

Megger



User's Guide
For
MCT- 1600
Megger Current Transformer Test Set

Megger

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Safety Precautions

Please read this user's guide before operating the instrument. Read and understand all safety precautions and operation instructions before attempting to use this unit. The purpose of this equipment is limited to use as described in this user's guide. Do not use the equipment or its accessories with any device other than specifically described. Should a situation arise that is not covered in the general or specific safety precaution please contact Megger regional representative or Megger, Dallas Texas.

The equipment under test must be de-energized and totally isolated from the electrical system before test connections are made. The test set and specimen to which it is connected are a possible source of electric shock hazard. Persons actually engaged in the test must stand clear of all parts of the test circuit and connections, unless the test set is de-energized. Persons not directly involved with the work must be kept away from test activities by suitable barriers, barricades or warnings.

Every effort has been made to point out the proper procedures and precautions to be followed by the user in operating this equipment. It is not possible to foresee every hazard which may occur in the various applications of this equipment. It is therefore essential that the user, in addition to following the safety rules, also carefully consider all safety aspects of the test before proceeding.

- Safety is the responsibility of the user.
- Misuse of this equipment can be extremely dangerous.
- Never connect the test set to energized equipment
- Ground connection should be made first and removed last. Any interruption of the grounding connection can create an electrical shock hazard.
- Always disconnect test leads from the power equipment before attempting to disconnect them at the test set.
- Do not use the test set in an explosive atmosphere.
- The instrument must only be used by suitably trained and competent persons.
- Observe all safety warnings marked on the equipment.
- Corrective maintenance must only be performed by qualified personnel who are familiar with the construction and operation of the test set and hazards involved.
- Refer to IEEE 510 "IEEE Recommended practices for safety in High-Voltage and High-Power testing", for information.

Note: Make sure all connections are made properly to avoid accidental opening of the current transformer secondary which can lead to damage of the transformer under test.

Input Power precautions

The instrument operates from a single phase power source. It has a three wire power cord and requires a two pole, three terminal (live, neutral and ground) type connector. The voltage to ground from live pole of the power source must be within the following operating voltage.
95-265 V 50/60 Hz

Before making connection to the power source, determine that instrument rating matches the voltage of the power source. The power input plug must be inserted only into a mating receptacle with a ground contact. Do not bypass the grounding connection. Any interruption of the grounding connection can create an electric shock hazard. Determine that the receptacle is properly wired before inserting the plug.

The control circuit of the instrument is protected by 15 A breaker.

Warning and Caution Notices

Warning and caution notices are used throughout this manual where applicable and should be strictly observed. These notices appear in the format shown below and are defined as follows:

WARNING

Warning, as used in this manual, is defined as a condition or practice which could result in personal injury or loss of life.

CAUTION

Caution, as used in this manual, is defined as a condition or practice which could result in damage to or destruction of the equipment or apparatus under test.

Introduction

Megger MCT 1600 test is a lightweight, portable unit for shop and field testing of current transformers using IEEE C57.13.1 method. The unit performs excitation, ratio and polarity test by providing a variable output voltage up to 1600 V AC. It will calculate the rated knee point in compliance with IEEE C57.13.1, IEC 60044-1, and IEC 60044-6. MCT 1600 test set provides the flexibility of both automatic as well as manual testing. It utilizes the latest DSP technology for testing single and multi-ratio CT's. The test set can also perform DC insulation resistance test on CT's to verify the condition of winding to winding and winding to ground insulation.

All three, excitation, ratio and polarity tests can be performed with same connection settings without changing any leads. Current Transformers can be tested in their equipment configuration, such as being mounted in transformers, oil circuit breakers or switchgear. This eliminates the need to remove CT's from switchgear. It is necessary for the equipment to be deenergized and totally isolated from the electrical system prior to testing.

MCT 1600 performs the tests on CT's to assure that CT's are of marked ratio and polarity and would perform satisfactorily as designed once put in service. Excitation and burden test ensures that CT's are of correct accuracy rating and is capable of supplying the known current at stated accuracy. The results obtained from ratio, polarity and excitation tests can be compared with name plate data and manufacturer's curve to verify the accuracy of the CT under test.

The results of the test are displayed on 6.5 inch daylight readable color LCD screen. Ratio and polarity test results can be read right off the screen without any need for calculations. Multiple saturation curves with knee points are shown on the same display for comparison and analysis purpose.

MCT 1600 can be operated either stand alone or remotely through computer using Power DB lite software. All the test results can either be stored to unit's internal memory or can be transferred to computer using a thumb drive, through one of the available USB port on the unit.

Key Features include:

- User friendly operation, simple connections
- One button automated testing
- CT ratio knee point saturation, polarity and phase deviation test
- Displays multiple instantaneous saturation curves with knee point
- Dual lead set, to minimize the effect of voltage drop in leads
- Variable 1600 VAC saturation test voltage
- Inbuilt 1000V DC Insulation tester
- Automatic and manual testing selectable
- Emergency stop button
- Automatically demagnetizes CT after testing
- Large , easy to read, color LCD screen
- Qwerty keypad for fast data entry
- “Save and print later” with USB stick
- Store up to 512 test results
- Power DB lite software for remote operation

Preparation for use

Receiving Instructions

Contents of MCT 1600 kit

Item (Qty.)	Cat No.
MCT 1600 Current Transformer Saturation, Ratio and Polarity Test set	MCT1600
Line cord, North America (1ea.)	620000
Line cord, International color coded wire (1ea.)	15065
Test Lead, H1 and H2 40ft. (1ea.)	620149
Test Lead, X black, 20ft., (1ea.)	620149
Test Lead, X red, 20ft., (1ea)	620150
Gnd lead, green with yellow, with large ground clip, 20ft., (1ea)	620151
Large Test clip, red, 40mm opening, (1ea.)	640266
Large Test clip, black, 40mm opening, (1ea.)	640267
Alligator clip, red, 4.1 mm, (1ea.)	684006
Alligator clip, black, 4.1 mm, (1ea.)	684007
Soft side lead case	684035
USB memory stick	830029
Instruction book	750025
Power DB Lite	544342

Check the equipment received against the packing list to ensure that all the materials are present. Notify Megger of any shortages. Telephone 1-800-723 2861 and ask for Dallas customer service department.

Examine the instrument for damage received in transit. If damage is discovered, file a claim with the carrier at once and notify Megger or it's nearest authorized sales representative, giving a detailed description of the damage.

Assembly and Installation

MCT 1600 has been thoroughly tested and inspected to meet rigid specifications before being shipped. The unit is read for use without any need of assembly or any installation procedure. Follow the instructions in this manual to understand the controls and operations of the unit before setting it up for performing the tests.

Supply Voltage

Unit operates on a single phase AC power source .The input operating voltage should be between the following limits.

95-265 V 50-60 Hz 15A max.

Please refer to Input power precautions in safety section for detailed description of input power requirements.

Operating System

Unit works on VX Work's operating system.

Basic Theory

General

The purpose of this section is to explain the basic theory of the following tests and to guide the operator for making appropriate measurements with MCT 1600. Following tests can be performed by MCT 1600.

- Ratio test
- Polarity Test
- Excitation Test
- DC Insulation Resistance Test

Ratio Test

The ratio is defined as the number of turns in the secondary as compared to the number of turns in the primary.

The purpose of ratio test is to prove the ratio of the CT, is as specified and also to verify the ratio at different taps of a multi tap CT. The turns ratio is equivalent to the voltage ratio and can be expressed as:

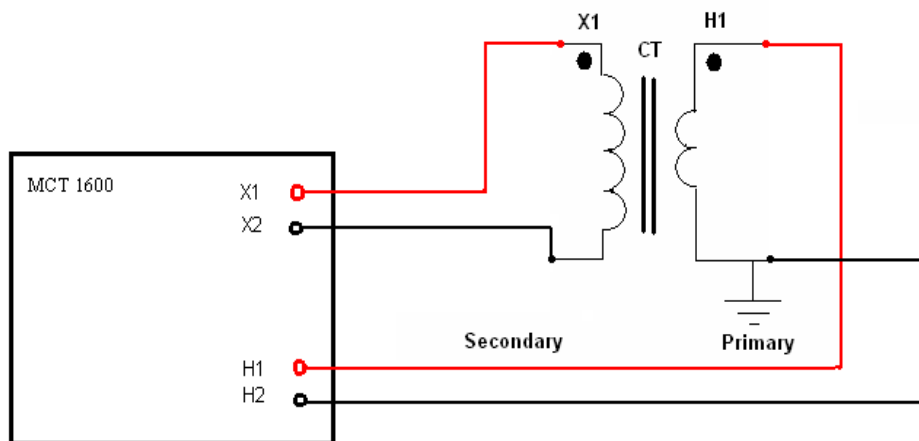
$$N2/N1=V2/V1$$

Where,

N2 and N1 are no. of turns of secondary and primary windings respectively

V2 and V1 are the secondary and primary side voltage readings respectively.

A suitable voltage, below saturation is applied to the secondary of the CT under test and primary side voltage is measured to calculate the turns ratio from above expression.

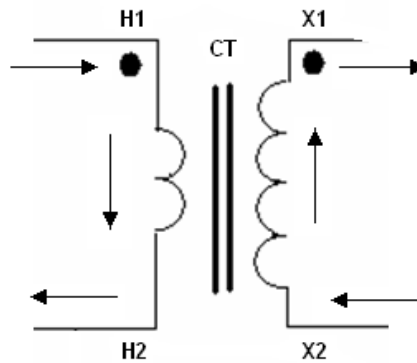


MCT 1600 performs the ratio test automatically by either selecting Saturation test or Ratio and polarity test. User can also select manual Ratio test by selecting manual option and controlling the secondary applied voltage.

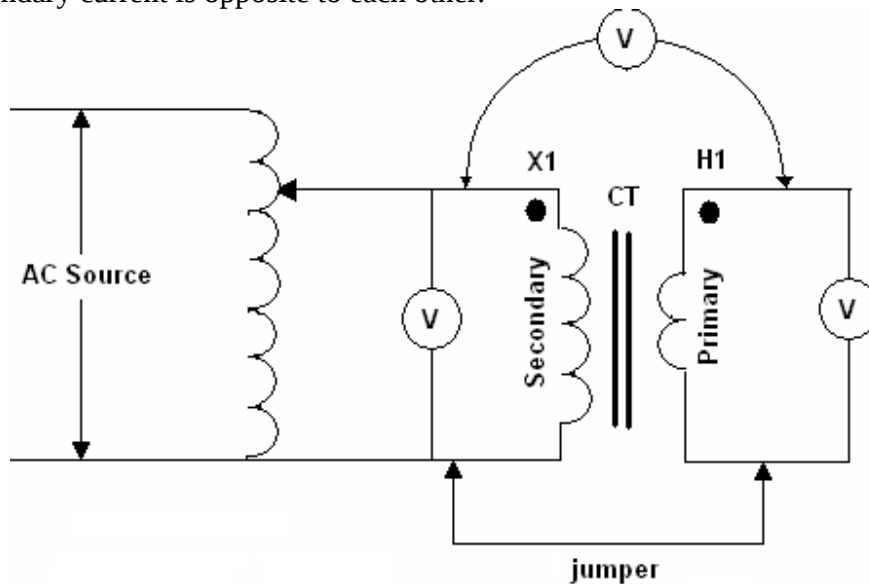
CAUTION

In the manual operation, do NOT apply the voltage high enough to the secondary of CT that would cause the CT to saturate; otherwise the readings won't be accurate.

The Polarity test proves that the predicted direction of secondary CT current (leaving) is correct for a given direction of primary current (entering).



Polarity marks designate the relative instantaneous directions of the currents. At the same instant of time that the primary current is entering the primary terminal the corresponding secondary current is leaving the similarly marked secondary terminal. A CT under test is supposed to have correct polarity if instantaneous current direction for primary and secondary current is opposite to each other.



Same connection settings as for Ratio test can be used for performing Polarity test. The two non polarity marks are shorted together internally and potential is measured across the two polarity mark points. For correct polarity, primary winding voltage will be in-phase with secondary winding voltage, with a phase angle difference of zero or close to that. A CT with reverse polarity would read the sum of the two primary and secondary voltages indicating a phase difference of approximately 180 degrees. MCT 1600

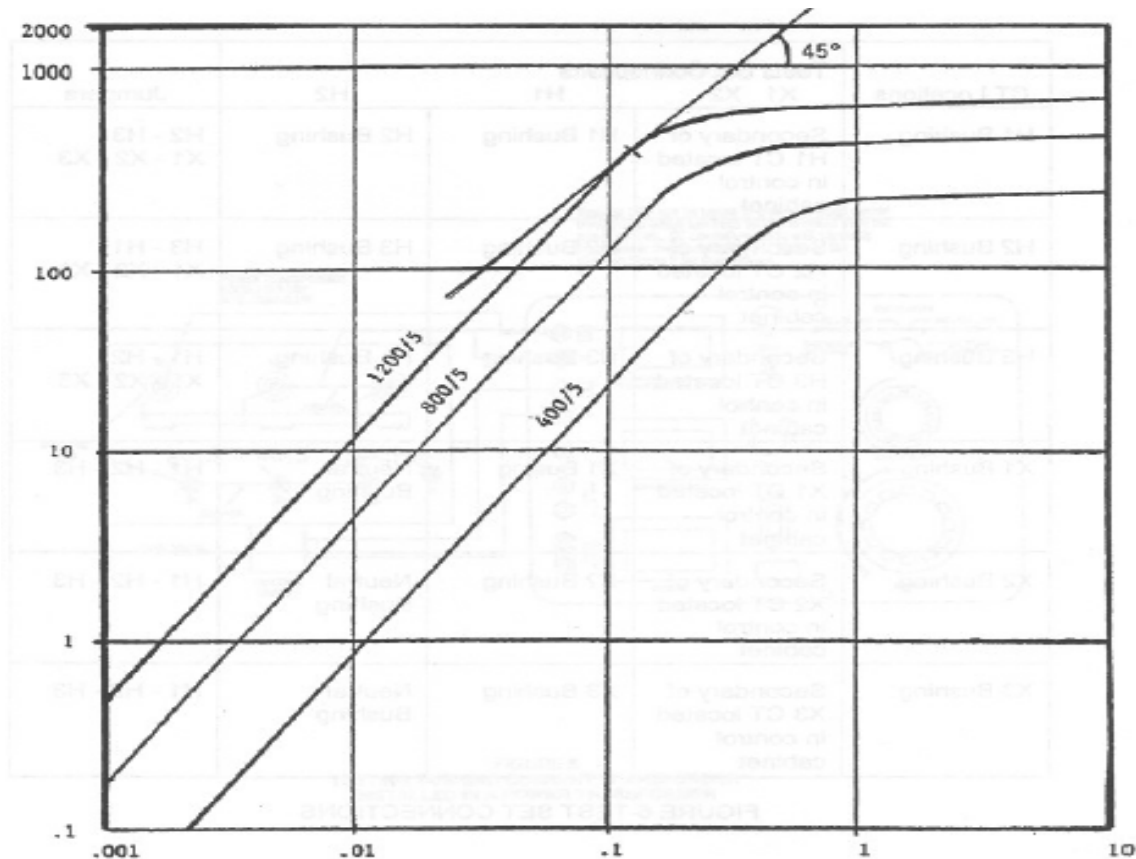
performs this test in automated fashion and display the result as either Polarity correct or incorrect.

Excitation Test

IEEE defines the saturation as “the point where the tangent is at 45 degrees to the secondary exciting amperes”. Also known as “knee” point.

This test verifies that the CT is of correct accuracy rating, has no shorted turns in the CT and no short circuits are present in the primary or secondary windings of the CT under test.

A typical excitation curve for C class current transformer is shown in figure below.



the points where current jumps up for a small increase of voltage; is very important for comparison of curves with published curves or similar CT curves.

MCT 1600 plots the saturation curve on the LCD display screen. Once a knee point is determined by the test set, it will also display the corresponding saturation voltage and saturation current on the display screen. Multiple CT saturation curves can be plotted on the same screen either for multi taps or for comparison of similar type CT's. The excitation test results should be compared with published manufacturer's data or previous recordings to determine any deviations from previously obtained curves.

The unit automatically demagnetizes the CT after performing the saturation test by slowing ramping down the secondary voltage all the way back to Zero. It is advisable to

demagnetize the CT before performing any test that requires accurate measurements. Please refer to the section of CT Demagnetization for details.

Insulation Resistance Test

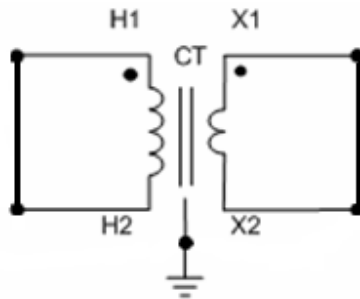
The insulation between the windings and winding to ground should be checked while performing a comprehensive CT test. The test set has inbuilt 1kV DC insulation tester that is used for measurement of insulation resistance.

The following connection needs to be made before performing an Insulation test on CT.

Short the primary winding of the CT under test by shorting H1 and H2.

