TESCO®
Knopp

OPERATIONS MANUAL

CURRENT TRANSFORMER TESTING SYSTEM

CATALOG NO. KCTS-8000X

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CATALOG NO. KCTS-8000X

TESCO METERING

Revision: 3.1.0

TESCO – The Eastern Specialty Company

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LIMITED WARRANTY & LIMITATION OF LIABILITY

TESCO warrants to the original purchaser that it will correct all defects in material and/or workmanship in the Instrument, test equipment or software covered by this warranty (herein called **"PRODUCT"**), provided that TESCO is notified of such defect within the warranty period (set forth below) in accordance with paragraph four of this Warranty.

WARRANTY PERIOD. The warranty period shall begin on the date of shipment of the PRODUCT or the date of the issuance of this warranty certificate, whichever is later. If no warranty period is specified below and signed by an authorized DISTRIBUTOR of TESCO, the Warranty Period shall be one (1) year. In no event shall this Warranty remain in effect for more than the stated Warranty Period plus two (2) months after the date of shipment. TESCO's sole obligation and the purchaser's sole remedy under this Warranty is limited to repair or replacement, at TESCO's option, free of charge, F.O.B. TESCO's factory at Bristol, PA of any workmanship and/or part which in TESCO's sole judgment displays evidence of defect. On-site Warranty repairs will be made when in TESCO's judgment the PRODUCT cannot practically be shipped to TESCO's factory. Any modifications, additions or upgrades made to the PRODUCT or control software after this warranty becomes effective shall not extend the term of this warranty.

COVERAGE. The warranty set forth above shall be applicable only if the PRODUCT:

1. Is used for the specific purpose for which it was intended;
2. Is operated in accordance with instructions, if any, supplied by TESCO;
3. Has not been modified, neglected, altered, tampered with, vandalized, abused or misused, or subjected to accident, fire, flood or other casualties;
4. Has not been repaired by unauthorized persons;
5. Has not had its serial number altered, defaced or removed;
6. Has not been connected, installed or adjusted other than in accordance with the instructions, if any, furnished by TESCO.

The warranty set forth herein DOES NOT APPLY to defects resulting from ordinary wear, tear and usage, or any cause, similar or dissimilar, not resulting solely from defective material and/or workmanship.

The Warranty set forth herein shall NOT be effective unless:

1. Notice of defect is given to TESCO by phone, fax, email, or mail as soon as the defect is discovered.
2. Notice of defect contains the following information: PRODUCT serial number, PRODUCT model number, date of original installation, and an accurate and complete description of the defect including the exact circumstances leading to the defect.
3. The defective PRODUCT or part is returned only upon authorization from TESCO as evidenced by the issuing of a Return Merchandise Authorization (RMA) number, and that the transportation charges are prepaid (except that TESCO may, at its option, appoint a qualified DISTRIBUTOR to make field inspections of the PRODUCT for which purpose the purchaser shall permit such DISTRIBUTOR to enter upon its premises and examine the PRODUCT).
4. The Return Merchandise Authorization (RMA) number is written on the shipping label and all paperwork defective PRODUCT or part.
5. The defective PRODUCT or part is returned in the original packing or packing approved by TESCO

TESCO is not responsible for drayage charges, damages or labor costs incurred in conjunction with failure, removal, or reinstallation of any PRODUCT, all of which shall be at the purchaser's expense. TESCO is not responsible for special, incidental, or consequential damages, whether resulting from breach of warranty, negligence, or any other reason.

TESCO manufactured parts will be available for a minimum period of at least two years after the manufacture of a PRODUCT has been discontinued.

TESCO will provide original purchaser during the Warranty Period, unlimited telephone consulting time for the purpose of PRODUCT trouble shooting/servicing and for the first thirty (30) days of the Warranty Period, unlimited telephone consulting time for the purpose of PRODUCT/software application.

THE WARRANTY CONTAINED HEREIN IS IN LIEU OF ALL OTHER WARRANTIES AND TESCOMAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OR CONDITION, DESIGN, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER MATTER.

No other Warranty, express or implied, is authorized by TESCO, and no DISTRIBUTOR of TESCO or any other person has any authority to amend, extend, modify, enlarge, or otherwise alter the foregoing warranty and disclaimers in any way whatsoever, except as provided for in an Extended Limited PRODUCT Warranty Agreement.

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1.0 INTRODUCTION

1.1 Introduction

The Knopp Current Transformer Test System (Type KCTS) is designed to check the accuracy of instrument transformers having primary ranges from 5 to 8000 amp. This system incorporates the new KATC-C2X comparator which provides high accuracy, instantaneous measurements, and modern connectivity. The new KATC-C2X also provides enhanced system diagnostics and immunity from operator errors. The system is engineered for ease of use and employs field-proven components to provide high reliability. Protective circuitry is incorporated to ensure safety for the operator, the KCTS-8000X, and the transformer-under-test.

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-8000X)

1.5.1 Key Features

- Accurate capability to test to 1% of ratio
- Single range operation allows continuous real time data presentation.
- 24-bit simultaneous sampling ADCs are combined with advanced frequency domain processing to provide the ultimate precision and accuracy.
- Direct simultaneous measurement of reference transformer, transformer under test and error signals.
- Accuracy Class for which the transformer-under-test qualifies is calculated displayed in real time.
- All parameters are monitored in real time to provide immediate error feedback. Errors such as wrong ratio, wrong polarity or open connections are sensed as soon as any current is applied to the transformers.

