



OPERATING INSTRUCTIONS

For the

KNOPP TYPE KCTS-8000

CURRENT TRANSFORMER TESTING SYSTEM

Serial Number: _____

Leaflet Number 2-015-G

October 2016



Knopp Incorporated
1307 – 66th Street
Emeryville, California 94608
USA

(510) 653-1661
Toll Free: (800) 227-1848
FAX: (510) 653-2202
sales@knoppinc.com
www.knoppinc.com

Contents

1.	Description	3
1.1.	General	3
1.2.	Test Ranges.....	3
1.3.	Test Burdens.....	3
1.4.	Comparator (Type KATC-C or KATC-C1).....	4
1.5.	System Accuracy	4
1.6.	Self Check.....	4
1.7.	Input Power Requirements.....	4
1.8.	Weight and Dimensions	5
2.	Installation	6
2.1.	Unpacking	6
2.2.	AC Power Connections.....	6
2.2.1.	Required Voltage and Current	6
2.2.2.	Cable Routing	6
2.2.3.	KCTS Connections	7
3.	Operation.....	8
3.1.	Description of Front Panel Controls and Indicators.....	8
3.1.1.	Power Switch	8
3.1.2.	TEST CURRENT ON Push-button	8
3.1.3.	TEST CURRENT OFF Push-button	8
3.1.4.	BURDEN Select Switch	8
3.1.5.	MODE Switch.....	8

3.1.6.	CURRENT Switch.....	9
3.1.7.	TEST CURRENT—COARSE	9
3.1.8.	TEST CURRENT—FINE	9
3.1.9.	READY Lamp.....	9
3.1.10.	TEST CURRENT ON Lamp.....	10
3.1.11.	Comparator Power Switch	10
3.2.	Description of Other Controls.....	10
3.2.1.	AUTO RUNDOWN Switch	10
3.2.2.	CIRCUIT BREAKERS.....	10
3.3.	Operating Procedure.....	11
3.3.1.	Connection of the Transformer-Under-Test (TUT).....	11
3.3.2.	Testing procedure	12
4.	Maintenance.....	14
4.1.	Knopp One-to-One Test.....	14
5.	Warranty.....	15
6.	Cable and Hardware Kit Option	16
8.	USING THE KATC-C1 FOR TESTING TO LESS THAN 1% CURRENT.....	18
9.	CALIBRATION DATA FOR KCTS-8000 PRECISION TRANSFORMER.....	19

1. Description

1.1. General

The Knopp Current Transformer Test System (Type KCTS) is designed to check the accuracy of instrument transformers having primary ranges from 5 to 8000 Amperes. Use of a microprocessor-based automatic, autoranging comparator, Knopp precision transformers, and a motorized variac for adjusting test current, provide minimum measurement time and maximum accuracy. The system is human 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, and the transformer-under-test.

1.2. Test Ranges

The following primary ranges are provided:

5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 80, 100, 120, 125, 150, 160, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1500, 1800, 2000, 2500, 3000, 4000, 5000, 6000, 7500, and 8000 Amperes.

400% tests can be performed up to 2000 Amperes and 200% tests can be run up to 4000 Amperes.

1.3. Test Burdens

The following ANSI burdens are switch selectable:

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 accurate to within 1%). Burdens up to B-1.8 are rated for 400% tests (20 Amperes secondary current) while the remaining burdens (B-2, B-4, and B-8) are rated for tests up to 200%. Provisions are also made for use of an external burden.

When connecting the secondary of the transformer-under-test to the KCTS it is important to use a 5 ft. (152.4 cm) pair of #8 copper leads. Leads of this type are assumed to be a part of the burden when the equipment is calibrated. If the

optional Cable and Hardware Kit was purchased, these leads are supplied.