Short the secondary winding of the CT under test by shorting X1 and X2

Remove the neutral ground and isolate the CT from any associated burden



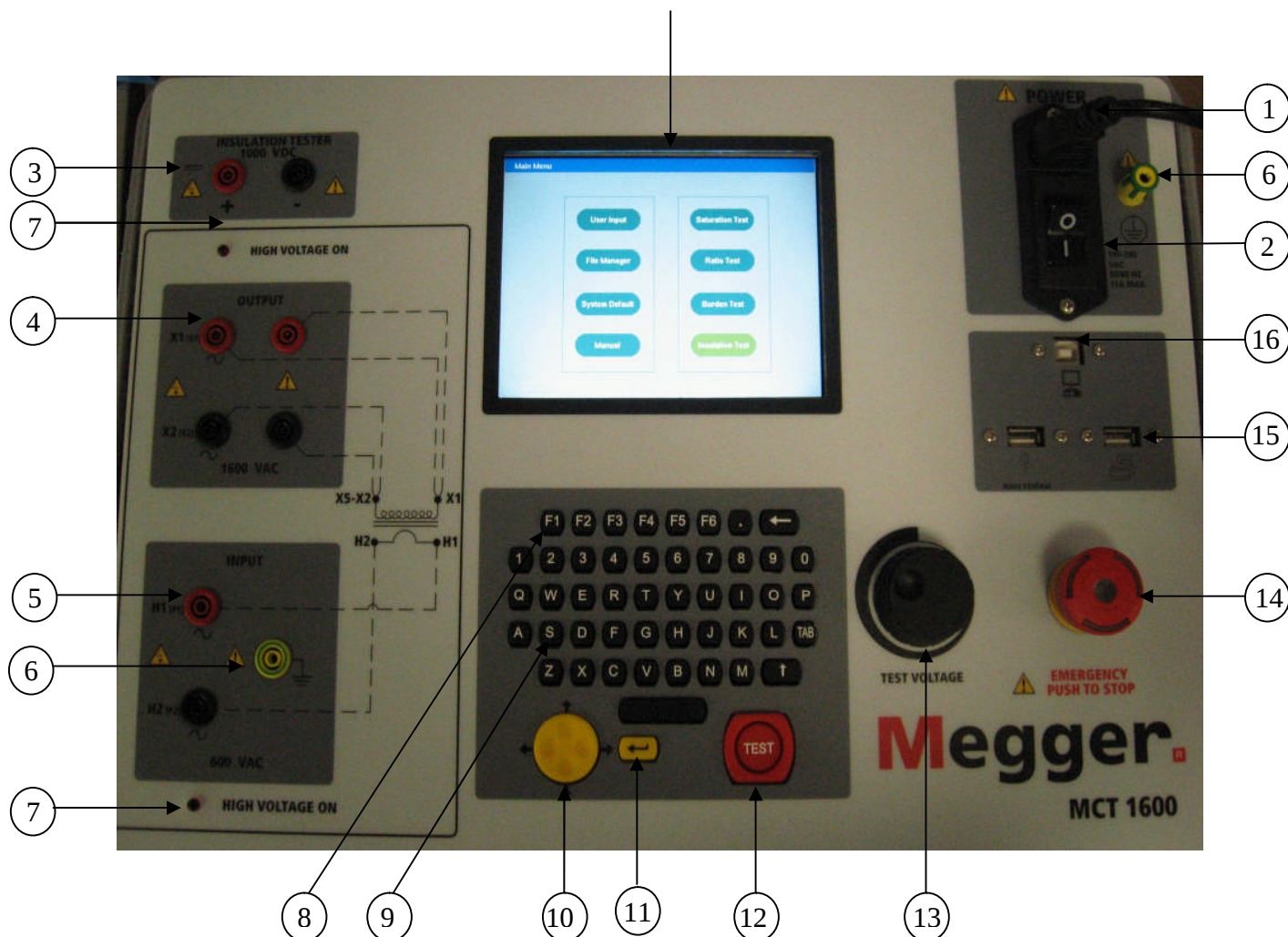
Two tests are performed to determine the condition of the insulation of the CT under test.

- Ground the shorted secondary winding and connect one lead from Insulation test set to primary winding and another to ground.
- Ground the shorted primary winding and connect one lead from Insulation test set to secondary winding and another to ground.

The DC test voltage is automatically ramped up slowly and the insulation reading in (M) ohms is displayed on the LCD display screen in digital format. The measured values should be compared with similar readings obtained previously and a large deviation should call for further investigation. Any reading in M ohms is considered to be a good insulation. The minimum insulation resistance that is accepted is 1 M ohms. More than a no., it's the trending of insulation test results that gives the true condition of CT insulation.

Insulation readings are greatly affected by the temperature. Should a reading be compared to previously taken readings, proper correction factors need to be applied, if taken under different temperature conditions before drawing any conclusion. Insulation resistance readings should remain fairly constant over a period of time. A sharp dip in trending of insulation resistance values, point towards insulation degradation and further investigation is warranted to diagnose the problem.

Description of Controls and Indicators



- | | | | |
|---|----------------------------|----|--------------------------|
| 1 | Input AC Power | 10 | Navigation/Scroll button |
| 2 | ON/OFF | 11 | Enter Button |
| 3 | Insulation Tester output | 12 | TEST button |
| 4 | Connection for X winding | 13 | Manual voltage controls |
| 5 | Connection for H Winding | 14 | Emergency stop button |
| 6 | Ground connections | 15 | USB storage (2) |
| 7 | High voltage ON indicators | 16 | Ethernet port |
| 8 | Function controls | 17 | LCD display screen |
| 9 | QWERTY keypad | | |

Connections:

1. Input power: Receptacle for connecting the test set to an AC power source. Rating for voltage input is 95-265 V, 50/60 Hz.
2. ON/OFF: Two pole, magnetic main circuit breaker controls the power to the test set and provide short circuit and overload protection.

CAUTION

Caution symbols are appropriately marked on the unit for input and output terminals. Follow the symbols to prevent any accidental electric shock.

3. Insulation Tester: 1000V DC output for performing Insulation test. Outputs are marked as positive (red) and negative (blue).
4. X winding connection: Dual point connection to X winding of the current transformer under test. A maximum of 1600V AC is available from this output.
5. H winding Connection: Connection to H winding of the current transformer. H1, H2 connections are used to measure the voltage across the H winding during test operation.

WARNING

Appropriate warning symbols are marked on the unit, indicative of possible source of electric shock. Follow the symbols while operating the unit.

6. Ground Connection: This wing nut is used to connect the test set to station ground.

Indicators:

7. High Voltage indicators: Red color LED's indicating the presence of high voltage at the outputs of the unit.

WARNING

High voltage is present at the X1, X2 output terminals of the unit whenever the two red color LED lights are flashing.

Controls:

8. Function controls: F1 to F6 function keys are used to select different options in menu screen.
 - F1- Back to test /Load test /Update software/Select voltage and current
 - F2- Delete file/Range selection/Tap ratio
 - F3- Rename the File
 - F4- Copy the File to USB/Print
 - F5- Save results
 - F6- Main menu

9. QWERTY Keypad: It is used to enter alpha numeric data for test report. Function buttons are used to access different control options in various test screens.
10. Navigation Button: These arrow keys are used to scroll sideways and up/down for accessing different menu options.
11. Enter: This is used to activate a particular selection in the menu options.
12. Test: This is used to initiate and terminate the testing.
13. Manual voltage controls: The potentiometer knob is used for manual control of output voltage from test set to the secondary of the CT. Press the knob for fast variation in voltage.
14. Emergency Stop Button: This red push button interrupts testing. When pressed, the switch is locked in OFF position. To reset the switch, turn the button in the direction indicated by the arrows.

Communication & Storage:

15. USB storage: Two USB ports are available for transfer of data from internal memory to any external memory device. User can connect optional printer to one of the USB port for printing of test results.
16. Ethernet port: Ethernet port is used for connection of unit to the computer for remote operation.

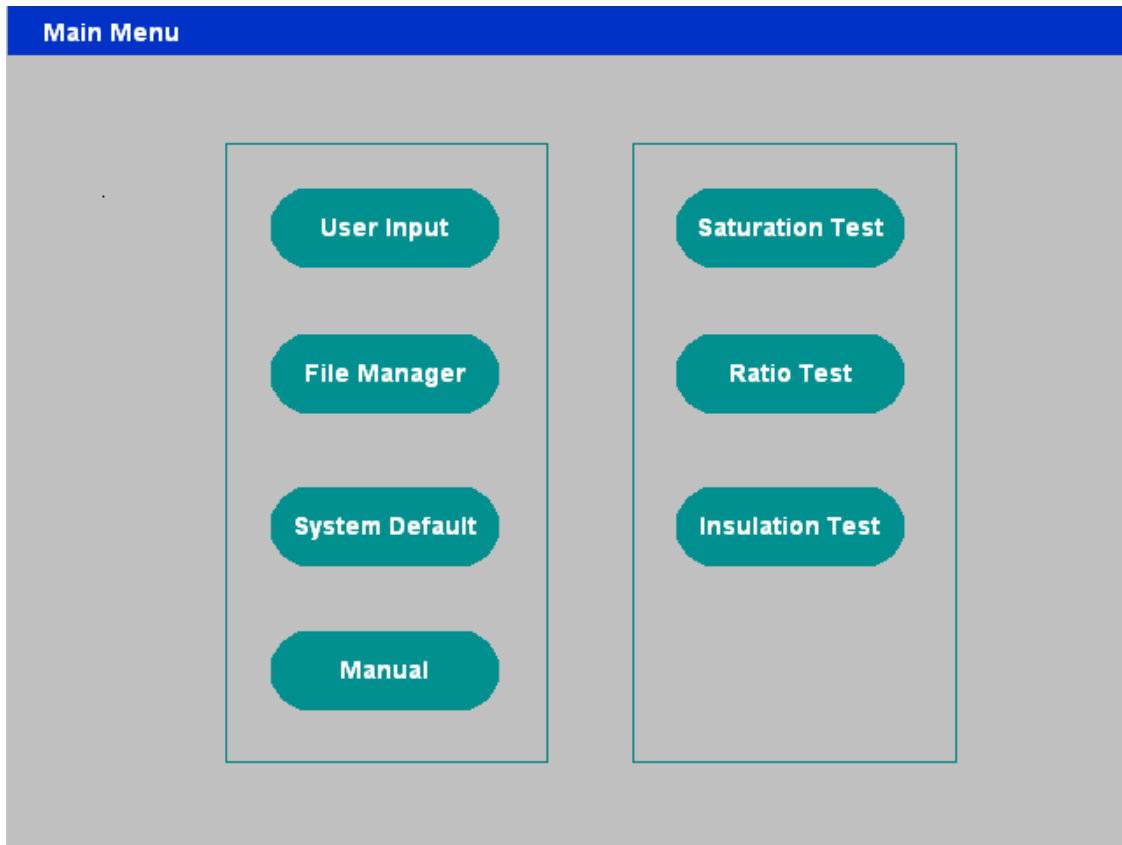
Display:

17. LCD display screen: The 6.5" large graphical display provides easy to read test results and CT saturation curve plots.

Operation and Controls

The MCT 1600 works on “VX Works” operating system. At the boot up of the test set, Main Menu screen will show up.

Main menu:



Main menu is the home screen of the test set. All the tests and settings for the unit can be accessed from this screen. With the help of navigation button and enter key one can select the desired operation. Following are the eight user selectable operation.

User Input
File Manager
System Default
Manual

Saturation Test
Ratio test
Insulation Test

Refer to description of each menu below for detailed information.

User Input:

User input screen is used to fill out the CT serial no., name plate data and test report information. Two pages are used for complete CT information. Toggle between the two pages of 'User Input' by the help of F2 function key.

CT ID:

User Input Frequency: 60 Hz CT_ID:

CT_ID Name Plate

CT_ID:

To save test results, CT_ID is required.
CT_ID is used as the file name.

Technician:

Company:

Station:

Location:

Position:

Phase:

Date / Time: 05/06/2008 15:24:21

F1 Back to Test F2 Change Page F5 Save Test F6 Main Menu

CT_ID page is used to fill out the optional testing information such as

- Technician name,
- Company information,
- Substation location,
- Position and phase of CT
- Other relevant testing data.

Note: Only CT id is required to save the test results.

Name Plate:

User Input		Frequency: 60 Hz	CT_ID:
CT_ID Name Plate			
Manufacturer:		Ratios: X1 - X2: : 0 X2 - X4: : 0 X1 - X3: : 0 X2 - X5: : 0 X1 - X4: : 0 X3 - X4: : 0 X1 - X5: : 0 X3 - X5: : 0 X2 - X3: : 0 X4 - X5: : 0 Humidity: Temperature:	
Serial No.:			
Type:			
Style:			
Voltage Rating:			
Accur. Class:			
Burden Rating:			
Insulation Rating:			
F1 Back to Test F2 Change Page		F5 Save Test F6 Main Menu	

Nameplate page is used to fill out the Name plate data of CT under test.

- **Manufacturer:** By using the tab button, place the cursor in this column and enter the manufacturer of the CT.
- **Serial No:** Fill CT serial no. from the nameplate of the CT under test.
- **Type:** Select the appropriate type of CT from available selection.
 - a) Bar Type
 - b) Window Solid Type
 - c) Window Split Core
- **Style:** The style of CT can be entered in this column.
- **Voltage rating:** Voltage rating can be obtained from CT nameplate.
- **Accuracy Class:** Select the CT accuracy class from available options.

a) C10	h) T10
b) C20	i) T20
c) C50	j) T50
d) C100	k) T100
e) C200	l) T200
f) C400	m) T400
g) C800	n) T800

- Burden Rating: Select the rated burden of the CT as either 1 Amp or 5 Amp.
- Insulation Rating: Select the insulation rating as either 500V or 1000V DC.
- Ratio: For a multi- tap CT, different tap ratios can be obtained from nameplate and can be entered in nameplate screen.
- Temperature & Humidity: If known, environmental conditions such as temp. and humidity can be entered.

Note: All the information in Nameplate screen is optional. It is not required to perform a test on CT. Only CT id is required for storage of results.

Function keys:

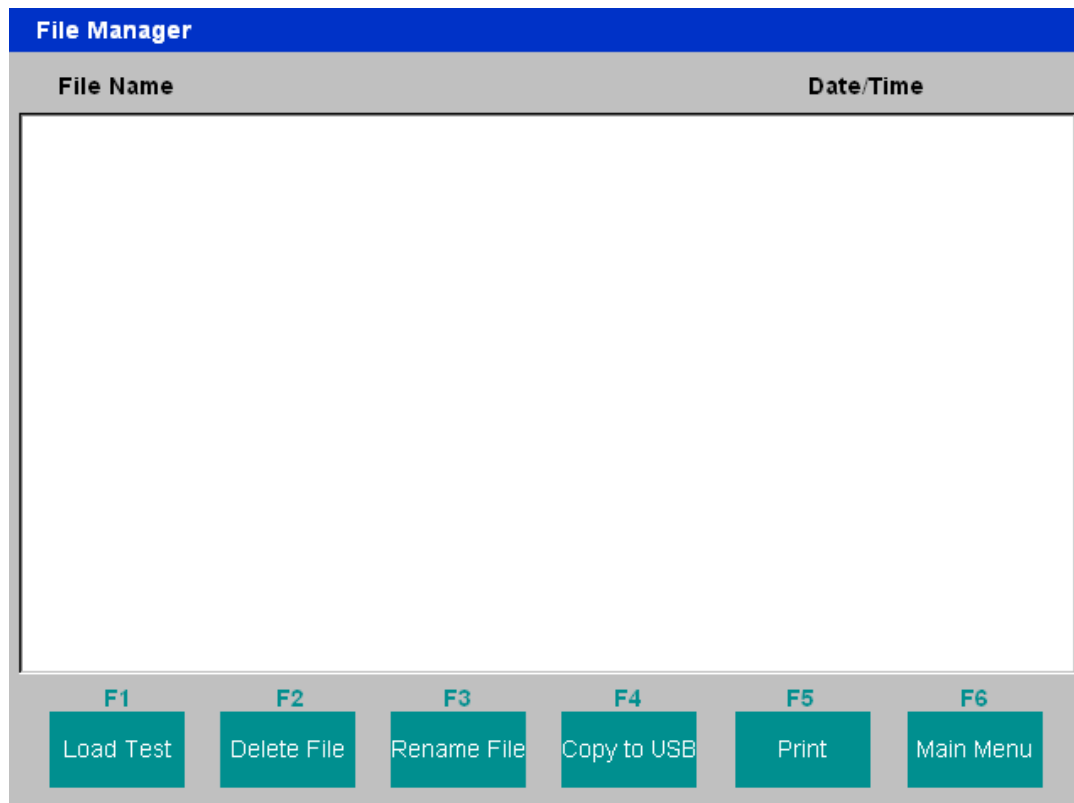
F1 Function: Hitting F1 function button would take user back to the previously selected test screen.

F2 Function: F2 function key is used to flip between the two pages (CT_ID and Name Plate) of 'User Input' menu.

F5 Function: This key would save the test results to internal memory of the test set with file name as CT id.

F6 Function: It is used to return back to the main menu or home screen.

File Manager:

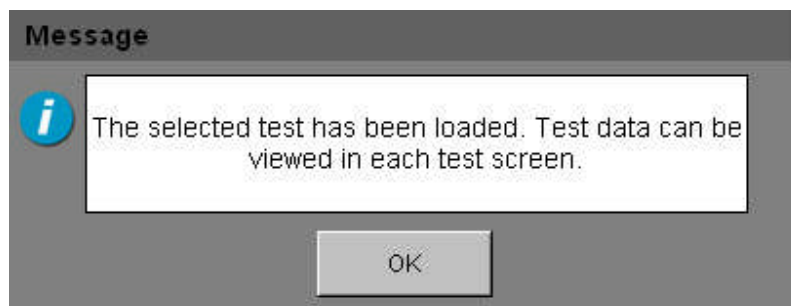


File manager screen is used to view and access the stored test results. All stored test results are displayed in alphabetical order along with date and time stampings. Test results are stored with the file name as CT id and extension as “.tst”. MCT 1600 test set can store up to 512 test results in it’s internal memory. Function buttons are used to recall, delete or transfer the test results.

Function keys:

F1 function: This key is used to load the test results on the MCT display screen.

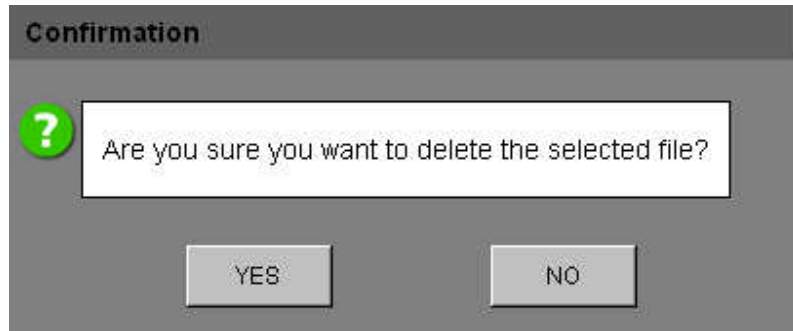
- Select the desired test results by highlighting it.
- Hit F1 function key.
- A message will pop up indicating that a particular test result has been loaded.



- The screen will go back to the main menu or home screen.
- Select the desired test to view the readings or curve.

F2 function: This key is used to delete the previously stored test results from internal memory of the unit.

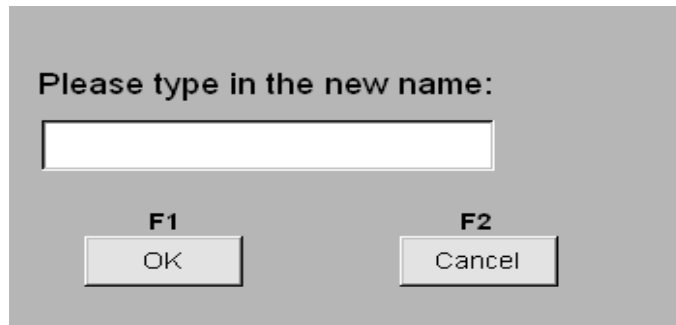
- Select the desired test to be deleted.
- Hit F2 function key.
- A window will come up for confirmation to delete the test result.



