



Scope Noise Characterization Help



077-1764-01



Scope Noise Characterization Help

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077-1764-01 May 2023

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Welcome

The Oscilloscope's vertical noise arises mainly from the analog front-end and digitizing process. The oscilloscope noise will degrade the actual measurement accuracy, especially when we are measuring low-amplitude signals. Hence, it is important to remove the oscilloscope noise from the measurement results.

Scope Noise Characterization is a standalone application used to characterize noise for Tektronix Performance Digital Oscilloscopes (DPO7000C, DPO70000C/D/DX, DSA70000C/D, MSO70000C/DX, and DPO70000SX Series).

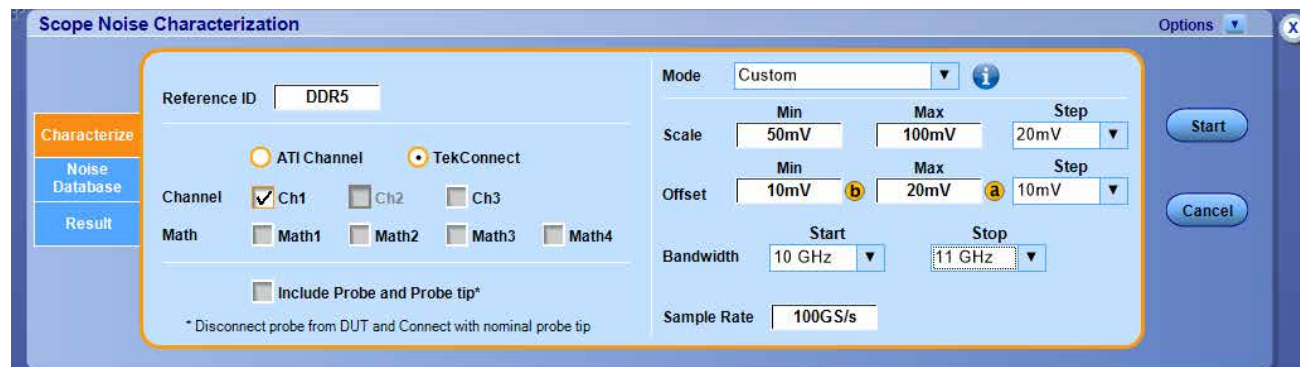


Figure 1: Scope Noise Characterization home screen

Key features:

- Supports Tektronix Performance Digital Oscilloscopes (DPO7000C, DPO70000C/D/DX, DSA70000C/D, MSO70000C/DX, and DPO70000SX Series).
- Supports characterizing the noise for the given range of values.
- Supports Noise characterization on both ATI and TekConnect channels.
- Supports Math expressions.
- Characterize the noise of the oscilloscope only or with the probe (and tip).
- Supports PI interface for all user controls.
- Interface to read the noise value for a specific oscilloscope configuration.
- Save/Recall of application setup file.
- Indicates the validity of the noise values.

Getting help and support

Product documents

Use the product documents for more information on the application functions, understand the theory of operation, how to remotely program or operate the application, and do other tasks.

Table 1: Scope Noise Characterization application documents

To learn about	Use this document
How to use the application	Scope Noise Characterization Help PDF version of this document can be downloaded from www.tek.com/downloads Compiled HTML (CHM) version is integrated with the application. Press F1 key from the keyboard to launch the help.

Conventions

This document uses the following conventions:

- When steps require a sequence of selections using the application interface, the “>” delimiter marks each transition between a menu and an option.
- For example, **Analyze > Scope Noise Characterization**
- The term “application” refers to Scope Noise Characterization application.
- The abbreviation used for “Scope Noise Characterization” will be “SNC”.
- The term “DUT” is an abbreviation for Device Under Test.
- The term “select” is a generic term that applies to the methods of choosing an option: with a mouse or with the touch screen.

Technical support

Tektronix values your feedback on our products. To help us serve you better, please send us your suggestions, ideas, or comments on your application or oscilloscope. Contact Tektronix through mail, telephone, or the Web site. See [Contacting Tektronix](#) at the front of this document for contact information.

When you contact Tektronix Technical Support, please include the following information (be as specific as possible):

General information

- All instrument model numbers
- Hardware options, if any
- Modules used
- Your name, company, mailing address, phone number, FAX number
- Please indicate if you would like to be contacted by Tektronix about your suggestion or comments.

Application specific information

- Software version number

- Description of the problem such that technical support can duplicate the problem
- If possible, save the setup files for all the instruments used and the application

Getting started

Software requirements

Scope Noise Characterization application requires DPOJET version 10.4.0.1 or later.

Supported probes

The application supports the following probes:

- P76xx
- P77xx

View software version

Click **Options** > **About** to view application details such as the software version number, application name, and copyright details. Refer to [Figure 2](#) on page 12



Figure 2: Scope Noise Characterization Version Number and Copyright information



Note: The version displayed above is indicative only, the version number displayed will vary depending upon the exact version of the application installed.

Virtual keypad and multi purpose knob


Select the  icon on any of the entry text boxes and use the virtual keypad to enter alphanumeric values, such as voltage levels and reference IDs.