1.4. Comparator (Type KATC-C or KATC-C1)

The comparator has the following features:

- *Automatic and autoranging*—providing minimum measurement time (typically a few seconds after adjustment of test current).
- *Digital display* of test current and test results:
 - ratio error in Percent (%) or Ratio Correction Factor (RCF).
 - phase error in minutes or milliradians.
- *Accuracy Class* for which the transformer-under-test qualifies is calculated and digitally displayed.
- *Protective circuitry* which senses error conditions such as wrong ratio or wrong polarity and then automatically removes power from the KCTS loading circuitry.

The Type KATC-C1 comparator includes more features than those described above.

Consult the comparator instruction manual (included) for more information on the particular comparator installed in your KCTS.

1.5. System Accuracy

The combined error of the precision current transformer and the transformer comparator is less than $\pm 0.025\%$ on ratio and ± 2 minutes on phase angle at 100% full load current.

1.6. Self Check

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. Refer to the section concerning the One-to-One test later in this manual.

1.7. Input Power Requirements

The KCTS loading circuitry requires 208 or 240 volt, 50/60 Hz, single-phase service at a nominal 200 Amperes. The supply voltage should have been specified at time of order.

In addition, the KCTS control circuitry requires a separate 120 volt, 50/60 Hz, single-phase service.

1.8. Weight and Dimensions

The approximate weight of the KCTS is 1500 lbs (680 kg). The system is 45 in. (114 cm) High, 55.5 in. (141 cm) Wide, and 35 in. (89 cm) Deep.

2. Installation

2.1. Unpacking

The KCTS is shipped pre-assembled in its packing which includes a skid underneath the unit. 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. Continue with the section entitled "AC Power Connections."

2.2. AC Power Connections

2.2.1. Required Voltage and Current

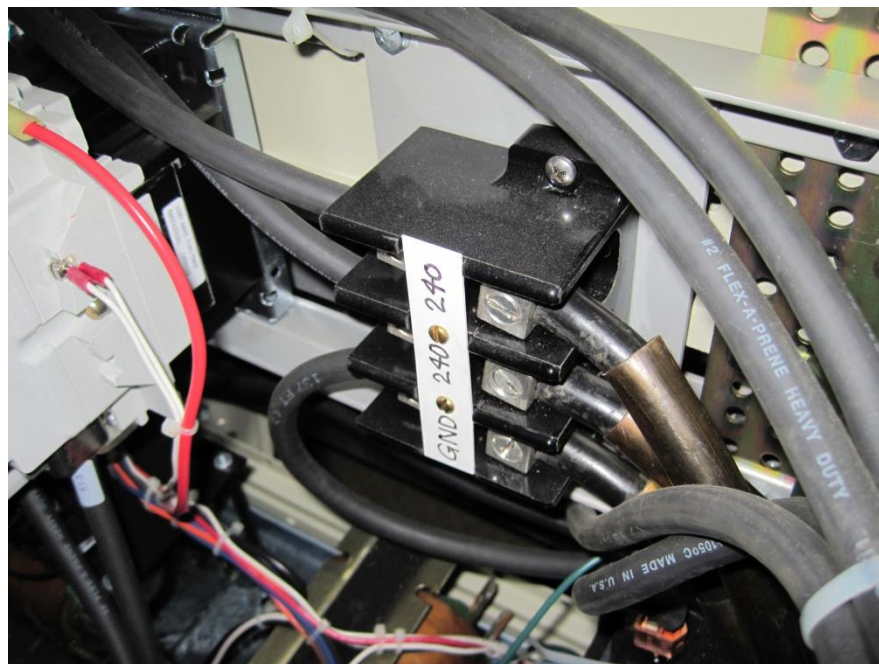
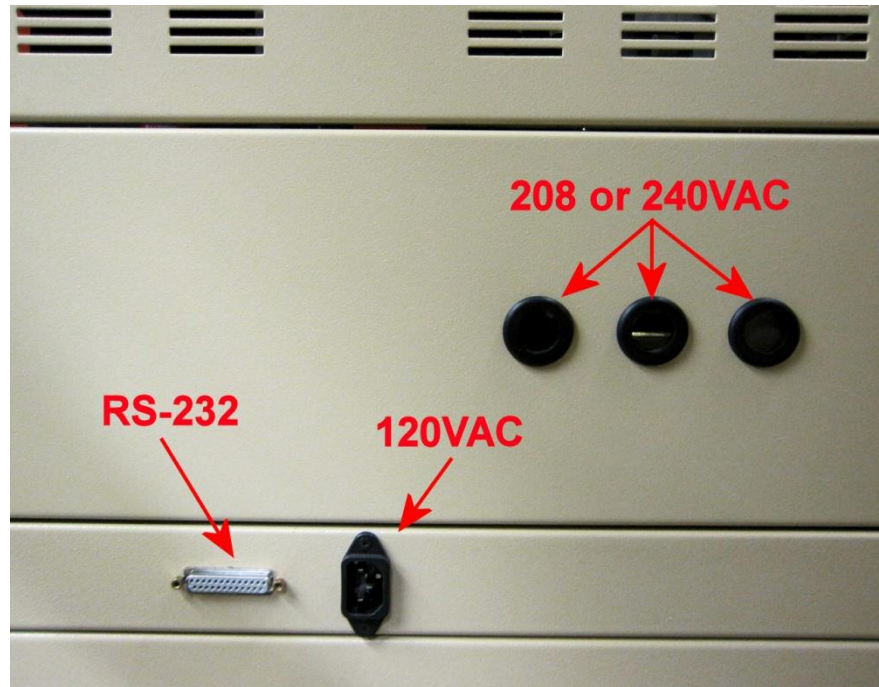
The loading circuitry requires 208 VAC or 240 VAC, single-phase, 50/60 Hz. service at 200 Amperes maximum. The control circuitry also requires 120 VAC, single-phase, 50/60 Hz service at 20 Amperes maximum.

