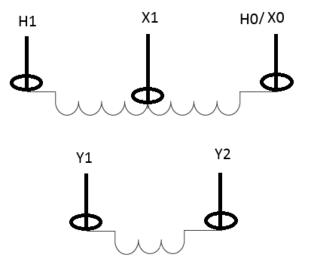


Testing bushing CTs in a high noise substation

Objective: This application note demonstrates how to hook up leads and perform the test with MRCT test equipment on bushings CTs of an auto transformer in a high voltage substation with extreme noise and interference.

Test object: Single phase auto transformer



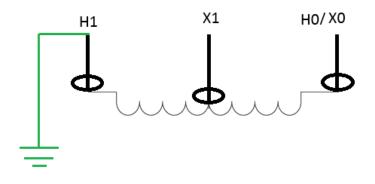
Single phase auto transformer with bushing CTs

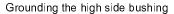
Test Equipment: MRCT

Test connections:

Ground the H1 bushing and leave it grounded for the whole duration of testing all CTs as shown

below:





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Testing bushing CTs in a high noise substation

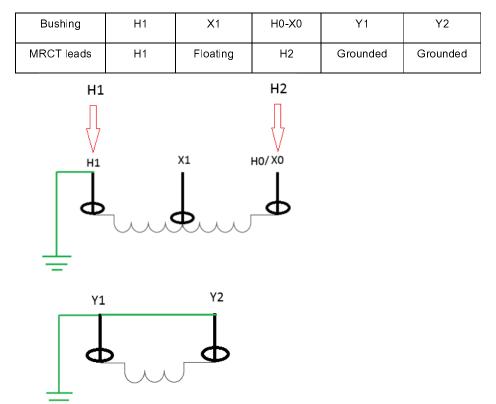
Grounding is performed to reduce any induced voltage from overhead energized lines

Testing CTs on H side bushing

MRCT unit has H and X test leads

a) Connection of H leads

Make following connections for H1 and H2 test leads

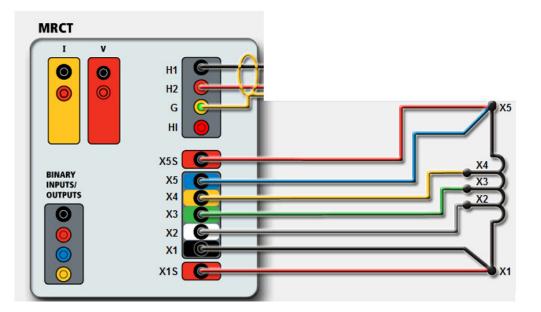


b) Connection of X leads

Connect MRCT secondary leads marked X1S, X1, X2, X3, X4, X5 and X5S to the secondary of the CT under test as per the diagram shown below.

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Testing bushing CTs in a high noise substation

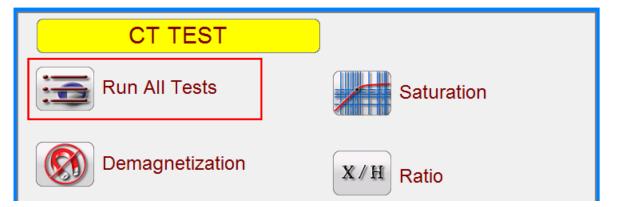


Before proceeding to start the test, please make sure that communication button at the top left side

of the software screen is green. This indicates that software is communicating with the test box.



From home screen of the MRCT software select Run All Tests



In the Test selection screen, check all saturation, all ratio and all winding resistance test. Ratio test includes polarity test.



Testing bushing CTs in a high noise substation

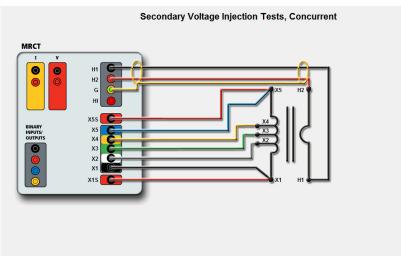
| # Taps 5 | Saturation Test | Ratio Test | Winding Resistance | Insulation Resistance |
|-----------------------------------|-------------------------|------------------------------|-------------------------|----------------------------|
| X1-X2 | \checkmark | \checkmark | \checkmark | Primary To Secondary 🗾 1KV |
| X1-X3 | N | | N | |
| X1-X4 | | | N | Primary To Ground |
| X1-X5 | $\overline{\checkmark}$ | N | $\overline{\checkmark}$ | Secondary To Ground 🚺 1KV |
| X2-X3 | \checkmark | \checkmark | \checkmark | All Ranges |
| X2-X4 | | $\overline{\mathbf{\nabla}}$ | | |
| X2-X5 | $\overline{}$ | \checkmark | \checkmark | |
| X3-X4 | N | N | N | |
| X3-X5 | \checkmark | \checkmark | \checkmark | |
| X4-X5 | $\overline{\checkmark}$ | $\overline{\checkmark}$ | V | |
| Saturation/Ratio X1 to Xn Only | | All Ratio Tests | All Winding Tests | |
| Concurrent | | | | |

It is important to NOT check insulation resistance test as high side is intentionally shorted to ground to eliminate the interference. User would have to perform the insulation resistance separately. Hit the play button to run the test

Following diagram will show up. Hit the play button again to confirm and unit will initiate the test.