Figure 3: Virtual numeric keypad

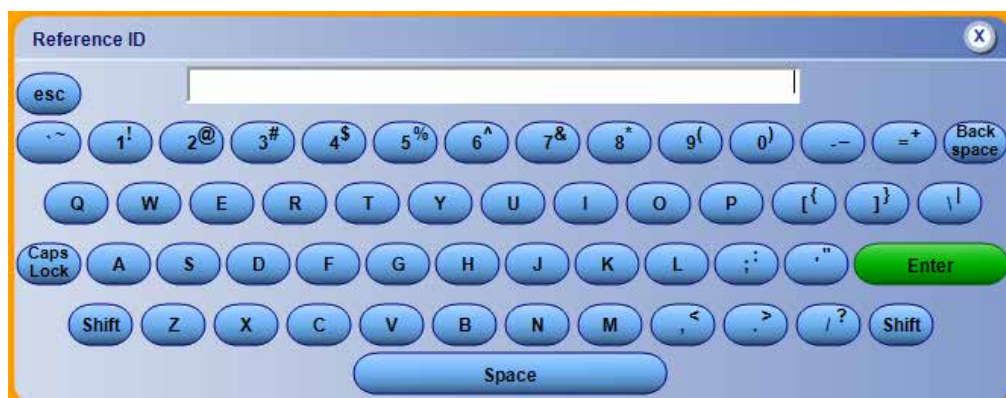


Figure 4: Virtual keyboard

The MP Knob Reference **a** and **b** are the identifiers that show which Multi-Purpose Knob (MPK) may be used as an alternate means to control a parameter; turn the knob on the oscilloscope front panel to adjust the corresponding parameter, refer to [Figure 3](#) on page 13 and [Figure 4](#) on page 13. Also, the value can be entered directly on the MPK display component.

Icon descriptions

This section lists the icons displayed in the Scope Noise Characterization application and their description.

Table 2: Icon descriptions

ICON	Description
	This icon identifies warning / error.
	This icon displays the description for various characterization modes.

Application directories

Table 3: Application directories

Default directory	Used for
C:\Program Files\TekApplications\SNC	The installation directory for Scope Noise Characterization application.
C:\ProgramData\Tektronix\TekApplications\SNM\Database	Noise characterization database.

File name extensions

Table 4: File name extensions

File Extension	Description
".set"	Binary file containing scope noise application setup information in a proprietary format.
".csv"	CSV file containing noise characterization database values.
".html"	HTML file containing noise characterization database values.

Operating basics

Launching the application

Select **Analyze > Scope Noise Characterization** from the oscilloscope menu bar to launch the application.

Tip: You can use the shortcut key **Alt+A+N** to launch the Scope Noise Characterization application.

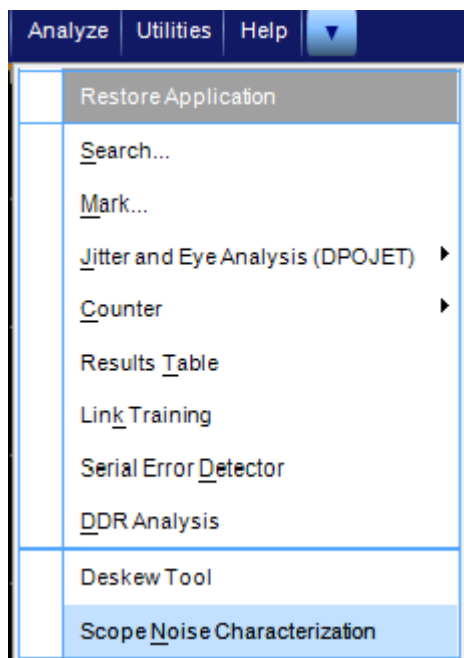


Figure 5: Starting the Scope Noise Application from Analyze menu



Note: Analyze menu entries may vary depending upon the application(s) installed.

After you click **Scope Noise Characterization** application, the following window appears, as [Figure 6](#) on page 15.

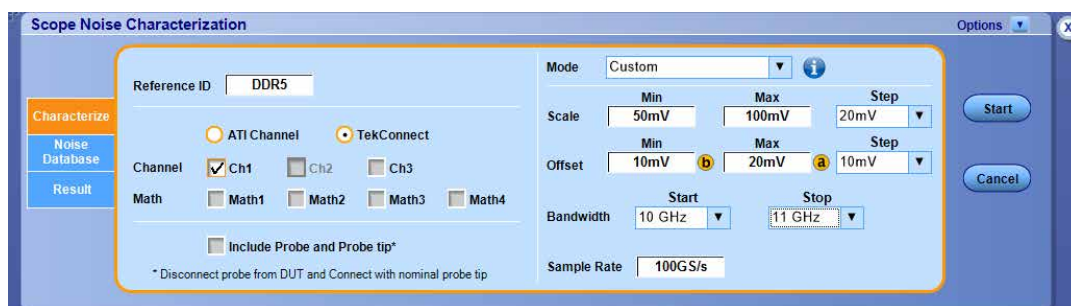
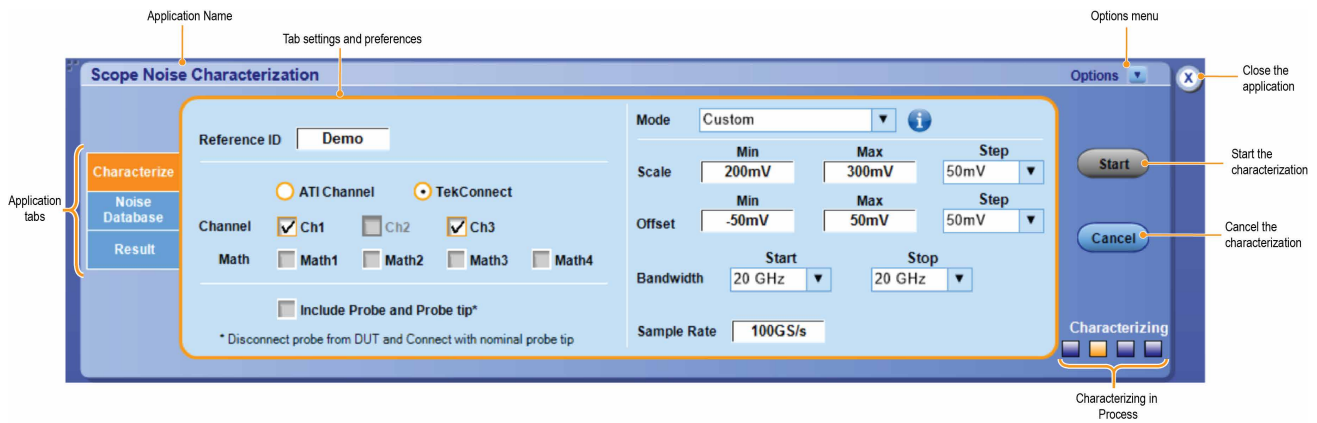



Figure 6: Scope Noise Characterization application window

Application controls

This section describes the controls in the Scope Noise Characterization application.



