OPERATIONS MANUAL

AUTOMATED CURRENT TRANSFORMER TESTING SYSTEM

CATALOG NO. KCTS-8000XA

AUTOMATED CURRENT TRANSFORMER TESTING SYSTEM OPERATIONS MANUAL

CATALOG NO. KCTS-8000XA

TESCO METERING

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1.9 About This Operations Manual

1.1 Introduction

The Knopp Automated Extended Range Current Transformer Testing System (KCTS-8000XA) is designed for precise, efficient, and repeatable testing of instrument current transformers with 5A secondaries and primaries up to 8000A. The system combines automated control functions, electronically compensated burdens, and integrated diagnostic capabilities to support traceable accuracy down to a 1% rating factor.

Testing operations are controlled through the comparator interface, allowing automated execution of the test sequence after the Transformer-Under-Test (TUT) has been connected. Measurement results and test data can be integrated with software platforms such as TESCO Device Manager (TDM), Meter Manager, or other compatible data management systems for storage, reporting, and analysis.

1.2 Contacting TESCO

For Technical Support or Calibration/Repair, please call 215.228.0500.

You can also send an email to **support@tescometering.com** with any questions.

To view, print, or download the latest manual supplement, visit **www.tescometering.com**.

1.3 General Safety Summary

This manual contains information and warnings that must be observed to ensure safe operation and keep the KCTS in a safe condition. Operation or service in conditions or in a manner other than specified could compromise safety. For the correct and safe use of this device**, it is essential that both operating and service personnel follow accepted safety procedures in addition to the safety precautions specified**, including PPE guidelines.

In this manual, a **WARNING** identifies conditions and actions that pose hazard(s) to the user, while a **CAUTION** identifies conditions and actions that may damage the KCTS or the test equipment.

WARNING

To avoid electrical shock, personal injury, or fire hazard:

- **The device must not be switched ON if it is damaged or suspected to be faulty.**
- **Do not operate the device in wet, condensing, dusty, or explosive gas conditions.**
- **If the equipment is used in a manner not specified in this manual, the protection provided by the KCTS may be impaired.**

- **Whenever it is likely that safety protection has been impaired, the device must be made inoperative and be secured against any unintended operation. Inform qualified maintenance or repair personnel.**
- **Safety protection is likely to be impaired if, for example, the KCTS displays visible damage or fails to operate normally.**

1.4 Description of Safety-related Icons

ICONS	*DESCRIPTION*
	Risk of danger. Important information. See manual.
	Hazardous voltage. Risk of electrical shock.

1.5 Product Features (KCTS-8000XA)

1.5.1 Key Features

- Complete CT verification after the Transformer-Under-Test (TUT) is connected, helping standardize test results and reduce operator-dependent variability.
- Maintains traceable measurement accuracy down to 1% rating favor, extending beyond traditional 5% and 10% limits used in CT testing environments.
- Displays and records burden measurements during testing to support validation and recordkeeping.
- Integrated protection circuitry, system monitoring, and safety interlocks help protect both the operator and the equipment during operation.
- Supports testing of up to four current transformers in series from a single setup to improve laboratory throughput.
- Provides the ability to demagnetize transformers as part of the testing process to help ensure accurate measurements.
- Test results can be captured and stored through TESCO Device Manager (TDM) or Meter Manager for data and tracking.
- System operation includes controlled shutdown behavior that returns internal components to safe conditions before power removal.
- Supports repeated testing cycles to verify consistent measurement performance and system behavior.
- Allow operators to observe system status, alarms, and operational behavior during testing to assist with troubleshooting and validation.
- Designed to support high-accuracy CT testing while improving workflow efficiency, repeatability, and data consistency.

1.5.2 Standard Features

- **PROTECTIVE CIRCUITRY**
  Automatically detects incorrect ratios, polarity, or open connections and removes power from the KCTS-8000XA loading circuitry for safety.
- **SELF CHECK**
  Performs an internal diagnostic routine prior to testing to verify system readiness.
- **10" Screen**
  Displays test current, ratio error, phase angle error, and calculated CT accuracy information in real time.
- **ZERO START**
  Prevents application of test current until system controls are confirmed at zero and safety conditions are satisfied.
- **E-STOP**
  Immediately interrupts system operation when activated, removing power from active testing functions and preventing further operation until the condition is evaluated and the system is reset.
- **Interlock**
  Internally bypassed, or externally connected dry contact interlock system. Customer may add whatever device(s) they require. (Foot pedal, Weight mat, etc)

1.6 General Specifications (KCTS-8000XA)

1.6.1 Power Supply to the system

PARAMETERS	DATA
Power Supply	240 VAC
Supply Frequency	60 Hz
Max Current Draw	200A

1.6.2 Dimensions

PARAMETERS	DATA
Height	75 1/8" (190.82 cm)
Width	60" (152.4 cm)
Depth	35" (89 cm)
Weight	Approximately 1,500 lbs (680.4 kg)

1.6.3 Accuracy

PARAMETERS	DATA
Current Measurement Accuracy	±0.025%
Phase Angle	±2 min. at 100% full load current
Traceable Accuracy	Down to 1% rating factor

1.6.4 Test Ranges

Primary current ranges include:

0–5000A on top of machine, 600–8000 A via side taps (does not support multiple CT's)

1.6.5 Test Burdens

Selectable ANSI burdens include:

E0.04, E0.2, B-0.1, B-0.2, B-0.5, B-0.9, B-1, B-1.8, B-2, B-4, and B-8.

The system includes electronically compensated burdens designed to maintain accuracy across multiple burden settings.

1.7 Product Features (KATC-C3)

1.7.1 Key Features

- 10" Full-color LCD display
- Front keypad for data entry
- USB and Ethernet connectivity
- Multi-core processing architecture
- High-resolution autoranging measurement capability
- Reduced testing time
- Comes with Pelican Case, easy connection to and from machine
- Mounted on arm with adjustment per operator requirements

1.8 General Specifications (KATC-C3)

1.8.1 Input Power

PARAMETERS	DATA
Power Supply	Provided 24VDC

1.8.2 Dimensions

PARAMETERS	DATA
Height	11.25” (28.6 cm)
Width	16.25” (40.65cm)
Depth	4.5” (11.43cm)

1.9 About This Operations Manual

This manual provides information for the setup, operation, and maintenance of the KCTS-8000XA Automated Current Transformer Testing System.

The manual describes procedures related to:

System installation and setup, connection of transformers for testing, operation of the testing system, monitoring of system behavior during testing, and routine verification. **Operators should read and understand all safety and operational instructions before using the equipment.**

2.0 INSTALLATION

2.1 Introduction

2.2 Unpacking and Inspection

2.3 AC Power Connections

2.3.1 Required Voltage and Current

2.3.2 Cable Routing

2.3.3 KCTS Connections

2.3.4 RS-232 Connection

2.3.5 Cable and Hardware Kit Option

2.1 Introduction

This section provides general information for installing the KCTS-8000XA. Before placing the system into service, the equipment should be unpacked, inspected, and connected to the required power sources and system interfaces.

Proper installation ensures that the system operates safely and that all electrical and communication connections are correctly established before testing operations begin.

2.2 Unpacking and Inspection

The KCTS-8000XA is shipped in protective packaging designed to help prevent damage during transport. Upon receipt, inspect the packaging and equipment for any visible signs of damage that may have occurred during shipment.

Carefully remove all packaging materials and verify that all standard and optional components are present. The system is typically shipped mounted on a skid and should be handled using appropriate lifting equipment and safe lifting practices. Screws holding skid walls are T20 and T25.

If any damage or missing components are identified, notify the carrier and contact TESCO before placing the equipment into service.

2.3 AC Power Connections

The KCTS-8000XA requires external AC power connections for operation of the loading circuitry, comparator, and control electronics. These connections must be completed before the system can be placed into operation.

The system uses one power supply for the loading circuitry and derives internally for the comparator and associated control circuitry. Before making any electrical connections, verify that all incoming power sources are de-energized. A knock-out is provided on the side panel of the unit where power must be landed.

After the power connections are installed, confirm that all terminals are secure and that the system is properly grounded before applying power. Please note that due to the large power requirements of the machine, a large main breaker at the input would not suffice and as such, power is distributed to many circuit breakers within the machine to stop faults at rating. The input power blocks will remain hot as long as the feed to unit is on even if machine is powered down. These are all finger safe and internal.

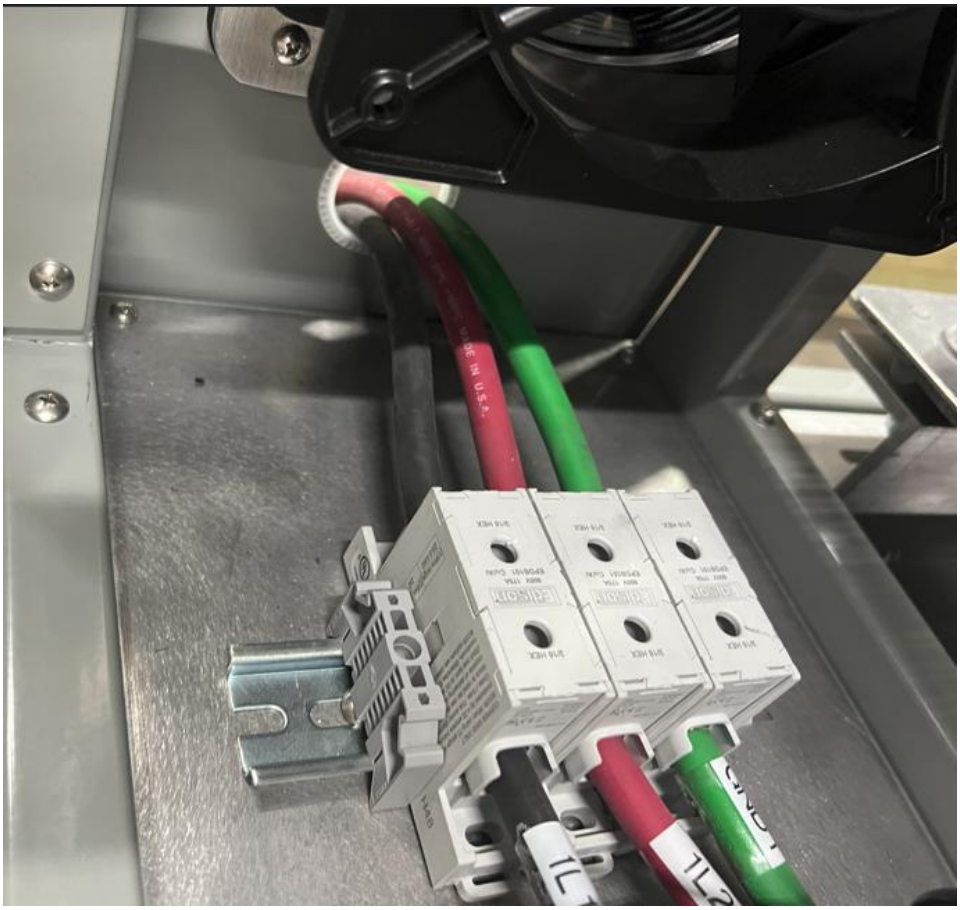


Figure 2.3a Power in Terminal Blocks

2.3.1 Required Voltage and Current

The loading circuitry requires a single-phase power source of **240 VAC, 200A, 60 Hz**.