Testing bushing CTs in a high noise substation





The tests will be performed in following order:

- DC winding resistance of CT secondary
- Demagnetization
- Saturation or Excitation Test
- Ratio and Polarity test

At the end of the test, a report similar to below will show up:



Testing bushing CTs in a high noise substation

| MAN | NUFACTURER | | - | SE | RIAL NO. | 5226t3a00 | 1 | | PHASE | | |
|------|-------------|---------------|---------------------------------------|------------|------------|------------|------------|------------|---|----------|-----------|
| | | | ACCURACY CLASS SATURATION STD ANSI 45 | | | | | | | | |
| | | | | | | ° | | SATURA | | 0140 | |
| BUR | RDEN | | | | VA | | | | | | |
| Se | condary Vol | tage Injectio | | | | | | | | | |
| | Тар | X1-X2 | X1-X3 | X1-X4 | X1-X5 | X2-X3 | X2-X4 | X2-X5 | X3-X4 | X3-X5 | X4-X5 |
| 2 | Nameplate | 1000:5 | 2200:5 | 2500:5 | 3000:5 | 1200:5 | 1500:5 | 2000:5 | 300:5 | 800:5 | 500:5 |
| | Measured | 1000.291:5 | 2200.464:5 | 2500.626:5 | 3000.644:5 | 1200.172:5 | 1500.335:5 | 2000.353:5 | 300.163:5 | 800.18:5 | 500.018:5 |
| b | % Error | 0.029 | 0.021 | 0.025 | 0.021 | 0.014 | 0.022 | 0.018 | 0.054 | 0.023 | 0.004 |
| L | Test V (V) | 99.866 | 219.68 | 249.65 | 299.57 | 119.82 | 149.79 | 199.71 | 29.967 | 79.888 | 49.920 |
| L | Test I (A) | 0.1674 | 0.0761 | 0.0670 | 0.0558 | 0.1395 | 0.1116 | 0.0837 | 0.5579 | 0.2093 | 0.3349 |
| | Prim V (V) | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 |
| Ph | nase Dev. | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' |
| | Polarity | Correct | Correct | Correct | Correct | Correct | Correct | Correct | Correct | Correct | Correct |
| Knee | | 196.23 | 431.30 | 490.20 | 589.27 | 235.07 | 293.96 | 393.05 | 58.893 | 157.93 | 99.016 |
| | Cur.(A) | 0.2643 | 0.1203 | 0.1058 | 0.0882 | 0.2209 | 0.1765 | 0.1324 | 0.8801 | 0.3306 | 0.5292 |
| | 10 | | | | | | *** | | x1-x2 x1-x3 x1-x4 x1-x5 x2-x3 x2-x4 x2-x5 x3-x4 x3-x5 | | |
| | 22 | | 0.01 | Cum | ent | 0.1 | Displ | 1 | n Test Data | _ | |

Hit the save button to save the file by giving it a file name.

| FILE HOME TOOLS | HELP | |
|---------------------|--|------------------------------|
| | Import ▼ Import ▼ Import ▼ Import ▼ Import ▼ | 🔌 🗵 🔰 🗊 🐼 |
| New Open Save Print | K Cut Select Instrume | |
| File | Edit Data Instru | ument Settings Test Controls |

Testing CTs on X1 bushing

Before testing X1 bushing, follow the below steps to enable a specific setting in MRCT software:

Click on the nameplate icon on the home screen of the software as shown below:



Testing bushing CTs in a high noise substation



In the nameplate screen, click on the area shown in the blue circle:

| Nameplate | | |
|--|--------------------------|-------------------------------|
| CT1X CT2X CT3X CT4X CT5X CT6X CT7X CT83 | X CT9X CT10X CT11X CT12X | |
| No. of CTs 12 No. of Cores 1 | No. of Taps 5 | CT Label X Name CT1 |
| Manufacturer |] | Meter Protection |
| Serial No. 5226t3a001 | Accuracy Class | |
| Asset ID | VA | |
| Phase | Burden | |
| | | Buried CT in Delta Connection |
| Ratios X1-X2 1,000 : 5 X1-X3 2,200 : 5 | X1-X4 2,500 : 5 X1-X5 | 3,000 : 5 |
| User Descriptions and Values | | |
| Description | Value | Сору |
| | | |
| | | |