Options menu

To access the Options menu, click  in the upper-right corner of the application. It has the following selections:

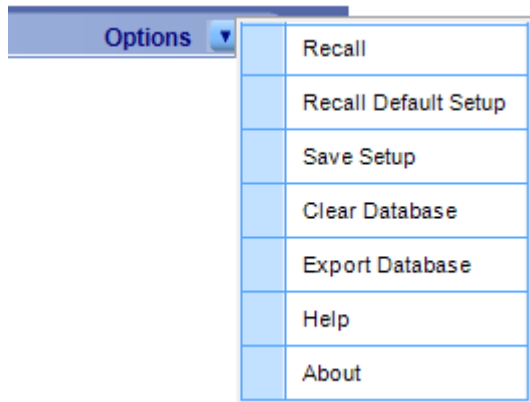


Table 5: Options menu settings

Menu	Function
Recall	Recalls setup from the selected file in directory.
Recall Default Setup	Recalls setup with default configurations.
Save As	Saves the setup with a different file name.
Clear Database	Clears all the noise entries from the database.
Export Database	Export the noise characterization database in either CSV or HTML format.
Help	Displays the Scope Noise Characterization help.
About	Displays the Scope Noise Characterization application details.

Characterize tab

The Characterize tab can be used to configure settings to perform scope noise characterization.

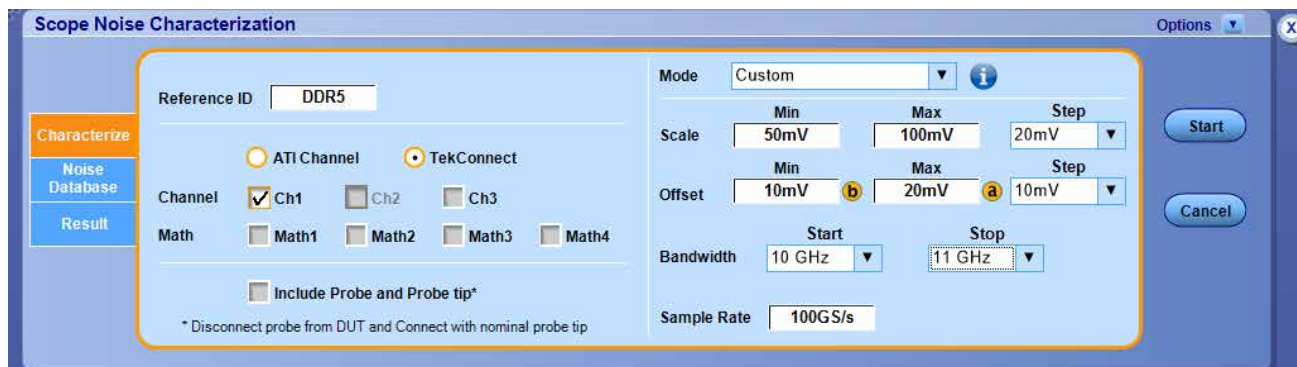


Figure 7: Characterize tab view

The Characterize tab contains the following settings:

- **Reference ID:** The Reference ID value can be used to distinguish the noise values characterized over the same or overlapped range of configurations or different applications/technologies. (For example: DDR5, LPDDR5 etc.).
- **Channel:** Select the live channels for which the characterization must be performed. The availability of channels depends upon the scope model and the configuration. At least one channel should be selected to start of the scope noise characterization.
 - Characterize the noise sequentially for ATI and TekConnect channels.
 - When the TekConnect radio button is selected, all ATI channel (for example, Channel 2) selections are disabled.
 - For the dual-stack oscilloscopes, channels will appear either ATI-Channels or Tek-Connect depending on the dual-stack configuration.
- **Math:** Select the Math channels for which the characterization must be performed. Make sure appropriate math expression is set before starting the scope noise characterization. Math channels with REF waveforms will be excluded the characterization.
- **Include Probe and Probe tip:** Check this option if probe and probe tip should be considered while characterization. Suppose if different types of probes are connected to multiple channels, the maximum bandwidth among all probes is considered as the probe bandwidth. The stop bandwidth will be limited by the minimum of either oscilloscope bandwidth or probe bandwidth.
- **Scale:** Specify the minimum, maximum, and step values over which the noise needs to be characterized. The scale values considered for characterization will be from minimum to maximum (both inclusive) in the increments of step size. When both min and max values are configured the same, the noise will be measured only on that scale.
- **Offset:** Specify minimum, maximum, and step values of vertical offset over which the noise needs to be characterized. The offset values considered for characterization will be from minimum to maximum (both inclusive) in the increments of step size. When both min and max values are configured the same, the noise will be measured only on that offset.
- **Bandwidth:** Specify the Start and Stop values of bandwidth over which the noise needs to be characterized. When both Start and Stop values are configured the same, the noise will be measured only on that bandwidth. When Start and Stop values are different, the application will measure the noise for all the Bandwidth options available in the vertical menu (between Start and Stop) of that oscilloscope.
- **Sample Rate:** Set the sample rate for which the oscilloscope noise needs to be performed. The default value is the maximum sample rate supported on that oscilloscope model.
- **Mode:** Select the appropriate noise characterization mode by selecting from the dropdown button. There are three modes are available:
 1. Automatic
 2. Custom
 3. Current Scope Setting

The Automatic Mode is available only on SX oscilloscope models.

