USER GUIDE

MTOU3

True Three Phase Transformer Winding Ohmmeter

EN
ENGLISH

Notice

The information presented in this manual is adequate for the intended use of the product. Use of the product or its individual instruments for purposes other than those specified herein requires confirmation of their validity and suitability from Megger. Refer to the warranty information below. Specifications are subject to change without notice.

WARRANTY

Products supplied by Megger are warranted against defects in material and workmanship for a period of 1 years following shipment. The warranty is void in the event of abuse (failure to follow recommended operating procedures) or failure by the customer to perform specific maintenance as indicated in this manual.

Megger

400 Opportunity Way

Phoenixville, PA 19460

610-676-8500 (Telephone)

610-676-8610 (Fax)

www.megger.com

Contents

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Introduction

Thank you for your purchase of the Megger MTOU3 True Three Phase Transformer Analyzer. The MTOU3 design emphasizes safety, reliability, and ease of use. It will provide you with the information you need to test power, distribution, and instrument transformers and make informed electromechanical maintenance decisions

Purpose of this manual

This document is the user manual for the Megger MTOU3 True Three Phase Transformer Analyzer. It provides a description of the instrument as well as operating instructions. Read this manual before using the equipment, with special emphasis on all safety discussions.

Audience

This manual is for technical personnel who are familiar with the various transformer measurements performed by electrical test equipment and have a general understanding of their use and operation. Such personnel should also be thoroughly familiar with the hazards associated with the use of this equipment and should have received proper safety training.

If you find any discrepancies in the MTOU3 manual or have any comments, please send them to Megger via fax, e-mail, or phone.

Megger

400 Opportunity Way

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610-676-8500 (Telephone)

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USTechSupportGrp@megger.com

For technical support, please consult the Megger web site at www.megger.com for the local distributor near you.

Item received

MTOU3 Models

Part Number	Description	Image
MTOU3-BASIC	10 ADC three phase switched winding ohmmeter test set	
MTOU3-ADV	16 ADC true three phase winding ohmmeter test set	
MTOU3-PRO	32 ADC true three phase winding ohmmeter test set	
MTOU3-EXP	32 ADC true three phase winding ohmmeter test set with select optional hardware and software accessories included	

MTOU3-BASIC and MTOU3-ADV Leads

Part Number	Description	Image
2008-15KIT2	16 A H & X leads. 5 m (15 ft)	
2008-30KIT2	16 A H & X leads. 9 m (15 ft)	
2008-60KIT2	16 A H & X leads. 18 m (15 ft)	
2008-100KIT2	16 A H & X leads. 30 m (100 ft) H leads and 18 m (60 ft) X leads	
2008-30XKIT2	16 A H & X lead extensions. 9 m (30 ft)	

Item received

Part Number	Description	Image
2008-15KIT3	16 A H & 32 A X leads. 5 m (15 ft)	
2008-30KIT3	16 A H & 32 A X leads. 9 m (15 ft)	
2008-60KIT3	16 A H & 32 A X leads. 18 m (15 ft)	
2008-100KIT3	16 A H & 32 A X leads. 30 m (100 ft) H leads and 18 m (60 ft) X leads.	
2008-30XKIT3	16 A H & 32 A X lead extensions. 9 m (30 ft)	 

Part Number	Description	Image
1014-927	AC Power Cords	
CA-USB	USB 2.0 Cable	
1011-622	OLTC Tap Changer Cable	
2012-180	Cable Bag – Back Pack (qty 2)	
4702-7	Ground Lead	

Item received

Part Number	Description	Image
90012-878	Blank Thumb Drive	

Optional software accessories

Part Number	Description
SW-POWERDB	PowerDB Control
SW-CUSTOMAPP	Custom application control
SW-DRM	Dynamic resistance measurements
SW-DRYOUT	Transformer dry out / winding temperature measurements
SW-HEATRUN	Transformer heat run / cool down measurements

Optional hardware accessories

Part Number	Description	Image
MTOU3-CAL-CERT	MTOU3 Calibration Certificate	
1004-639	Safety Beacon – 18 m (60 ft)	
1014-928	Transit Case (for instrument)	

90029-537	USB Printer	
90029-573-P	USB Printer Paper (48 rolls)	
1011-622-A	OLTC tap changer cable adapters	
TOS1	TOS1 resistance calibration standard	

Item received

ORDERING INFORMATION

Item (Qty)	Cat. No.
MTOU3 BASIC and ADV lead sets **16 Amp H leads with red jacket and red, yellow, blue, and white clamps (4 total)**	
16 Amp X leads with black jacket and red, yellow, blue, and white clamps (4 total)	
5 m (15 ft) H and X leads	2008-15KIT2
9 m (30 ft) H and X leads	2008-30KIT2
18 m (60 ft) H and X leads	2008-60KIT2
30 m (100 ft) H and 18 m (60 ft) X leads	2008-100KIT2
Optional Lead Accessories	
MTOU3 BASIC and ADV 16 A H and 16 A X lead extensions	
9 m (30 ft) H and X extensions	2008-30XKIT2
Included Accessories - BASIC, ADV, PRO, EXP	
AC Power Cords (US, EU, UK)	1014-927
USB 2.0 Cable	CA-USB
OLTC Tap Changer Cable	1011-622
Cable Bag – Backpack	2012-180
Ground Lead 4.5m (15 ft)	4702-7
Thumb Drive	90012-878
Included accessories - EXP	
Second Cable Bag - Backpack	2012-180
OLTC Tap changer cable adapters	1011-622-A
USB printer	90029-573
Safety beacon - 18 m (60 ft)	1004-639
Included accessories - PRO	
Second Cable Bag - Backpack	2012-180
Optional Software Accessories	
PowerDB control	SW-POWERDB
Custom application control	SW-CUSTOMAPP
Dynamic resistance measurements*	SW-DRM
Transformer dry out measurements*	SW-DRYOUT
Transformer heat run measurements*	SW-HEATRUN

Item (Qty) For Price List	Cat. No.
MTOU3 PRO and EXP lead sets **16 Amp H leads with red jacket and red, yellow, blue, and white clamps (4 total)**	
32 Amp X leads with black and white stripe jacket and red, yellow, blue, and white clamps (4 total)	
5 m (15 ft) H and X leads	2008-15KIT3
9 m (30 ft) H and X leads	2008-30KIT3
18 m (60 ft) H and X leads	2008-60KIT3
30 m (100 ft) H and 18 m (60 ft) X leads	2008-100KIT3
Optional Lead Accessories	
MTOU3 PRO and MTOU3 EXP 16 A H and 32 A X lead extensions	
9 m (30 ft) H and X extensions	2008-30XKIT3
Optional Hardware Accessories	
Calibration Certification	MTOU3-CAL-CERT
Safety Beacon – 18 m (60 ft)	1004-639
Transit case (for instrument)	1014-928
USB Printer	90029-573
USB Printer Paper (x48 rolls)	90029-573-P
OLTC Tap changer cable adapters	1011-622-A
Motor current monitor*	1014-929
Vibration monitor*	1014-930
Temperature probe kit*	1014-931
TOS1 Calibration Standard	TOS1

Warnings and safety precautions

Safety

Warnings and safety precautions

WARNING!

Death, serious injury, or fire hazard could result from improper use of this instrument. Read and understand this manual before installing this instrument.

Usage of this instrument must comply with the National Electric Code and any additional safety requirements applicable to your country and company policies.

Qualified personnel MUST perform operation and maintenance of this instrument. The National Electrical Code defines a qualified person as one familiar with the construction and operation of the equipment and the hazards involved.

Safety Precautions

Take the following safety precautions whenever the instrument is used:

- **Wear safety glasses and insulated gloves when making circuit connections**
- **Hands, shoes, floor/ground must be dry when making any connection to a powered line**

These warnings and safety precautions are to be used where appropriate when following instructions in this manual.

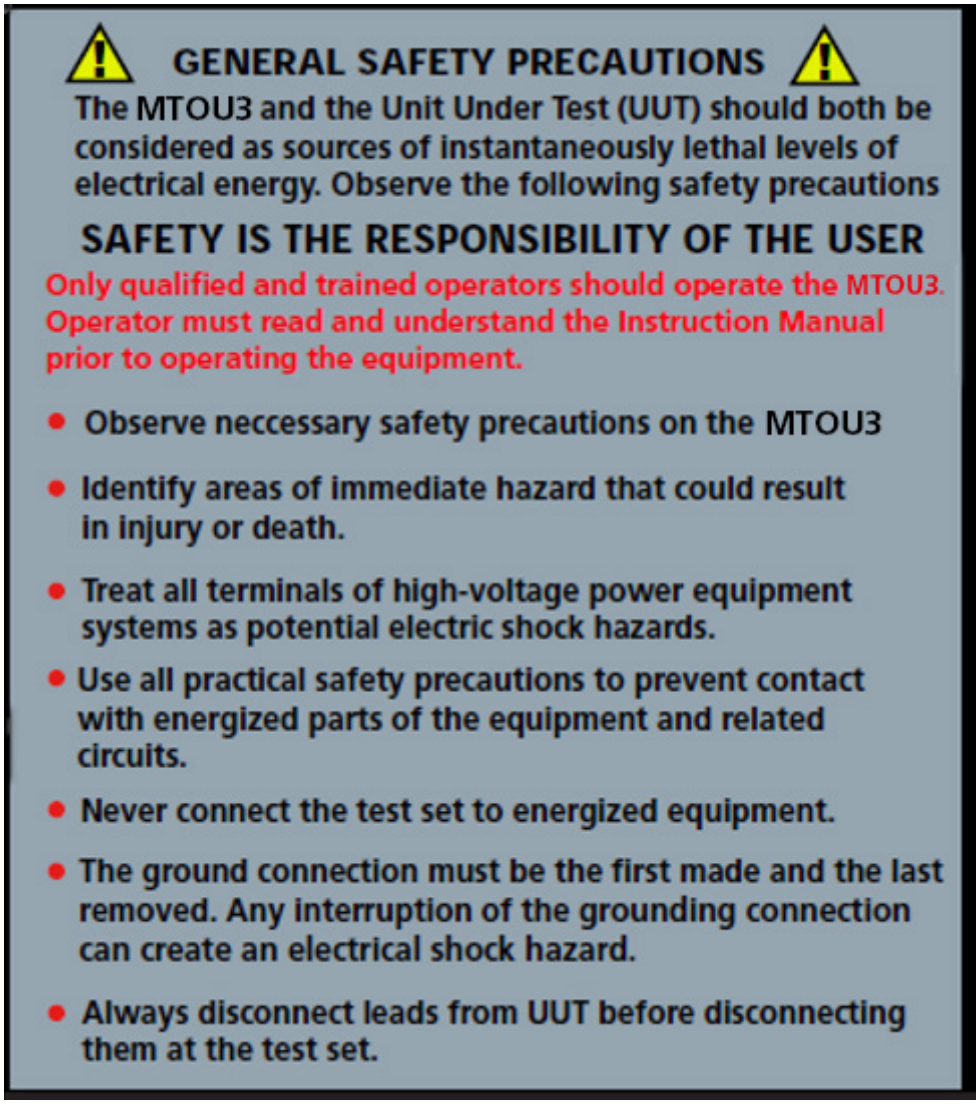
CAUTION!

The equipment could be impaired from improper use not specified in this user guide. Read the complete manual before use.

CAUTION!

Do not use detachable mains supply cords with inadequate electrical ratings.