This will pop up a window asking to enter a password. Enter password vapower (case sensitive)



Hit green OK button

This will enable a new selection check box on nameplate screen: "H2 connected to shroud" as

shown below:



Testing bushing CTs in a high noise substation

| Nameplate | |
|--|-----------------------------------|
| CT1X CT2X CT3X CT4X CT5X CT6X CT7X CT8 | 3X CT9X CT10X CT11X CT12X |
| No. of CTs 12 No. of Cores 1 | No. of Taps 5 CT Label X Name CT1 |
| Manufacturer | Meter Protection |
| Serial No. 5226t3a001 | Accuracy Class |
| Asset ID | VA |
| Phase | Burden |
| H2 Connected to Shroud | Buried CT in Delta Connection |
| Ratios X1-X2 1,000 : 5 X1-X3 2,200 : 5 | X1-X4 2,500 : 5 X1-X5 3,000 : 5 |
| User Descriptions and Values | |
| Description | Value Copy |
| | |
| | |
| | |
| | |

Please note that user does not have to perform these steps every time. It is performed just one time

and can be saved as default settings by following the steps below:

| | | Save As Default |
|-------------|-----------------------------|-----------------|
| 92. 😚 🚍 → 🤇 | Default Settings Options | Restore Default |
| | | Restore Factory |

MRCT unit has H and X test leads

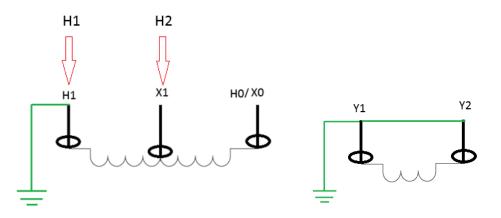
a) Connection of H leads

Make following connections for H1 and H2 test leads

| Bushing | H1 | X1 | H0- Xo | Y1 | Y2 |
|------------|----|----|----------|----------|----------|
| MRCT leads | H1 | H2 | Floating | Grounded | Grounded |

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Testing bushing CTs in a high noise substation



Please note that by connecting H1 and H2 test leads as shown above will generate incorrect polarity

but that will be taken care of in section below.

In the nameplate screen check the box "H2 connected to Shroud"



This will take care of incorrect polarity issue.

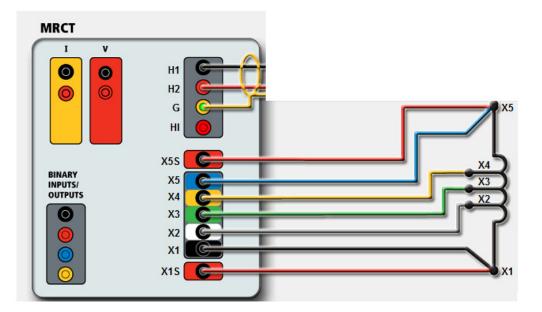
b) Connection of X leads

Connect MRCT secondary leads marked X1S, X1, X2, X3, X4, X5 and X5S to the secondary of the

CT under test as per the diagram shown below.



Testing bushing CTs in a high noise substation



From home screen of the MRCT software select Run All Tests

| CT TEST | |
|-----------------|------------|
| Run All Tests | Saturation |
| Demagnetization | X/H Ratio |

In the Test selection screen, check all saturation, all ratio and all winding resistance test. Ratio test includes polarity test.



Testing bushing CTs in a high noise substation

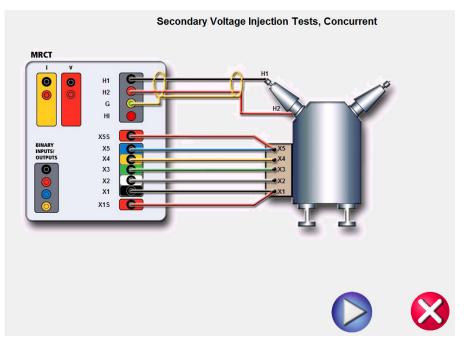
| # Taps 5 | Saturation Test | Ratio Test | Winding Resistance | Insulation Resistance |
|-----------------------------------|-------------------------|------------------------------|-------------------------|----------------------------|
| X1-X2 | \checkmark | \checkmark | | Primary To Secondary 🗾 1KV |
| X1-X3 | N | | N | |
| X1-X4 | | | N | Primary To Ground |
| X1-X5 | $\overline{\checkmark}$ | N | $\overline{\checkmark}$ | Secondary To Ground 🚺 1KV |
| X2-X3 | \checkmark | \checkmark | \checkmark | All Ranges |
| X2-X4 | | $\overline{\mathbf{\nabla}}$ | | |
| X2-X5 | $\overline{}$ | \checkmark | \checkmark | |
| X3-X4 | N | N | N | |
| X3-X5 | \checkmark | \checkmark | \checkmark | |
| X4-X5 | $\overline{\checkmark}$ | $\overline{\checkmark}$ | V | |
| Saturation/Ratio X1 to Xn Only | | All Ratio Tests | All Winding Tests | |
| Concurrent | | | | |