2.2.2. Cable Routing

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

2.2.3. KCTS Connections

Make appropriate connections inside the KCTS to the terminals labeled "0", "208" or "240," and "GND." Connect the supplied 120 VAC control circuit power cord to the three prong connector located on the rear of the KCTS.



3. Operation



NOTE: See separate instructions for the comparator.

3.1. Description of Front Panel Controls and Indicators

3.1.1. Power Switch

This switch is a combination switch/circuit breaker/indicator for the 120 VAC **control** circuitry.

3.1.2. TEST CURRENT ON Push-button

This push-button applies power to the **loading** circuitry. The red lamp below this push-button is lit when the loading circuitry is energized.

3.1.3. TEST CURRENT OFF Push-button

This push-button is used to de-energize the **loading** circuitry.

3.1.4. 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 Amperes.

3.1.5. MODE Switch

This switch selects the testing mode. The SELF TEST position (the CURRENT select switch must be at 3000D) selects the One-to-One test mode such that the precision transformer and comparator can be checked.

3.1.6. CURRENT Switch

This switch 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 the following table.

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

3.1.7. TEST CURRENT—COARSE

The "joystick" controls the motorized variac and provides coarse control of the test current.

3.1.8. TEST CURRENT—FINE

This manual variac provides fine control of the test current.

3.1.9. READY Lamp

The amber lamp located near the joystick is lit when both the motorized variac and the fine control variac are at zero—indicating that the loading circuitry is "ready" to be energized.

3.1.10. TEST CURRENT ON Lamp

The red lamp located between the ON and OFF push-buttons is lit when the loading circuit has been energized by pressing the ON push-button. For safety, this lamp will not light (and the loading circuit will not be energized) unless both coarse and fine variacs are at zero.

3.1.11. Comparator Power Switch

Power to the comparator is controlled through the main KCTS power switch. Thus, the comparator power switch can be left in the ON position all the time.

3.2. Description of Other Controls

Note: *Open the doors by pulling up on the handle; then rotate the handle 90° CCW.*

3.2.1. 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, pushing the HOLD button on the comparator causes automatic "run-down" of the motorized (coarse) variac. 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 variac must be returned to zero through use of the joystick.