Verify that the available facility power matches the required voltage and frequency before connecting the system.

2.3.2 Cable Routing

Power Supply cables should be routed through the designated cable entry point on the rear of the system. When routing cables, avoid sharp bends, excessive tension, or contact with edges that may damage the cable insulation.

Cables should be positioned so they do not obstruct ventilation openings or interfere with access to system panels. Proper cable routing helps protect the connections and supports safe system operation.

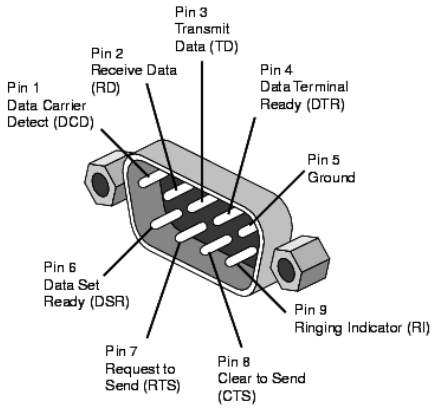
2.3.3 KCTS Connections

The KCTS-8000XA includes labeled connection terminals used to interface the system with the Transformer Under Test (TUT). These terminals identify the required primary and secondary connection points used during testing. 5 secondary cables are included with the unit and twist-to-lock at each connection. Install the transformer(s) on the primary conductor and connect the secondary leads to the appropriate terminals as indicated on the system (these positions will then be selected for use in software).

Ensure that all connections are secure and that the transformer is properly positioned before beginning testing operations. Secondary connections should be screwed down to the forks, and primary bussing bolted down with the provided hardware or connection kit. Untightened primary bussing may lead to failed tests, or excessive heat.

2.3.4 RS-232 Connection

The RS-232 connector is located on the side of the face panel on the C3 Comparator. This port supports legacy communication and data output. The KCTS-8000XA also includes an Ethernet port for network connectivity. The Ethernet port can be used with DHCP or a manually assigned static IP address.



Rear DB9	Connection	Description	DB9 Standard Pin	
1	-		DCD[1]	[1]Data Carrier Detect
6	DSR	Data Set Ready	6	
2	RxD	Data from DCE to DTE	2*	
7	RTS	Request To Send	7	
3	TxD	Data from DTE to DCE	3*	
8	CTS	Clear To Send	8	
4	DTR	Data Terminal Ready	4	
9	-		RI[2]	[2]Ring Indicator
5	GND		5	
			*(reverser required when going to/from DB9/DB25)	
			DTE: Data Terminal Equipment	
			DCE: Data Communication Equipment	

2.3.5 Cable and Hardware Kit Option

The KCTS-8000XA is supplied with a cable kit used to assist with transformer connections and test setup. The kit includes #4 and 4/0 cables that may be used to establish standard testing connections between the system and the Transformer Under Test.

When using the kit, verify that all components are present and properly installed before performing testing operations. Do not exceed current ratings as shown below:

This option consists of various cables and bus bars to aid in connecting the Transformer-Under-Test (TUT):

- 4 Cables of 4/0 Welding Cable; each 20" Long (4/0 is good to about 400A)
- 2 Cables of 4/0 Welding Cable; each 48" Long
- 4 Cables of # 4 Wire; each 20" Long (#4 is good to about 150A)
- 2 Cables of # 4 Wire; each 48" Long
- 1- 3/8" X 4" X 20" Silver Flashed Copper Bus Bar (good to 8000A)
- 2- 3/8" X 4" X 32" Silver Flashed Copper Bus Bar
- 2- 90-degree Silver Flashed Copper Bus Bar Connectors
- 2 Cables of # 8 Wire; each 5' Long for connection of the TUT secondary to the KCTS

This is an example of how it may be used:

Figure 2.3.5a KCTS-8000XA Transformer Under Test (TUT)

Especially when testing above 4,000 amps, the configuration of the TUT and busbar can be critical to getting accurate test results. Always connect the busbars as shown above with the long bar connected at its outside-most holes. Also, be careful to center the busbar in the opening of the CT. This configuration maximizes field uniformity.

3.0 FUNCTIONALITY

3.1 Introduction

3.2 Front Panel

3.2.1 Ratio Settings

3.2.2 KATC-C3

3.3 Operating Procedure

3.3.1 Connection of the Transformer

3.3.2 Testing Procedure

3.3.3 Optional Demagnetization Circuit

3.1 Introduction

This section describes the operating functions of the KCTS-8000XA and its associated comparator interface. The system is designed to perform testing of current transformers after the Transformer-Under-Test (TUT) has been properly installed and connected.

During operation, the system applies controlled primary current to the transformer while monitoring the secondary output through the comparator. Measurement results such as ratio error and phase angle error are displayed through comparator interface.

Operators should become familiar with the system controls and interface before performing testing operations.

3.2 Front Panel

This section describes the primary system components used during operation of the KCTS-8000XA.

The front panel of the KCTS-8000XA provides the primary system status indicators and safety controls used during operation. These indicators allow the operator to quickly verify system readiness and monitor test conditions.

The panel includes the following components:

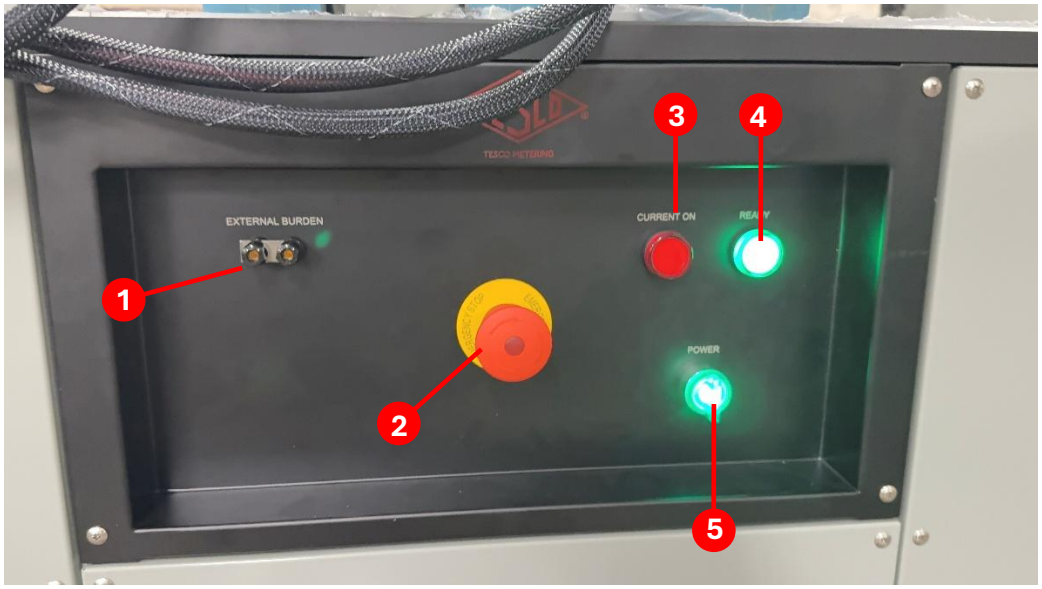


Figure 3.2.1a Front Panel

#	NAME	DESCRIPTION
1	**External Burden Connections**	Connection points used when an external burden is required during testing.
2	**Emergency Stop (E-Stop)**	A safety control that immediately interrupts system operation when pressed. This control should only be used in emergency situations or when it is necessary to immediately stop the system
3	**Current On Indicator**	Illuminates when test current is being applied by the system
4	**Ready Indicator**	Indicates when the system is powered and ready for operation
5	**Power Indicator**	Illuminates when system power is turned on. (Does not indicate if incoming 240v is energized!)

Table 3.2.1 KCTS-8000XA Front Panel

The layout of the panel allows the operator to safety access system controls while maintaining visibility of the transformer mounting area and comparator interface during testing operations.

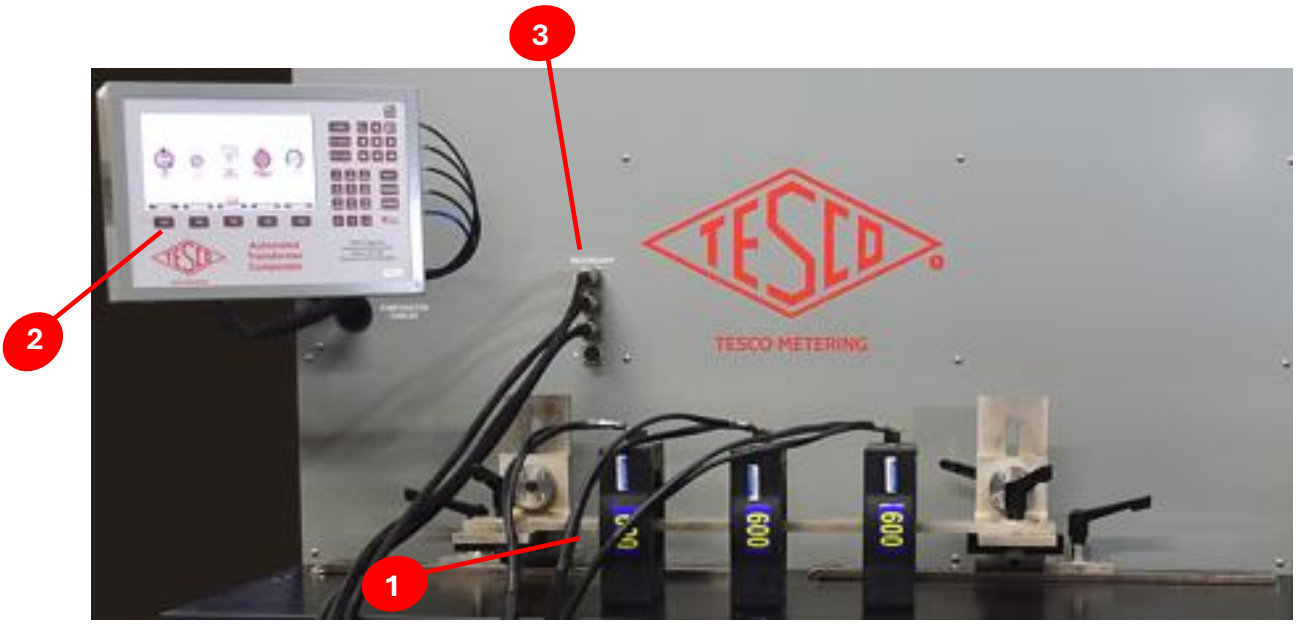


Figure 3.2.1b CT Mounting

#	NAME	DESCRIPTION
1	**Transformer Mounting Area**	Area where the Transformer Under Test is installed for testing
2	**Comparator Interface**	Interface used to configure tests and display measurement results
3	**Secondary Cable Connections**	(4) Twist lock secondary cable locations. Numbers indicate position in software.

