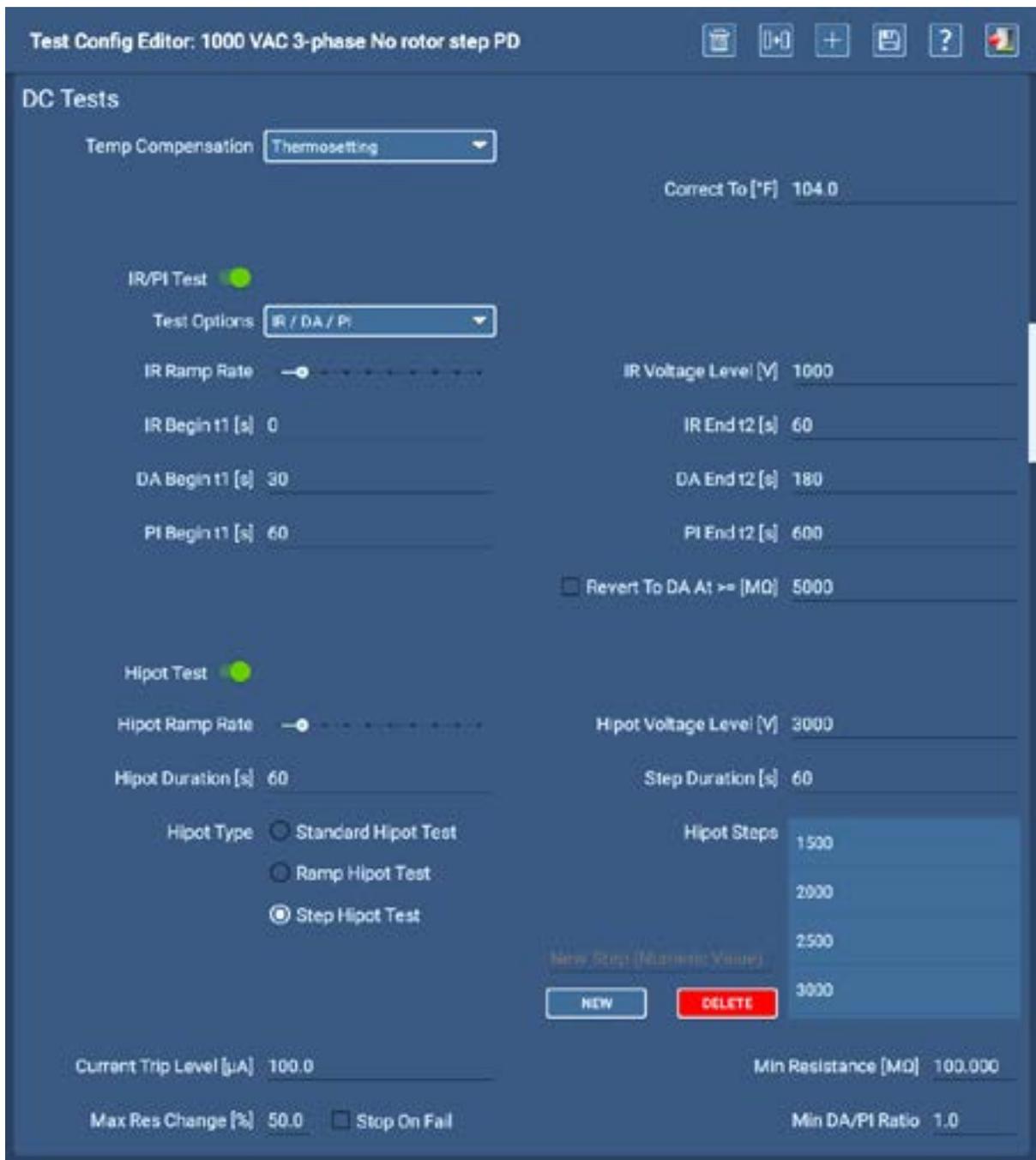
Fig 45: *Test Configuration screen; DC Tests section.*

Temperature Compensation

The analyzer will correct the IR/megohm tests to the value entered in the Correct To field. By default (when creating a new Test Configuration), this value is 104° F (40° Celsius).

> NOTE: Depending on the location (language setting in Android setup) in which the tester is used, the Temperature Compensation fields will be displayed in the scale (Fahrenheit or Celsius) commonly used in the region.

> NOTICE: Because the information collected during testing is commonly used for identifying trends, it is crucial to ensure that values specified in testing are used consistently.

IR/PI Test Sub-section

The DC insulation resistance (IR) test is performed at or near the asset's operating voltage. The IR test quantifies the resistance for a defined period (usually 60 seconds). The insulation's ability to polarize can also be assessed by extending the IR for an additional period using the dielectric absorption (DA) or polarization index (PI) evaluations.

If enabled, the (IR) test runs first, followed immediately by a DA and/or PI ratio comparison.

The first minute of that overall test is the IR; the remaining time is used to evaluate change. The DA and PI are ratio evaluations of that change over time.

The timer for these tests starts when the test voltage is reached. Assuming defaults parameters, after 60 seconds from test start, the IR test completes and the first evaluation marker is set. If a PI test is selected, testing runs for nine more minutes (10 total) then the last evaluation marker is set.

The DA is essentially the same as PI, but shorter in duration (3 minutes vs. 10 for PI—using default durations).

Table 3: *DC Tests; IR/PI Test sub-section field and control descriptions.*

Field/Control	Description
IR/PI Test Toggle switch	Slide right = test enabled.
IR Ramp Rate	A slider used to set the rate at which voltage will ramp for IR/PI tests. The scale is 1–10 from left to right, with 1 being the slowest rate.
IR Voltage Level [V]	The IR Voltage Level is typically at or near the normal operating voltage of the Asset. Refer to "Appendix D — Recommended Test Voltages" to determine the proper voltage level for your Asset.
IR Begin t1 [s]	The start of the IR test, in seconds. This value should always be zero (0).
IR End t2 [s]	The end of the IR test. Typical duration is 60 seconds.
DA Begin t1 [s]	The start of the DA test. This value should be between 0 and 60. In any case, ensure that it completes before the PI test completes.
DA End t2 [s]	The end of the DA test. Typical duration is 180 seconds.
PI Begin t1 [s]	The start of the PI test. Test starts when you get the test voltage; that is zero point. After 60 seconds has elapsed from test start, that is the first PI marker. Then it runs for nine more minutes (10 total) to get to the last marker.
PI End t2 [s]	Typical duration is 600 seconds.
Revert to DA AT >= [MΩ]	If IR/DA/PI is selected and the DA test yields a measurement greater than or equal to the defined value, the low-voltage test stops at the completion of the DA.

One of each test—IR DA PI (STEPS x n) and HIPOT—can be saved into a single test record.

HiPot Test Sub-section

The high potential (HiPot) test demonstrates that the ground wall insulation system can withstand a "high" applied voltage (usually more than twice the asset's nominal operating voltage) without exhibiting an extraordinarily high leakage current (within defined limits) or causing the ground wall insulation to break down. Deciding which HiPot test type to assign to the Text Configuration is an important part of defining HiPot testing.
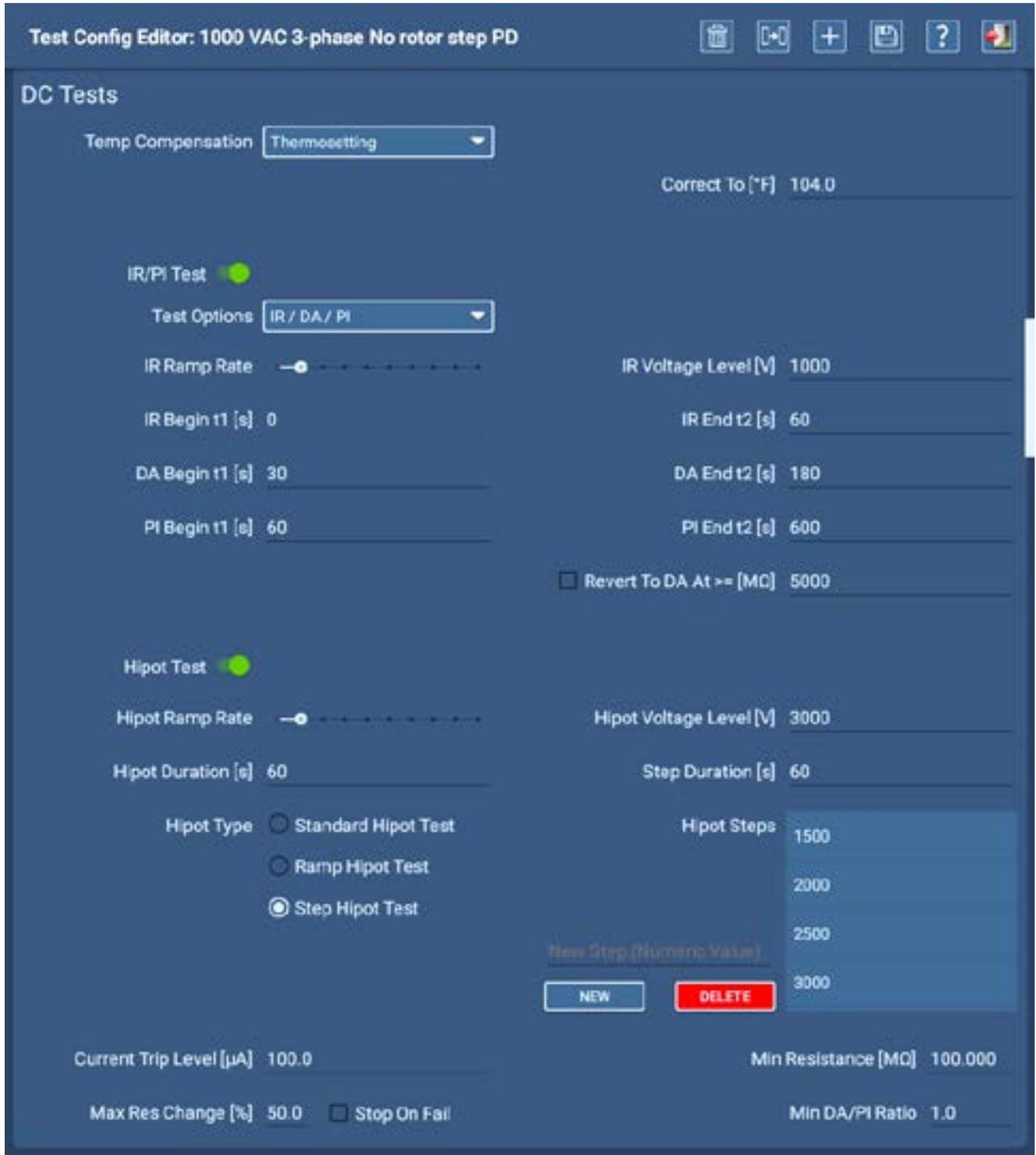

Fig 46: *Test Configuration screen; DC Tests section.*

Standard HiPot— Applies a DC voltage to the machine's windings at a higher voltage—usually more than twice the voltage of the motor's operating voltage—for 60 seconds. This is the fastest HiPot test type, but it yields less information.

Ramp HiPot— Applies a DC voltage at a slower linear ramping rate to the machine's windings.   As the test runs, the software monitors the charging current. This higher current is sustained longer due to the slower ramp rate. If it remains linear with the voltage, the winding is in good condition. This test provides a linear assessment of charging current and is faster than step test.

HiPot Step Test—A succession of equally-divided voltage levels are applied to the asset to allow the tester to analyze linearity of leakage current. Step test provides the linearity of leakage current with the most controlled approach of test voltage. If step durations are different, the linearity assessment becomes invalid; the software cannot accurately calculate delta T (time) if the times (step durations) are different.

Table 4: *DC Tests; HiPot Test sub-section field descriptions.*

Field/Control	Description
HIpot Test Toggle switch	Slide right = test enabled.
Hipot Ramp Rate	A slider used to set the rate at which voltage will ramp to the defined level for HiPot tests. The scale is 1–10 from left to right, with 1 being the slowest rate.
Hipot Voltage Level [V]	Refer to "Appendix D — Recommended Test Voltages" to determine the proper voltage level for your Asset.
Hipot Duration [s]	Typical duration is 60 seconds. Applies to standard and ramp HiPot testing.
Step Duration [s]	The duration of each step in a HiPot Step Test. Because a standard HiPot test duration needs to be 60 seconds (default), and the point of step testing is to examine linearity, all steps must also be 60 seconds.
Hipot Type	Select the type of HiPot test you want to run by using the radio buttons.
Hipot Steps	Voltage level of each step in a Step HiPot Test. Step tests should have at least four steps above the IR test voltage. (HiPot Test Voltage - IR Test Voltage) / 4 (For example, 2000 - 500 = 1500 / 4 = 375 per step Because the DC Test starts at the Asset operating voltage (IR Voltage Level; set at 500 in this example) the first step in a Step HiPot test will ramp to the next target level for the Asset (875 volts in this example).
Current Trip Level [μA]	Current trip level trips by default at 1200 μA, but you can specify a lower threshold if you want to provide a larger measure of protection for your assets.
Min Resistance [MΩ]	The minimum resistance (in megohms).
Max Res Change [%]	During ramping, voltage increases to a charging current value defined by several factors including ramp rate and circuit capacitance. When test voltage is reached and ramping reduces to zero, the current drops to a value that represents the sum of polarization current, surface leakage current, and internal leakage current. Max Res Change % compares the summed leakage currents from step to step. If the insulation system is weak, then as voltage increases near its breakdown point it will cause resistance to decrease. The reduction in resistance results in an increase in current, and the change will be seen. Default is commonly around 50%. If the Stop on Fail box is checked, the test will stop immediately; otherwise, the test will complete and then flag the test as a failure.
Min DA/PI Ratio	The PI test is typically performed on assets of 100 HP or greater. Per IEEE 43, the ratio should be set 1.5 for NEMA class A insulation, and 2.0 for class B, F, and H insulation. The DA test is performed on insulation systems that polarize very quickly—usually motors < 100Hp. These suggested ratios assume that you are testing clean dry insulation systems. In high humidity environments, consider setting lower ratios even for class B, F, or H insulation systems.

Surge Tests Section

In the Surge Tests section, Surge and PD tests can be enabled, and values can be provided for test voltages, EAR limits, and more. Line-to-line/Reference EAR+™ limits can be applied to individual leads (phases) or to all leads. Pulse-to-pulse EAR+™ limits and coil reference limits are always applied to all leads.
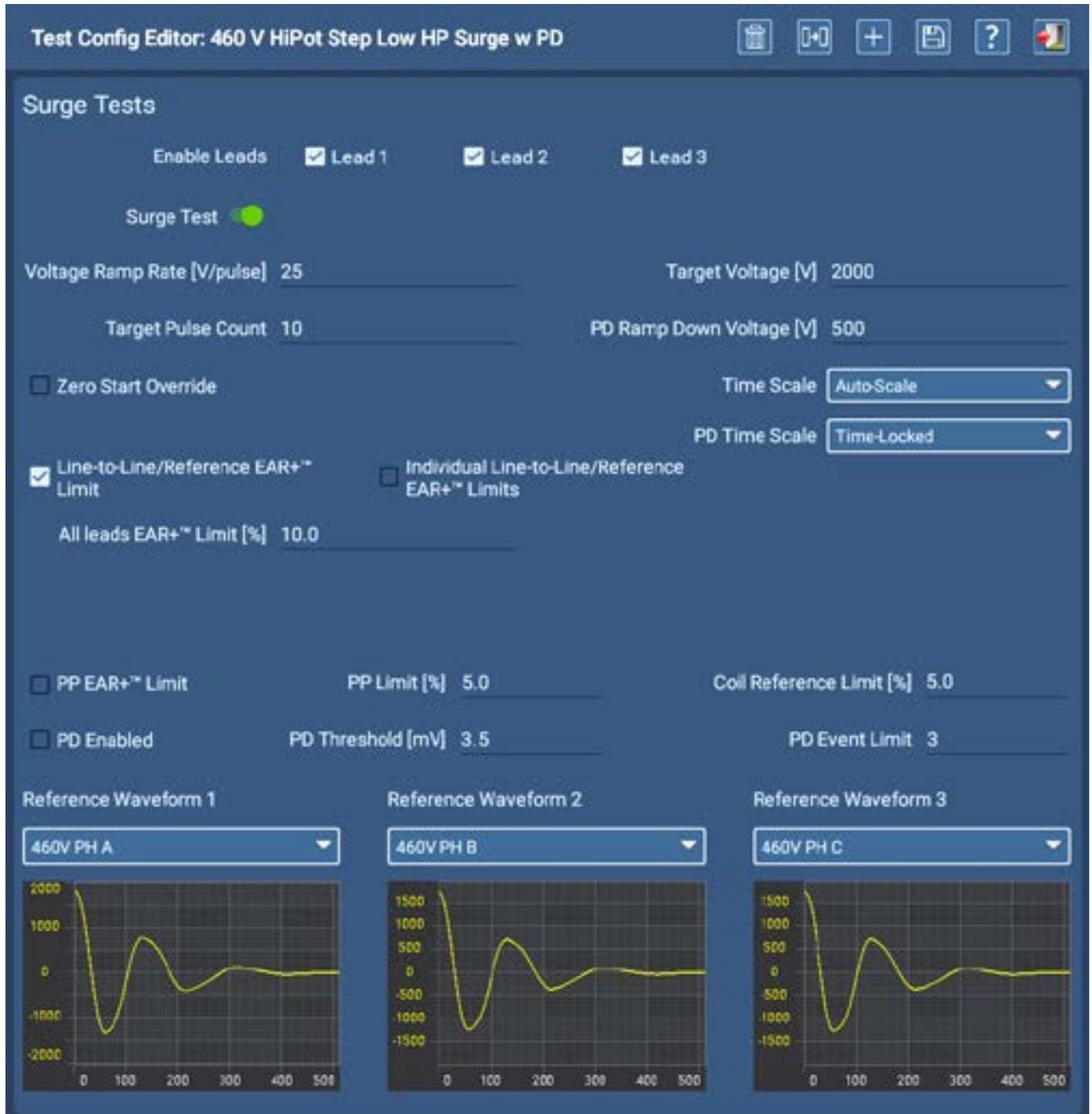
Fig 47: *Test Configuration screen; RLC section.*

The ADX allows you to select up to three reference waveforms for your surge tests. Due to potential differences between phases, each reference waveform should be assigned to a specific phase (A, B, or C) of a known good Asset to ensure that each waveform for the device under tests is compared to a valid reference. If you use only one surge reference, it will be applied to all surge waveforms collected.

If you create a test configuration for single coil testing, two references can be used—one for each direction.

Table 5: *Surge Tests section field descriptions.*

Field	Description
Surge Test	Slide right = test enabled.
Enable Leads	Check each box to enable Surge testing on the associated test leads.
Voltage Ramp Rate [V/pulse]	Defines the increments in volts per pulse that the tester will ramp to the target voltage.
Target Voltage [V]	Target voltage level; max voltage for test. Commonly, 2 x nominal + 1000. Refer to "Appendix D — Recommended Test Voltages" to determine the proper voltage level for your Asset.
Target Pulse Count	The number of pulses applied to the winding after the defined test voltage is reached; number of pulses applied to complete the test. A value in the 10–15 pulses range is common.
PD Ramp Down Voltage [V]	During PD testing, the software tests for inception voltages during ramp up and extinction voltages during ramp down. The ramp down voltage is the level at which PD testing can stop. Set it at a level below which extinction voltages will not likely be detected. Note that setting the ramp down voltage too low could result in an increase in PPEAR near the end of the test. This increase could create a false trip. The software does not allow a value below 250 volts.
Zero Start Override	Checking this box disables the zero start feature (voltage output begins at zero volts) and allows the tester to apply full output voltage to the unit under test. The feature is used in situations where you want to apply a higher voltage to a unit under test without ramping up. For example, you might test an initial single coil, ramping up to the target voltage, then select ZS Override and apply the same voltage level to subsequent identical coils.
Line-to-line EAR Limit	Checking this box, only one limit is set for all three leads. Commonly used when testing stators that have very low line-to-line EAR by design.
Individual Line-to-Line EAR Limits	Check this box when you want to set individual limits for each phase-to-phase comparison.
1-2 EAR Limit [%]	EAR limit for line 1 to line 2; comparison between line 1 and line 2. Sets the maximum Line-to-Line Error Area Ratio (EAR) allowed between the different leads. This is often set to 10%; however, some customers have found settings as low as 4% to be useful.
2-3 EAR Limit [%]	EAR limit for line 2 to line 3; comparison between line 2 and line 3.
3-1 EAR Limit [%]	EAR limit for line 3 to line 1; comparison between line 3 and line 1.
PP EAR+ Limit	Checking this box turns on the Pulse-to-pulse EAR limit. This limit should always be turned on because it provides instantaneous protection for insulation during the surge test.
PP Limit [%]	Use this field to set the maximum Pulse-to-Pulse Error Area Ratio percentage allowed for the test.
Coil Reference Limit [%]	When set, enables pass/fail criteria when comparing the surge waveforms from the test to a previously stored reference waveform.
PD Enabled	Checking this box enables partial discharge testing. PD test elements appear in the Surge test screen.
PD Threshold [mV]	Defines the amplitude at which a high-frequency transient (PD Event) is counted towards the PD Event Limit.
PD Event Limit	Defines the cumulative number of PD Events during each surge pulse required to constitute a PD surge pulse. When the number of PD Events exceeds this limit, a PD surge pulse is detected.
Reference Waveform 1	Select reference waveform 1. Stored reference waveform for phase A; line 1–2.
Reference Waveform 2	Select reference waveform 2. Stored reference waveform for phase B; line 2–3.
Reference Waveform 3	Select reference waveform 3. Stored reference waveform for phase C.; line 3–1.

Assets

Assets are typically motors used to run machinery within your organization. The ADX system is built around assets because they are the devices that will be tested.

When the system is set up, assets are created and associated with test configurations, sequences, and installations. In turn, installations and assets are used to build routes.

Asset screens can be accessed from any main menu screen by touching the ASSETS icon.

Fig 48: *Accessing Assets screens from a main menu.*

Browse and Search Mode Tools

Before you can select an asset, you need to find the particular asset you want to test from among the many assets stored in your system.

The right half of the screen provides SEARCH MODE and BROWSE MODE tools to help you find an asset.

The main list on the left displays the results of the search criteria specified. The list can include assets or other dynamic directories that contain assets meeting the specified criteria.
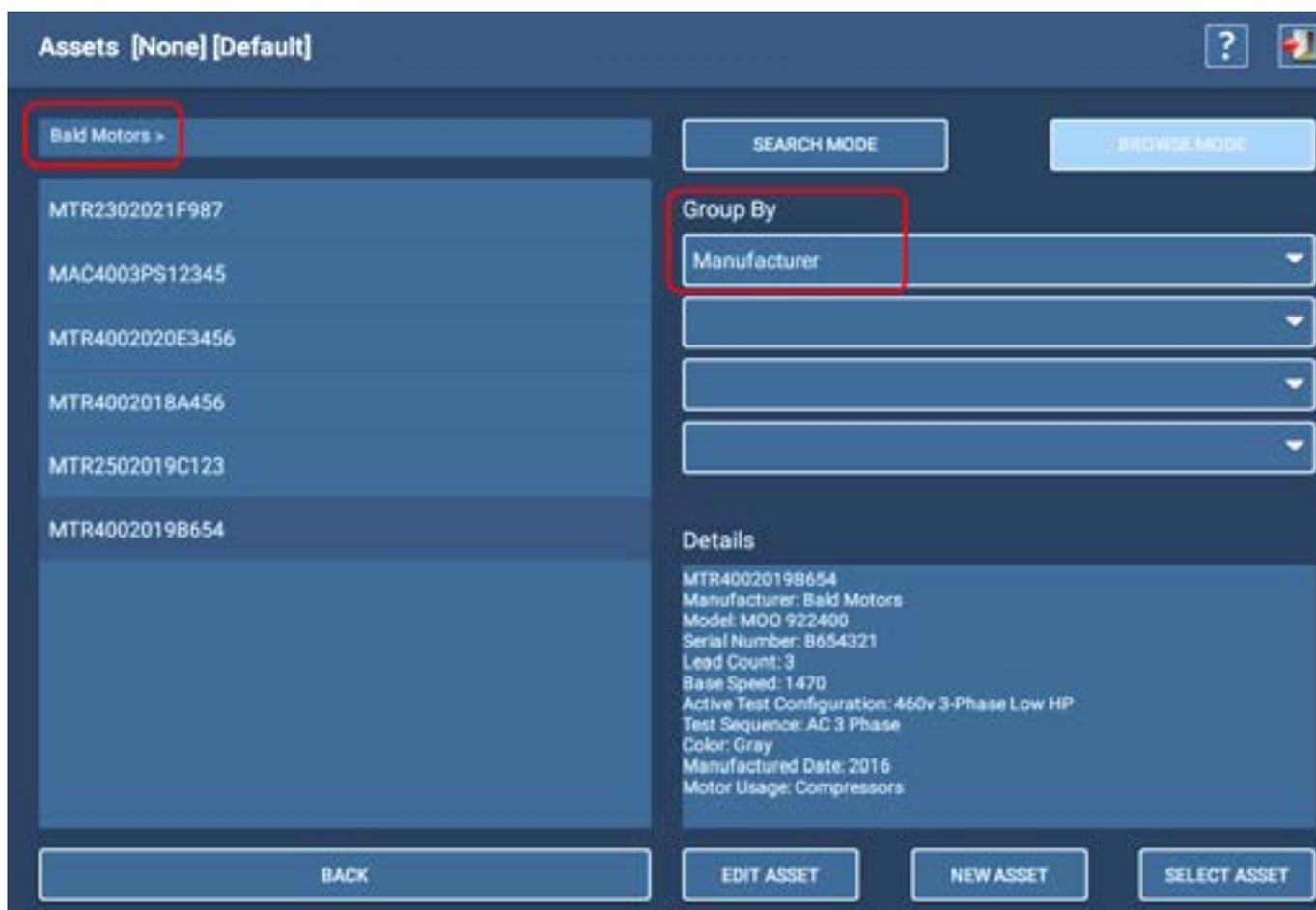
Fig 49: *Selecting an Asset; Browse mode.*

Browse Mode helps you refine your database search by creating smaller inclusive groupings based on the user-defined criteria presented in the Group By drop-down lists. Criteria can include characteristics such as manufacturer, model, output power, and more.

The Group By lists come from common nameplate fields defined during the asset creation process, along with attributes created during that process.

As each criterion is entered, the characteristics are combined to refine the search and the list to the left updates accordingly. Depending on the criteria used in filtering, the top-left field can display a path that the software dynamically builds as you use the Browse tool to locate the asset you want to test.

In the example above, Manufacturer was selected in the Group By list, which produced a list of manufacturers. Bald Motors was selected (shown in path line) then the asset list updated as shown above.

As the Assets list builds, use the BACK button below the list to step back one level at a time within the path presented. You can then change the grouping as needed to refine or redirect your asset search.

Using Search Mode, select search criteria from the drop-down lists provided to filter through the database by characteristics such as manufacturer, model, output power, and more. The Search Criteria lists come from common nameplate fields defined during the asset creation process, along with attributes created during that process.
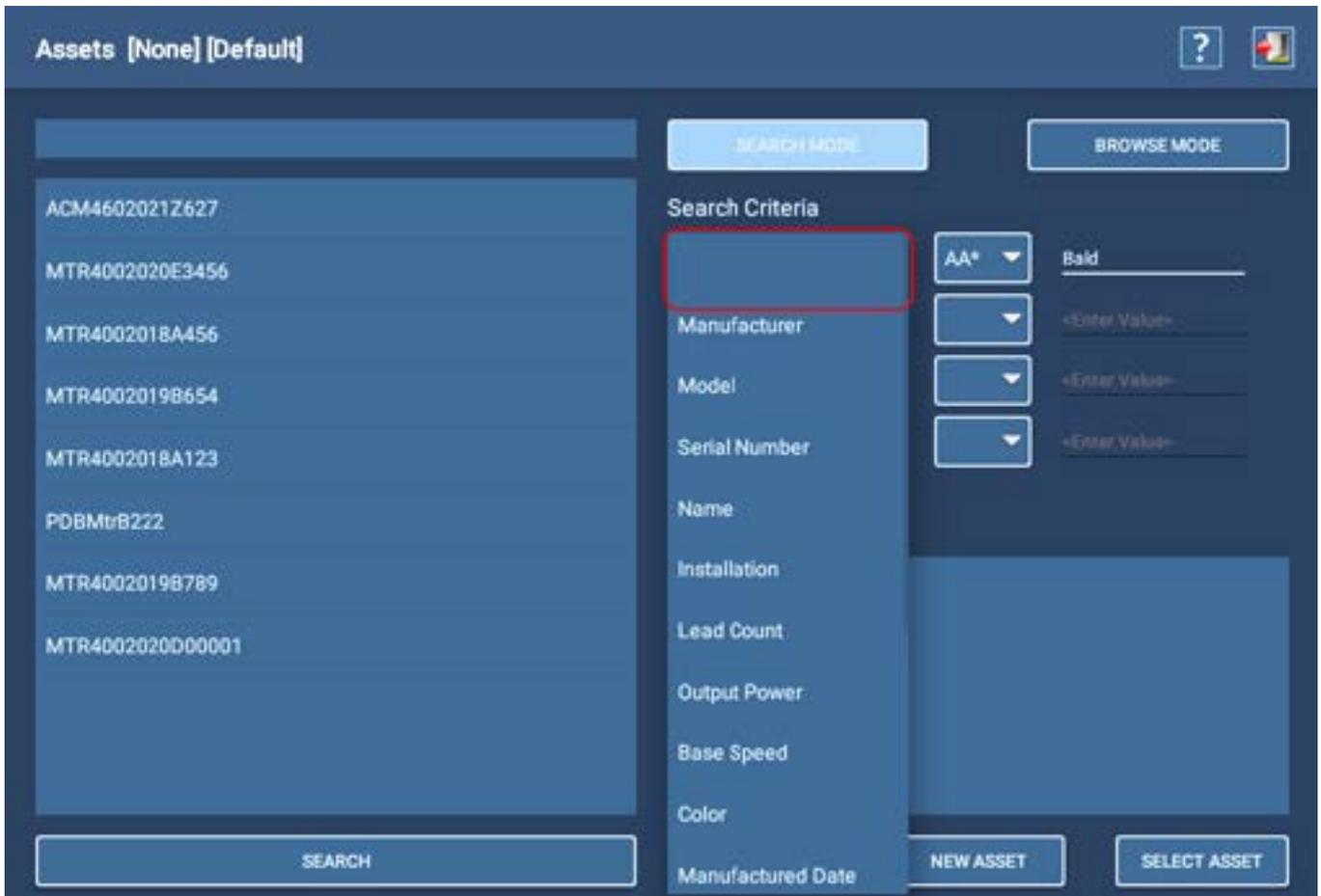
Fig 50: *Selecting an asset; Search mode.*

Search mode has type-ahead capability—as you type, the software filters the list to display items that contain the characters entered.

> NOTE: To clear a Search of Browse field, open the Search Criteria list then select the top (blank) row as shown in the image above.

As each criterion is selected, mathematical operators relevant to the selected data type appear in the adjacent drop-down list. You then need to enter a value in the third column to complete the conditions for the criterion. Values entered in this field are case-sensitive. You can add criteria as needed to further refine the search.

In the example above, the operator AA* means: Find values that start with matching characters up to the asterisk (*) and any or no characters following.

Similarly, *AA means: Find values that end with the matching characters.

!= Means: Not equal to. Standard operators are used for other search criteria.

Selecting Assets

In best practice, the first step in any testing process is selecting an asset.

1. Using the preferred tool described above, locate the asset you want to test.

2. Tap on the asset to highlight it in the list. Information about the asset appears in the Details section. Information can include nameplate content, test sequence assignment, and attributes assigned to the asset. Note in particular the Active Test Configuration assigned to the asset.

3. The selected asset name and its active test configuration will be identified at the top of the screen here and in the screens you use when testing.

4. Press the SELECT ASSET button to select the asset for testing.

5. If you want to edit the asset or create a new one, press the appropriate button for those functions.

6. When you have selected the asset you need, press the EXIT icon in the top right corner of the screen to exit the Asset Select screen and return to the previous screen.
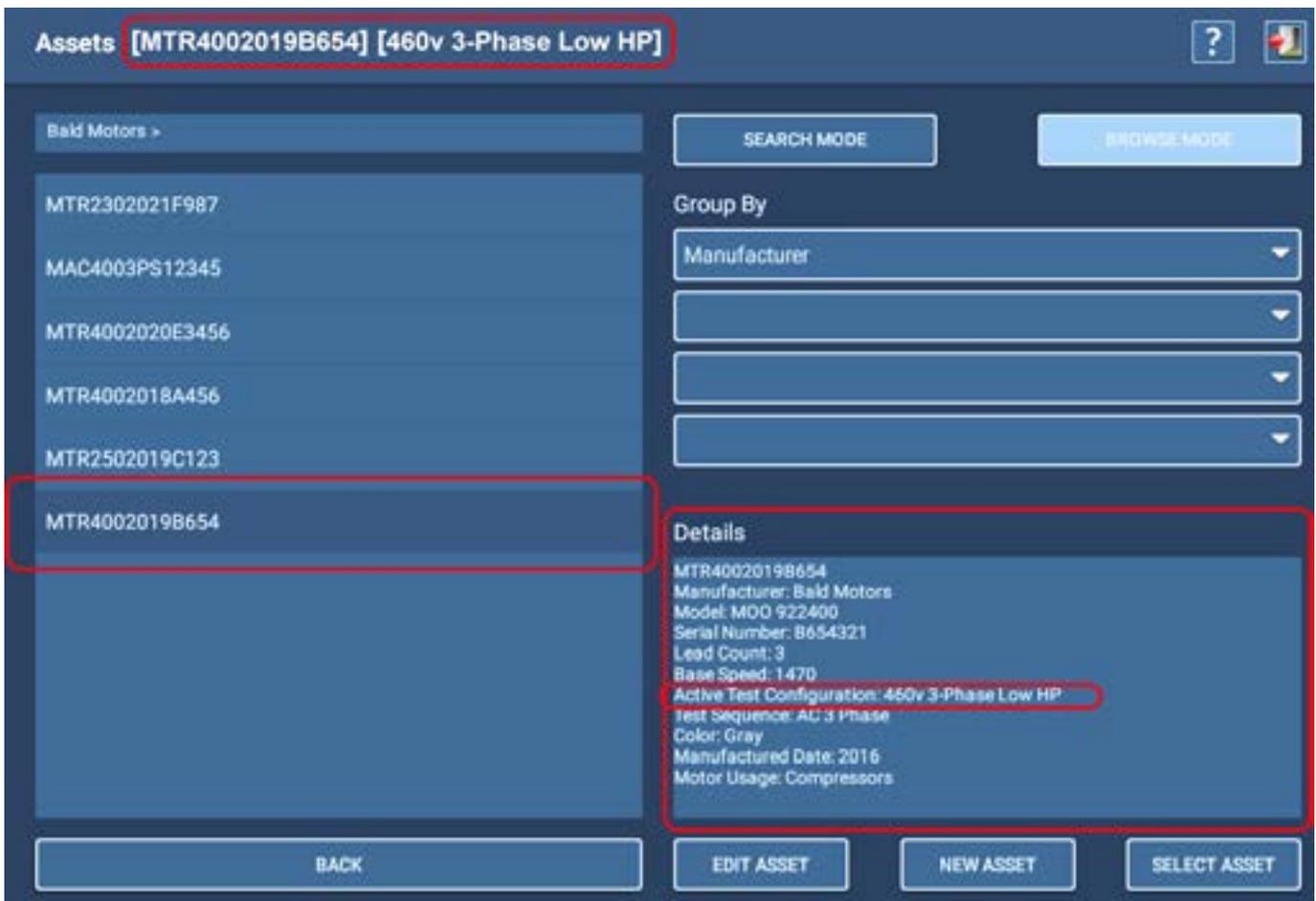
Fig 51: *Selecting an asset; Browse mode.*

Adding and Editing Assets

The process for creating a new asset starts by pressing or clicking on the NEW ASSET button in the Asset Selection screen. (Editing an existing asset also starts in the screen by locating and selecting the Asset you want to edit then pressing or clicking on the EDIT ASSET button.)

Assets descriptions include Asset Type and Sub-type, typical fields associated with nameplate information, and custom fields called *attributes* that can be added to fit your organization's needs.

Test configuration and sequence are also assigned to the asset using the Asset Editor screen.

Defining the Asset Type and Sub-type determines which labels will be used in the screen to collect asset information. In the following example, AC 3 Phase Induction motor is selected, so the resulting fields are labeled for data most commonly found on the nameplates for this Asset Type.

After defining asset values in the upper section, you can add notes describing the asset's typical usage, motor status, or other information that can be useful for normal applications or testing.

Fig 52: *Asset Editor: Asset Type and Sub-type with nameplate information.*

Winding Configuration

When defining asset specifications, one of the parameters is Winding Configuration: how the motor is wound (Wye or Delta). The nameplate can have information that shows how wires are (or can be) connected. Those values, when applied to a reference document (such as motor specifications or common motor testing handbooks), can show what the wiring configuration is.   Enter to Wye or Delta in this field as appropriate.

Creating a New Asset

> 💬 NOTE: There are two ways to create a new asset: starting with a blank New Asset form or copying an existing asset.
>
> Copying an existing asset is an efficient way to create multiple assets of the same type and general description. That process is covered later in this chapter in "Copying an Asset."
>
> This section addresses creating a new asset using the blank New Asset form.

1. Click on the ASSET icon in any main menu.

2. Press or click on the NEW ASSET button in the Asset Selection screen.

3. Select the Asset Type and Sub-type then enter a name for the asset in the Asset Name field.

4. Press the SAVE icon near the top right to add the new asset to your database, but do not exit the screen.

5. Continue entering nameplate information into the appropriate fields then enter notes about the asset to expand its description as needed.

Fig 53: *Asset Editor screen; selecting AC Asset Type and entering related nameplate data.*

Assigning Sequence and Test Configurations

1. Scroll down to the next section then select the Test Sequence from the drop-down list if the asset will use a sequenced test. Sequenced tests are fully-defined sets of tests that run automatically in Sequence mode.

2. In the All Test Configurations list, touch or click on each test configuration that you want to include in the list of available test configurations for this asset. A check mark appears in the configuration's row to let you know which configurations will be added to the list of tests that can be run on the asset.