It is important to NOT check insulation resistance test as high side is intentionally shorted to ground to eliminate the interference. User would have to perform the insulation resistance separately. Hit the play button to run the test

Following diagram will show up. Hit the play button again to confirm and unit will initiate the test.



Testing bushing CTs in a high noise substation



The tests will be performed in following order:

- DC winding resistance of CT secondary
- Demagnetization
- Saturation or Excitation Test
- Ratio and Polarity test

At the end of the test, a report similar to below will show up:



Testing bushing CTs in a high noise substation

| МА | NUFACTURER | Ł | | SE | RIAL NO. | 5226t3a00 | 1 | | PHASE | | |
|-------------|---------------------|------------|------------|------------|-------------|------------|------------|------------|--|----------|----------|
| AS | SET ID | | | | CURACY CLAS | s | | SATURA | | ISI 45 | |
| BU | RDEN | | | _ | VA | | | | | | |
| | | | | _ | | | | | | | |
| 56 | econdary Vol Tap | X1-X2 | n X1-X3 | X1-X4 | X1-X5 | X2-X3 | X2-X4 | X2-X5 | X3-X4 | X3-X5 | X4-X5 |
| ٤T | Nameplate | 1000:5 | 2200:5 | 2500:5 | 3000:5 | 1200:5 | 1500:5 | 2000:5 | 300:5 | 800:5 | 500:5 |
| | Measured | 1000.291:5 | 2200.464:5 | 2500.626:5 | 3000.644:5 | 1200.172:5 | 1500.335:5 | 2000.353:5 | 300.163:5 | 800.18:5 | 500.018: |
| ŀ | % Error | 0.029 | 0.021 | 0.025 | 0.021 | 0.014 | 0.022 | 0.018 | 0.054 | 0.023 | 0.004 |
| ۲ŀ | Test V (V) | 99.866 | 219.68 | 249.65 | 299.57 | 119.82 | 149.79 | 199.71 | 29.967 | 79.888 | 49.920 |
| ŀ | Test I (A) | 0.1674 | 0.0761 | 0.0670 | 0.0558 | 0.1395 | 0.1116 | 0.0837 | 0.5579 | 0.2093 | 0.3349 |
| ŀ | Prim V (V) | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 |
| P | hase Dev. | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' |
| | Polarity | Correct | Correct | Correct | Correct | Correct | Correct | Correct | Correct | Correct | Correct |
| Kne | e Volt.(V) | 196.23 | 431.30 | 490.20 | 589.27 | 235.07 | 293.96 | 393.05 | 58.893 | 157.93 | 99.016 |
| | Cur.(A) | 0.2643 | 0.1203 | 0.1058 | 0.0882 | 0.2209 | 0.1765 | 0.1324 | 0.8801 | 0.3306 | 0.5292 |
| Voltage L Z | | | | | | | *** | | X1-X3 X1-X4 X1-X5 X2-X4 X2-X4 X3-X4 X3-X4 X3-X5 | | |
| | 5 2 0,001 | <i>A</i> | 0.01 | Curr | | 0.1 | Disp | 1 | n Test Data | _ | |

Hit the save button to save the file by giving it a file name.

| FILE HOME TOOLS | HELP | | | | | | | |
|---------------------|------|--------------------------|----------------------|----------|-----------------|--------------------|---------------------|---------------|
| New Open Save Print | Cut | 🕞 Import 🔹 🋃 Export 🔹 | Select Instrument | Setup | 9 Initialize | Simulation Mode | Simulate Contact | Abort Test |
| File | Edit | Data | Instrum | ent Sett | ings | Tes | t Controls | |

Testing CTs on X0 bushing

MRCT unit has H and X test leads

a) Connection of H leads

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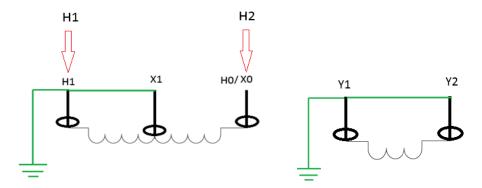
Testing bushing CTs in a high noise substation

Make following connections for H1 and H2 test leads

| Bushing | H1 | X1 | H0- Xo | Y1 | Y2 |
|------------|----|----------|--------|----------|----------|
| MRCT leads | H1 | Grounded | H2 | Grounded | Grounded |

Please note that by connecting H1 and H2 test leads as shown above will generate incorrect polarity

but that will be taken care of in section below.