1.5.2 Standard Features

- **PROTECTIVE CIRCUITRY**
  Senses error conditions, such as wrong ratio or wrong polarity, and then removes power from the KCTS-8000X loading circuitry.
- **SELF CHECK**
  Allows the system accuracy to be easily verified without the use of an external reference standard.
- **ZERO START**
  Requires that both coarse and fine test current controls be at zero before power can be applied to the loading circuitry (and thus the TUT).

1.6 General Specifications (KCTS-8000X)

1.6.1 Main Supply to the Motorized Variac

PARAMETERS	DATA
Power Supply	208 or 240 VAC
Supply Frequency	60 Hz

1.6.2 Comparator and KCTS Control Circuitry Power Supply

PARAMETERS	DATA
Power Supply	120 VAC, 5 A
Supply Frequency	60 Hz

1.6.3 Dimensions

PARAMETERS	DATA
Height	45” (114 cm)
Width	55.5” (141 cm)
Depth	35” (89 cm)
Weight	1,330 lbs (603 kg)

1.6.4 Accuracy

PARAMETERS	DATA
Current Measurement Accuracy	±0.025%
Phase Angle	±2 min. at 100% full load current

1.6.5 Test Ranges

The following primary ranges are provided:

A Primary	B Primary	C Primary	D Primary
5-20A	**25-100A**	**120-500A**	**600-8000A**

1.6.6 Test Burdens

These ANSI burdens are switch selectable: 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 / B-8.

These burdens are very stable and highly accurate. The resistive and inductive component values are within +/-5% in engineering mode, +/-10% in production mode. Burdens up to B-1.8 are rated for 400 percent tests, and the B-2, B-4, and B-8 burdens are rated for 200 percent tests. You may also use an external burden if needed

1.7 Product Features (KATC-C2X)

1.7.1 Key Features

- **Improved low current accuracy compared to KATC-C2:**
  - **Below 2.5 Accuracy class; RCF accuracy within +/-15ppm, else +/-150ppm**
  - **Above 0.5A, phase accuracy within 0.18minutes, else 0.48 minutes**
- **Now includes burden applied to TUT measurement (Z) within +/-0.1%**
- **178ppi Full Color LCD Screen**
- **Front Keypad for Data Entry**
- **Front USB and Ethernet Connectivity**
- **Powerful, multi-core, 32-bit processors**
- **0.001 Accuracy Class Resolution**
- **Reduced Testing Time**

1.7.2 Standard Features

- **Auto-Rundown Capable**
- **Configurable Units**
- **(Degrees, MilliRads, Minutes),(Amps, %Ratio),(RCF, %Error)**
- **3U Compatible Enclosure**

1.8 General Specifications (KATC-C2X)

1.8.1 Input Power

PARAMETERS	DATA
Power Supply	120 VAC
Supply Frequency	60Hz
Rated Current	170A

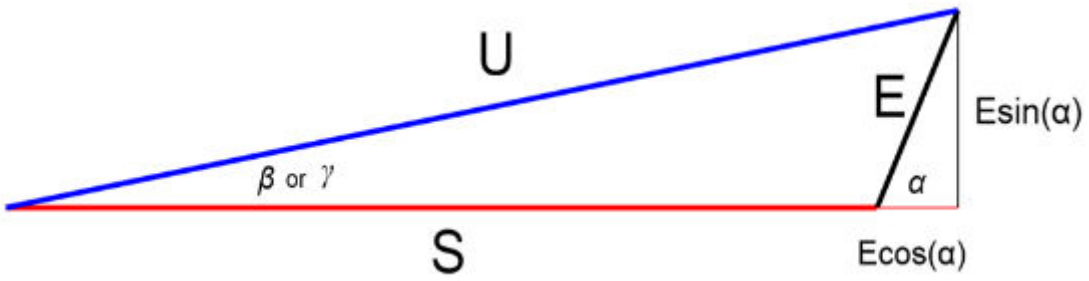
1.8.2 Dimensions

PARAMETERS	DATA
Height	5.25” (13.33 cm)
Width	19” (48.26 cm)
Depth	18.1” (45.97 cm)
Weight	≈10 lbs (≈16kg)

NOTE: *This is a standard 3U rack enclosure.*

1.8.3 Measurement Accuracy

Quantity	Description	Range	Error
S	Reference Amplitude (amps)	0.05 A ≤ S < 0.25 A	±200ppm
		0.25 A ≤ S ≤ 20 A	±80ppm
$U_{comp.}$	$TUT_{Comp.}$ Amplitude (amps)	0.05 A ≤ S < 0.25 A	±200ppm
		0.25 A ≤ S ≤ 20 A	±80ppm
E	Error Current (amps)	0.005 A ≤ E < 0.01 A	±1000ppm
		0.01 A ≤ E ≤ 0.025 A	±600ppm
		0.025 A < E < 0.25 A	±300ppm
		0.25 ≤ E < 2	±30ppm
α	Error Current Phase (degrees) -180° to +180°	0.01 A ≤ E ≤ 0.025 A	±0.1°
		0.025 A < E < 0.25 A	±0.05°
		0.25 A ≤ E < 2 A	±0.01°
$\beta_{Comp.}$	$TUT_{Comp.}$ Phase Angle (degrees)	S ≤ 0.5 A	±0.008 °
		0.5 A < S ≤ 20 A	±0.003°
RCF	Ratio Correction Factor (S/Ucomp.)	Acc. Class ≤ 2.5	±15 ppm
		Acc. Class > 2.5	±150 ppm
Accuracy Class	Accuracy Class	Acc. Class ≤ 2.5	±0.0063
		Acc. Class > 2.5	±0.02
Impedance	Z	0.002 V ≤ Vmeas ≤ 80 V	±0.1%



2.0 SETUP & INSTALLATION

2.1 Introduction

The Instruments are shipped in a container designed to prevent damage during shipping.