Warnings and safety precautions



Max Technical Specifications

Specifications - Valid from -20 ° to +50 °C

Input power

100-240 V AC, 47-63 Hz, 1200 W
±10% Mains supply voltage fluctuations Overvoltage category II

Output power

Voltage	3-phase, 1-100 V
Frequency	DC, 40-480 Hz
Current	0.1 mA – 1 A @ 100 V
Current	0.1 mA – 32 A @ 24 V

Regulatory

Safety	IEC 61010-1:2010 + AMD1:2016
EMI/EMC	IEC 61326-1:2012
RoHS2	EN50581
Vibe/Shock	MIL-STD-810G
Ingress protection	IP65 (Lid closed)

Transformer testing standards

IEEE	C57.152-2013
IEC	60076-1:2011
AS/NZS	6076 1:2014
CIGRE	445 2 011
GOST	3484.1-88

Dimensions 55.8 x 28.7 x 19 cm
22 x 11.3 x 7.5 in

Weight 17 kg 38 lbs

Case

Rugged case with built in wheels and handle

Backpack lead bag for leads and accessories

Internal/external data storage

Up to 10 000 sets of three-phase results internal storage

Transferable via USB 2.0 drive

Communication/control software

USB Interface for PC Control with custom GUI

Touch screen (optional)

25.6 cm 10.1 in

1024 x 600 Resolution

1000 NITS

Printer (optional)

51 mm (2 in) thermal printer

Prints all measurement data displayed on GUI

Environmental

Operating	-20 ° to 50 °C (-4 ° to 122 °F)
Storage	-30 ° to 70 °C (-22 ° to 158 °F)

Relative Humidity 0-90 %, non-condensing

Indoor and outdoor use in dry locations
Elevation 2000 m MAX
Pollution degree 2

WR

Resistance measurement methods

1 phase wye, delta, zigzag

2 phase wye w/neutral

3 phase wye w/neutral

Dual winding excitation

DC Open circuit voltage

Up to 100 V

DC Measurement voltage

Up to 100 V

ADV/PRO/EXP Resistance accuracy

1.0 µΩ to 30 kΩ

±0.1 % reading, ± 1µΩ

30+ kΩ

±0.5 % reading

BASIC Resistance accuracy

1.0 µΩ to 30 kΩ

±0.2 % reading, ± 1µΩ

30+ kΩ

±0.5 % reading

Resistance resolution 5 digits

DC voltage accuracy ±0.05 % reading, ±0.1 mV

DC current accuracy ±0.05 % reading, ±0.1 mA

Current and resistance ranges

Typical with 9 m (30 ft) leads

Current	Min Ω	Max Ω
32 A	1.0 µΩ	400 mΩ
16 A	1 mΩ	1.0 Ω
8 A	1.0 Ω	2.0 Ω
1 A	2.0 Ω	20 Ω
100 mA	1.0 Ω	100 kΩ

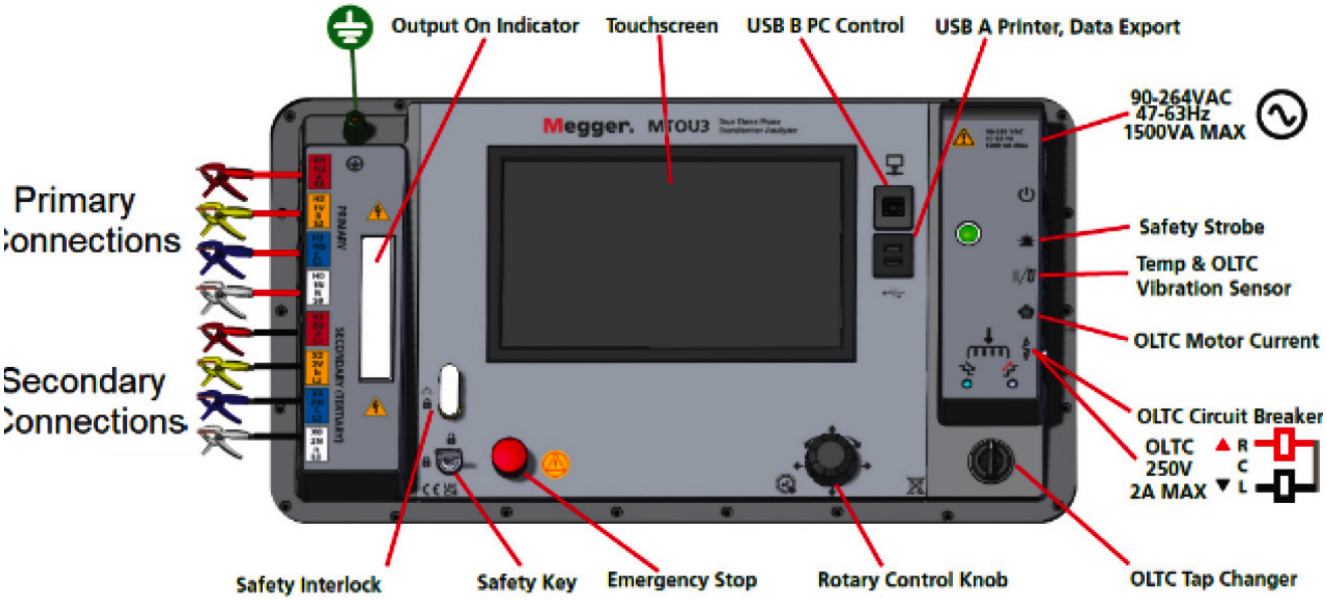
Dynamic resistance measurement method

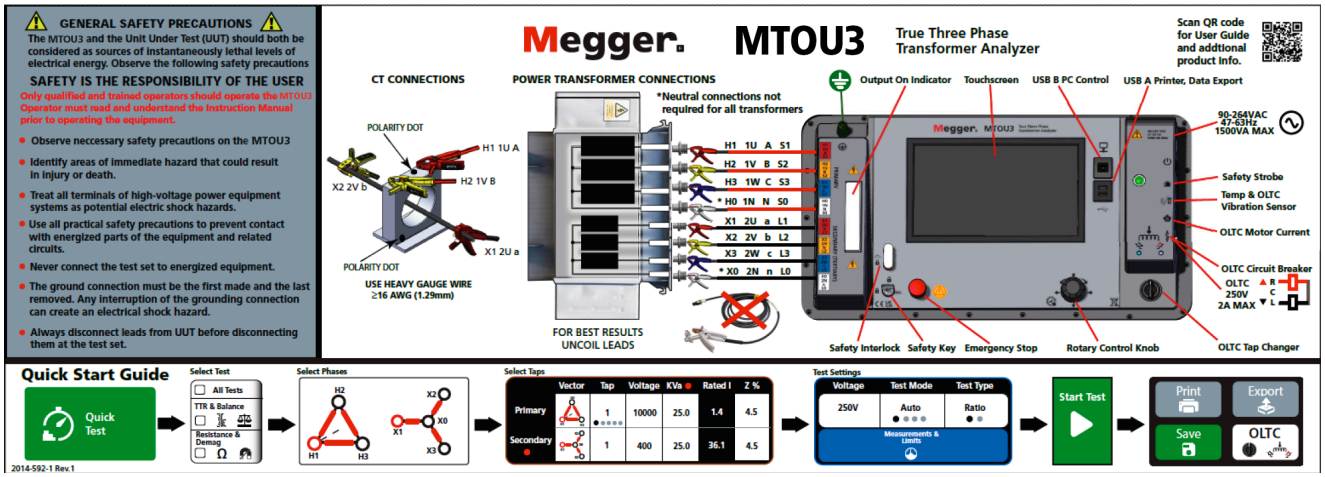
Dynamic voltage
Dynamic current
Dynamic resistance

Dynamic Resistance Speed

Speed 20 kHz

Connections and controls

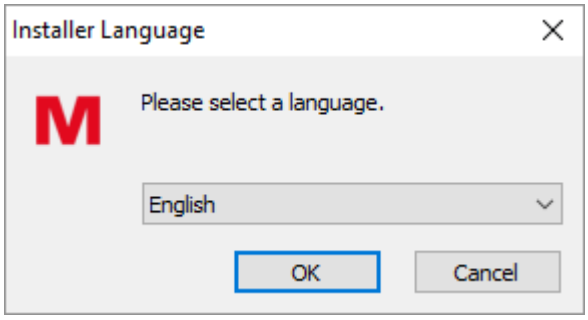




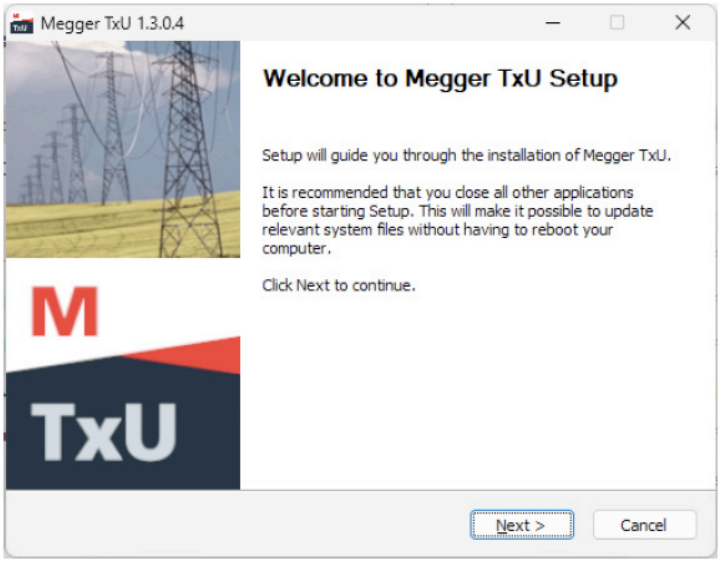
Before installing PC software, contact your IT department. Your IT department can assist with install and provide administrator approval if required.

Control of the MTOU3 is possible from the built-in touchscreen or from a USB connected PC with the PC software installed. To install the PC SW:

1. Locate the MTOU3 PC software installer
    a. From the MTOU3
        i. Connect the MTOU3 to a PC with the included USB cable
        ii. Turn on the MTOU3
        iii. After initialization, a CD drive will appear on the PC which contains the software
        iv. Locate the file named TxU_installer_X.xxx.exe. X.xxx is the version.
    b. From the internet
        i. Go to www.megger.com/MTOU3
        ii. Download the latest PC installer
2. Double click to launch the installer
3. Select a language for the install and click OK.

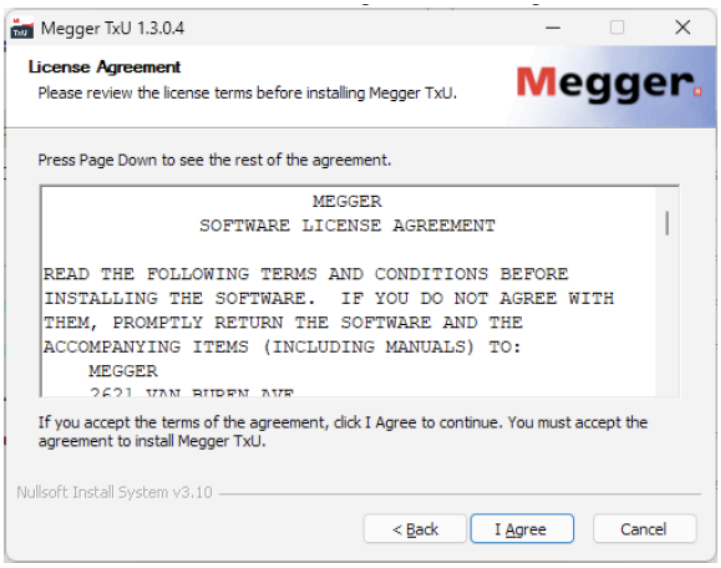


4. Click Next on the welcome screen

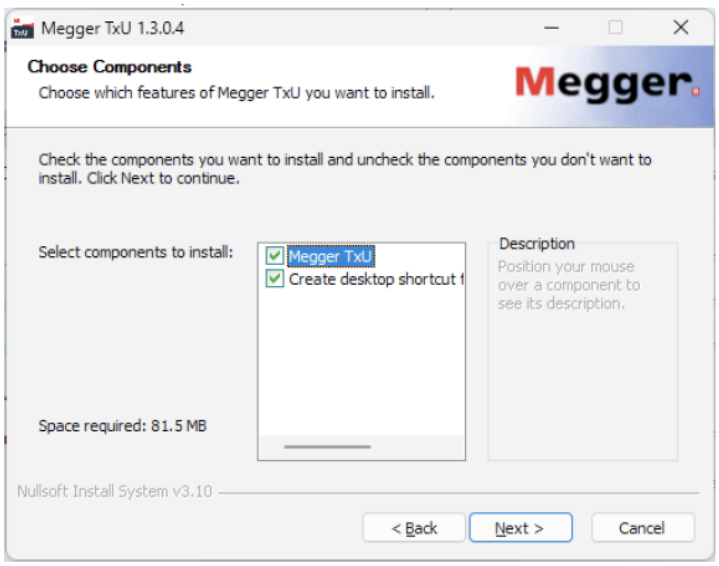


PC software installation

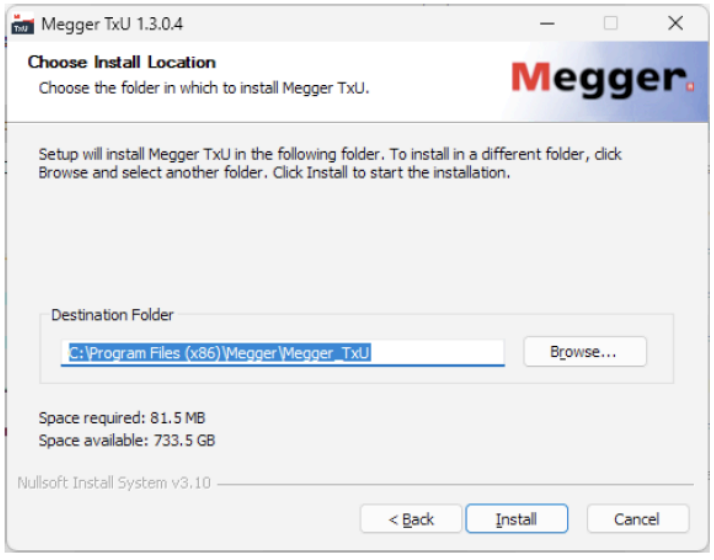
5. Review the license agreement and click I Agree