In the nameplate screen check the box "H2 connected to Shroud"



This will take care of incorrect polarity issue.

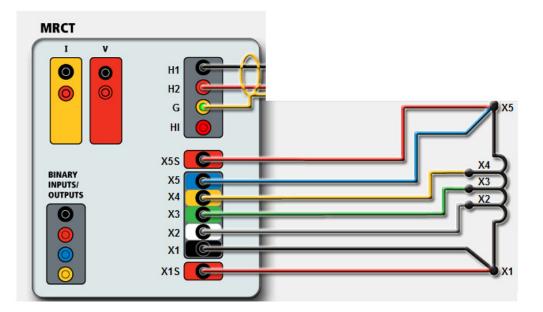
b) Connection of X leads

Connect MRCT secondary leads marked X1S, X1, X2, X3, X4, X5 and X5S to the secondary of the

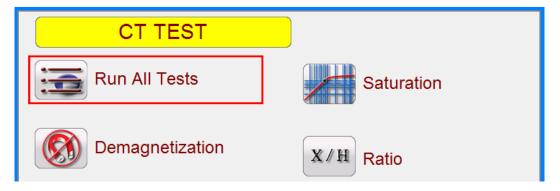
CT under test as per the diagram shown below.



Testing bushing CTs in a high noise substation



From home screen of the MRCT software select Run All Tests



In the Test selection screen, check all saturation, all ratio and all winding resistance test. Ratio test includes polarity test.



Testing bushing CTs in a high noise substation

| # Taps 5 | Saturation Test | Ratio Test | Winding Resistance | Insulation Resistance |
|-----------------------------------|--------------------|------------------------------|------------------------------|----------------------------|
| X1-X2 | \checkmark | \checkmark | | Primary To Secondary 🗾 1KV |
| X1-X3 | V | N | N | |
| X1-X4 | | | | Primary To Ground |
| X1-X5 | | | | Secondary To Ground 1KV |
| X2-X3 | \checkmark | \checkmark | | All Ranges |
| X2-X4 | | $\overline{\mathbf{\nabla}}$ | | Air Nairges |
| X2-X5 | $\overline{}$ | \checkmark | $\overline{\mathbf{\nabla}}$ | |
| X3-X4 | N | $\overline{\mathbf{v}}$ | N | |
| X3-X5 | $\overline{}$ | \checkmark | $\overline{\mathbf{v}}$ | |
| X4-X5 | \checkmark | $\overline{\checkmark}$ | N | |
| Saturation/Ratio X1 to Xn Only | | All Ratio Tests | All Winding Tests | |
| Concurrent | | | | |

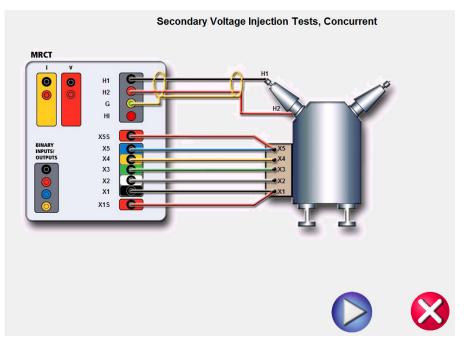
It is important to NOT check insulation resistance test as high side is intentionally shorted to ground to eliminate the interference. User would have to perform the insulation resistance separately.

Hit the play button to run the test

Following diagram will show up. Hit the play button again to confirm and unit will initiate the test.



Testing bushing CTs in a high noise substation



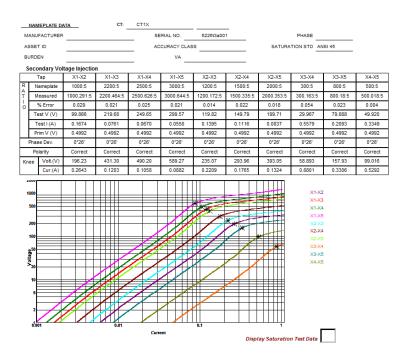
The tests will be performed in following order:

- DC winding resistance of CT secondary
- Demagnetization
- Saturation or Excitation Test
- Ratio and Polarity test

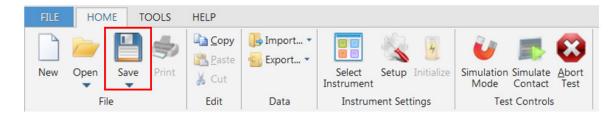
At the end of the test, a report similar to below will show up:



Testing bushing CTs in a high noise substation



Hit the save button to save the file by giving it a file name.