Inspect the Instruments carefully for damage and immediately report any damage to the shipper. A packing list is included in the packaging. When you unpack the Instruments, check for all the standard equipment listed and check the shipping order for any additional items ordered. Report any shortage to the place of purchase, to your distributor, or directly to TESCO.

2.2 Unpacking and Inspection

The KCTS is shipped pre-assembled in its packing which includes a skid underneath the equipment. To remove the KCTS from the skid, follow this procedure:

- **a.** Remove the packaging from around the KCTS. This will expose the skid on which the KCTS is resting.
- **b.** The top of the KCTS is hinged along the rear edge. To raise the top, remove the two screws found along the front edge of the top where it meets the metal lip.
- **c.** After removing the two screws, raise the top to its fully upright position until it rests on the strap.
- **d.** Identify the four lift points inside the KCTS. There are two eyelets marked “LIFT HERE” on the right side (when viewed from the front). There are also two “STRAP” labels on the framework on the left side of the KCTS (when viewed from the front). Connect hooks to the two eyelets and use a strap around the framework. Remember that the KCTS weighs approximately 1500 lbs. (680 kg) so the hoist should be of sufficient size to accommodate this load.
- **e.** Raise the KCTS just enough to be able to slide the skid out from underneath. Once the skid has been removed, lower the KCTS to the floor. The KCTS has wheels to enable it to be moved on a hard surface.
- **f.** Proceed to “AC Power Connections” for the setup.

2.3 AC Power Connections

2.3.1 Required Voltage and Current

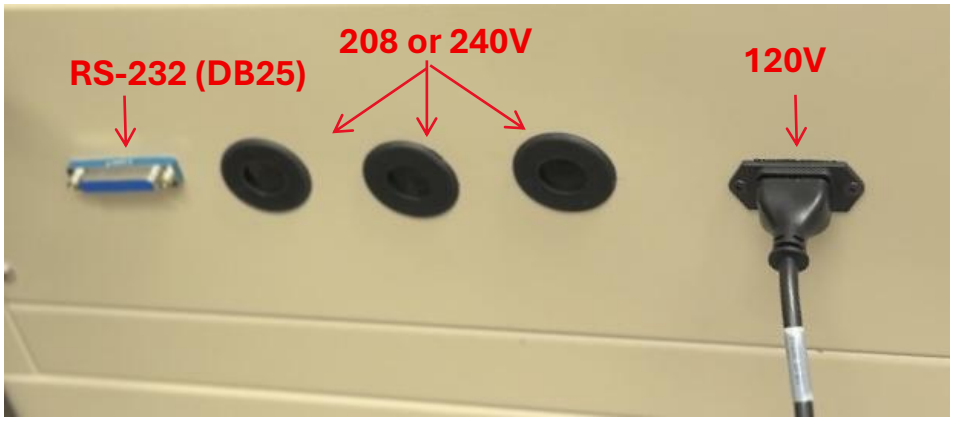
The loading circuity requires 208 VAC or 240 VAC, single-phase, 60 Hz service at 200 amp maximum. The KATC-C2X requires 120 VAC, single-phase, 60 Hz service at 5 amp maximum.

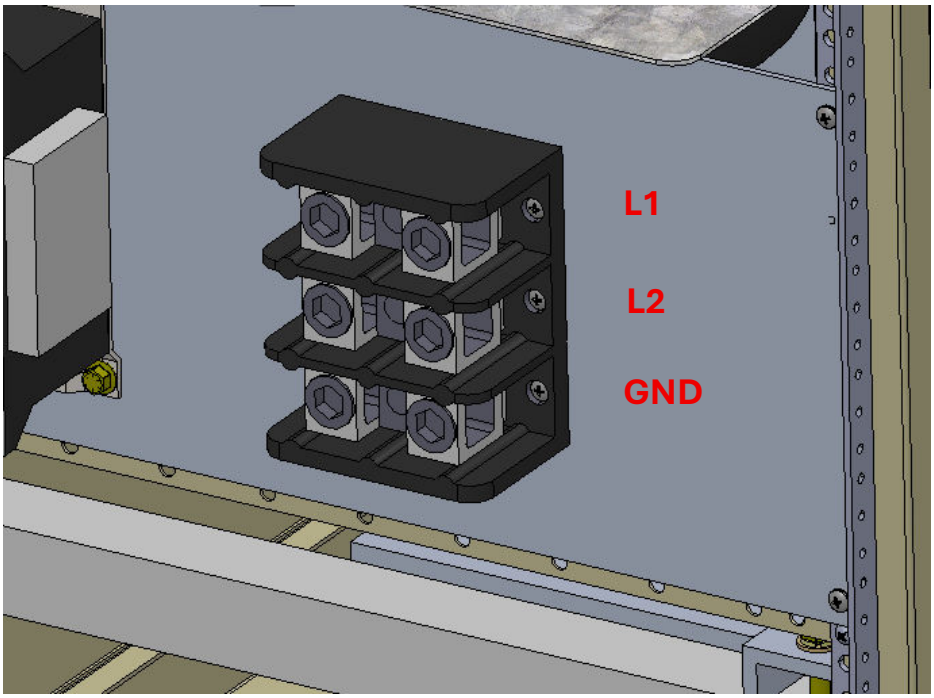
2.3.2 Cable Routing

A cable entrance is provided through the lower-left panel (when the KCTS is viewed from the rear).