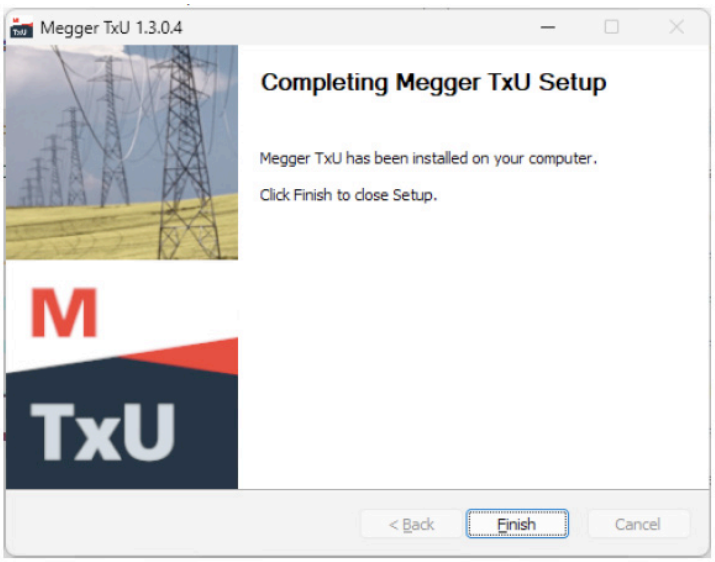
6. Choose components and select Next. Defaults recommended.



7. Select Install Location and click Install. Defaults recommended.



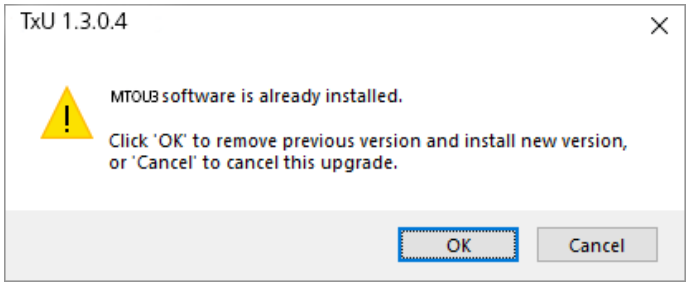
8. Click Finish to complete the install.



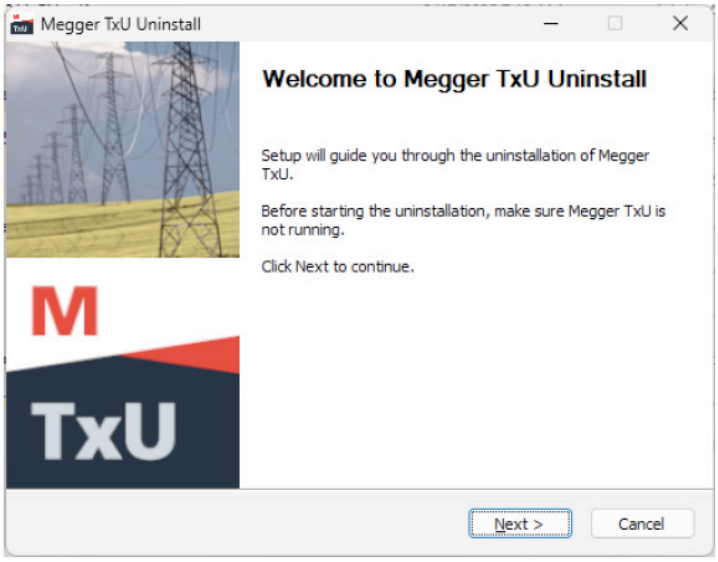
PC software update

When updating to a new version of the MTOU3 software, the installer will remove the installed version of software.

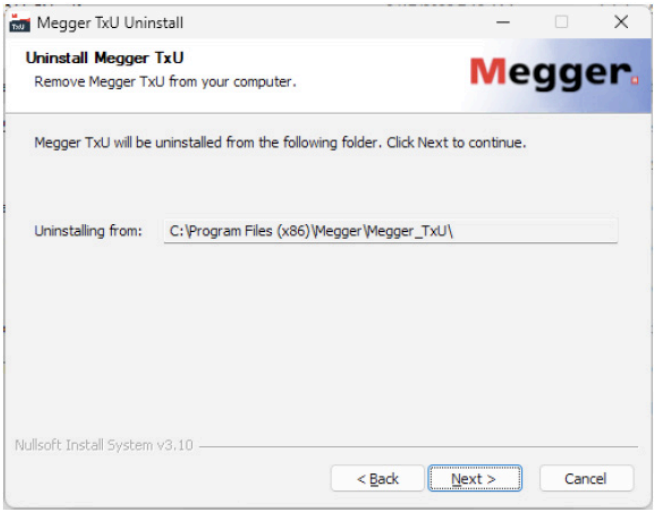
1. Locate the updated MTOU3 PC software installer
    a. From the MTOU3
        i. Connect the MTOU3 to a PC with the included USB cable
        ii. Turn on the MTOU3
        iii. After initialization, a CD drive will appear on the PC which contains the software
        iv. Locate the file named MTOU3_installer_X.xxx.exe. X.xxx is the version.
    b. From the internet
        i. Go to www.megger.com/MTOU3
        ii. Download the latest PC installer
2. Double click to launch the installer
3. Click OK to remove the previous MTOU3 version



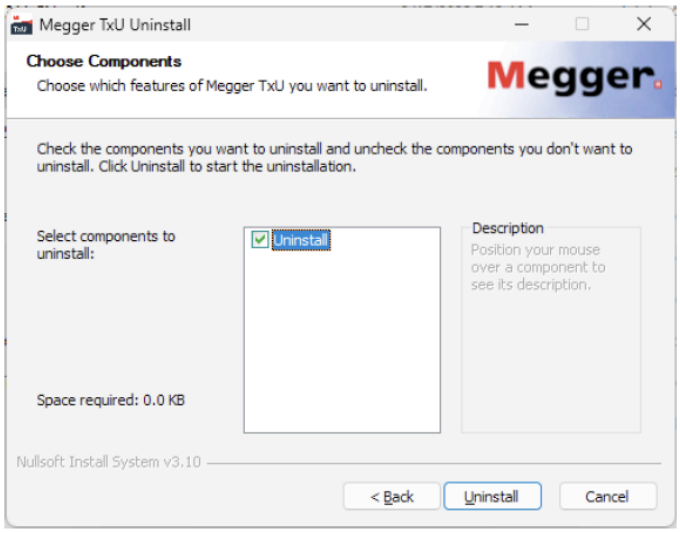
4. Click Next on the welcome screen



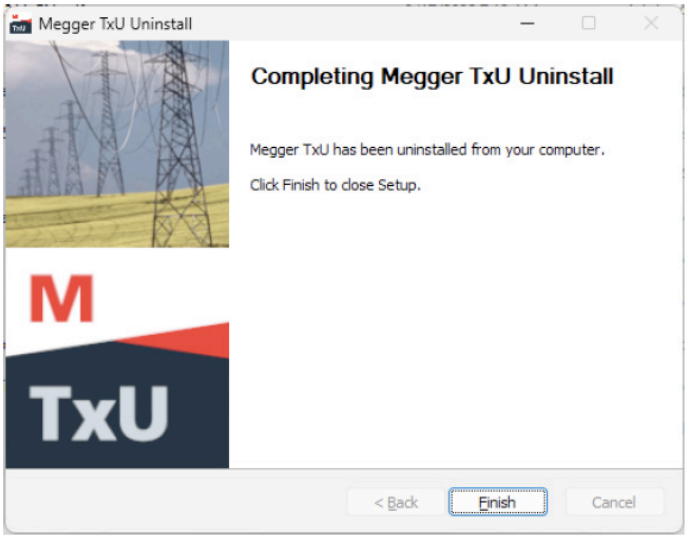
5. Click Next on the uninstall MTOU3 software screen



6. Click Uninstall



7. Click Finish



PowerDB installation

PowerDB installation

PowerDB Installation

PowerDB can import MTOU3 data. In addition, PowerDB can control the MTOU3 with the optional SW-POWERDB license.

To install PowerDB, download the latest version from www.powerdb.com. Follow the instructions on screen to install PowerDB.

After turning on the MTOU3, the Megger logo will display, followed by a progress screen during system initialization.

Home Screen

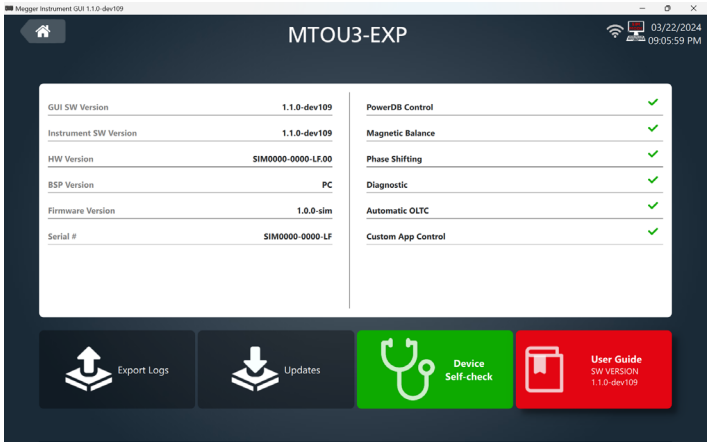
After the MTOU3 has initialized, the display will show the home screen.

There are six options to select from the Home Screen

- About
- Settings
- Quick Test
- Results
- Asset Template
- Template Test

About

The about screen provides detailed information about the MTOU3.



In addition, the following options are available:

- Export Logs
  - Used to provide Megger with detailed information about testing performed

- Updates
  - Used to update the MTOU3 to a different software version

- Device Self-check
  - - Used to perform hardware verification of the MTOU3

- User Guide
  - - Access the user guide of the MTOU3

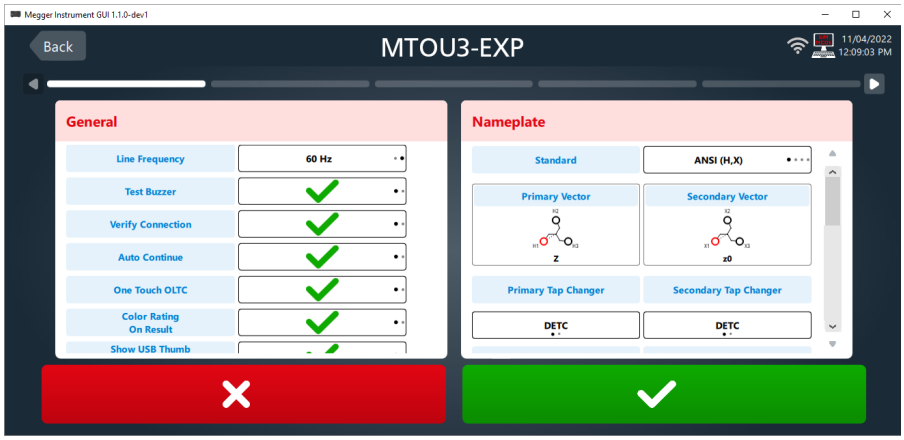
The settings screen provides options to configure the MTOU3 to meet regional and testing needs

There are five options on the settings screen

- Measurement & Limits
  - Configure nameplate and set limits for output and measurement verification
- Region
  - Configure the MTOU3 to the region it is being used
- OLTC Control
  - Configure the tap changer controller for on load tap changers
- Display
  - Adjust brightness of the display
- Administrative & Maintenance
  - Perform lead calibration and restore factory settings

Measurements & Limits Settings

The measurement & limits screen is broken into ten different sections. Swiping left or right or using the left and right arrows navigate to the different setting sections.