Testing CTs on Y1 bushing

If the tertiary winding has only single tap, user can change the no. of taps to two by going to

nameplate screen:



Testing bushing CTs in a high noise substation

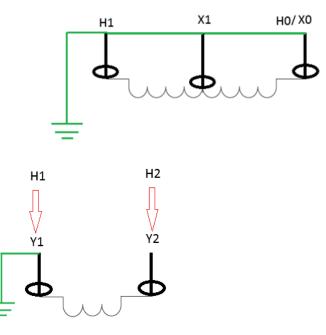
| Nameplate | | | |
|--------------|------------------------|----------------|-------------------------------|
| Numeplate | | | |
| | | | |
| No. of CTs | 1 No. of Cores 1 | No. of Taps 2 | CT Label X Name CT1 |
| Manufacturer | | | Meter Protection |
| Serial No. | | Accuracy Class | |
| Asset ID | | VA (| |
| Phase | | Burden | |
| | H2 Connected to Shroud | | Buried CT in Delta Connection |

MRCT unit has H and X test leads

a) Connection of H leads

Make following connections for H1 and H2 test leads

| Bushing | H1 | X1 | H0- Xo | Y1 | Y2 |
|------------|----------|----------|----------|-----------------|----|
| MRCT leads | Grounded | Grounded | Grounded | H1 and Grounded | H2 |



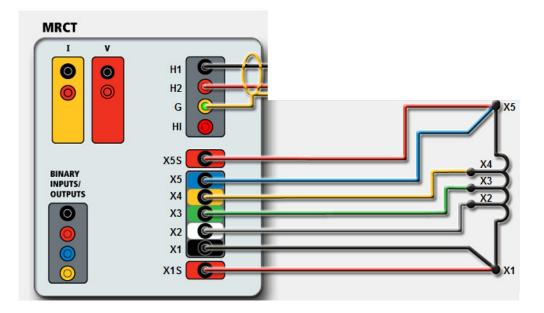


Testing bushing CTs in a high noise substation

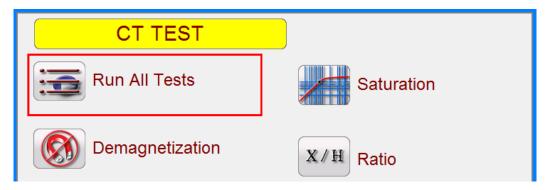
b) Connection of X leads

Connect MRCT secondary leads marked X1S, X1, X2, X3, X4, X5 and X5S to the secondary of the

CT under test as per the diagram shown below.



From home screen of the MRCT software select Run All Tests



In the Test selection screen, check all saturation, all ratio and all winding resistance test. Ratio test includes polarity test.



Testing bushing CTs in a high noise substation

| # Taps 5 | Saturation Test | Ratio Test | Winding Resistance | Insulation Resistance |
|--|-------------------------|------------------------------|-------------------------|----------------------------|
| X1-X2 | \checkmark | \checkmark | | Primary To Secondary 🗾 1KV |
| X1-X3 | $\overline{}$ | $\overline{\mathbf{\nabla}}$ | | Primary To Ground |
| X1-X4 | \checkmark | \checkmark | \checkmark | Primary To Ground |
| X1-X5 | N | $\overline{\mathbf{\nabla}}$ | N | Secondary To Ground1KV |
| X2-X3 | \checkmark | \checkmark | \checkmark | |
| X2-X4 | N | $\overline{\checkmark}$ | N | All Ranges |
| X2-X5 | \checkmark | \checkmark | N | |
| X3-X4 | N | \checkmark | N | |
| X3-X5 | \checkmark | \checkmark | $\overline{\mathbf{A}}$ | |
| X4-X5 | $\overline{\checkmark}$ | $\overline{\checkmark}$ | N | |
| Saturation/Ratio | | All Ratio Tests | All Winding Tests | |
| Concurrent | | | | |

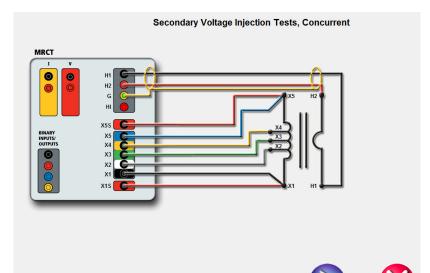
It is important to NOT check insulation resistance test as high side is intentionally shorted to ground to eliminate the interference. User would have to perform the insulation resistance separately.