> NOTE: The Test Configuration drop-down list that appears within the Test Initiation screen before running automatic and sequenced tests contains the list defined at this time. Operators can change the Test Configuration if needed for a particular testing session using this list.

3. Use the Active Test Configuration drop-down list to select which of the previously enabled test configurations will be the default configuration used when the asset is selected.

> NOTE: At least one test configuration is required for assets that will be tested in Automatic or Sequence modes. Assets that will be tested in Sequence mode must also have a sequence assigned.

Fig 54: *Asset Editor screen; selecting Test Sequence and Test Configurations.*

Assigning Attributes

At the bottom of the Asset Editor screen, tools are provided to create Attributes for the asset and to add images to the asset that will appear within a sequenced test.

The software allows you to assign attributes to assets, which can later be used to help locate assets via the Asset screen Search and Browse tools. Attributes created here become part of the parameter lists applied by these tools in the Asset Selection screen as the following example illustrates.
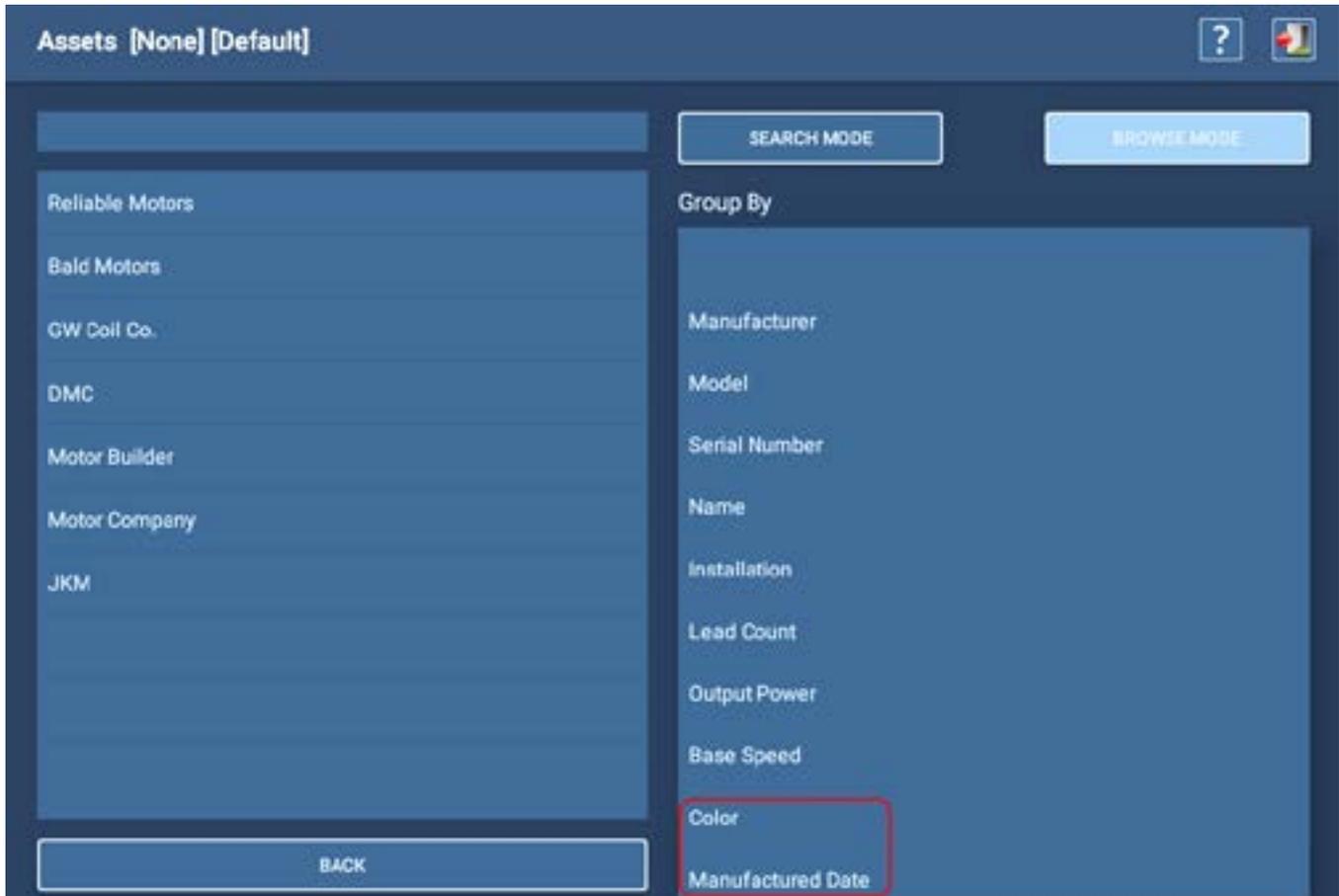
Fig 55: *Assets Selection screen showing user-defined asset attributes.*

NOTE: Attributes created during the asset creation process are included in the test results for the asset. When test events and results are sent to PowerDB Dashboard, attributes are available for filtering and data analysis applications within that software environment.

1. To the left of the Add Attribute button are two fields. Click on the arrow to the left of the first attribute field to open a list of existing attributes. If the attribute you need already exists, select the attribute then enter the value in the adjacent field. For example, if your organization uses Assets for multiple applications, a "Motor Usage" attribute can be added along with the values that apply.

2. If the attribute you need is not found in the list, type the name of the new attribute directly in the first attribute field.

> NOTE: Be careful when creating new attributes so that you do not create a duplicate or near-duplicate attribute. Refer to "Naming Attributes" below for more information on the issue.

3. Other examples might be Motor Status, Asset Color, Last Service Date, and Manufactured Date.

> NOTE: Attributes assigned here are specific to the asset. They can include anything that adds value for searching for an asset; however, they typically do not include attributes that are relative to *Installations*. Installations can also have attributes assigned as discussed later in this chapter. If you do not use Installations, those types of attributes could add value by assigning them to assets.
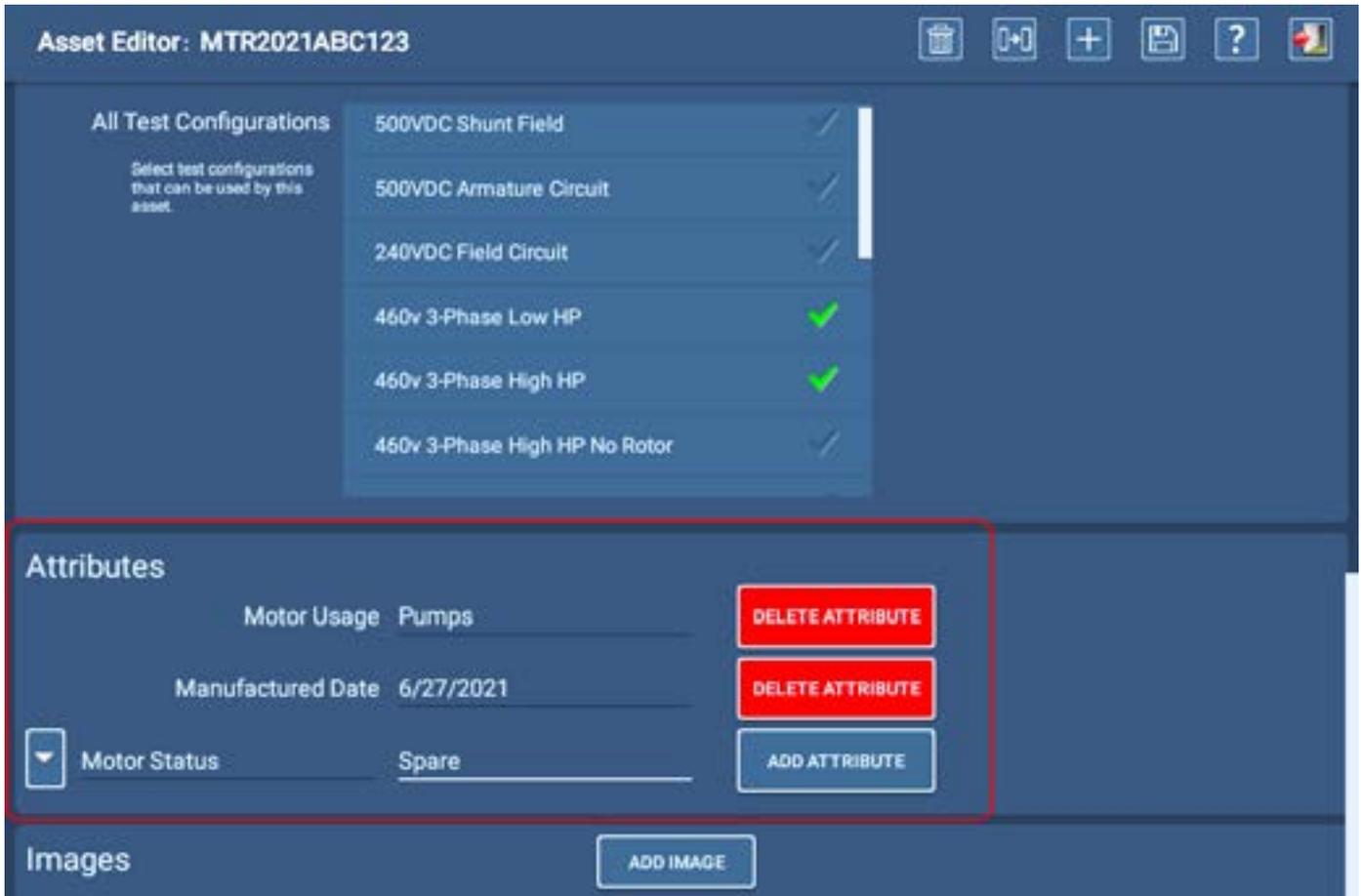
Fig 56: *Asset Editor screen; creating new attributes.*

The number of attributes that can be added is limited only by the practical application. Because attributes are used as filtering parameters when using the Browse and Search mode tools, assigning specific attributes that will help narrow the search is the more practical use of the feature.

If you need to remove an attribute for any reason, click on or touch the Delete Attribute button to the right of the attribute to be deleted.

Naming Attributes

When attributes are created, you need to be careful about how they are named because small differences will result in a "near duplicate" attribute being created, which will reduce the efficiency of using attributes with the Search and Browse tools.

In the example Installation Selection screen shown below, examples of two attributes—building and location—each have duplicate entries simply because one user preferred capitalizing the attributes while another preferred using lower case. Extra spaces at the end of an attribute name can also create a duplicate entry that looks identical to the original.

In most cases, using the arrow to the left of the attribute field in the respective editor screens to open a list of existing attributes will help reduce duplication issues.
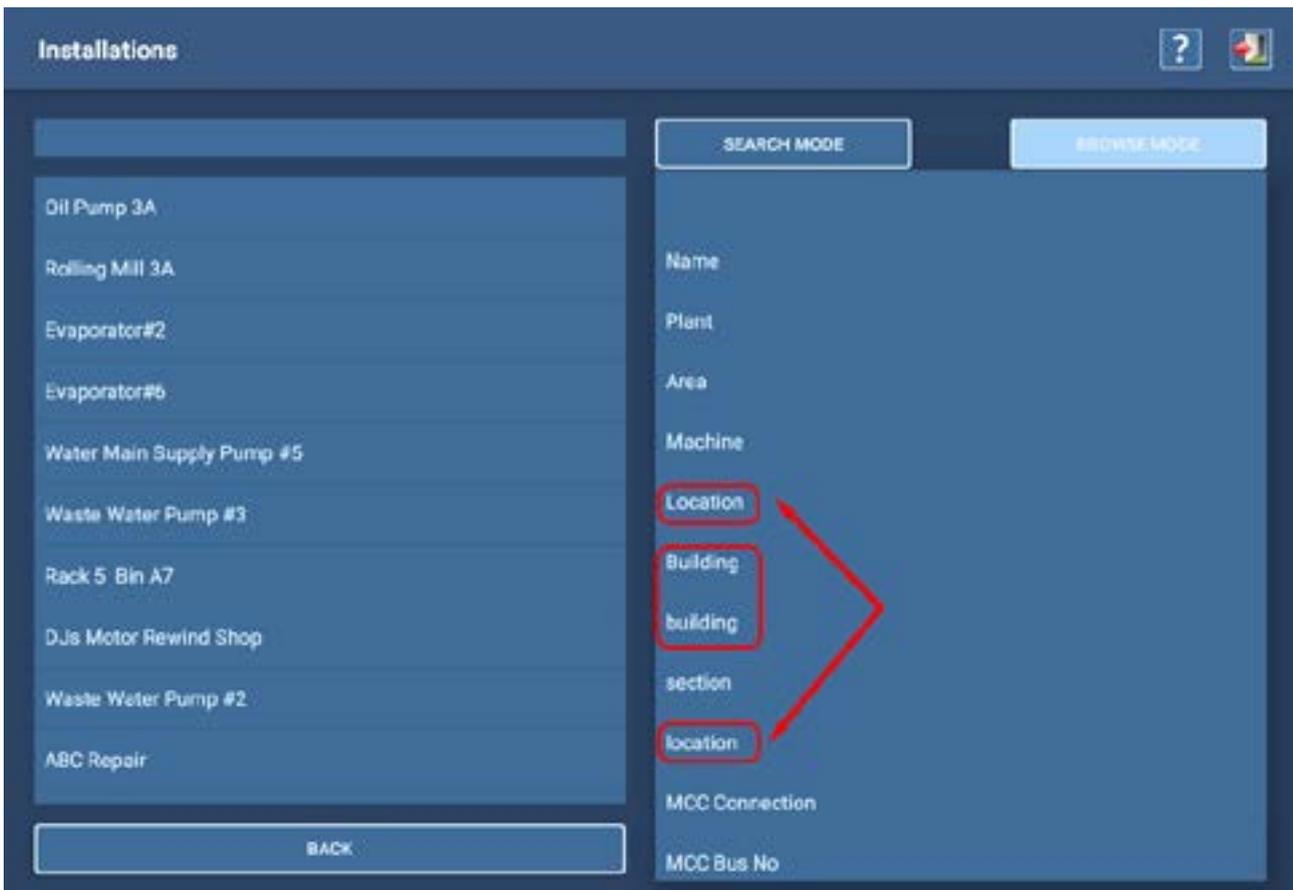
Fig 57: *Installations screen showing examples of duplicate attributes.*

Adding Images

Creating asset images might include taking a picture of the asset with test leads connected, or taking a picture of the asset's connections within the switchgear. You can also capture screens from a PDF or other document that contains relevant information. You can also create image files from MS PowerPoint slides that contain information you want to convey to operators prior to testing.

Common file formats include .png and .jpg, which are typically smaller in size. Use the smallest possible file size to avoid filling the database too quickly.

> NOTE: MS PowerPoint slides can be saved as image files, so you can easily import them for use with Sequences or Assets.

1. Just below the Attributes section, the Images section allows you to add up to two images of the asset that can be used to help with identification, test lead connection, and more.

2. These images appear early in the testing process when a Sequence Test is used.

3. With the asset-related image(s) stored on a USB drive, plug the drive into one of the ADX USB connectors on the front panel.

4. Click on the ADD IMAGE button to open a new screen in which you can select an image.
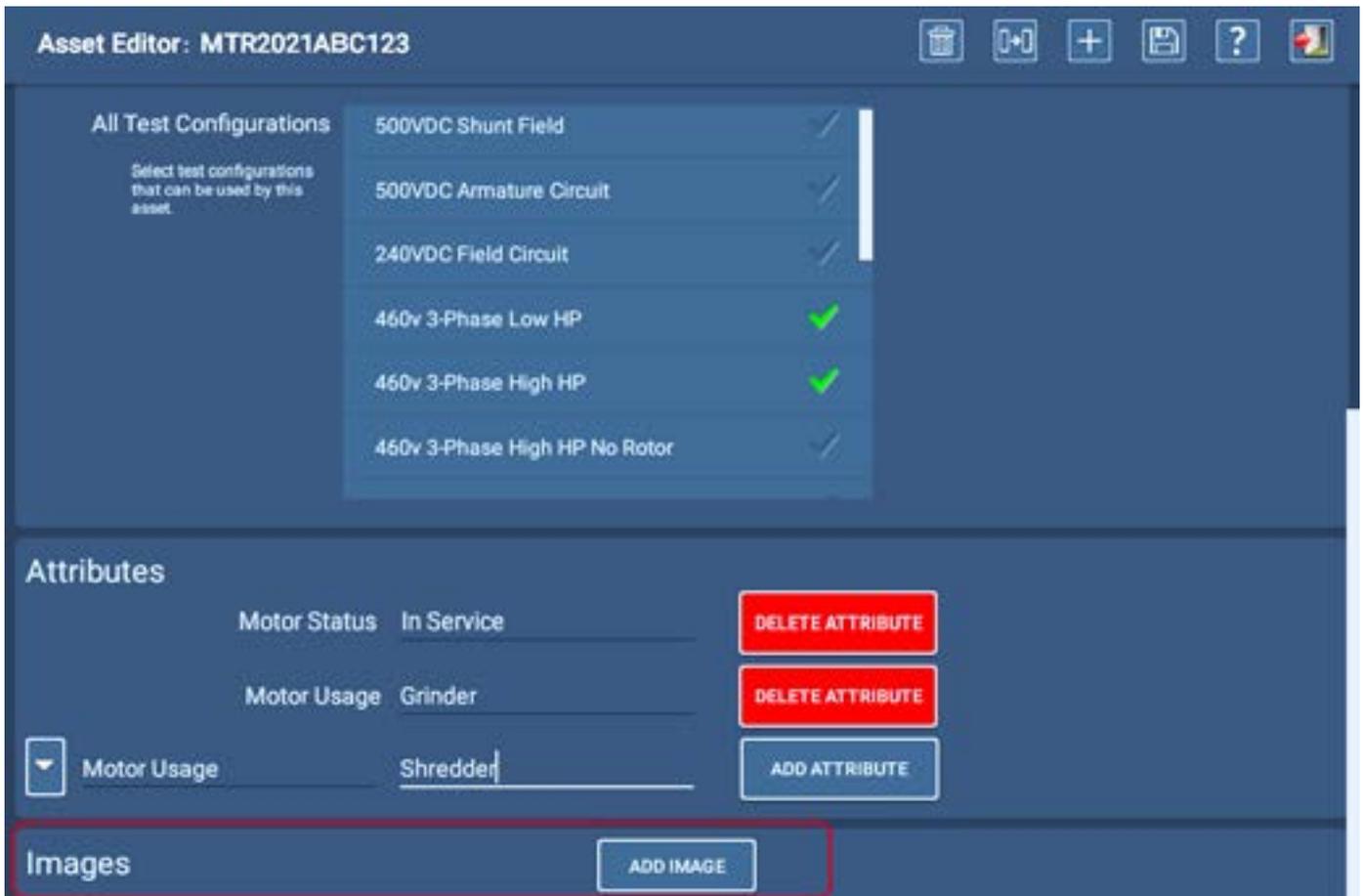
Fig 58: *Asset Editor screen; adding images.*

5. The software takes you directly to the USB drive contents list. You might need to select folders within the drive depending on how you originally structured your files.
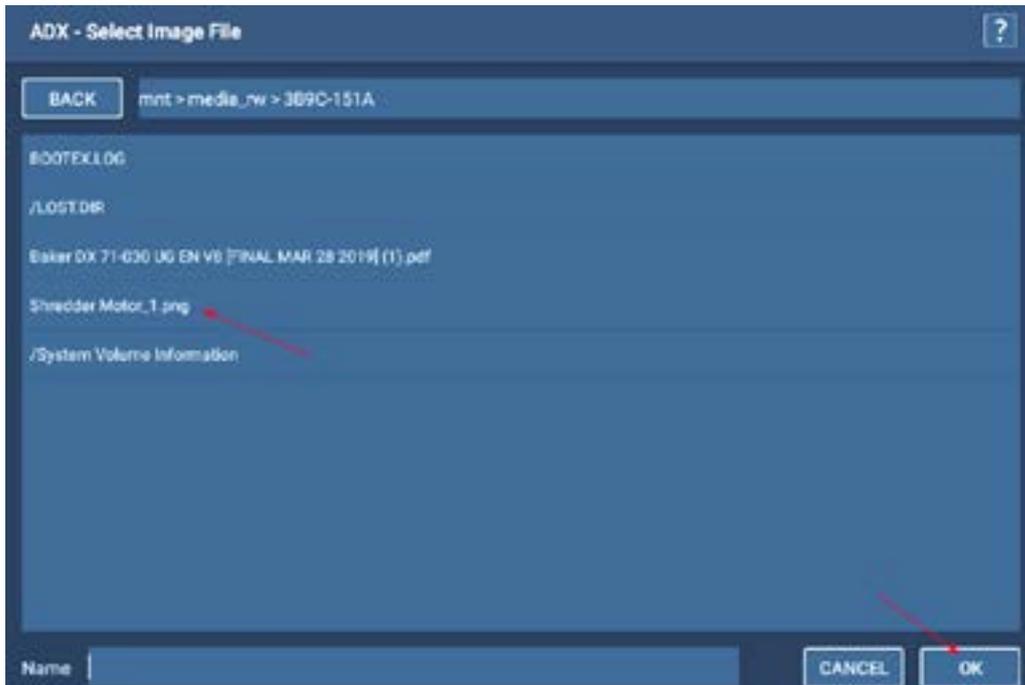
Fig 59: *Selecting an image to add.*

6. The following example shows an image added to the Asset being edited. These images appear within Sequenced tests (as addressed in the "Test Sequence" section found below), describing connection and physical aspects of the Asset. You can add up to three images for each Sequenced test.
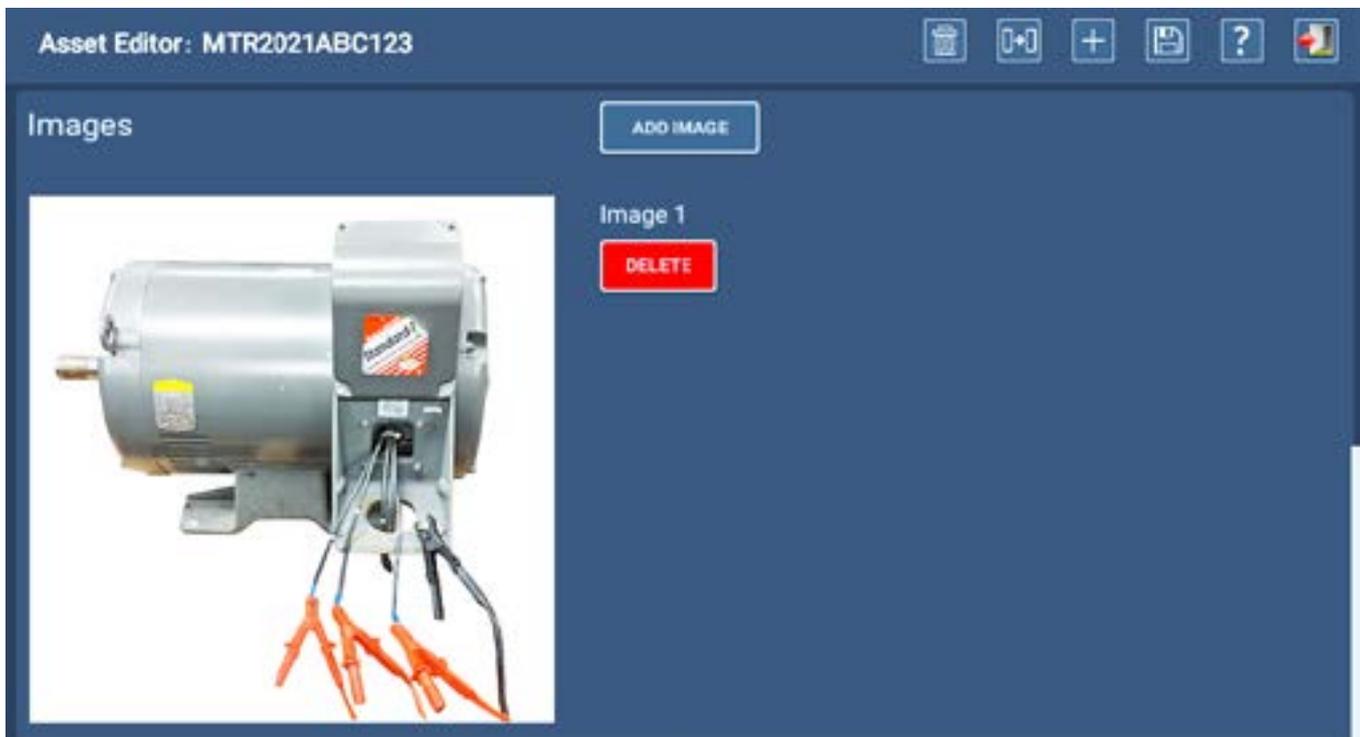
Fig 60: *Image added to selected Asset.*

Editing an Existing Asset

1. Click on the ASSET icon in any main menu.

2. In the Asset Selection screen, locate and select the asset you want to edit.

3. Press or click on the EDIT ASSET button.

4. In the Asset Editor screen, revise the asset as needed.

5. Press the SAVE icon at the top of the screen to commit your changes.

6. Press the EXIT icon to leave the Asset Editor.

Copying an Asset

1. Click on the ASSET icon in any main menu.

2. In the Asset Selection screen, locate and select the asset you want to edit.

3. Press or click on the EDIT ASSET button.

4. Press the COPY icon at the top of the screen. The software will clear the Asset Name field/replace the name of the selected Asset with "New Asset" in the Asset Name field, but it will retain all other elements of the originally selected asset including sequence and test configuration assignments.

5. Enter a name for the new asset in the Asset Name field.

6. Make other changes to the asset as needed then press or click on the SAVE icon to save the new asset to the database.

Fig 61: *Asset Editor: copying an existing asset.*

Test Sequences

Main Menu—Sequenced Tests

The Sequenced Tests screen provides tools to add images to test sequences, execute routes, and run fully automated tests on a selected asset.

Common controls help you select assets to test, generate reports on test results, and log out of the application.

Depending on the role and permissions assigned to a specific user, some of the options might not be accessible. Accessing Test Sequences is restricted to users with proper permissions.

Fig 62: *Sequenced Tests main menu.*

Test Sequence Selection

Test Sequences are predefined descriptions of the steps and processes that a fully automatic (sequenced) test follows when executed. They convey safety and connection messages to prepare the user for the test, along with defining the types of tests that will be run on the asset.

Sequence can include installation-specific pictures, general information that you want to include in all testing (such as Job Safety sheets), or other reminders that could benefit all of your operators.

A simplified example sequence is shown below.

Images added when editing a Test Sequence appear within the sequence as "Safety" elements as shown in the example below.

Images added when editing an asset appear within an assigned sequence as the three "connection" elements as shown in the example.

As the graphic illustrates, up to three images can be added to the Safety and Connection groups..
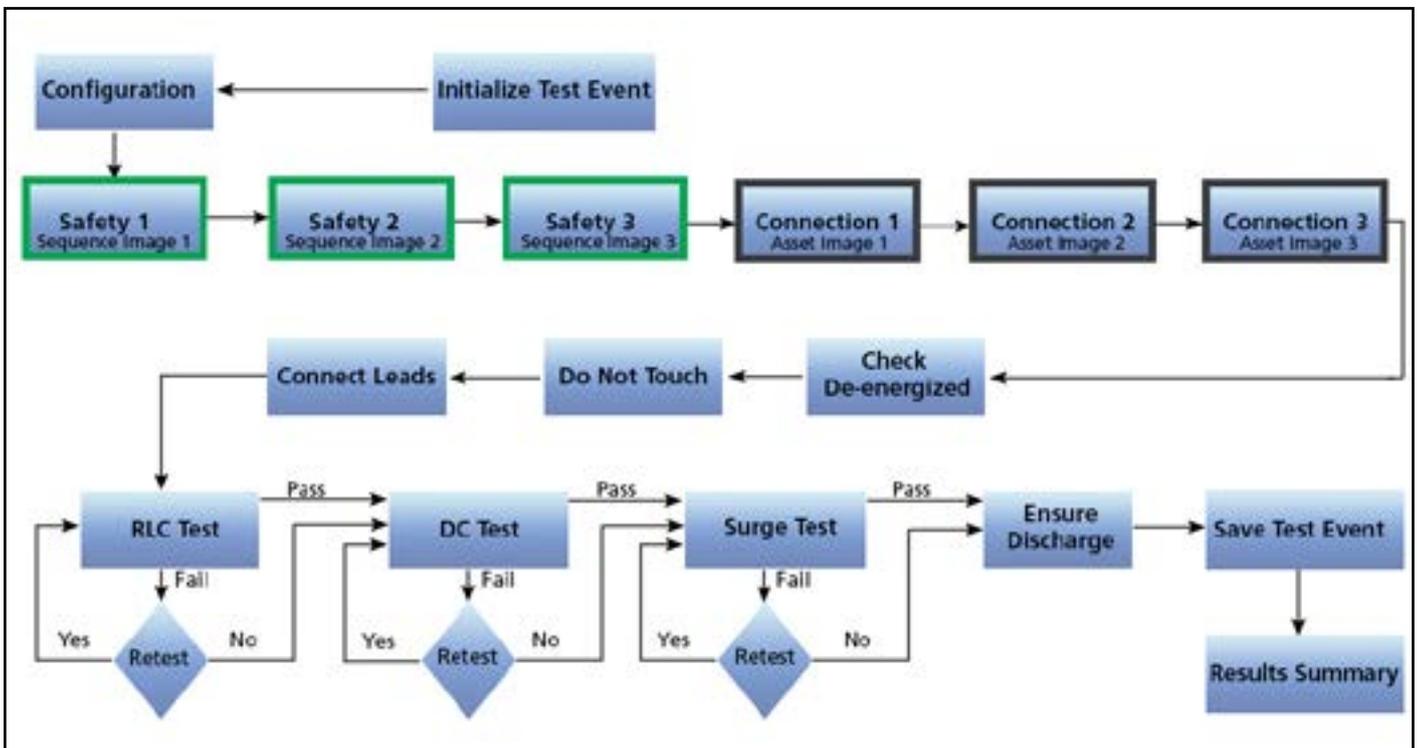
Fig 63: *Simplified Test Sequence showing positions of Sequence and Asset Images.*

The sequences are created and managed by Megger Baker Instruments. If you need additional sequences besides those provided as the standard set with the ADX, or if you need modifications to current sequences to better fit your organization's needs, please contact Megger Baker Instruments for assistance.

> NOTE: A number of graphical Safety and Connection messages that address common topics are built into the sequences. Images added to the Asset or Sequence from within the ADX software are added to these built-in messages and are typically specific to the Asset being tested.

The Test Sequence Selection screen displays a list of the Test Sequences available in the system.

The Single RLC, Single DC, and Single Surge are the test sequences that the system uses for Automatic Tests mode. When you go to Automatic Tests and execute a specific test type, the software uses the "Single" sequence for that test type. You would not normally assign the Single sequences to a motor.

The other sequences in this list cover most common asset types, and you would assign them to an asset during the asset creation or editing processes.

Sequences vary in the types of tests run, the order in which tests run, the connection steps needed to properly test Assets, and the messages conveyed to safely guide operators through the process. Assigning the proper sequence to the related asset is important to ensure that all aspects are optimally aligned with the asset being tested.
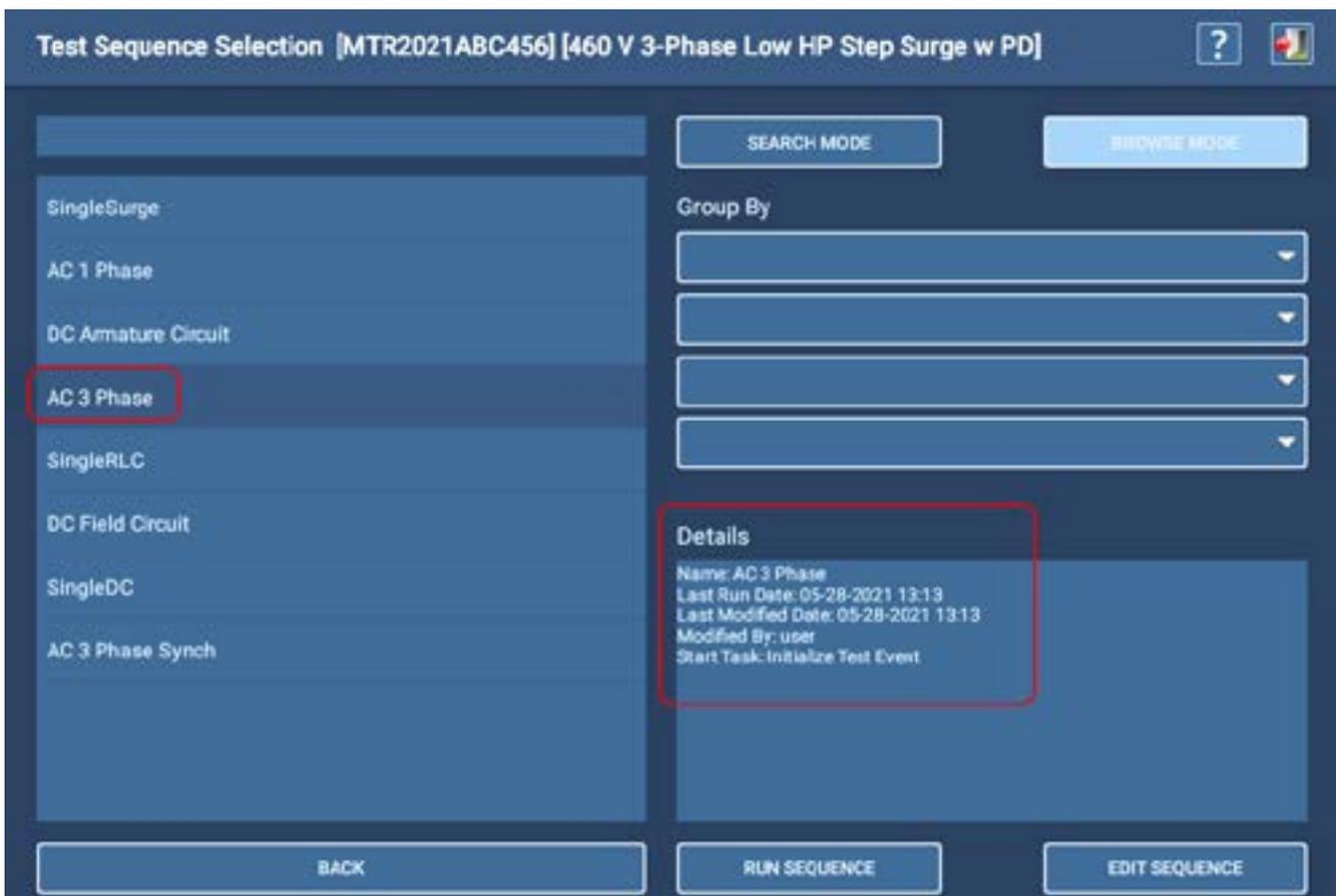
Fig 64: *Test Sequence Selection; selected sequence details.*

Editing a sequence within the ADX only involves adding images to the sequence. Such images typically include process or warning messages and graphics that should appear in the sequence.

1. To edit a sequence, touch a sequence within the list to highlight it. Information about the sequence appears in the Details section.

2. Press the EDIT SEQUENCE button to open a screen in which you can select images/photos to add to the sequence.

If you need modifications to current sequences to better fit your organization's needs, please contact Megger Baker Instruments for assistance.

As with other screens within the user interface, you can use either Browse or Search mode to locate a specific sequence.

Test Sequence Edit

Pressing the EDIT SEQUENCE button opens this screen. From here, you can select up to three images (graphics, photos) to add to the sequence.

Such images typically include process or safety messages. They appear in the Safety segments of a sequence as shown earlier in the example flow diagram.

Creating sequence images might include taking a picture of a Job Safety Analysis (JSA), or capturing a screen from a PDF that contains relevant information. You can also create image files from MS PowerPoint slides that contain information you want to convey in a sequence prior to testing.

Common file formats include .png and .jpg, which are typically smaller in size.

> NOTE: MS PowerPoint slides can be saved as image files, so you can easily import them for use with Sequences or Assets.
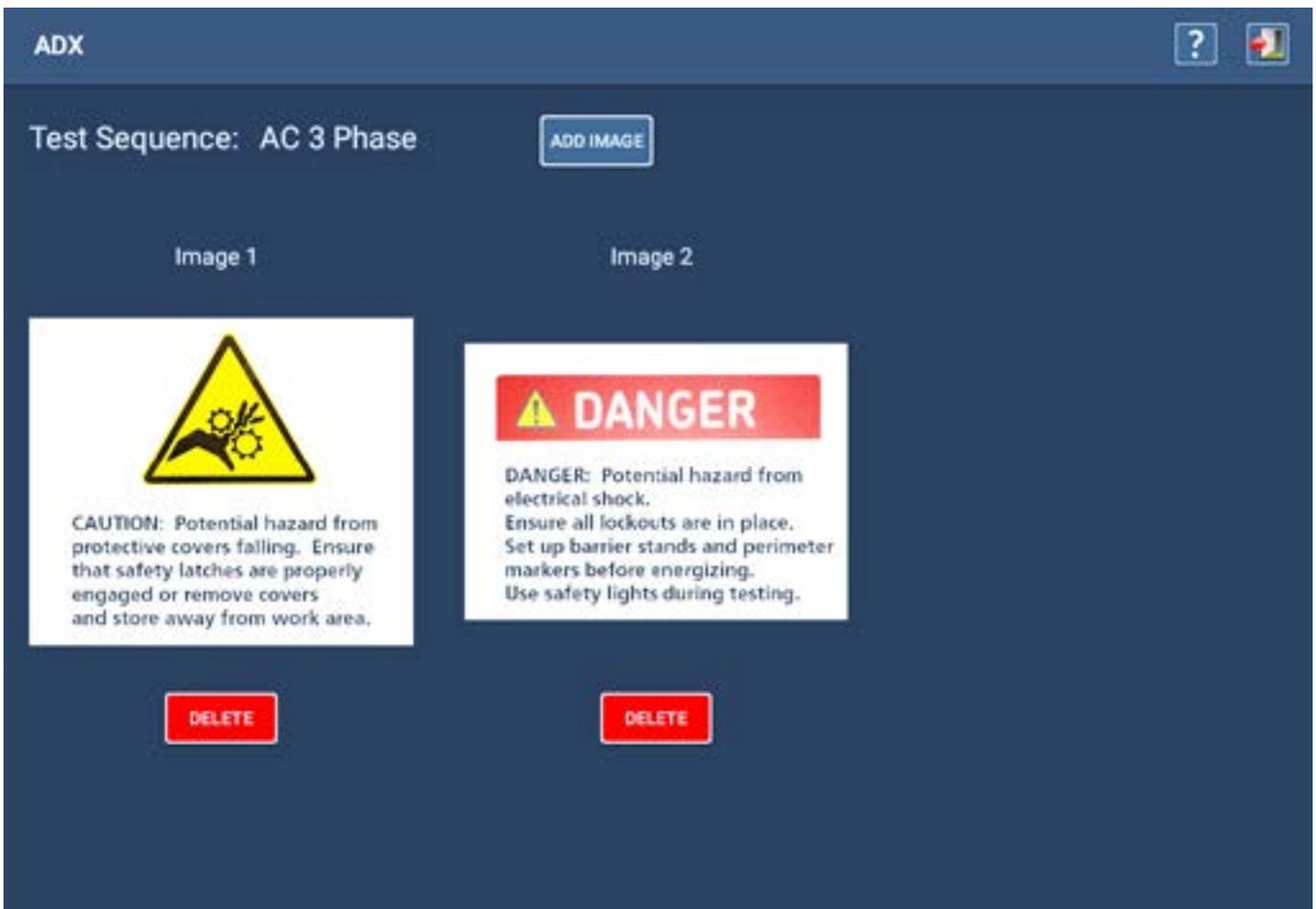
Fig 65: *Editing test sequence; adding images.*

Installations

Access the Installation Editor screen by clicking on the Installations icon in the SETUP main menu.