- **Automatic Mode:** In Automatic mode, for the selected sources, oscilloscope random noise will be characterized over the optimum ranges for scale & offset matched to the oscilloscope architecture. The Bandwidth and Sample Rate are configurable. The oscilloscope noise values are stored in the noise database after the completion of characterization.
- **Custom Mode:** The Custom Mode option can be used to perform noise characterization for specific values. For the selected sources, scope random noise will be characterized over user-configured ranges for vertical scale and offset in steps. After the characterization, the scope noise values are stored in the noise database.

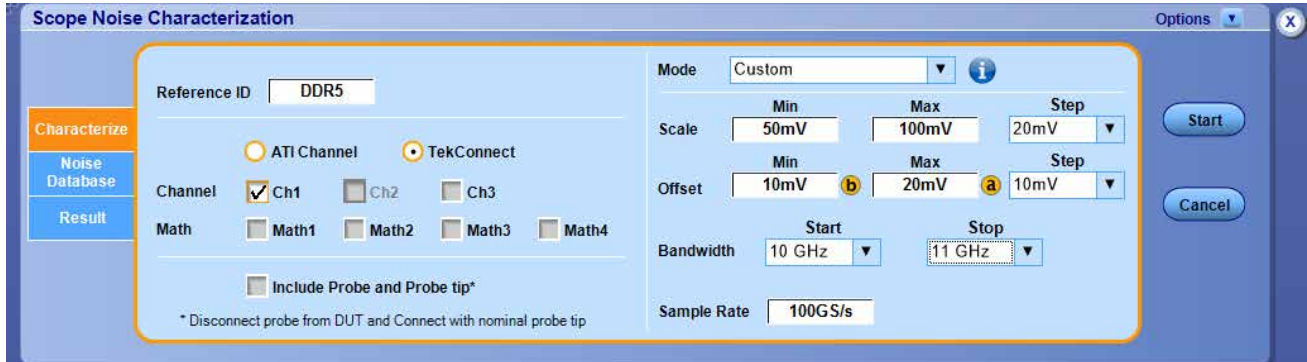


Figure 8: Custom mode configuration

Considering the above configuration in the [Figure 8](#) on page 18, the oscilloscope noise will be measured for the following values in Custom mode.

Table 6: Example of scope noise values in Custom mode

Channel	Scale	Position	Offset	Bandwidth
Ch1	50 mV	-4 div to 4 div	10 mV	10 GHz
Ch1	70 mV	-4 div to 4 div	10 mV	10 GHz
Ch1	90 mV	-4 div to 4 div	10 mV	10 GHz
Ch1	50 mV	-4 div to 4 div	20 mV	10 GHz
Ch1	70 mV	-4 div to 4 div	20 mV	10 GHz
Ch1	90 mV	-4 div to 4 div	20 mV	10 GHz
Ch1	50 mV	-4 div to 4 div	10 mV	11 GHz
Ch1	70 mV	-4 div to 4 div	10 mV	11 GHz
Ch1	90 mV	-4 div to 4 div	10 mV	11 GHz
Ch1	50 mV	-4 div to 4 div	20 mV	11 GHz
Ch1	70 mV	-4 div to 4 div	20 mV	11 GHz
Ch1	90 mV	-4 div to 4 div	20 mV	11 GHz

- **Current Scope Setting mode:** In this mode, for the selected sources, oscilloscope random noise will be characterized only for the current oscilloscope configuration. The Reference ID, Scale, Offset, Bandwidth, Sample Rate user controls are disabled. The measured oscilloscope noise value is not persistent.

Noise Database tab

This tab displays the characterized values from the database. The values are updated dynamically during characterization and the most recent values are displayed on the top of the list.

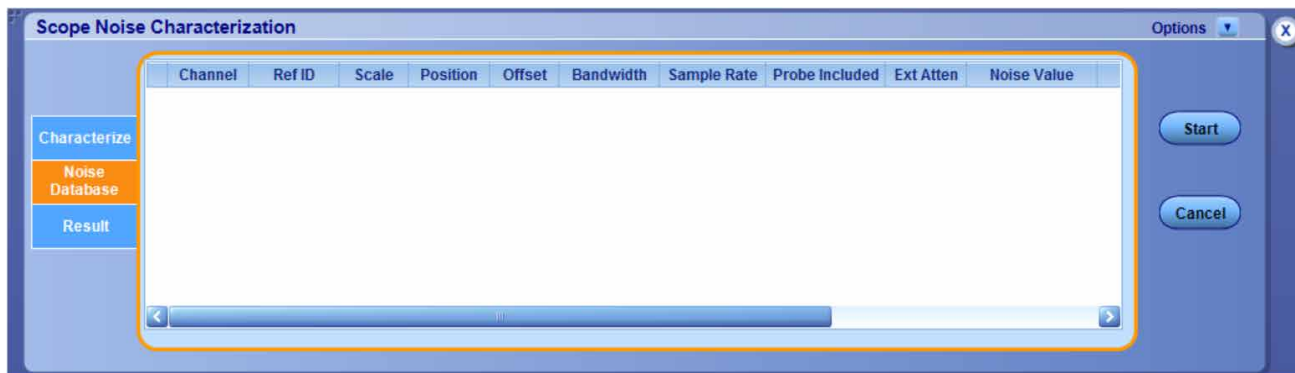


Figure 9: Noise Database tab displaying characterization values

The table contains the following fields:

- Channel
- Ref ID
- Scale
- Position
- Offset
- Bandwidth
- Sample Rate
- Probe Included
- External Attenuation – External Attenuator value in dB which is connected in front of the oscilloscope considered for the characterization.
- Measured vertical noise value
- Validity – Indicates if the corresponding noise value is valid.
- Time Stamp – In "day of week, Date Month Year, Hour:Minute:Seconds" format.
- Additional Info – Contains information about Math expression, Probe type, and Probe model number.