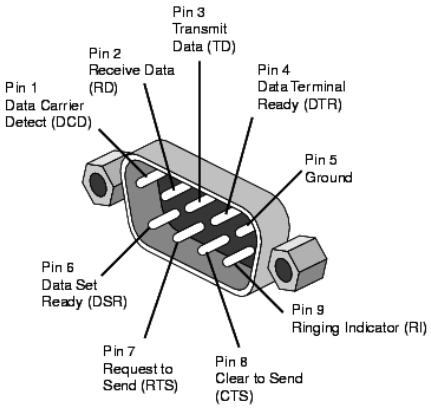
2.3.3 KCTS Connections

Make appropriate connections inside the KCTS to the terminals labeled "L1", "L2", and "GND." Connect the supplied 120 VAC control circuit power cord to the three prong connector located on the rear of the KCTS.

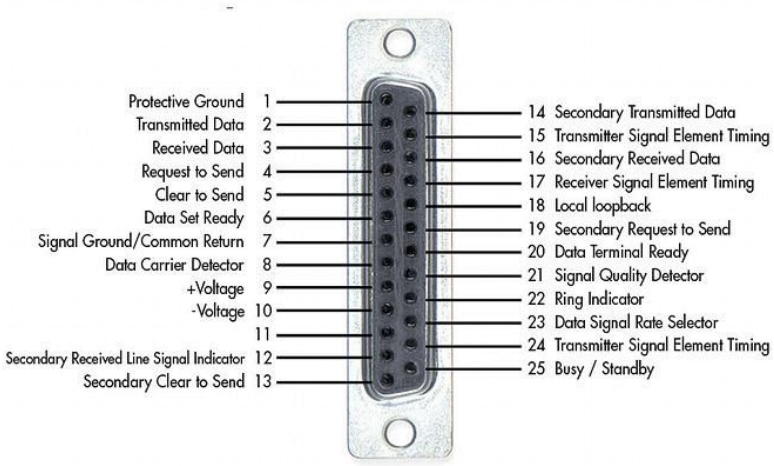




2.3.4 RS-232 Connection



A DB-25 RS-232 connector is located on the rear of the KCTS-8000X. This port supports legacy communication and data output. The KCTS-8000X also includes an Ethernet port for network connectivity. The Ethernet port can be used with DHCP or a manually assigned static IP address.



J607 of MB	Rear DB9	Connection	Description	DB25 Standard Pin	DB9 Standard Pin	
1	1	-		-	DCD[1]	[1]Data Carrier Detect
2	6	DSR	Data Set Ready	6	6	
3	2	RxD	Data from DCE to DTE	3*	2*	
4	7	RTS	Request To Send	4	7	
5	3	TxD	Data from DTE to DCE	2*	3*	
6	8	CTS	Clear To Send	5	8	
7	4	DTR	Data Terminal Ready	20	4	
8	9	-		-	RI[2]	[2]Ring Indicator
9	5	GND		7	5	
				*(reverser required when going to/from DB9/DB25)		
				DTE: Data Terminal Equipment		
				DCE: Data Communication Equipment		

2.3.5 Cable and Hardware Kit

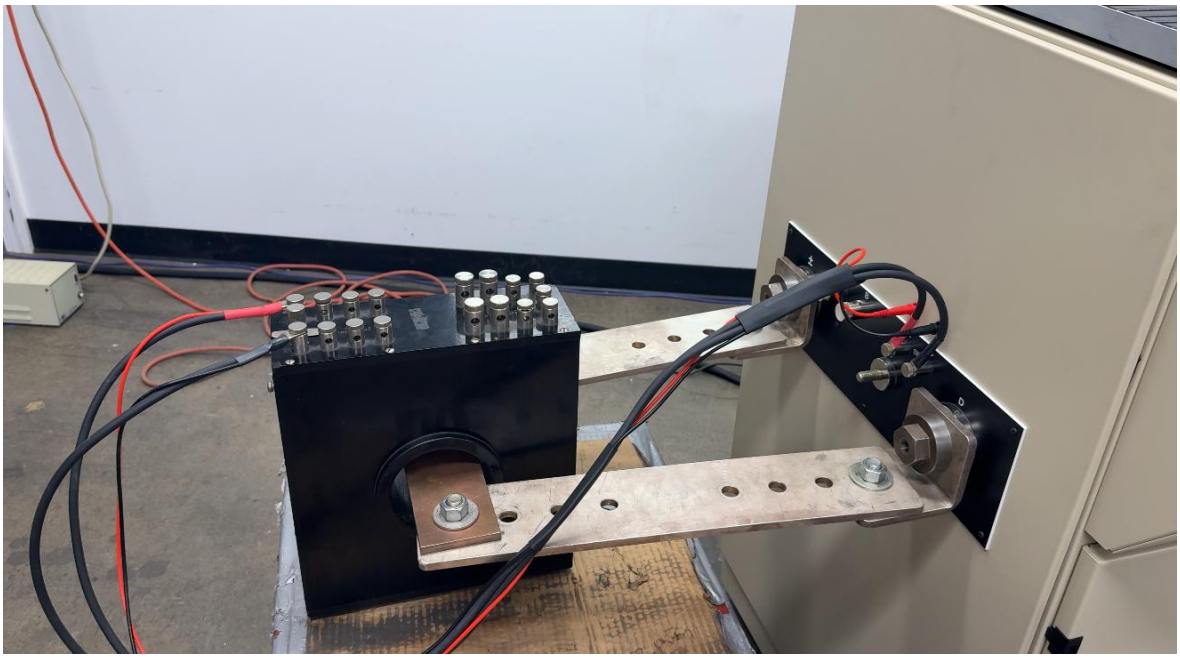
Use only the secondary cable types included with the KCTS-8000X system. Two cable styles are included, both use a 4wire measurement for burden. One cable is fork to fork, and the other cable is fork to post terminal. Always use nuts and bolts for secure attachment. Do not use alligator clips.