Use the Installation Editor to edit or copy existing Installations, or to create new ones. Icons at the top right of the screen (left to right) are used to: delete, copy, add new, save Installations, help, and exit the current screen.
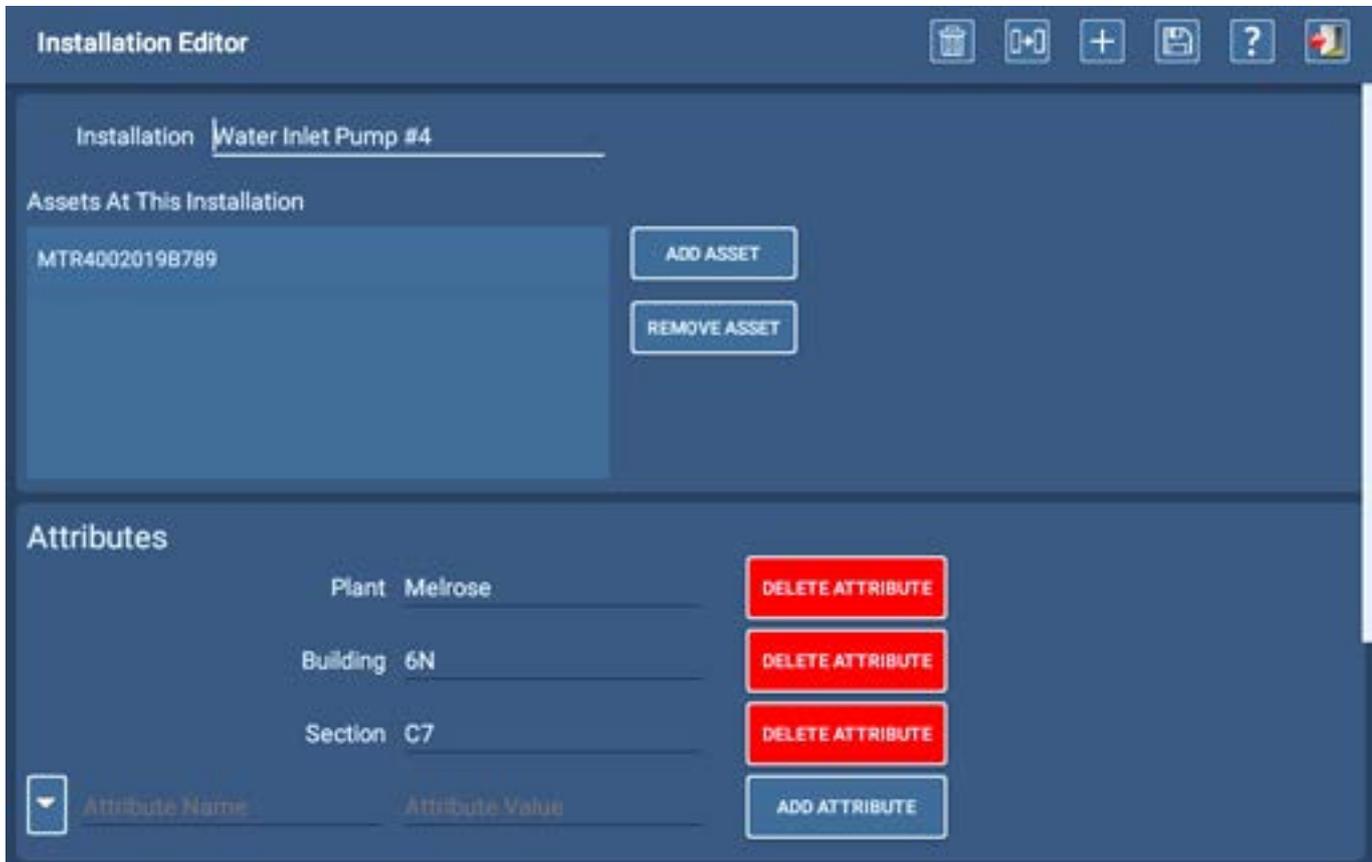
Fig 66: *Installation Editor screen showing installation with three location-type attributes.*

The Installation Editor is used to assign assets to specific *installations*, and to provide additional information—via attributes—about the installation. Attributes can provide more information about the installation's location, power supply characteristics, environmental conditions, and more. The attributes you assign will depend on your needs and preferences.

1. To the left of the Add Attribute button are two fields. Click on the arrow to the left of the first attribute field to open a list of existing attributes. If the attribute you need already exists, select the attribute then enter the value in the adjacent field. For example, if your organization uses location attributes such as Plant and Building, you can add these attributes to you installation as shown in the example above.

2. If the attribute you need is not found in the list, type the name of the new attribute directly in the first attribute field.

> NOTE: Be careful when creating new attributes so that you do not create a duplicate or near-duplicate attribute. Refer to "Naming Attributes" on page 61 for more information on the issue.

An asset is commonly a motor attached to a machine somewhere within the organization—that machine is commonly the asset's *installation*. Defining exactly where that machine (and its related asset) can be found is a primary role of *attributes,* but they can also be used to provide other installation details.

How installations are defined identifies the structure (and naming conventions) used by an organization. For example, a contracting maintenance company often needs multiple attributes to identify the specific installation of an asset: Customer Name, City and State, Plant or Address, Building, Section, and Line are examples of location attributes commonly assigned to installations. Depending on the organization performing the services, some or all of these attributes could be needed.

The example above shows that the selected Asset (MTR4002019B789) is assigned to the installation "Water Inlet Pump #4," which is the machine driven by the assigned asset. Attributes in the example include Plant, Building, and Section. These attributes appear in the Search and Browse lists used to find and select an installation within the software.

Focusing on location-type attributes for installations is common, but other attribute types can provide information that can be useful to operators or others within your organization. For example, some information could even be used for root cause analysis.

Table 6: *Attribute examples that describe environment, application, configuration, and more.*

Attribute	Potential Values	Description
Surge arrestors	Yes/No	Helpful to identify unique testing procedures.
Variable Frequency Drive	Yes/No	VFD's impose a unique stress on windings.
Power supply bus	Bus numbers, identifiers	
Motor control cabinet	MCC ID, location, connections	Identify the bucket for testing.
High moisture area	Yes/No	Aid in understanding leakage current characteristics.
Moisture	High/Nominal/Dry	More specific method of the above.
Plant criticality	1–5	Identify critical plant assets.
Re-order quantity	1–5	Related to a storage bin installation

> NOTE: When an asset is assigned to an installation, the installation's attributes are included in the asset's test records. Attributes are used in PowerDB Dashboard for filtering and potential analysis applications.

Re-assigning Assets

An asset can be assigned to only one installation, and the software keeps track of these assignments.

If you try to assign an asset to an installation, and that asset is already assigned somewhere else, the software displays a message alerting you that the asset is assigned to another Installation. The software will also ask if you want to move the asset to the new installation. If you answer "yes," the asset will be moved to the new installation.

If the installation is in a route, the software also automatically removes the asset from the original installation and assigns it to the new installation. Unless another asset is assigned to the original installation, it will appear within the route without an asset assigned.

Best practice is to replace the asset removed with a new asset then update the installation as needed.

> NOTE: Most installations will have just one asset assigned. However, installations such as a store room, service center, or warehouse can have multiple assets assigned.

Adding Images

Photos and other images of the Asset in its Installation can help personnel recognize the Installation of an Asset, and can provide insight into factors (accessibility, moisture, and other environmental conditions) that can affect testing. Add an image to the Installation by clicking on the Add Image button. A dialog box appears to help you locate the needed image.
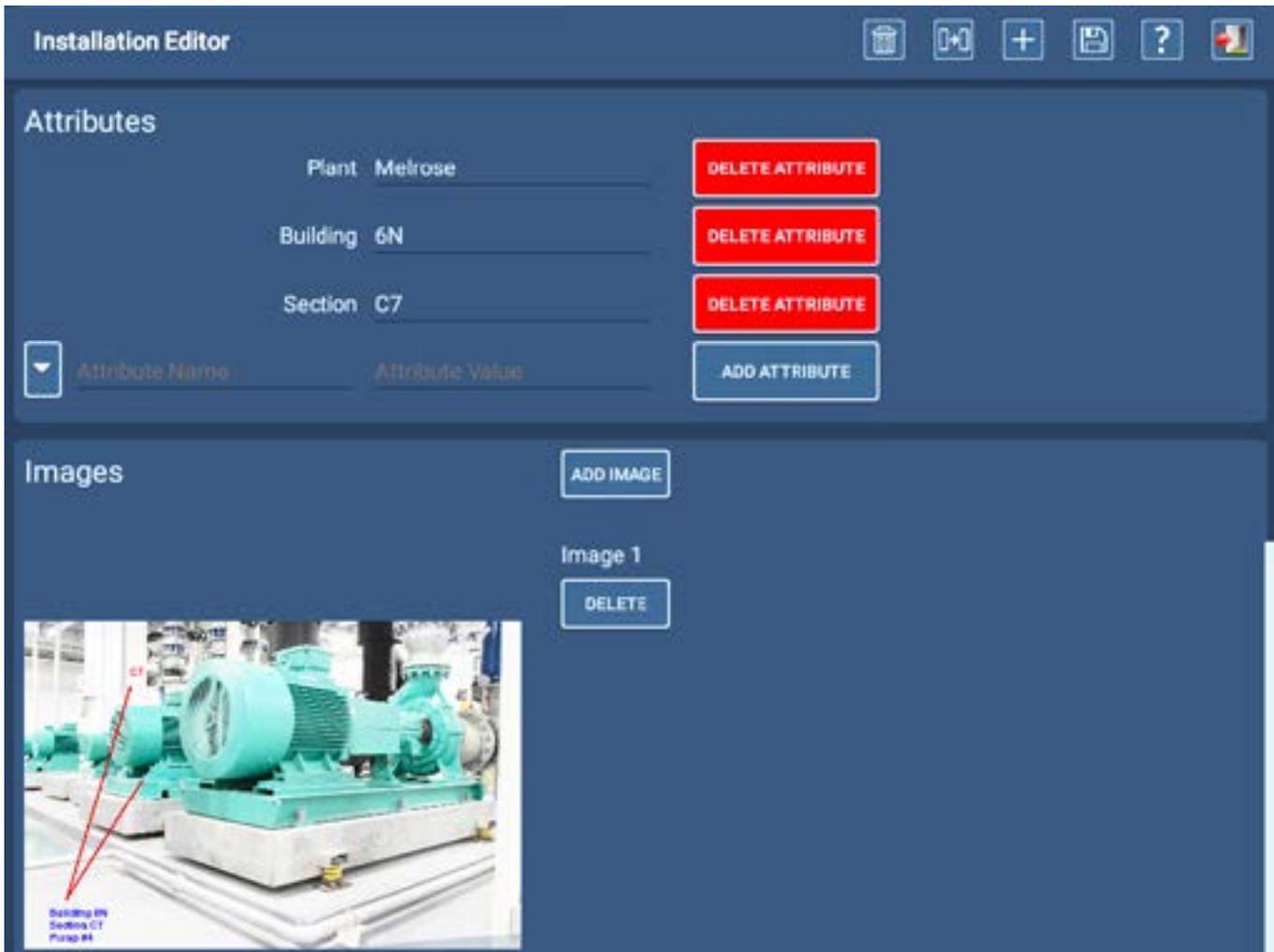
Fig 67: *Installation Editor screen; adding an image showing Assets in Installations.*

NOTE: At this time, Installation images are only seen within the Installation Editor screen, which operators can use to view the images to help in their search for the Asset and its environment. Permissions are required to edit the installation so that these images can be viewed.

Deleting Installations

Using the Installation Editor screen, select the installation that you want to delete then press the DELETE icon at the top of the page.

If the installation has an asset assigned to it, a message appears letting you know that you will need to remove the asset before the software will allow you to delete it. If the installation is assigned to one or more routes, another message will appear alerting you to this association, but the software will delete the asset when you press Yes in the message dialog.

Routes

Clicking on or pressing the ROUTES icon in the SETUP main menu opens the Route Editor screen.

Creating New Routes

When you enter the Route Editor, the name of the currently selected route appears in the Route field; its assigned objects appear in the Assets and Installations list.

1. Create a new route by entering a name in the NEW ROUTE field then press the NEW ROUTE button. The Assets and Installations field will clear, and the new route will appear in the Route field.

2. Add Assets and Installations as described above. The software automatically saves changes made during the process.

3. When you have completed building or editing routes, press the EXIT icon in the top right of the screen to return to the Main Menu.
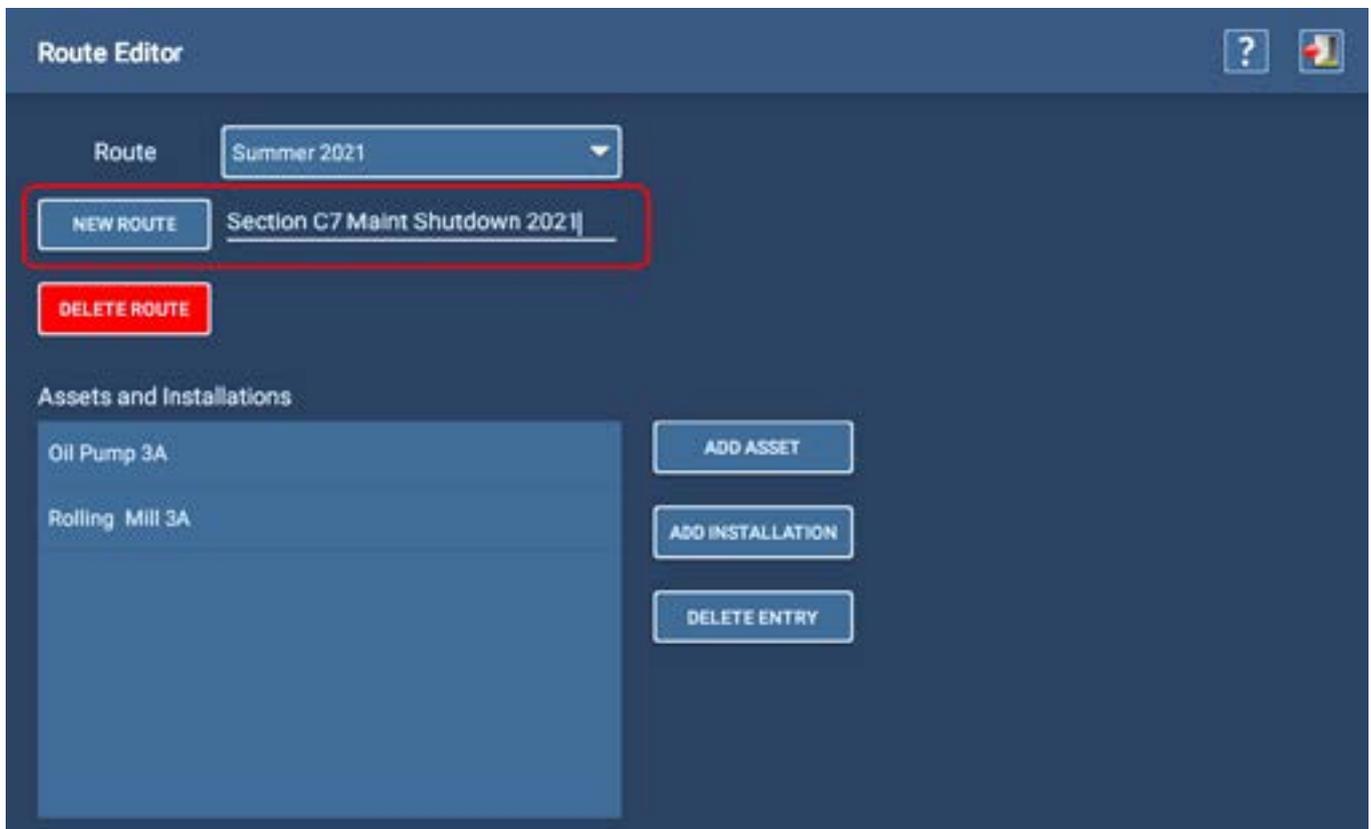
Fig 68: *Route Editor screen; adding a new route.*

Deleting Routes

To delete a route, ensure that the route you want to delete is shown in the Route field then press the DELETE ROUTE button.

Editing Existing Routes

When you enter the Route Editor, the name of the currently selected route appears in the Route field; its assigned objects appear in the Assets and Installations list.

1. If this is the route you want to work on, you can proceed.

2. If you want edit another route, press or click on the arrow at the right end of the Route field to open a drop-down list that you can use to locate and select the route you need.

3. Add Assets and/or Installations as needed by pressing the appropriate button then selecting the object from the related Asset Selection or Installation Selection screen.

4. After you select an Asset or Installation to add to the Route, the software automatically returns you to the Route Editor screen and adds the selected object to the list.

5. Repeat the process for each object that you want to add to the route.

6. Remove an object from the Assets and Installations list by tapping on the object to highlight it then press the DELETE ENTRY button.
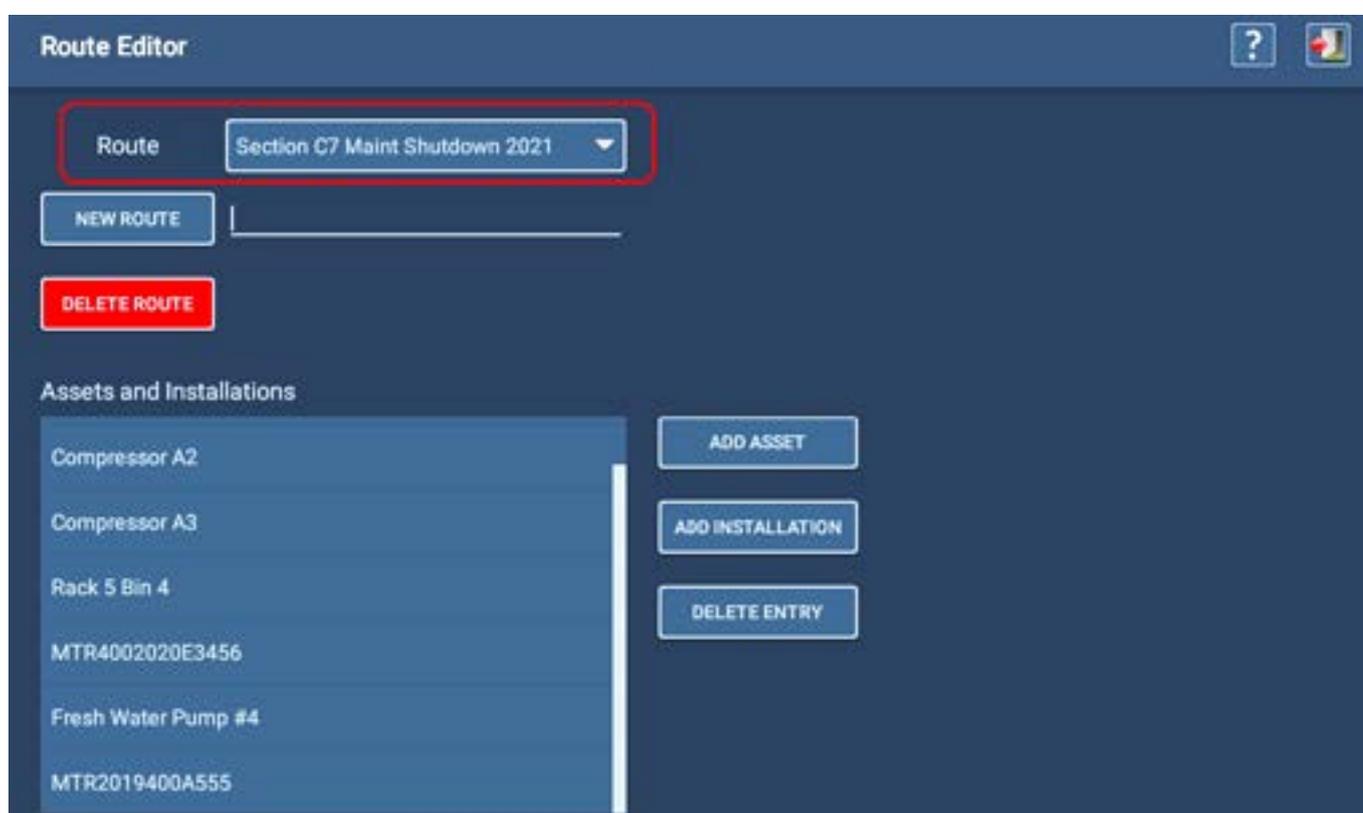
Fig 69: *Route Editor screen; editing an existing route.*

Routes

6 — Procedures for Testing with the ADX Analyzer

ADX Login Screen

After you turn the ADX on, a short video runs while the software loads and initializes. When the start-up process completes, the ADX application automatically starts at the Login screen.

The Login screen is the access point for all users to the ADX software application.

Select the proper user type then enter the corresponding password. Some user types (for example, default Technician user) do not require passwords.

Consult your system administrator or Megger Baker Instruments technical support to address user, role, or password issues.
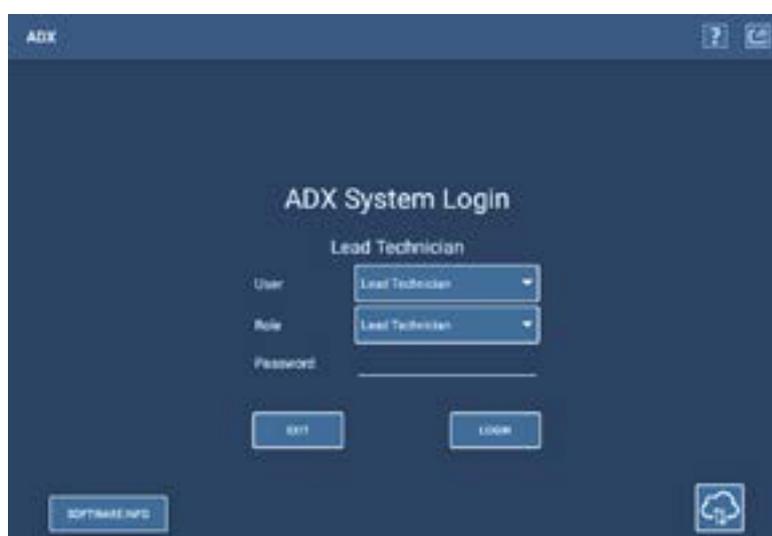
Fig 70: *ADX System Login screen.*

A "Lead Technician" user with a broad range of permissions is provided in the user list; default password is "BAKER".

A "Technician" user is also provided in the user list. No password is assigned to this user, but this user has minimal access and permissions (cannot create or edit assets and test configurations).

A "Customer Admin" user with full permissions is also provided. A unique password assigned by Megger is required. Contact Megger Baker Instruments Support (see back page) to obtain your password if you do not already have it.

At the bottom left of the login screen is the SOFTWARE INFO button. Touching this button opens a dialog box that provides current software version information. Another button in the dialog box tells the application to go online and check for an updated version of the software.

At the bottom right is the Cloud Connection icon. You can check the cloud connection by touching this icon.

Otherwise, log into the system using the credentials for the user of your choice.

When the tester is not required, use the EXIT button to close the ADX software prior to shutting down the ADX.

Pressing the EXIT button also provides access to the Android operating system where you can make changes to language, date, time, and other system settings.

Users can conclude testing sessions at shift turnover, but they do not need to exit out of this screen. The can log out of the testing screen and a new user can log in here to begin a new session.

Realm Cloud Connection

The ADX tester connects to the Realm Cloud Server (and, in turn, PowerDB Dashboard) via an internet portal, which is defined using this screen in the user interface.

Use this screen to view the database and server currently selected for the ADX.

⚠ CAUTION: DO NOT MAKE CHANGES TO ENTRIES IN THIS SCREEN without proper permissions and system knowledge. Errant changes can break the established connection.

In most cases, the information in this screen will not need to be changed. It is set at the factory for your specific organization. Only qualified system administrators working directly with Megger Baker technical support should make changes to this information.

Most organizations will use only one database, so there will be no need to make changes. If your organization has multiple databases, they will also be set up at the factory.

In such cases, you should see the available options in the Past Connections drop-down list. If multiple databases are used, you can change the server and database being used by selecting it from this drop-down list.

When the correct values appear in the Realm Cloud Server and Database Name fields, enter the appropriate password.

Click Select to connect to the new server/database instance.

Fig 71: *Realm Cloud Connection screen.*

Testing without Selecting an Asset

The ADX is most commonly used to test AC and DC motors; but it can also be used to test generators, transformers, coils, and other devices. For that reason, the software refers to the devices tested as **_Assets_**.

You can use the ADX to test a device without selecting an asset, but features are limited:

- You can run only RLC, DC, and Surge tests in Manual mode— no references or PD testing in Surge.

- Any saved data is not automatically associated with the asset being testing.

- The software uses a default test configuration that cannot be viewed or edited. The default test configuration provides only the least conservative overcurrent protection and no other threshold limitations.

- There are no limits included in the default test configuration. Overcurrent is set at 1200 amps. PPEAR is set at 10%.

- There is no overvoltage protection provided during HiPot and Surge tests. ADX can ramp up to the default maximum value for the device.

For a quick introduction, you can test without an asset to get familiar with the basic Manual mode testing features.

One practical application might be using the ADX in a shop environment for troubleshooting tasks where saving data for long-term use is not needed.

When testing without selecting an asset, ensure that the top line of the screen shows [None] [Default] indicating no asset is selected. If an asset is selected and you want to test without an asset selected, press or click on the DESELECT ASSET icon in the Manual Tests screen before selecting the test you want to run.

> NOTE: While selecting an asset prior to testing is the typical application, it is not required. The results can be viewed, printed, and saved to a USB storage device connected to the ADX front panel. When saving, you can rename the file to indicate the asset tested.
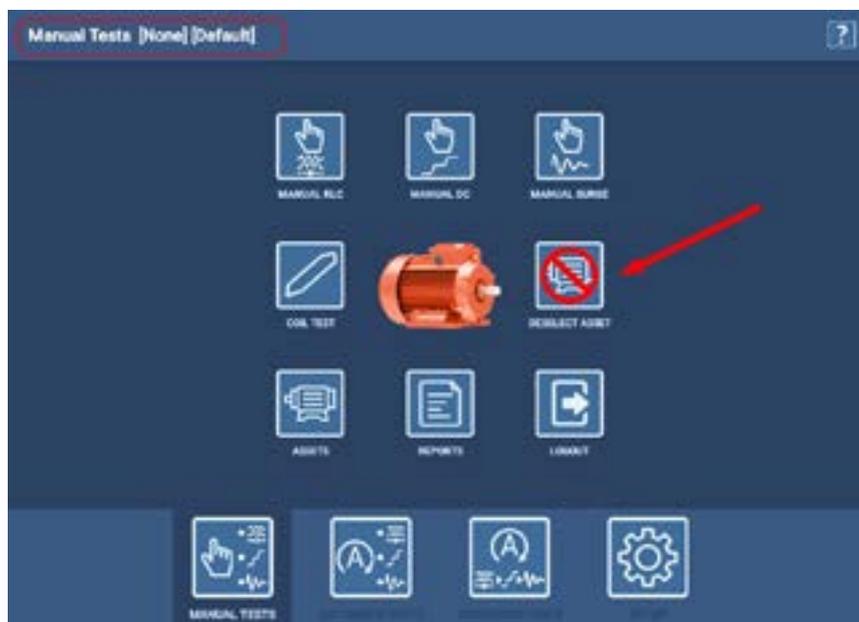
Fig 72: *Manual Tests mode main screen with icon for deselecting asset.*

> NOTE: Because the software retains and automatically reloads the last selected asset when a new testing session begins, you might want to use the DESELECT ASSET feature to reset the system to ensure that the next user does not accidentally collect data on the asset.

Recommended Testing Sequence

To properly test assets and to establish effective condition assessment while minimizing insulation stress, the following testing sequence is recommended when using Manual or Automatic mode. The approach involves conducting a series of progressively rigorous tests. If a test failure occurs, testing should be halted and the data should be evaluated prior to any continued testing.

The suggested testing sequence is:

1. Low-voltage RLC (resistance, inductance, and (optional) capacitance) test.

2. Megohm/insulation Resistance (IR), dielectric absorption (DA), and/or polarization index (PI).

3. HiPot (standard, ramp, or step).

4. Surge.

Android Navigation Bar

During the course of testing, or when setting up tests (such as editing a test configuration), the standard Android navigation bar may appear at the bottom of the test screen. This is standard Android behavior that cannot be fully eliminated in all applications of the ADX software.

To remove the navigation bar, click on the arrow icon as shown in the example below.

Fig 73: *Removing the Android navigation bar from the screen display.*

Failure Messages During Testing

If the software encounters failures during any testing process, it will display error messages to alert you to the failure. Some messages will also provide options for re-testing, saving results, continuing with testing, or other options depending on the test type and the mode used (manual, automatic, or sequenced).

Refer to "Error and Failure Messages List" in "Appendix A — Troubleshooting" for more information.

Selecting an Asset and Test Configuration

For any test mode you want to work in, best practice is to first select an *Asset* that has the *test configuration* you want to use assigned as the *active test configuration*.

> NOTE: Test procedures provided in the User Guide follow the best practice of selecting an asset first.

1. Press the ASSETS icon in any test mode screen to open the Assets screen.

2. Use the Browse or Search Mode features to locate the asset needed. Attributes that are created—along with standard nameplate information—are used to help you find your assets.

3. When you see the target asset in the list, click on or touch the asset to highlight it.

4. Look at the Details section to see if the active test configuration line shows the test configuration you want to use. If so, press Select Asset to return to the Main Menu you started from then select the test you want to run.
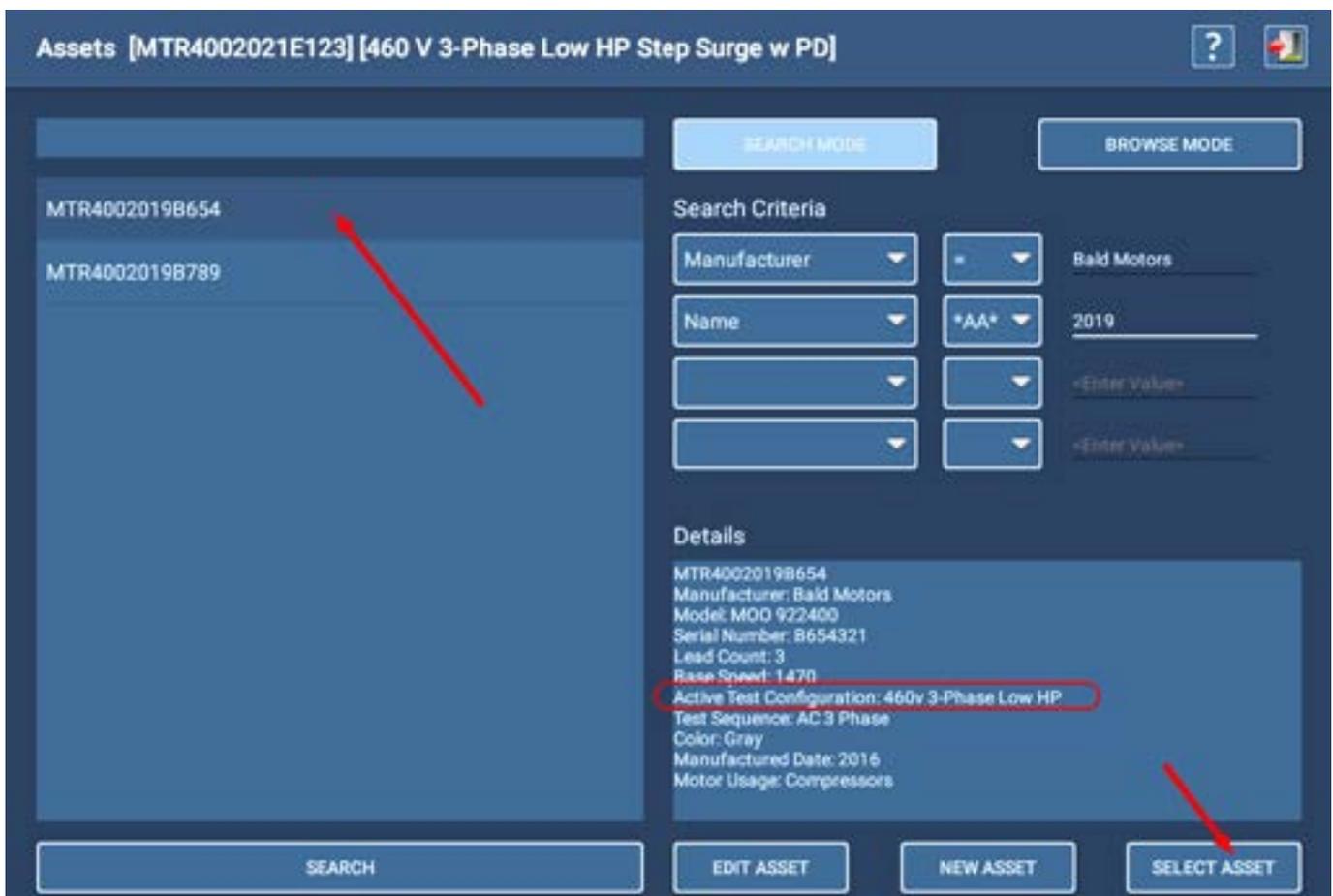
Fig 74: *Selecting asset for testing; confirm active test configuration in Details section.*

5. If the active test configuration in the Details section is not the one you want to use, highlight the target asset then press EDIT ASSET.
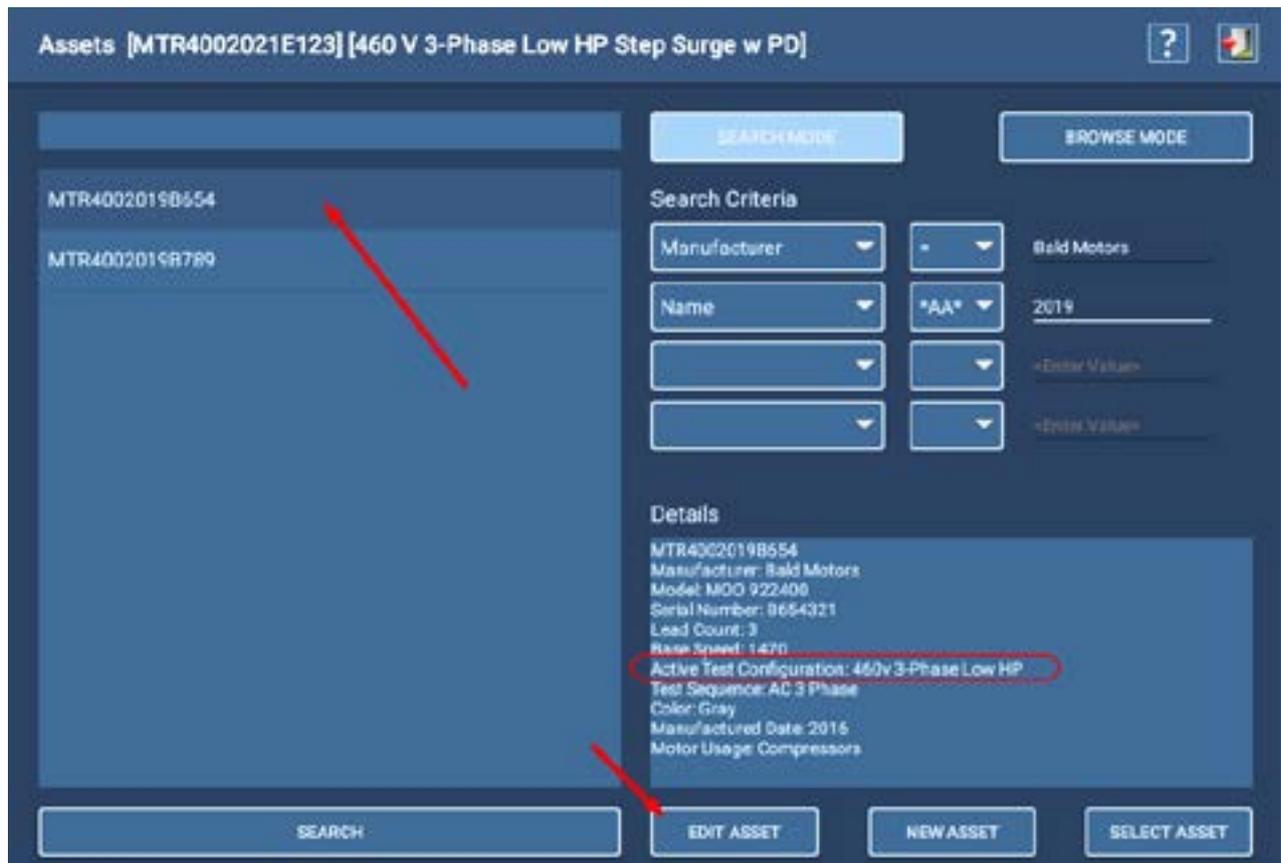
Fig 75: *Selecting a target asset to edit to change active test configuration.*

6. The software takes you to the Asset Editor screen. Scroll down to active test configuration and All test configurations section.

7. Click on the active test configuration drop-down list then select the test configuration that you want to use for your tests. If the desired configuration is not in this list, scroll through the All test configurations list to ensure that the target configuration has a check mark highlighted.