General

General settings apply to all tests performed by the MTOU3.

- Line Frequency
  - Set to 50 Hz or 60 Hz
- Test Buzzer
  - Enable or disable a countdown before each test
- Verify Connection
  - Enable or disable connection verification before each test. Disable if only one side of the transformer is connected to the MTOU3
- Auto Continue
  - When enabled, the MTOU3 will boot to the last test performed. When disabled, the MTOU3 will boot to the home screen
- One Touch OLTC
  - When enabled, the One Touch OLTC option will be enabled by default when performing Template Tests that have an OLTC
- Color Rating on Results
  - Enable to emphasize measurements that exceed limits
- Show USB Thumb Drive
  - Enable to display a USB Thumb Drive when connected to a PC. Disable to prevent the USB Thumb Drive from displaying
- Output Indicator Brightness
  - Change the output brightness of the warning indicator
- Export Folder
  - Change the default folder where results are exported. This option is only available when controlling the MTOU3 from a PC.

Configure the default nameplate used when performing tests

- Standard
  - Choose from ANSI, IEC, Australian, or GOST
- Primary Vector
  - Choose the default primary vector
- Secondary Vector
  - Choose the default secondary vector
- Primary Tap Changer
  - Choose the default primary tap changer. DETC, OLTC, or NA
- Secondary Tap Changer
  - Choose the default secondary tap changer. DETC, OLTC, or NA
- Primary Tap Labels
  - Choose the default primary tap labels
- Secondary Tap Labels
  - Choose the default secondary tap labels
- Primary # of Taps
  - Choose the default primary number of taps. If associated tap changer set to NA, this will be NA
- Secondary # of Taps
  - Choose the default secondary number of taps. If associated tap changer set to NA, this will be NA
- Primary Winding Material
  - Choose the default primary winding material. Copper or Aluminum. Selection will impact temperature correction for winding resistance, short circuit impedance, and efficiency tests
- Secondary Winding Material
  - Choose the default secondary winding material. Copper or Aluminum. Selection will impact temperature correction for winding resistance, short circuit impedance, and efficiency tests
- Round Tap Voltages
  - Choose the rounding used for tap calculations. 1 V, 5 V, or 10 V.
- Winding Temperature
  - Choose the default winding temperature used for temperature correction.
- Correct winding to temperature
  - Enable or disable. When enabled, winding resistance, short circuit impedance, and efficiency tests will be automatically corrected to the specified temperature.
- Auto Transformer / VReg Labels
  - Choose the labels for autotransformers. Standard naming convention (ANSI, IEC, Australian, or GOST) or S,L
- Tap Phase Shift
  - Choose to enable or disable tap phase shifting. Used rarely

1P Primary/secondary connections

- Choose which leads to use for 1P transformer. H1-H2/X1-X2 or H1-H0/X1-X0 options available.

Resistance

Configure the winding resistance settings used when performing tests

- Max Current
  - Set the maximum current limit. Applies to primary and secondary windings
  - Maximum current will be limited based on model
- Stability %
  - Set the stability criteria for winding resistance tests.
- Stability time
  - Set the time the stability % must be maintained to indicate a measurement is stable
- Auto Save
  - When enabled, results will automatically save when stability time and % criteria have bene met
  - When performing winding resistance on multiple OLTC taps in template tests, Auto Save will be disabled for the first tap of each phase. After saving the first tap, the test will automatically save for the remaining taps for that phase.
- Max Winding Difference
  - Set the maximum resistance difference evaluation criteria. Recommended 3.0%
- Winding Difference Calculation
  - - ANSI/IEC
    - Diff % = ((Rmax - Rmin) / Ravg) x 100
  - - CEE
    - Determine |Max Phase Error| from
      - AVG = (Phase 1 + Phase 2 + Phase 3)
      - Phase 1 Error = Phase 1 - AVG
      - Phase 2 Error = Phase 2 - AVG
      - Phase 3 Error = Phase 3 - AVG
  - - Diff % = (|Max Phase Error| / AVG) * 100
- Dual Winding Excitation
  - When enabled, primary and secondary will be energized and measured simultaneously
- Make Before Break
  - Set current sag (10%) time limit during OLTC transitions. 5 ms recommended.
- Hard Break
  - Set limit for hard break during winding resistance tests.

    200 ms recommended. This setting is used to protect the operator in the event of inadvertent lead disconnection during winding resistance tests

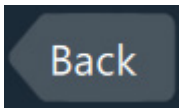
Demagnetization

Configure the demagnetization settings used when performing tests

- Phase
  - Select a phase or all phases. Recommended B Phase
- Auto Demag After Resistance
  - When enabled, the MTOU3 will automatically demagnetize the transformer after a resistance test has been performed.

Select cancel to discard changes. Select accept to save changes.

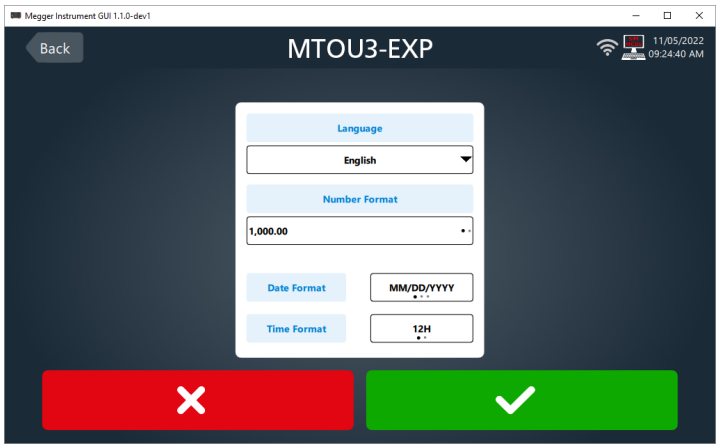
Select back to return to the settings screen.



Select home to return to the home screen.

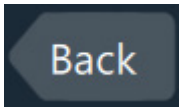
Regional

Select the preferred language, number format, date format, and time format for the MTOU3. Date and time can be set on the MTOU3. When controlled by a PC, the MTOU3 will use the PC date and time.



Select cancel to discard changes. Select accept to save changes.

Select back to return to the settings screen.

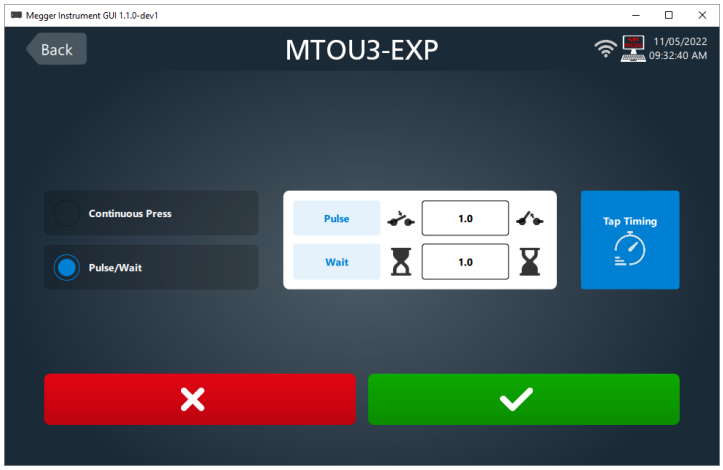


Select home to return to the home screen.

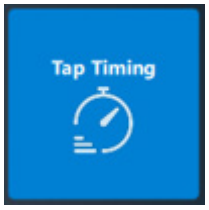
OLTC Control

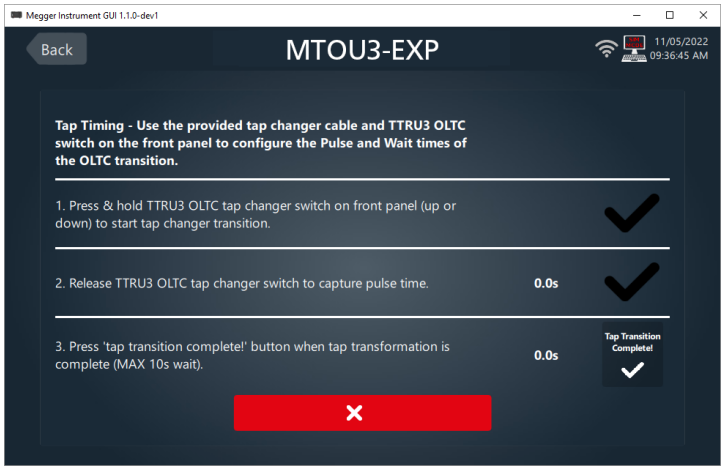
Select continuous press or pulse/wait operation for the on load tap changer. The majority of transformers use a pulse/wait.

When pulse/wait is selected, options for setting pulse and wait time will be displayed. Pulse is the duration required to initiate a tap change. Wait is the amount of time the tap changer requires to complete the tap changer after initiation.



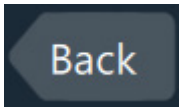
Select tap timing to use the OLTC controls on the MTOU3 to set the pulse and wait time.





Select cancel to discard changes. Select accept to save changes.

Select back to return to the settings screen.



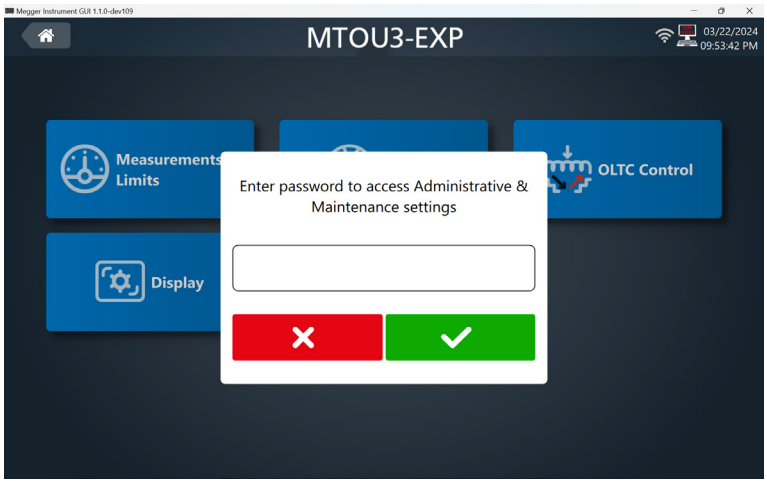
Select home to return to the home screen.

Display
Use the slider to adjust the brightness of the MTOU3 display

Administrative & Maintenance

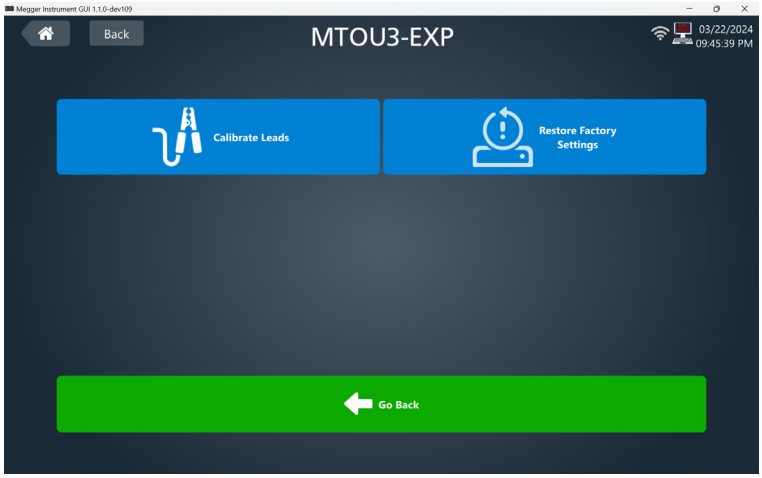
Administrative & Maintenance

After clicking on the Administrative & Maintenance setting, a password dialog box will appear. Enter the password 2621 to proceed.