- Hit 'YES'.
- Test result is now deleted.

F3 function: This key is used to rename the already stored file.

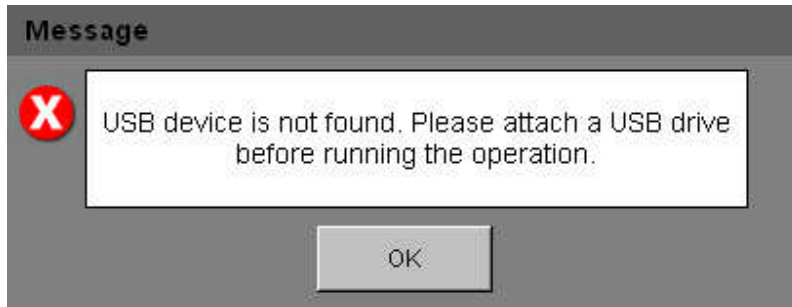
- Select the file to be renamed.
- Hit F3 function key.
- A window will come up with column to put a new file name. Enter the new file name.



- Hit OK.
- File name is now changed.

F4 function: This key is to copy the stored test results from internal memory to external memory device like USB stick.

- Select the file to be transferred.
- Hit F4 function key.
- The unit will try to detect the external memory device. If there is no memory stick, following message will come up.



- If external memory device is present, following message will be displayed, indicating that data has been copied to the external memory device.



- Hit Ok.

Note: Stored test results are copied NOT transferred to the external memory device. In order to free up the internal memory of the test set, user have to delete the test results.

F5 function: This key is used to print out the list of all stored test files inside the unit.

F6 function: This key is used to return back to main menu or home screen.

System Default:

System Default

Frequency:		System Properties
Secondary Current:		Unit Serial No.:
Measurement STD:		Software Version:
Date Format:		Firmware Version:
Time Format:		Hardware Version:
Date / Time:	11/07/2008 01:36:52	Language:
	Change Date/Time	Boot On Screen:
	IP Address	

F1 **F5** **F6**

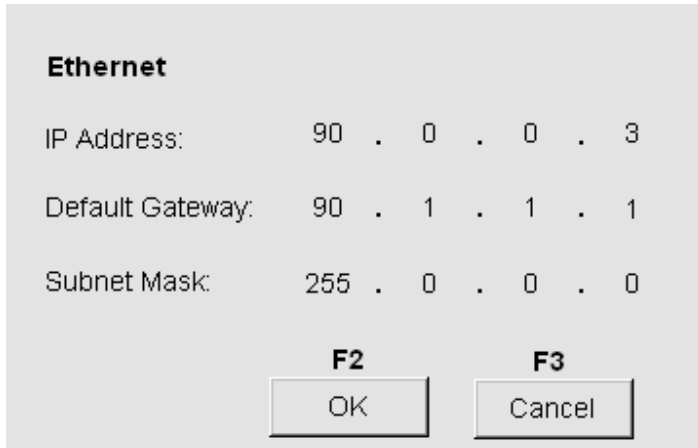
The default settings for MCT 1600 can be changed by accessing system default menu screen. This screen also provides the software and firmware version information along with serial no. of the unit.

- Frequency: Mains rated frequency 50 or 60 Hz.
- Secondary current: Rated secondary current at 1 Amp or 5 Amps.
- Measurement STD: Select the desired standard from the following ones.
 - a) ANSI 30
 - b) ANSI 45
 - c) IEC 60044-1
- Date Format: Indicates current date format. User can select any date format out of the following two.
 - a) Month/Day/Year
 - b) Day/Month/Year
- Time format: Select time format as 12 hours or 24 hours.
- Language: Select language from the following options:
 - a) English
 - b) Spanish
 - c) French
 - d) German
- Boot on screen: Select which screen should come up at the boot up of the test set.
 - a) Main Menu

b) Saturation Screen

Change Date/Time: This button would let user to change current date and time.

IP Address: This button will launch a window that will allow the user to set the IP Address.



The image shows a screenshot of an 'Ethernet' configuration window. It has a title bar 'Ethernet' in bold. Below the title bar, there are three rows of configuration fields: 'IP Address:', 'Default Gateway:', and 'Subnet Mask:'. Each row has a corresponding numerical value displayed to its right, separated by dots. The IP Address is 90 . 0 . 0 . 3. The Default Gateway is 90 . 1 . 1 . 1. The Subnet Mask is 255 . 0 . 0 . 0. At the bottom of the window, there are two buttons: 'OK' and 'Cancel'. Above the 'OK' button is the label 'F2' and above the 'Cancel' button is the label 'F3'.

Ethernet	
IP Address:	90 . 0 . 0 . 3
Default Gateway:	90 . 1 . 1 . 1
Subnet Mask:	255 . 0 . 0 . 0
F2 OK F3 Cancel	

Function Keys Ethernet:

F2: Hit F2 key to say displayed settings

F3: Hit the F3 key to Cancel

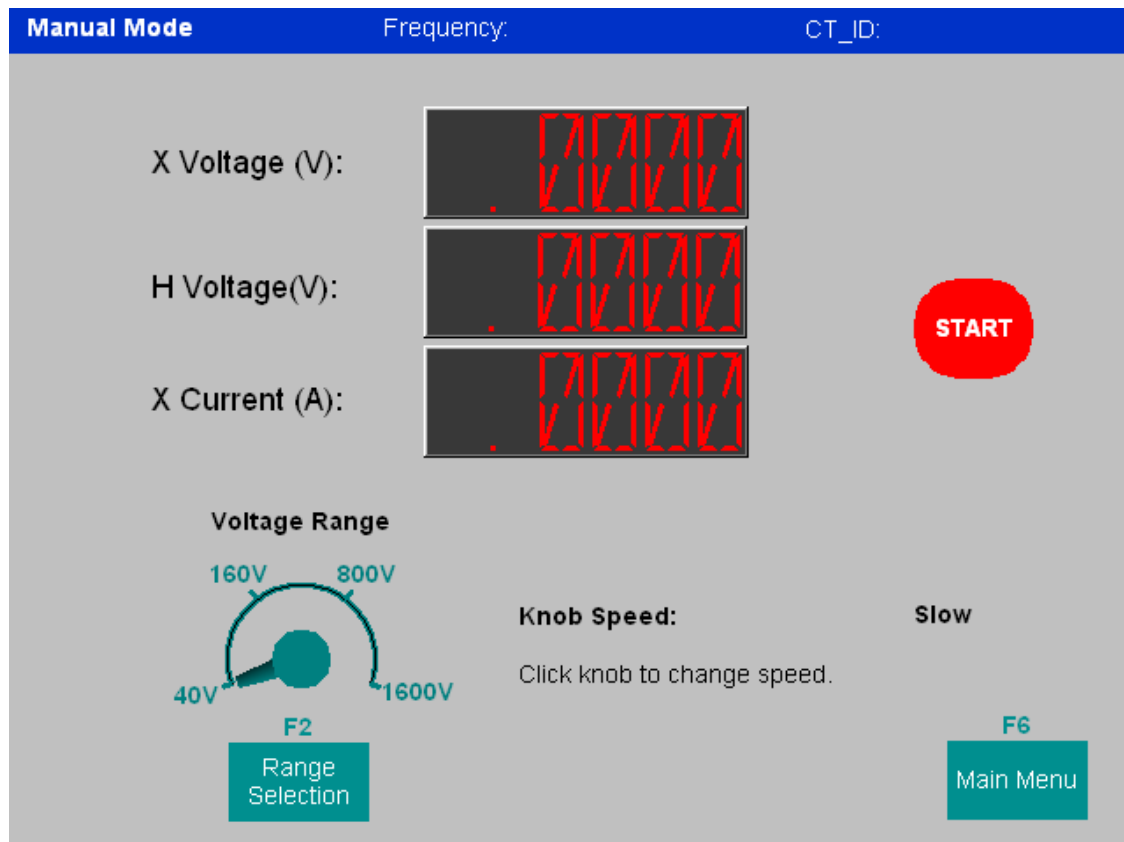
Function keys System Defaults:

F1 Function: Hit F1 key to update the software. Unit look for the latest software files in the external memory device connected to the USB port.

F5 Function: Hit F5 function key to save the settings on this screen.

F6 Function: This key is used to return back to main menu or home screen.

Manual:



MCT 1600 gives user the option of manual testing on current transformers. Manual screen is used for performing a manual test. In manual mode, manual voltage controls knob is used for application of test voltage to the secondary of CT under test.

Range Selection: Use F2 function key to select the desired secondary voltage range. User can select any one out of the four (40,160,800 and 1600V) available voltage ranges by repeatedly hitting F2 key.

Manual voltage controls: The test voltage knob on the front panel of the unit is used to apply a controlled secondary test voltage to the CT under test. The manual voltage controls is a free to rotate knob with no start/stop point. The default speed of knob is set to low. To increase the speed (medium/fast) press the knob and a higher voltage variation can be achieved for same rotation of the knob. Three steps (slow, medium and fast) are available for the voltage variations. To revert back to low speed press the knob again. Screen will display the current knob speed.

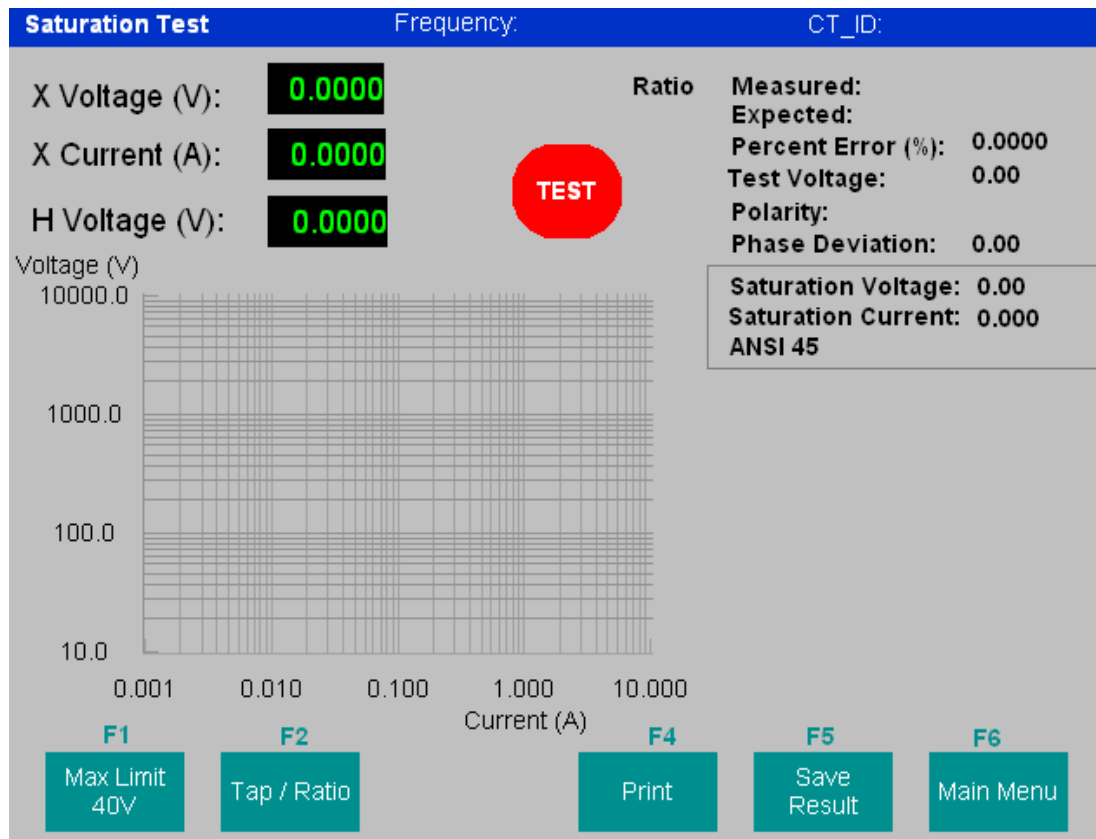
Secondary (X) Voltage: The applied secondary test voltage is displayed on the screen in digital readout form.

Primary (H) Voltage: The measured primary voltage is displayed on the screen in digital readout form.

Secondary(X) Current: The secondary current is displayed for user reference to monitor while performing ratio and saturation tests.

Saturation Test:

Saturation test menu screen is used to perform a saturation test on CT. At the end of test, saturation curve, measured ratio and polarity test results are displayed for the CT under test.



X Voltage (V): It displays the real time voltage readings of the secondary X winding while the test is in progress.

X Current (A): It displays the real time current readings for the secondary X winding while the test is in progress.

H Voltage (V): It displays the real time voltage readings of the primary H winding while the test is in progress.

Excitation Curve: The excitation curve is Log-Log curve with secondary current on X coordinate and secondary voltage on Y coordinate.

Ratio: At the completion of test, the measured ratio is compared with expected ratio (obtained based upon user input) and a percent error in Ratio is determined by following formula.

$$[(\text{Expected ratio} - \text{Measured ratio}) / \text{Expected ratio}] * 100$$

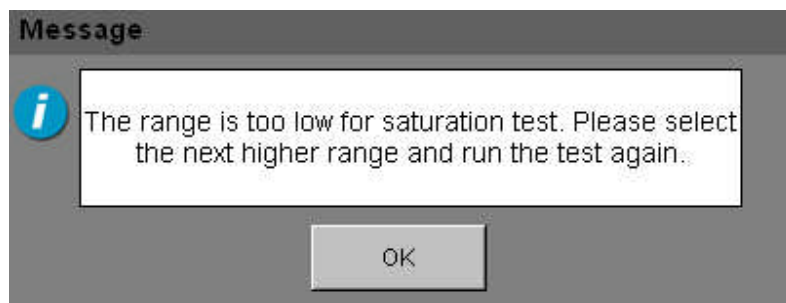
Test voltage: It displays the selected test voltage. User can select any one out of four available test voltages (40,160,800 and 1600).

Polarity: Unit automatically determines the polarity connections and displays the result as either polarity Correct or Incorrect. The phase angle deviation between the secondary and primary voltage is also displayed along with polarity.

Saturation points: The unit automatically determines the knee point based upon the user selected standard (ANSI 30, ANSI 45 or IEC 60044-1). Saturation voltage and saturation current corresponding to that knee point are displayed along with other results at the completion of the test.

Max limit: Hit F1 function button to select the desired test voltage. Four test voltages available are 40V, 160V, 800V and 1600 V. For instance, on selecting a test voltage of 800V, the unit will automatically vary the voltage from 0 to 800V to determine the saturation curve and knee point.

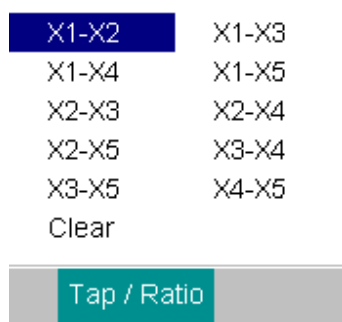
If the selected voltage is not sufficient enough to determine the required parameters, the unit will display the following error message.



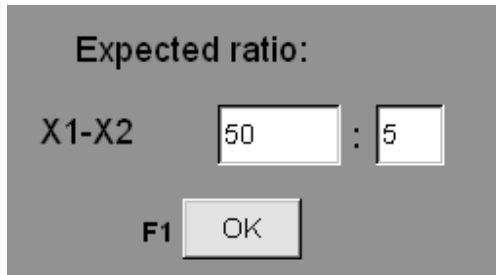
Select a higher test voltage range and perform the test again.

Note: Appropriate voltage range can be selected by knowing the accuracy class of CT under test.

Tap ratio: Hit F2 function to put the expected tap ratio of the CT under test. Following pop up will come up on hitting the F2 button.



Select the desired Tap and a window will pop up to enter the tap ratio.



Use tab button and numeric keypad to enter the desired tap ratio. Hit OK button to finish.

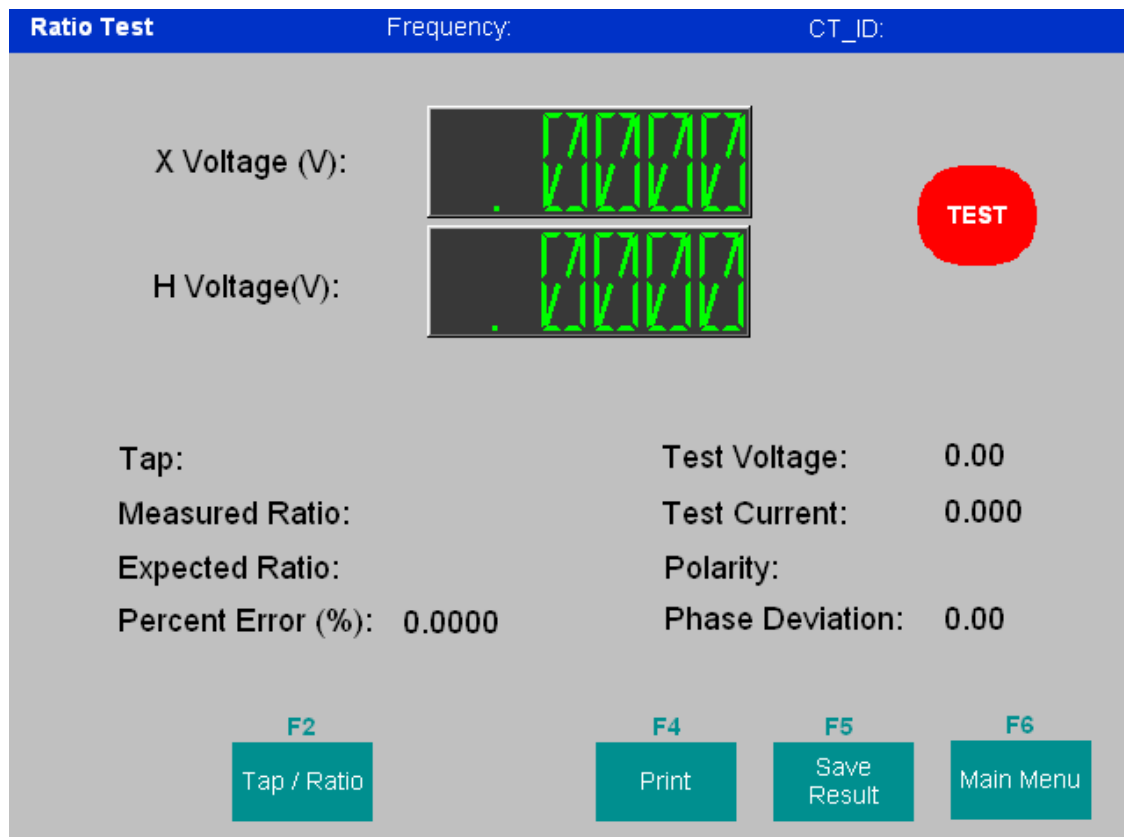
Note: To clear the saturation test screen, user “clear all” option in Tap/Ratio screen to wipe off previous test results and a blank saturation test screen will be displayed.