8. If the desired test configuration is not in the All test configurations list, it will need to be created. Refer to chapter "5 — Defining Assets, Test Configurations, Installations, and Routes" for details on creating new test configurations.

9. If you find the test configuration you need, ensure that it is set as the active test configuration then press the Save icon to commit the changes.

10. Press the Exit icon to leave the Asset Editor and return to the Asset Selection screen.
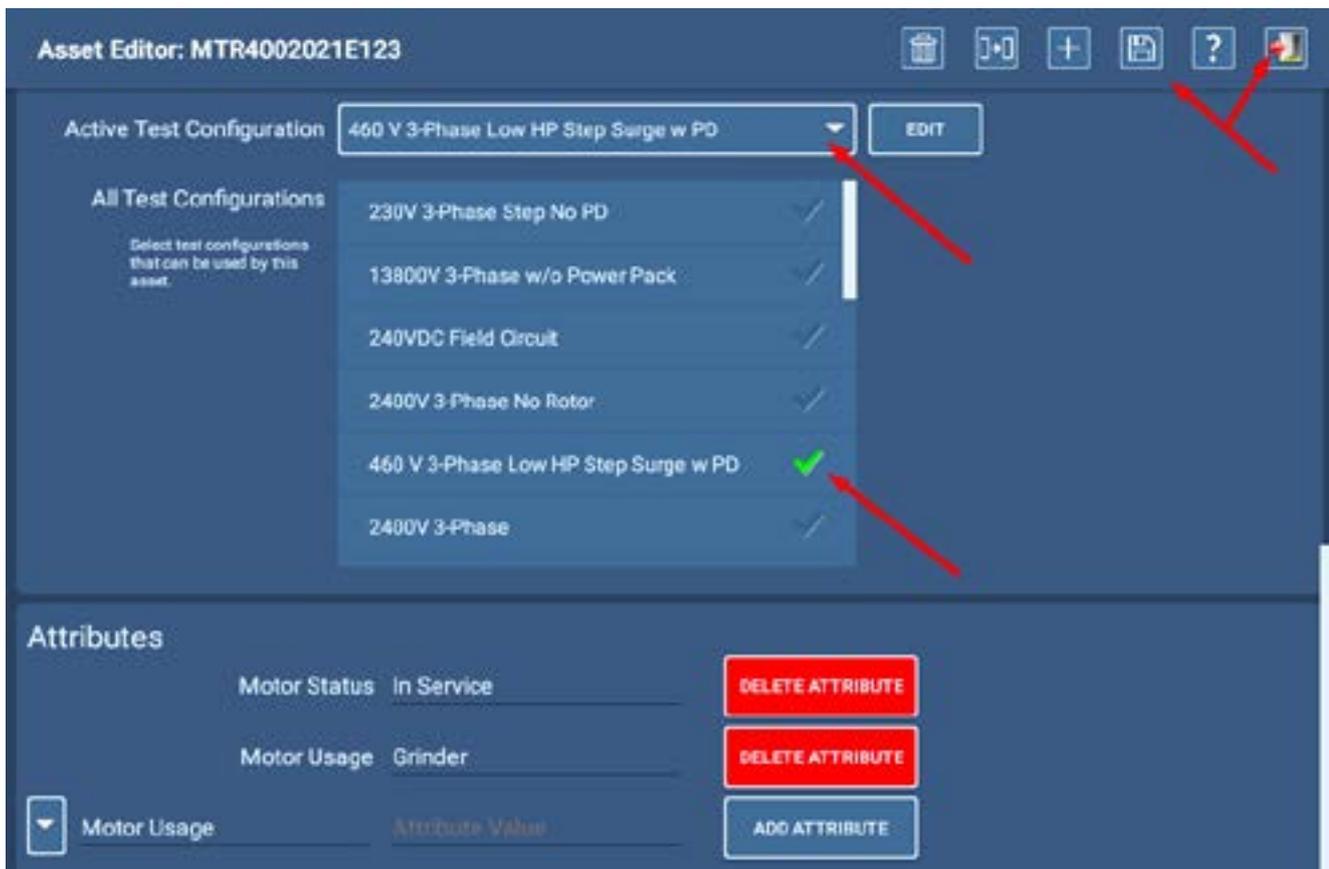
Fig 76: *Setting the active test configuration.*

NOTE: When you are in the Asset Editor, you can revise the active test configuration if needed by clicking on the EDIT button to the right of the active test configuration drop-down list. The software will take you to the test configuration Editor where you can make your changes.

11. After you have located and selected your asset and the proper test configuration, both elements will be shown in order on the top line of most ADX screens.

12. The asset remains selected and displayed until another asset is selected to replace it. When a testing session has been completed and the ADX application closed, the software holds the asset selection in memory and reloads the asset when the ADX software is re-started.

Fig 77: *Example test screen showing selected Asset and test configuration.*

Saving Successive Tests in the Same Session

During a test session, you can conduct successive tests then save the results for each test before exiting the screen. However, you can only view the results of the *first* test saved using the ADX Reports features. All test results will be saved to the test event and the results can be viewed using the PowerDB Dashboard PDF download feature.

For example, in Manual RLC testing, you could press ALL LEADS and when the software completes the test you would press the SAVE icon to store those results in the session's test event. If you do not exit the test screen, the session's test event is still active. You could then (for any reason) press ALL LEADS again and when the software completes the retest, you would press the SAVE icon again to store those results in the active test event.

When you want to view the test results, you would only be able to view results in the ADX Reports screen for the first test saved. Similarly, the View feature in PowerDB Dashboard displays only the first results, but all results saved in the same session (test event) are included in the test event report when downloaded to a PDF file.

Manual Tests

Main Menu—Manual Tests

Clicking on the MANUAL TESTS icon reveals a screen containing icons that provide access to manual RLC, HiPot, Surge, and Coil tests.

NOTE: The icons shown in this screen can vary depending on roles and permissions assigned to the user.

You can also select REPORTS to view report results or to generate new reports for completed tests.

Press the LOGOUT icon to sign out of your user profile and return to the Login screen when you have completed your tasks.

Fig 78: *Manual Tests Main menu.*

Refer to chapter "3 — Preparing the Megger Baker ADX for Testing" to ensure that the ADX Test Leads are properly connected to the asset being tested.

Manual RLC Test

> 💬 NOTE: The examples in this section follow the best practice of selecting an asset with an active test configuration. However, selecting as asset is not required. The process and functionality are alike in most aspects. For more information on using Manual Mode screens without selecting an asset, refer to "" on page 76.

Use this screen to manually execute Resistance, Inductance, and Capacitance tests. Elements within the screen provide control over how the tests are executed.

In manual mode, the software will use limits specified in the test configuration, but you directly specify test parameters such as the Imbalance Calculation to use, Temperature Compensation parameters, and which tests to enable.

From this screen, you can make the following adjustments if needed:

- Select the Imbalance Calculation to use during resistance, inductance, and impedance testing by using the Imbalance Calculation drop-down list.

- Select which tests you want to run by moving the toggles to the right.

- For temperature compensation, select the winding material using the Temperature Compensation drop-down list then enter the Actual and Correct To values as needed.
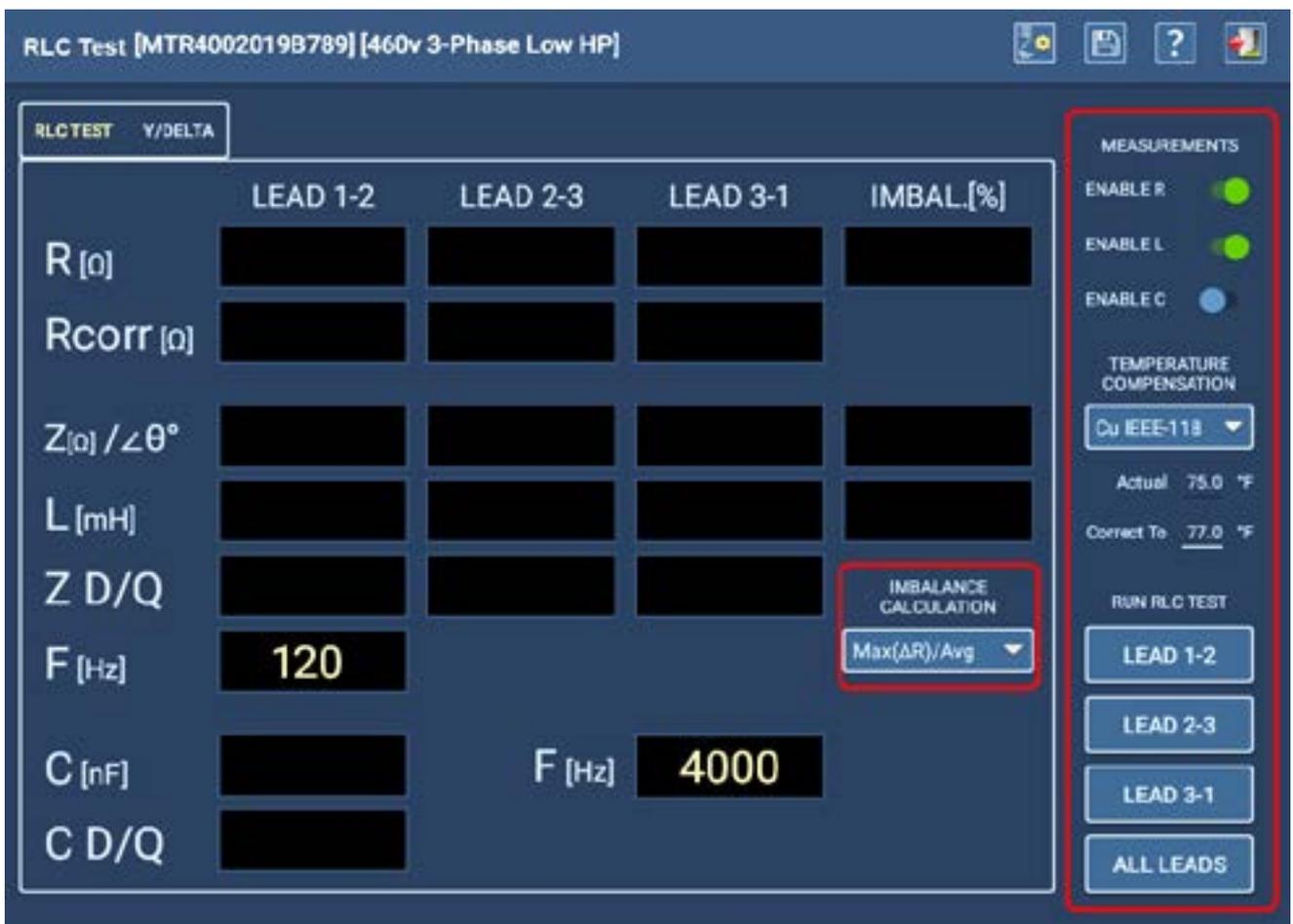
Fig 79: *Manual Test—RLC start screen.*

1. After setting up your test parameters, press the individual Lead tests that you want to run, or press ALL LEADS.

2. If you choose to run capacitance testing, the software will alert you to reconfigure the test leads as shown in the example below. Test Lead 1 will be connected to motor lead 1, test lead 2 to the motor frame, and test lead three will be disconnected (not contacting any motor lead or ground).

> NOTE: Acknowledge this message only after the leads have been reconfigured. Pressing the OK button will immediately initiate the capacitance test.
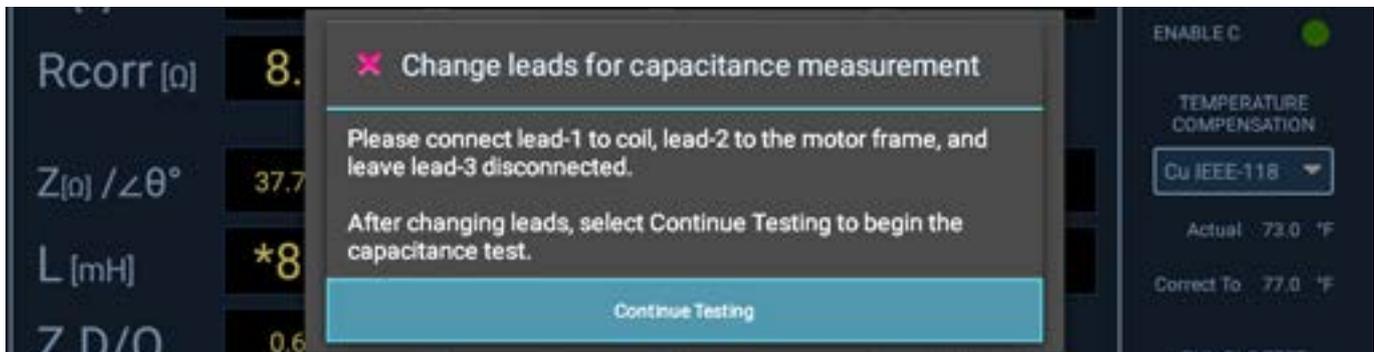
Fig 80: *Manual Test; lead reconfiguring message for capacitance testing.*

3. Another message will appear after the capacitance test completes telling you to return the test leads to their original configuration. ***Ensure that the connections are restored before clicking OK.***

4. The RLC test registers the measurements taken on each test lead and compares them to the target values specified in the test configuration. If the measure values are within specified limits, the test will pass. The test also checks for imbalance between the phases and displays results in the main RLC Test tab.

5. When the RLC testing completes, you will see measurement results displayed in the RLC Test tab as shown in the example below. Failing tests will appear in red. Examine the results to start your assessment of the problem for failed tests.

Fig 81: *Manual Test—RLC main test results tab.*

6. You can use the Y/Delta tab to view additional test details that can help you identify which winding is causing the test to fail. After all three L-L values are directly measured, a software algorithm calculates the values for each phase in both wye and delta configurations for the motor, and presents them in this tab.

Fig 82: *Manual Test—RLC Y/Delta tab.*

One example for how this information might be used is troubleshooting to identify a faulty component.

In an ideal motor, all three windings are equally balanced. In a faulty motor, the L-L measurements can show two higher resistance values, but only one phase might be bad because the faulty phase is actually attached to two of the L-L leads; two L-L readings are high and one is not.

With the software showing the calculated results for each phase, you can see that one is reading high, but because of the winding configuration, the "bad" phase affects two of the L-L measurements. By looking at each phase value presented in this tab, you can identify the problem component. These values should be compared to the motor specification values to confirm that the one "bad" phase is indeed the culprit, and the other two are good.

> NOTE: The preceding is only one potential example of how this screen and its data could be used. Other factors can exist that would change how you should interpret the data presented.

Manual DC Test

NOTE: The examples in this section follow the best practice of selecting an asset with an active test configuration. However, selecting as asset is not required. The process and functionality are alike in most aspects. For more information on using Manual Mode screens without selecting an asset, refer to "" on page 76.

Use this screen to manually execute IR/DA/PI, and standard, ramp, or step HiPot tests.

Icons at top right include an E-stop indicator, edit test configuration, current output device selected, save, help, and exit the screen.

Before running any test, you should select the asset that you want to test. See "Selecting an Asset to Test" earlier in this chapter. The default values for some test parameters are defined by the active test configuration of the selected asset. However, because this is manual mode, you control much of the functionality directly by selections made here.

From this screen, you can make the following adjustments if needed:

- Select whether Current and/or Megohms will appear in the test results display.
- Set the Ramp Rate using the slider to provide a slower or faster ramp rate.
- Temperature Compensation controls help you select insulation material type, and define the actual temperature and correct to values so measurements are properly adjusted based on your conditions.
- Control the execution of all DC tests.

Fields at the bottom display time remaining in the selected test, and results as each test is conducted. Corresponding fields at the top of the graph display numerical values measured during each test increment.

The field in the lower left corner identifies which test is running, and how much time remains for the test.

NOTE: Use the E-STOP button on the lower right of the ADX front panel to stop the test and quickly de-energize the high-voltage leads if needed.

Fig 83: *Manual DC Test start screen.*

1. After selecting your test options and values, press the START button.

2. Turn the Voltage Output Ramp Switch on the ADX front panel (top right) clockwise to increase to the target voltage level for the asset.   If you overshoot the target level, turn the Voltage Output Ramp switch counter-clockwise.

3. Move the Ramp Rate slider to a lower ramp rate to slowly increase the voltage to prevent an overcurrent condition.

4. Select the test you want to run by clicking on the buttons in the bottom right corner. In most cases, you should run the IR/DA/PI tests before running a HiPot test to ensure that the asset passes the lower voltage tests before progressing to high-voltage testing.

5. When voltage is applied to the test leads, the indicator in the top right corner flashes while the leads are energized. LEDs on the ADX front panel also light to show which leads are energized.

Fig 84: *Manual DC Test screen—tests completed.*

6. Monitor the display during testing to track progress and view results. If a test fails, the software will notify you of the issue before stopping the test.

> NOTE: If Temperature Compensation is used (set in this screen using the drop-down list, or in the active test configuration) the MΩ field will display the corrected value based on that compensation, not the direct calculated value. You can change this display during testing by changing the value in the Temp Compensation drop-down list.

7. Monitor each test as it runs by looking at the test indicator and timer in the lower left corner. It will show which test is running along with the time remaining for that test.

8. When the IR/PI tests complete and you have reviewed the results to your satisfaction, ramp the voltage up to the next target level for the type of HiPot test you want to conduct.

9. Press the button for the type of HiPot test you want to conduct then monitor the timer to complete the test (or step for HiPot Step test).

10. When the timer reaches zero, ramp the voltage to the next level for HiPot Step tests and repeat until you complete the final step.

11. When the test completes, touch the STOP button to end the test. The LEADS ENERGIZED light above the START/STOP button turn off. A message appears, notifying you that the asset is being discharged. When the message disappears, the leads energized LEDs on the front panel will turn off.

12. Touch the Save icon in the bar at top right to save your results then touch the EXIT icon to leave the DC Test screen.

> ⚠️ **WARNING: To ensure the safety of all personnel, refer to "Ensure Proper Grounding and Discharge after Conducting DC Tests" in chapter 1, "General Operating and Safety Information" for guidance on properly discharging and grounding the asset (DUT).**

If you plan to continue with Surge testing, no grounding is needed at this time, but do not touch test leads before testing is properly executed and completed. Grounding should be conducted as needed after completion of all tests.

Alternatives for Starting Manual DC Testing

1. Press and hold PTT button (top left of ADX front panel—1 below) to activate DC test then turn the Voltage Output Ramp switch (top right of the ADX front panel—3 below) clockwise to increase the voltage to the target level.

> 💬 NOTE: If you have a footswitch connected to the ADX, it provides an alternative to using the PTT button to start and stop the test.

2. Run test then release PTT / footswitch to stop test.

3. Press the Start button (2 below) at any time if you want to lock the PTT function then continue ramping voltage using the Voltage Output Ramp switch. At this point, the PTT button / footswitch become inactive.

4. Press Stop when the test completes.

Fig 85: *ADX front panel and user interface controls for starting DC test.*

Manual Surge Test

> NOTE: The examples in this section follow the best practice of selecting an asset with an active test configuration. However, selecting as asset is not required. The process and functionality are alike in most aspects. For more information on using Manual Mode screens without selecting an asset, refer to " " on page 76.

The Manual Surge Test screen provides a full set of features so you can conduct Surge tests on one or more phases of your asset.

> CAUTION: Do not coil excess test leads on top of the ADX during testing. Surging current in coiled test leads generates high magnetic field that could interfere with proper ADX operation. In some cases, the interference could even damage the unit.

Icons at top right provide controls for saving a test reference, indicating equipment stop, editing the selected test configuration, saving the test data, accessing help, and exiting the Surge Test screen.

Before Running a Surge Test

1. Select an asset to test. When the software loads the asset information, it will use the active test configuration to set test parameters such as the target voltage (displayed top right in the waveform display area).

Fig 86: *Manual Surge Test start screen; PD disabled.*

2. Use the scale controls above the waveform display graph to select specific scales for each axis.

By default, the **Voltage Scale** (Y axis) is set to Auto Scale. As you ramp up the voltage, the display automatically changes scale to improve waveform view. While the default is auto-scale, you can select a specific scale value if you prefer.

The **Time Scale** (X axis) is also set to Auto Scale by default; the software determines the common optimal waveform display and automatically scales the X-axis accordingly. You can manually select specific scales to adjust the amount of the waveform displayed to meet your needs and preferences.

3. Confirm or change the OUTPUT DEVICE from the drop-down list just above the top-right corner of the waveform

display graph to identify the hardware being used to conduct the test.

4. With the test leads properly connected to the asset, press the appropriate LEAD select button on the right side of the screen to choose which lead will be tested. Manual mode Surge tests only one lead at a time.

Executing a Surge Test

1. Press the Push to Test (PTT) button (top left of ADX front panel) then turn the Voltage Output Ramp switch on the ADX front panel clockwise to increase the voltage to the target level. If you overshoot the target level, turn the Voltage Output Ramp switch counter-clockwise.

2. Release the Voltage Output Ramp switch when you have reached your target voltage, but continue pressing the PTT button.

3. The ADX will apply the test voltage to the selected lead(s) in turn. The LEADS ENERGIZED indicator (above the LEAD buttons) flashes to alert you that voltage is being applied. LEDs on the ADX front panel also light in turn to show which lead is energized.

4. With the target level set, monitor the Pulse Count until you reach the desired number of pulses then release the PTT button to complete the test for the selected lead. Repeat the process to test the other leads.

5. The voltage field (**V** at top left) displays the voltage level being applied as you turn the ADX Voltage Output Ramp switch clockwise. Setting the Voltage Ramp Rate in the active test configuration to a slower rate can reduce overcurrent or overvoltage conditions.

> NOTE: The voltage in the upper left will always display the last voltage measured. The recorded test voltage will be the last voltage unless there is a failure in which case it will record the voltage immediately prior to the fault.

6. Pulse-to-pulse EAR⁺ measurements are presented on the smaller graph on the bottom-left, while Line-to-Line EAR⁺ percentages are displayed in their respective fields to the right of the PPEAR⁺ graph.
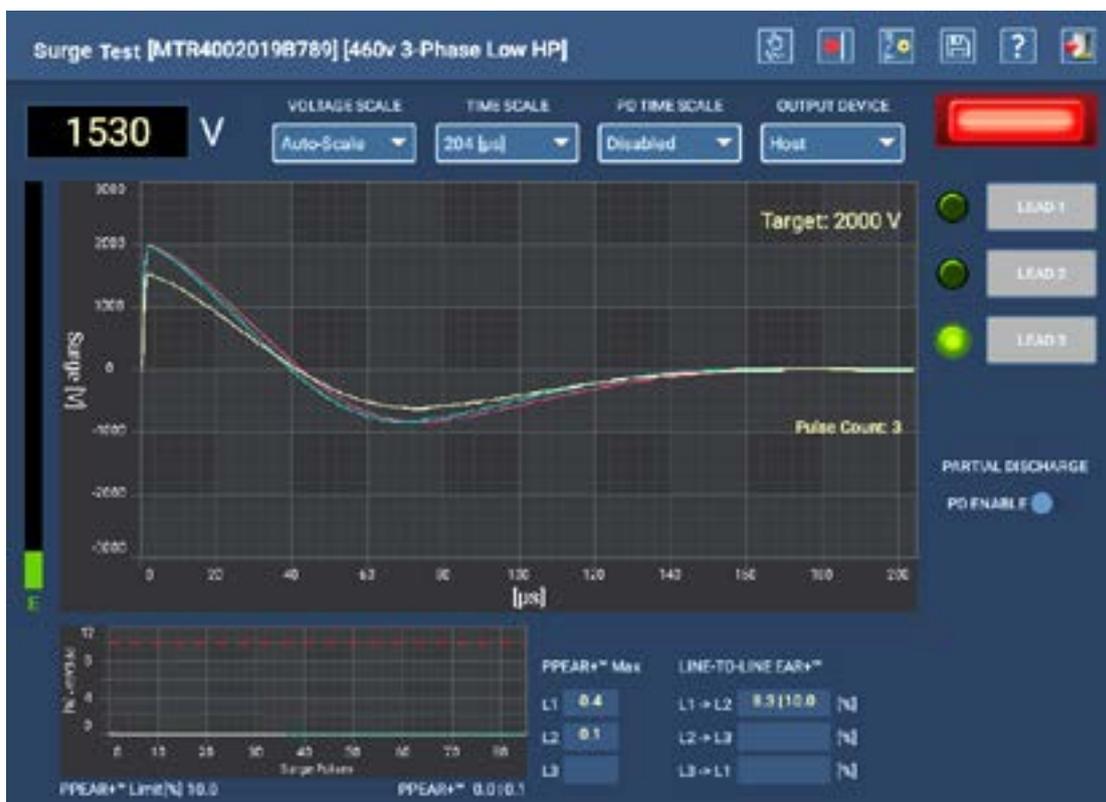
Fig 87: *Manual Surge Test in progress.*

Alternatives for Starting Manual Surge Testing

1. Press LEAD button to select lead to test.

2. Press and hold PTT button (top left of ADX front panel—1 below) to activate Surge test then turn the Voltage Output Ramp switch (top right of the ADX front panel—2 below) clockwise to increase the voltage to the target level.

> NOTE: If you have a footswitch connected to the ADX, it provides an alternative to using the PTT button to start and stop the test.

3. Run test for the desired number of pulses then release PTT / footswitch to stop test for the selected lead.

Fig 88: *ADX front panel controls for starting Surge test.*

Setting up References for Surge Testing

⚠️ CAUTION: Ensure that the ADX test leads are properly connected to the asset being tested and that the immediate area is clear of hazards. Ensure that all safety protocols are observed.

💬 NOTE: Ensure that you are familiar with the processes for creating a new test configuration and new asset before starting this procedure. Refer to chapter "5 — Defining Assets, Test Configurations, Installations, and Routes" for descriptions of these processes.

References can be used when running Surge tests in Manual or Automatic mode. The process for setting references is the same regardless of the mode used to run tests.

This section addresses creating references for 3-phase motors and single coils. The process for single-phase motors is essentially the same, but use only leads 1 and 2.

Surge testing can include using test references and the Zero Start Override feature (if practical) to ensure that identical assets conform to a benchmark set from a known-good asset.

1. ***Use a known-good asset to run your tests as you set up the references.***

2. Select an existing test configuration for the asset type that you will be testing, or create a new one. Define values for all testing elements needed. Ensure that Surge test is enabled and the Leads that will be tested are also enabled. *Do not enable Zero Start Override at this time.*

3. When you have completed your initial settings, give the test configuration a name that you can easily identify. (Best practice is to follow your organization's naming conventions while giving the configuration a name that reflects the model or design specific to this Reference Test.)

4. Select an existing asset for the asset type you will be testing, or create a new one. Provide all values needed to properly describe the asset. When building the asset, you must also select the test configuration created for the intended testing application.

5. For this application, copying an existing asset and saving it with a new name is a common practice. (Best practice here is to name the asset based on its model, along with the job, serial, or lot number.)

6. Ensure that your new asset is displayed in the top line of the screen along with the desired test configuration.

7. Connect the test leads to the asset as described in chapter 3, "Setting up the Megger Baker ADX Tester and Accessories" for the type of asset you will be testing.

8. You can perform this process in Manual or Automatic mode. For this example, start in Automatic mode and open the Surge Test screen.

💬 NOTE: Automatic mode is often a more practical mode to use when setting up references for surge testing. It is a more controlled method and ensures exact test voltages are achieved because the ADX controls the ramping process more precisely using defined target voltages.
The process can also be performed using the Manual mode Coil Test screen.

9. With the proper asset and active test configuration loaded, press the Surge test icon to start the testing process.

10. Confirm the active test configuration in the Test Initiation screen then continue the process.

11. In the Surge Test screen, press the Edit test configuration icon.

12. In the Surge section of the test configuration screen, turn off (uncheck) all test leads.

13. Set the Target Pulse Count to 10–15 pulses.

14. Zero Start Override and PD test should also be disabled during this process.

15. Save the changes to the test configuration then exit the screen.

16. When you return to the Surge Test screen, press the LEAD 1 button then the START button.

17. After the voltage ramps to target voltage, the software will run the test for the defined pulse count then the test will stop.

Fig 89: *Acquiring reference waveform for Surge Test on LEAD 1.*

18. When you have a satisfactory waveform that you want to use as your reference for Lead 1, press the Save Reference icon at the top of the screen.

19. A dialog box appears so you can give the reference a recognizable name to make it easier to add the reference later when editing the test configuration. An asset reference such as the manufacturer and the corresponding lead number are common elements to include in the name.
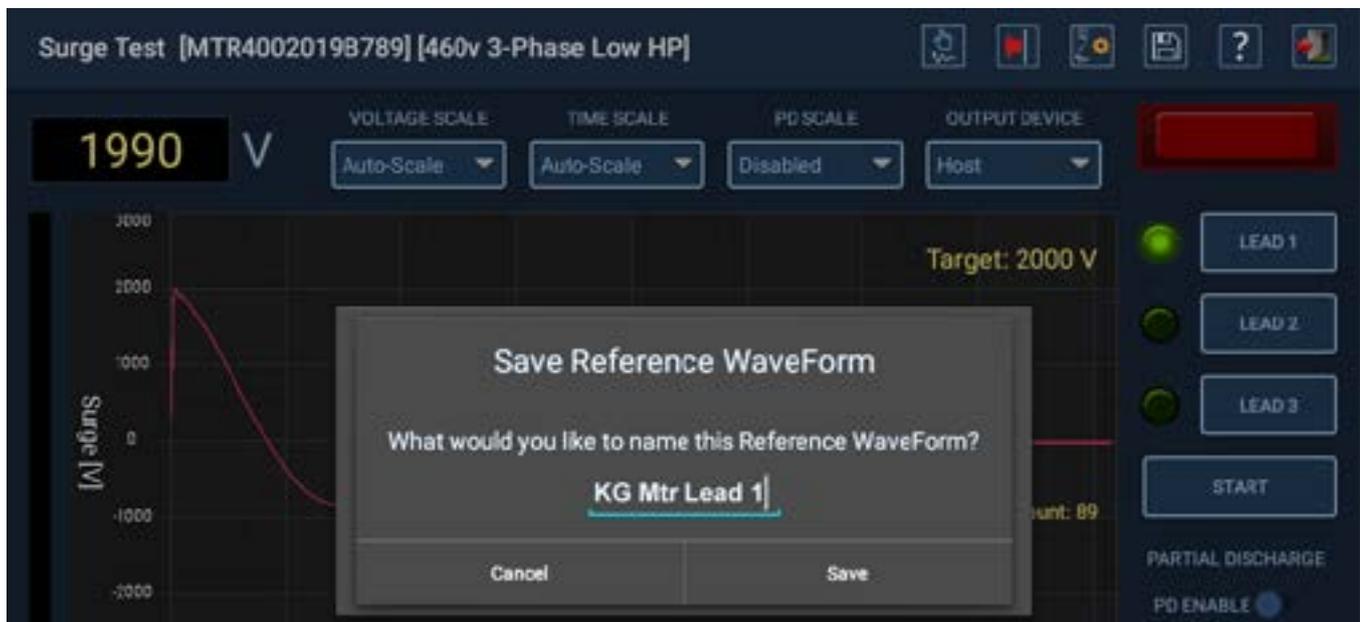
Fig 90: *Saving reference for Known Good Motor Lead 1—3-phase motor example.*

> NOTE: In the case of testing single coils, you might want to include something like "L1 or L2" in the name to identify which lead will be driven during the coil test. In the Coil Test screen, a toggle icon identifies which lead—L1 or L2—is being driven for each step in a two-direction test.
>
> Correlating this direction with the physical connection of the coil can have a significant impact on the accuracy of the readings for coils that a significant physical difference between lead 1 and lead 2.

20. Touch the Lead 2 icon to switch to the next lead for testing then repeat the process for acquiring a reference waveform for this lead.

21. Repeat the process if you will use a third reference.

> NOTE: Surge waveforms can be very different on any given asset, so applying the surge pulse to each lead can be valuable for ensuring consistent and repeatable test results over time.

22. After saving references for all leads related to the asset, edit the active test configuration.

Editing the Test Configuration to Add References

> NOTE: If you want to use references for testing, but do not want to save them to the active test configuration, use the process for "Editing the Test Configuration to Use In-session References" in the next section.

1. Press the Edit test configuration icon at the top of the Surge Test screen to open the active test configuration for your selected asset.

Surge Test [MTR4002019B789] [460v 3-Phase Low HP]

Fig 91: *Edit test configuration icon.*

2. Scroll to the bottom of the test configuration screen to find the Surge section.

3. Check the Lead 1, Lead 2, and Lead 3 boxes to enable them for a 3-phase motor (as used in this example).

> NOTE: For single-coil testing, check the Lead 1 and Lead 2 boxes if you plan to test in both directions. If you plan to test in only one direction, check the Lead 1 box only. Lead 3 is not used in coil testing.

4. Ensure that Surge Test is enabled.

5. Check the Zero Start Override box if you want to use this feature.

6. Touch the drop-down list for Reference Waveform 1 then select the reference created earlier in the process for Lead 1. The name and reference waveform will appear as shown in the example below.

> NOTE: You can create up to three references for 3-phase motors, and up to two references for single coils.
>
> In some cases, only one reference will be used for all three phase measurements. Leaving Reference Waveform 2 and 3 blank will apply Reference Waveform 1 to all other measurements.
>
> For single coils, if only one reference waveform is used, and both Lead 1 and Lead 2 are selected, the software will use the same reference when surging in each direction of testing when using the Coil Test screen.

7. If required, select the references for Reference Waveform 2 and 3.

8. PPEAR+ Limit cannot be used in conjunction with Zero Start Override; checking the Zero Start Override box will automatically uncheck the PPEAR+ Limit box.

9. Set the Coil Reference Limit to the maximum allowed percentage of wave area deviation compared to the reference.

> NOTE: Using Zero Start Override is not required. In some cases, ramping the target voltage provides a more precise indication of the point where an issue occurs. Jumping directly to the target voltage might miss the point in the waveform where such an issue occurs.

10. When you have completed your entries, press the SAVE icon at the top of the screen

Fig 92: *Setting up the test configuration for Surge testing with references.*

11. When you return to the Surge Test screen, a message appears to alert you that Zero Start Override has been enabled for the active test configuration when that box is checked.

⚠️ **WARNING: When Zero Start Override is enabled, the full target voltage will be applied to the test lead when the PTT button is pressed. Follow all safety precautions to prevent severe injury from electrical shock.**
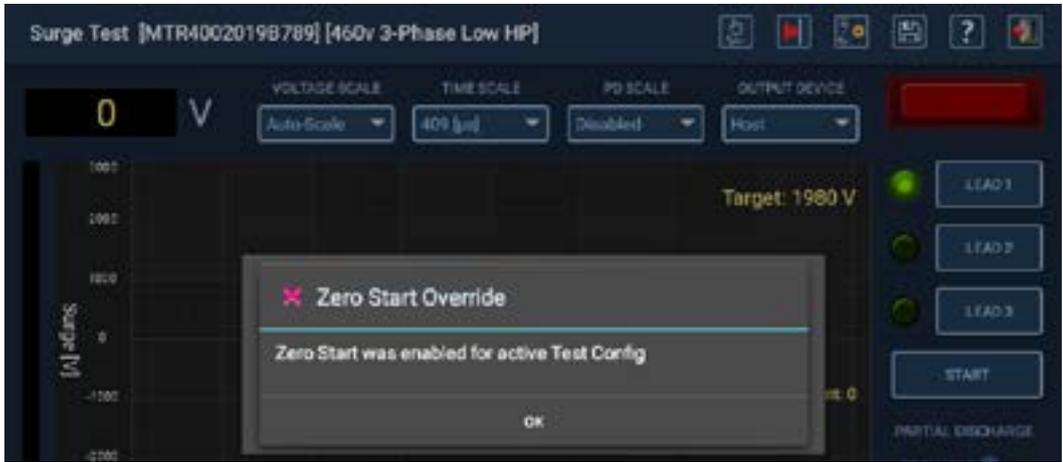
Fig 93: *Zero Start Override warning message.*

12. Press OK to close the dialog then you will be ready to start testing using the newly-assigned references.

Assets that are identical to the known-good asset used to create the references can then be created by copying and renaming the asset, and re-using the same test configuration as the active configuration.

Editing the Test Configuration to Use In-session References

Assigning references to the active test configuration can restrict how the configuration can be applied; assets under test essentially need to be identical to the source of the reference to yield reliable accurate results.

This process describes how to use test references for your immediate testing session, without assigning the references to the active test configuration. That way, all other parameters in the test configuration can be re-used, and practical relevant references can be used for the assets being testing during the session.

This process is particularly useful during coil or armature testing. Test references are saved by the ADX, but they are not assigned to the active test configuration.

1. Press the Edit test configuration icon at the top of the Surge Test screen to open the active test configuration for your selected asset.

Fig 94: *Edit test configuration icon.*

2. Scroll to the bottom of the test configuration screen to find the Surge section.

3. Check the Lead boxes to enable them for testing you specific asset type.

> NOTE: For single-coil testing, check the Lead 1 and Lead 2 boxes if you plan to test in both directions. If you plan to test in only one direction, check the Lead 1 box only. Lead 3 is not used in coil testing.

4. Ensure that Surge Test is enabled.

5. Check the Zero Start Override box if you want to use this feature.

6. PPEAR+ Limit cannot be used in conjunction with Zero Start Override; checking the Zero Start Override box will automatically uncheck the PPEAR+ Limit box.

7. Set the Coil Reference Limit to the maximum allowed percentage of wave area deviation compared to the reference.

> NOTE: Using Zero Start Override is not required. In some cases, ramping the target voltage provides a more precise indication of the point where an issue occurs. Jumping directly to the target voltage might miss the point in the waveform where such an issue occurs.