Hit the play button to run the test

Following diagram will show up. Hit the play button again to confirm and unit will initiate the test.



Testing bushing CTs in a high noise substation



The tests will be performed in following order:

- DC winding resistance of CT secondary
- Demagnetization
- Saturation or Excitation Test
- Ratio and Polarity test

At the end of the test, a report similar to below will show up:

| | NAMEPLATE DA | ATA | CT: | CT1X | | | | | | | |
|----|--------------------------------------|------------------|--|------------------|------------------|------------------|------------------|------------------|---|----------------------------|------------------|
| м | IANUFACTURER | | | SE | RIAL NO. | 5226t3a00 | 1 | | PHASE | | |
| A | SSET ID | | ACCURACY CLASS | | | | | SATURA | TION STD AN | ISI 45 | |
| в | URDEN | | VA | | | | | | | | |
| 5 | Secondary Vol | tage Injectio | n | | | | | | | | |
| | Тар | X1-X2 | X1-X3 | X1-X4 | X1-X5 | X2-X3 | X2-X4 | X2-X5 | X3-X4 | X3-X5 | X4-X5 |
| R | Nameplate | 1000:5 | 2200:5 | 2500:5 | 3000:5 | 1200:5 | 1500:5 | 2000:5 | 300:5 | 800:5 | 500:5 |
| Ŧ | Measured | 1000.291:5 | 2200.464:5 | 2500.626:5 | 3000.644:5 | 1200.172:5 | 1500.335:5 | 2000.353:5 | 300.163:5 | 800.18:5 | 500.018:5 |
| 0 | % Error | 0.029 | 0.021 | 0.025 | 0.021 | 0.014 | 0.022 | 0.018 | 0.054 | 0.023 | 0.004 |
| | Test V (V) | 99.866 | 219.68 | 249.65 | 299.57 | 119.82 | 149.79 | 199.71 | 29.967 | 79.888 | 49.920 |
| | Test I (A) | 0.1674 | 0.0761 | 0.0670 | 0.0558 | 0.1395 | 0.1116 | 0.0837 | 0.5579 | 0.2093 | 0.3349 |
| | Prim V (V) | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 | 0.4992 |
| | Phase Dev. | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' | 0°26' |
| | Polarity | Correct | Correct | Correct | Correct | Correct | Correct | Correct | Correct | Correct | Correct |
| Kr | Cur.(A) | 196.23 0.2643 | 431.30 0.1203 | 490.20 0.1058 | 589.27 0.0882 | 235.07 0.2209 | 293.96 0.1765 | 393.05 0.1324 | 58.893 0.8801 | 157.93 0.3306 | 99.016 0.5292 |
| 1 | | | Jan Harrison (Construction of the second sec | | | | | | X1-32 X1-32 X1-32 X1-32 X2 X2-32 X2 X2-32 X2 X2-32 X2 X2-32 X2 X2-32 X2 X2-32 X2 X2-32 X2 | 4 5 5 5 5 5 | |
| | Current Display Saturation Test Data | | | | | | | | | | |



Testing bushing CTs in a high noise substation

Hit the save button to save the file by giving it a file name.

| FILE HOME TOOLS | HELP | | |
|---------------------|---|-------------------------|--|
| New Open Save Print | Copy Import Paste Export Cut Import | Select Setup Initialize | Simulation Simulate Abort Mode Contact Test |
| File | Edit Data | Instrument Settings | Test Controls |

Testing CTs on Y2 bushing

If the tertiary winding has only single tap, you can change the no. of taps to 2 by going to nameplate

screen:

| Nameplate | | | |
|--------------|------------------------|----------------|-------------------------------|
| No. of CTs | 1 No. of Cores 1 | No. of Taps 2 | CT Label X Name CT1 |
| Manufacturer | | | Meter Protection |
| Serial No. | | Accuracy Class | |
| Asset ID | | VA | |
| Phase | | Burden | |
| | H2 Connected to Shroud | | Buried CT in Delta Connection |

MRCT unit has H and X test leads

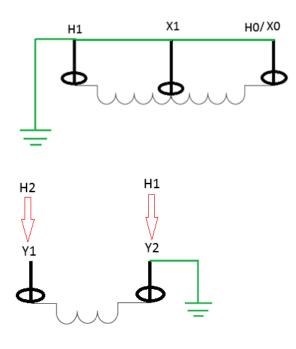
a) Connection of H leads

Make following connections for H1 and H2 test leads

| Bushing | H1 | X1 | H0- Xo | Y1 | Y2 |
|------------|----------|----------|----------|----|-----------------|
| MRCT leads | Grounded | Grounded | Grounded | H2 | H1 and Grounded |