3.2.1 Ratio Settings

Top Taps						Side Taps	
PRIMARY AMPS	**RF %**	**PRIMARY AMPS**	**RF %**	**PRIMARY AMPS**	**RF %**	**PRIMARY AMPS**	**RF %**
5	400	160	400	1800	330	600	400
10	400	200	400	2000	300	750	400
15	400	250	400	2500	200	800	400
20	400	300	400	3000	200	1000	400
25	400	400	400	4000	150	1200	400
30	400	500	400	5000	120	1500	400
40	400	600	400	6000	100	1800	400
50	400	750	400			2000	400
60	400	800	400			2500	300
75	400	1000	400			3000	250
80	400	1200	400			4000	200
100	400	1500	400			5000	150
120	400					6000	130
125	400					7500	100
150	400					8000	100

Table 3.2.1 KCTS-8000XA Primary Test Current

3.2.2 KATC-C3

The KATC-C3 comparator provides the primary interface for configuring tests and viewing measurement results. The comparator includes a display and keypad used to configure test parameters, initiate testing, and review measurement data.

During testing, the comparator measures the transformer response and calculates parameters such as ration error and phase angle error. Measurement results are displayed on the screen and may also be recorded through compatible software when connected.

Figure 3.2.2a KATC-C3 Front Panel

NUMBER	DESCRIPTION
1	Function keys
2	Power button
3	TFT LCD Screen. 10” 1024x600, full color TFT LCD screen
4	Navigation Keys
5	Alphanumeric membrane keyboard

Table 3.2.2a KATC-C3 Interface

Navigation Keys

SYMBOL	DESCRIPTION
▼ or ▼	Functions any of the following: • Selects the NEXT or PREVIOUS **MENU** item. • Moves the **SELECTED LINE** UP or DOWN • Select an Item from a dropdown menu
◀ or ▼	Functions any of the following: • Moves the cursor left/right of the current character in text boxes. • Moves the selection left/right of the current selected cell in tables.
⇤ or ⇥	Selects the NEXT or PREVIOUS **TAB/FIELD** item.
←	Deletes the previous character
⮌	Returns to the previous screen
F1 F2 F3 F4	Function Keys
⏻	Power button
ENTER	Selects a response

3.3 Operating Procedure

This section shows how to operate the KCTS-8000XA with the KATC-C3 comparator. Before performing any testing, verify that the system is properly connected and turned ON.

3.3.1 Power up

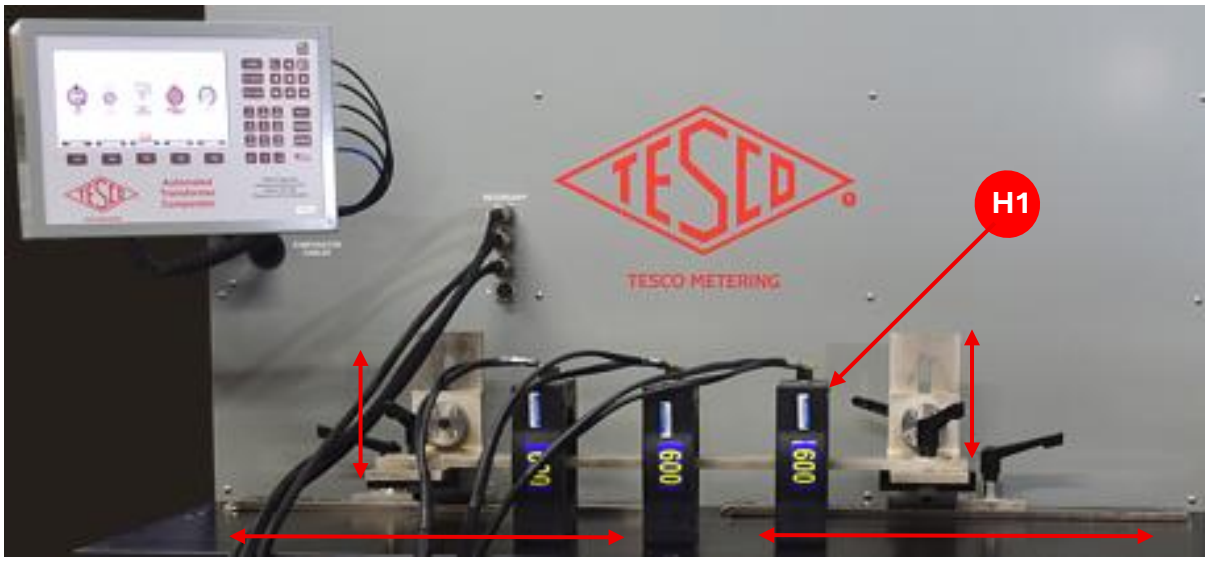
Figure 3.3a Side Panel of Comparator

1. Install the C3 comparator to its mounting arm, connect the cable harness as shown (NOTE: the RJ45 cable labeled “RS-485” must be installed into the RS-485 jack, NOT the ethernet jack or the unit will not run. This is the communication from the C3 comparator to the rest of the machine.
2. Install and enable mains power (240v)
3. Turn on the system power switch. The green indicator light should illuminate, indicating that the equipment is powered
4. Press the KATC-C3 Comparator power button to power it ON

5. **Figure 3.3b Comparator from Front Main Menu**

3.3.1 Connection of the Transformer (Top Taps)

Place the transformer(s) on the test bench. The transformers should all be the same ratio during testing. Ensure that the H1 dot is on the right (Primary+ Label side). Install the bar through the CT(s), or connect the CT(s)'s bar to the busswork. If the height needs adjusted, do so now. Be sure to align the bar through the center of the CT when testing window type transformers.



(NOTE: Do not completely spin off the levers as the busswork may drop. Lightly loosen them and slide the bussbars up and down)

Adjust the vertical busswork left and right as needed to fit the CT(s) and mate up with the slots on the bar. (There are two span bars included with the KCTS-8000XA that can be used, a shorter one and a longer one)

Install the Secondary cables to each transformer, ensure that X1 is correctly wired on each. Screw these down, do not clip on. If a lead falls off during testing, it can arc. Make note of which CT is connected to each secondary as these will need to be entered into the software by each Serial Number.

WARNING: Do NOT use "alligator clips" for primary or secondary connections!

It is very important that secure connections are made to the secondary terminals of the transformer-under-test to avoid an open circuit. An open circuit on the secondary of the transformer-under-test can generate lethal voltages. Under no circumstances should the operator touch the transformer connections while the loading circuit is energized.

3.3.1 Connection of the Transformer (Side Tap)

When using the side taps (Ratio 600:5 and above only), use the provided busbar kit. Be sure to bolt these connections with the provided hardware. These connections are similar to previous KCTS setups. Be sure to use the secondary terminal between the primary taps and select “Secondary 5” in software.

H1 of the CT should be on the side that says “Primary+”. Be sure to screw the secondary connections in place (X1 and X2).

4.0 GRAPHICAL USER INTERFACE (GUI)

4.1 Introduction
4.2 Main Menu Screen Icon and Bar Overview
4.2.1 Main Menu
4.2.2 Manual Mode Menu
4.3 TUTS INFO – Manual RwB
4.3.1 TUTS INFO – Manual DEMAG
4.3.2 TUTS INFO – Sequence Test
4.4 Sequence Selector
4.4.1 TUTS INFO – Sequence Test (TUT Information)
4.4.2 TUTS INFO – Sequence Test (CT Tap Management)
4.5 Settings Menu
4.6 General Options
4.7 Network Setup
4.8 User INFO
4.9 Testing Options
4.10 Calibration
4.11 System Menu
4.12 Temperature INFO
4.13 Configurations (System INFO Tab)
4.13.1 Configurations (Board Firmware Tab)
4.13.2 Configurations (Part Serials NUMS Tab)
4.13.3 Configurations (Limit Tab)
4.13.4 Configurations (Other Tab)

4.14 Metrology Calibration (Popup)

4.15 Database Menu

4.15.1 Database-TUT

4.16 TUT Information

4.16.1 CT Tap Management

4.17 Database-Sequence

4.17.1 New Sequence

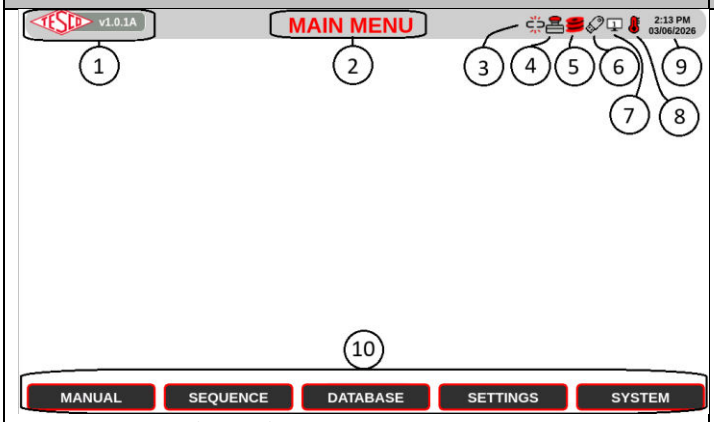
4.17.2 Edit Sequence

4.17.3 Sequence Testing

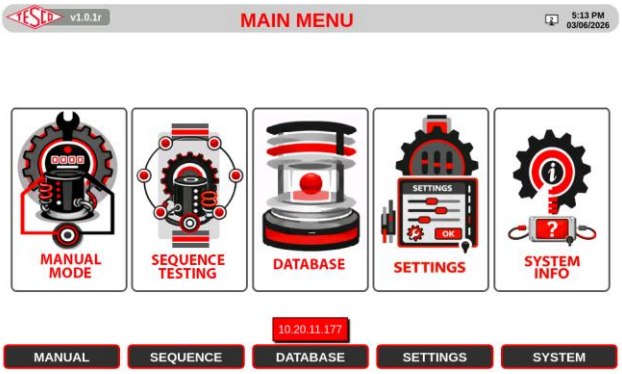
4.1 Introduction

The GUI (graphical user interface) is like other TESCO Products with slight difference in keypad layout and testing functions. It features keypad navigation, allows CT parameter selection, , test configuration options, and displays real-time testing results including pass/fail status.