Included as well are #4 and 4/0 primary cables. These cables should not be used above approximately 800 to 1,000 amps. Soldered ends can melt if the cables overheat. Multiple wrapping may be required for very high current testing. Use included bussing when testing at high current and allow for cooldown when over 4000A.

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:



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.

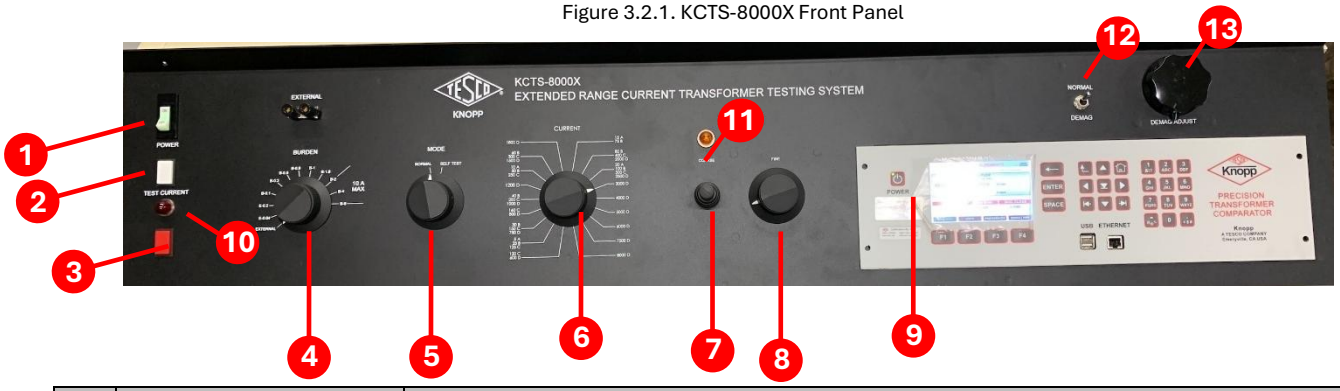
3.0 FUNCTIONALITY

3.1 Introduction

This chapter is a reference for the functions and locations of the KCTS's front panel features and provides brief descriptions of each feature for quick access. **Please read this information before operating the KCTS.**

3.2 Front Panel

Figure 3.2.1. KCTS-8000X Front Panel



#	NAME	DESCRIPTION
1	**Power Switch**	This switch is a combination switch/circuit breaker/indicator for the 120 VAC control circuitry. This switch makes available power to the control circuitry and comparator. To turn on the 208V/240V contactor, press and hold the power button on the comparator until the green LED illuminates. Once the comparator boots and runs the initialization check, it will engage the main contactor.
2	**TEST CURRENT ON Pushbutton**	This pushbutton applies power to the ***loading*** circuitry. The red lamp below this pushbutton is lit when the loading circuitry is energized.
3	**TEST CURRENT OFF Pushbutton**	This pushbutton is used to de-energize the ***loading*** circuitry.
4	**BURDEN Select Switch**	This switch determines the ANSI burden to be inserted in the secondary of the transformer-under-test. The two terminals above this switch are to be used for an external burden. ***CAUTION: Do not use burdens B-2, B-4, B-8 above 10 amp.***
5	**MODE Switch**	This switch selects the testing mode. Production Mode provides faster testing and allows wider tolerance. Engineering Mode provides more precise adjustments and uses tighter tolerances. The Self-Test position splits the reference transformer in half and tests one section against the other. Self-Test must be performed at the 3000D ratio setting, and the primary and secondary must be disconnected before activating Self-Test.
6	**CURRENT Switch**	This dial selects the appropriate primary test current range. The alphabetical suffix following each labeled current range indicates the side panel terminal to be used (A, B, C, or D). Ranges available for each terminal are listed in **Table 3.2.2**.
7	**TEST CURRENT – COARSE**	The "joystick" controls the motorized variable transformer and provides coarse control of the test current.
8	**TEST CURRENT – FINE**	This manual variable transformer provides fine control of the test current.
9	**Comparator Power Switch**	The main 208/240V contactor is controlled by the comparator. Press the power button until the green LED illuminates. The comparator will boot. When it has booted and ran through an initial check, it will turn on the main contactor.
10	**TEST CURRENT ON Lamp**	The red lamp located between the ON and OFF pushbuttons is lit when the loading circuit has been energized by pressing the ON pushbutton. For safety, this lamp will not light (and the loading circuit will not be energized) unless both coarse and fine variable transformers are at zero.