3.2.2. CIRCUIT BREAKERS

Located behind the lower, front, right-hand door of the KCTS are two circuit breakers with the following functions:

- The 100 Ampere breaker protects the input to the KCTS. Even though the breaker is rated at 100 Amperes, we require that the main power supply to the KCTS be 200 Ampere service to ensure that the KCTS has an adequate supply for testing high current transformers.
- The 2 Ampere RE-CIRK-IT breaker protects the One-to-One supply transformer.

3.3. Operating Procedure

3.3.1. Connection of the Transformer-Under-Test (TUT)



- a) 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.
- b) Connect the primary of the transformer between the appropriate terminal for the range desired (A, B, C, or D) and the \pm terminal.
- c) 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.

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 SO AS 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 an included Type KATC-C Comparator. If your KCTS has a Type KATC-C1 Comparator, refer to the instruction manual for that comparator (included) for information on any differences in operation.

- a) Turn the KCTS and KATC power switches to ON.

These switches can be left on throughout the working day.

- b) Set the MODE switch to NORMAL.
- c) 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.
- d) Double-check that the CURRENT switch has been properly set to match the transformer-under-test.
- e) Check to see that the amber light is lit. If not, set the coarse and fine control variacs to zero. The loading circuitry cannot be energized until the amber lamp is lit (both variacs at zero).
- f) Press the ON (TEST CURRENT) push-button. The RED light should come on to indicate that the loading circuit is energized.
- g) Adjust the FINE control variac until the comparator gives a reading, or until the variac is approximately one-half of the way through its full range of travel, whichever comes first.

As the FINE control variac 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 Amperes 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 TRANSFORMER CONNECTIONS WHILE THE LOADING CIRCUIT IS ENERGIZED.

- h) Briefly press the "joystick" up for COARSE control while watching the digital ammeter on the comparator. **You should "jog" this control in small increments and then wait for the comparator to display**

a new reading. As the comparator displays a reading, take a brief moment to look at it and ensure that the values are close to what would be expected. In other words, if the ratio error is off by a substantial amount, this might be an indication that the wrong current has been selected on the KCTS. Continue increasing the test current until it is just below the desired value.

WARNING: When increasing test current with the COARSE control, do it *slowly* in small increments. To do otherwise can result in KCTS component damage caused by excessive test current or by excessive rate of current change.

- i) Adjust the FINE control variac to give the final test current value.
- j) After the readings stabilize, press HOLD on the comparator. If AUTO RUNDOWN has been selected, the motorized variac will automatically return to zero.

If the motorized variac does not automatically return to zero you will need to use the joystick to run the variac down. See the section on the AUTO RUNDOWN Switch, earlier in this manual, for more information on this feature.

- k) Return the FINE control variac to zero.
- l) Record the comparator readings or, if the KATC comparator includes a printer or RS-232C port, the results may be printed, or sent to a computer, by pressing the HOLD push-button again (PRINT button on KATC-C1)
- m) Press RESET on the comparator to prepare for the next measurement.
- n) Press OFF (TEST CURRENT) after all measurements on a given transformer are complete.

If excessive error current exists during the measurement, such as would be caused by wrong polarity or wrong ratio, the comparator will automatically de-energize the loading circuitry and sound an alarm. If this occurs, correct the condition, press RESET, and proceed.

4. Maintenance

4.1. Knopp One-to-One Test

In order 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:

- a) Remove all connections from the terminals on the left panel of the KCTS.
- b) Set the MODE selector to SELF TEST.
- c) Set the CURRENT switch to 3000D.
- d) Press the POWER switch to ON. **(It is *not* necessary to Press the ON (TEST CURRENT) push-button).** Current will be available when POWER is turned on.
- e) Adjust the FINE control variac until the comparator gives a reading. The COARSE variac is not used during this test.

The results should agree with the One-to-One data originally supplied with the equipment to within ± 1.0 minute and $\pm 0.01\%$ on phase angle and ratio error, respectively.