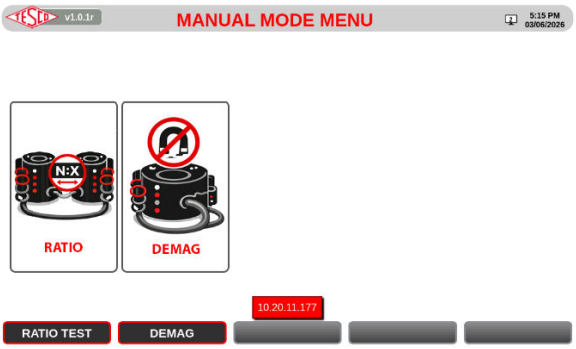
4.2 Main Menu Screen Icon and Bar Overview

SCREEN	DESCRIPTION
 **Function Keys (Bottom):** **(10) Function Keys (F1 – F5):** Soft keys for user actions. Their functions vary depending on the screen context and are labeled dynamically on the display.	**(1) Left Panel:** Logo and Software version. **(2) Page Title:** Displays the title of the current screen, helping users quickly identify the function or mode they are in. **(3) Interlock Icon:** Indicates if unit's interlock is activated. **(4) E-Stop Icon:** Indicates if unit's E-Stop is pressed. **(5) Database Busy Icon:** Shows if database is busy. **(6) Flash Drive Icon:** If a flash drive is inserted, this icon will show up. **(7) Remote Connections Icon:** Shows number of remote connections (like TDM connection) **(8) Hot Temperature Indicator:** Shows up when temperature is too hot **(9) Date and Time Inf**o: Shows current date and time

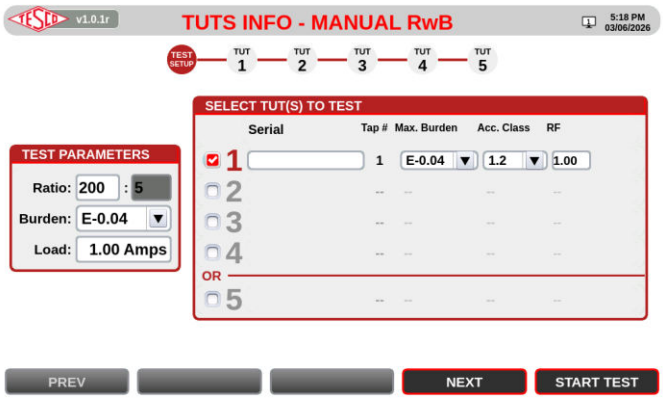
4.2.1 Main Menu

SCREEN	DESCRIPTION
 **Action Buttons:** If you select **MANUAL MODE** button, see page 25. If you select **SEQUENCE TESTING** button, see page 43. If you select **DATABASE** button, see page 39. If you select **SETTINGS** button, see page 29. If you select **SYSTEM INFO** button, see page 34	**Main Buttons:** • **MANUAL MODE**: Navigates manual testing options. • **SEQUENCE TESTING**: Opens the sequence testing section. • **DATABASE**: Provides access to the database for managing stored data, adding CT's, or creating sequences. • **SETTINGS**: Opens the settings for system preferences. • **SYSTEM INFO**: Opens the settings for system configuration.

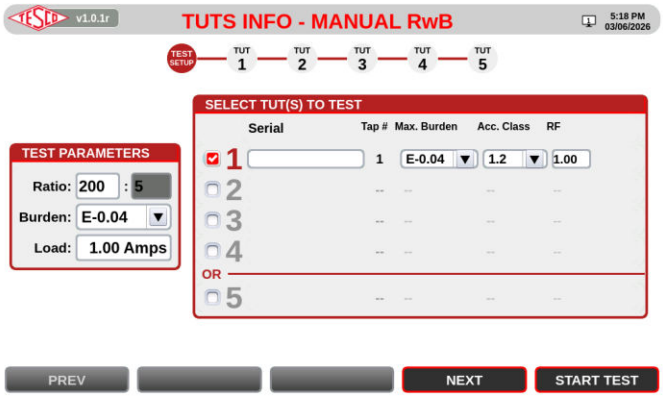
4.2.2 Manual Mode Menu

SCREEN	DESCRIPTION
 **Action Buttons:** If you select **RATIO TEST** button, see page 26. If you select **DEMAG** button, see page 26.	**Main Buttons:** • **RATIO TEST**: Opens ratio with burden test setup. • **DEMAG**: Opens demagnetization test setup.

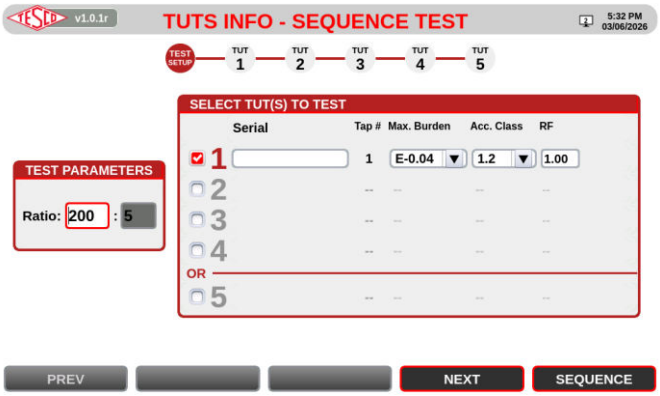
4.3 TUTS INFO – Manual RwB (Ratio with Burden)

SCREEN	DESCRIPTION
 **Action Buttons:** If you press **NEXT** button, it will let you navigate to CT info pages. If you press **START TEST** button, RwB test will run. See page 43	**TEST PARAMETERS:** This screen requires users to input *CT ratio*, *target burden* and *target load* for test parameters. **SELECT TUT(S) TO TEST:** Then they need to select TUT(s) selected by putting a check on the checkbox widget. *Serial number* can be written or else it will create a temporary serial number after the test is done. Users need to put the *max burden*, *accuracy class* and *RF* of the CT(s). **BUTTONS:** Once the test parameters and CT information are entered, click **PREV** | **NEXT** to navigate to CT info pages or click **START TEST** for *Ratio with Burden Test* to run.

4.3.1 TUTS INFO – Manual DEMAG

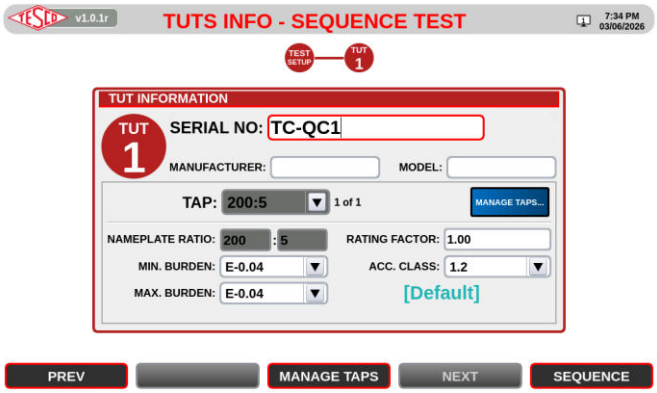
SCREEN	DESCRIPTION
 **Action Buttons:** If you press **NEXT** button, it will let you navigate to CT info pages. If you press **START TEST** button, RwB test will run. See page 43.	**TEST PARAMETERS:** This screen requires users to input *CT ratio*, *target burden* and *target load* for test parameters. **SELECT TUT(S) TO TEST:** Then they need to select TUT(s) selected by putting a check on the checkbox widget. *Serial number* can be written or else it will create a temporary serial number after the test is done. Users need to put the *max burden*, *accuracy class* and *RF* of the CTs. **BUTTONS:** Once the test parameters and CT information are entered, click **PREV** | **NEXT** to navigate to CT info pages or click **START TEST** for *Ratio with Burden Test* to run.

4.3.2 TUTS INFO – Sequence Test

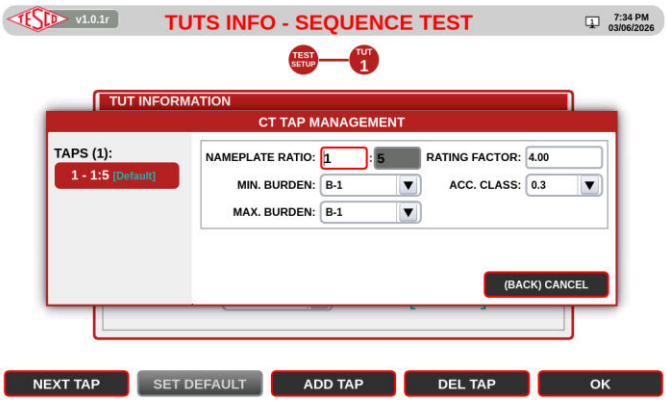
SCREEN	DESCRIPTION
 **Action Buttons:** If you press **NEXT** button, it will let you navigate to CT info pages. If you press **SEQUENCE** button, see page 28.	**TEST PARAMETERS:** This screen requires users to input *CT ratio*. **SELECT TUT(S) TO TEST:** Then they need to select TUT(s) selected by putting a check on the checkbox widget. *Serial number* can be written or else it will create a temporary serial number after the test is done. Users need to put the *max burden*, *accuracy class* and *RF* of the CTs. **BUTTONS:** Once the test parameters and CT information are entered, click **NEXT** to navigate to CT info pages or **SEQUENCE** to open sequence selector page.

4.4 Sequence Selector

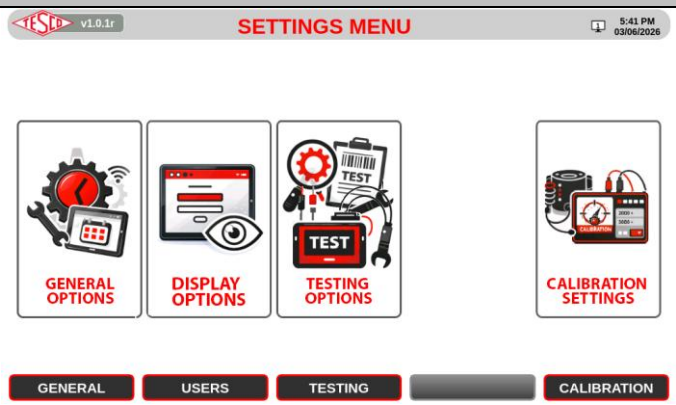
4.4.1 TUTS INFO – Sequence Test (TUT Information)

SCREEN	DESCRIPTION
 **Action Buttons:** • **Manage Tap:** Opens the tap configuration interface. See page 41. • **Save**: Saves the TUT information to the database. • **SEQUENCE**: Goes to the sequence selection page 41.	**TUT INFORMATION** This screen allows the user to **create or edit a Transformer Under Test (TUT)** entry in the system db. The information entered here defines the electrical characteristics of the transformer used during testing. **Fields to Input:** • **Serial No –** Unique serial number assigned to the transformer. • **Manufacturer –** Name of the transformer manufacturer. • **Model –** Model designation for the transformer. • **Tap –** Displays the currently selected tap ratio configuration. Multiple tap ratios can be defined and managed using the Manage Taps function. • **Nameplate Ratio –** Defines the primary-to-secondary current ratio listed on the transformer nameplate. • **Rating Factor –** Indicates the transformer rating factor used for measurement calculations. • **Min. Burden –** Minimum burden class supported by the transformer. • **Max. Burden –** Maximum burden class supported by the transformer. • **Acc. Class –** Accuracy class rating of the transformer. **Other Information:** • **Manage Taps** – Opens the tap management screen where additional tap ratios can be added, edited, or removed.