Print result: Hit F4 function button to print out the saturation test results. Results will be printed on 8” by 11” paper through an external printer.

Save result: Hit F5 function button to store the saturation test results in the internal memory of the unit. Only CT id is required to store the test results.

Main menu: Hit F6 button to return to main menu or home screen of the unit.

Ratio Test:



Ratio menu screen is used to perform the ratio and polarity test. Measured ratio, polarity, test voltage and current are displayed at the end of the test. Unit automatically selects the voltage range for the ratio test.

X Voltage (V): It displays the real time applied voltage to the secondary X winding of the CT under test.

H Voltage (V): It displays the real time measured voltage of the primary H winding of the CT under test.

Tap: Displays the selected tap of the CT.

Ratio: At the completion of test, the measured ratio is compared with expected ratio (obtained based upon user input) and a percent error in Ratio is determined by following formula.

$$[(\text{Expected ratio} - \text{Measured ratio}) / \text{Expected ratio}] * 100$$

Test voltage: Unit automatically applies the required voltage for the ratio test. It displays secondary test voltage at the completion of test.

Test current: Unit continuously monitors the secondary excitation current and displays test current at the end of the ratio test.

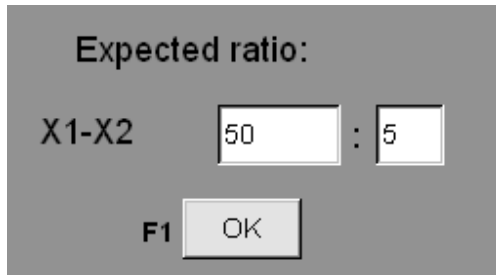
Polarity: Unit automatically determines the polarity connections and displays the result as either polarity Correct or Incorrect. The phase angle deviation between the secondary and primary voltage is also displayed along with polarity.

Tap ratio: Hit F2 function to put the expected tap ratio of the CT under test. Following pop up will come up on hitting the F2 button.

X1-X2	X1-X3
X1-X4	X1-X5
X2-X3	X2-X4
X2-X5	X3-X4
X3-X5	X4-X5
Clear	

Tap / Ratio

Select the desired Tap and a window will pop up to enter the tap ratio.



Use tab button and numeric keypad to enter the desired tap ratio. Hit OK button to finish.

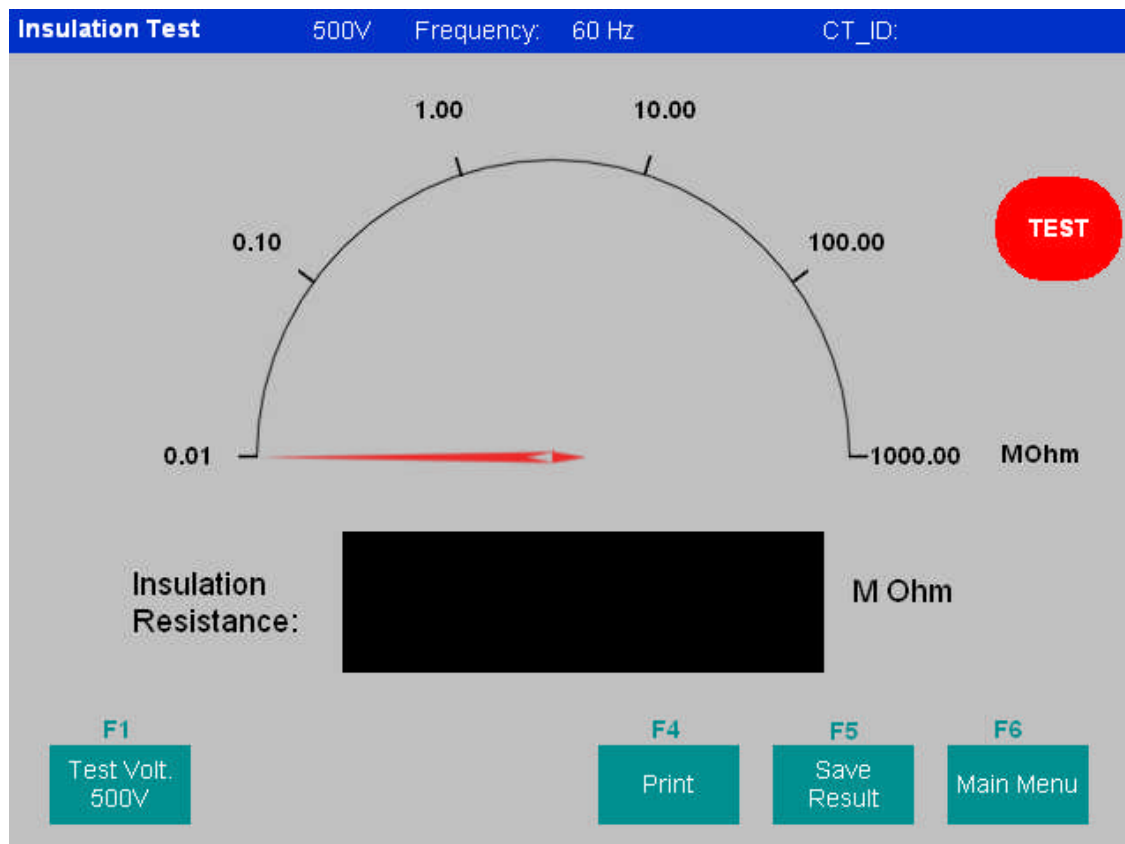
Note: To clear the ratio test screen, user “clear all” option in Tap/Ratio screen to wipe off previous test results and a blank ratio test screen will be displayed.

Print result: Hit F4 function button to print out the ratio and polarity test results. Results will be printed on 8” by 11” paper through an external printer.

Save result: Hit F5 function button to store the ratio and polarity test results in the internal memory of the unit. Only CT id is required to store the test results.

Main menu: Hit F6 button to return to main menu or home screen of the unit.

Insulation Test:



Insulation test menu screen is used to perform an insulation test between the windings (or windings to ground) of the CT, by applying a 1000 VDC. Insulation resistance is displayed in (M) ohms.

Digital analog indicator: Displays the insulation resistance with a digital pointer on a linear scale from 0.01 M ohms to 1000 M ohms.

Insulation resistance: Displays the insulation resistance in M ohms on digital read out.

Test volt: Select either 500V or 1000V DC test voltage.

Print result: Hit F4 function button to print out the insulation test results. Results will be printed on 8" by 11" paper through an external printer.

Save result: Hit F5 function button to store the insulation test results in the internal memory of the unit. Only CT id is required to store the test results.

Main menu: Hit F6 button to return to main menu or home screen of the unit.

Operating Instructions

Ratio & Polarity Test:

The ratio is defined as the number of turns in the secondary as compared to the number of turns in the primary.

$$N2/N1=V2/V1$$

Where,

N2 and N1 are no. of turns of secondary and primary windings respectively

V2 and V1 are the secondary and primary side voltage readings respectively.

A suitable voltage, below saturation is applied to the secondary of the CT under test and primary side voltage is measured to calculate the turns ratio from above expression.

Connections for the test set:

1. Refer to the safety instructions first before the use of equipment.
2. Verify the Power ON/OFF switch is OFF. Power the test set from a suitable source of power (95-265 V 50/60 Hz).
3. Connect the ground wing nut to a suitable ground.

WARNING

There is always a possibility of voltages being induced at the terminals of the test specimen because of proximity to high voltage energized lines. A residual static voltage charge may also be present at these terminals. Ground each terminal to be tested with a safety ground stick, before making connections.

4. Connect the test set secondary output binding posts X1 and X2 to secondary of the current transformer X1 and X2 (or X2-X5, tap under test). Observe the polarity marks on the CT (X1 on test set is polarity terminal).
5. Connect the test set primary binding posts H1 and H2 to CT primary bushings H1 and H2. Observe the polarity marks on the CT (H1 on the test set is polarity terminal).
6. Turn Power ON/OFF switch to ON.
7. After the boot up, select the "Ratio Test" menu from the main screen by using scroll button.
8. In the ratio screen, hit F2 function button to select the appropriate tap to be tested.

X1-X2	X1-X3
X1-X4	X1-X5
X2-X3	X2-X4
X2-X5	X3-X4
X3-X5	X4-X5
Clear	

Tap / Ratio

9. Enter the expected nameplate ratio for the desired tap. Toggle through different columns by using scroll and "TAB" button.

Expected ratio:

X1-X2 :

F1

Hit OK to finish.

10. Hit the "TEST" button to start the test.

Test Confirmation

Press TEST button again to start test.

Or press ENTER to cancel.

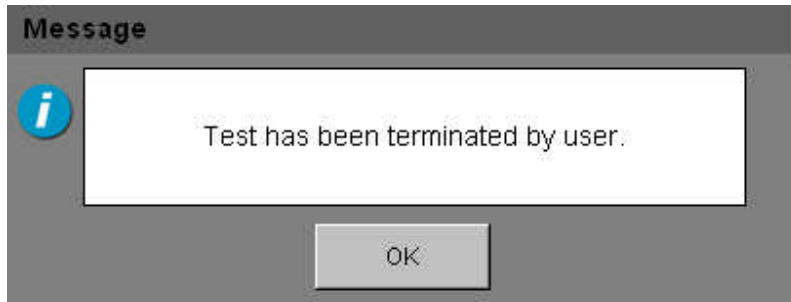
11. A dialog box appears for confirmation of the test. Hit TEST button again.

WARNING

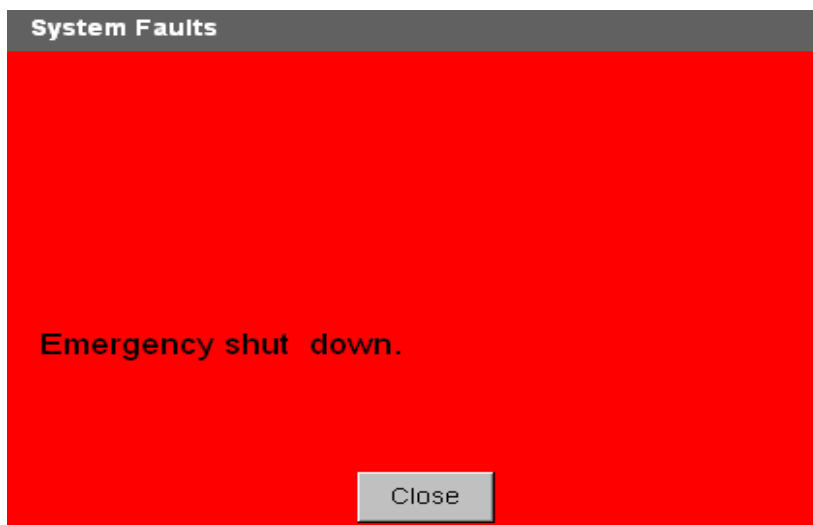
High Voltage is now present at the terminals of the specimen



12. This will start the test and a warning high voltage symbol will appear on the “test in progress” screen.
13. At any point of time Test can be terminated by hitting the Test button again. Following message will appear.



14. Test can also be stopped under emergency condition by hitting the “Emergency Push to Stop” button on the front panel of MCT 1600. Unit will shut off the output voltage and following message will appear.



15. After completion of test, ratio and polarity results will be displayed on the screen along with test voltages and current.

X Voltage (V): 

H Voltage(V): 

TEST

Tap:	Test Voltage:	0.00
Measured Ratio:	Test Current:	0.000
Expected Ratio:	Polarity:	
Percent Error (%): 0.0000	Phase Deviation:	0.00

16. Save the results by hitting F5 function button.
17. The CT_ID screen will open up.

User Input Frequency: 60 Hz CT_ID:

CT_ID Name Plate

CT_ID:

Technician:

Company:

Station:

Location:

Position:

Phase:

To save test results, CT_ID is required.
CT_ID is used as the file name.

Date / Time: 05/06/2008 15:24:21

F1 F2 F5 F6

Back to Test Change Page Save Test Main Menu

18. Put in the CT id information. All other information is optional.
19. Hit F5 function button again.
20. Following message will appear indicating that test has been saved.

Message

 Test has been saved.

OK

Saturation Test:

IEEE defines the saturation as “the point where the tangent is at 45 degrees to the secondary exciting amperes”. It is also known as “knee” point.

This test verifies that the CT is of correct accuracy rating, has no shorted turns in the CT and no short circuits are present in the primary or secondary windings of the CT under test.

Connections for the test set:

Refer to the safety instructions first before use of the equipment.

1. Verify the Power ON/OFF switch is OFF. Power the test set from a suitable source of power (95-265 V50/60 Hz).
2. Connect the ground wing nut to a suitable ground.

WARNING

There is always the possibility of voltages being induced at the terminals of a test specimen because of proximity to high voltage energized lines. A residual static voltage charge may also be present at these terminals. Ground each terminal to be tested with a safety ground stick, before making connections.

3. Connect the test set secondary output binding posts X1 and X2 to secondary of the transformer X1 and X2 (or X2-X5, tap under test). Observe the polarity marks on the CT (X1 on test set is polarity terminal).
4. Connect the test set primary binding posts H1 and H2 to CT primary bushings H1 and H2. Observe the polarity marks on the CT (H1 on the test set is polarity terminal).
5. Turn Power ON/OFF switch to ON.
6. After the boot up, select the “Saturation Test” menu from the main screen by using scroll button.
7. In the saturation test screen, hit F1 function button to select appropriate test voltage range based upon CT accuracy class.
8. Hit F2 function button to select the appropriate tap to be tested.

X1-X2	X1-X3
X1-X4	X1-X5
X2-X3	X2-X4
X2-X5	X3-X4
X3-X5	X4-X5
Clear	

Tap / Ratio	
-------------	--

9. Enter the expected nameplate ratio for the desired tap. Toggle through different columns by using scroll and “TAB” button.

Expected ratio:

X1-X2 :

F1

Hit OK to finish.

10. Hit the "TEST" button to start the test.
11. A dialog box appears for confirmation of the test.

Test Confirmation

Press TEST button again to start test.

Or press ENTER to cancel.

12. Hit TEST button again.

WARNING

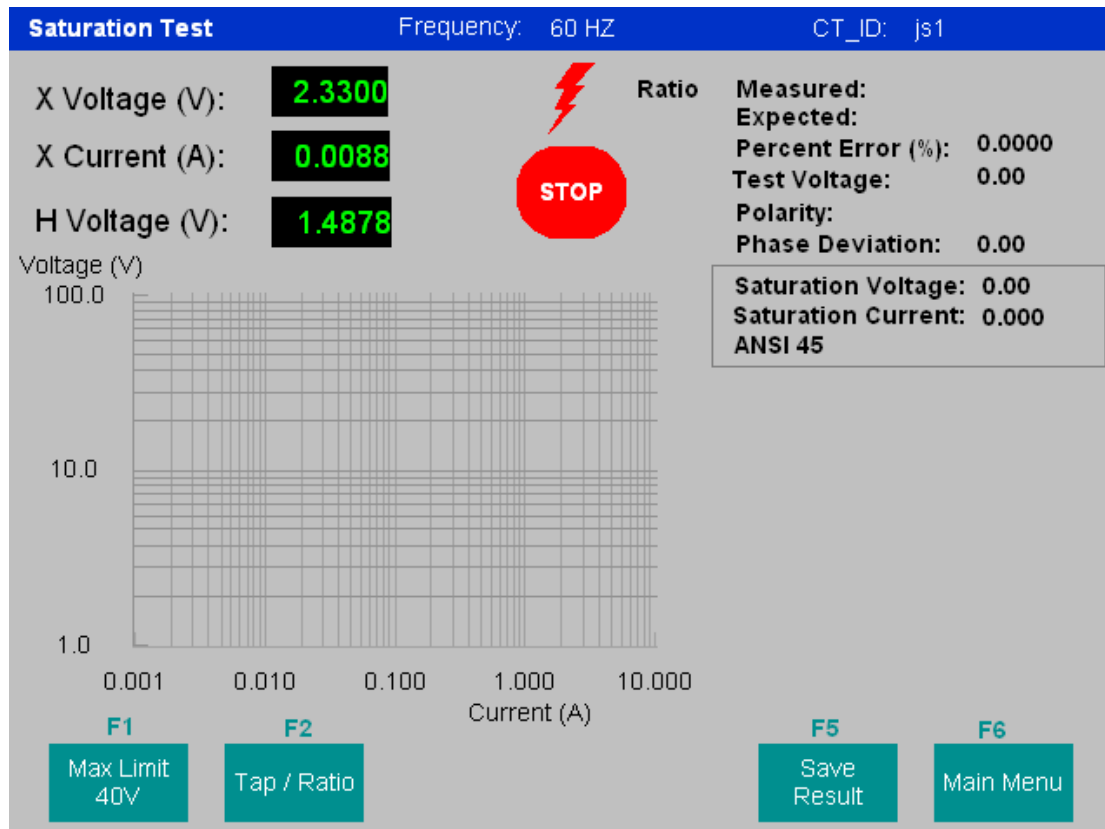
High Voltage is now present at the terminals of the specimen

13. This will start the test and a warning high voltage symbol  will appear on the "test in progress" screen.
14. If the selected Test voltage range is not enough to perform the saturation test, following message will appear.

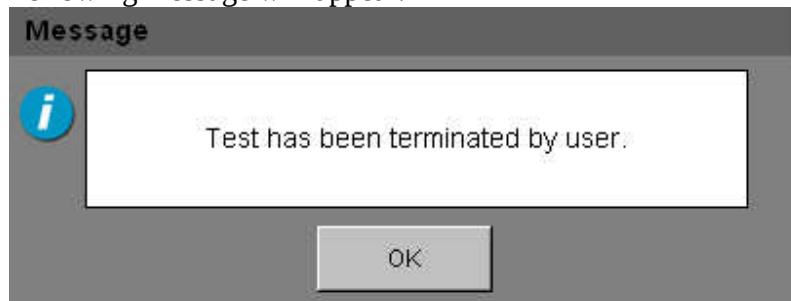
Message

 The range is too low for saturation test. Please select the next higher range and run the test again.