5. **Warranty**

The Knopp Type KCTS-8000 Current Transformer Test System is warranted against defects in materials and workmanship for a period of **ONE YEAR**.

If the KCTS-8000 does not perform in accordance with stated operating specifications during the warranty period, necessary parts and assistance will be supplied under warranty to restore the equipment to service.

Normal service is accomplished through telephone conversation with the Knopp Engineering Department. The Knopp Engineering Department can be contacted by telephoning (800) 227-1848 (toll-free) or (510) 653-1661 (collect).

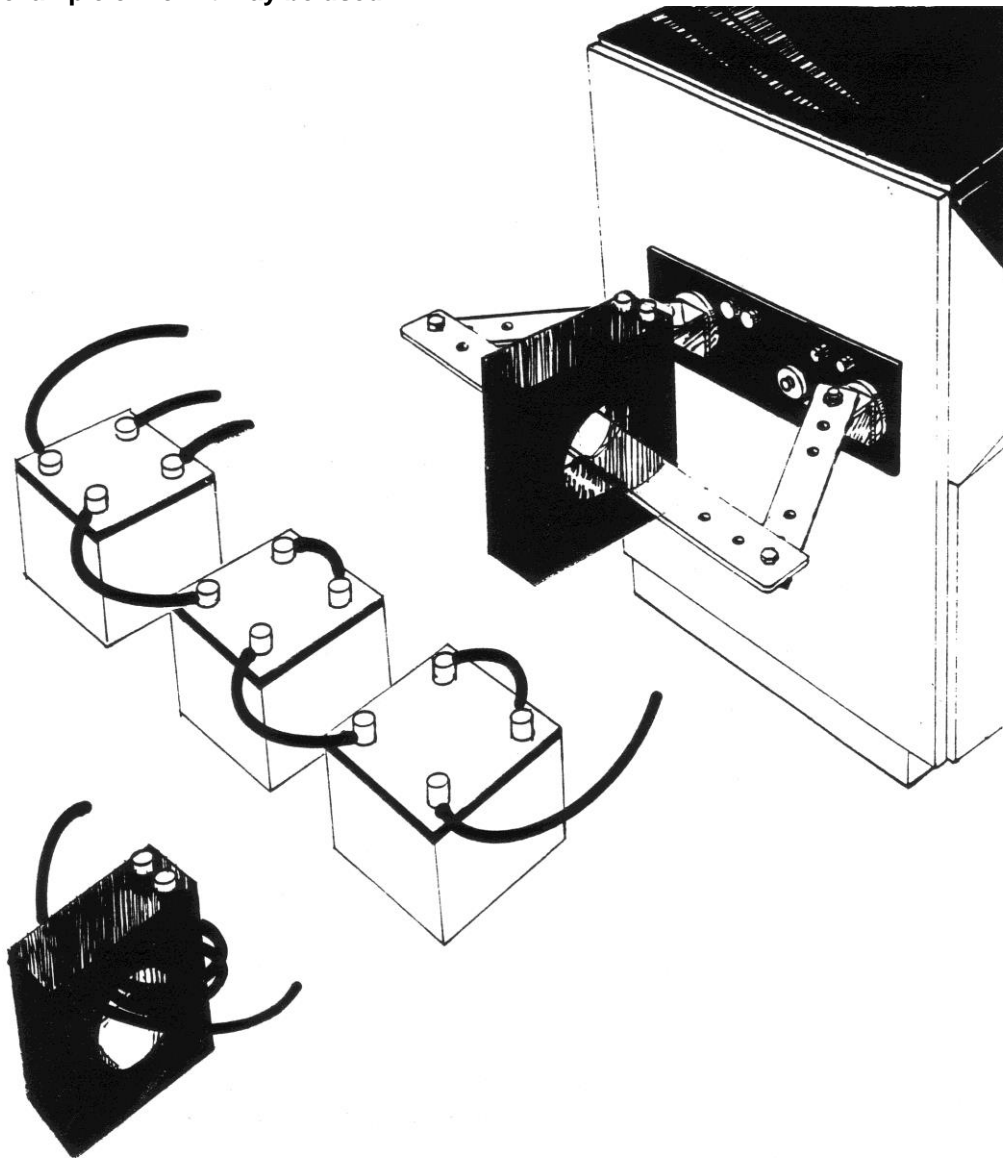
Parts are shipped by overnight carrier.