For stack oscilloscope, the Noise database contains an additional column 'Scope Config' which indicates the configuration (ATI, TimeSync, TekConnect or NA) for which the respective noise value was measured. NA indicates that the characterization was performed on the standalone oscilloscope.

Updating the database

If the scope noise characterization configuration (Reference ID, Channel, Scale, Offset, Position, Sample Rate, Bandwidth, Include Probe and Probe Tip) is unique, then a new entry is added to the database. Else, the older entry in the database will be updated with the new values (including the noise value).

The database is updated only for Automatic and Custom mode of characterization. The noise values obtained from **Current Scope Settings** mode of characterization are not stored in the database and will be lost on closing TekScope.

Result tab

The Result tab is used to query the characterized noise value for a specific oscilloscope. Enter the values for the settings in the Configuration section, matching the values from the characterize tab. The Result section will display the Scope RN(rms) value and the Additional Info for the matched result.

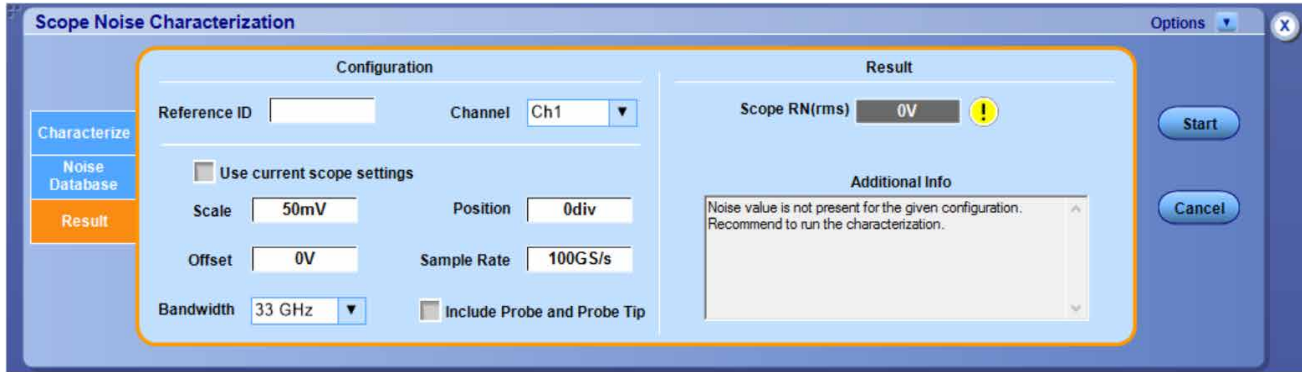


Figure 10: View of the Result tab

- **Scope RN (rms)**

The scope noise value will be displayed against **Scope RN(rms)** along with additional information if any.

- **Additional Info**

If the noise value for the required configuration is not present in the database, then the noise value will be displayed as 0V and a warning message is displayed in the additional info section. For some reason, If the measured noise value is much higher than the expected value, a warning message would be displayed in additional info. This additional info also contains information about Math expression, Probe type, Probe model number.

The **Scope RN(rms)** and **Additional Info** fields are Read-only and cannot be edited.

Querying Scope RN values for Custom or Automatic Mode

In case of querying noise value characterized with Custom or Automatic mode, the Reference ID, Channel, Bandwidth, Sample Rate, Include Probe and Probe Tip should be an exact match with the entries in the database. The attenuation value is obtained automatically from the oscilloscope Vertical Setup for the channel.

The Scale, Offset, and Position values will be interpolated for the configured value from available entries in the database.

Querying Scope RN values for Current Scope Setting Mode

While querying for noise values with the “Use Current Scope settings” option, the following controls are disabled.

- Reference ID
- Scale
- Position
- Offset
- Sample Rate
- Bandwidth
- Include Probe and Probe Tip

Scope RN value for the required channel can be queried by changing the channels in the drop-down.

Saving and recalling setup

Saving a setup

You can save a setup before or after configuring the SNC. When you save a setup, all the parameters, and other configuration settings are saved under the setup name. When you select the default test setup, the parameters are set to the application's default value.

1. Click **Options > Save As**.
2. In the file browser, select the directory to save the setup file.
3. Select or enter a file name. The application appends the ".set" extension to the file name.
4. Click **Save**.

Recalling a setup

To recall a saved setup follow the steps:

1. Click **Options > Recall**.
2. Select the directory in the file browser.
3. Select a .set file and click **Recall**.

Recalling default setup

To recall the default settings, click **Options > Recall Default Setup**.

Tutorial

Performing characterization with Automatic or Custom Mode

Noise Characterization

1. Perform Signal Path Compensation (SPC) for the oscilloscope. Refer to the oscilloscope User Manual for more details.
2. If the measurement is performed with embed/de-embed/equalization, then configure the appropriate Mathematical expressions from Math subsystem.
3. If there are probes to be included in the characterization, ensure that all probes are compensated and connected to the channels. Refer to the oscilloscope manual for probe compensation details.
4. If any external attenuation is connected to any channel, then set the attenuation value on the **Atten icon of Vertical Setup**, as shown in [Figure 11](#) on page 22