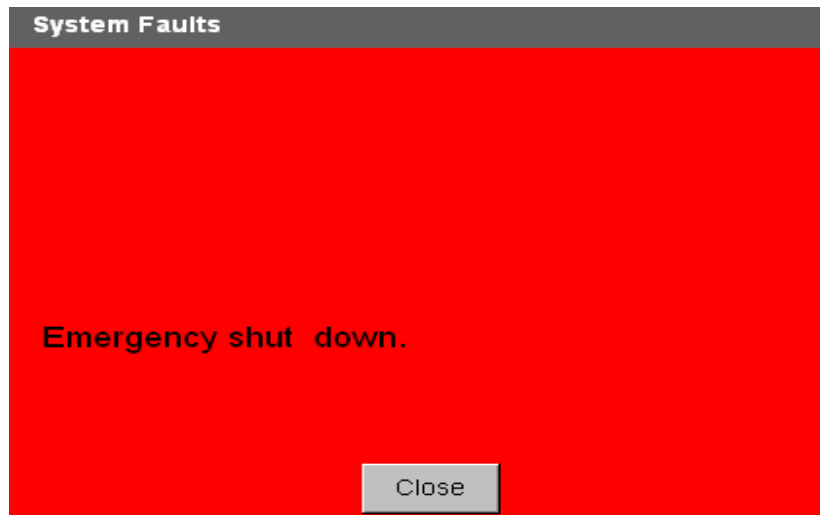
15. Select the higher voltage range and perform the Test again.
16. Following test screen will appear with a red indicator showing that the test is in progress.



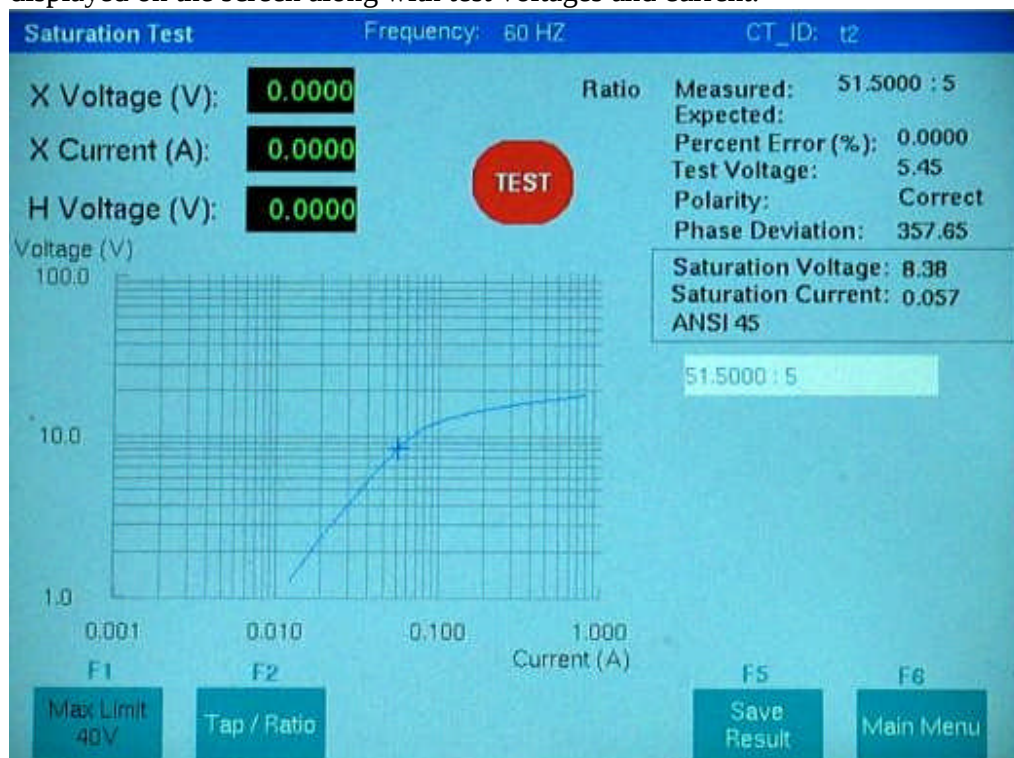
17. At any point of time Test can be terminated by hitting the Test button again. Following message will appear.



18. Test can also be stopped under emergency condition by hitting the “Emergency Push to Stop” button on the front panel of MCT 1600. Unit will shut off the output voltage and following message will appear.



19. After completion of test, saturation curve, ratio and polarity results will be displayed on the screen along with test voltages and current.



20. Save the results by hitting F5 function button.
21. It will open up the CT-ID screen.

User Input		Frequency: 60 Hz	CT_ID:
CT_ID Name Plate			
CT_ID:		Technician:	
		Company:	
To save test results, CT_ID is required. CT_ID is used as the file name.		Station:	
		Location:	
		Position:	
		Phase:	
Date / Time: 05/06/2008 15:24:21			
F1	F2	F5	F6
Back to Test	Change Page	Save Test	Main Menu

22. Put in the CT id information. All other information is optional.
23. Hit F5 function button again.
24. If the result with same CT id already exists, following message will appear.

Confirmation	
?	File already exists. Do you want to overwrite it?
YES	NO

Note: Save all the test results (ratio, saturation, insulation) of one CT with same CT id. It will give you the above message .Hit YES. It will save all the test results for that CT in one single file; with CT_ID as it's file name.

25. Following message will appear indicating that test has been saved.

Message	
i	Test has been saved.
OK	

26. Multiple saturation curves for different taps can be plotted on same chart by re running the test. As many as 10 curves can be displayed at one time. Please refer to "How to run multiple saturation tests" below.

How to run multiple saturation tests

- After finishing first saturation test, hit F2 function to select the next tap settings.

X1-X2	X1-X3
X1-X4	X1-X5
X2-X3	X2-X4
X2-X5	X3-X4
X3-X5	X4-X5
Clear	

Tap / Ratio

- Enter the expected nameplate ratio for the selected Tap.

Expected ratio:

X1-X3 200 : 5

F1 OK

Hit OK.

- Select the appropriate voltage range by hitting F1 (Max Limit) function button.
- Hit the “TEST” button to start the test.
- A dialog box appears for confirmation of the test.

Test Confirmation

Press TEST button again to start test.

Or press ENTER to cancel.

CANCEL

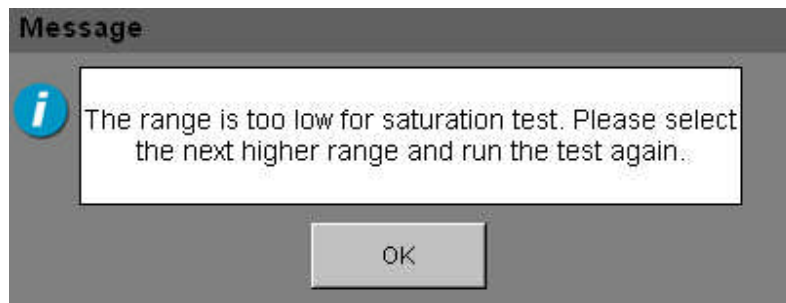
- Hit TEST button again.

WARNING

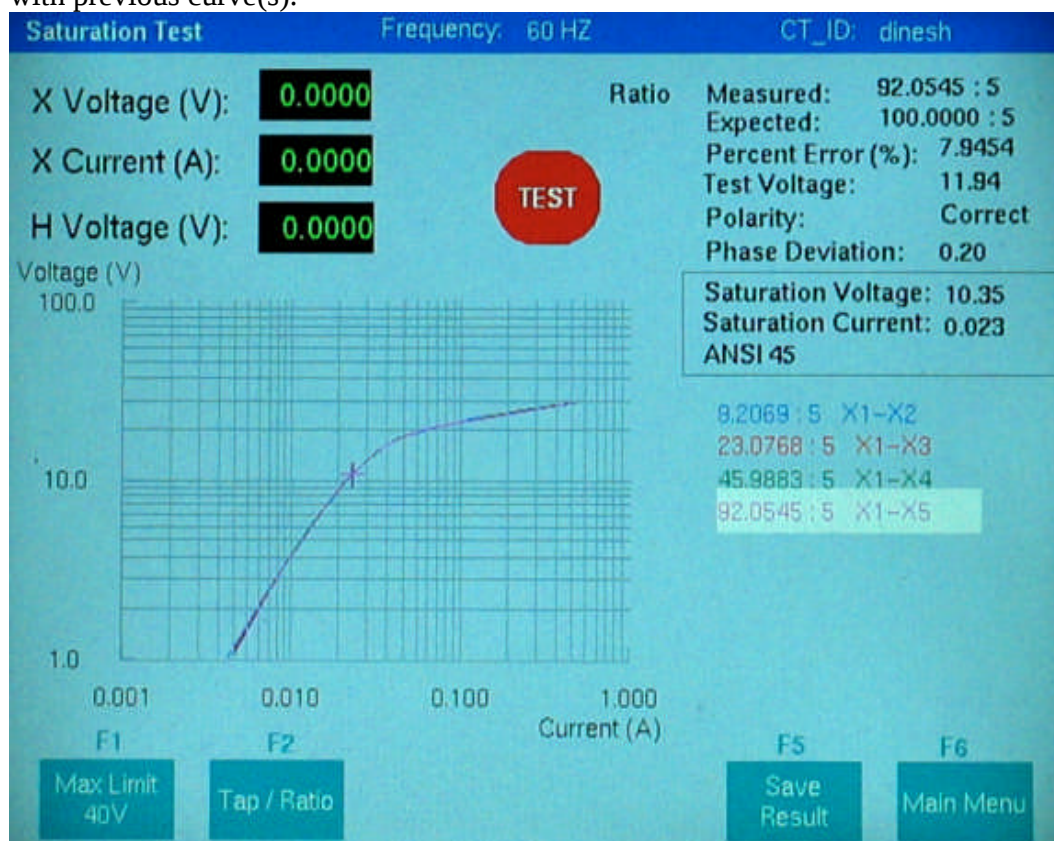
High Voltage is now present at the terminals of the specimen

- This will start the test and a warning high voltage symbol  will appear on the “test in progress” screen.

- If the selected Test voltage range is not enough to perform the saturation test, following message will appear.



- Select the higher voltage range and perform the Test again.
- At the completion of test saturation curve will be displayed on the same graph along with previous curve(s).



- All the results like ratio, polarity, saturation voltage and current will also be displayed for the current saturation test.
- As many as 10 different curves can be plotted on the same graph by repeating the same steps and selecting different CT taps.
- The ratios for different taps are displayed on right hand side of screen in different colors. Use Tab button to scroll through different ratios and detailed results for that particular Tap.

DC Insulation Resistance Test:

The insulation between the windings and winding to ground should be checked while performing a comprehensive CT test. The test set has inbuilt 1kV DC insulation tester that is used for measurement of insulation resistance.

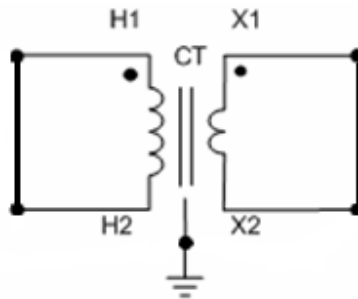
Connections for the test:

1. Refer to the safety instructions first before use of the equipment.
2. Verify the Power ON/OFF switch is OFF. Power the test set from a suitable source of power (95-265 V 50/60 Hz).
3. Connect the ground wing nut to a suitable ground.

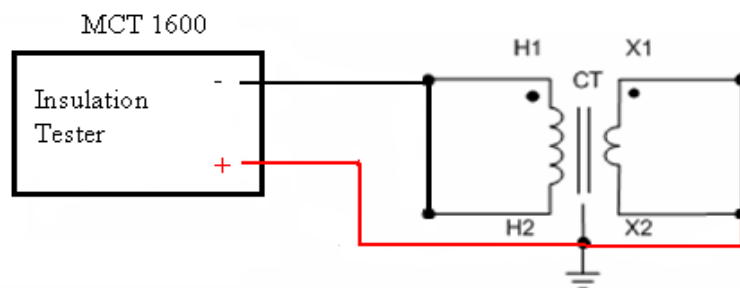
WARNING

There is always the possibility of voltages being induced at the terminals of a test specimen because of proximity to high voltage energized lines. A residual static voltage charge may also be present at these terminals. Ground each terminal to be tested with a safety ground stick, before making connections.

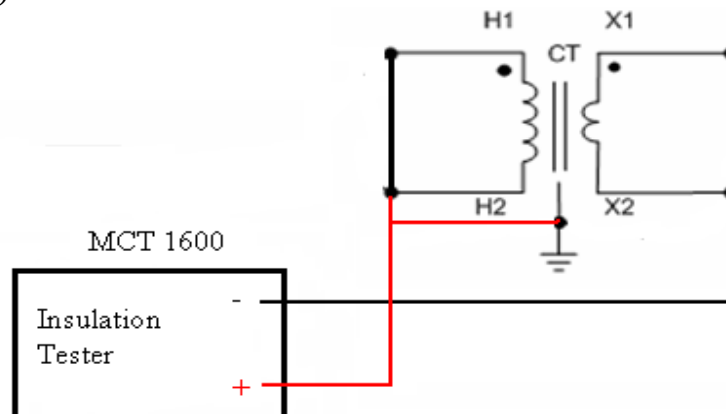
4. Short the primary winding of the CT under test by shorting H1 and H2 terminals.
5. Short the secondary winding of the CT under test by shorting X1 and X2 terminals.



6. Remove the neutral ground and isolate the CT from any associated burden.
 7. Two **DIFFERENT** tests are performed to determine the condition of the insulation of CT under test. Connections for the two tests are:
- First- Ground the shorted secondary winding .Connect negative(black) lead from Insulation test set to primary winding (H1-H2) and positive (red) lead to ground (X1-X2).

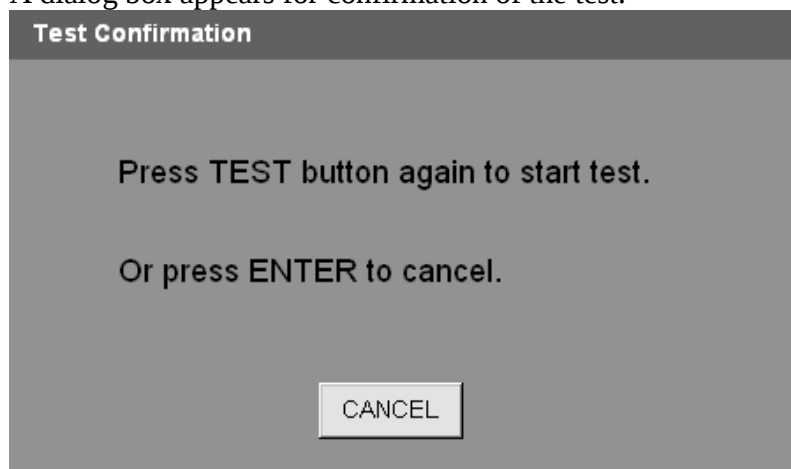


- Second- Ground the shorted primary winding .Connect negative(black) lead from Insulation test set to secondary winding(X1-X2) and positive (red) lead to ground (H1-H2).

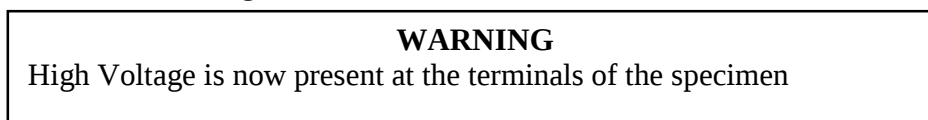


Note: Refer to the Insulation Test diagram (Figure 9,10 & 11) in Appendix for more details.

8. Turn Power ON/OFF switch to ON.
9. After the boot up, select the “Insulation Test” menu from the main screen by using scroll button.
10. In the insulation test screen, hit F1 function button to select appropriate DC test voltage either 500V or 1000V based upon the ratings of the CT under test.
11. Hit the “TEST” button to start the test.
12. A dialog box appears for confirmation of the test.



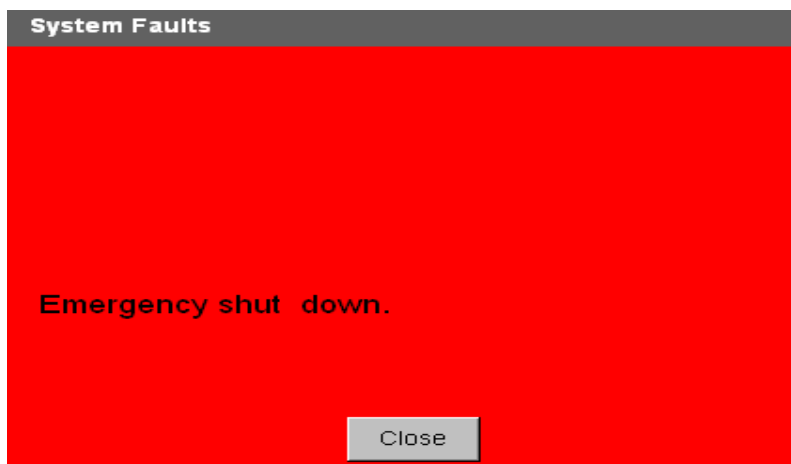
13. Hit TEST button again.



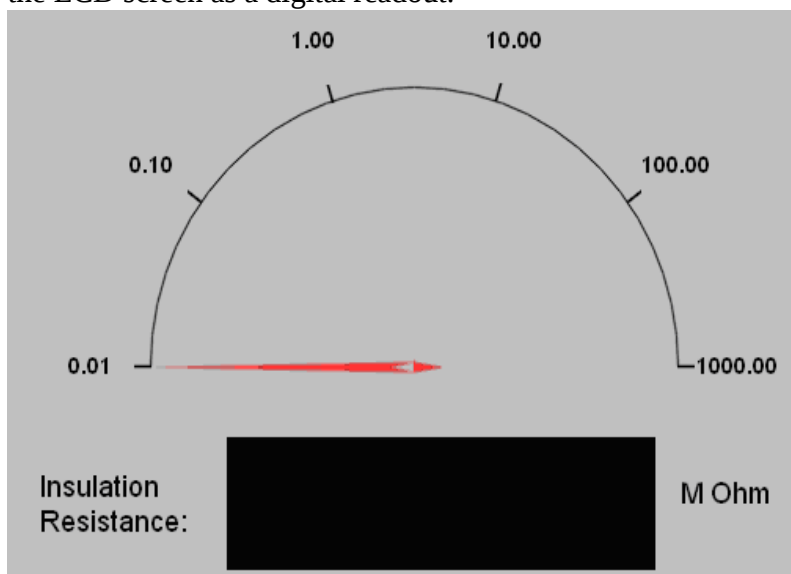
14. This will start the test and a warning high voltage symbol  will appear on the “test in progress” screen.
15. At any point of time Test can be terminated by hitting the Test button again. Following message will appear.