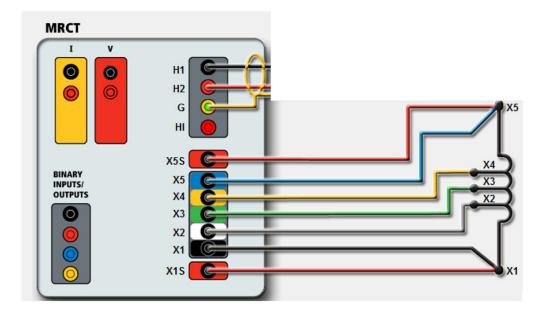
Testing bushing CTs in a high noise substation



b) Connection of X leads

Connect MRCT secondary leads marked X1S, X1, X2, X3, X4, X5 and X5S to the secondary of the

CT under test as per the diagram shown below.

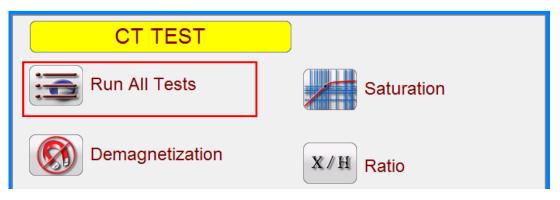


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Testing bushing CTs in a high noise substation

From home screen of the MRCT software select Run All Tests



In the Test selection screen, check all saturation, all ratio and all winding resistance test. Ratio test

includes polarity test.

| # Taps 5 | Saturation Test | Ratio Test | Winding Resistance | Insulation Resistance |
|-----------------|------------------------------|------------------------------|------------------------------|----------------------------|
| X1-X2 | \checkmark | | \checkmark | Primary To Secondary 🗾 1KV |
| X1-X3 | $\overline{\mathbf{\nabla}}$ | $\overline{\mathbf{\nabla}}$ | | Primary To Ground |
| X1-X4 | N | N | | Primary To Ground |
| X1-X5 | \checkmark | | \checkmark | Secondary To Ground 1KV |
| X2-X3 | \checkmark | \checkmark | \checkmark | |
| X2-X4 | $\overline{\checkmark}$ | $\overline{\checkmark}$ | \checkmark | All Ranges |
| X2-X5 | \checkmark | \checkmark | | |
| X3-X4 | $\overline{}$ | | $\overline{\mathbf{\nabla}}$ | |
| X3-X5 | $\overline{}$ | \checkmark | \checkmark | |
| X4-X5 | N | V | N | |
| Saturation/Rati | | | All Winding | |
| X1 to Xn Only | / Tests | V Tests | V Tests | |
| Concurrent | | | | |

It is important to NOT check insulation resistance test as high side is intentionally shorted to ground

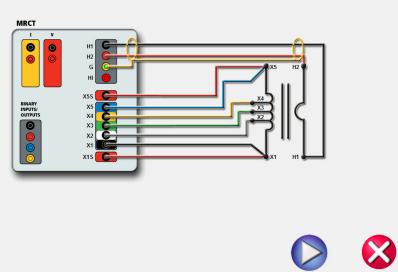
to eliminate the interference. User would have to perform the insulation resistance separately.



Testing bushing CTs in a high noise substation

Hit the play button to run the test

Following diagram will show up. Hit the play button again to confirm and unit will initiate the test.



Secondary Voltage Injection Tests, Concurrent

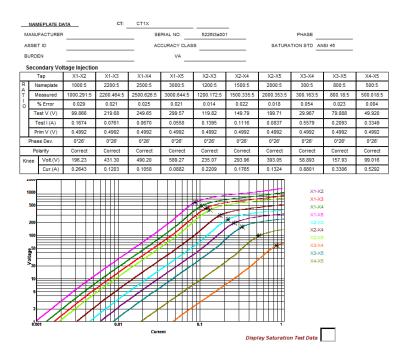
The tests will be performed in following order:

- DC winding resistance of CT secondary
- Demagnetization
- Saturation or Excitation Test
- Ratio and Polarity test

At the end of the test, a report similar to below will show up:



Testing bushing CTs in a high noise substation



Hit the save button to save the file by giving it a file name.

| FILE H | OME TOOLS | HELP | | | | | | |
|----------|------------|--|--------------------------|----------------------|------------------|----------------------|---------------------|---------------|
| New Oper | Save Print | ि <u>a</u> <u>C</u> opy Copy Cut | ि Import… ▼ Export… ▼ | Select Instrument | Setup Initialize | Simulation S Mode | Simulate Contact | Abort Test |
| | File | Edit | Data | Instrum | nent Settings | Test | Controls | |