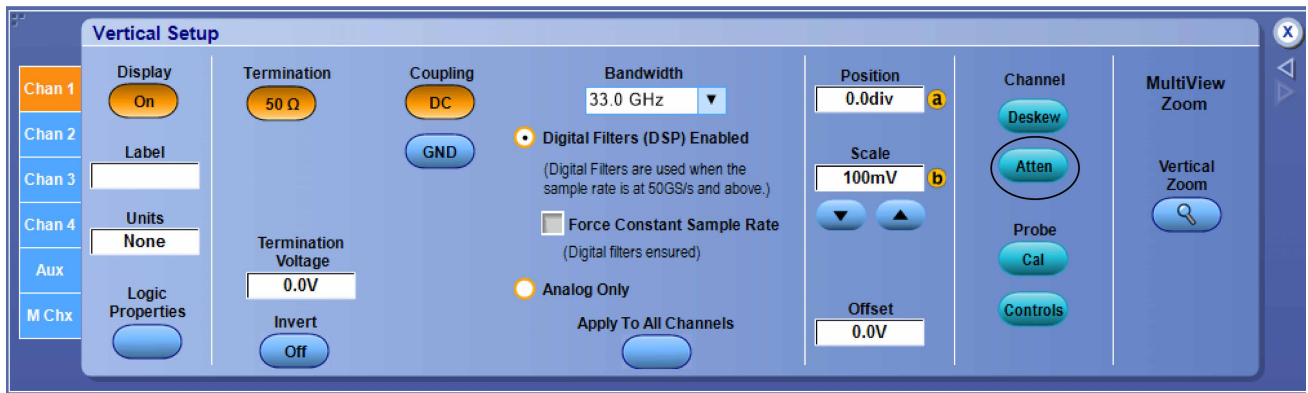


Figure 11: Vertical setup

5. Make sure all the setup connections are done as per test-MOI/ procedure.
6. Start the **Scope Noise Characterization** application from Analyze menu.
7. Go to the **Characterize** tab for more information, refer to [Figure 12](#) on page 22.

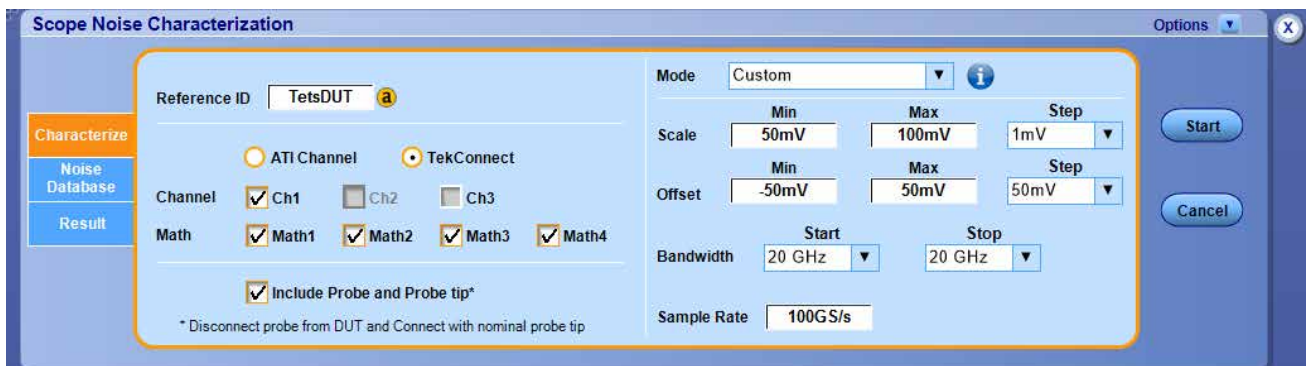


Figure 12: Scope Noise Characterization application with Characterize tab selected

8. Enter the unique **Reference ID**.
9. Select required live/math channels for noise to be characterized.
10. If probe need to be considered along with the oscilloscope for the noise characterization, click on the **Include Probe and Probe tip** check box.

11. For SX oscilloscope select the characterization mode as **Automatic**
12. For non-SX models, select the characterization mode as **Custom**. Configure min, max, and step for **Scale** and **Offset** based on the signal dynamic range on which measurements to be done.
13. Choose the Bandwidth range and Sample Rate required for the measurement.
14. Click **Start** and wait for characterization to complete.
15. If probes are connected and probe compensation is performed then, the following pop-up will be displayed. It is recommended to Click **No** and perform the probe compensation.

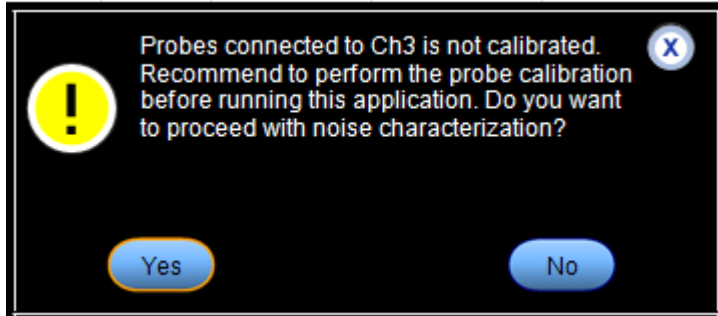


Figure 13: Probe calibration information pop-up window

16. If probe compensation was already performed, then the following pop-up will be displayed.

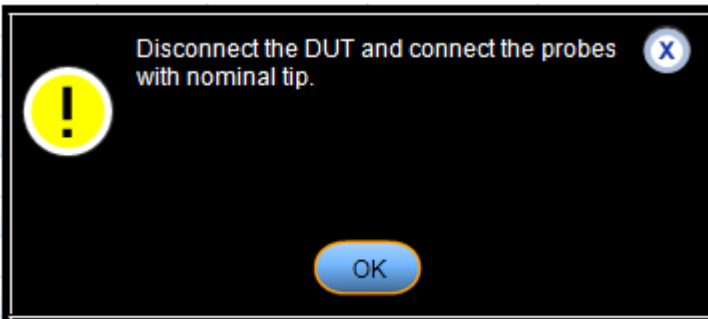


Figure 14: Probe-tip information pop-up window

17. Either turn off the DUT or disconnect the probe tip from the DUT. Suppose if the probe tip cannot be disconnected from the DUT, terminate the probe with a nominal tip and Click **OK**.
18. If any ATI channels are selected, a pop-up will come, as shown in [Figure 15](#) on page 23. Ensure 50 Ω termination to the channel and click **OK**.