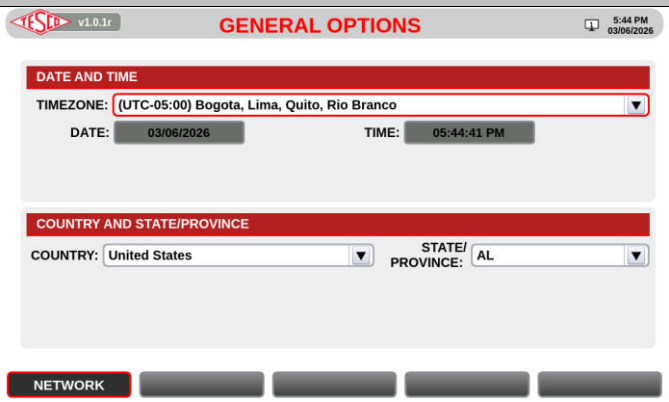
4.4.2 TUTS INFO – Sequence Test (CT Tap Management)

SCREEN	DESCRIPTION
 **Action Buttons:** • **NEXT TAP:** Iterates to the next tap on list of taps • **SET DEFAULT:** Sets the current tap as the default setting. • **ADD TAP:** Adds a new tap that can be edited. • **DEL TAP:** Deletes the presently editing tap. • **OK:** Closes and saves the taps within the CT. • **BACK:** (Back key) Escapes the current editing without saving	This screen allows the user to manage **tap configurations for a Transformer Under Test (TUT)**. Each tap represents a different current ratio configuration for the transformer. **Tap List** The panel on the left displays all configured taps for the transformer. • **Tap Entry** – Shows the tap number and the corresponding ratio (e.g., **1 – 200:5**). • **Default Indicator** – The default tap used by the system is marked as **[Default]**. **Tap Configuration** When a tap is selected, the parameters for that tap are displayed and can be edited. • **Nameplate Ratio** – Defines the primary-to-secondary current ratio for the selected tap. • **Rating Factor** – Specifies the rating factor associated with the transformer tap. • **Min. Burden** – Minimum burden class supported for the selected tap. • **Max. Burden** – Maximum burden class supported for the selected tap. • **Acc. Class** – Accuracy class rating of the transformer for the selected tap.

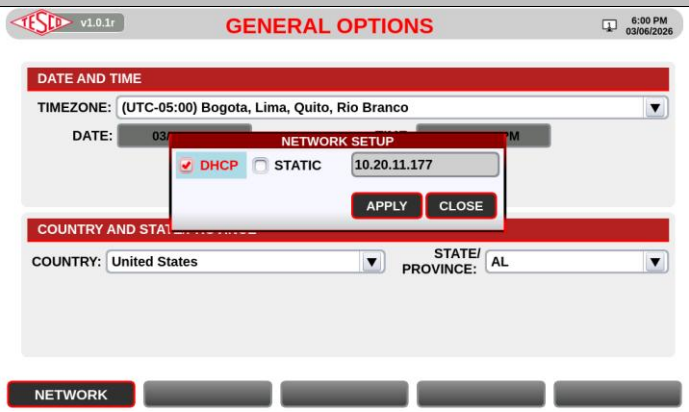
4.5 Settings Menu

SCREEN	DESCRIPTION
 If you select **GENERAL** button see page 30. **USERS** button see page 31. **TESTING** button see page 32. **CALIBRATION** button see page 33.	This is the **Preferences Menu** screen. From here, you can adjust various settings that control how the system operates: • **GENERAL OPTIONS**: Accesses general configuration settings that impact overall system behavior. • **USER**: Manages user profiles and permissions. • **TESTING OPTIONS**: Allows you to configure settings specific to the tests being conducted, such as timing and accuracy thresholds. • **CALIBRATION**: Provides options for calibrating the device to ensure accurate test results. Each button navigates to its respective submenu for further adjustments.

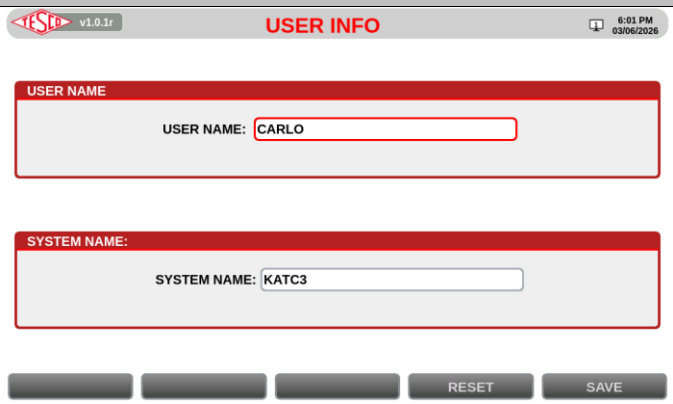
4.6 General Options

SCREEN	DESCRIPTION
 **Action Buttons:** If you select **NETWORK** button, see page 30.	This is the **General Options** screen where you can configure basic settings related to the system's date, time, language, and network settings. • **Timezone:** Allows you to select the appropriate time zone from the dropdown menu. • **Time and Date:** Displays the current system time and date. These can be adjusted as needed. • **Language:** Lets you select the language for the user interface from the dropdown. • **Network Button:** Opens the network settings to configure DHCP or static IP addresses. When clicked, a pop-up window appears where you can choose between DHCP and static IP for network configuration. This screen helps you customize the system's time, date, and language to match your preferences.

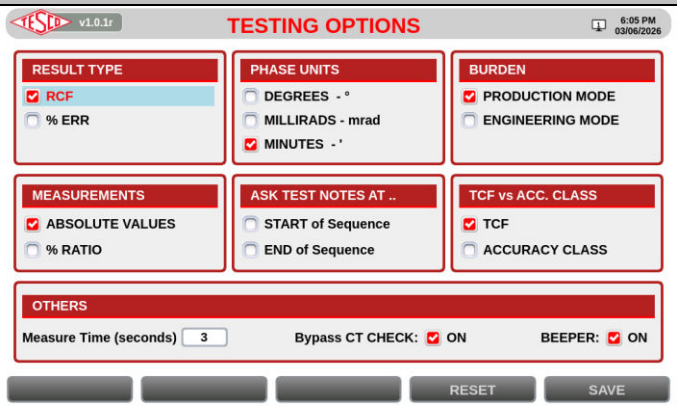
4.7 Network Setup

SCREEN	DESCRIPTION
 **Action Buttons:** • **Apply:** Saves and applies all current network configuration settings. • **Close:** Exits the setup window without applying changes.	This screen, accessed from the **General Options** menu, allows the user to configure the device's primary network connection. **Primary Network Options:** • **DHCP:** When enabled, the device automatically obtains its IP address from the network's DHCP server. • **Static:** When selected, the user can manually enter a fixed IP address (e.g., *10.20.11.104*). **Notes:** • Using DHCP is recommended for most users to simplify setup and ensure compatibility with the network. • Static IP mode is useful when the device must always use the same IP address for consistent access or integration into larger systems.

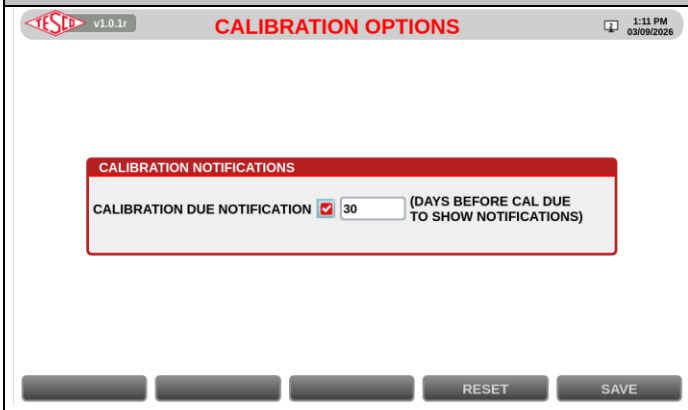
4.8 User INFO

SCREEN	DESCRIPTION
 **Action Buttons:** • **RESET:** Cancels changes and restores the previous saved values. • **SAVE:** Saves the updated user and system information.	This screen allows the user to input or update key information related to the device configuration. 1. **User Name:** Identifies the user of the device. This field can be updated to match the current operator or account (e.g., *TESCO-NEW*). 2. **System Name:** Represents the system or setup in use. This field is typically used to identify the device or environment (e.g., *Turbo Tester*). **Note Section:** Displays a reminder that *any unsaved changes will be discarded* if not saved.

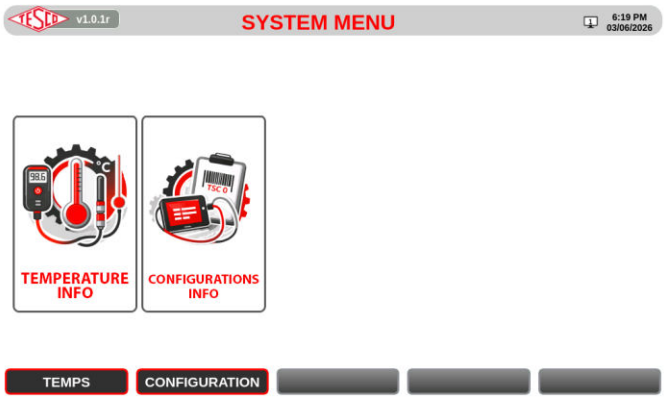
4.9 Testing Options

SCREEN	DESCRIPTION
 **Action Buttons:** • **RESET:** Cancels changes and restores the previous saved values. • **SAVE:** Saves the updated user and system information.	• **Result Type** - Users can select how to show test result (RCF or %ERR) • **Phase Units** - Default phase units to show test results (Degrees, Millirads or Minutes) • **Measurements** - Default options on how to show measurements value (Absolute Values or %Ratio) • **Ask Test Notes** - START of Sequence, every start of the test sequence, a test notes popup will appear - END of Sequence, every end of the test sequence, a test note popup will appear • **TCF vs ACC. CLASS** - Users can select to show result by TCF or Accuracy class • **Measure time** - Users can set how long the measurements needed for averaging • **Bypass CT CHECK** - If checked, user can bypass CT Check • **Beeper** - If checked, unit will beep after every test

4.10 Calibration

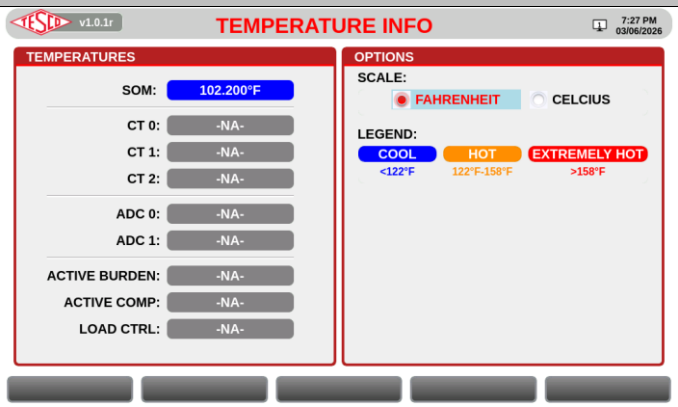
SCREEN	DESCRIPTION
 **Button States:** • **Changed State:** If any values are modified, the RESET and SAVE buttons become active. • **RESET:** Discards any changes and restores the previous settings. • **SAVE:** Saves the updated calibration notification settings.	This tab allows configuration of calibration reminder notifications. **Calibration Notification:** • **Cal Due Notification:** Checkbox to enable or disable calibration reminders. • **Days Before Calibration Due:** Field to set the number of days before the calibration due date when notifications should appear. (Example: *30 days* or *50 days*.) This screen ensures that calibration reminders are issued in advance, helping maintain proper calibration schedules.