11	**READY Lamp**	The amber lamp located near the joystick is lit when both the motorized variable transformer and the fine control variable transformer are at zero, indicating that the loading circuitry is "ready" to be energized.
12	**Demag Switch**	This switch enables/disable demag to the TUT. In the up position it is disabled, and down is enabled. When performing a demag, switch the comparator into demag mode first, then toggle this switch. The adjustment can be turned the entire way up, then current turned on. This will apply about a 23ohm load to the TUT, ramp the current up until the RCF begins to climb (1.01 in RCF is enough). When the RCF is this poor, it is representative of the TUT core being saturated with flux which will demagnetize it. The current can then be ramped down, turned off, demag disabled and comparator set back to normal mode. CAUTION: not setting the comparator to demag can be damaging if pushing hard and will cause error messages. Demag will disable the active burden as well so the demag adjust can be the only application of load to the TUT.
13	**Demag Adjust**	Variable transformer that ramps up the load being applied to a TUT when performing a demag. This in most cases can just be left at maximum (Fully clockwise).
	AUTO RUNDOWN Switch	Located behind the lower, front, right-hand door of the KCTS is a toggle switch with the following function: When this switch is ON, completion of a measurement initiated by pushing the HOLD button on the comparator causes automatic "run-down" of the motorized (coarse) variable transformer. This allows the majority of current to be removed from the transformer-under-test as soon as test data is displayed. With this switch in the OFF position, the coarse variable transformer must be returned to zero through use of the joystick.
	Circuit Breakers	Located behind the lower, front, right-hand door of the KCTS are two circuit breakers with the following functions: • The 100-amp breaker protects the input to the KCTS. Even though the breaker is rated at 100 amp, we require that the main power supply to the KCTS be 200-amp service to ensure that the KCTS has an adequate supply for testing high current transformers. • The 2-amp RE-CIRK-IT breaker protects the One-to-One supply transformer.

Table 3.2.1. KCTS-8000X Front Panel

3.2.1 Ratio Settings

TERMINAL A		TERMINAL B		TERMINAL C		TERMINAL D	
PRIMARY AMPS	**MAX. % LOAD**	**PRIMARY AMPS**	**MAX. % LOAD**	**PRIMARY AMPS**	**MAX. % LOAD**	**PRIMARY AMPS**	**MAX. % LOAD**
5	400	25	400	120	400	600	400
10	400	30	400	125	400	750	400
15	400	40	400	150	400	800	400
20	400	50	400	160	400	1000	400
		60	400	200	400	1200	400
		75	400	250	400	1500	400
		80	400	300	400	1800	400
		100	400	400	400	2000	400
				500	400	2500	200
						3000	200
						4000	200
						5000	100
						6000	100
						7500	100
						8000	100

Table 3.2.2. KCTS-8000X Primary Test Current

3.2.2 KATC-C2X

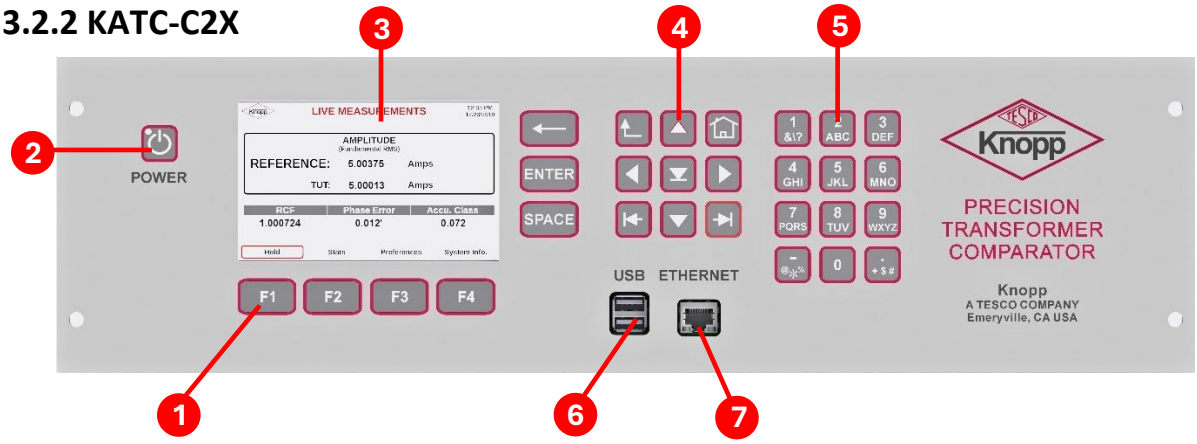


Figure 3.2.1. KATC-C2X Front Panel

NUMBER	DESCRIPTION
1	Function keys
2	Power button
3	TFT LCD Screen. 5” 800x480, full color TFT LCD screen
4	Navigation Keys
5	Alphanumeric membrane keyboard
6	Dual USB Connection
7	RJ45 Ethernet Connection

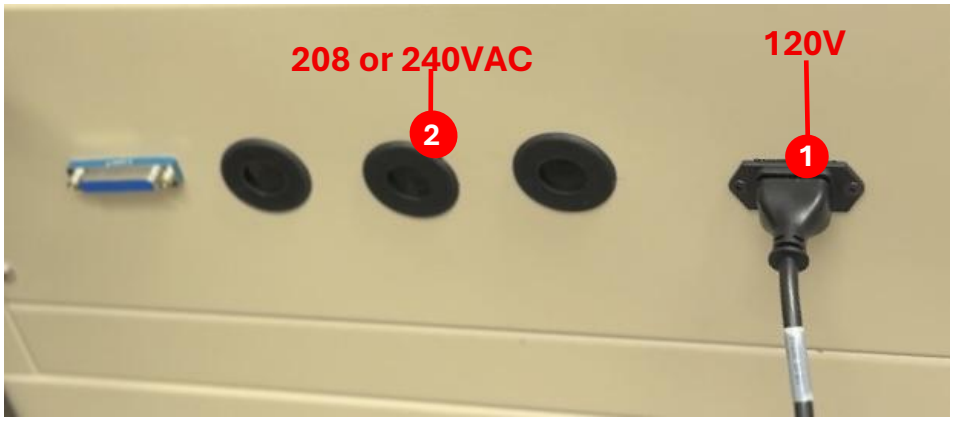
Table 3.2.1. KATC-C2X Front Panel

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** 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