16. Test can also be stopped under emergency condition by hitting the “Emergency Push to Stop” button on the front panel of MCT 1600. Unit will shut off the output voltage and following message will appear.



17. After completion of test, Insulation resistance in (M) ohms will be displayed on the LCD screen as a digital readout.



18. Save the results by hitting F5 function button.

Manual Test:

MCT 1600 is an automatic AND manual CT test set. Manual mode of testing is available, for controlling the secondary test voltage to the CT under test. This is done by using a manual voltage controls knob.

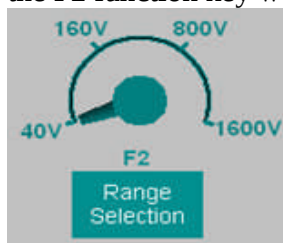
Connections for the test set:

1. Refer to the safety instructions first before use of the equipment.
2. Verify the Power ON/OFF switch is OFF. Power the test set from a suitable source of power (95-265 V 50/60 Hz).
3. Connect the ground wing nut to a suitable ground.

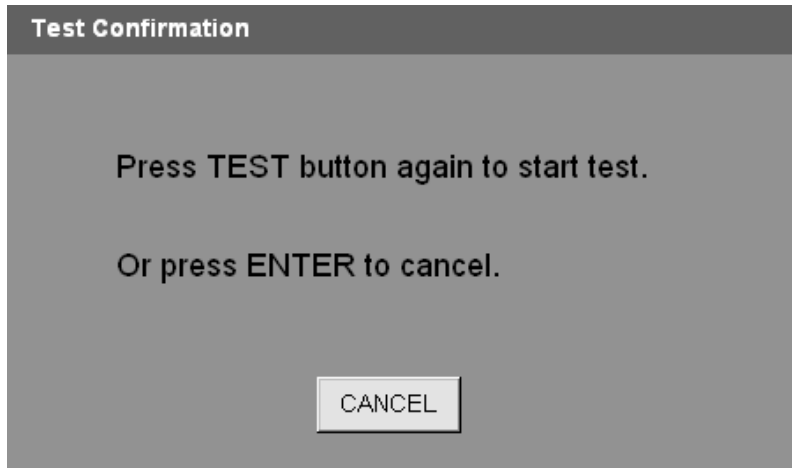
WARNING

There is always the possibility of voltages being induced at the terminals of a test specimen because of proximity to high voltage energized lines. A residual static voltage charge may also be present at these terminals. Ground each terminal to be tested with a safety ground stick, before making connections.

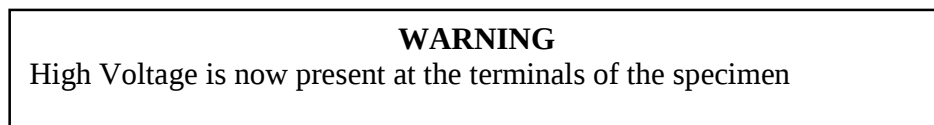
4. Connect the test set secondary output binding posts X1 and X2 to secondary of the transformer X1 and X2 (or X2-X5, tap under test). Observe the polarity marks on the CT (X1 on test set is polarity terminal).
5. Connect the test set primary binding posts H1 and H2 to CT primary bushings H1 and H2. Observe the polarity marks on the CT (H1 on the test set is polarity terminal).
6. Turn Power ON/OFF switch to ON.
7. After the boot up, select the “Manual Test” menu from the main screen by using scroll button.
8. In the manual test screen, hit F2 function button for range selection. Multiple hit of the F2 function key would select different voltage ranges (40, 160, 800 and 1600).



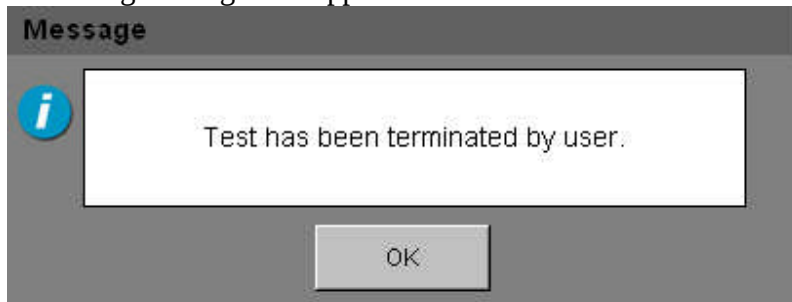
9. Hit the “TEST” button to start the test.
10. A dialog box appears for confirmation of the test.



11. Hit TEST button again.



12. This will start the test and a warning high voltage symbol  will appear on the "test in progress" screen.
13. At any point of time Test can be terminated by hitting the Test button again. Following message will appear.



14. Test can also be stopped under emergency condition by hitting the "Emergency Push to Stop" button on the front panel of MCT 1600. Unit will shut off the output voltage and following message will appear.



15. Use the manual voltage controls knob to apply a known voltage to the secondary of the CT under test. Keep an eye on secondary amps reading to prevent CT saturation. Most of the CT would saturate at 1 amp of secondary current.
16. For Ratio test, apply one volt per turn to the secondary of the CT. Raise voltage slowly while observing the meters.

CAUTION

CT secondary current should not go above 1A, that will saturate the CT and readings for Ratio test will be incorrect

17. If CT saturates before one volt per turn is reached, apply a smaller voltage which is a fraction of one volt per turn.
18. Once a known secondary voltage is reached, note down the primary and secondary voltage readings to get the turn's ratio.
19. Hit the "TEST" button again to stop the test.

Recalling and Saving of Results:

Saving Results

1. After performing saturation, ratio, polarity, or insulation test hit F5 function key to store the test results.



2. Enter the CT id to store the results. Test results are saved with CT id name.

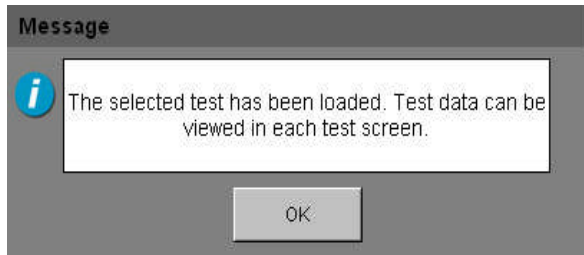
A screenshot of a software interface. It shows a label 'CT_ID:' followed by a white rectangular input field. Below the input field, a message reads: 'To save test results, CT_ID is required. CT_ID is used as the file name.'

Recalling Results

3. To recall a previous test result, select the "File Manager" option from the main menu screen.



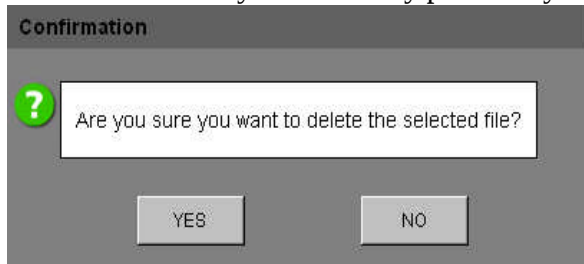
4. File manager screen will display all the test results stored into the internal memory of the unit.
5. Select the desired test and hit on F1 function key to load the test results. Following message will appear.



6. Screen will go to main menu from where different test results can be viewed.

Deleting Results

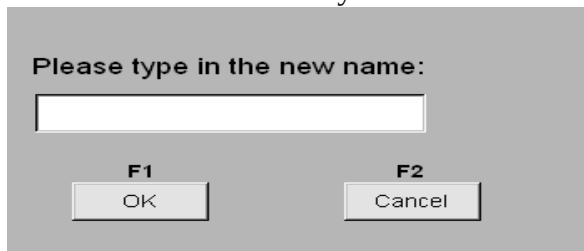
7. Hit F2 function key to delete any previously stored test results.



A confirmation box will come up; hit YES to delete a selected test.

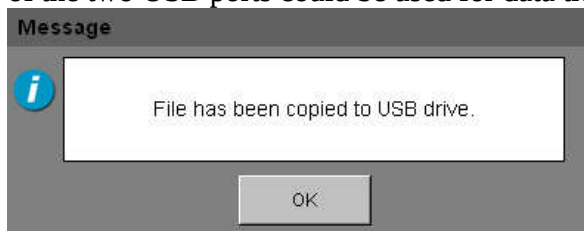
Renaming File

8. Hit F3 function key to rename already stored file. Enter the new name in the dialog box and hit F1 function key to rename the file.



Transferring Results

9. Hit F4 function key to transfer the data from internal memory to USB stick. Either of the two USB ports could be used for data transfer to USB stick.



Note: MCT 1600 works on VX operating system. The recommended limit of USB drive capacity is up to 1 GB.

Home Screen

10. Hit F6 function key to return to main menu screen.



Appendix

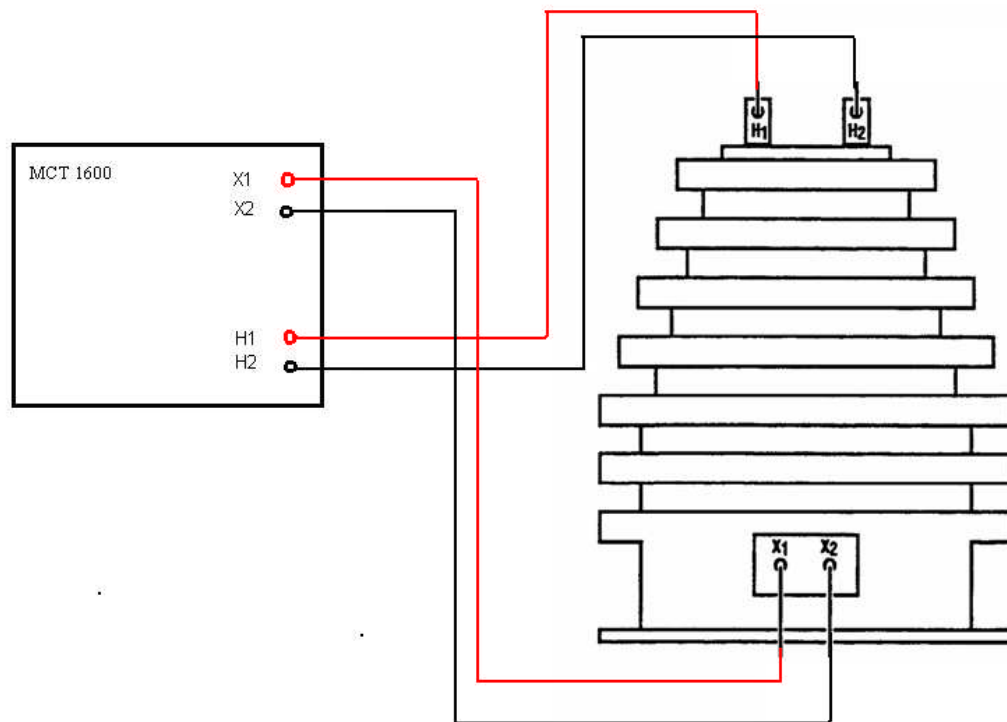


Figure 1: Saturation, Ratio and Polarity Test

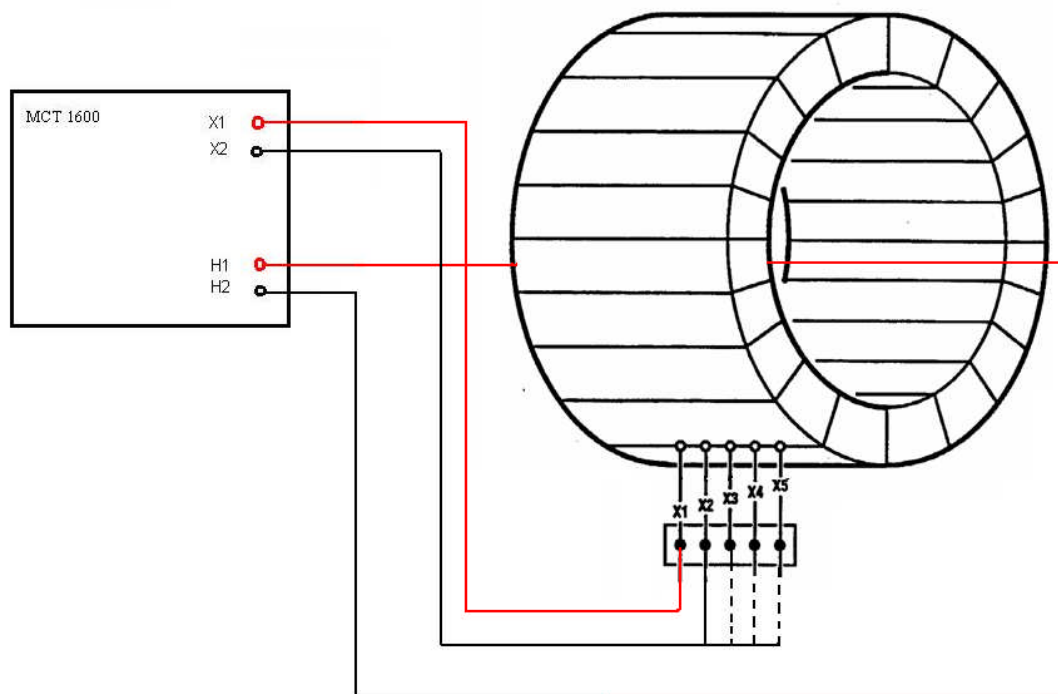


Figure 2: Multi Ratio Current Transformer Test- A

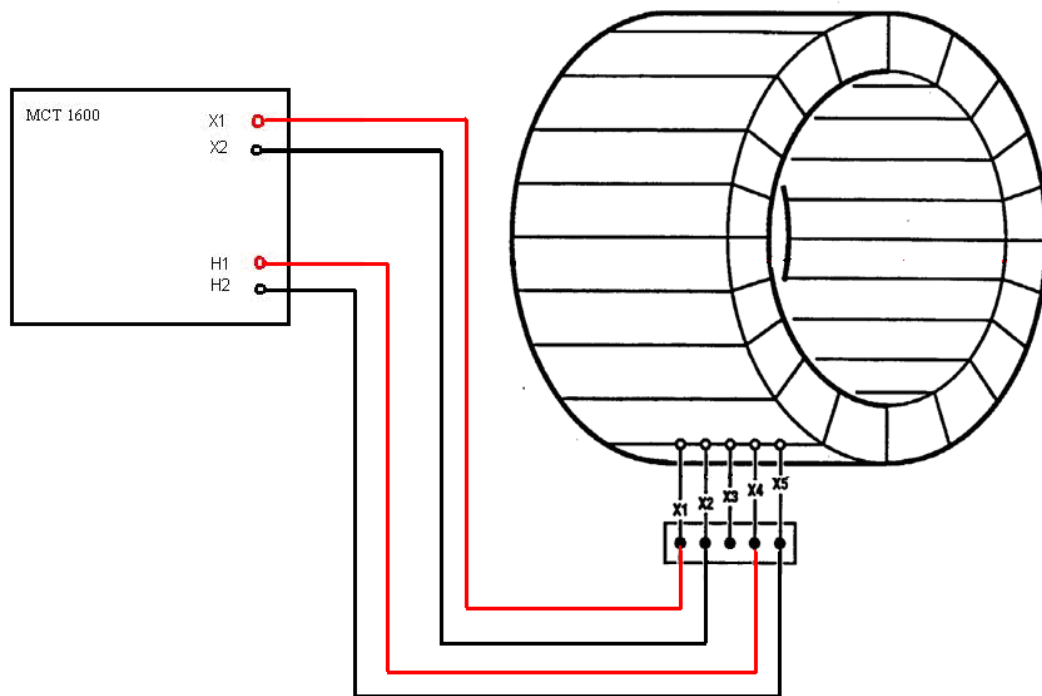
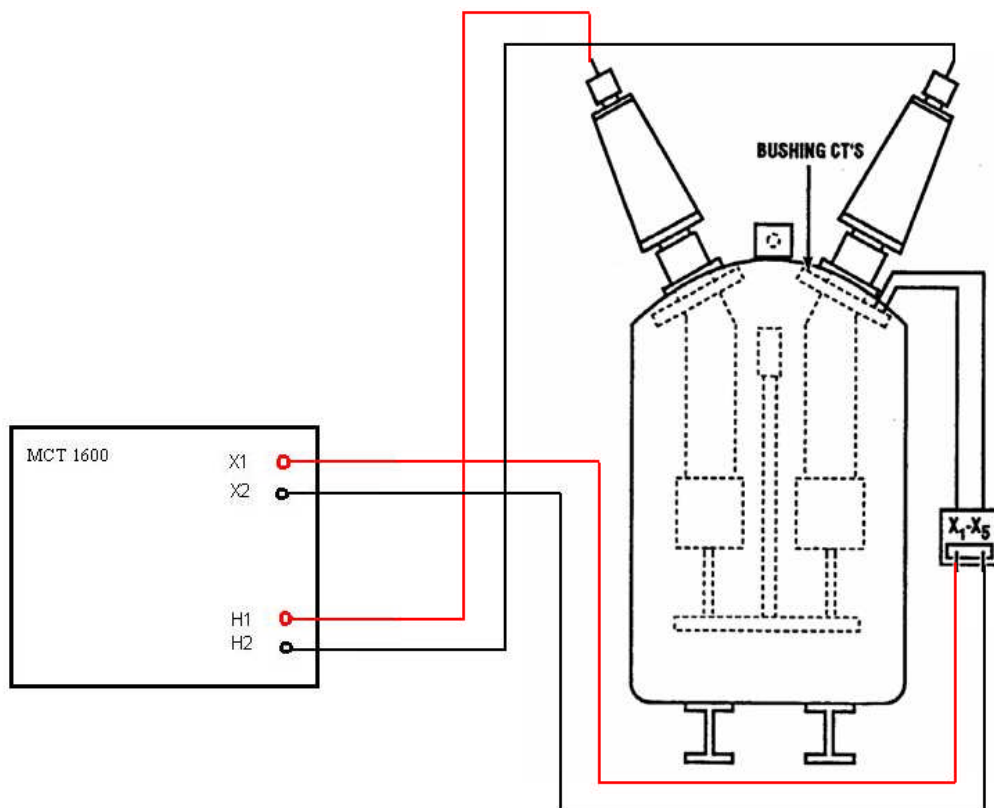


Figure 3: Multi Ratio Current Transformer Test- B

- CT's with no access to the primary side can be tested with connections to the secondary winding as shown above for multi-ratio CT's.
- Voltage applied to the X1-X2 taps of the CT will induce a proportionate voltage on the remaining taps. By measuring voltage at different taps of CT, CT ratio can be verified.