4.11 System Menu

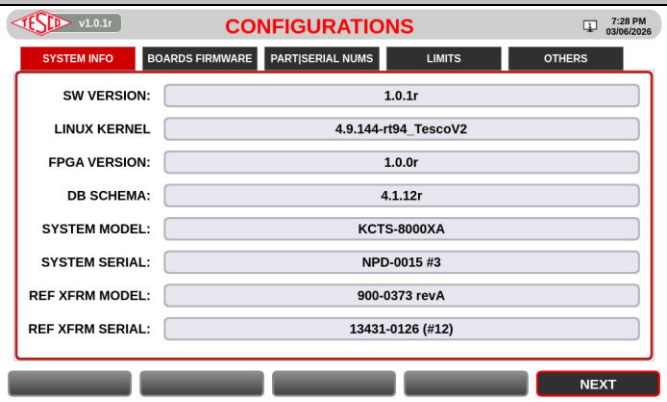
SCREEN	DESCRIPTION
 **Action Buttons:** • **TEMPS** button, see page 34. • **CONFIG** button, see page 34.	**System Menu** This screen allows you to access various system-level options: • **Temperature Info**: View temperature-related data for different components. • **Configurations**: Access configuration information about the system, including model and hardware details. At the bottom of the screen: • **TEMPS**: Shortcut to the Temperature Info section. • **CONFIG**: Shortcut to the Configurations section.

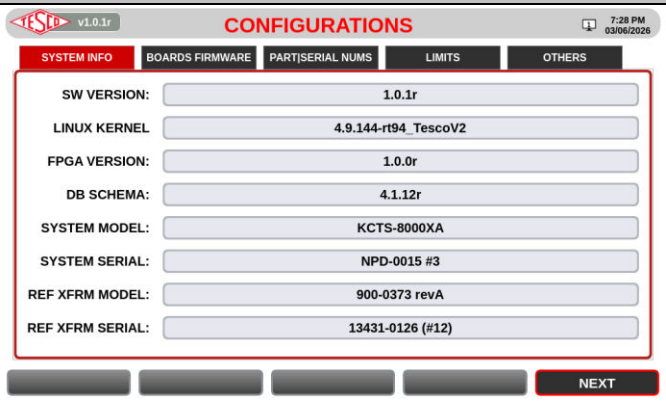
4.12 Temperature INFO

SCREEN	DESCRIPTION

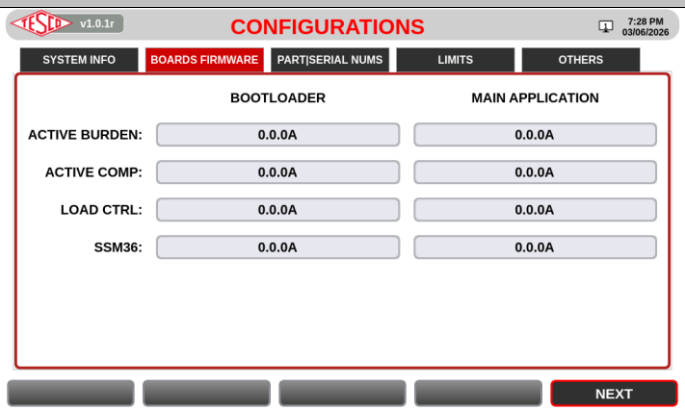

Notes:
• This layout displays temperature readings for several internal components and monitoring points within the system.
• The scale and legend provide clear visual context for determining whether temperatures are within safe operating limits.
	This screen displays real-time temperature readings for multiple system components and provides configuration options for how the data is presented.
	
	Temperature Readings (Left Panel):
	• **SOM:** System-on-Module temperature.
	• **CT 0 / CT 1 / CT 2:** Current transformer temperature sensors.
	• **ADC 0 / ADC 1:** Analog-to-Digital converter temperature sensors.
	• **Active Burden:** Temperature of the active burden circuit.
	• **Active Comp:** Temperature of the active compensation circuitry.
	• **Load CTRL:** Temperature of the load control circuitry.
	
	Options (Right Panel):
	• **Scale:** Allows switching between Fahrenheit and Celsius for temperature display.
	• **Legend:** Color-coded guide to indicate operating ranges:
	  ○ COOL (<80°C): Blue
	  ○ HOT (80°C–100°C): Orange
	  ○ EXTREMELY HOT (>100°C): Red

4.13 Configurations (System INFO Tab)

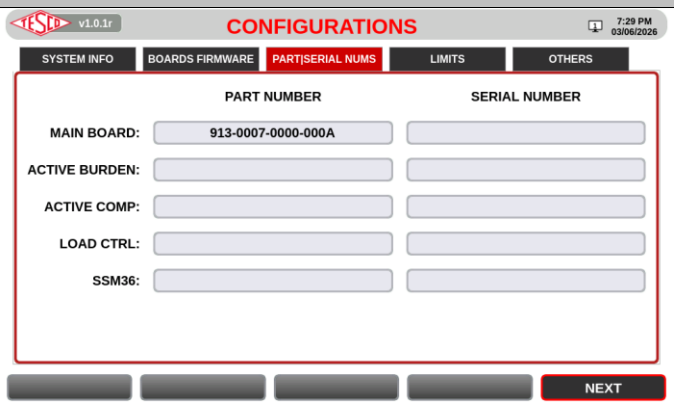
SCREEN	DESCRIPTION
 **Action Buttons:** **NEXT:** Moves to the next configuration tab.	This screen displays detailed configuration information for the device, including software, firmware, system model, and database versions. **Versions Tab (Current View):** • **SW Version –** Indicates the version of the device software installed on the system (e.g., 1.0.1r). • **Linux Kernel –** Displays the Linux kernel version and build running on the device (e.g., 4.9.144-rt94_TescoV2). • **FPGA Version –** Shows the firmware version programmed into the FPGA hardware. • **DB Schema –** Indicates the database schema version currently used by the system (e.g., 4.1.12r). • **System Model –** Identifies the model of the device (e.g., KCTS-8000XA). • **System Serial –** Unique serial number assigned to the device (e.g., NPD-0015 #3). • **REF XFRM Model –** Model number of the reference transformer used by the system. • **REF XFRM Serial –** Serial number of the reference transformer installed in the device. **Tab Navigation:** • • **System Info –** Displays core system information including software version, kernel version, FPGA firmware, database schema, and system identification details.

	• **Boards Firmware –** Shows firmware versions for individual hardware boards installed in the device. • **Part/Serial Nums –** Lists part numbers and serial identifiers for system components. • **Limits –** Displays configuration limits and operating constraints defined for the system. • **Others –** Provides additional system information not included in the other tabs.
SCREEN	**DESCRIPTION**
 **Action Buttons:** **NEXT:** Moves to the next configuration tab.	This screen displays detailed configuration information for the device, including software, firmware, system model, and database versions. **Versions Tab (Current View):** • **SW Version –** Indicates the version of the device software installed on the system (e.g., 1.0.1r). • **Linux Kernel –** Displays the Linux kernel version and build running on the device (e.g., 4.9.144-rt94_TescoV2). • **FPGA Version –** Shows the firmware version programmed into the FPGA hardware. • **DB Schema –** Indicates the database schema version currently used by the system (e.g., 4.1.12r). • **System Model –** Identifies the model of the device (e.g., KCTS-8000XA). • **System Serial –** Unique serial number assigned to the device (e.g., NPD-0015 #3). • **REF XFRM Model –** Model number of the reference transformer used by the system. • **REF XFRM Serial –** Serial number of the reference transformer installed in the device. **Tab Navigation:** • **System Info –** Displays core system information including software version, kernel version, FPGA firmware, database schema, and system identification details. • **Boards Firmware –** Shows firmware versions for individual hardware boards installed in the device. • **Part/Serial Nums –** Lists part numbers and serial identifiers for system components. • **Limits –** Displays configuration limits and operating constraints defined for the system. • **Others –** Provides additional system information not included in the other tabs.

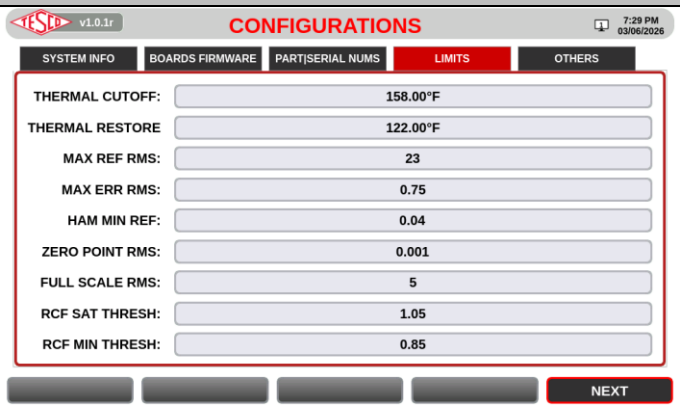
4.13.1 Configurations (Board Firmware Tab)

SCREEN	DESCRIPTION
 You can switch between different sections of configuration using the tabs (System Info, Boards Firmware, Part/Serial Nums, Limits, Others), and navigate through the pages with the **Prev** and **Next** buttons. **Action Buttons:** • **PREV:** Returns to the Versions tab. • **NEXT:** Advances to the Limitations tab.	This tab displays part numbers and serial numbers for the major boards inside the device. **Listed Components:** • **Active Burden –** Displays the firmware versions for the Active Burden control board. • **Active Comp** – Displays the firmware versions for the Active Compensation board. • **Load CTRL** – Displays the firmware versions for the Load Control board. • **SSM36** – Displays the firmware versions for the SSM36 board.

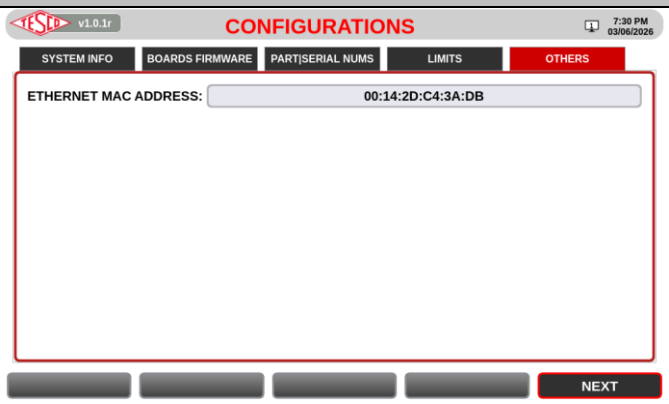
4.13.2 Configurations (Part Serial NUMS Tab)

SCREEN	DESCRIPTION
 This tab shows all connected MC devices, and you can move to other sections using the **Prev** and **Next** buttons, or switch tabs (System Info, Boards Firmware, Part/Serial Nums, Limits, Others).	This tab displays the **part numbers and serial numbers for the major hardware boards installed in the system**. These identifiers are used for hardware tracking, service, and verification of installed components. • **Main Board** – Displays the part number and serial number for the system's main control board. • **Active Burden** – Displays the part number and serial number for the Active Burden board used in burden control. • **Active Comp** – Displays the part number and serial number for the Active Compensation board. • **Load CTRL** – Displays the part number and serial number for the Load Control board. • **SSM36** – Displays the part number and serial number for the SSM36 board. **Each component includes:** *Part Number* – The hardware part identifier assigned to the board. *Serial Number* – The unique serial number used to track the specific board installed in the device.).