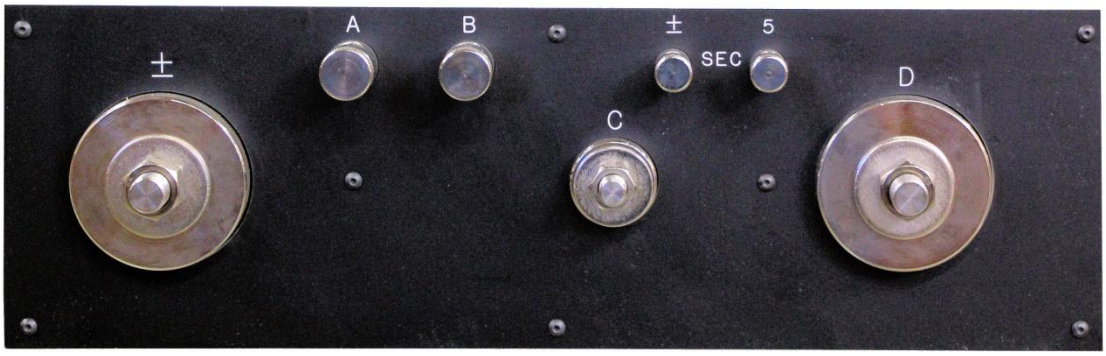
This section shows how to operate the KCTS-8000 with the KATC-C2X comparator. Before proceeding to the test, properly turn ON the equipment by doing the following:



1. Connect 120 V power cord at the back of the equipment.
2. Connect Motorized Variac Supply source.

3. Turn on power switch where a green light indictor should light up to know that the equipment is turned on.
4. Press KATC-C2X power button to power it ON.

3.3.1 Connection of the Transformer



1. Set the KCTS CURRENT switch for the primary current of the transformer to be tested. Note the letter printed next to the current range (A, B, C, or D). This letter designates the KCTS terminal to which the TUT should be connected.
2. Connect the primary of the transformer between the appropriate terminal for the range desired (A, B, C, or D) and the ± terminal.
3. Connect the secondary of the transformer to the terminals marked as such on the KCTS using a 5-ft. (152.4 cm) pair of #8 closely spaced copper conductors. It is important that these leads are used, as they are part of the calibrated internal ANSI burdens.

   It is also important to connect the transformer with the proper polarity. If the transformer is connected improperly, the comparator will display a message indicating wrong polarity and no measurements will be taken.

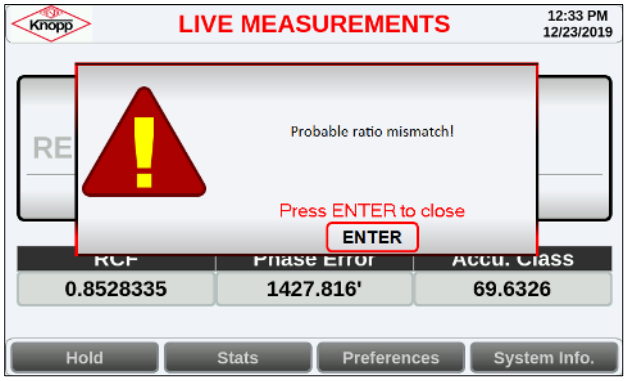
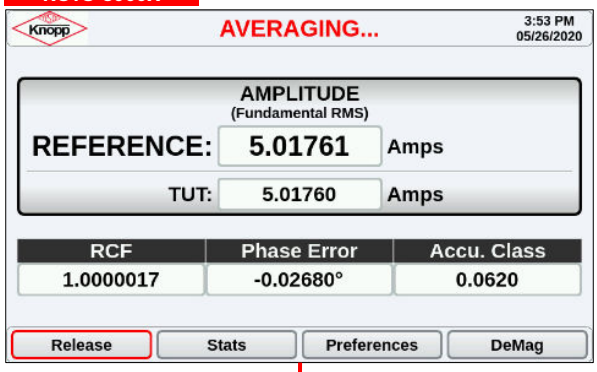
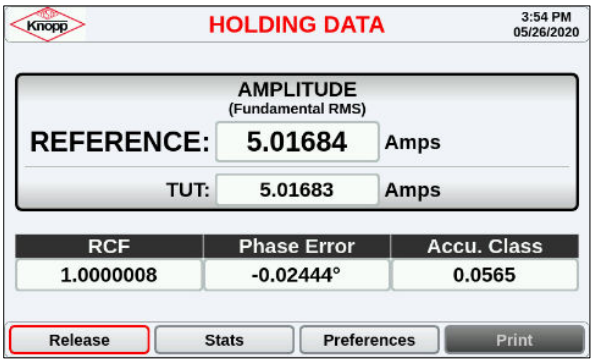
WARNING: Do NOT use “alligator clips” for primary or secondary connections!

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.

3.3.2 Testing Procedure

The following procedure describes use of the KCTS with a KATC-C2X Comparator.