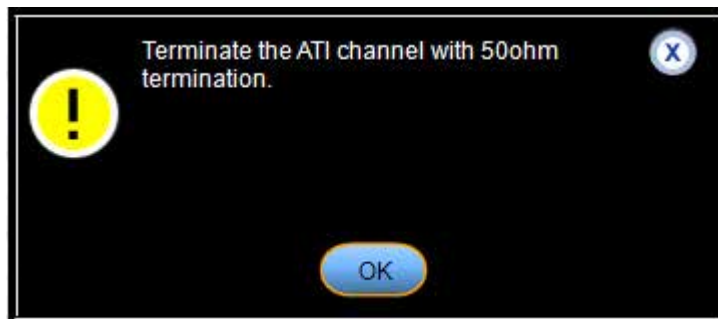


Figure 15: Pop-up for 50 Ohm termination for channel

19. The application will now start the characterization process and the focus will be shifted to the Noise Database tab which will display the settings and noise value as the characterization is performed, as shown in [Figure 16](#) on page 24. The Latest entry will appear on top of the list.

Channel	Ref ID	Scale	Position	Offset	Bandwidth	Sample ...	Probe In...	Ext A...	Noise Value	Validity
Ch1	TestDUT	100 mV	4 div	50 mV	11 GHz	33 GS/s	No	0dB	7.207 mV	True
Ch1	TestDUT	100 mV	2 div	50 mV	11 GHz	33 GS/s	No	0dB	7.403 mV	True
Ch1	TestDUT	100 mV	0 div	50 mV	11 GHz	33 GS/s	No	0dB	7.039 mV	True
Ch1	TestDUT	100 mV	-2 div	50 mV	11 GHz	33 GS/s	No	0dB	6.593 mV	True
Ch1	TestDUT	100 mV	-4 div	50 mV	11 GHz	33 GS/s	No	0dB	7.162 mV	True
Ch1	TestDUT	90 mV	4 div	50 mV	11 GHz	33 GS/s	No	0dB	6.615 mV	True
Ch1	TestDUT	90 mV	2 div	50 mV	11 GHz	33 GS/s	No	0dB	6.607 mV	True
Ch1	TestDUT	90 mV	0 div	50 mV	11 GHz	33 GS/s	No	0dB	6.514 mV	True
Ch1	TestDUT	90 mV	-2 div	50 mV	11 GHz	33 GS/s	No	0dB	5.815 mV	True

Figure 16: Database update during on-going noise characterization

20. Once the characterization is complete a pop-up will appear, as shown in [Figure 17](#) on page 24. If a probe is connected to any channel. Connect the probes back to DUT.



Figure 17: Characterization completion pop-up while probe is connected

You can continue performing the measurement.

Compensating noise value

1. Connect the signal and perform the **Auto set** so that signal occupies a minimum of 8 division on the graticule.
2. Note down the scale, offset, bandwidth, and sample rate from the Vertical and Horizontal menu of oscilloscope.
3. Make sure the correct math expressions are set in the **Math** menu.
4. Start the Scope Noise Characterization application and go to the **Result** panel, as shown in [Figure 18](#) on page 25.

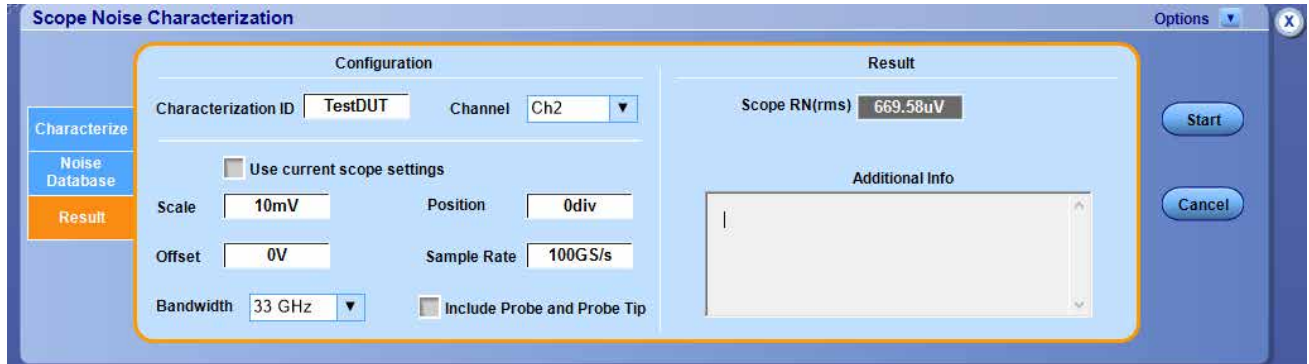



Figure 18: Compensating Noise Value

5. Enter the **Reference ID** for which characterization was performed.
6. Enter values of scale, offset, position, sample rate, and bandwidth noted earlier. If the probe was considered while characterization, select **Include Probe and Probe Tip** option.
7. Select the real-time channel or math channels on which the measurement should be done.
8. The noise result appears on the **Scope RN (rms)**.
9. The warning icon  may appear beside ScopeRN value and the error/warning message is described in the Additional Info box. The Math function will also appear if a math channel is selected for the noise query, as shown in [Figure 19](#) on page 25.