4.13.3 Configurations (Limits Tab)

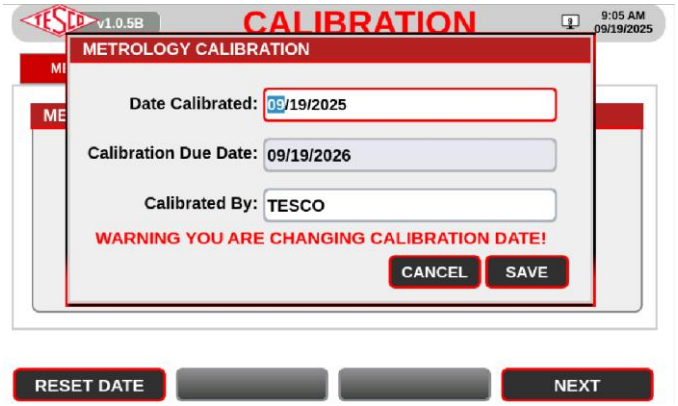
SCREEN	DESCRIPTION
 This tab shows all connected MC devices, and you can move to other sections using the **Prev** and **Next** buttons, or switch tabs (System Info, Boards Firmware, Part/Serial Nums, Limits, Others).	This tab defines operational limits and safety thresholds used by the system. These parameters control temperature protection and reference signal limits used during testing. **Parameters** • **Thermal Cutoff** – Maximum allowed internal temperature before testing is stopped or prevented from starting (e.g., 158.00°F). • **Thermal Restore** – Temperature threshold below which testing can resume after a thermal cutoff event (e.g., 122.00°F). • **Max Ref RMS** – Maximum RMS value allowed for the reference signal. • **Max Err RMS** – Maximum RMS error allowed in the measurement system. • **HAM Min Ref** – Minimum reference level required for HAM (High Accuracy Measurement) operation. • **Zero Point RMS** – RMS threshold used for determining the zero reference point of the measurement signal. • **Full Scale RMS** – RMS value used to represent the full-scale measurement range. • **RCF Sat Thresh** – Saturation threshold used by the RCF (Reference Correction Factor) algorithm. • **RCF Min Thresh** – Minimum threshold used by the RCF correction algorithm.

4.13.4 Configurations (Others Tab)

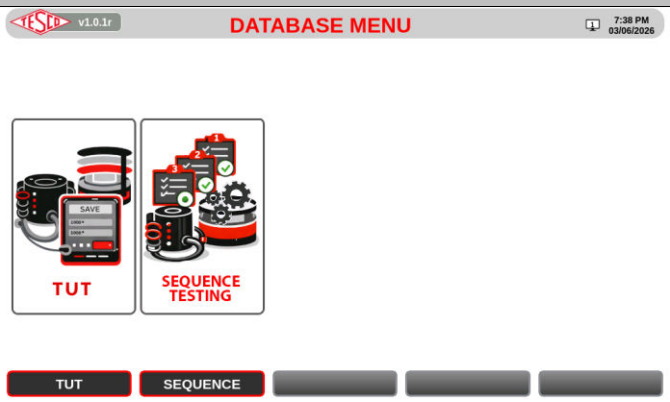
SCREEN	DESCRIPTION
 **Action Buttons (Bottom):** This tab shows all connected MC devices, and you can move to other sections using the **Prev** and **Next** buttons, or switch tabs (System Info, Boards Firmware, Part/Serial Nums, Limits, Others).	*This screen provides calibration information for the system and allows management of calibration records.* ***Metrology Tab (Current View):*** • ***Ethernet MAC Address*** *– Displays the unique hardware address assigned to the device's Ethernet network interface (e.g., 00:14:2D:C4:3A:DB).* *This address is used for network identification and communication when the device is connected to a local network or service system.*

4.14 Metrology Calibration (Popup)

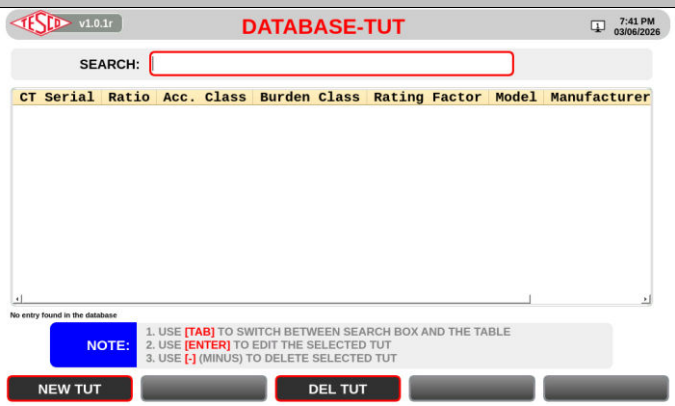
SCREEN	DESCRIPTION


Action Buttons:
• **CANCEL:** Exits the window without saving changes.
• **SAVE:** Triggers the confirmation warning before changes are applied.
	This popup window allows the user to adjust and update calibration details.
	Fields:
	• **Date Calibrated:** Editable field showing the most recent calibration date.
	• **Calibration Due Date:** Editable field showing the next scheduled calibration date.
	• **Calibrated By:** Field identifying the entity or technician who performed the calibration (e.g., *TESCO*).
	Warnings:
	• A red message is displayed: *"WARNING YOU ARE CHANGING CALIBRATION DATE!"*
	• If **Save** is clicked, an additional confirmation warning appears:
	  ○ *"ARE YOU SURE YOU WANT TO CHANGE CALIBRATION DATE!"*
	  ○ The user must select **YES** to confirm or **NO** to cancel.
	• This ensures users understand that changing calibration dates without an actual calibration event will result in **incorrect or misleading records**.

4.15 Database Menu

SCREEN	DESCRIPTION
 **Action Buttons:** • If you select **TUT** button, see page 40. • If you select **SEQUENCE** button, see page 41.	The Database Menu screen allows you to access and manage stored databases: 1. **TUT Database:** View and manage stored CTs. 2. **Sequence Database:** View and manage stored test sequences for automated workflows.

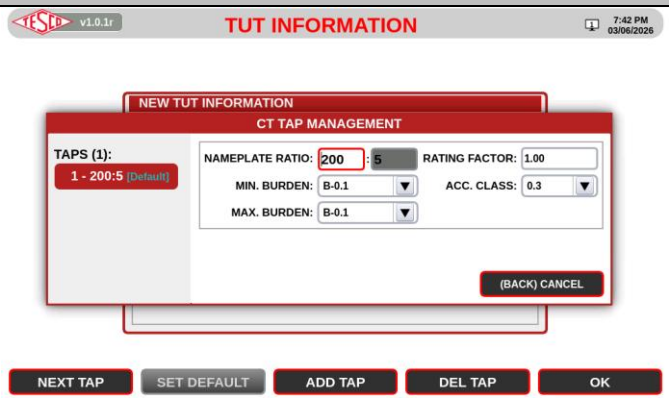
4.15.1 Database-TUT

SCREEN	DESCRIPTION
 **Action Buttons:** • **NEW TUT –** Creates a new CT database entry. See next page • **DEL TUT –** Deletes the currently selected CT entry from the database.	This screen represents the **Meter Station Database**. It lists the saved meter stations along with their relevant details. **Key Elements:** • **Search Field –** The search box at the top allows users to filter CT records in the database. **Table Columns**: • **CT Serial** – Serial number of the current transformer. • **Ratio** – Primary-to-secondary current ratio of the CT. • **Acc. Class** – Accuracy class rating of the CT. • **Burden Class** – Burden classification for the transformer. • **Rating Factor** – Rating factor associated with the CT. • **Model** – Model designation of the transformer. **Manufacturer** – Manufacturer of the CT. The stable provides an overview of all the meter stations saved in the system, allowing users to interact with the entries for further actions.

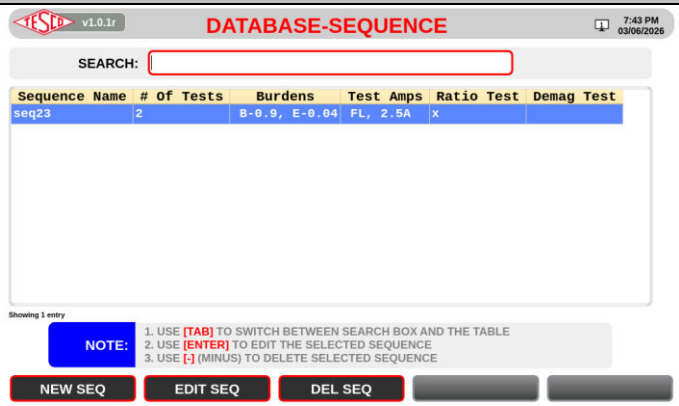
4.16 TUT Information

SCREEN	DESCRIPTION
 Buttons: • **Manage Tap** – Opens the tap configuration interface. See page 41. • **Save** – Saves the TUT information to the database.	This screen allows the user to **create or edit a Transformer Under Test (TUT)** entry in the system db. The information entered here defines the electrical characteristics of the transformer used during testing. **Fields to Input:** • **Serial No –** Unique serial number assigned to the transformer. • **Manufacturer –** Name of the transformer manufacturer. • **Model –** Model designation for the transformer. • **Tap –** Displays the currently selected tap ratio configuration. Multiple tap ratios can be defined and managed using the Manage Taps function. • **Nameplate Ratio –** Defines the primary-to-secondary current ratio listed on the transformer nameplate. • **Rating Factor –** Indicates the transformer rating factor used for measurement calculations. • **Min. Burden –** Minimum burden class supported by the transformer. • **Max. Burden –** Maximum burden class supported by the transformer. • **Acc. Class –** Accuracy class rating of the transformer. **Other Information:** • **Manage Taps** – Opens the tap management screen where additional tap ratios can be added, edited, or removed.

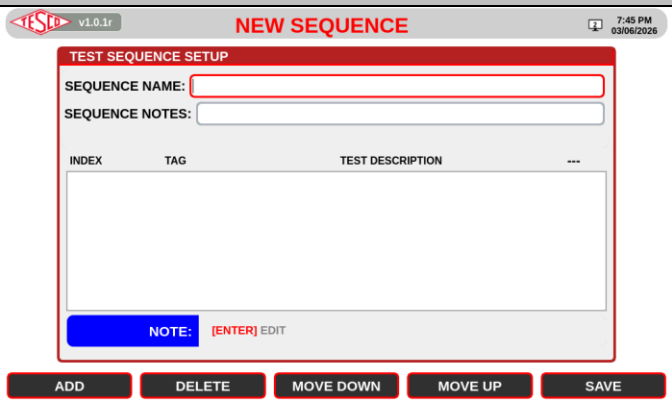
4.16.1 CT Tap Management

SCREEN	DESCRIPTION
 **Buttons** • **Next Tap –** Moves to the next available tap configuration. • **Set Default –** Sets the currently selected tap as the default tap for the transformer. • **Add Tap –** Creates a new tap configuration. • **Del Tap –** Deletes the currently selected tap configuration. • **OK –** Saves the tap configuration and returns to the TUT information screen. • **Cancel / Back –** Closes the tap management window without saving changes.	This screen allows the user to manage **tap configurations for a Transformer Under Test (TUT)**. Each tap represents a different current ratio configuration for the transformer. **Tap List** The panel on the left displays all configured taps for the transformer. • **Tap Entry** – Shows the tap number and the corresponding ratio (e.g., **1 – 200:5**). • **Default Indicator** – The default tap used by the system is marked as **[Default]**. **Tap Configuration** When a tap is selected, the parameters for that tap are displayed and can be edited. • **Nameplate Ratio** – Defines the primary-to-secondary current ratio for the selected tap. • **Rating Factor** – Specifies the rating factor associated with the transformer tap. • **Min. Burden** – Minimum burden class supported for the selected tap. • **Max. Burden** – Maximum burden class supported for the selected tap. • **Acc. Class** – Accuracy class rating of the transformer for the selected tap.