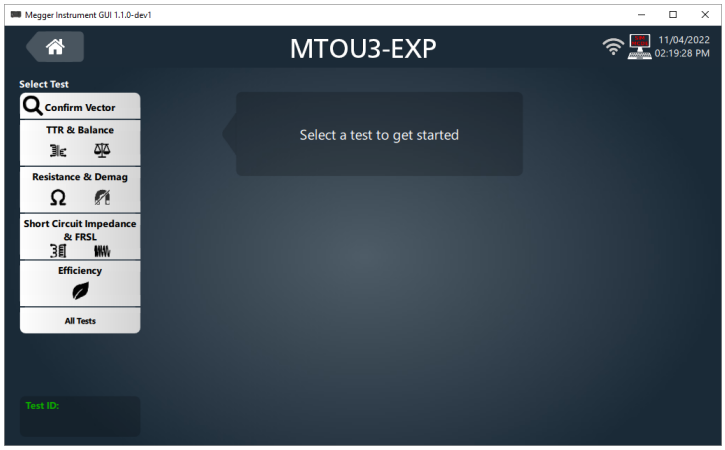
Lead calibration is used for accurate impedance and efficiency test results. A one time lead calibration is typically required when using leads different than the default 9 m (30 ft) calibration. Follow testing best practices when calibrating the leads by fully uncoiling and extending leads.

Restore factory settings is used to reset the MTOU3 back to the original settings from the factory. User will be prompted to confirm



Quick Test

After selecting quick test, test options will display on the left hand side of the screen. Enter a Test ID for test identification.



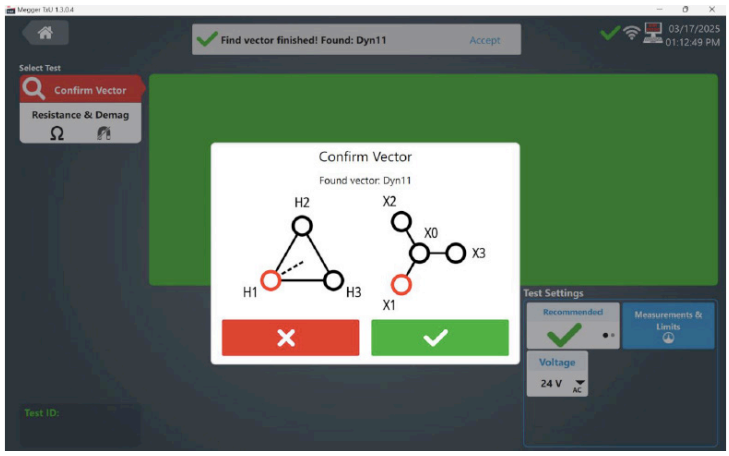
Select home to return to the home screen.

Confirm Vector

Confirm Vector

Confirm vector automatically detect the vector of the connected transformer. Recommend test settings selected by default.

Click Start Confirm Vector to begin the test

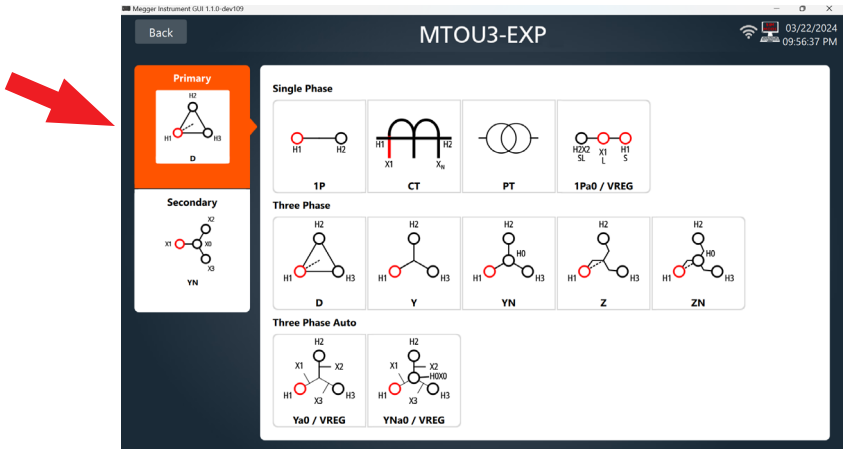


When confirm vector completes, the vector found will be displayed. Verify the vector matches the nameplate of the transformer under test and select Accept. If the vector does not match the nameplate, select Reject.

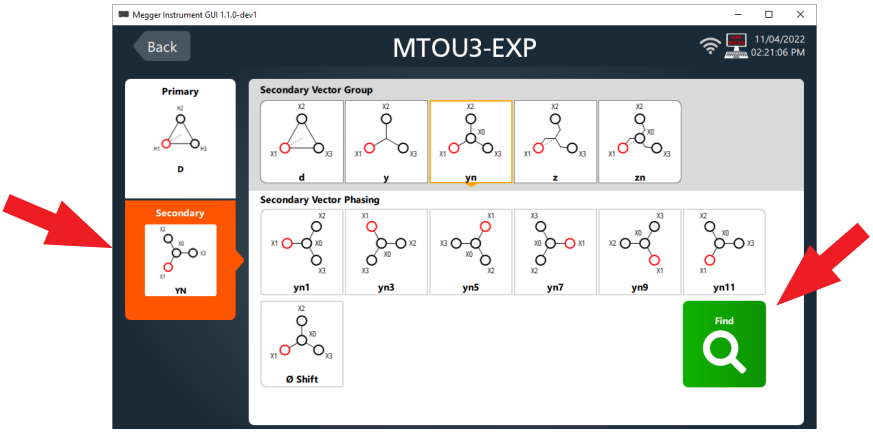
It is the responsibility of the user to confirm that the vector matches the transformer under test. Megger accepts no responsibility for incorrectly identified vectors.

Clicking accept will select the vector found and progress quick test to TTR test setup. Clicking reject will progress to the primary vector selection screen.

Select a primary vector or autotransformer from the Primary vector select screen.

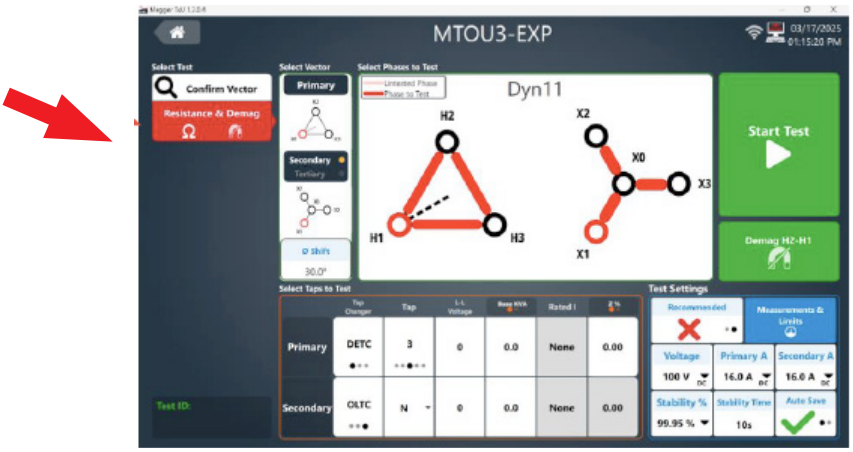


After selecting a primary vector, The secondary vector select screen will display. Select a secondary vector group and phasing. Once selected, the TTR test setup will be displayed. Select find to find the vector phasing for the selected primary and secondary group.



Vector, Phases, and Nameplate

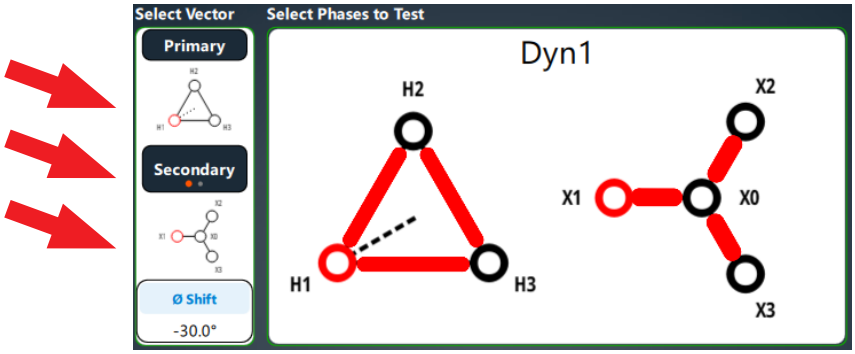
Select Resistance & Demag to display the Select Vector, Select Phases to Test, and Select Taps to Test sections.



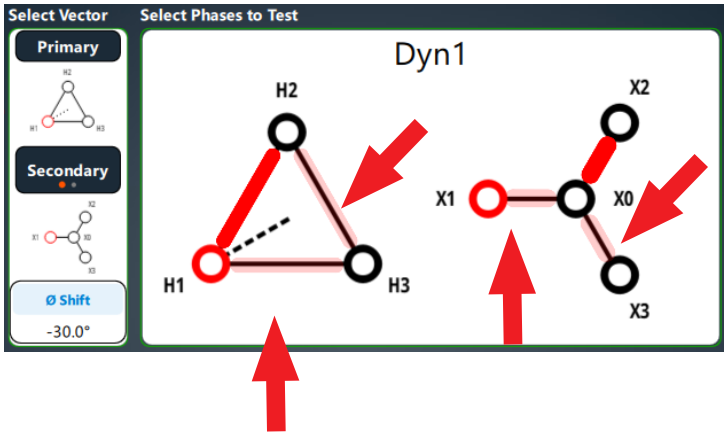
Select Vector and Select Phases to Test

Select Vector and Select Phases to Test

Select Primary to view the primary vector options for the transformer under test. Select Secondary to view the secondary vector options for the primary vector of the transformer under test. Select the Secondary button to change to Tertiary if testing a tertiary winding. Phase shift enables testing of phase shifting transformers. **Phase shifting test capabilities not available on the MTOU3-BASIC.**



Individual phases can be enabled or disabled for testing. When testing ratio, impedance, and efficiency, in phase primary and secondary phases are tied together. For example, disabling phase A and C on the primary will disable phase A and C on the secondary.

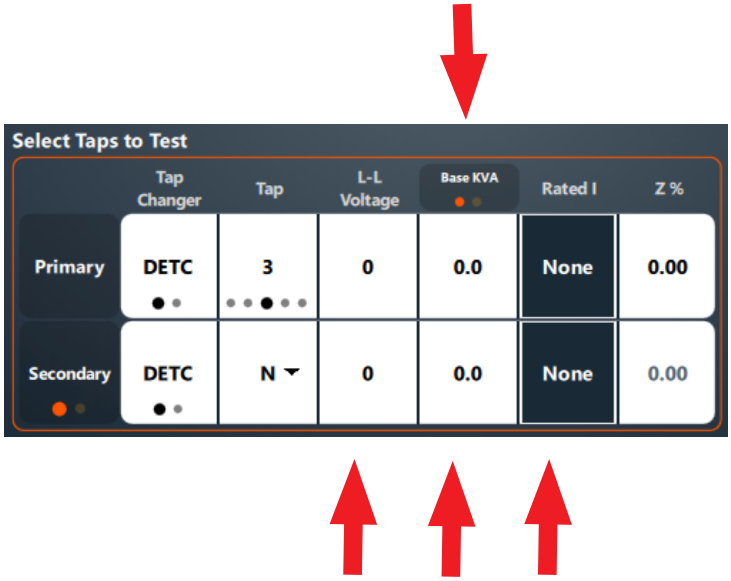


Nameplate

The nameplate section will populate with default settings from Measurement & Limits. Enter tap information for the transformer for evaluation against limits. Secondary can be changed to Tertiary. Base KVA can be changed to Base MVA.

Entering tap voltages for two taps of a winding will automatically calculate tap voltages for the remaining taps of the winding.

Entering L-L voltage and base KVA/MVA will calculate RATED I for the transformer.

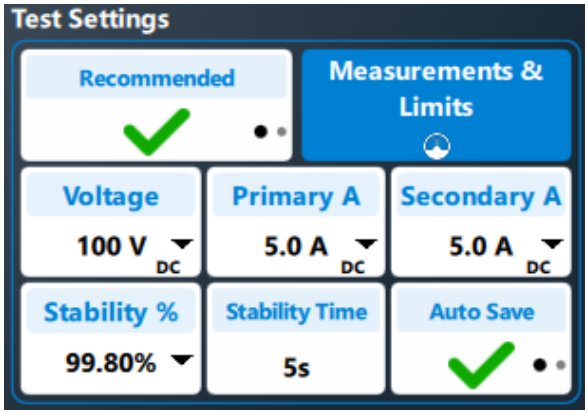


Winding Resistance & Demagnetization

Winding Resistance & Demagnetization

Voltage, Primary Current, Secondary Current, Stability %, Stability Time, and Auto Save settings display when Winding Resistance & Demagnetization is selected.