8. ***DO NOT set anything up in the Reference Waveforms section; this will be done during the test session.***

9. When you have completed your entries, press the SAVE icon at the top of the screen
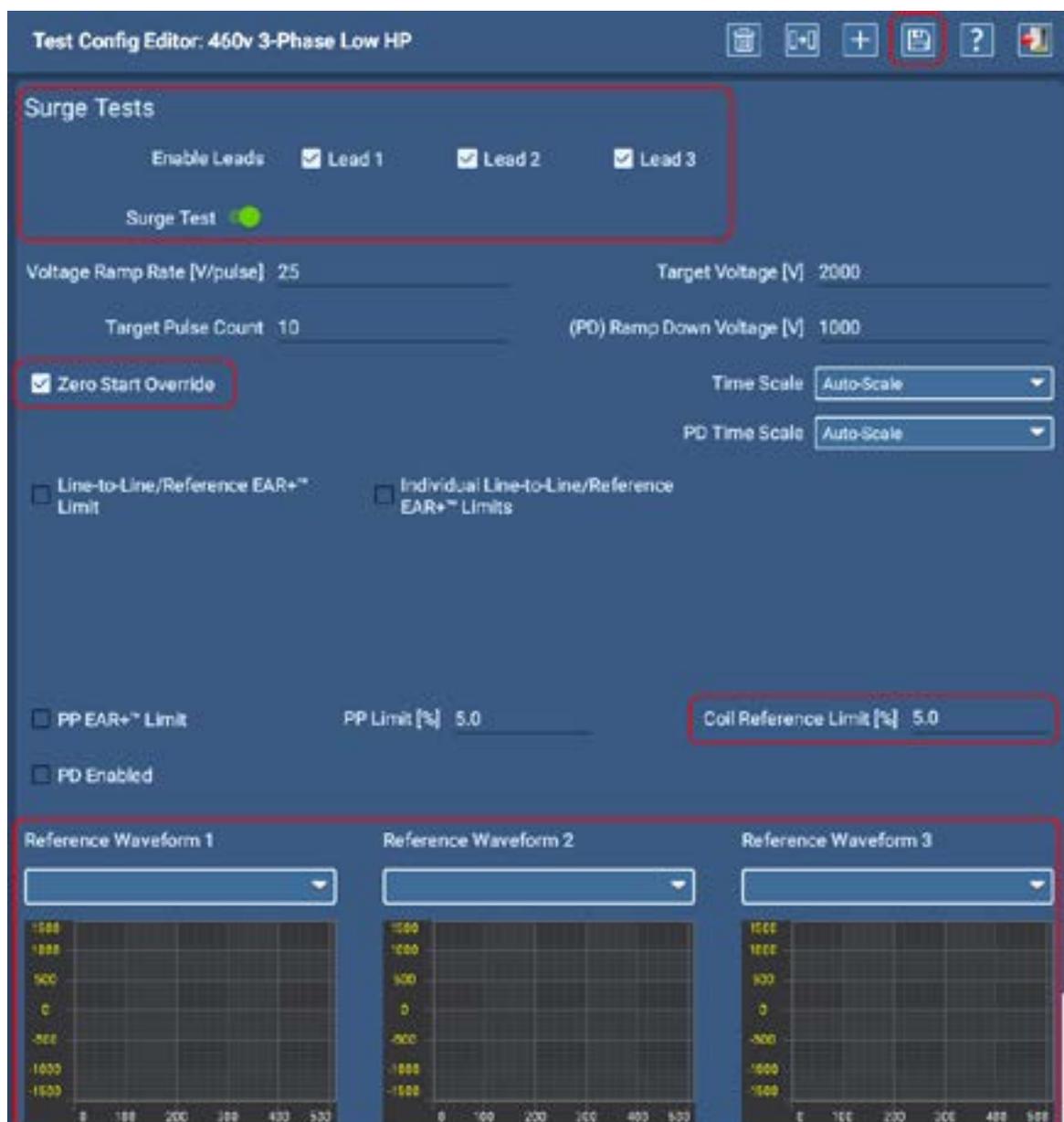
Fig 95: *Setting up the test configuration for Surge testing using session references.*

10. When you return to the Surge Test screen, a message appears to alert you that Zero Start Override has been enabled for the active test configuration when that box is checked.

⚠️ **WARNING: When Zero Start Override is enabled, the full target voltage will be applied to the test lead when the PTT button is pressed. Follow all safety precautions to prevent severe injury from electrical shock.**
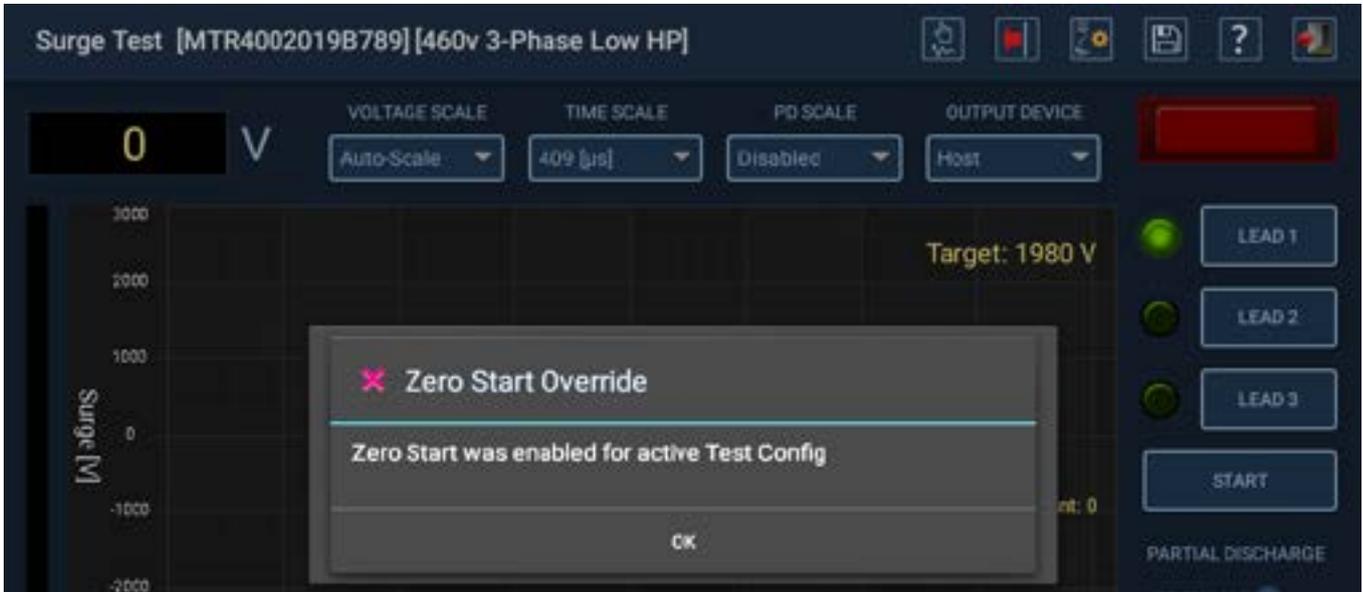
Fig 96: *Zero Start Override warning message.*

11. Press OK to close the dialog.

12. A message appears within the surge display area instructing you to create or load a reference waveform.

13. Begin the testing process using the equivalent (or a close approximation) of a known-good asset. For example, you can use a coil in a batch that successfully passes testing, or the first bar pair on a commutator that yields acceptable results.

14. Run the surge test on your asset to obtain a good waveform for Lead 1. When you are satisfied with the waveform, press the SAVE TEST REFERENCE icon in the toolbar then enter a name for the reference. When this reference is saved, it can be used for the duration of the test session without saving it as a "permanent" part of the active test configuration.

15. If you will use additional references (depending on the asset type), repeat the last step as needed. For example, for coil testing that will apply a surge pulse to each test lead (L1 and L2), switch the LEAD icon in the toolbar to L2 and acquire a good waveform then save the reference for L2. Otherwise, testing can continue using just one reference.

16. Continue with testing as normal then save your results when completed.

The active test configuration can then be re-used for other similar applications, and you will set the test reference for each session following this same process.

Manual Coil Testing

The Manual Coil Test screen is used when conducting coil comparison testing, or when testing armatures. The screen combines RLZ and Surge testing. Basic pass/fail PD testing can also be conducted.

Measurements are taken from individual coils or from bar to bar on an armature commutator.

An asset must be created and selected before conducting tests because an active test configuration with defined test references is needed to make proper comparisons between coils.

Selecting an asset also provides the option to collect test data that can, for example, show the test results for a batch/ lot of coils tested.

> NOTE: In this application, an asset typically refers to a type of coil rather than to a specific individual coil. Assets can be created for a coil type and re-used over time—often in pass/fail applications where saving individual test results is not needed. Alternatively, assets can be created for batches of coils if you want to save testing information for quality assurance or other applications.

Fig 97: *Coil Test screen toolbar icons.*

No	Description
1	This icon toggles between L1 (Lead 1 → 2) and L2 (Lead 2 → 1). It indicates the lead that the surge pulse is applied to during a Surge test.
2	Save Test Reference. Saves the acquired waveform to be used as a reference.
3	Indicates equipment stop. ADX will lock operations when this icon is active. Press and turn red E-Stop button on ADX front panel clockwise to release.
4	Test configuration icon. Touch to edit the active test configuration.
5	Save completed test data.
6	Open Help for the currently selected screen.
7	Exit the Coil test screen.

The graphic and table below provide an overview of the Coil Test screen elements.

Fig 98: *Coil Test screen elements.*

No	Description
1	E-bar graphically displays the energy level drawn during Surge testing.
2	Displays the voltage level applied during Surge testing. Changes when manually ramping.
3	Control buttons for selecting what will appear within the adjacent measurement graph.
4	Go to first result in graph.
5	Go to previous result in graph.
6	Identifies coil number being viewed when reviewing results, or coil being tested during test process. A green indicator cursor moves over the coil selected for viewing or testing.
7	Go to next result in graph.
8	Go to last result in graph.
9	Last measurement display field; always displays the last measurement recorded in the testing process.
10	Upper graph displays results for DC resistance, inductance, impedance, phase angle, or line-to-reference EAR+ tests.
11	Leads energized light; flashes to indicate that test leads are energized.
12	Active Test button; toggles between RLZ and Surge.
13	Auto Advance button; toggles between ON and OFF.
14	An EAR bar appears to the right of the waveform graph, displaying the level of L-R EAR measured in the test in progress.
15	Lower graph displays the results of Surge testing the coil. It displays the surge waveform, along with the target voltage and pulse count as defined in the active test configuration. The graph uses the same display scale controls as the dedicated Surge Test screen.

The box at the bottom of the green coil indicator cursor serves a variety of functions depending on the type of test result being displayed and the selection of other screen elements. In the example below, it displays the L-R EAR[+] measurement value for L1 (red circle) for coil number 2. Using this example, if L1 is changed to L2, the number would change to show the measurement value for L2, coil number 2.

Pressing on another button to the left of the graph would change the number to the measurement value for the selected test type.

If a point of the graph was out of range, a small arrow would also appear in this box to show you the direction that the value is out of range.

Fig 99: *Coil Test screen cursor box with measurement value features.*

Manual Coil Testing Processes Overview

> NOTE: This process is written from the perspective of using a test configuration with test references assigned as described in "Setting up References for Surge Testing" on page 93.

1. With the test leads properly connected to the asset, ensure that Coil #1 is displayed in the top middle field. This is the number of the coil you are presently testing. You can select the coil being tested manually after each coil is tested, or you can turn on the AUTO ADVANCE ON/OFF button found in the lower right corner to have the software advance to the next coil automatically.

1. If AUTO ADVANCE is OFF and this number is not advanced after a test, results will be overwritten for the currently selected coil. ***This process example continues with AUTO ADVANCE ON.***

2. With the ACTIVE TEST button set to RLZ, press the Push-to-test (PTT) button on the top left of the ADX front panel for a couple of seconds then release. All low-voltage tests will be run.

3. The LEADS ENERGIZED indicator (middle right) flashes to alert you that voltage is being applied. LEDs on the ADX front panel also light to indicate the leads energized.

4. Values for the RLZ tests will be plotted in the upper graph. Change test leads to the next coil and repeat until all coils have been tested for RLZ.

Fig 100: *Coil Test screen with example RLZ test in progress.*

5. When all coils have been tested for RLZ, switch the ACTIVE TEST button to SURGE and set the coil to number 1.

6. Press and hold the Push-to-Test button on the top left of the ADX front panel to run a surge test.

> ⚠️ CAUTION: When test references are set up for the asset and Zero Start Override is active, the full target voltage (displayed top right in the lower graph) will automatically be applied to the asset.

7. The LEADS ENERGIZED indicator (middle right) flashes to alert you that voltage is being applied. LEDs on the ADX front panel also light to indicate the leads energized.

8. When you reach the target level, continue to hold the PTT button until the software generates a satisfactory Pulse Count (displayed middle right in the Surge waveform graph). Typically, 10–15 pulses are sufficient to obtain a stable waveform.

9. Release the PTT button when you have a satisfactory waveform.

10. If your active test configuration is set up to test coils in both directions, and AUTO ADVANCE is OFF, touch the Leads Direction icon at the top to switch test direction from Lead 1–2 to Lead 2–1 then run the Surge test procedure again. With AUTO ADVANCE ON, this will happen automatically.

11. Change test leads after each surge test completes and repeat until all coils have been surge tested.

> 💬 NOTE: When you use a separate reference for each lead (L1 and L2), you must physically connect each coil in the same manner to ensure that the proper reference applies to the lead that will have the surge pulse applied. Properly correlating the references with the physical connection will ensure that your test results are accurate across all coils.

12. Save results after completing your tests.
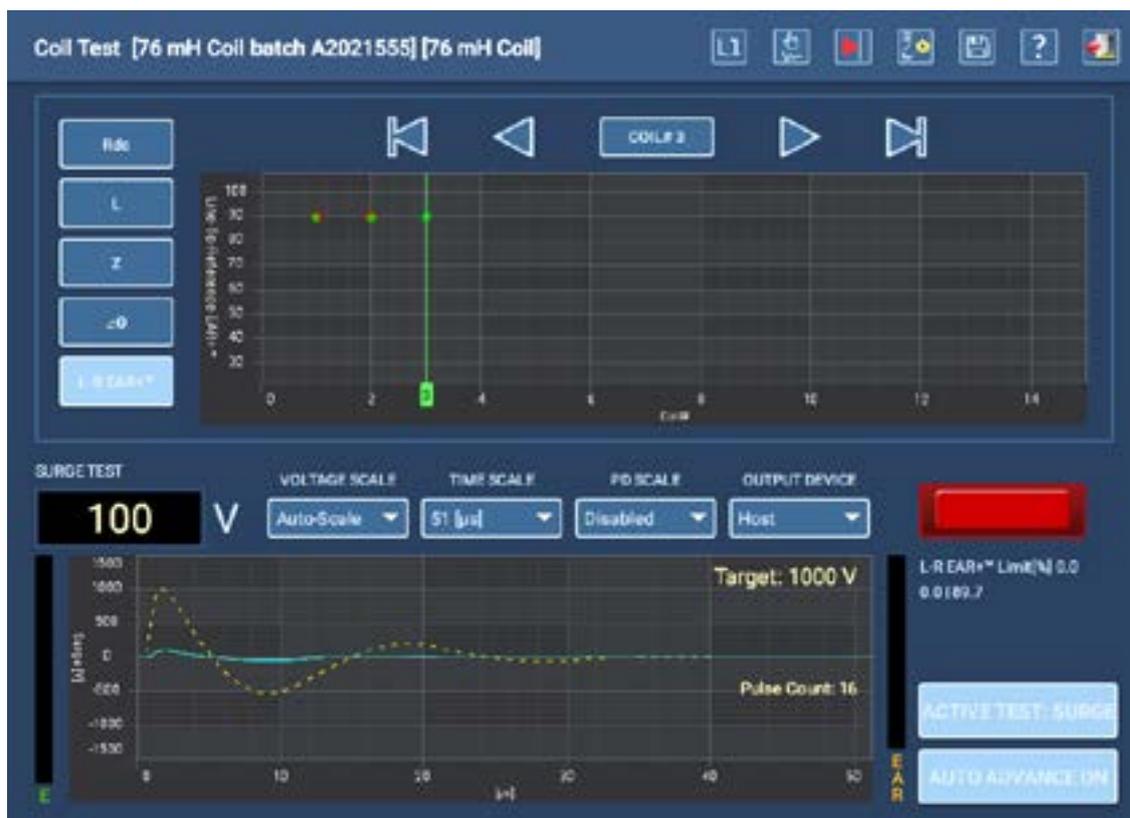
Fig 101: *Coil Test screen with example Surge test in progress.*

> 💬 NOTE: If PD testing is enabled in coil mode and a PD event is detected, a red "PD" symbol will appear just above the ACTIVE TEST button and a PASS/Fail result will be added to the test event record.

Armature Testing

The Manual Coil Test screen is also used when testing DC armatures, and the screen's features behave in the same manner. However, rather than testing a physically single coil with only two contacts, armature testing involves applying the armature testing probe tips sequentially from bar to bar around the commutator. Depending on winding equalization, a portion or all of the bars can be tested in this manner.

Armature testing involves using special leads and accessories for RLZ and Surge testing.

Armature RLZ Testing

RLZ testing uses the low-voltage probes connected to the RLC adapter on the back of the unit as shown below.

Fig 102: *Armature RLZ testing uses RLC adapter and hand-held probes—smaller probe set shown.*

1. Remove the standard lead set from their receptacles and store in their backpack or a clean dry place.

2. Ensure that the RLC test leads are properly connected to the RLC adapter. Connect lead 1 to the lower level and lead 2 to the upper level.

3. Two options are included with the ADX15A as shown in the image below. The set on the left uses the DLRO Connect system with pistol-grip spring-loaded probes. They are typically used on medium or larger sized commutators. The spring-loaded probes on the right are used for smaller devices.

Fig 103: *Armature RLZ testing leads included with the ADX15A.*

4. Test leads options are all Kelvin-type leads. Ensure that all four probe tips make proper contact with the armature bars.

Armature Surge Testing

Surge testing uses the ADX ARM SRG fixture or the hand-held probes as shown in the second image below. These accessories are plugged into the ARMATURE receptacle on the back of the ADX.

1. Remove the RLC low-voltage lead set from their receptacles and store in their backpack or a clean place.

2. Ensure that the selected accessory is properly connected to the ARMATURE receptacle on the back of the ADX.

3. When testing the armature bars, ensure that all probes properly contact their bars.

4. If using the ADX ARM SRG adapter, ensure that the activator buttons connector is properly attached to the FOOTSWITCH receptacle on the back of the ADX.

5. If using the hand-held probes, a footswitch should be used to activate testing. Plug the footswitch connector into the FOOTSWITCH receptacle on the back of the ADX.

6. Hold the test accessory contacts in place for 10–15 pulses to obtain a stable waveform.

Fig 104: *Armature Surge testing uses ADX ARM SRG adapter or hand-held probes for surge testing.*

Auto Tests

CAUTION: Ensure that the ADX Test Leads are properly connected to the asset being tested as described earlier in this guide.

Ensure that all safety precautions are in place before conducting any test.

Main Menu Automatic Tests

Touching the AUTOMATIC TESTS icon reveals a screen containing icons that provide access to automated individual RLC, HiPot, and Surge tests.

You can also select REPORTS to view report results or to generate new reports for completed tests.

Press the LOGOUT icon to sign out of your user profile and return to the Login screen when you have completed your tasks.

Fig 105: *Auto RLC Test screen.*

NOTE: Due to the complex nature of Automatic and Sequence testing, an asset with an assigned test configuration is required for testing.

Test Initiation Screen

When starting an automatic test, a Test Initiation screen appears first so you can confirm the test configuration to use (or change it if needed) and you can enter the actual winding temperature value.

Use the Test Condition fields to select or define specific conditions related to executing the test. Examples include, defining a specific testing process, or describing the environment in which the asset is being tested.

Pressing the TEST ASSET button starts the testing process.

Testing safety message screens appear next, followed by the screen for the selected test.

Fig 106: *Automatic test initiation screen.*

Automatic RLC Test

1. When the Auto RLC test starts to run, select the lead(s) that you want to test or select ALL LEADS. Monitor the RLC screen to view test results collected when the test completes.

2. If capacitance testing is turned on in the test configuration, the software will alert you to reconfigure the test leads as shown in the example below. Test Lead 1 will be connected to motor lead 1, test lead 2 to the motor frame, and test lead three will be disconnected (not contacting any motor lead or ground).

> NOTE: Acknowledge this message only after the leads have been reconfigured. Pressing the OK button will immediately initiate the capacitance test.
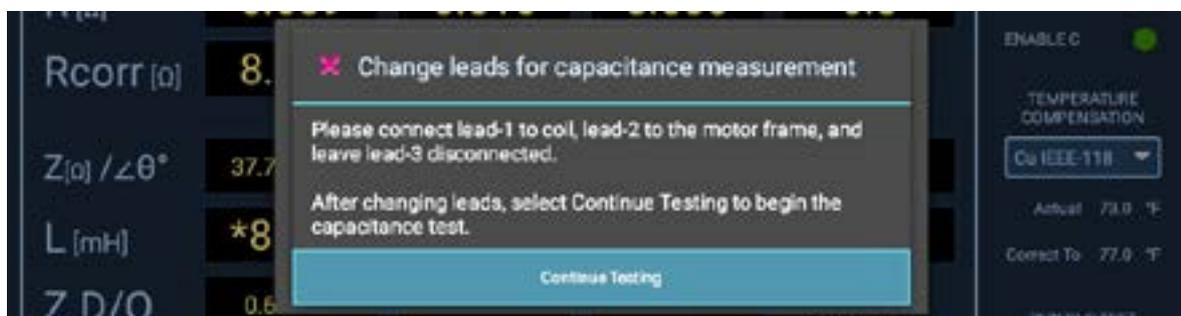
Fig 107: *Auto RLC test: change lead message for capacitance testing.*

3. Another message will appear after the capacitance test completes, telling you to restore the test leads to their original connections. ***Ensure that the connections are restored before clicking OK***.

4. When testing completes, press SAVE to record your data on the local database.

5. Press the EXIT icon in the top right corner to leave the RLC Test screen.

Automatic DC Test

During Automatic DC testing, you can use the toggles below the graph to display or hide Y-axis elements for current and resistance. Otherwise, all testing is automatically executed from this screen using the parameters specified in the active test configuration of the selected asset.

> NOTE: Use the E-STOP button on the lower right of the ADX front panel to stop the test and quickly de-energize the high-voltage leads if needed.

Notice that this screen has only a START/STOP button in place of all the controls available in manual mode.

After pressing START, voltage is applied to the test leads automatically by the ADX. The LEADS ENERGIZED indicator in the top right corner flashes until the leads have properly discharged. LEDs on the ADX front panel also light when leads are energized.

You can monitor test progress, viewing applied voltage along with current and resistance values as the test executes. The software adds markers to key points in the test process where IR, DA, and PI testing complete. Markers also appear for HiPot tests.

If a test fails during this process, the software will provide a message notifying you of the issue and will terminate the test immediately. In the event of a failure, stop testing and evaluate the test data before conducting any further troubleshooting or testing.

Fig 108: *Auto DC Test screen running Standard Hipot Test.*

When testing completes, a small message box appears in the middle of the screen showing the progress of the discharge process (in seconds). When the message disappears, the LEADS ENERGIZED indicator will turn off, and the test leads will be discharged.

Fig 109: *Auto DC Test completed and displaying discharging message box.*

Review the test results here as needed then press the EXIT icon to leave the DC Test screen.

> NOTE: If Temperature Compensation is used (set in this screen using the drop-down list, or in the active test configuration) the MΩ field will display the corrected value based on that compensation, not the direct calculated value. You can change this display during testing by changing the value in the Temp Compensation drop-down list.

Before returning to the Automatic Test main menu, a message appears instructing you to allow the asset sufficient time to discharge before removing test leads. Depending on the asset's size and the amount of time high voltage has been applied, this time will vary.

> **WARNING: To ensure the safety of all personnel, refer to "Ensure Proper Grounding and Discharge after Conducting DC Tests" in chapter 1, "General Operating and Safety Information" for guidance on properly discharging and grounding the asset (DUT).**

If you plan to continue with Surge testing, no grounding is needed at this time, but do not touch test leads before testing is properly executed and completed. Grounding should be conducted as needed after completion of all tests.

Automatic Surge Test

During automatic Surge test, you can use the scale features to adjust the waveform display as needed. The test will run based on the parameters defined in the test configuration currently assigned to the selected asset. For example, if PD testing is disabled within the test configuration, none of the PD elements will appear within the Surge test screen. However, you can enable PD testing here manually if needed.

In this example, PD is disabled in the test configuration and all three test leads have been selected (turned on) for Surge testing.

1. You can press START to continue testing as configured, or you can select the Leads (phases) that you want to test. The indicator light next to each LEAD button appears in bright green when the associated lead has been selected.

2. Press the START button to initiate testing.

After pressing the START button, voltage is applied to the test leads automatically by the ADX.

The LEADS ENERGIZED indicator in the top right corner flashes until the leads have properly discharged. LEDs on the ADX front panel also light to indicate which leads are energized.

As each phase is being tested, its green indicator light remains on. When a lead (phase) test has completed, its indicator light will turn off.

Fig 110: *Auto Surge test screen—Start.*

The example below shows the auto Surge test screen in progress. The LEAD indicators in the screen turn off as each test completes and the LEAD button is disabled.

The software handles all test functions automatically and the analyzer will run through the full test without stopping unless a failure is encountered.

3. Pressing the STOP button terminates the test in progress.

> NOTE: If a test fails during the testing process, the software will provide a message notifying you of the issue. You are given choices such as saving the test results, continuing with testing, or exiting without saving. Messages and options vary depending on the failure type encountered.

Fig 111: *Auto Surge test screen—test in progress.*

4. When testing completes, press the EXIT icon in the top right corner to leave the Surge Test screen.

> **WARNING: To ensure the safety of all personnel, refer to "Ensure Proper Grounding and Discharge after Conducting DC Tests" in chapter 1, "General Operating and Safety Information" for guidance on properly discharging and grounding the asset (DUT).**

Surge Testing with Partial Discharge

Partial discharge testing is an optional feature on the ADX. Contact Megger Baker Instruments support for information on adding the feature to your tester.

> NOTE: PD can occur from test leads to ground, or from lead to lead. Keeping test leads off of the floor and separated from each other can mitigate some issues that can affect PD test results.

Surge testing with the ADX can include partial discharge (PD) detection. PD testing detects the discharge of localized ionic charge build-up within voids in the insulation system. This charge build-up is present due to the high electrostatic charge associated with high-voltage transients stimulated by the surge pulse. *Partial discharge does not result in a full conductor-to-conductor current flow.*

These discharges can ionize gasses within insulation voids, forming ozone and nitric acid, which will damage insulation over time.

Partial discharge testing relies on the accurate detection of four key metrics:

- PDIV—partial discharge inception voltage.
- RPDIV—repetitive partial discharge inception voltage.
- RPDEV—repetitive partial discharge extinction voltage.
- PDEV—partial discharge extinction voltage.

The ADX uses two parameters to monitor PD:

- PD Threshold—the amplitude at which a high-frequency transient (PD Event) is counted towards the PD Event Limit.
- PD Event Limit—the cumulative number of PD Events during each surge pulse required to constitute a PD surge pulse. When the number of PD Events exceeds this limit, a PD surge pulse is detected.

These parameters are defined in the active test configuration assigned to an asset.

As test voltage increases, PDIV is detected and recorded the first time that a PD Event Limit is reached or exceeded.

As voltage continues to increase, when PD is present, PD events tend to increase and are deemed repetitive when more than 50% of consecutive surge pulses contain PD. RPDIV is recorded the first time that this repetition occurs.
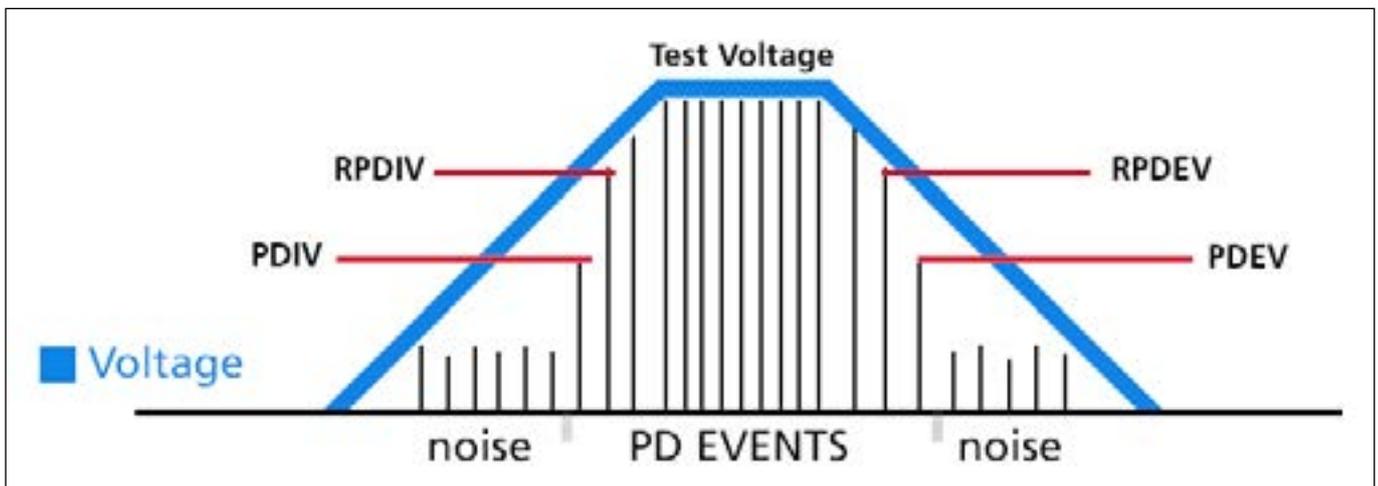
Fig 112: *Simplified representation of PD event detection elements. While these metrics are not usually symmetrical, PD events typically occur in a nearly symmetrical fashion.*

As voltage decreases, PD events tend to decrease. RPDEV is recorded the last time that more than 50% of consecutive surge pulses contain PD. When PD events cease, the voltage of the last PD event is recorded as PDEV.

> NOTE: To conduct PD testing on the ADX, you must first select an asset with an active test configuration assigned. Surge parameter will need to have PD enabled and PD parameters defined.

The partial discharge testing features on the ADX can be directly enabled within the Surge Test and Coil Test screens, or within the active test configuration. The image below provides an example of a Surge Test screen with PD enabled.

Just below the STOP button is the slider that enables PD. With this slider ON, the fields below the slider become visible. During testing, PD values are displayed in these fields along with the values for PD threshold, events, and limits. The threshold and limit values are defined in the active test configuration for the asset being tested.

> NOTE: Values for PDIV through PDEV are only displayed if PD is detected during the test. A completed test with no PD values indicates that your insulation system does not have detectable PD activity.
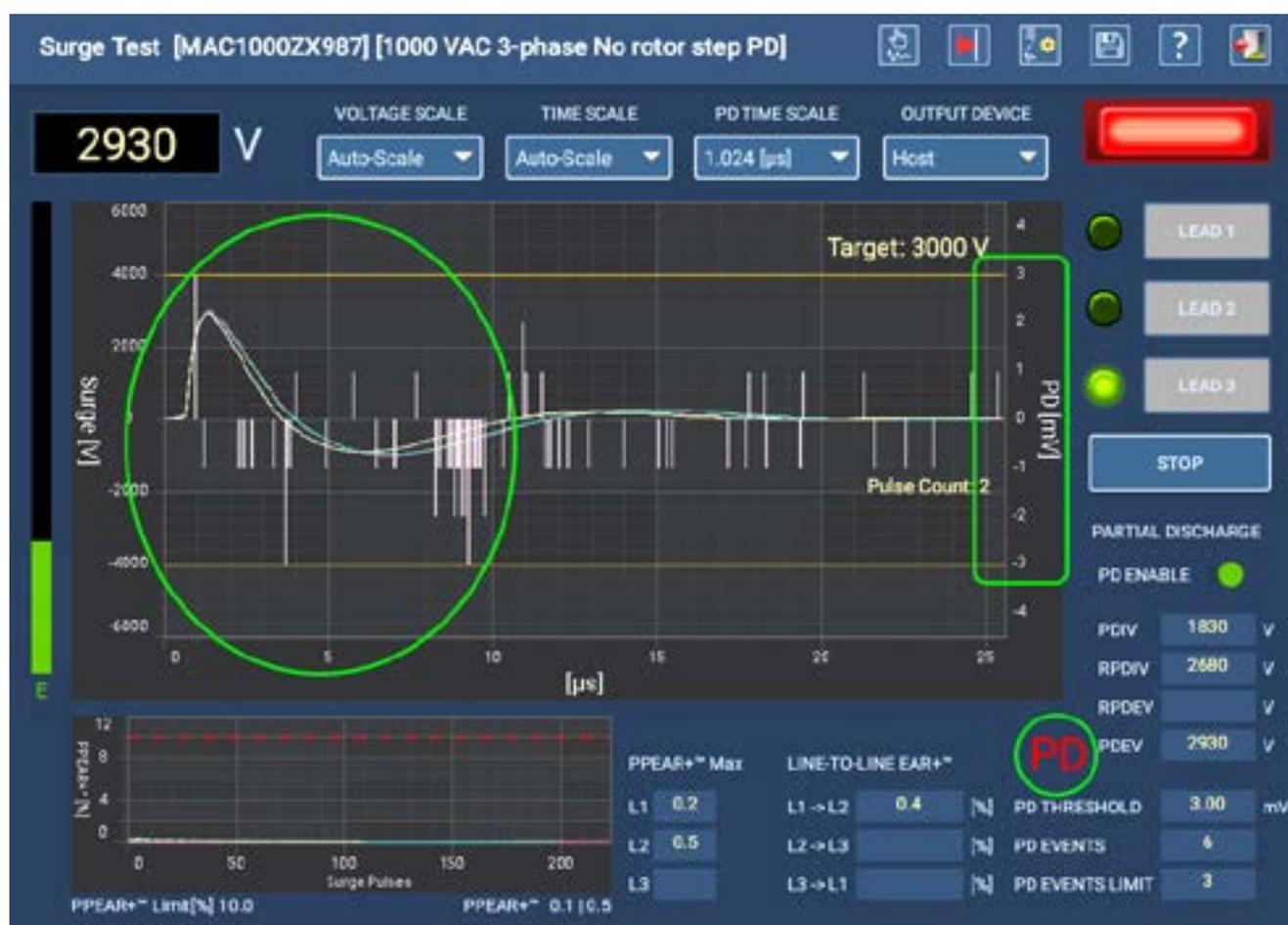
Fig 113: *ADX Surge Test screen with PD enabled and values recorded.*

When a PD surge pulse is detected, a flashing red "PD" appears adjacent to the PDEV line to alert the user. Corresponding *spikes* also appear in the PD display region (circled in example above). Most of the white lines displayed here indicate system *noise* detected by the hardware.

> NOTE: A value appears in the PDEV field when PDIV is recorded. That value changes as the test progresses. A recorded PDIV value will always have a PDEV counterpart.

The Y-axis scale to the right of the waveform display area shows PD information in millivolts. The yellow lines above and below show the PD threshold value. When spikes cross this threshold, they are counted towards the PD Event Limit. PD EVENTS are displayed in a dedicated field.

> NOTE: To ensure that PD values are accurately detected, voltage ramping should occur at a controlled rate—slowly increasing and decreasing. For this reason, we recommend conducting Surge with PD testing in Automatic mode or as part of a sequence (Sequence Mode, Auto test) with a lower value for the Voltage Ramp Rate.

As with all Surge testing, PD testing is conducted on each selected test lead. In the Surge Test screen, selected test leads are indicated by the green light to the left of each LEAD button.

> CAUTION: The red LEDs on the ADX front panel indicate when test leads are active and identify which test lead is energized. Within the Surge screen, an indicator light above the LEAD buttons also flashes when a test lead is energized.

Fig 114: *Voltage dropping to ramp down target (1000 V here), capturing extinction values for Lead 3.*

Defining PD Parameters in the Active Test Configuration

Parameters for PD testing are defined in the test configuration assigned to the selected asset. The Surge section is found near the bottom of the test configuration.

1. Surge Test must be enabled along with the leads that will be tested.

2. Define common Surge test parameters such as Target Voltage and EAR limits.

3. Set the Voltage Ramp Rate to a lower value to improve detection of the voltages associated with PD activity.

> NOTE: Ramp rates over 50V/pulse are not recommended for PD detection.

4. Define the (PD) Ramp Down Voltage—a "lower target" level at which PD detection is not expected (so the system does not have to ramp down to 0 volts before ending the test). This setting also minimizes the effect on PP EAR while ramping down.

5. Check the PD Enabled box and enter values for PD Threshold and PD Event Limit.

   ■ PD Threshold—the amplitude at which a high-frequency transient (PD Event) is counted towards the PD Event Limit.

   ■ PD Event Limit—the cumulative number of PD Events during each surge pulse required to constitute a PD surge pulse. When the number of PD Events exceeds this limit, a PD surge pulse is detected.

Fig 115: *Surge Test section in test configuration Editor screen.*

> NOTE: The PD Time Scale value shown above adjusts the display so that you see only one microsecond of the high-frequency content. Zooming in on the front edge of the surge waveform helps you see the region where PD activity is most likely to occur. The activity shown is more representative of what the PD event counter displays.

Setting PD Parameters

> CAUTION: Because PD signals are at a very high frequency, PD cannot be properly evaluated through distribution cables. Connect test leads directly to the asset's terminals.
>
> Ensure that all safety precautions are in place before conducting any test.

Finding the Noise Threshold in Manual Surge Mode

The PD Threshold and PD Event Limit will have default values set at the factory, but you will need to adjust the values for every motor tested because the noise levels change based on the location of the test and the device being tested. This change in noise levels requires adjustment to the PD Threshold so that it is 1–2 mV above the noise base line.

1. Select the asset you will be testing and ensure that it has the proper test configuration set as the active configuration for your testing needs.

2. From Manual mode, open the Surge Test screen and confirm that the top line displays the asset and test configuration needed then press or click on the Edit test configuration icon in the toolbar.

3. To start the process, set the PD Threshold to 1.0 mV and the PD Time Scale to 1.024 µs as shown in the preceding Test Config Editor example. These values help you see the noise levels more easily for the first steps in the process. Set the PD Event limit at 3, which is a good starting point for this part of the process.

4. Adjust other values if needed. Save your changes then press Exit to close the Test Config Editor and return to the Surge Test screen.

5. Check the values in the lower right corner to confirm your starting settings then press and hold the Push-to-test (PTT) button on the top left of the ADX front panel, ***but do not ramp up the voltage***.