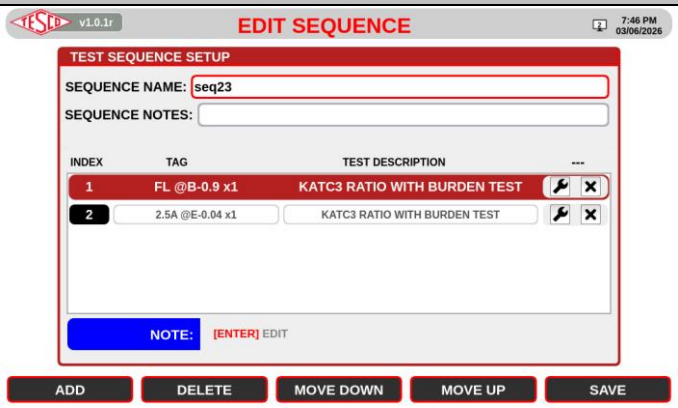
4.17 Database-Sequence

SCREEN	DESCRIPTION
 **Action Buttons** • **NEW SEQ –** Creates a new test sequence. • **EDIT SEQ –** Opens the selected sequence for modification. • **DEL SEQ –** Deletes the selected sequence from the database.	This screen displays the **Sequence Database**, which stores predefined CT testing sequences used by the system. Users can search, create, edit, or delete sequences that define how transformer tests are executed. **Key Elements** • **Search Field – The search box at the top allows users to filter and locate specific sequences stored in the database.** **Table Columns** The table lists available sequences and their associated testing parameters. • **Sequence Name** – Name assigned to the test sequence. • **# of Tests** – Total number of tests included in the sequence. • **Burdens** – Burden values applied during the sequence tests. • **Test Amps** – Current levels used for the tests. • **Ratio Test** – Indicates whether ratio testing is included in the sequence. • **Demag Test** – Indicates whether a demagnetization test is included. The table provides an overview of all sequences currently stored in the system.

4.17.1 New Sequence

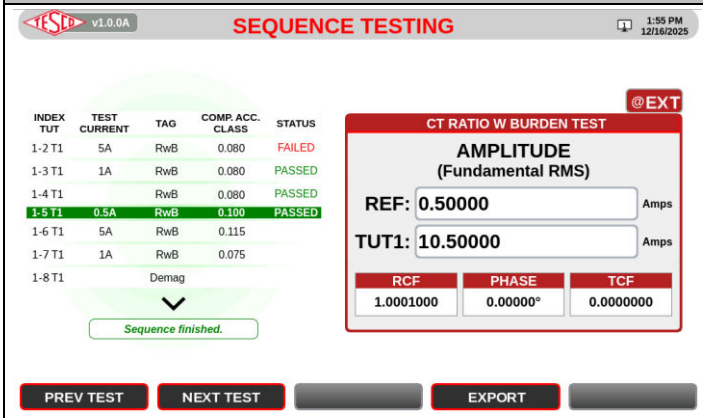
SCREEN	DESCRIPTION
 **Buttons:** • **ADD** – Adds a new test to the sequence. • **DELETE** – Removes the selected test from the sequence. • **MOVE DOWN** – Moves the selected test one position lower in the sequence order. • **MOVE UP** – Moves the selected test one position higher in the sequence order. **SAVE** – Saves the sequence and stores it in the sequence database.	This screen is used to create or edit a **test sequence** that defines the order and type of tests performed on a Transformer Under Test (TUT). A sequence can contain multiple tests that will run in the order listed. **Test Sequence Setup** • **Sequence Name** – Name assigned to the test sequence. This identifier will appear in the sequence database. • **Sequence Notes** – Optional field for adding comments or descriptions about the sequence. **Test List** The table displays all tests included in the sequence. Columns include: • **Index** – The position of the test within the sequence. Tests execute from top to bottom. • **Tag** – Short identifier describing the type of test. • **Test Description** – Detailed description of the test operation.

4.17.2 Edit Sequence

SCREEN	DESCRIPTION
 **Buttons:** • **ADD** – Adds a new test to the sequence. • **DELETE** – Removes the selected test from the sequence. • **MOVE DOWN** – Moves the selected test one position lower in the sequence. • **MOVE UP** – Moves the selected test one position higher in the sequence. • **SAVE** – Saves all changes to the sequence in the database.	This screen allows the user to **view and modify an existing test sequence**. A sequence defines the ordered set of tests that will be performed on a Transformer Under Test (TUT). **Test Sequence Setup** • **Sequence Name –** Displays the name of the selected test sequence. This field can be edited to rename the sequence. • **Sequence Notes –** Optional field for adding notes or additional details about the sequence. **Test List** The table displays all tests included in the sequence. Columns include: • **Index** – Position of the test within the sequence. Tests execute in numerical order from top to bottom. • **Tag** – Short identifier describing the test configuration (for example current level, burden, or number of repetitions). • **Test Description** – Describes the test operation performed by the system. • **Edit / Delete Controls** – Icons on the right side allow quick editing or removal of individual tests. Example tests shown: • **FL @B-0.9 x1** – KATC3 ratio with burden test at full load with B-0.9 burden. • **2.5A @E-0.04 x1** – KATC3 ratio with burden test at 2.5 A using E-0.04 burden.

4.17.3 Sequence Testing

SCREEN	DESCRIPTION


Buttons:
• **PREV TEST**: Used for navigating the test results table (equivalent of pressing arrow up)
• **NEXT TEST**: Used for navigating the test results table (equivalent of pressing arrow downs)
• **EXPORT**: Allows user to export current test results.
	Test Results Table
	The table shows the list of tests for the test sequence.
	Columns:
	• Index – Tut – (Iteration)
	  ○ Show current test index, TUT index and iteration
	• Test Current
	  ○ Target load set by the user
	• Tag
	  ○ Shows test type
	• Comp. Acc. Class
	  ○ Shows computed accuracy class
	• Status
	  ○ Shows if test result status (PASSED or FAILED)
	
	Test Measurements and Result Table
	• **REF**: shows current at reference channel
	• **TUT**: shows current at TUT channel
	• **RCF**: shows calculated RCF value
	• **PHASE**: show error phase
	• **TCF**: show calculated TCF value

5.0 MAINTENANCE

5.1 Introduction

5.2 Repair/Parts Replacement/Recalibration

5.2.1 Internal Circuit Breakers

5.2.2 Internal Fuses

5.2.3 Main Breaker

5.1 Introduction

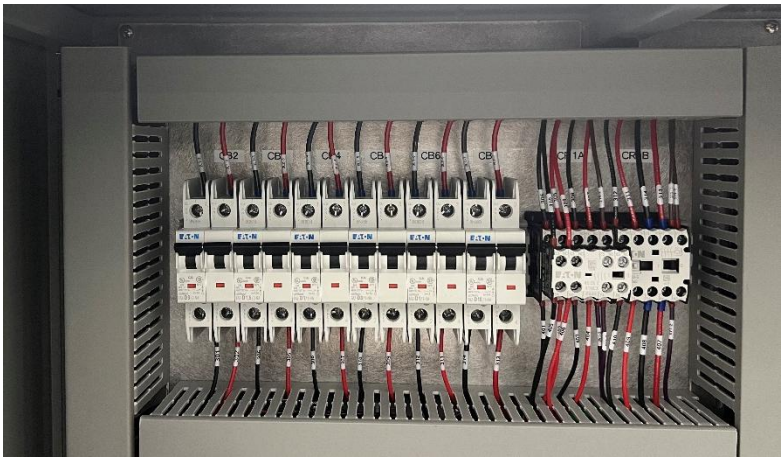
This chapter explains how to perform the routine user maintenance required to your KCTS in optimal operating condition. The precision transformer calibration can be periodically checked by the Knopp One-to-One method, whereby the ratio and phase angle performance can be quickly and accurately checked without the use of an external reference standard.

5.2 Repair/Parts Replacement/Recalibration

For the KCTS's repair, parts replacement, and recalibration, directly contact TESCO through phone or email. See section 1.2 Contacting TESCO for contact details. TESCO recommends recalibration on an annual basis. Further details can be found on the Calibration Certificate provided with your KCTS.

5.2.1 Internal Circuit Breakers

The circuit breakers inside the machine are accessible by opening the rear doors. At the top left there are the controls breakers which should not open unless an error occurred. If one of these opens, please contact TESCO to assess what could have occurred.



5.2.2 Internal Fuses

Similarly, the fuses are accessible about mid-way up the panel on the left. These should not blow unless an error occurred. If one needs replaced, please contact TESCO to assess what could have occurred.

5.2.3 Main Breaker

In an event where too much current is drawn through the machine, or max current has been drawn for too long, the main breaker (CB1) may trip. In this instance, it may be reset after a cool down period and testing resumed. It should be made of note that the current draw of the machine can reach 200A but only when pushing 8000A through the primary. These tests are not intended to be ran over and over with lingering test points at high current, and cooldown should be allowed inbetween tests. If this breaker trips without pushing the machine to high current at all, please contact TESCO to assess if an internal short has occurred.

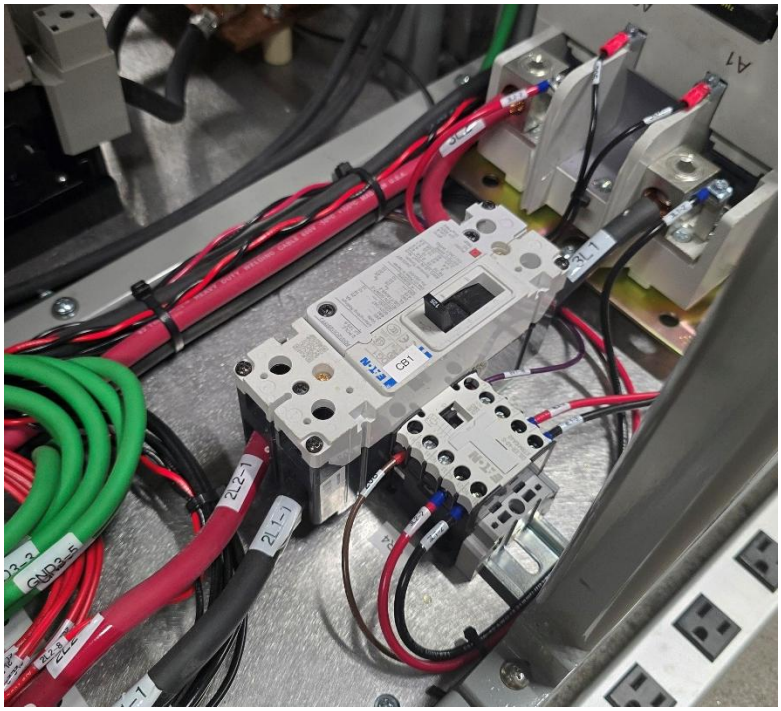


Figure 5.2.3a Main Breaker

6.0 KCTS-8000XA QR CODE

KCTS-8000XA

Figure 6.1 QR Code for KCTS-8000XA Product Page