Bushing CT's can be tested in a de-energized circuit breaker which has been totally isolated from the power system. The breaker must be closed to perform ratio and polarity tests.



NOTE: The breaker does not have to be closed to perform the voltage test.

Figure 4: Testing Bushing CT installed in a Circuit Breaker

Bushing CT's can be tested in a de-energized circuit breaker which has been totally isolated from the power system. CT secondary leads will normally terminate in the control cabinet. Refer to the chart on for connections.

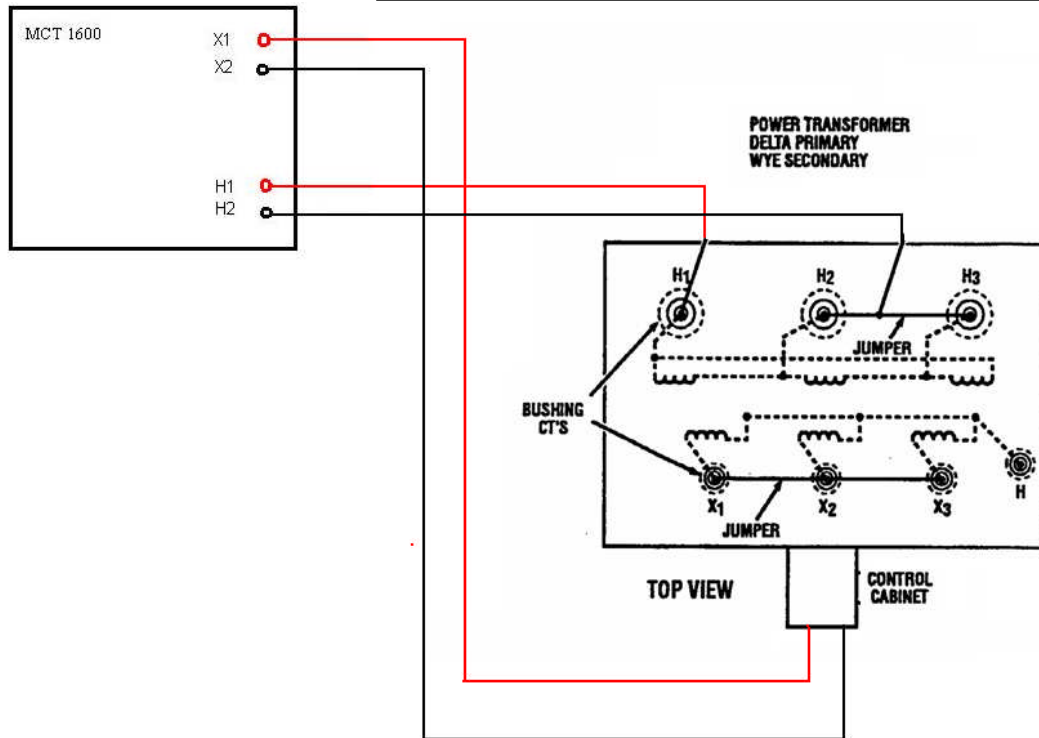


Figure 5: Testing bushing CT installed in a Power Transformer- A

CT Locations	Tests Set Connections				Jumpers
	X1	X2	H1	H2	
H1 Bushing	Secondary of H1 CT located in control cabinet		H1 Bushing	H2 Bushing	H2 - H3 X1 - X2 - X3
H2 Bushing	Secondary of H2 CT located in control cabinet		H2 Bushing	H3 Bushing	H3 - H1 X1 - X2 - X3
H3 Bushing	Secondary of H3 CT located in control cabinet		H3 Bushing	H1 Bushing	H1 - H2 X1 - X2 - X3

Bushing CT's can be tested in a de-energized circuit breaker which has been totally isolated from the power system. CT secondary leads will normally terminate in the control cabinet. Refer to the chart on for connections.

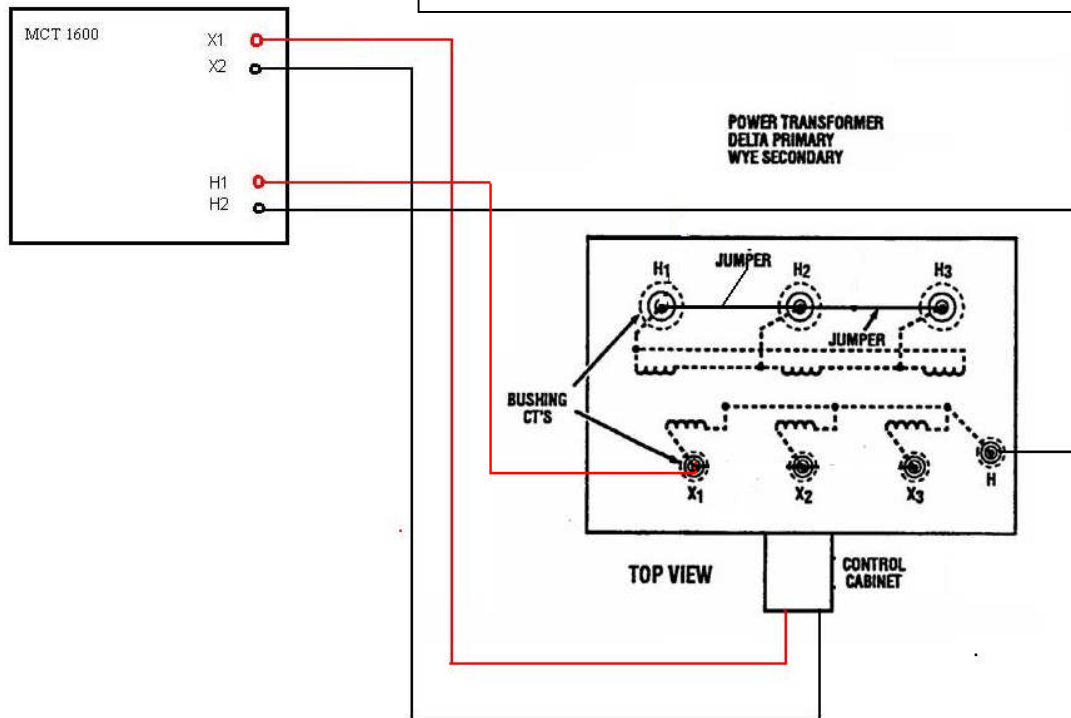


Figure 6: Testing bushing CT installed in a Power Transformer- B

CT Locations	Tests Set Connections			
	X1	X2	H1	H2
X1 Bushing	Secondary of X1 CT located in control cabinet		X1 Bushing	Neutral Bushing
X2 Bushing	Secondary of X2 CT located in control cabinet		X2 Bushing	Neutral Bushing
X3 Bushing	Secondary of X3 CT located in control cabinet		X3 Bushing	Neutral Bushing
	Jumpers			
	H1 - H2 - H3			

Insulation Testing

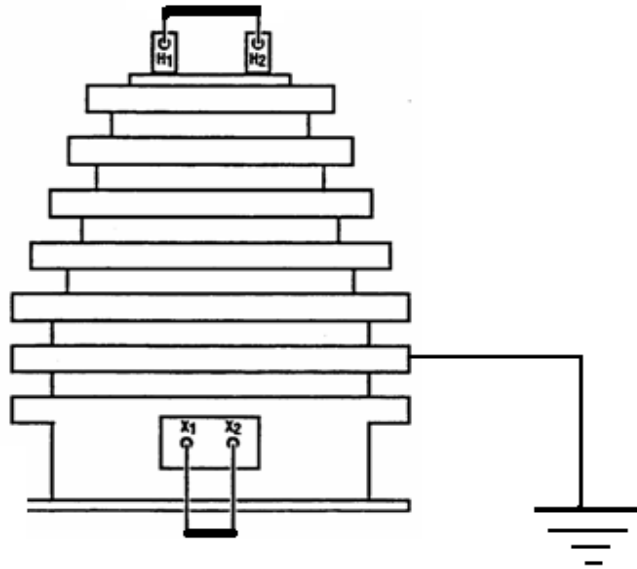


Figure 7: Short Primary winding H1, H2 and short Secondary winding X1, X2

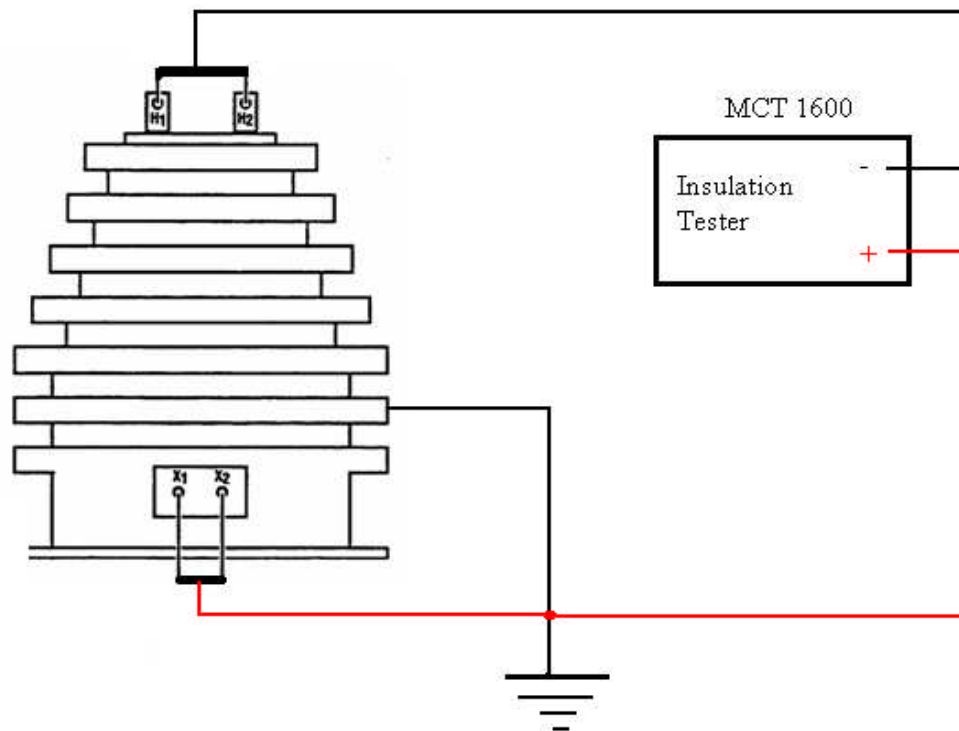


Figure 8: Ground secondary side and measure insulation resistance between high to ground

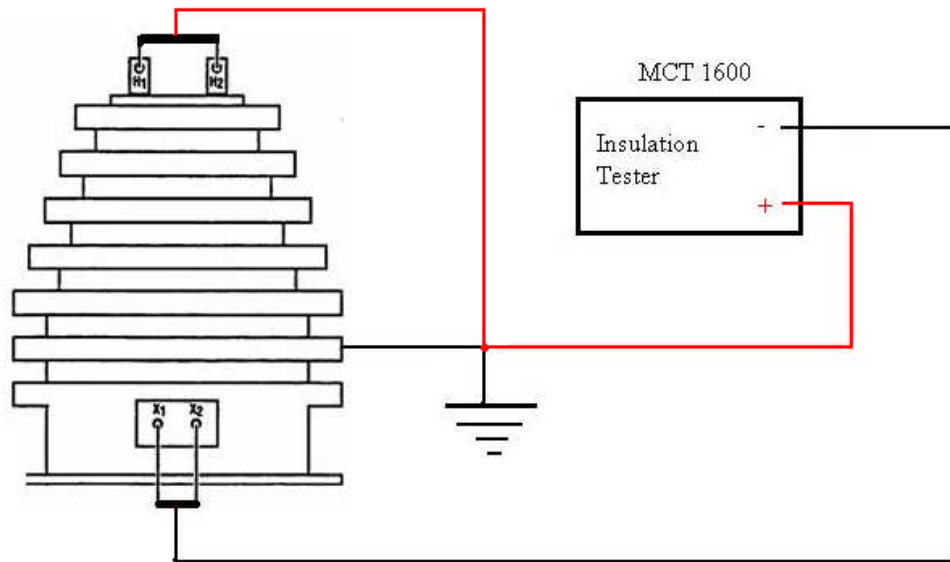


Figure 9: Ground primary side and measure insulation resistance between low to ground

Power DB Lite

Introduction

PowerDB Lite provides you with professional looking data forms with minimal effort. Print your files to paper or .PDF and reduce the time it takes to complete your report generation.

PowerDB Lite allows you to view the MCT test files and save the forms with test results onto your computer.

Minimum Recommended System

Operating System: Windows 2000 or later

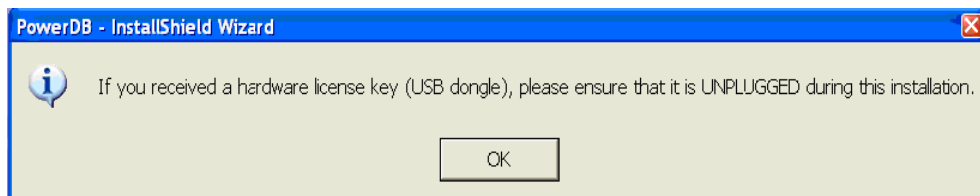
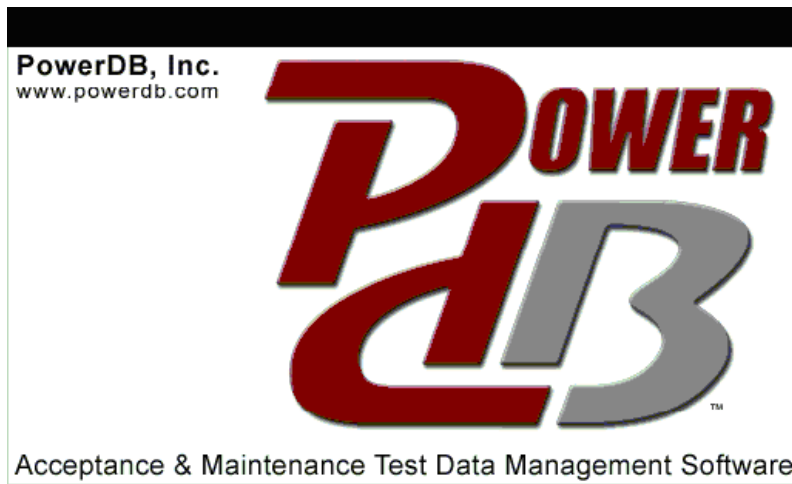
RAM: 64 MB RAM minimum, 512+ MB RAM recommended

Processor: 300 MHz Pentium class processor minimum, 1 GHz or better recommended

Software Installation

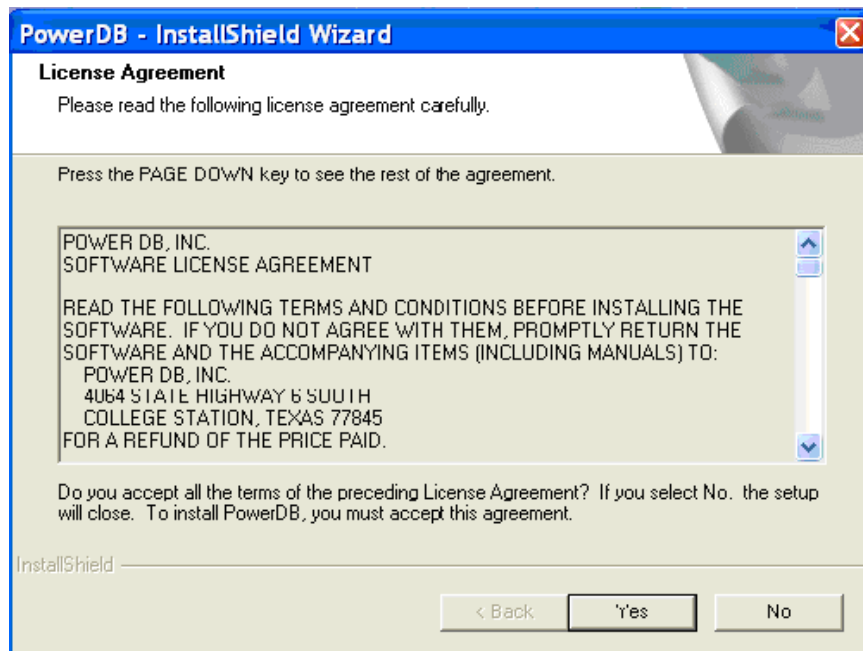
To install PowerDB Lite:

1. Load the PowerDB Lite CD into your CD-Rom drive and follow the on-screen instructions.
2. Double click on the PowerDB Lite exe file. Following messages will appear.

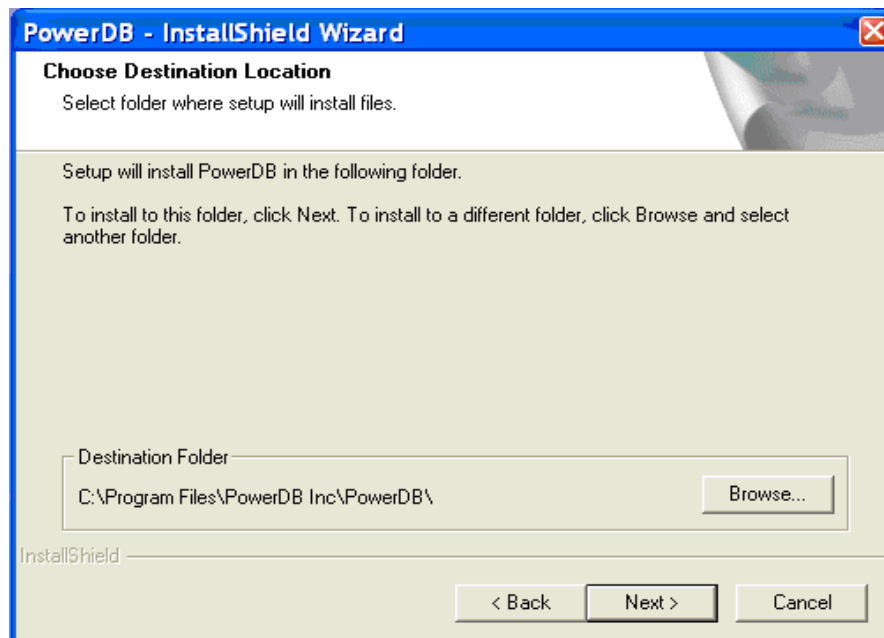


Hit OK.