> NOTE: The first part of the process does not ramp the voltage because you only need to determine the system noise level. This is also why Manual mode is used at this time.
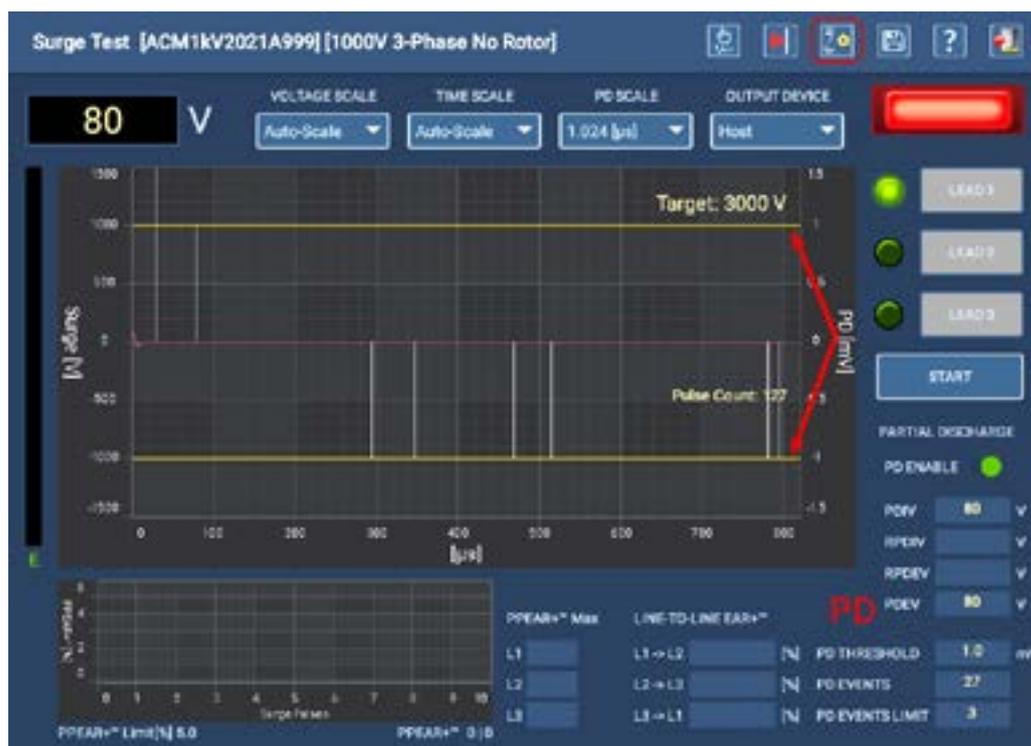

Fig 116: *Surge Test screen in Manual mode for setting PD parameters.*

6. Note the white vertical lines appearing; these represent the high-frequency content.   The yellow horizontal lines

mark the upper and lower ranges of the PD Threshold.

7. While continuing to hold the PTT button, take notice of where the white lines terminate and how far above the threshold lines some extend. These are your first indicators of what the threshold value should be. For example, in many cases, most of the white lines will reach or exceed the 1 mV threshold limits, and a fair number could be .5 or 1 mV above or below the threshold lines.

8. You should also notice that the number of PD Events reported is rather high, which at this point also suggests that the threshold value is set too low.

9. Release the PTT button when you have sufficient information to make your first adjustment.

Fig 117: *Surge Test screen in Manual mode for setting PD parameters.*

10. Using these observations, press the EDIT TEST CONFIGURATION icon then scroll down to the Surge Tests section and change the PD Threshold value to something reflecting your observations. For this example, the majority of spikes reached the 1 mV threshold lines and others reached 2 mV, so choosing a value 1.5–2.0 mV higher is a good next step.

11. Save your changes then return to the Surge Test screen.

> NOTE: If the Android navigation bar pops up on the bottom of the screen, click on the left Arrow to remove it so you can see the full screen.

12. Press and hold the PTT button again and observe the spikes and how they appear with the new threshold. Also take note of the number of PD Events indicated. If you are still seeing more than two or three occasional events, release the PTT button and return to the test configuration to make fine adjustments.

13. If the number of test events indicated is still higher than expected, but you are satisfied with the noise level, increase the Test Event Limit value by two more than the number indicated then re-check the results.

You can repeat this process until you have a satisfactory PD Threshold and PD Event Limit then move onto the next part of the process to see how your settings perform during testing.

Testing Your Settings in Automatic Surge Mode

This part of the process involves putting your asset through a normal Surge-with-PD test process.

1. Switch to Automatic Mode to test your asset using the established settings. For this example, 3.5 µs was set for PD Threshold and PD Events Limit remains at 3. As a rule, you want to see enough PD spikes to establish a practical value for capturing a valid PD Event.

2. With all three leads selected for test (set in the test configuration) press the START button to being the process.

3. Using Automatic Mode lets the tester do all the work while you observe the spikes that occur, compare them to the system noise level, and monitor the number of PD Events occurring.

4. You can also observe the recorded levels for inception and extinction voltages.

Fig 118: *Surge testing with PD in Automatic Mode to confirm settings.*

Surge Testing Notes and Recommendations

The following notes are provided for additional insight into specific Surge testing issues and situations.

Surge Testing with Rotor Removed (typically shop testing)

- Enable L-L EAR and set tolerance to 2% (form wound asset).
- Enable LL-EAR and set tolerance to 3% (random wound asset).
- Enable P-P EAR and set tolerance to 2–5%.

Surge Testing with Rotor Installed (typically field testing)

- Enable P-P EAR and set tolerance to 10%.
- Disable L-L EAR when testing in the field.

> NOTE: L-L EAR can be used in cases where you know that the specific asset has minimal rotor influence or standard offset by design.

False Pulse-to-Pulse EAR Failures

In some assets, the waveform will slowly migrate to the left as the voltage is increased. This slow draw to the left is caused by rotor influence. If the voltage is increased at too fast a rate, the movement can cause the P-P EAR to generate smooth but large changes that could exceed the P-PEAR limit threshold leading to a potential failure. To eliminate this nuisance trip, set the Voltage Ramp Rate to a lower value in the active test configuration.

Removing Ancillary Components

When performing electrical testing on an asset (applies to all test types), all ancillary electrical components should be removed from the circuit under test. These devices could lead to artificially lower insulation readings, and shifts and attenuation of the surge waveforms. Such devices include but are not limited to, power factor correction capacitors, lightning arrestors, surge capacitors, auxiliary devices being powered from the motor incoming power leads, and more.

Surge Test Underpowered

The Surge test is load dependent. Anything that adds capacitance to the asset under test will increase load on the tester. If the asset draws more energy than the tester can deliver, the test will fall short of the recommended test voltage.

Additionally, windings that have very low inductance, such as commutating coils or armature coils, require greater current flow and therefore higher energy to affect the desired test voltage.

Testing through long cable runs can also add significant capacitance to ground, which steals some of the energy intended to ring with the testers capacitor.

This will be realized when the energy bar on the left side of the Surge test screen tops out and the surge voltage stop below the expected test voltage. An example is shown in the image below.

If this occurs, a larger surge tester with more joules of energy should be used.

Fig 119: *Surge energy bar indicating maximum energy reached.*

Sequenced Tests Mode

⚠️ CAUTION: Ensure that the ADX Test Leads are properly connected to the asset being tested as described earlier in this guide. Ensure that all safety precautions are in place before conducting any test.

Main Menu Sequenced Tests

The SEQUENCED TESTS main menu provides tools to modify test sequences, execute routes, and run a fully-automated programmed sequence of tests on a selected asset.

Common controls help you select assets to test, generate reports on test results, and log out of the application.

Depending on the role and permissions assigned to a specific user, some of the options might not be accessible.

Fig 120: *Sequenced Tests—Main Menu.*

A test sequence can include a number of different test types including RLC, DC, Surge tests, and more depending on the asset type being tested. For the following example, we use a 3-phase AC Test sequence that includes the three test types noted above.

The test sequence defines the types of tests that are available in the sequence and the order in which they will be performed. The active test configuration defines whether these tests will be run.

If a test fails during this process, the software will provide a message notifying you of the issue then will provide you with options to save and exit, terminate, or continue testing. In some cases, you may also be given the option to perform retests, with or without saving data. Select the option desired and follow normal testing processes until you complete the sequence.

Test Asset

In Sequenced Tests mode, clicking on TEST ASSET runs a fully-automatic execution of all tests in sequence specified for the active test configuration of the selected asset.

1. Before running TEST ASSET in this mode, you must select an asset.

> NOTE: The asset must have a test configuration and Sequence assigned to it or this mode will not work. Sequences are designed to tell the tester which tests are available to run and in what order. The test configuration specifies which tests are actually run.

2. Tap on TEST ASSET to start the testing process. A Test Initiation screen appears before the test runs.

3. From this screen, you can confirm the test configuration you want to run or change it if needed.

> NOTE: Using this tool to change the test configuration only affects the immediate testing session. It does not change the active test configuration for the asset. Future tests will revert to the assigned active test configuration.

4. You can also enter values in the Test Condition row to provide additional information about the test.

5. Enter the actual temperature for the asset winding being tested then press the TEST ASSET button.

6. Testing safety message screens appear next, followed by any user-added connection and safety screens, and then the screen for the first test type in the sequence.
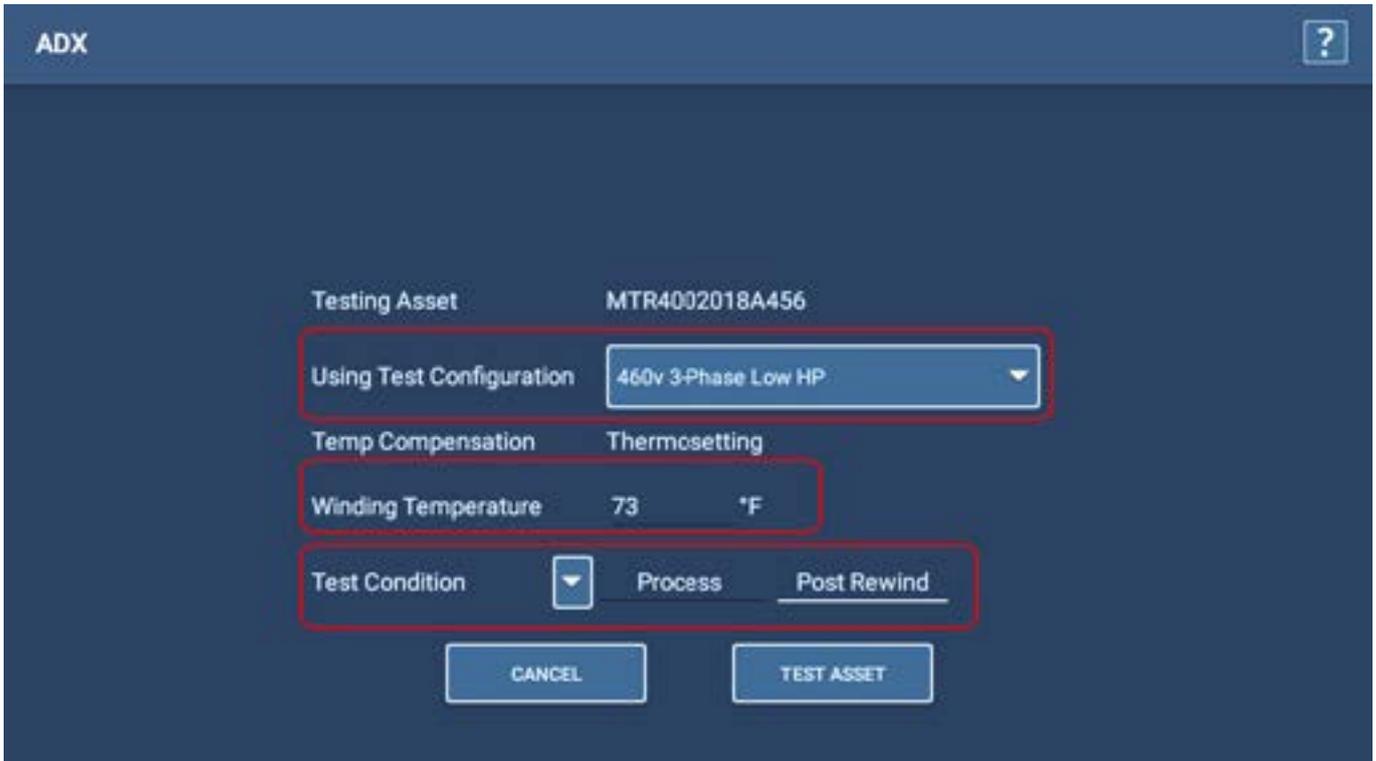

Fig 121: *Sequenced Tests mode Test Asset—Test Initiation screen.*

7. The RLC tests will run first in this example sequence. The test runs quickly and you will see very little as the test executes. If capacitance testing is enabled in the test configuration, the software will alert you to reconfigure the test leads as shown in the example below.

8. Test Lead 1 will be connected to motor lead 1, test lead 2 to the motor frame, and test lead three will be disconnected (not contacting any motor lead or ground).

> NOTE: Acknowledge this message only after the leads have been reconfigured.
> ***Pressing the OK button will immediately initiate the capacitance test.***
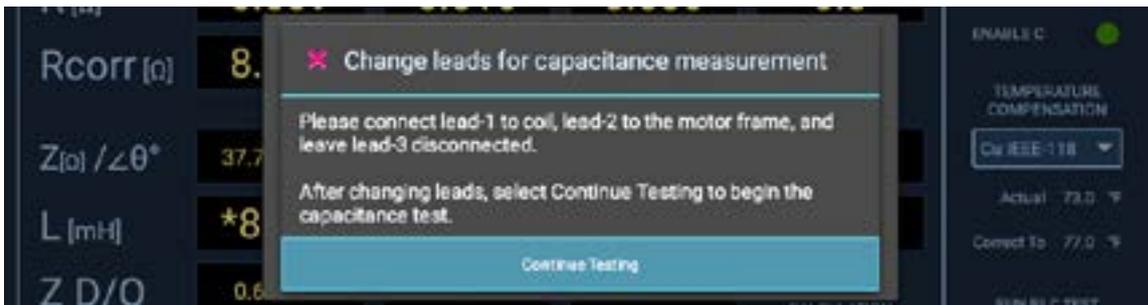
Fig 122: *Auto RLC Test; leads reconfiguring message for capacitance testing.*

9. After the capacitance test completes, another message appears letting you know that the capacitance test has completed and that you must restore the test leads to their original connections ***before continuing on with the next test in the sequence***.

> CAUTION: Acknowledge this message only after the leads have been reconfigured. After pressing the Continue Testing button, the software will immediately continue with the next test in the sequence—often DC Tests.
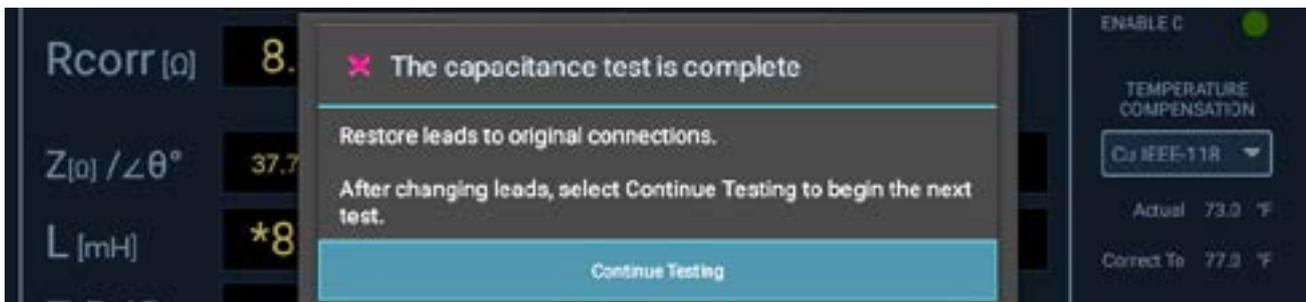
Fig 123: *Auto RLC Test; leads reconfiguring message for capacitance testing.*

10. During sequenced DC testing, you can monitor test progress, viewing applied voltage along with current and resistance values as they are collected. The software adds markers to key points in the test process where IR, DA, PI, and HiPot testing completes.

> NOTE: If Temperature Compensation is used (set in this screen using the drop-down list, or in the active test configuration) the MΩ field will display the corrected value based on that compensation, not the direct calculated value. You can change this display during testing by changing the value in the Temp Compensation drop-down list.

11. Testing begins immediately and runs non-stop unless a failure is encountered.

> NOTE: Use the E-STOP button on the lower right of the ADX front panel to stop the test and quickly de-energize the high-voltage leads if needed.

Fig 124: *Auto DC Test screen—test in progress.*

12. When testing completes, a small dialog appears in the middle of the screen showing the progress of the discharge process (in volts). When the dialog disappears, the indicator will turn off.

13. Surge test automatically begins next. The leads that will be tested are identified by the green indicators to the left of the LEAD buttons.

14. All other functions will be disabled and the test will run based on the parameters defined in the active test configuration of the selected asset. For example, if PD testing is disabled within the test configuration, none of the PD elements will appear within the Surge test screen.

15. When voltage is applied to the test leads (automatically by the ADX), the LEADS ENERGIZED indicator in the top right corner flashes until the leads have properly discharged; ADX front panel LEDs show which leads are energized. The LEAD indicators in the screen turn off as each test completes.

16. If the Surge tests pass, the sequence will automatically save the data and move onto the discharge screen or the next programmed sequence step. Manual interaction and saving test data is only required if there is an interruption in testing.

Fig 125: *Auto Surge test screen.*

17. Before displaying the test results summary, a message appears instructing you to allow the asset sufficient time to discharge before removing test leads. Depending on the asset's size and the amount of time high potential voltage has been applied, this time will vary.

> **WARNING: To ensure the safety of all personnel, refer to "Ensure Proper Grounding and Discharge after Conducting DC Tests" in chapter 1, "General Operating and Safety Information" for guidance on properly discharging and grounding the asset (DUT).**

18. When all testing has completed, you will see a results screen similar to the example below providing you with a summary of the test results collected.

In this example, all tests in the sequence passed. The Test Event row shows Pass and consequently indicates that all tests in the hierarchy passed.
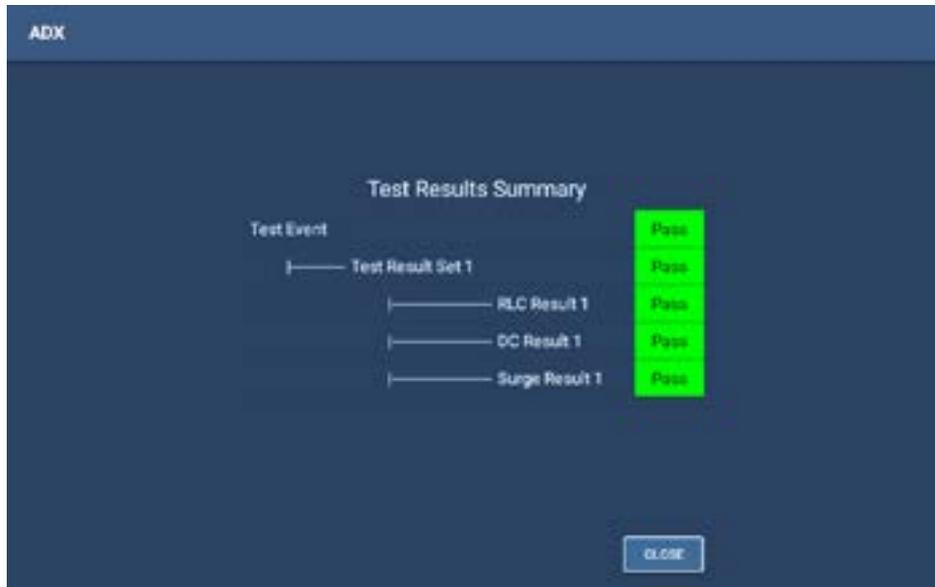
Fig 126: *Auto Test Results Summary.*

In this example, the Test Event row shows Fail, indicating that at least one Test Result Set failed. In turn, when a Test Result Set shows a Fail, it also indicates that at least one test within the set has failed.

Fig 127: *Auto Test Results Summary*

19. Click Close after reviewing the results to return to the SEQUENCE TESTS main menu.

NOTE: During Sequenced testing, if specific test segments are disabled, the software will display an error message or it will truncate testing depending on the test type involved.
* If RLC or Surge tests are disabled, a failure message will appears.
* If DC Tests are disabled, the software omits those tests.

Execute Route

As its name indicates, routes are executed from this screen.

1. Select the route you want to execute using the Route drop-down list. The table changes to display the Installations and assets assigned to the route.

As the table is populated, the software checks the assigned assets for existing results. If the software does not locate a prior test, the Tested and P/F (Pass/fail) fields will be blank. If a result is found, the date of the last result recorded will be listed along with the pass/fail status.

2. Before you test the asset, you can view the last result if needed. To do so, tap on the asset result you want to view to highlight it.

3. Press the VIEW RESULTS button to the right of the list to open the Reports screen for that result.

4. When you have finished reviewing the result, touch the EXIT icon in the top right of the Reports screen to return to the Execute Route screen.
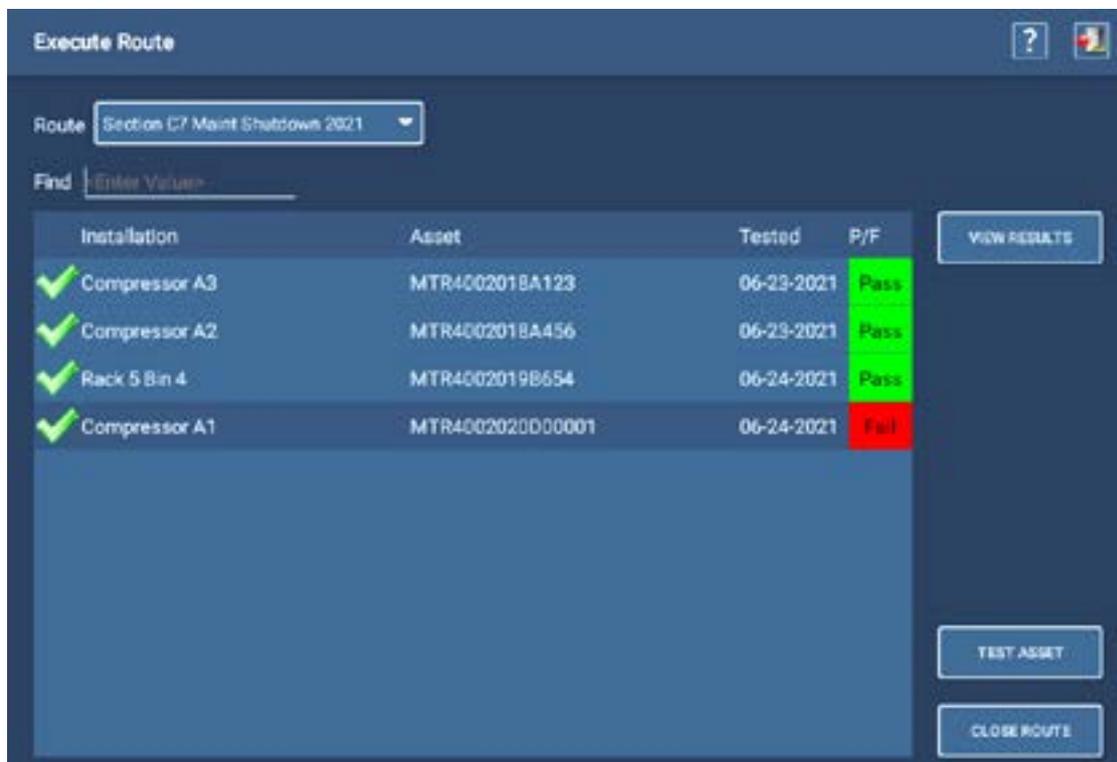
Fig 128: *Execute Route screen example.*

5. If you have a longer list of assets and you want to find something specific in the list, start typing in the Find field. The Find field has type-ahead capability—as you type, the software filters the list to display items that contain the characters entered. It will search all the fields and display items matching what you enter.

6. If you want to sort the items in the table, touch the header labels to toggle between ascending and descending order for that column.

7. If you are ready to test an asset, tap on the asset within the list that you want to test to highlight/select it then press the TEST ASSET button.

> NOTE: When selecting an Installation to test, the Installation must have an asset assigned to it, and the asset must have a sequence assigned to it.

8. Follow instructions presented for testing. When the test completes, the software automatically returns you to the *Execute Route* screen to continue with your route.

When an asset has been tested, the new result will be saved automatically and will replace the most recent result. A check mark will appear at the beginning of the row indicating that the asset was tested. The results will lock until all assets in the route have been tested.

9. When you have completed testing *all of your assets* within the route, press the CLOSE ROUTE button to save results and leave the screen.

10. If you have not completed testing all assets within the route, but you plan to continue testing (for example, shift change or end of work day), press the EXIT icon to leave the Execute Route screen. The route's progress is automatically saved and the software will return to the route's last-known state when testing resumes.

> NOTE: The software allows you to close a Route without testing all assigned assets; however, when you re-open the route to complete testing, you will be required to retest all assets because the software resets the progress of the route, removing all check mark progress indicators.

11. When you try to close a route that has untested assets, a message appears warning you that not all assets have been tested. Press No to cancel and return to the Execute Route screen then press the EXIT icon to leave the screen and keep your route open with the progress saved in its current state.
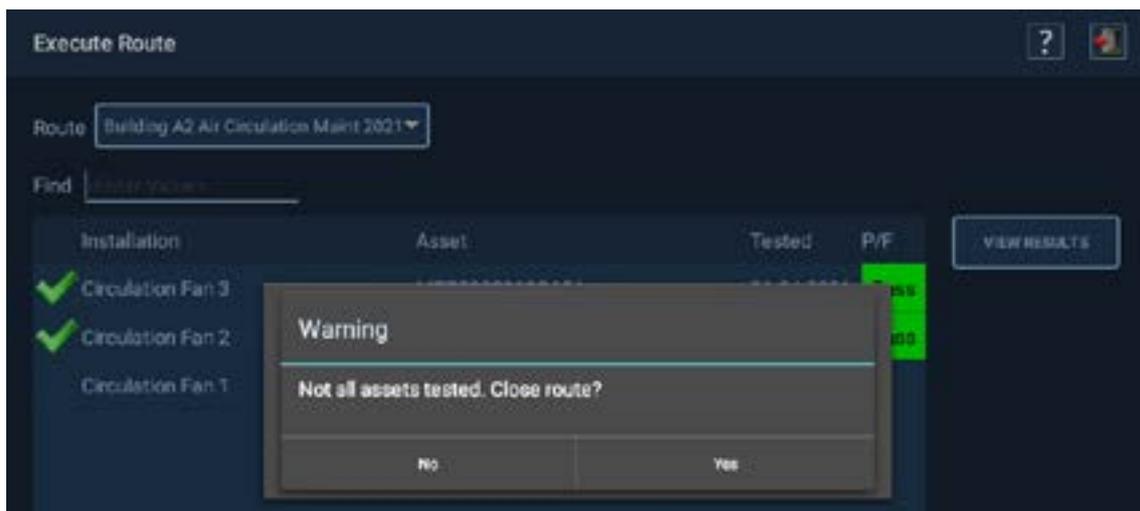
Fig 129: *Warning message presented when trying to close a route with untested assets.*

12. If you press Yes in response to this warning, when the route is re-opened, its progress will be reset (check marks removed), but the software will retain information about the last time each asset was tested as the example below illustrates.
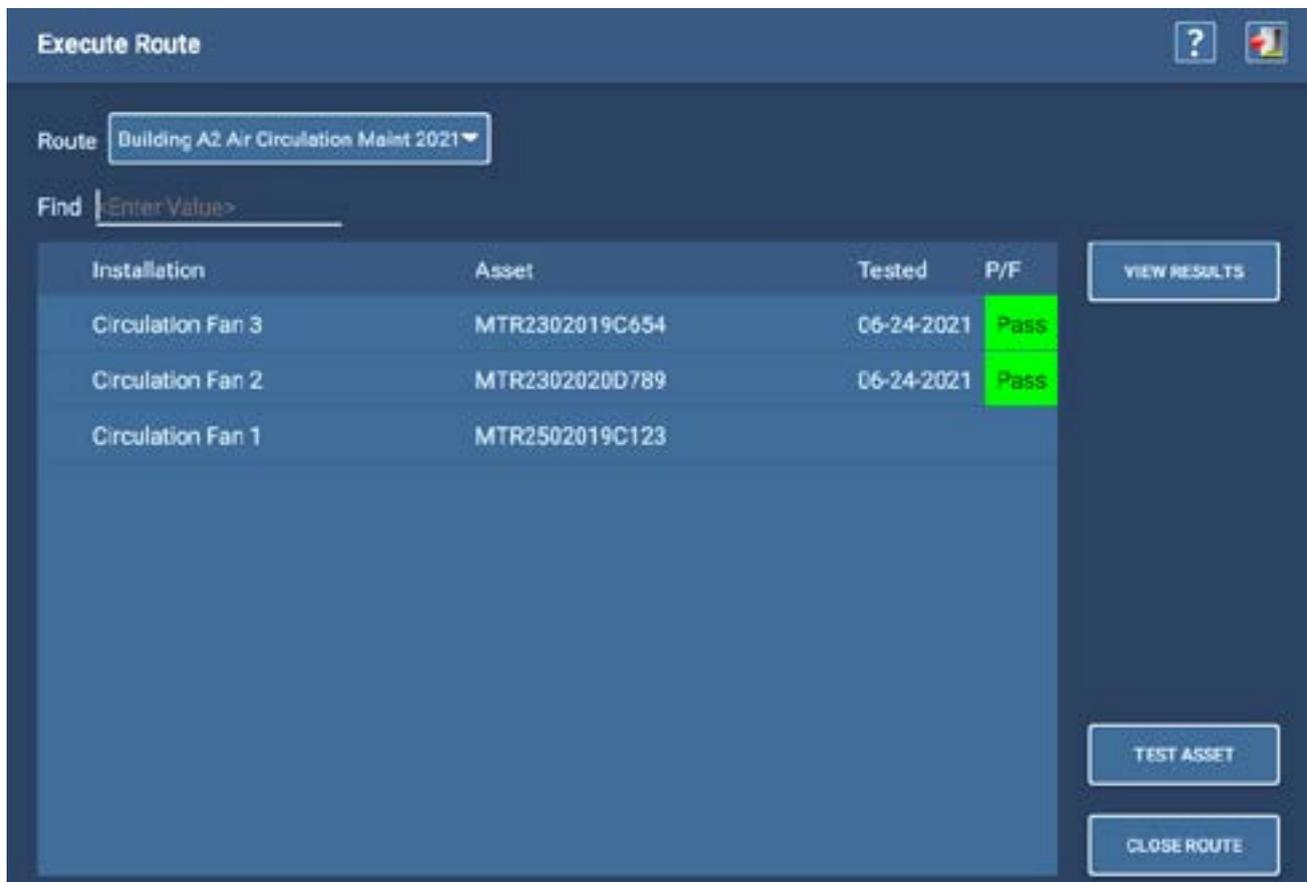
Fig 130: *Route display reset when saving route without completing tests on all assets.*

In most cases, an Installation will have only one asset assigned to it—commonly a motor driving a specific machine. However, Installations such as warehouses can have more than one asset assigned. Within a Route list, you should see one asset assigned to each installation, but the installation could be repeated in cases such as testing multiple spare motors in a warehouse.

Keep in mind that the software will display Installations with no assets assigned, and assets that have not been assigned to a Installation. In the first case, an asset might have been removed from a Installation, but the operator forgot to assign a new asset in its place. Checking with a supervisor or administrator might be needed to determine if a new asset has been installed in the Installation. Physically visiting the Installation will also reveal if an asset is installed. In any case, the installed asset should then be entered into the software at the current Installation to keep the route information current.

In the case of an unassigned asset, you will have to know where the asset is before it can be tested. This case commonly applies to smaller motor testing shops where all the assets are located within one staging or storage area.

Using the RLC Adapter for Low-voltage Testing

The RLC adapter (optional for most units; standard on ADX15A) is installed on the back of the unit as shown below.

Fig 131: *RLC adapter and hand-held probes—smaller probe set shown.*

1. Remove the standard lead set from their receptacles and store in their backpack or a clean dry place.

2. Ensure that the RLC test leads are properly connected to the RLC adapter. Connect lead 1 to the lower level and lead 2 to the upper level.

Two options are included with the ADX15A as shown in the image below. The set on the left uses the DLRO Connect system with pistol-grip spring-loaded probes. They are typically used on medium or larger sized commutators. The spring-loaded probes on the right are used for smaller devices.

Fig 132: *Armature RLZ testing leads included with the ADX15A.*

A variety of other test lead options are available to use with the RLC adapter. Refer to chapter "2 — Megger Baker ADX Instrument Overview" more information, or contact your Megger Baker Instruments sales representative for details.

The Manual mode RLC screen is used when testing with the RLC adapter. As the example below illustrates, only the first column (LEAD 1-2) is used when testing with the adapter because only one phase can be tested. Three-phase assets can be tested using the adapter, but only one phase at a time.

> NOTE: A footswitch is typically used in this application because the operator will need both hands to make contact with the asset under test.

3. Test leads options are all Kelvin-type leads. Ensure that all four probe tips make proper contact with the armature bars.

4. Press the footswitch to activate testing.

5. Results will appear in the RLC Test screen similar to the example shown below.

6. Press the SAVE icon in the top toolbar to save test results to the database.

7. Press EXIT to leave the screen.

Fig 133: *Manual RLC test screen used when testing with RLC adapter.*

Reports

Reports are accessed from any main mode screen by pressing on the Reports icon.

Reports—Test Results Selection

The right half of the Test Results Selection screen provides tools to help you find a test result. One of two modes can be used to locate test results: Search or Browse.

In some cases, the top field of the Test Results Selection screen displays a path that the software dynamically builds as you use the Browse tool to locate the test results you want to use in the report generation process.

The display area just below the "path field" lists the results of the browse (or search) criteria specified. The list can include test results or higher-level virtual directories that contain test results meeting the specified criteria.
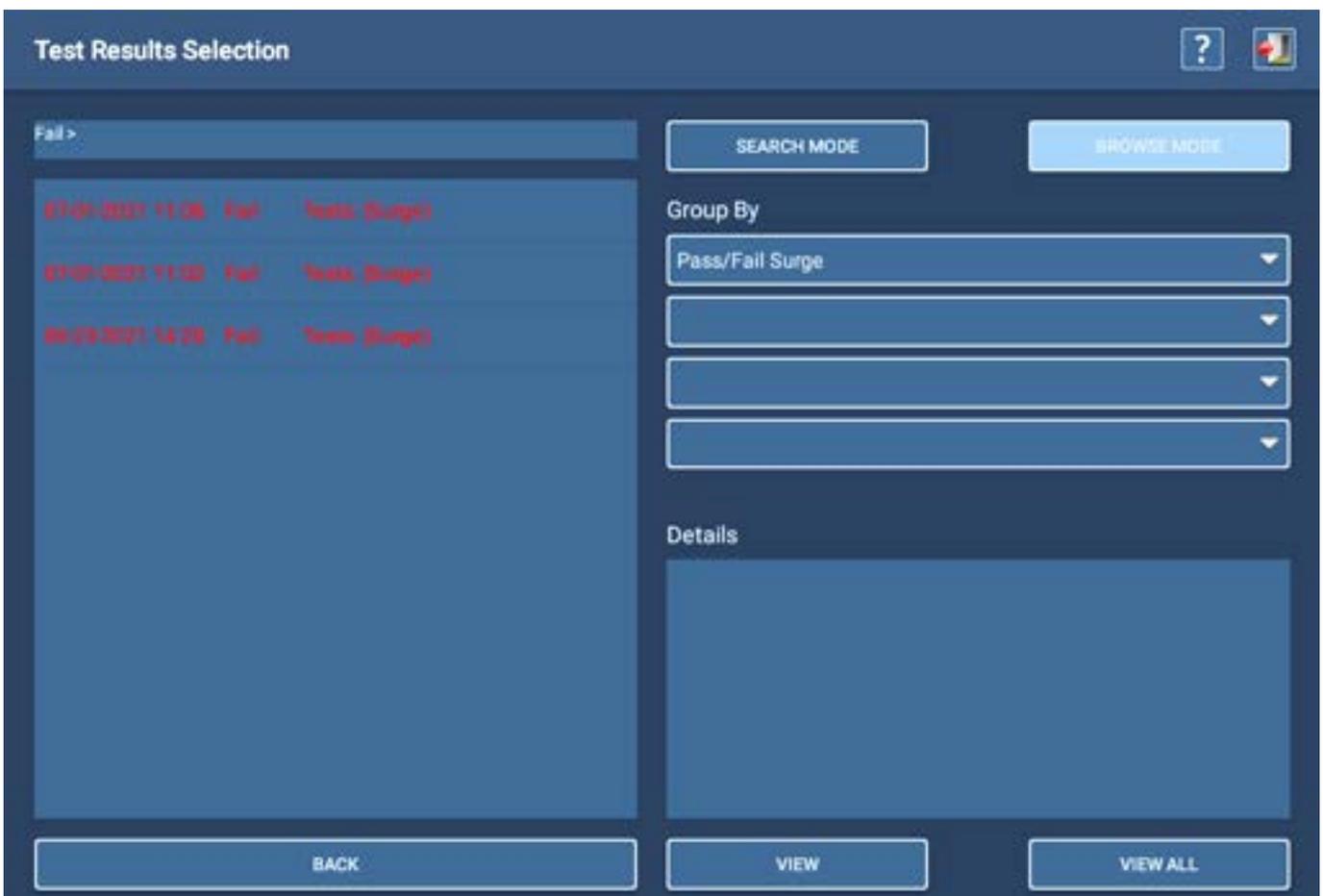
Fig 134: *Test Results Selection; Browse Mode example.*

The Test Results Selection screen includes other features for finding test results, such as the calendar tool used in Search mode to help find results from specific dates.
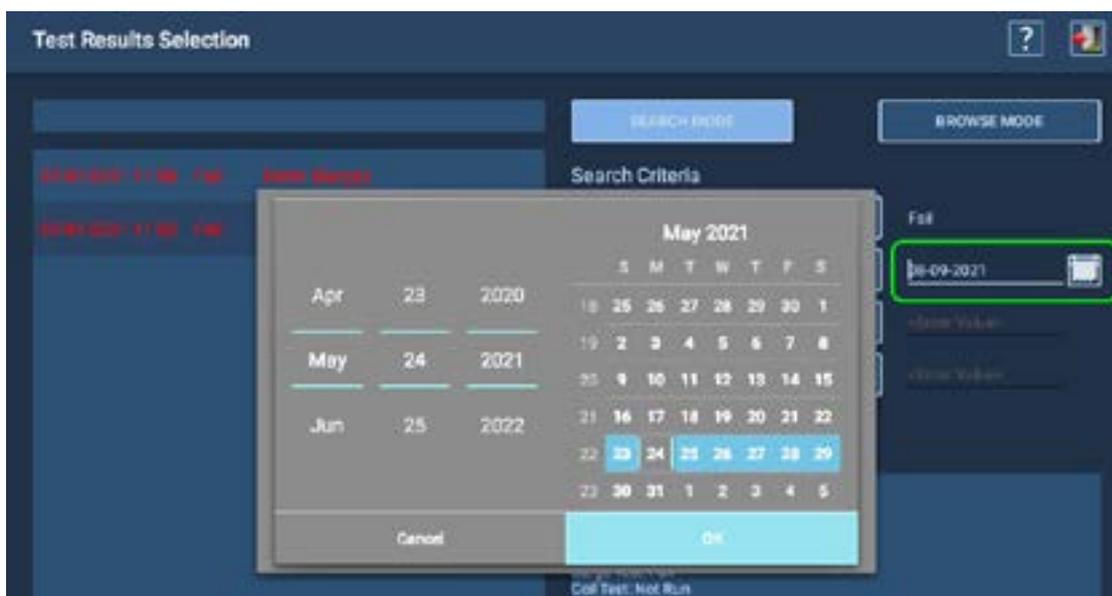
Fig 135: *Test Results Se*

1. When you have narrowed your list of test results, press the VIEW ALL icon at the bottom of the screen to see reports for all test results in the current list.