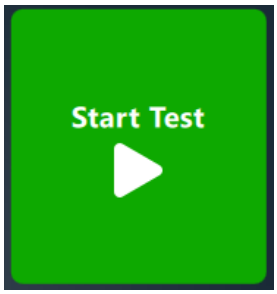
Select Measurement & Limits for complete settings options.



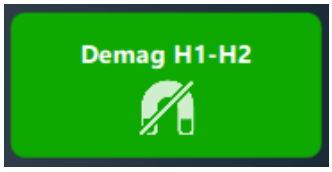
Primary test current is determined by the RATED current of the primary winding. The MTOU3 will select 15% of rated current, or the maximum output of the MTOU3, whichever is lower. MTOU3 BASIC maximum primary current is 10 A. MTOU3 ADV, PRO, and EXP maximum primary current is 16 A.

Like primary test current, secondary test current is determined by the RATED current of the secondary winding. The MTOU3 will select 15% of rated current, or the maximum output of the MTOU3, whichever is lower. MTOU3 BASIC maximum secondary current is 10 A. MTOU3 ADV maximum secondary current is 16 A. MTOU3 PRO and EXP maximum secondary current 32 A.

Click Start Test to start the winding resistance test.



Click Demag to perform demagnetization

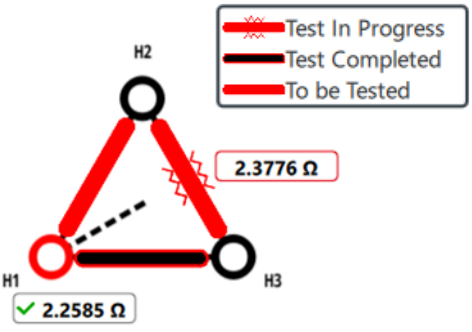


The winding resistance test in progress screen will display after clicking start test.

Phases for windings that have yet to be tested will be displayed in red (H1-H2 below)

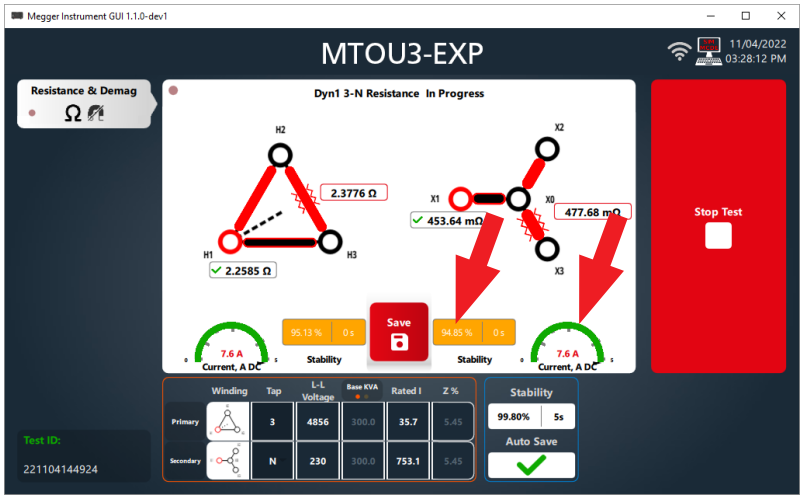
Phases that are in progress will show an excitation symbol around the phase (H2-H3 below). Resistance values will be displayed next to phases that are in progress and will continuously update until the resistance measurement is saved.

Phases saved are displayed in black (H1-H3).



Resistance, current, stability %, and stability time will be displayed for each winding. When the stability % exceeds the set limit, a timer will start. When the timer exceeds the setting for both windings, the Save button will turn green. If Autosave is enabled, the result will automatically save, and the next phase will be tested. If no more phases remain to be tested, the winding resistance test will finish by discharging the transformer. Discharge is indicated by orange/red lights of the output indicator.

Do not disconnect the leads from the transformer or MTOU3 during discharge. In the event of power loss during winding resistance tests or discharge, the MTOU3 will continue to discharge the transformer passively, indicated by red LEDs on the output indicator. When discharge is complete, the LEDs will turn off, and the leads can be removed.



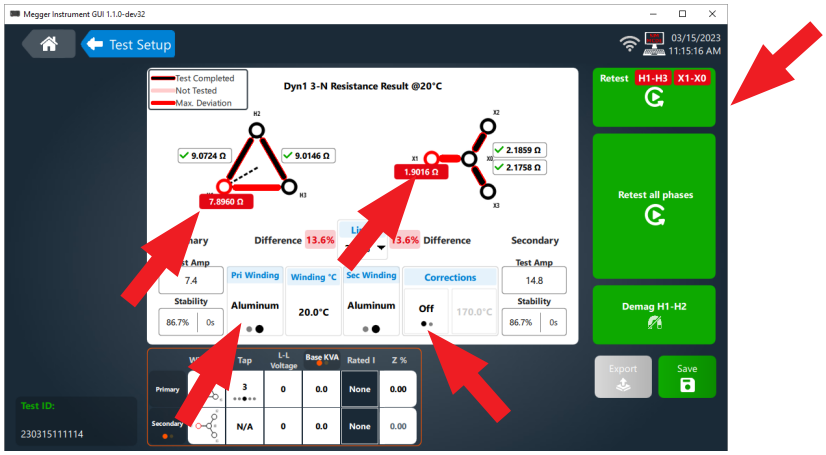
If Auto Demag after Resistance is enabled, or if Demag is selected from the Resistance & Demagnetization screen is clicked, the Demag in progress screen will be displayed.

Demag is performed by applying +DC voltage and measuring the time it takes for the transformer core to begin saturation. Polarity is then reversed, and time is measured until saturation occurs in the opposite direction. Based on these initial tests, +DC and -DC voltage is applied in decreasing time intervals until the transformer is demagnetized.

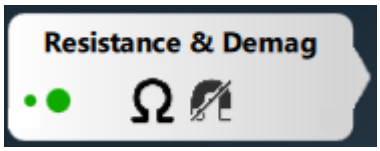
When the winding resistance test is complete, the following screen will be displayed. Phases that exceed limits will be highlighted in red. The software will recommend to retest these individual phases.

Corrections to a set temperature can be enabled or disabled. Ensure that winding temperature and primary and secondary winding material are set correctly for accurate temperature correction.

Winding Resistance & Demagnetization



Selecting Resistance & Demag will display the demagnetization graph



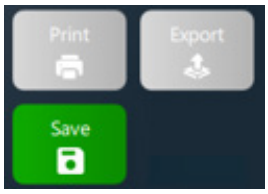
The phase that was demagnetized, along with before and after remanence and demag time will be displayed.

Save, Print, Export, Retest, Home, Quick Test Setup

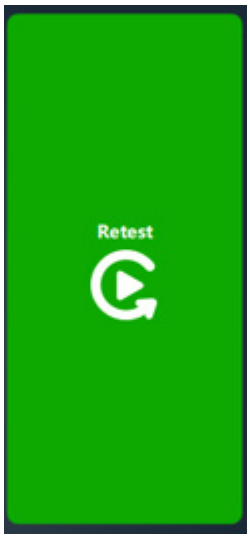
Quick test results are automatically saved at the end of the test. If the namplate or test results settings are changed, a save button will appear. Click save to update the results with the new setting and return to the test setup screen.

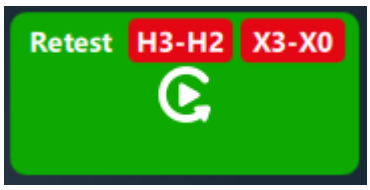
Print will print to the optional 2" printer. Print will only display when the printer is detected

Export will export results to a USB thumb drive. Export will only display when a thumb drive is detected, or when operating the MTOU3 from a USB connected PC.

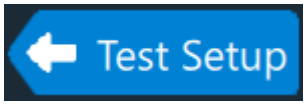


After completing a test, an option to retest will be displayed.





Select test setup to return to the quick test setup screen.



Select home to return to the home screen.

Results

Results

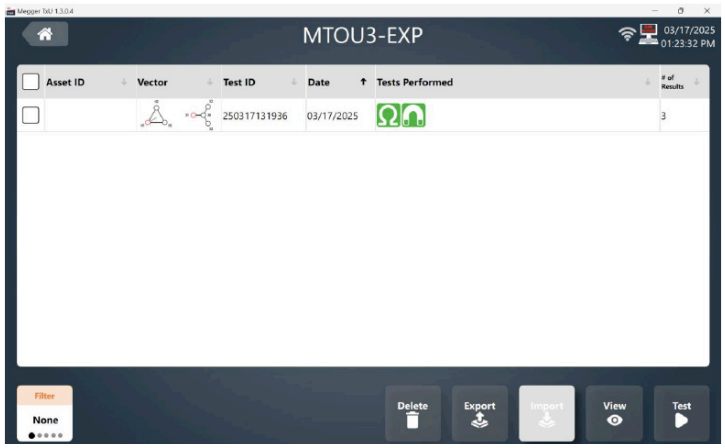
After saving, results will be available for review in the results screen. Results can be sorted by asset ID, vector, test ID, Date, tests performed, and # of results. In addition, results can be filtered by Asset ID.

Tests Performed will show icons for the tests saved for the test ID. TTR, Magnetic Balance, Resistance, Short Circuit Impedance, and Frequency Response Stray Losses icons in green indicate results that are within limits. A demag symbol in green indicates a successful demagnetization of the transformer. Icons in red indicate results that are not within limits.

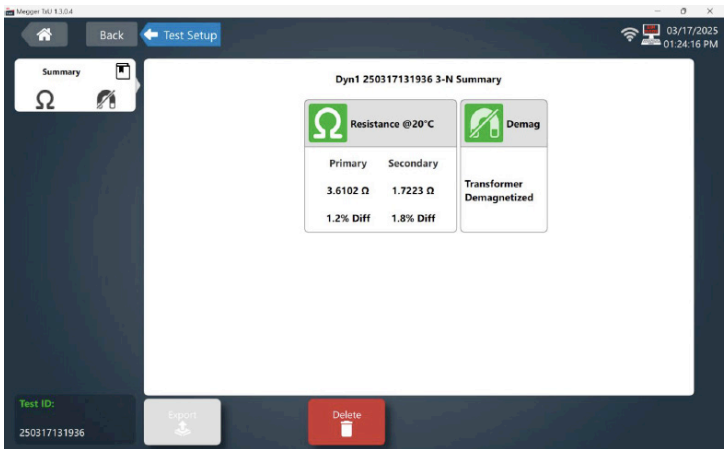
Select a result to view the test information. Selecting a check box will enable delete, export, and test options

Select multiple check boxes to delete or export multiple results

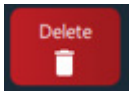
Select the check box in the table header row to select all results.

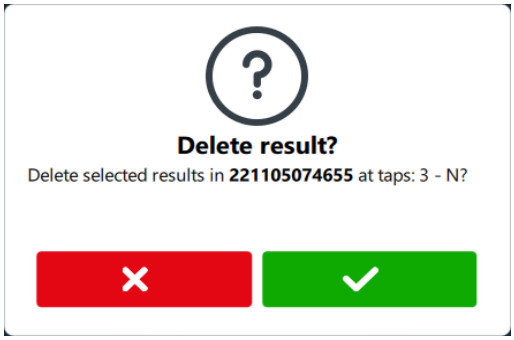


After selecting a result, the test information will be displayed.



Select delete to delete the results. Confirmation is required to delete the result

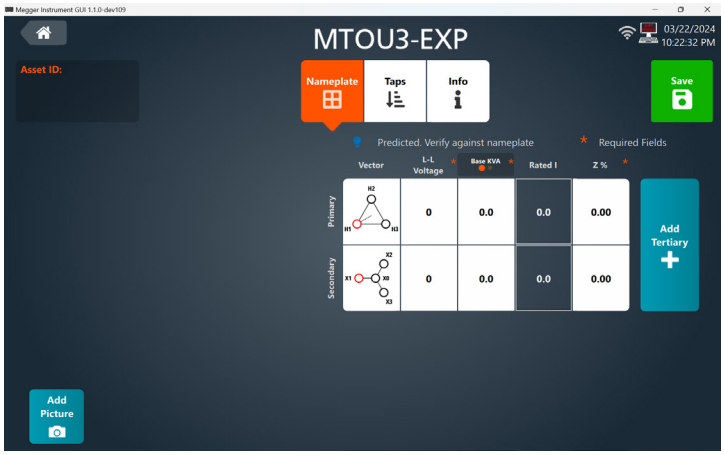




Asset Template

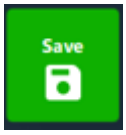
Enter an Asset ID for identification of the asset.