6. Cable and Hardware Kit Option (Installed 10/15)

This option consists of various cables and bus bar 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:



7. Demagnetization Circuit Option

A demagnetizing circuit is an optional feature of the KCTS. This feature can be used to demagnetize any transformer which is suspected of being magnetized. The feature consists of the Demag Ammeter, Demag/Normal Switch, and Demag Variac. All three of these components are mounted above the KATC-C Automatic Comparator on the right-hand side of the KCTS. Operation of the demagnetization feature is as follows:



- a) Connect the transformer to be demagnetized to the KCTS as if a normal accuracy test were to be performed.
- b) Set the **Demag/Normal** Switch to the DEMAG position.
- c) Set the **Burden** Switch to EXTERNAL. Make sure that the shorting link is present across the EXTERNAL BURDEN terminals.
- d) Set the **Mode** Switch to NORMAL.
- e) Make sure that the Demag variac is fully counterclockwise.
- f) Press the **ON** pushbutton to energize the current circuit.
- g) Use the FINE and, if necessary, COARSE current adjustments to obtain a 5 ampere reading on the TEST CURRENT display of the KATC-C (or C1) Comparator. *[The KATC-C may display an error message, such as "No Zero Crossing," during the adjustment of the test current. This is normal when performing a demagnetization. Disregard the error message.]*
- h) Turn the Demag variac slowly clockwise until the Demag Ammeter above the KATC-C reads 3 amperes. Maintain 5 amperes on the KATC-C (or C1) display by using the FINE and COARSE current adjustments. ***[Note that it may not be possible to get 3 amperes on the Demag Ammeter. For some transformer designs, there may be NO indication at all on this meter. In this case, turn the Demag Variac fully clockwise to the end of travel.]***

- i) Return the Demag Variac counterclockwise to zero.
- j) Return the FINE and COARSE current adjustments to zero.
- k) Press the OFF pushbutton to de-energize the current circuit. Turn the **Demag/Normal** switch to NORMAL. This completes the demagnetization.

This procedure should be sufficient to demagnetize virtually all transformers.

NOTE

The demagnetization circuit should only be energized for 10 to 15 seconds at a time. The circuit was not designed for continuous operation.

8. USING THE KATC-C1 FOR TESTING TO LESS THAN 1% CURRENT

The following allows testing to 0.8% of the test current

- a. Set the "REFERENCE TRANSFORMER" switch to 5A.
- b. Set the "TRANSFORMER UNDER TEST" switch to 1A.
- c. On the Knopp KCTS Testing System, choose a value on the "CURRENT" switch that is one fifth (1/5) of the primary of the TUT. For example if the TUT is a 200:5, choose 40 on the "CURRENT" switch.

9. CALIBRATION DATA FOR KCTS-8000 PRECISION TRANSFORMER

See the following three pages.

TABLE 1

PRECISION CURRENT TRANSFORMER
60 HERTZ CALIBRATION DATA ON
TYPE KCTS-8000, SERIAL NUMBER: 1512892
September 12, 2016

BURDEN: KNOPP TYPE KATC-C COMPARATOR

Current Selector Positions marked with a dagger (†)
are the ranges used for the Calibration Data.