3. Accept the terms of the license agreement by clicking 'YES'.

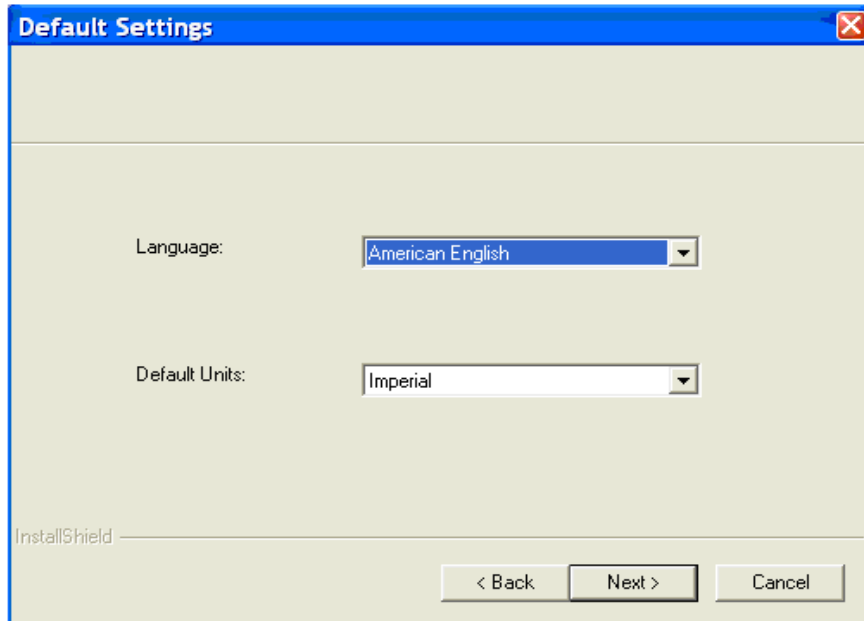


4. Choose the destination location for the PowerDB Lite files.

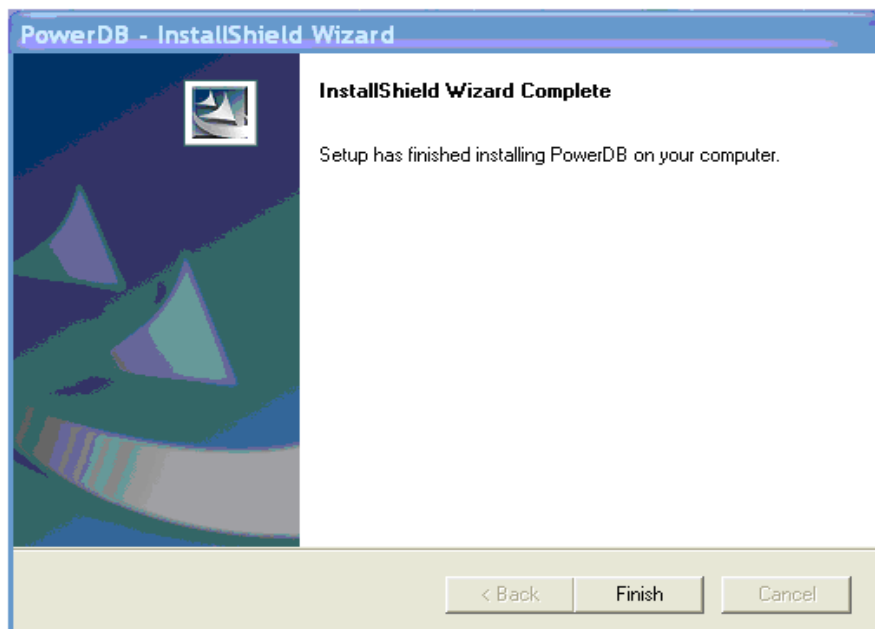


Click Next.

5. Select default settings.



6. Install Shield Wizard will complete the installation of PowerDB Lite software. Click finish to close the installation program.



Viewing Test Results:

Using PowerDB Lite

1. Open your Power DB Lite software.
2. Select your instrument from the Instrument Setup screen.

Instruments Setup

Description	Setup	
Current Transformer		
Earth Forms		
Megohmmeter		

Learn more about PowerDB: <http://www.powerdb.com/about/>
View all forms shipped with PowerDB: <http://www.powerdb.com/forms/>
For technical support call: 1-800-723-2861 x3519

OK

3. Click on File> Open to view the MCT test results.

Open

Look in: PowerDB

1.pdbxml	elzy 1.pdbxml
2cycle.pdbxml	ins1.pdbxml
121212.pdbxml	insl2.pdbxml
a121212.pdbxml	nokneepoint.pdbxml
ct1.pdbxml	t2.pdbxml
dinesh.pdbxml	test.pdbxml

File name: *PdbXm

Files of type: PowerDB XML File (*.PdbXm)

☐ Open as read-only

Open Cancel

4. Select the desired test file and hit Open.

5. Current Transformer Test file with date and time stamping will show up.

Open PowerDB XML file

Form name: 27650 - CURRENT TRANSFORMER TEST

To view or edit a set of results, select a test date and press the Open button.

To remove a set of results, select a test date and press the Delete button.

Press the New button to enter another set of test results.

Test Date
05/12/2008 10:27:56

Open New Delete

Undo Save Close

6. Select the file and hit Open to view the test results. To open a blank CT Test Form, Hit 'New'.

7. A Current transformer Test form will be opened displaying the test results.

Sample PowerDB test form with results



CURRENT TRANSFORMER TEST

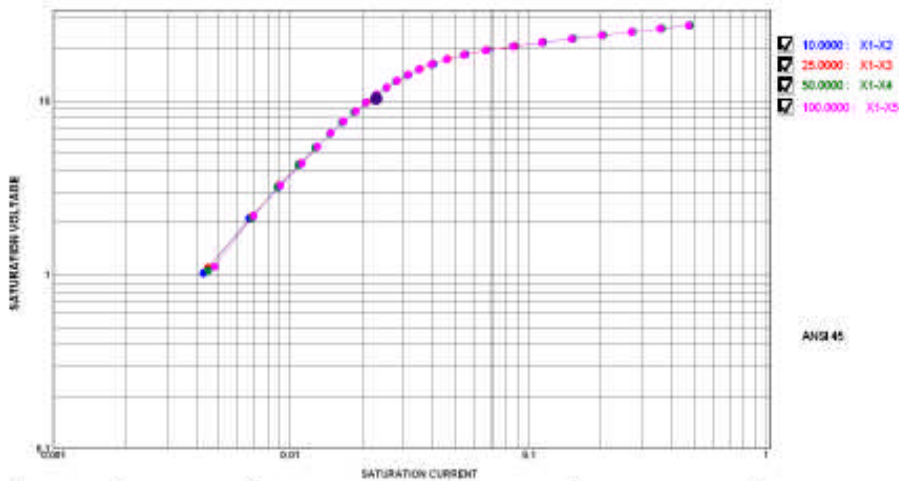


SUBSTATION Forth Worth POSITION North West PAGE 1
 EQPT. LOCATION Bushing DATE 04/12/08
 ASSET ID 752388 TEMPERATURE 78 HUMIDITY 85 % JOB # 8831
 EQPT. INVENTORY NO. 24A55 TESTED BY

NAMEPLATE DATA

MANUFACTURER ABB SERIAL NO. ASSET ID 752388 PHASE
 TYPE BarType VOLTAGE RATING 8000 ACCURACY CLASS 0.5 FREQUENCY 60 Hz
 STYLE BURDEN RATING 5A INSULATION RATING 18V
 NUMBER OF TAPS 4

Tap	CT RATIOS						SATURATION KNEE	
	NAMEPLATE RATIO	ACTUAL RATIO	RATIO % ERROR	PHASE DEV. (min.)	POLARITY	X VOLTAGE (volts)	VOLTAGE (volts)	CURRENT (amps)
X1-X2	10 : 5	9.2069 : 5	7.9	0.14	Correct	1.25	10.32	0.0231
X1-X3	25 : 5	3.0766 : 5	7.7	0.14	Correct	3.04	10.36	0.0231
X1-X4	50 : 5	15.9563 : 5	8.0	16.32	Correct	5.85	10.26	0.0229
X1-X5	100 : 5	32.0545 : 5	7.8	0.21	Correct	11.94	10.35	0.023



BURDEN	VA	PHASE (min)	INSULATION RESISTANCE	SECONDARY TO GROUND
	0.00	0.00		0.0000C
COMMENTS:				
DEFICIENCIES:				

#	VOLTAGE/CURRENT	X1-X2	X1-X3	X1-X4	X1-X5
1	VOLTAGE (volts)	1.0218	1.0657	1.2557	1.1105
	CURRENT (amps)	0.0043	0.0045	0.0045	0.0045
2	VOLTAGE (volts)	2.1088	2.1737	2.432	2.1829
	CURRENT (amps)	0.0057	0.0065	0.0089	0.007



#	VOLTAGE/CURRENT	X1 - X2	X1 - X3	X1 - X4	X1 - X5
3	VOLTAGE (volts)	3.1847	3.2501	3.1889	3.2642
	CURRENT (amps)	0.0089	0.0089	0.0088	0.0091
4	VOLTAGE (volts)	4.3769	4.3548	4.3961	4.3725
	CURRENT (amps)	0.0109	0.011	0.0108	0.0112
5	VOLTAGE (volts)	5.3903	5.4502	5.3879	5.4591
	CURRENT (amps)	0.0127	0.013	0.0127	0.013
6	VOLTAGE (volts)	6.473	6.5331	6.4599	6.5416
	CURRENT (amps)	0.0147	0.0148	0.0147	0.0148
7	VOLTAGE (volts)	7.5672	7.6347	7.5446	7.6334
	CURRENT (amps)	0.0167	0.0167	0.0166	0.0167
8	VOLTAGE (volts)	8.6766	8.7137	8.6437	8.717
	CURRENT (amps)	0.0187	0.0188	0.0186	0.0189
9	VOLTAGE (volts)	9.7692	9.8049	9.7164	9.7955
	CURRENT (amps)	0.0208	0.0209	0.0208	0.0208
10	VOLTAGE (volts)	10.8654	10.9126	10.8052	10.9017
	CURRENT (amps)	0.0231	0.0231	0.0229	0.023
11	VOLTAGE (volts)	11.9588	11.9919	11.8937	11.969
	CURRENT (amps)	0.0256	0.0256	0.0254	0.0255
12	VOLTAGE (volts)	13.0469	13.0648	12.9876	13.0472
	CURRENT (amps)	0.0283	0.0283	0.028	0.0282
13	VOLTAGE (volts)	14.1568	14.1653	14.0696	14.1426
	CURRENT (amps)	0.0316	0.0316	0.0312	0.0314
14	VOLTAGE (volts)	15.2455	15.2434	15.1613	15.2095
	CURRENT (amps)	0.0353	0.0352	0.0349	0.035
15	VOLTAGE (volts)	16.3432	16.335	16.253	16.3043
	CURRENT (amps)	0.0401	0.0397	0.0395	0.0395
16	VOLTAGE (volts)	17.45	17.4327	17.3553	17.3776
	CURRENT (amps)	0.0452	0.0451	0.0456	0.0457
17	VOLTAGE (volts)	18.5245	18.5038	18.444	18.4548
	CURRENT (amps)	0.0549	0.0544	0.0539	0.0541
18	VOLTAGE (volts)	19.6336	19.6016	19.513	19.5374
	CURRENT (amps)	0.0677	0.0672	0.0666	0.0667
19	VOLTAGE (volts)	20.7183	20.6951	20.6363	20.6188
	CURRENT (amps)	0.0867	0.0859	0.0853	0.0854
20	VOLTAGE (volts)	21.8031	21.781	21.7436	21.7044
	CURRENT (amps)	0.1144	0.1135	0.1132	0.1126
21	VOLTAGE (volts)	22.8956	22.8675	22.8578	22.7954
	CURRENT (amps)	0.1533	0.1522	0.1527	0.1509
22	VOLTAGE (volts)	23.9717	23.9454	23.9563	23.8796
	CURRENT (amps)	0.2052	0.2042	0.2057	0.2029
23	VOLTAGE (volts)	25.05	25.0471	25.0513	24.9831
	CURRENT (amps)	0.2725	0.2718	0.274	0.2703
24	VOLTAGE (volts)	26.1441	26.1412	26.1852	26.0498
	CURRENT (amps)	0.3589	0.3586	0.3631	0.3572
25	VOLTAGE (volts)	27.2125	27.2144	27.2725	27.1517
	CURRENT (amps)	0.4714	0.4714	0.4786	0.4705

Specifications

Input

95 to 265 V, 1 ϕ , 50 or 60 Hz

Output

Continuously variable in six ranges:

0 to 40V at 5.0A max (1 minute on' 15 minute off)

0 to 160 V at 5.0 A max (1 minute on'15 minute off)

0 to 800 V at 1.5 A max (5 min on, 15 min off)\

0 to 1600 V at 1.0 A max (5 min on, 15 min off)

Instrumentation

Voltmeters

Output

4 ½ digit, auto ranging

Resolution: 0.0000 to 1.9999/19.999/199.99/1999.9

Ranges: 0 to 40/160/800/1600

Accuracy: +/- 0.5 % of reading and +/- 0.5% of range typical

+/- 1% of reading and +/- 1 V maximum

Input

4 ½ digit, auto ranging

Resolution: 0.0000 to 1.9999/1.999/1.99/1.9/600 V

Ranges: 0 to 2/600V

Accuracy: 2 V Range: +/- 0.5 % of reading and +/- 0.25% of range

600 V Range: +/- 0.5% of reading and +/-0.5% of range

Ammeter

4 ½ digit

Range: 0.0000 to 1.0000A/10.000

Accuracy: +/- 0.85 % of reading and +/- LSD

Phase Angle

3 digits

Range 0 to 360 degrees

Accuracy: +/- 1 degree

Ratio

Range

Accuracy

0.8 to 5000:

+/- 0.4% typical

+/-0.8% maximum

Insulation Test

Test Voltage 1000 VDC, 500 VDC

Measuring Range 10 K Ω – 999 M Ω
Short circuit current 1.5 mA nominal
Test current on load 1 mA at min. pass values of insulation
(As specified in BS7671, HD 384 and IEC 364)
Accuracy: +/- 3%, +/- 2 digits up to 10M
 +/- 5%, up to 100 M
 +/- 30% up to full scale

Computer Interface

USB
Ethernet

Environment

Operating: -10°C to 50°C
Storage: -30°C to 70°C

Enclosure

The unit is housed in a rugged enclosure suitable for use in outdoor substations

Standards

IEC 61010
CSA 22.2
CE

Dimensions

7.5”H X 19.25” W X 15” D
(190H X 489W X 940 D mm)

Weight

47.6 lb (21.6 kg)

CT Demagnetization

A magnetized CT with residual magnetism will give incorrect ratio and saturation results. It is very important to demagnetize the CT before/after every saturation test. MCT 1600 automatically demagnetize the CT at the completion of the test.

CT can have some residual magnetism if a large DC current was passed through it's winding or high over currents were interrupted at it's peak value. The effect of residual magnetism is when the CT is energized next time; it would result in CT ratio error and unpredictable early saturation.

The MCT 1600 demagnetizes the CT by applying a suitable AC voltage to CT secondary and taking it above saturation point. The unit then slowly decreases the secondary voltage back to zero thereby demagnetizing it and clearing any residual magnetism.

The demagnetizing function is inbuilt to the unit and operator doesn't have to do anything for CT demagnetization.

Maintenance & Calibration

Maintenance

Maintenance should be performed only by qualified persons familiar with the hazards involved with high voltage test equipment. Read and understand the safety section, before performing any service.

Routine maintenance is all that is required for these test sets. The cables and connectors should be inspected frequently to be sure that all connections are tight and no damaged or loose connection has developed.

The appearance of the test set can be maintained by occasional cleaning of the MCT case and assemblies. The front panel can be cleaned with a dry cloth or a cloth dampened with detergent and water. Do not allow water to penetrate through output terminals or any panel holes, because damage to components on the underside may result.

Calibration

A self calibration check can be done to verify the calibration of the unit. If there is any deviation in results from normal, please contact Megger for more information. A complete operation and calibration check is recommended at least once a year.

Self Check:

1. Make sure test set is OFF
2. Connect the ground wing nut to a suitable ground.
3. Connect the H1 lead to X1 and H2 lead to X2.
4. Turn the test set ON.
5. From main screen, select the manual option.
6. Select the Voltage range as 40V by using F2 function button.
7. Apply a certain test voltage, for example 10V to the secondary X1 and X2.
8. Read the primary and secondary voltage readings from the screen.
9. Observe that both the readings should be same, or very close to each other.

10. Now increase the voltage to 20 V gradually. The change in secondary voltage will reflect same and proportionate change in primary voltage.

Warranty & Repair

Warranty

Megger warrants to the original purchaser that the product is free from defects in material and workmanship for a period of one (1) year from the date of shipment.

This warranty is limited and shall not apply to equipment which has damage, or cause of defect, due to accident, negligence, improper operation, faulty installation by purchaser, or improper service or repair by any person, company or corporation not authorized by Megger. If examination by Megger discloses that the product is or has been defective, then our obligation is limited to repair or replacement of the defective units or it's components, at our option.

The foregoing warranty constitutes Megger's sole liability and is in lieu of any other warranty of merchantability or fitness. Megger shall not be responsible for any incidental or consequential damages arising from any breach of warranty.

Repair

In the event that MCT 1600 appears defective, call the Megger Dallas service department at 1-800-723 2861. The service and technical support department will determine the cause of apparent malfunction and provide the necessary support to correct the problem. At times, problems can be corrected by troubleshooting on phone. Therefore, before returning the equipment to the factory for repair/service discuss all problems with Megger.

If factory service is required, request repair service department for return instructions. A Return Authorization (RA) number will be assigned for proper handling of the unit when it arrives at the factory. Provide relevant information like model number, serial number of the unit, nature of the problem, return address, your name and where you can be reached should the factory need to contact you.