Select Primary and Secondary vector and enter line to line voltage, KVA/MVA, and Z % for the transformer.

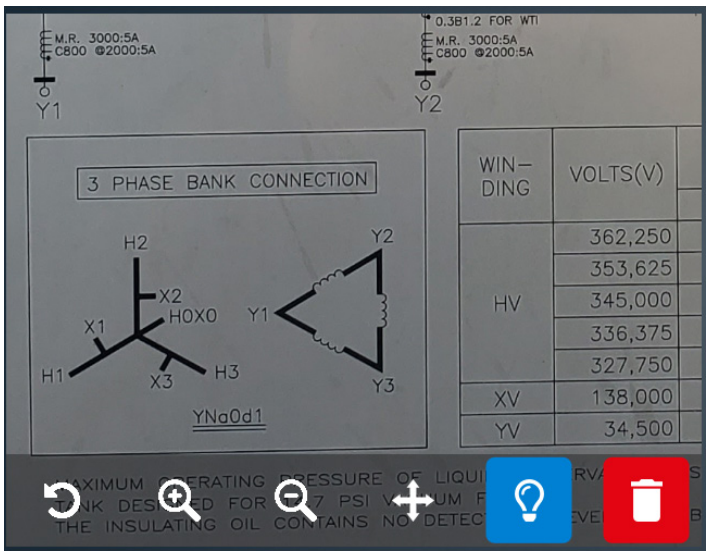


Select add tertiary if the transformer has a tertiary winding.

Select save to save the asset template



Select add picture to add pictures to the asset template.

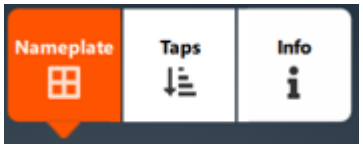


Asset Template

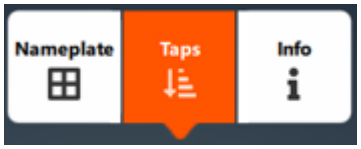
Use the rotate, zoom in, and zoom out buttons to view picture details. Click and hold to move the picture around. Pinch to zoom and swipe to view picture details on the MTOU3 display.

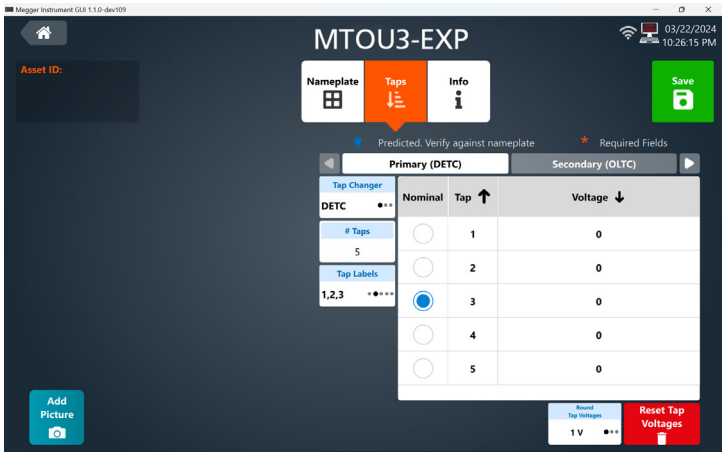
Delete will remove the picture from the asset template

When asset template is first selected, nameplate entry will selected.



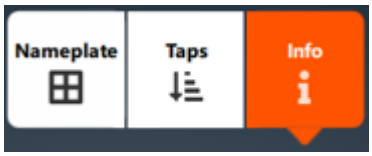
Select taps to configure the tap changers for the primary and secondary winding. Winding options will be prepopulated based on measurement & limits settings.

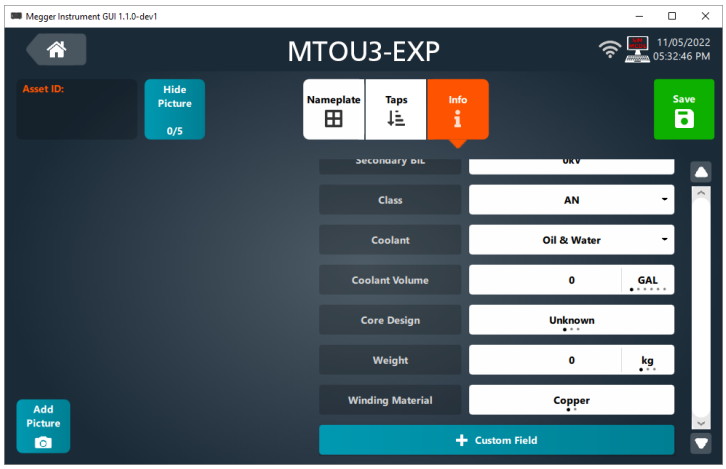




After entering two tap voltages, the remaining tap voltages will automatically calculate. Override tap voltages as required. Select reset tap voltages to clear tap voltages.

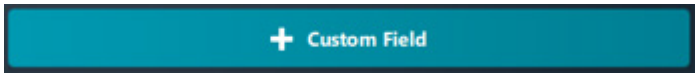
Select Info to enter additional common nameplate information.





- Manufacturer
- Serial Number
- Year
- Substation
- Position
- Tank Type
- Primary BIL
- Secondary BIL
- Class
- Coolant
- Core Design
- Weight
- Primary winding material
- Secondary winding material

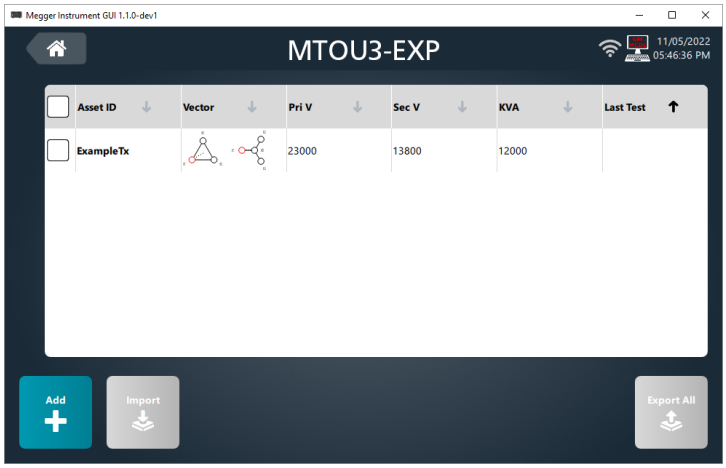
Select add custom field to enter custom nameplate information.



Template Test

Template Test

Asset templates can be sorted by Asset ID, vector, primary voltage, secondary voltage, KVA, and last test date and time. Select an Asset ID to proceed to the template test screen.

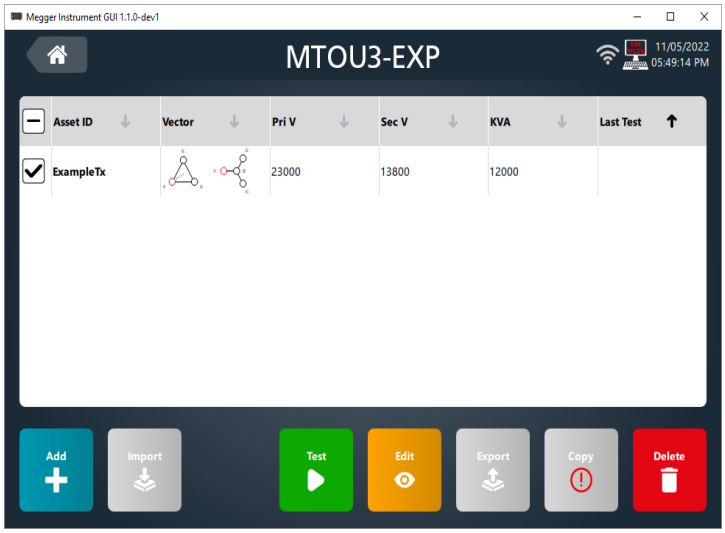


Select add to create a new asset template

Select export all to export all asset templates

Select import to import exported asset ids.

Select the check mark next to an asset id to show additional options.



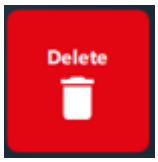
Select test to go to the template test screen

Select edit to edit the asset template

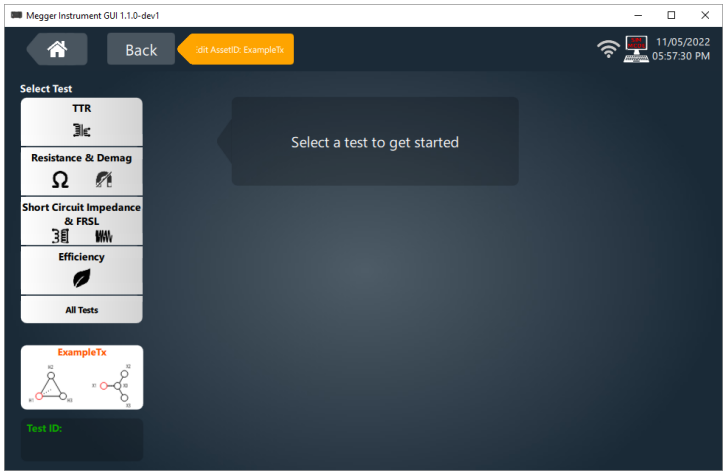
Select export to export the asset template

Select copy to copy the asset template

Select delete to delete the asset template



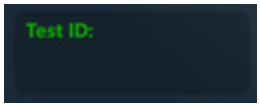
The template test screen is similar to quick test. Select a test to get started.



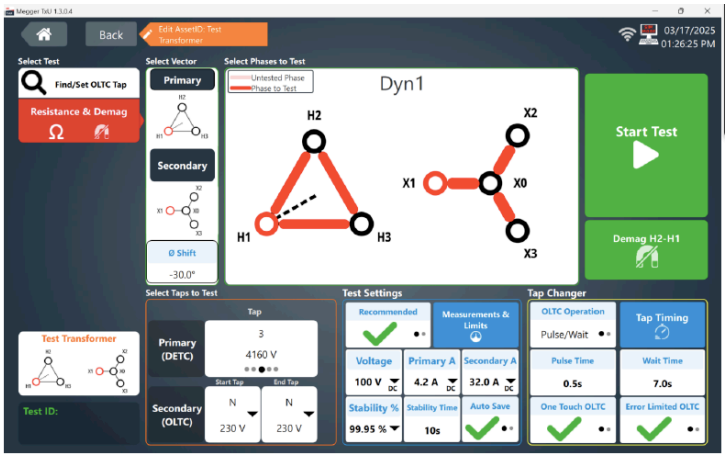
Select edit to edit the asset template.

Enter a Test ID for the asset template test. Useful for grouping asset test results for specific testing activities or for tests performed on different days.

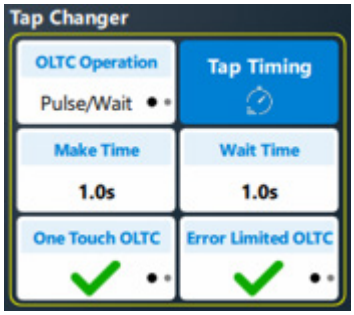
Template Test



After selecting a test, taps to test and test settings will display. Tap selections available based on asset template configuration. Specific test settings will be displayed based on the test selected, same as quick test.