<i>Ampere-Turn Value of Internal Standard Current Transformer at 100% Current</i>	<i>Current Selector Position</i>	<i>Percent Current</i>	<i>Calibration of Internal Standard Current Transformer</i>	
			<i>Phase Angle (±) Minutes</i>	<i>Ratio Correction Factor</i>
600	120C, 600D†	200%	+ 0.05	0.99997
		‡100%	+ 0.09	0.99999
		10%	- 0.06	1.00001
625	5A, 25B†, 125C	200%	+ 0.10	1.00000
		100%	+ 0.05	1.00000
		10%	- 0.01	1.00002
750	30B, 150C, 750D†	200%	- 0.01	0.99996
		100%	+ 0.10	0.99998
		10%	+ 0.01	1.00001
800	160C, 800D†	200%	- 0.55	0.99972
		100%	+ 0.11	0.99993
		10%	+ 0.18	1.00001
1000	40B, 200C, 1000D†	200%	- 0.02	0.99994
		100%	+ 0.10	0.99997
		10%	+ 0.04	1.00000
1200	1200D†	200%	+ 0.08	0.99999
		‡100%	+ 0.06	1.00000
		10%	- 0.11	1.00002
1250	10A, 50B, 250C†	200%	+ 0.06	0.99995
		100%	+ 0.07	1.00000
		10%	- 0.05	1.00003

<i>Ampere–Turn Value of Internal Standard Current Transformer at 100% Current</i>	<i>Current Selector Position</i>	<i>Percent Current</i>	<i>Calibration of Internal Standard Current Transformer</i>	
			<i>Phase Angle (±) Minutes</i>	<i>Ratio Correction Factor</i>
1500	60B, 300C, 1500D†	200%	+ 0.08	0.99998
		‡100%	+ 0.07	0.99999
		10%	– 0.10	1.00002
1800	1800D†	200%	+ 0.04	0.99998
		100%	+ 0.05	1.00000
		10%	– 0.05	1.00003
1875	15A, 75B†	200%	+ 0.15	0.99999
		100%	+ 0.07	0.99999
		10%	– 0.06	1.00000
2000	80B, 400C, 2000D†	200%	+ 0.09	0.99997
		‡100%	+ 0.12	0.99998
		10%	– 0.01	1.00000
2500	20A, 100B, 500C, 2500D†	200%	+ 0.06	0.99995
		‡100%	+ 0.11	0.99997
		10%	+ 0.00	0.99999
3000	3000D†	200%	+ 0.04	0.99993
		‡100%	+ 0.12	0.99996
		10%	+ 0.01	0.99998
4000	4000D†	200%	– 0.00	0.99992
		‡100%	+ 0.12	0.99995
		10%	+ 0.04	0.99997
5000	5000D†	‡100%	+ 0.11	0.99993
		10%	+ 0.05	0.99997
6000	6000D†	100%	+ 0.03	1.00006
		10%	– 0.47	1.00006
7500	7500D†	100%	+ 0.05	1.00007
		10%	– 0.31	1.00000
8000	8000D†	100%	+ 0.12	1.00024
		10%	– 0.23	1.00002

TABLE II

60 HERTZ ONE-TO-ONE DATA

TYPE KCTS-8000, SERIAL NUMBER: 1512892
PRECISION CURRENT TRANSFORMER

BURDEN: KNOPP TYPE KATC-C COMPARATOR

<i>Applied Current</i>	<i>Phase Angle (±) Minutes</i>	<i>Ratio Correction Factor</i>
10	- 0.02	1.00000
9	- 0.02	1.00000
7	- 0.01	1.00000
5	0.00	1.00000
2	+ 0.01	1.00000
1	+ 0.01	1.00000
0.5	+ 0.03	1.00000

All results are certified to be correct to within $\pm 0.025\%$ on ratio and ± 2 minutes on phase angle. The results marked with a double dagger (‡) are directly traceable to National Institute of Standards and Technology (NIST) by Knopp Reference Standard Type P-5000, Serial Number 8040571 (NIST Certificate Number 722/223941, Order Number 3659, dated 14 October 1980). Calibration data on the 6000D, 7500D, and 8000D ranges are referenced to Knopp Reference Standard – a Knopp Precision CT.

KNOPP INC.
1307 – 66th Street
Emeryville, CA 94608