SCREEN	DESCRIPTION
	**1.** Set the MODE switch to NORMAL. **2.** Set the DEMAG switch to NORMAL. **3.** Set the BURDEN rotary switch to the appropriate position for the transformer being tested. Normally, the transformer nameplate will designate for which burden (or burdens) it will maintain its rated accuracy. **4.** Double-check that the CURRENT switch has been properly set to match the transformer-under-test. **5.** Check to see that the amber light is lit. If not, set the COARSE and FINE control variable transformers to zero. The loading circuitry cannot be energized until the amber lamp is lit (both variable transformers at zero). **6.** Press the ON (TEST CURRENT) pushbutton. The RED light should come on to indicate that the loading circuit is energized. **7.** Adjust the FINE control variable transformer until the comparator gives a reading, or until the variable transformer is approximately one-half of the way through its full range of travel, whichever comes first. As the FINE control variable transformer is turned, it is not unusual to first see the current displayed on the comparator decrease, pass through zero, and then increase. This will occur most often when testing transformers of 200 amp and below with a light burden applied. If the displayed current does not change, there may be an open circuit in the secondary of the transformer-under-test. An open circuit on the secondary of the transformer-under-test can generate lethal voltages. Under no circumstances should the operator touch the former connections while the loading circuit is energized.

SCREEN	DESCRIPTION
	**NOTE:** The KATC-C2X detects most connection errors and runs down the motorized variable transformer. However, current from the fine variable transformer must be manually returned to zero.
KCTS-8000X 11 	1. The KATC-C2X comparator makes 15 measurements per second. Therefore, there is no lag in the data displayed on the screen. The KATC-C2X is also virtually immune to damage from over current conditions. Therefore, current can be ramped up quickly without the need to stop periodically. **NOTE:** At low ratios, the motorized variable transformer increases current VERY quickly, so use appropriate caution. 2. Adjust the FINE control variable transformer until the comparator begins reading. During this adjustment the burden status may display Adjusting or Intolerance Adjusting while the system settles. 3. When the burden status displays Stable, press HOLD on the comparator to record the measurement. 4. If AUTO RUNDOWN has been selected, the motorized variable transformer will automatically return to zero after the measurement. If the motorized variable transformer does not automatically return to zero, you will need to use the joystick to run the variable transformer down. See **Table 3.2.1. KCTS-8000X Front Panel Sections** for more information about the AUTO RUNDOWN Switch. AUTO RUNDOWN must be enabled in the KATC's settings, which can be found in Preferences. 5. Return the FINE control variable transformer to zero. 6. Press RESET on the comparator to prepare for the next measurement. 7. Press OFF (TEST CURRENT) after all measurements on a given transformer are complete.
12 	

3.3.3 Optional Demagnetization Circuit

The DMAG function saturates the transformer using a large impedance. The maximum current for DMAG is 5 amps. During the DMAG process you increase current and watch for the Ratio Correction Factor (RCF) to climb toward 1.01. Once the RCF approaches 1.01, you then return the unit to normal mode after completion.

Operation of the demagnetization feature is as follows:

1. Connect the transformer to be demagnetized to the KCTS as if a normal accuracy test were to be performed.
2. Set the **Demag/Normal** Switch of the KCTS to the DEMAG position. KATC-C2X should also be on Demag function/page before turning ON the test current switch. Otherwise, this will set off the buzzer that there is an error on the test setup/configuration.
3. Set the **Burden** Switch to EXTERNAL. Make sure that the shorting link is present across the EXTERNAL BURDEN terminals.
4. Set the **Mode** Switch to NORMAL.
5. Set the Demag Adjust variable transformer is fully clockwise, this is the equivalent of about 23 ohms of impedance. The amber ready lamp should be lit. Otherwise, the test current button is disabled for safety reasons such as the fine or coarse variac not in the zero position.
6. Press the **ON** Test Current pushbutton to energize the current circuit.
7. Use the FINE and, if necessary, COARSE current adjustments to obtain an RCF of 1.01 or 5-amp reading on the TEST CURRENT display of the KATC-C2X Comparator (DO NOT exceed 5 amps).
    a. By ramping up until an RCF of ~1.01, the TUT will have had its core saturated which is a form of demagnetization. If the RCF cannot reach 1.01, it may not have reached saturation but significant load being applied still applies a demagnetization.
8. Return the FINE and COARSE current adjustments to zero.
9. Press the OFF pushbutton to de-energize the current circuit. Turn the **Demag/Normal** switch to NORMAL, turn the comparator back to normal. This completes the demagnetization and a normal test can be performed.

This procedure should be sufficient to demagnetize virtually all transformers, larger ratios are what may not always reach the target RCF of 1.01.

NOTE: The demagnetization circuit should only be energized for **10 to 15 seconds** at a time. The circuit was not designed for continuous operation and should not exceed 5amps.

4.0 MAINTENANCE

4.1 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.

4.2 Knopp One-to-One Test

To check the overall performance of the equipment, the One-to-One test can be performed periodically. The results can then be compared to the data originally supplied with the equipment. This test is performed as follows:

1. Remove all connections from the terminals of the left panel of the KCTS-8000X.
2. Set the CURRENT switch to 3000 D.
3. Set the MODE selector to SELF TEST, which will turn power on.
4. Adjust the current utilizing the FINE control, the COARSE is disconnected in this mode.

The results should agree with the ONE-to-One data originally supplied with the equipment to within ±0.5 minutes and ±0.0001 RCF on phase angle and ratio error, respectively.

4.3 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.