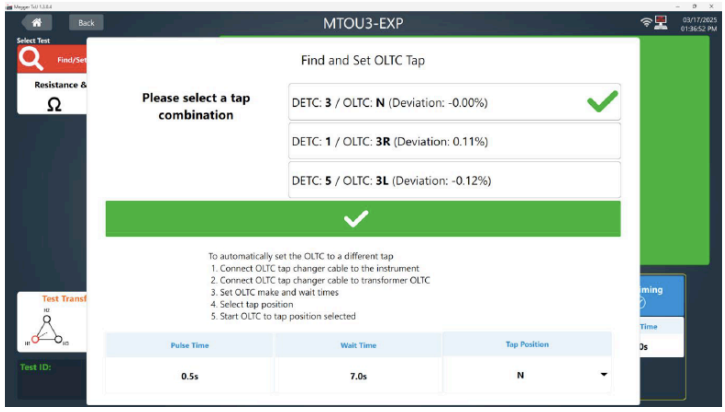
If the asset has an OLTC, there will be options for configuring OLTC control



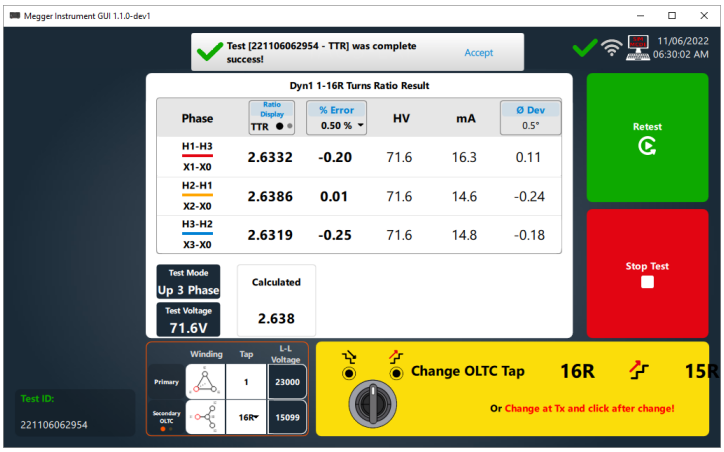
Find/Set OLTC

If the tap changer has an OLTC, the Find/Set OLTC feature will be displayed. After running the tap, the MTOU3 will determine, based on tap ratios, which tap is currently selected. Based on percent errors from expected, the found tap may not be the actual tap. Always consult the OLTC for actual tap position.

To automatically set the OLTC to a different tap, follow the directions on screen.

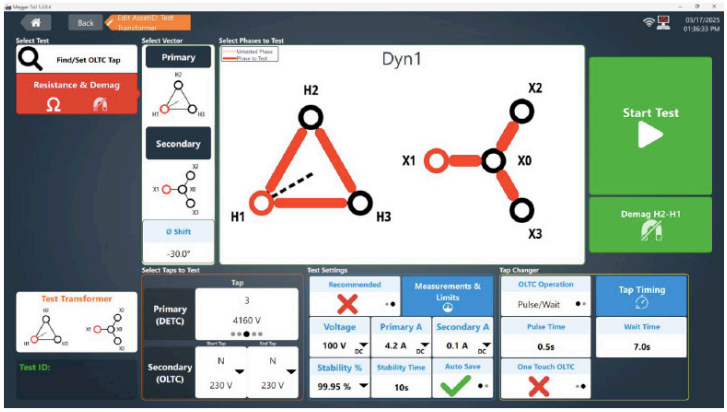


Single Tap Test

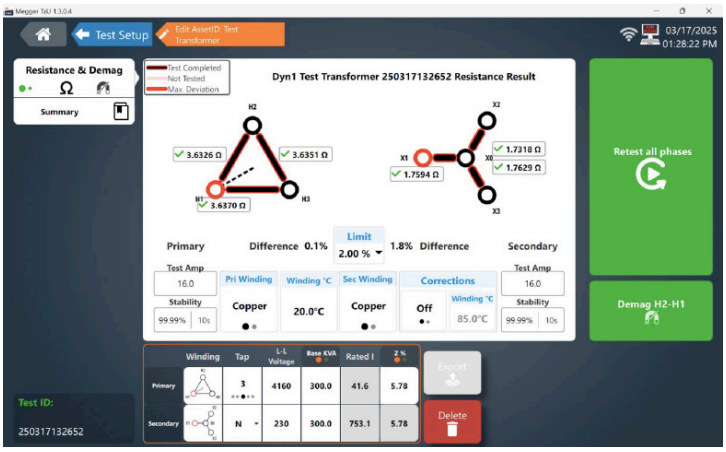


If the MTOU3 OLTC is not used, the OLTC must be changed manually at the transformer. When the tap change is complete, click the yellow button to begin the next test.

Single Tap Test



If the asset does not have an OLTC, or the start and end tap for the OLTC are the same, testing will be complete as described in quick test.

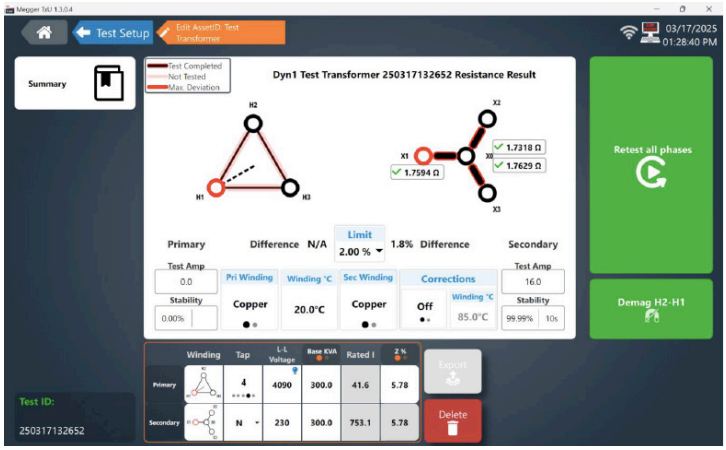


When testing is complete, the Test Setup button can be used to return to the Template Test setup screen.

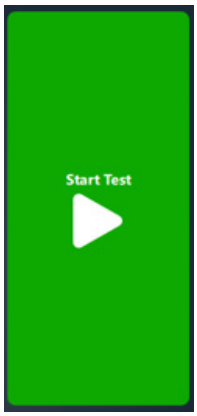
Single Tap Test

In addition, the tap can be changed in the nameplate section to test other tap positions.

Below is an example when the tap is changed and no results are available.



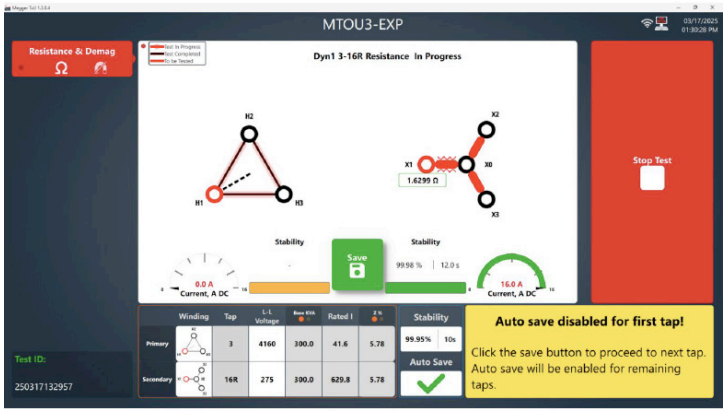
Click Start Test

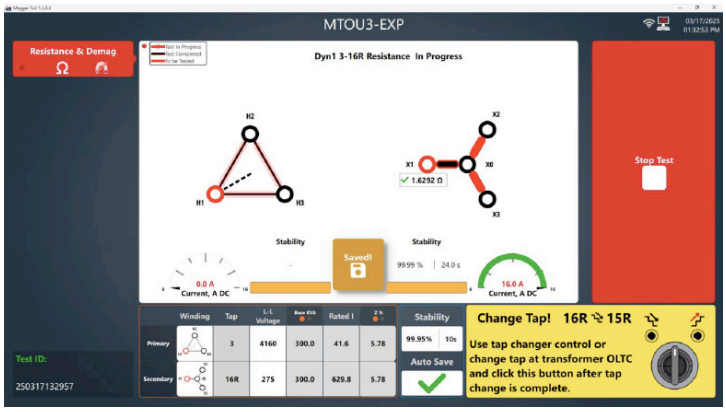


Multiple Tap OLTC Winding Resistance Tests

The start tap and end tap of an OLTC can be changed to test multiple tap positions.

The screen below is displayed after the first phase and tap are complete when testing winding resistance.



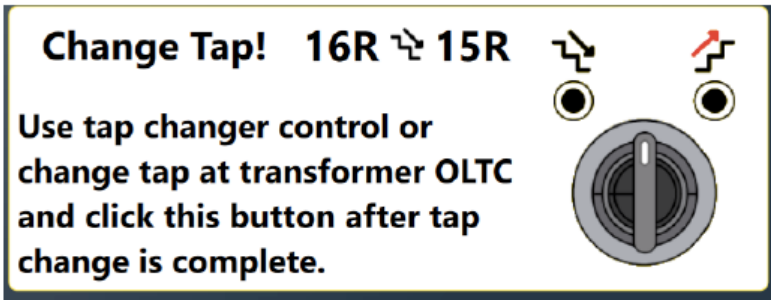


If the MTOU3 tap changer cable is connected to the MTOU3 and to the transformer OLTC control, the MTOU3 OLTC switch can be used to change the tap changer position. If set to Continuous Press, the next test will begin when the MTOU3 OLTC switch is released. If set to pulse/wait, the next test will begin when the pulse/wait timing is complete.

> **Note:** If the tap changer is operated in the opposite direction as indicated in the software, testing will continue in the new direction selected.

If the MTOU3 OLTC is not used, the OLTC must be changed manually at the transformer. When the tap change is complete, click the yellow button to begin the next test.

Multiple Tap OLTC Winding Resistance Tests



When the last tap of the first phase is completed, the test set will automatically discharge and energize the next phase to be tested.

Testing will complete when the last tap of the final phase has been saved.

When testing completes, a summary page will be displayed along with a graph of the winding resistance results.

PowerDB Import

The combined 3Ø form can be used to import MTOU3 data into PowerDB.

PowerDB Control

The combined 3Ø form can be used to configure and run tests with the MTOU3.

Service

Service

If immediate assistance is required, please contact the customer service by telephone or email:

+1 670 676 8500

vfcustomersupport@megger.com

Troubleshooting

The Troubleshooting Guide is designed to evaluate the reasons for a MTOU3 malfunction. The possible test set malfunctions and causes are listed below. Electronic circuit repairs should not be attempted in the field. Refer to Repair section.

MTOU3 does not turn on

- Check that the power cord is fully inserted into the MTOU3.
- Check that the power source is outputting voltage at acceptable levels and frequency.
- Check that the power cord is fully inserted into the source.
- Check that the power switch is in the correct position (I).
- Set the power switch to off (O)

  Wait 30 seconds

  Set the power switch to on (I)
- Try another power cord

MTOU3 Reports test failed, but still provides data

- Check lead connections. Reference Nameplate to ensure leads are connected to the correct bushing.

Printer not working

- Check battery is inserted into printer
- Charge printer battery using supplied charger
- Check printer paper is inserted properly
- Check USB cable is plugged into printer
- Check USB cable is plugged into TTRU3 USB port
- Check printer is turned on by holding power button
- Try other USB ports

OLTC moving in wrong direction

- Check the OLTC wiring diagram and ensure leads are connected to correct terminals.

Cannot connect TTRU3 to PC

Contact your IT department for primary assistance when connecting any device to your PC.

- Check USB cable is fully inserted into the MTOU3
- Check USB cable is fully inserted into PC
- Check the MTOU3 is powered on
- Check MTOU3 SW is installed

- Check MTOU3 is running
- Move USB cable to another USB port on your PC
- Try another USB Cable
- Try another PC

Maintenance

Only qualified persons familiar with the hazards involved with high-voltage test equipment should perform maintenance. Read and understand Sections 1, 2, 3, 4, and 5 before performing any service.

The TTRU3 requires only periodic inspection. Inspect all hardware items to ensure all are in good condition.

The TTRU3 may be cleaned periodically. In so doing, do not allow water to penetrate panel holes. An all-purpose, household spray cleaner can be used to clean the panel. Polish with a soft, dry cloth. Clean the cables and mating panel receptacles with isopropyl or denatured alcohol applied with a clean cloth.

Calibration

A complete performance and calibration check should be made at least once every year. This will ensure that the TTRU3 is functioning properly over the entire measurement range. The TTRU3 calibration is performed on each new or repaired unit before sending it to a customer.

Repairs

Any service or repair of this equipment should be performed only by qualified persons who are aware of electrical hazards and the necessary precautions required to prevent injury.

Megger offers a complete Repair and Calibration Service and recommends that its customers take advantage of this service for routine maintenance or in the event of any equipment malfunction.

In the event Service is required, contact your Megger representative for a product Return Authorization (RA) number and shipping instructions.

Ship the product prepaid and insured and marked for the attention of the Megger Repair Department. Please indicate all pertinent information, including catalog number, serial number, and problem symptoms.

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Part No: MTO3_UG_EN_AP