2. Touch an individual result to highlight it then press the VIEW icon to see the report for just that result. (When you select a single result, information on that result appears in the Details section.)
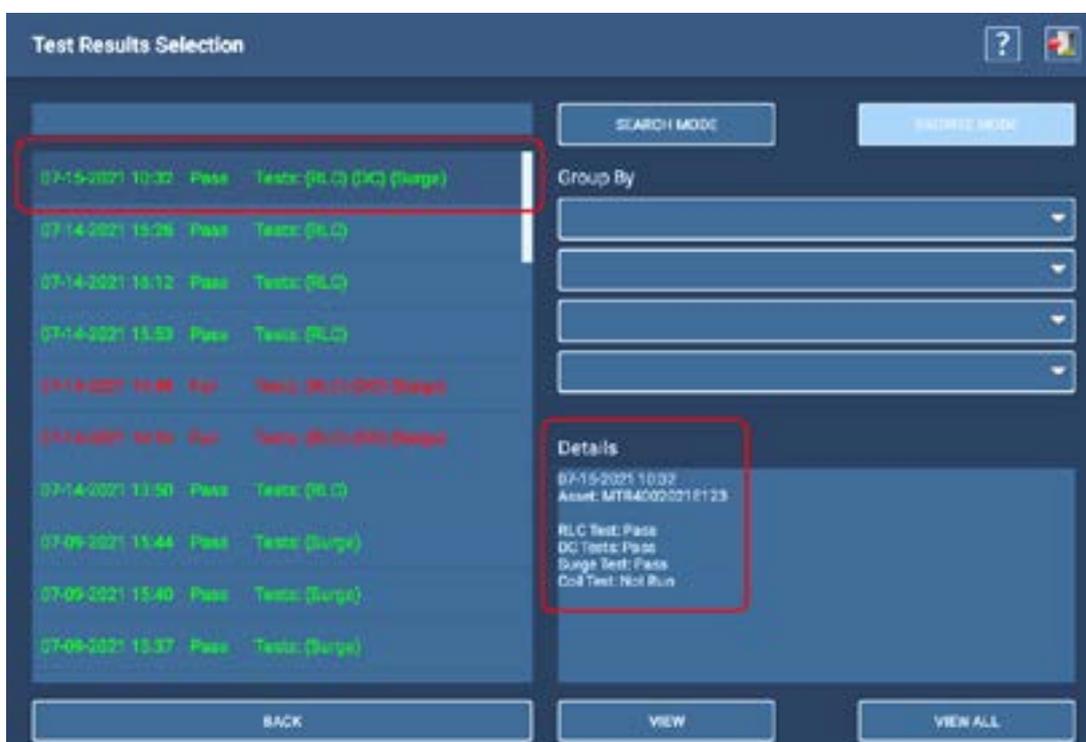
Fig 136: *Test Results Se*

3. The Reports screen appears next displaying a summary report for the recorded test event.

Reports Screen

The Reports screen displays one or more selected report results in a summarized format.

1. Add a logo to the report by checking the Display Logo box. If a file has already been selected, the logo will appear in the top right corner of the report. Tap on the logo to open a dialog that helps you locate or change files to use in this location.

2. Fields within the report that are underlined can be changed as needed. Tap on the field to select it then use your keyboard to make the appropriate changes. (If the keyboard is not attached to the ADX, a virtual keyboard will appear within the user interface.)

3. Add notes to the report by tapping on the Notes area. Add information to describe the report, specific testing conditions or issues, or other information to enhance the report.

> NOTE: Any changes made to the report by these means is automatically saved to the database. Pressing the save icon is not required.

4. If more than one test result was selected, you can use the controls above the screen to page through each report.

5. Press the Printer icon at the top right of the screen to print your report to a configured printer.

6. Press the Save icon at the top right to save a copy of the report in PDF format to a USB drive attached to the ADX.
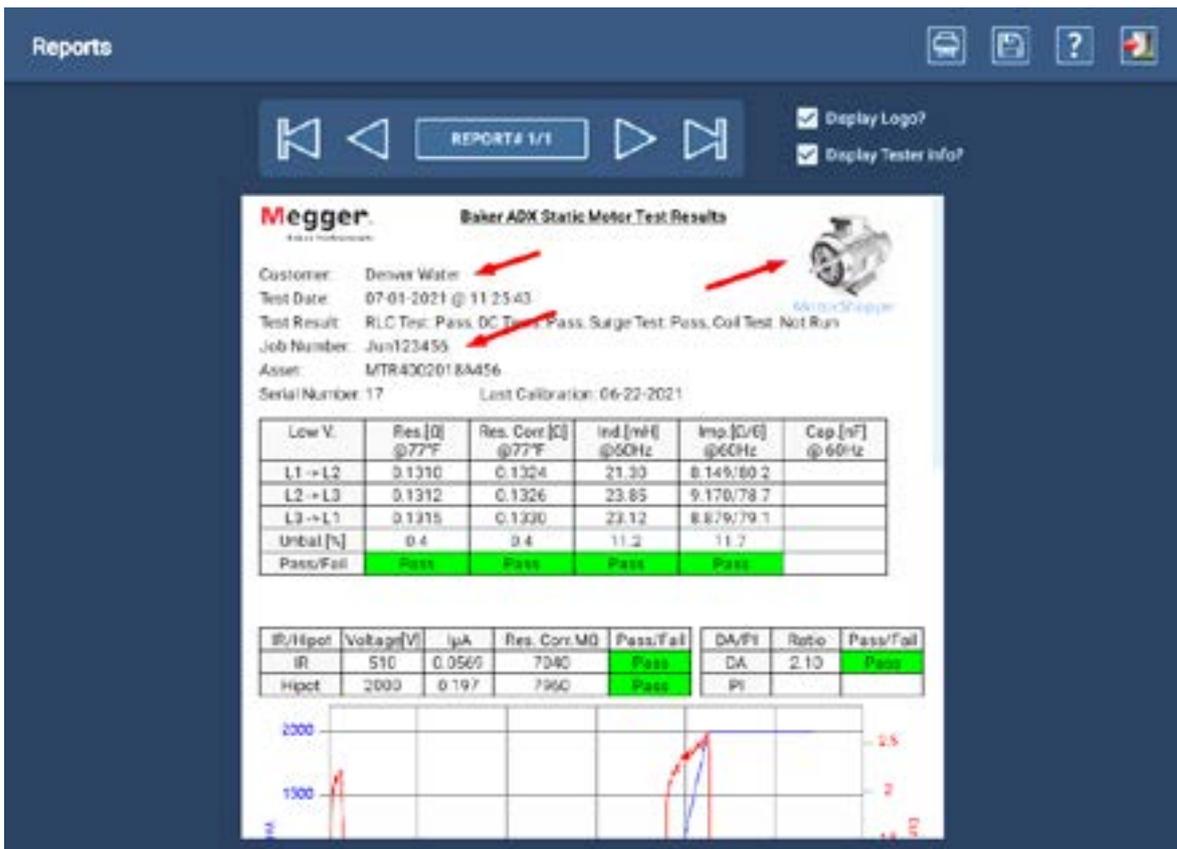
Fig 137: *Reports screen with example report—general information and RLC Test sections.*

The example image above shows the general information section of the report, along with the RLC Test results and the upper portion of the DC Test results section.

The next example shows a complete view of the DC Test section, along with a portion of the Surge Test results section.

Fig 138: *Reports screen with example report—DC Test section.*

The last example shows the complete Surge Test section that includes results for PD testing displayed in a table an complementing house plot.
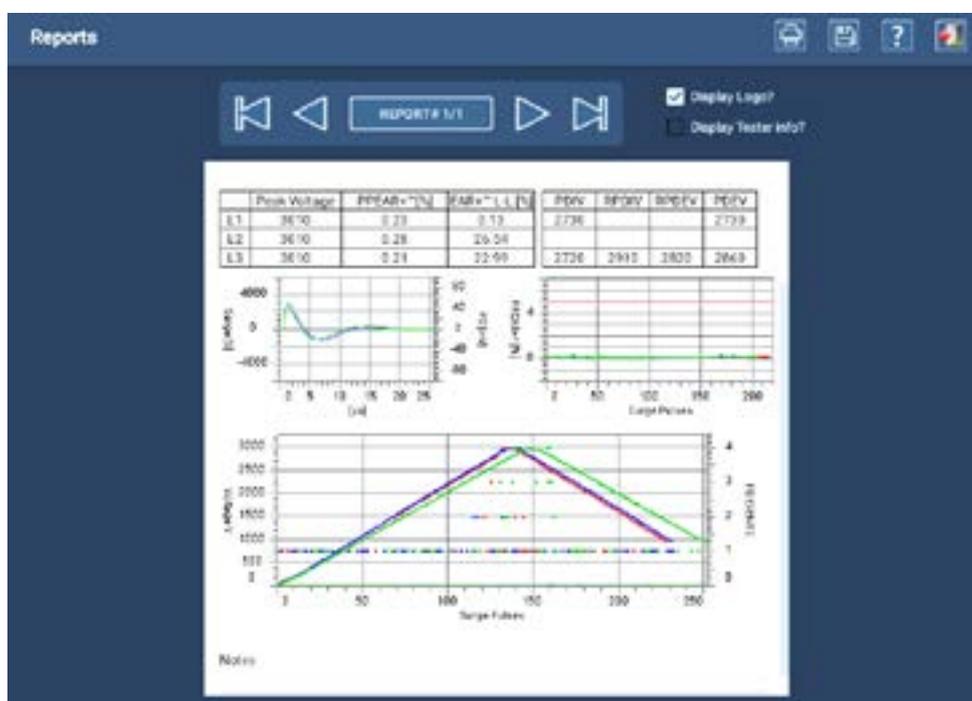
Fig 139: *Reports screen with example report—Surge Test sections.*

The ADX integrated Report Generator was designed to generate simple summary-styled reports. If you need to view and generate reports with additional features, use PowerDB Dashboard to leverage more options.

Appendix A — Troubleshooting

Site Map

The Site Map illustrates the flow of screens and controls within the ADX software user interface.
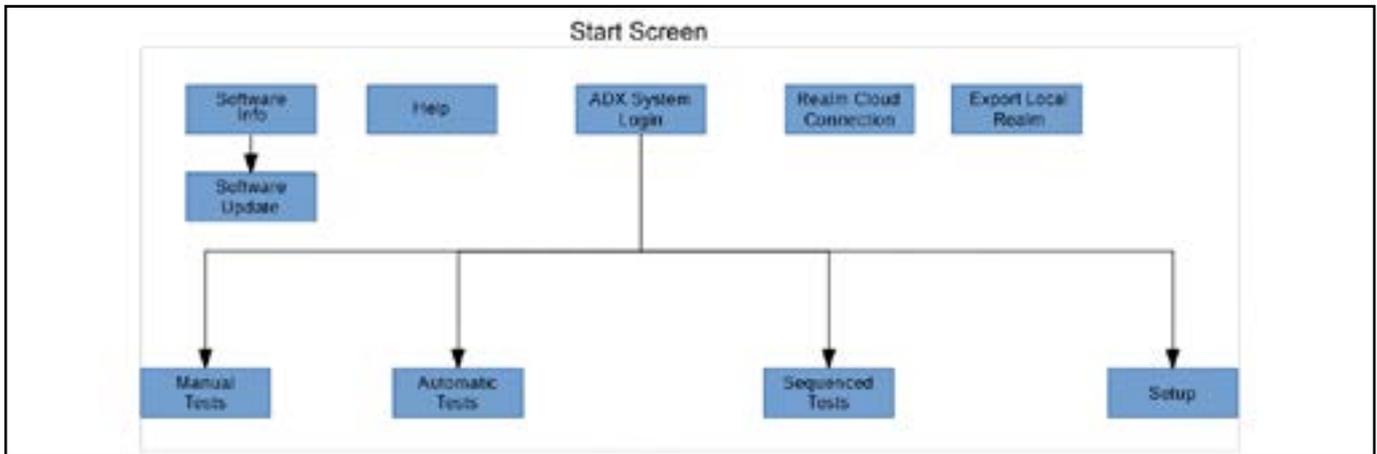
Fig 140: *Main Menu map.*
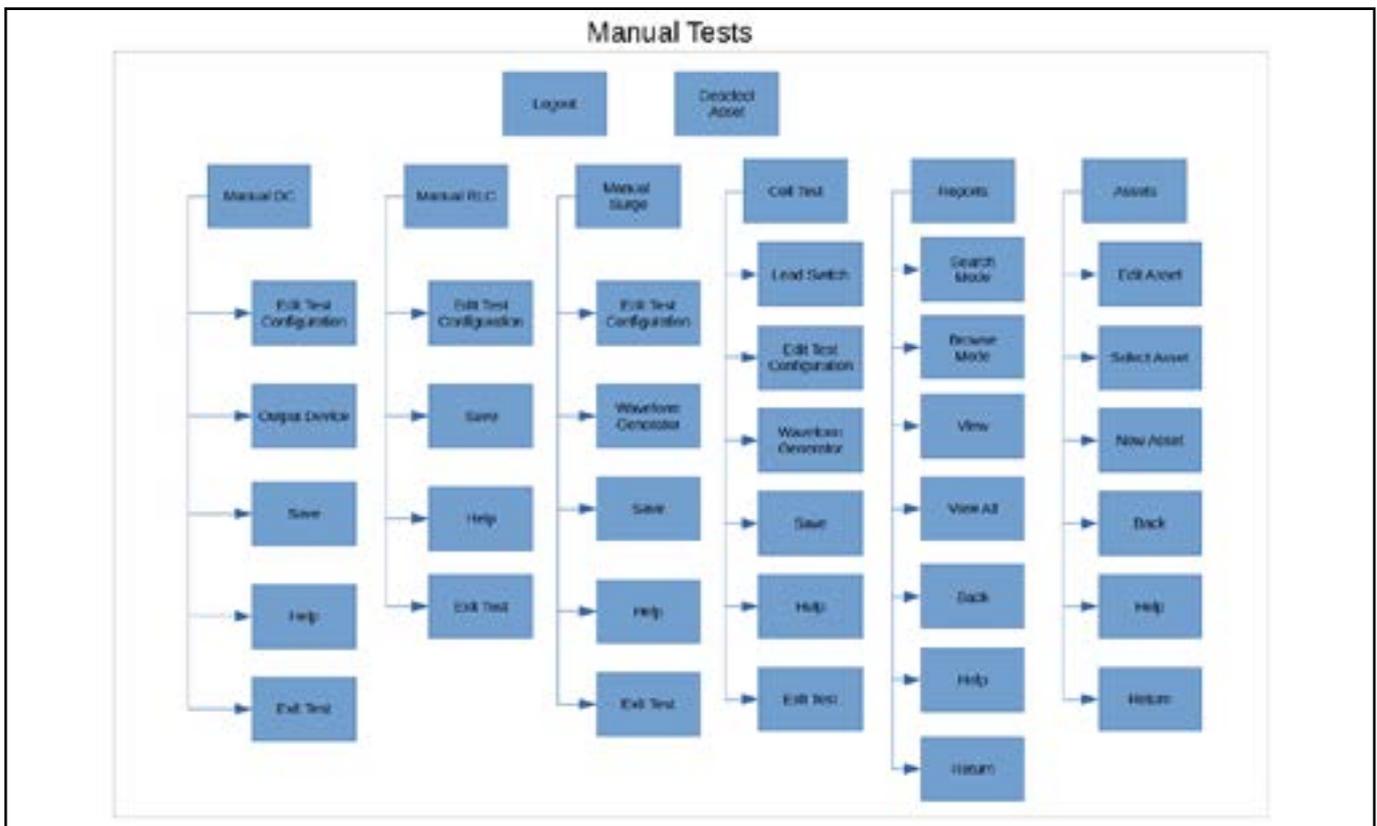
Fig 141: *Manual Tests Screen map.*
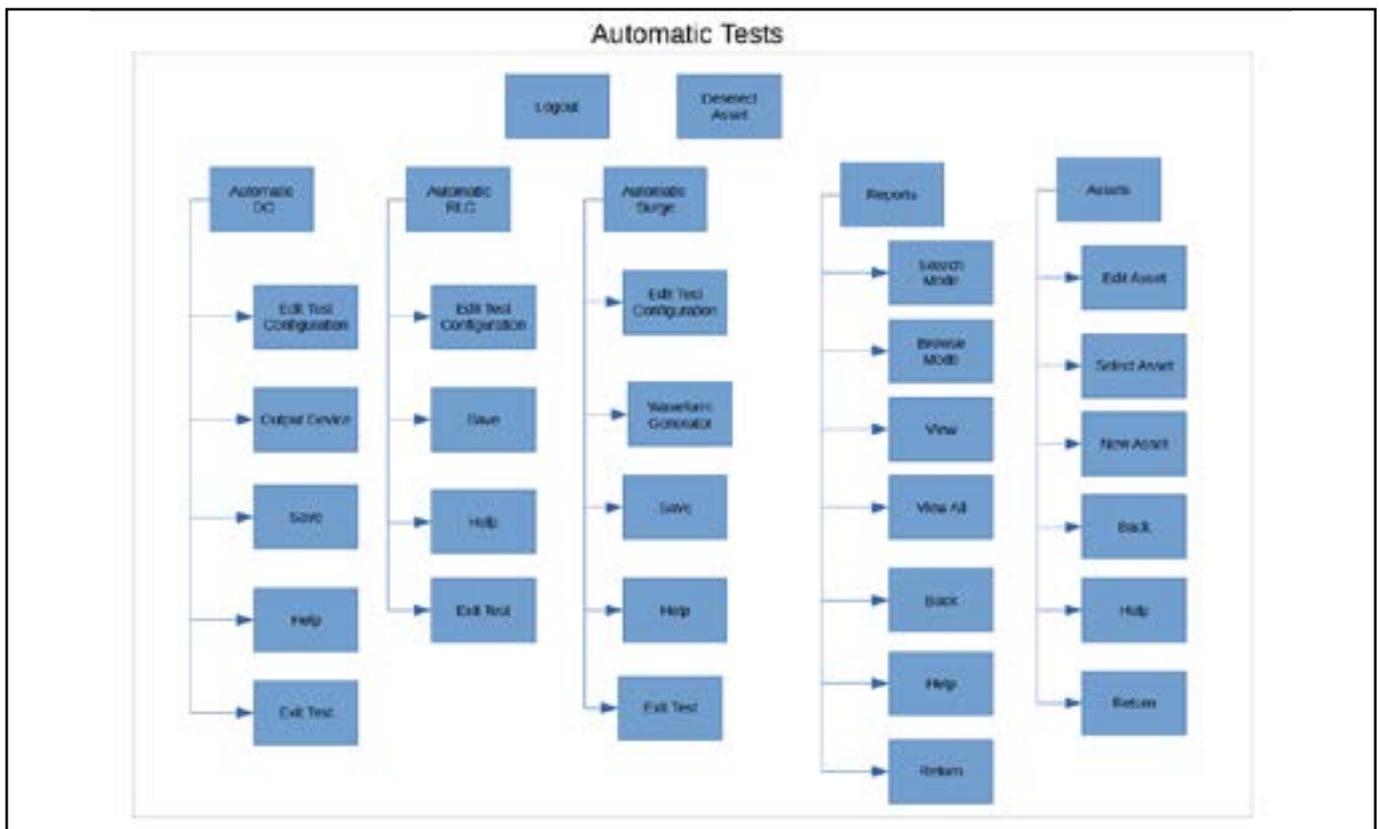
Fig 142: *Automatic Tests Screen map.*
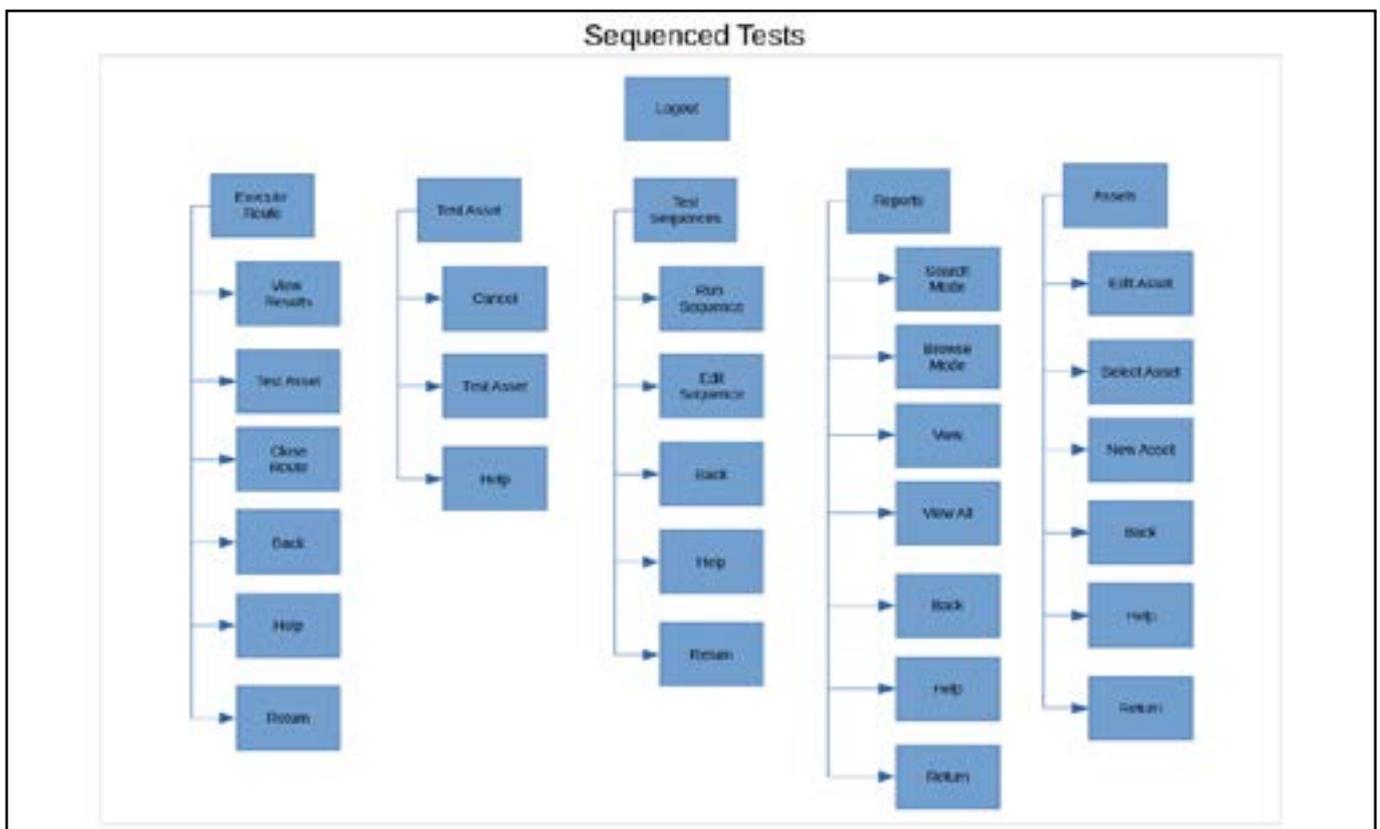
Fig 143: *Sequenced Tests Screen map.*
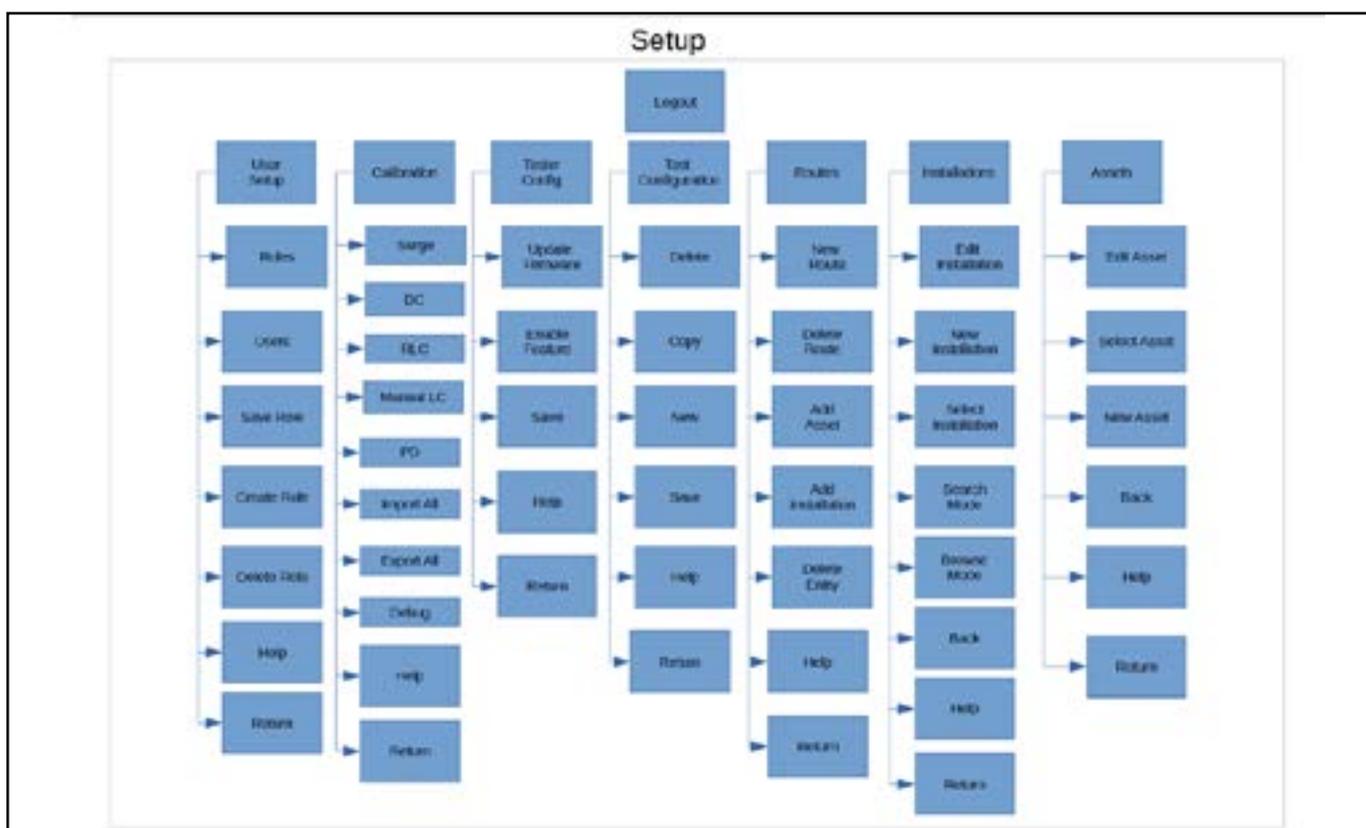
Fig 144: *Setup Screen map.*

The E-stop is an equipment stop button. It is not used for emergency stop use. It simply disables the output of the equipment (turns the enable line on the power supply off), but the display remains ON.

When the E-stop (equipment stop) button is pressed, the unit loses its ability to test. When conditions for stopping the equipment have been resolved, press the E-stop button in and turn counter-clockwise to reset.

An icon at the top of the screen appears when the E-stop button is activated. When the button is reset, testing can resume. If this icon still shows E-stop activated when the E-stop button is reset, ensure that the Stop Jumper is properly installed on the back panel or remote indicator lights if used without a remote E-stop.

Fig 145: *Megger Baker ADX showing Equipment Stop button.*

Error and Failure Messages List

Table 7: *Description of error messages.*

Message	Description	Appears in
Test Lead: ___ has failed due to the E-Stop being Activated, would you like to retest?	User has engaged the E-stop on the front panel, after disengaging it this error message is displayed.	Manual Surge, Automatic Surge, Coil Test
Test Lead: __ has failed due to PPEAR+ limit exceeding the set limit in test configuration, would you like to retest?	The inputed PPEAR limit from the test config the user had selected for the test has been exceeded resulting in a failure.	Manual Surge, Automatic Surge, Coil Test
Pulse-to-Pulse EAR+ limit has been exceeded	The active test config's PPEAR limit has been exceeded during testing resulting in a failure. Stops on failure.	Manual Surge, Automatic Surge, Coil Test
Line-to-Line EAR+ limit has been exceeded	The active test config's LLEAR limit has been exceeded during testing resulting in a failure.	Manual Surge, Automatic Surge, Coil Test
The current Voltage has exceeded the Target Voltage by over 10%	During testing the voltage has gone over the target by 10% resulting in test failure.	Manual Surge, Automatic Surge, Coil Test
No leads have been tested yet, no data to save	User has hit save on the screen without testing.	Manual Surge, Automatic Surge, Coil Test
___ is missing Calibration, Please Calibrate to be able to use.	Unit has not been calibrated for host for Surge, without having at least host calibrated unit will not allow for Surge Testing.	Manual Surge, Automatic Surge, Coil Test
Power Pack is in the wrong mode, please set to Surge mode	If power pack is set to incorrect mode and must be placed to Surge to work with ADX. ().	Manual Surge, Automatic Surge, Coil Test
Input Value must be a number, Go to Coil #	User has inputed something other than a number (ex: nine instead of 9) into the search field for the coil they want to be set at.	Coil Test
Attribute must have a Name	Optional Attribute field for Active Test Config screen before Auto Testing.	All Single Automatic Tests
Attribute must have a Value	Optional Attribute field for Active Test Config screen before Auto Testing.	All Single Automatic Tests
Name and Value cannot be the same	Optional Attribute field for Active Test Config screen before Auto Testing.	All Single Automatic Tests
Download Failed	Network issues causing the software update to not fully download, or causes corruption of file wile downloading.	Software Update Button
APK for update not found	APK has been removed or renamed under software table in Megger Server.	Software Update Button
Estop Activated!	Displays Dialog box letting test user know that E-stop is engaged.	Automatic DC
Calibration Export Failed	ADX failed to export Calibration data.	Calibration Export Screen
Calibration import Failed	ADX failed to import Calibration data.	Calibration Import Screen
Unable to Save	User Config failed to save.	User Config
Unable to Create	User Config was unable to create.	User Config
Unable to Delete	User Config was unable to delete.	User Config

Message	Description	Appears in
Role does not exist	Role being applied to Use Config doesn't exist.	User Config
User does not exist	User in User Config doesn't exist.	User Config
Role already exists	While trying to create a new Role, the Role already exists.	User Config
User already exists	While trying to create a new User, the User already exists.	User Config
Admin roles cannot be assigned.	User and role cannot be applied currently under User Config.	User Config
The remote server is unavailable	Cannot connect to remote server at this time.	Connection screen
Arc Detected	Arc was detected while performing DC Test.	Automatic and Manual DC Test)
Over Current Detected	Over Current was detected while performing DC Test.	Automatic and Manual DC Test)
____ is Invalid	User inputed value for field is invalid and does not fall within range.	Test Config
If primary device is not host, then a power pack must be selected	User must have host or power pack selected under test config.	Test Config
AC Power Not Available	AC Power was disconnected.	All tests.
Test Results could not be found for this asset	No test results were found for the selected asset.	Executing routes
Failure connecting to external devices	Could not connect to external device for calibration.	RLC Calibration
Firmware update failed	Firmware could not be updated onto device.	Tester Config
R unbalance exceeded test limit	Software detected resistance unbalance test limit failure.	Manual, Automatic, and Sequence RLC tests
Invalid Hipot Step	User inputed a value that is not valid for HiPot Step testing.	Test Config
Invalid IR/DA/PI Times	User inputed invalid test times for IR, DA, or PI tests.	Test Config
PI test must complete last	User attempted to specify a time for an IR, DA, or PI test where the PI test would not complete last.	Test Config
If primary device is not host then a power pack must be selected	User selected a primary device other than the host in the Test Configuration.	Test Config
Exceeded defined Target Voltage in Active Test Config.	User ramped to a target voltage that exceeded the voltage defined in the Test Configuration being used.	All DC and Surge tests Lowering ramp rate can help with this issue.
Resistance drop limit exceeded	When a resistance drop exceeds the percentage set in the active Test Configuration for Max res change and Stop on fail is checked, this message appears.	All DC Step HiPot Tests
No active route to close	User tried to close a route that is not active.	Executing routes
Not all assets tested. Close route?	User tried to close a route without testing all assets.	Executing routes

Message	Description	Appears in
Route has not been started	User tried to close a route without testing any assets.	Executing routes.
Route close failed	User tried to close a route without testing any assets.	Executing routes.
No asset selected	User tried to run an automatic or sequenced test without selecting an asset.	All automatic mode and testing assets in sequenced mode.
No asset selected or selected asset has no test configuration assigned	Testing in Automatic mode requires an asset selection and an active test configuration assigned.	All automatic mode tests.
No asset is selected or selected asset has no sequence or test configuration assigned	Testing in Sequenced mode requires an asset selection, an active test configuration, and an assigned sequence.	Sequenced mode.
Asset being tested has no sequence assignment	Testing in Sequenced mode requires an asset selection, an active test configuration, and an assigned sequence.	Sequenced mode.
Invalid connection information	User tried to change Realm connection using incorrect information.	Realm connection screen.
Connection Failed	User tried to change Realm connection using incorrect information.	Realm connection screen.
Asset Exists in Another Installation. Move Asset?	User tried to assign an asset to an installation, but the software detected that the asset is assigned to another installation.	Installation editor.
Test results could not be saved	User tries to save test results during surge and coil testing. Indicates a potential out-of-memory issue.	Surge and coil tests.
Test Results could not be found for this asset	User tries to open results for an asset that has not been tested.	Route Execute screen.
Pulse-to-Pulse EAR+ limit has been exceeded	PPEAR+ test results exceeded limit defined in Test Config.	All surge tests.
Line-to-Line EAR+ limit has been exceeded	L-L EAR+ test results exceeded limit defined in Test Config.	All surge tests.
Line-to-Reference EAR+ limit has been exceeded.	L-R EAR+ test results exceeded limit defined in Test Config.	All surge tests.
Warning Open Lead detected	The software detects that one or more test leads presents measurements indicating an open lead condition.	All RLC tests.
Unable to hit target voltage on current load. ADX energy is maxed out.	User tried to surge test an asset that requires more energy than the tester can provide.	All Surge tests.
Installation contains at least one asset. Remove all assets before deleting.	User tried to delete an installation that has one or more assets assigned to it.	Installation editor.
Installation is being used in route.	User tried to delete an installation that is assigned to one or more routes.	Installation editor.
Active routes exist for _____	User tried to delete an asset that has been assigned to one or more routes.	Asset editor.
Asset is being used in route	User tried to delete an asset that has been assigned to one or more routes.	Asset editor.

Message	Description	Appears in
Asset exists in Installation _____	User tried to delete an asset that has been assigned to one or more installations.	Asset editor.
Results exist for asset _____	User tried to delete an asset that has test results saved in the database.	Asset editor.
Assets are using this test config. Delete?	User tried to delete a Test Configuration that has been assigned to one or more assets.	Test Configuration editor.
Download Failed	Failure to download a software update.	Login screen.
Unable To contact software server, please check internet connection and retry.	User tried to check for software updates, but internet connection was too weak or out of range for Wi-Fi, and not connected via Ethernet.	Login screen.
Internal Thermal Temp. too high, must cool down	Software detects that the ADX is overheating.	All modes.
Power supply open ground detected	Open ground override not turned on.	HiPot, Surge, and Coil (high-voltage testing.
Faulty test initiation control	PTT button not working. Holding PTT button before going into test.	HiPot, Surge, and Coil (high-voltage testing.
This load does not appear to be capacitive	User tried to run a capacitance test on an asset that is not capacitive. Also, appears if leads are not switched during RLC test as instructed.	All RLC tests.
This load does not appear to be inductive	User tried to run an inductance test on an asset that is not inductive.	All RLC tests.
To use PD while manually testing, have an Asset selected	User tried to execute a Surge test with PD while in Manual mode.	Manual Surge mode.
Test limit exceeded	General message for all RLC tests (and others with limits).	All tests using limits.
Cannot delete active connection	User tried to use The Delete button to remove the active connection.	Realm Cloud Connection screen.
PD testing can only be used with Host selected as output device	User tried to execute a Surge test with PD while output device is not set to Host.	All Surge modes.
The entered reference waveform name is not unique.	User tried to save a new Surge test reference waveform using an existing name.	Manual or Automatic Surge test.
Invalid DA start time	User entered an invalid value.	Test Config
Invalid PI start time	User entered an invalid value.	Test Config
Invalid IR stop time	User entered an invalid value.	Test Config
Invalid DA stop time	User entered an invalid value.	Test Config
Invalid PI stop time	User entered an invalid value.	Test Config
Invalid hipot duration	User entered an invalid value.	Test Config
Invalid step duration	User entered an invalid value.	Test Config
Invalid value	User entered an invalid value.	Test Config
Value cannot be negative	User entered a negative value.	Test Config
Test is disabled in active test config	User tried to run a Sequence, but RLC and/or Surge test are disabled in the active test configuration.	Sequenced testing.

Message	Description	Appears in
Failed to export Realm DB	User tried to export the database, but did not provide a valid path to a device attached to one of the front panel USB connectors.	Login screen
Cannot export data when not connected to server	User tried to export the database, but internet connection was too weak or out of range for Wi-Fi, and not connected via Ethernet.	Login screen
Image size cannot exceed 1 MB	User tried to add an image to an asset or installation that is larger than 1 MB.	Asset editor and Installation editor.

Appendix B — Using the Android ™ Operating System

Android OS Basics

The ADX software runs on the Android™ operating system. While you should not need to use the OS features much, acquainting yourself with them will help when you need to make adjustments.

Access the Android OS while the ADX software is running by clicking or pressing on the top middle of the screen. A dialog similar to the one shown below will appear. The top section is the access point to the OS Settings.

Here, you will see several indicators including Wi-Fi connection status and battery life. Near the top edge, touch the Settings (Gear) icon to go directly to the Android Settings screen.
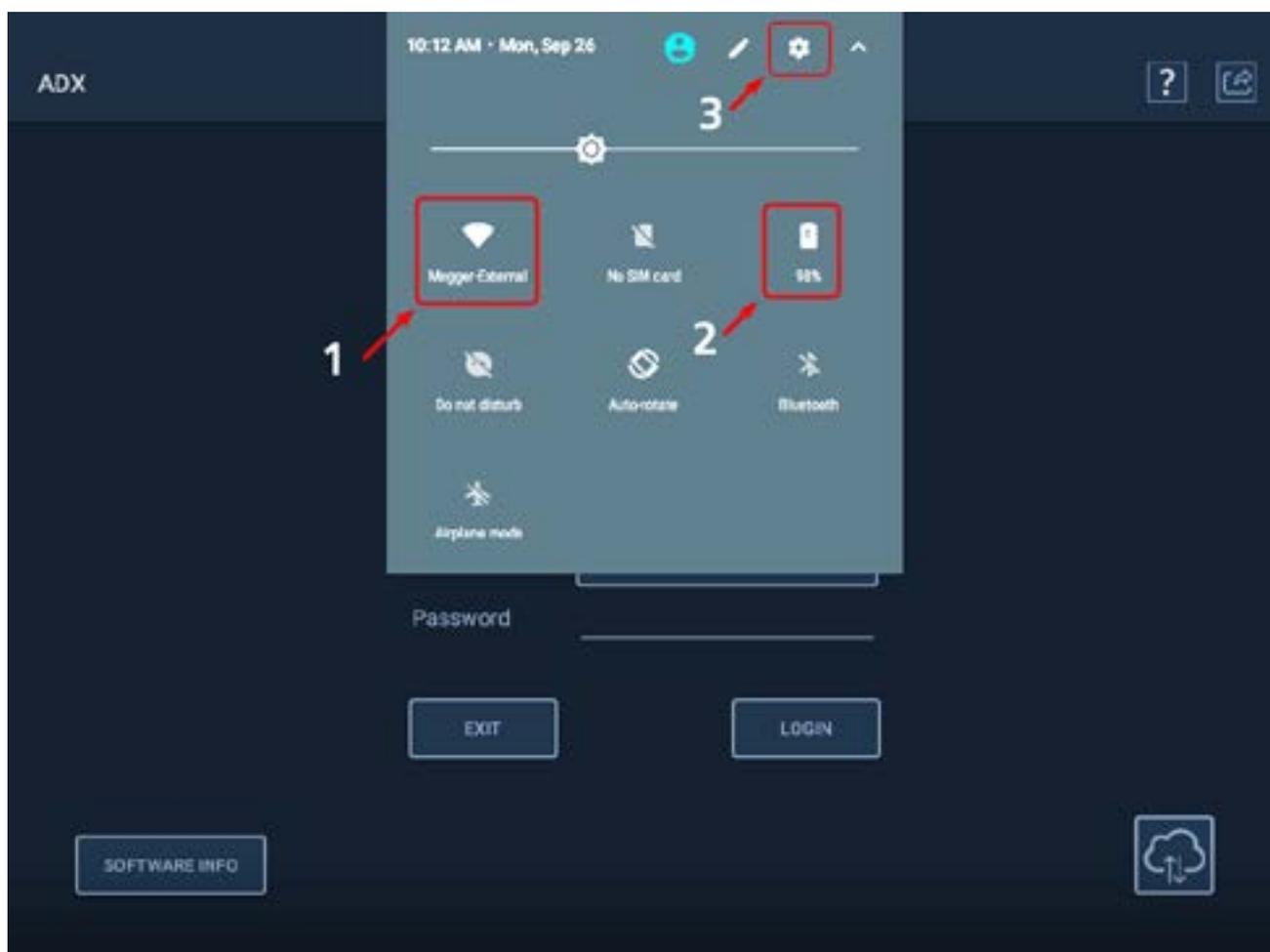

Fig 146: *Accessing Android OS from ADX screen.*

No	Description
1	Wi-Fi status indicator.
2	Battery life indicator.
3	Settings icon. Touch or click here to open Android Settings screen.

Settings Screen

The Settings screen provides access to other screens so you can define preferences such as Location, Language, Date & Time, Keyboard and Input Methods, and Wi-Fi connection.

The software adjusts units of measure and temperature scale (Fahrenheit or Celsius) based on the Language selected.

Click on each item to open related screens to define your preferences.

> NOTE: The default temperature scale for the US is Fahrenheit. If you prefer to use Celsius, select English (United Kingdom) for your language.
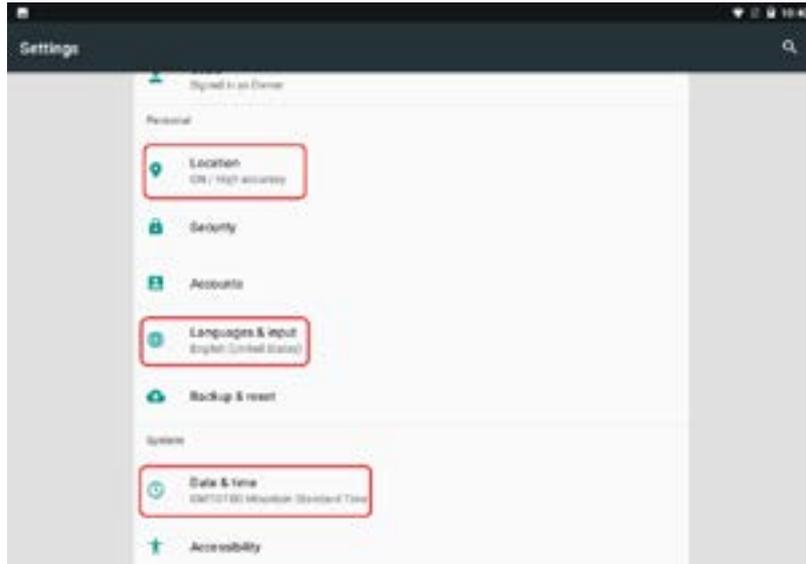

Fig 1: *Android Settings screen.*

Languages & Input

The Languages & Input screen helps you define preferences for your language, use of virtual and physical keyboard, and more.

Fig 2: *Android Languages & Input settings screen.*

Clicking on Languages opens the screen used to add languages and select the active language.

Click on Add Language to open a screen used to select new languages to add to this list.

When you select a new language, you could have options for selecting a region, which helps define language elements and typical units of measure used in the region.

Fig 3: *Android Languages settings screen; adding a language.*

Use the icons to the right to access additional functions such as moving a language to the top of the list, or removing a language from the list.

The language at the top of the list is the active language. The Android user interfaces will immediately change to the active language. The ADX user interface will change to the active language after the application is closed then restarted.
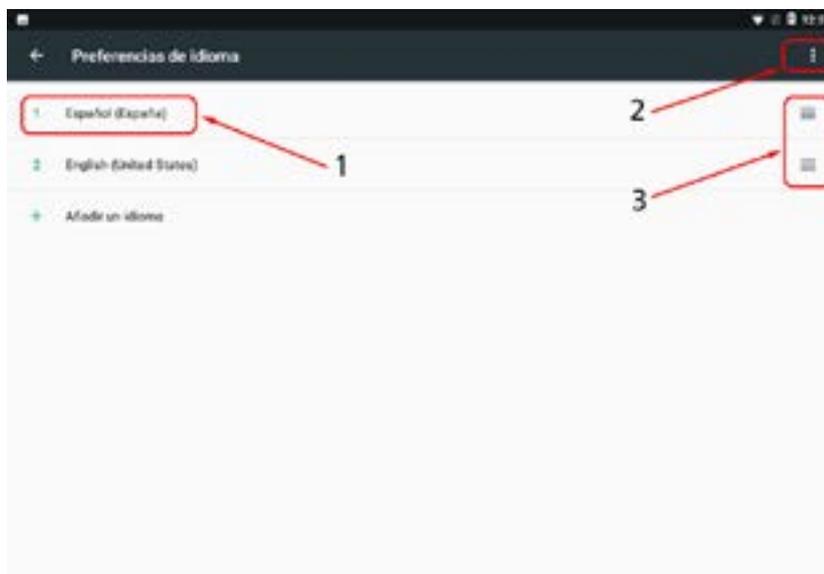
Fig 4: *Android Languages settings screen; active language and functional icons.*

No	Description
1	Language at top of list is current language selected. Also determines how the software adjusts units of measure and temperature scale (F or C) based on the Language selected.
2	Click to remove the selected language from the list.
3	Click and hold this icon then drag the language to a new location in the list.

Date & Time

Clicking on the Date & Time items opens the Date & Time screen. From here, you can set all elements for date and time as needed using automatic functions (requires internet connection), or by using manual tools.

Move the sliders next to items to enable or disable. Automatic selection items must be enabled and the ADX connected to the internet to automatically find and select date, time, and zone information.

Click on Select time zone to change to your local zone.
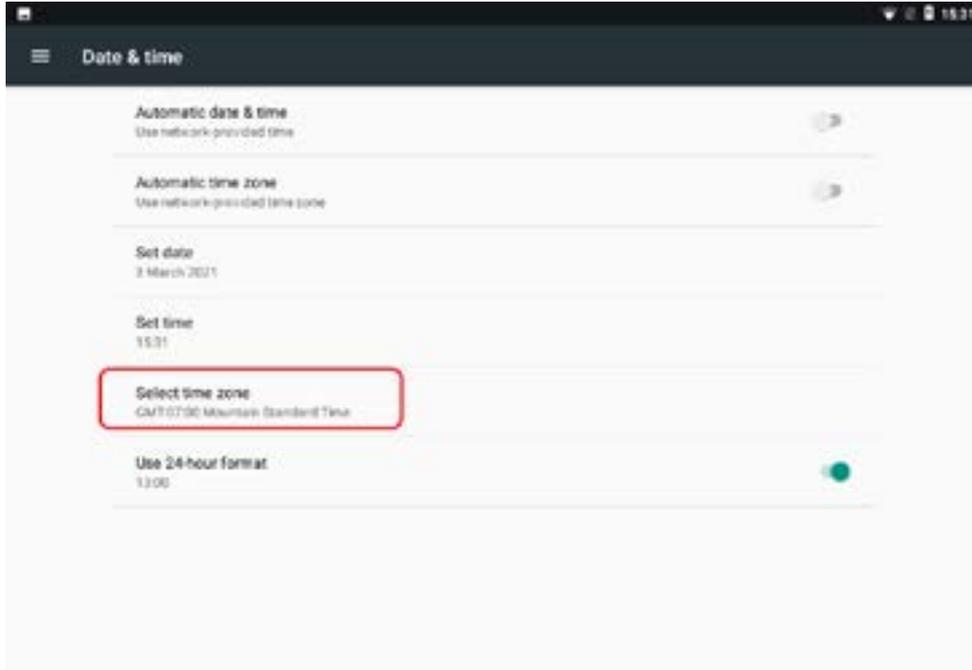
Fig 5: *Android Settings Date & Time screen.*

Clicking on each item opens a new screen or dialog with tools needed to set your preferences. In the following example, the Set time element opens the time clock dialog to help you set the time.

Click and hold on the hands in the clock then drag to their time positions.
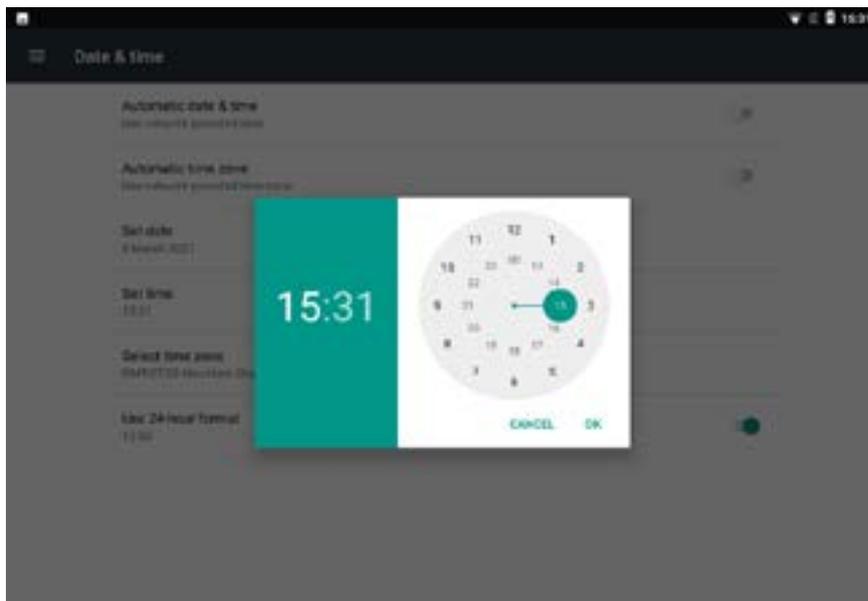
Fig 6: *Android Date & Time screen tool example; setting time.*

Keyboard Preferences

Keyboard preferences tools help you identify the physical keyboard used, along with setting the display preferences for the virtual keyboard. Use the slider to turn the display on and off.
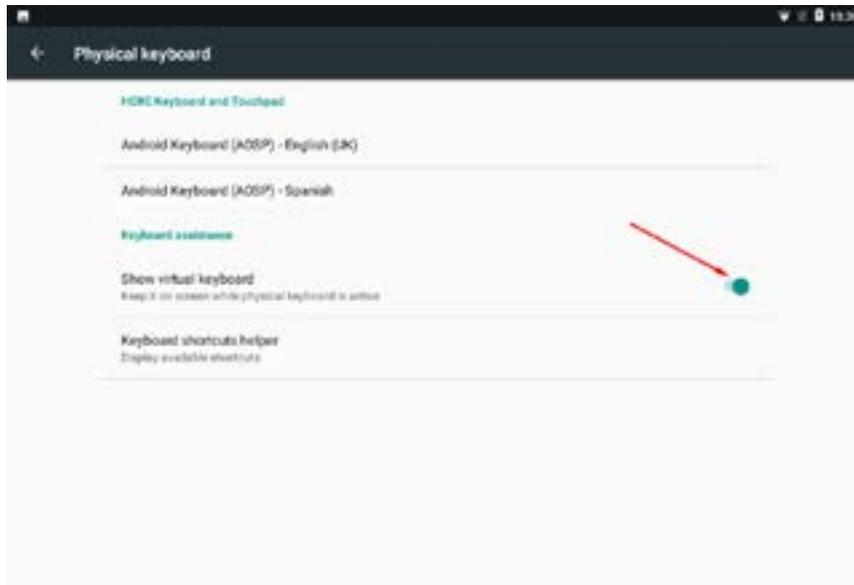
Fig 7: *Android Physical keyboard settings screen.*

Use the settings screens to define other preferences including Wi-Fi as needed.

When you have completed your Android setup process, return to the ADX app by tapping on the ESC key on your keyboard.

Appendix C — Printing Reports Using PrintHand

The ADX software uses a third-party printing solution—called PrintHand™—for communicating with printers via Wi-Fi® or USB®.

Printing Reports

1. After you select reports for viewing via the Reports screen, click on the Print icon at the top of the screen as shown below to start the printing process.

Fig 147: *Starting the printing process from the Reports screen.*

The PrintHand application will start shortly, opening the following screen to preview the selected report and check your settings.

2. Click on "Select a printer" at the top left of the screen then click on "Add printer" in the next screen.
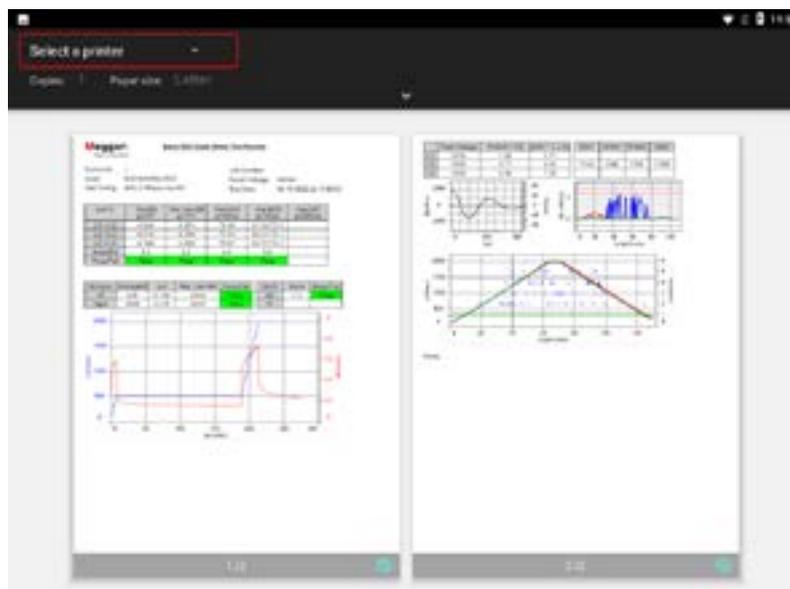
Fig 148: *Select a printer when first using PrintHand.*

3. A selection dialog box opens offering you a choice of services. Click on PrintHand (other services are not supported).
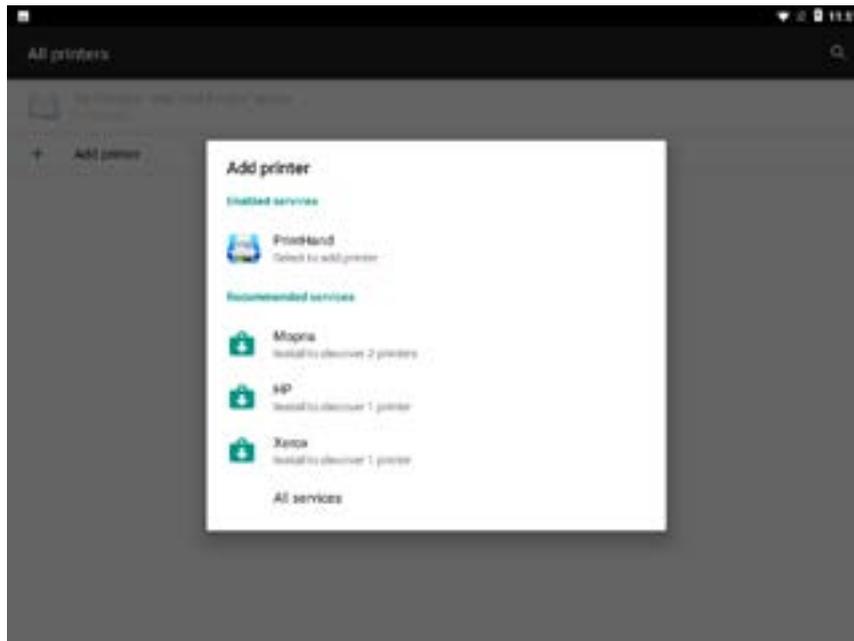
Fig 1: *Select PrintHand printer service.*

After the application loads, you will see a number of menu options on the left side that you can use for setting up your printer(s). The ADX supports the WiFi and USB Printers options.

> NOTE: Bluetooth**®** printers are not supported at this time. Do not use Print to File or PDF as printing options with PrintHand. Use the Save option within the ADX software to save a report file as PDF.

Fig 2: *Select printer setup option from the left-side menu.*

For printers connected directly to the ADX via USB, use the USB Printers option.

4. Touch or click on the option you need then press Next. For this example, we use Nearby Wi-Fi Printers.

5. Click on Scan for Wi-Fi Printers.

To select a Wi-Fi printer, it will need to be installed on the same Wi-Fi network as your Android® device (the ADX).

> NOTE: The number of printers that appear in the list will depend on how many printers are installed on your Wi-Fi®network. You will need to do a little research to identify your target printers.

6. Locate the printer in the list then click on it to select it.
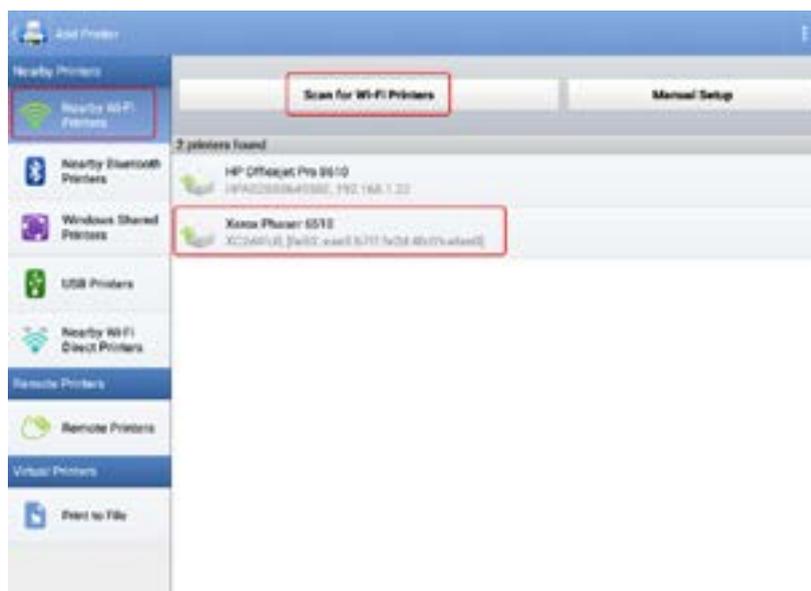
Fig 3: *Selecting printer connection options.*

7. If a message appears informing you that you need to install or update a Driver Pack, click on Install to continue. There is no additional cost to install drivers.
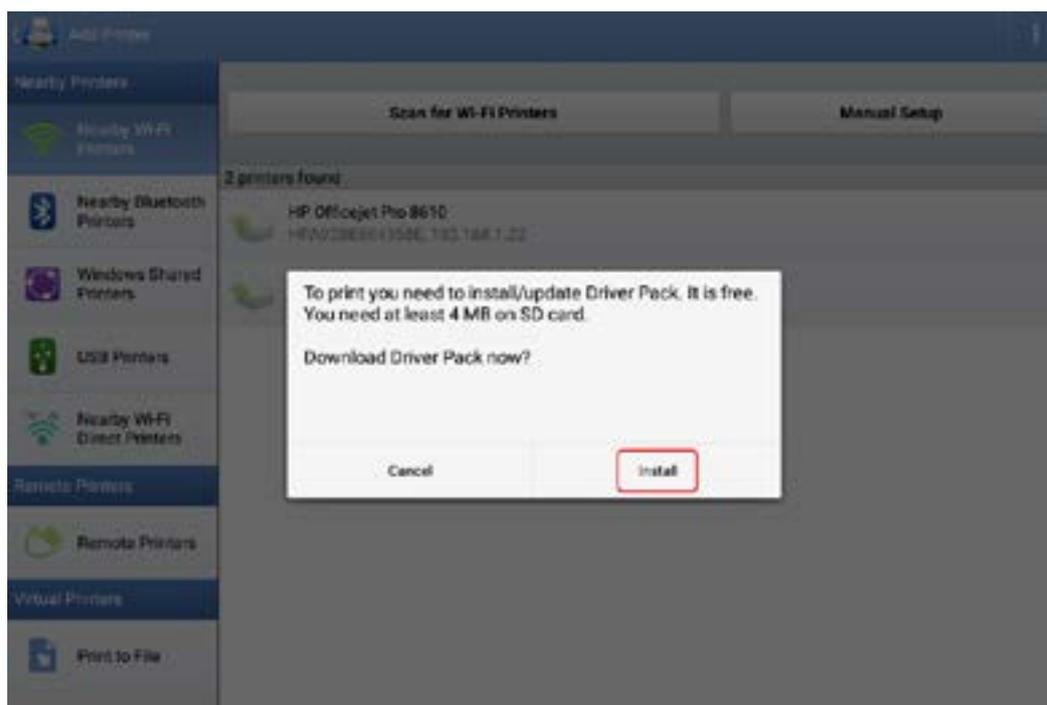
Fig 4: *Install/update Driver Pack dialog.*

8. If the Add printer dialog appears as shown below, click outside the box to continue. PrintHand should be shown as the enabled service and no change should be made.
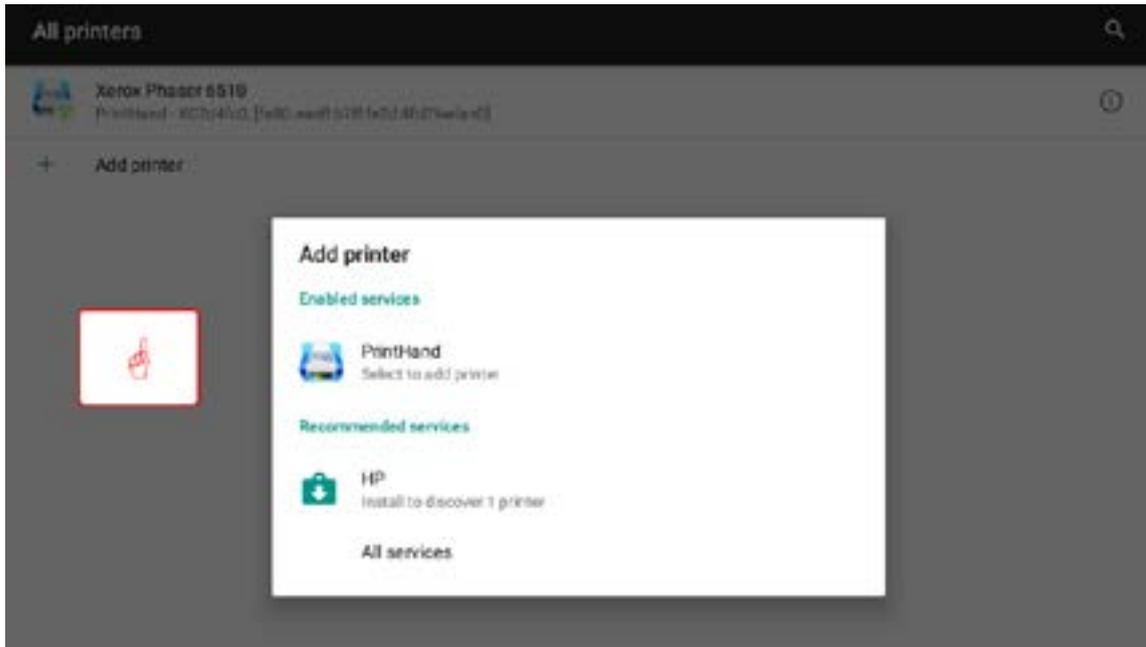
Fig 5: *Dialog box showing PrintHand as enabled service.*

9. Ensure that the proper printer is selected, along with settings such as paper size.

10. Press or click on the arrow in the middle of the screen to view an change printer settings.

11. Press the print icon to the right to proceed.

Fig 6: *Previewing report, printer selected, and options in PrintHand.*

12. You might see a message letting you know that your document may pass through one or more servers on its way to the printer. This usually happens only with the first print job after a new printer is set up.
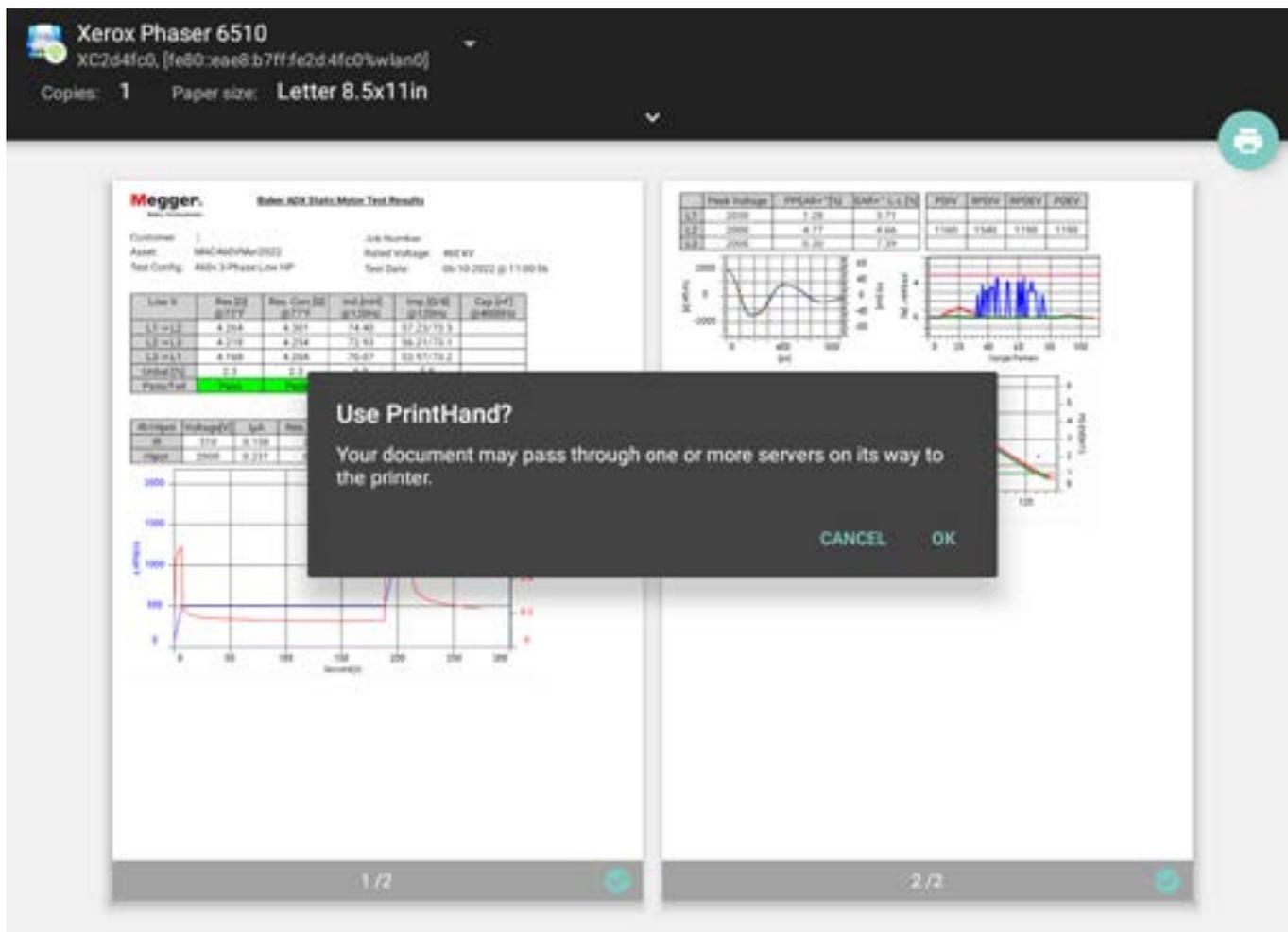
Fig 7: *Message for servers passed through when printing.*

13. When PrintHand completes the printing process, it will close and automatically return you to the ADX reports screen.

Appendix D — 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 Insulation Resistance (IR) testing. Test voltage should be applied for one minute.

Table 8: *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

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 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 9: *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

Table 10: *IEEE 95 for HiPot test.*

V Line	Per Unit	Min Test, V Line x 1.25 x 1.7	Max Test, VLine x 1.5 x 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 11: *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 12: *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 13: *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

Appendix E — Technical Specifications

Installation Category Definitions

CAT IV—Measurement category IV: Equipment connected between the origin of the low-voltage mains supply and distribution panel.

CAT III—Measurement category III: Equipment connected between the distribution panel and electrical outlets.

CAT II—Measurement category II: Equipment connected between the electrical outlets and user's equipment.

Measurement equipment may be safely connected to circuits at the marked rating or lower.

General Specifications

Table 14: *Physical specifications.*

Model	Weight	Size (W x D x H)
ADX15	45 lbs (20 kg)	18 x 23 x 8.5 in (457 x 584 x 216 mm)
ADX15A	49 lbs (22 kg)	18 x 23 x 8.5 in (457 x 584 x 216 mm)

Table 15: *System specifications.*

Parameter	Value
Internal memory	RAM 2GB DDR3
Internal storage	8GB MMC and 480GB SSD Drive
Processor speed	1.0 Ghz (Quad core)
User interface	Capacitive touch screen, mouse, keyboard, stylus
Platform	Android
Display	10.4-in touch screen
Resolution	XGA 1024 x 768
Wi-Fi	802.11 a/b/g/n Dual Band 2.4 / 5 GHz
Ethernet	Gigabit Ethernet 10/100/1000 Mbps
USB flash drive	USB 2.0
Battery Backup	4+ hours standby time

Table 16: *Languages supported—user interface and documentation localization.*

Language	Regional Translations
English	
French	Europe
Spanish	Europe and Latin America
Portuguese	Europe and Brazil
German	
Czech	
Russian	
Chinese	Traditional and Simplified

Table 17: *Instrument rating summary.*

Parameter	Variant / Option	Value
Internal and operating environment		Pollution degree 2
Operating altitude		≤ 3,000 m (9,842 ft)
Operating temperature		5–40 °C (41–104° F)
Operating humidity		≤ 80% RH for temperature up to 31°C (88° F), decreasing linearly to 50% RH at 40° C (104° F).
Storage temperature		0–60° C (32–140° F) Ensure that the unit has sufficient time to warm to ambient temperature before operating after storing the unit in a colder area.
Storage humidity		Less than 95% non-condensing.
IP Rating		IP40
Mains Power Input		90–264 VAC, 47–63 Hz, 2.5 A, CAT II 300 V
Measurement connection rating		16 kV DC (nominal 15 kV)
Maximum generated voltage *Peak voltage for AC or DC test*	ADX4	Nominal 100 V–4 kV
	ADX6	Nominal 100 V–6 kV
	ADX12	Nominal 100 V–12 kV
	ADX15	Nominal 100 V–15 kV
	ADX15A	Nominal 100 V–15 kV Nominal 10 V–2kV armature output
Maximum input voltage rating		Must be connected only to isolated, de-energized circuits. **See Caution below.**
Standard Kelvin 4-wire test leads voltage rating		16 kV DC peak

CAUTION: The ADX must be connected only to isolated, de-energized circuits. Connection to live circuitry can expose personnel to severe electrical shock risk, permanently damage tester, and void warranty. Refer to chapter 1, "General Operating and Safety Information" for complete information on safely connecting and operating the unit.

DC Insulation Resistance and HiPot Test Specifications

Table 18: *DC IR and HiPot test specifications.*

Parameter	Variant	Value
Voltage accuracy		± 2% ± 5 V
Maximum output current		1.2 mA
Displayed current resolution		1 nA
Current measurement resolution		16 pA
Current accuracy	Test voltage 0–2 kV	± 4% ± 5 nA
	Test voltage 2–4 kV	± 4% ± 10 nA
	Test voltage 4–8 kV	± 4% ± 25 nA
Over current trip settings		Adjustable to 1.2 mA
IR measurement range		100 kΩ–1 TΩ

Surge Test Specifications

Table 19: *Surge test specifications.*

Parameter	Variant	Value
Nominal surge capacitance		100 nF
Typical surge energy		11.25 J at 15 kV
Typical short circuit current		700 A
Repetition rate		4 Hz nominal
Minimum inductance	4 kV	70 µH
	6 kV	100 µH
	12 kV	120 µH
	15 kV	170 µH
Voltage accuracy		±10%

Table 20: *Surge through Impedance Transformer test specifications.*

Parameter		Value
Maximum voltage		1.5 kV
Short circuit current		2000 A
Minimum inductance		3 µH
Voltage accuracy	(Voltages < 1 kV)	±12% ±3 V

Table 21: *Surge with Partial Discharge (PD) test specifications.*

Parameter		Value
Inception and extinction voltages (PDIV, PDEV)		Measured per IEC 61934
Repetitive inception and extinction voltages (RPDIV, RPDEV)		Measured per IEC 61934
Programmable PD threshold range	(Resolution to 0.1 mV)	1.0–999 mV
PD time scaling		1.024–26,400 µs

Resistance, Inductance, and Capacitance Test Specifications

Table 22: *Resistance test specifications.*

Parameter	Value
Measurement range	0.001 mΩ–100 kΩ
4-wire measurement	Yes
Maximum test current	10 A
Accuracy	±2% ±0.25 mΩ

Table 23: *Inductance test specifications.*

Parameter	Value
Measurement range	0.01 µH–10 H (120 Hz) 0.01µH–200 mH (1000 Hz)
4-wire measurement	Yes
Test frequency	120, 1000 Hz
Accuracy	±5% ±5 µH

Table 24: *Capacitance test specifications.*

Parameter	Value
Measurement range	0.01 nF–50 µF
4-wire measurement	Yes
Test frequency	4000 Hz
Accuracy	±5% ±1 nF

Table 25: *ADX testing and safety standards compliance.*

Standard	Topic
IEC 61326-1 Ed. 2.0 2012-07	Electrical equipment for measurement, control and laboratory use - EMC requirements - Table 1
FCC 47CFR: Part 15 Subpart B: 2020	Unintentional Radiators
ICES-003 Issue 7, October 2020	Limits and Methods of Measurement to Information Technology Equipment (including Digital Apparatus).
IEC 61010-031:2015	Safety requirements for electrical equipment for measurement, control, and laboratory use. Safety requirements for hand-held probe assemblies for electrical measurement and test.
IEC 61010-2-034:2017	Safety requirements for electrical equipment for measurement, control, and laboratory use. Particular requirements for measurement equipment for insulation resistance and test equipment for electric strength.
IEC 62133-2:2017	Safety Test Standard of Li-Ion
CISPR 11:2009 +A1:2010, Class A	Radiated Emissions and AC Mains Conducted Emissions
IEC 61000-3-2:2014	Harmonics
IEC 61000-3-3:2013	Flicker
IEC 61000-4-2:2009	Electro-Static Discharge Immunity Test
IEC 61000-4-3:2010	Radiated, Radio-Frequency, Electromagnetic Immunity
IEC 61000-4-4:2012	Electrical Fast Transient/Burst Immunity Test
IEC 61000-4-5:2006	Immunity to Surges
IEC 61000-4-8:2010	Power Frequency Magnetic Field Immunity Test
IEC 61000-4-11:2004	Voltage Dips/Interruptions Immunity Test

For more safety compliance information, see "EU Declaration of Conformity" in Notices—front section.

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