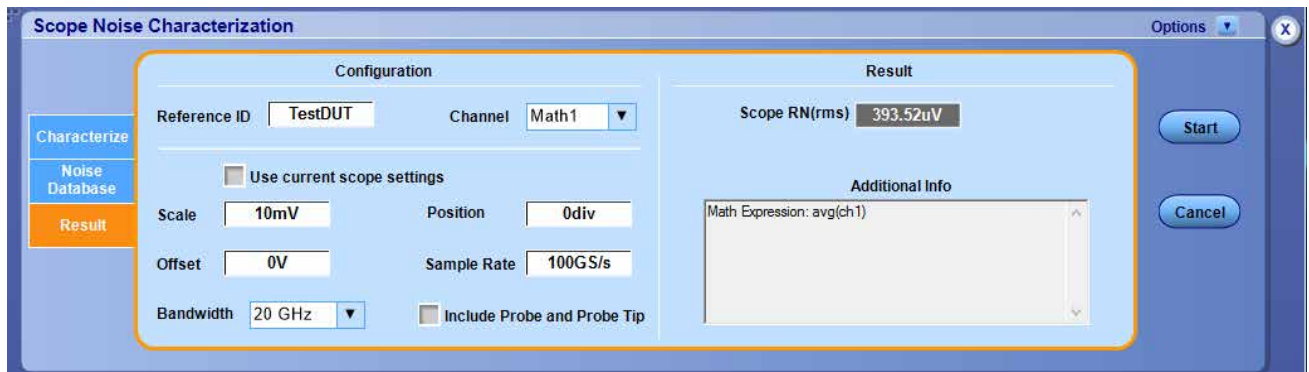


Figure 19: Showing Math expression in "Additional Info" box

10. Note down the Scope RN value from the **Scope Noise Characterization** application. Go to DPOJET measurement configuration with the RnDn tab and enter this into the **Noise Compensation** field. Refer to [Figure 20](#) on page 25 and [Figure 21](#) on page 26.

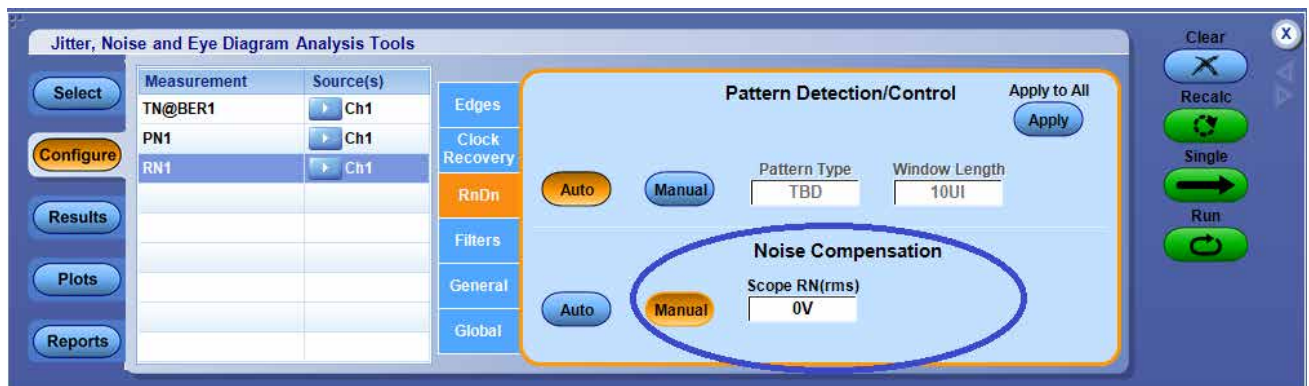


Figure 20: Noise Compensation for RN measurement in the configuration panel DPOJET

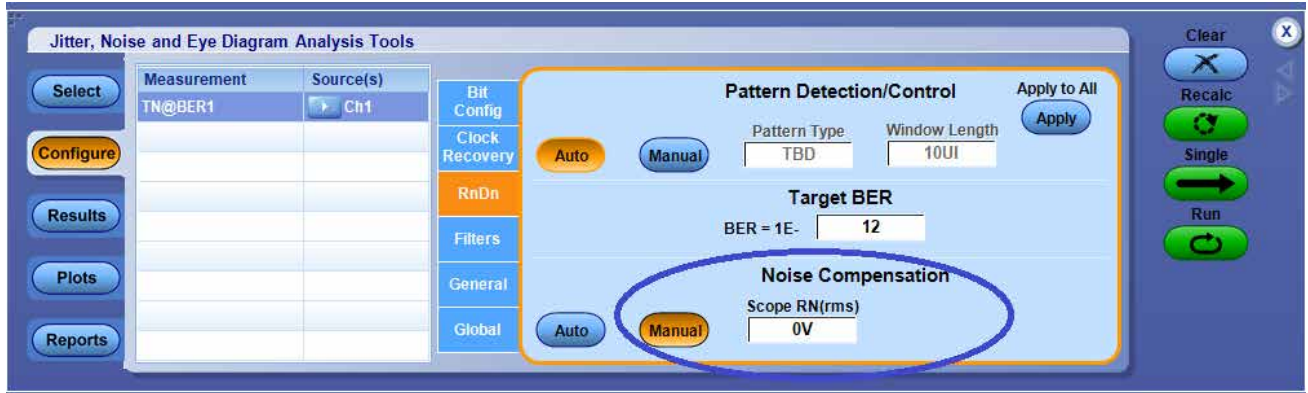


Figure 21: Noise Compensation for TN@BER measurement in the configuration panel DPOJET

Performing characterization with Current Scope Setting mode

Noise Characterization

1. Make sure the Perform Signal Path Compensation (SPC) for the oscilloscope is passed.
2. If the measurement is performed with embed/de-embed/equalization, then configure the appropriate mathematical expressions from Math subsystem.
3. If there are probes to be included in the characterization, ensure that all probes are compensated and connected to the channels. Refer to the oscilloscope manual for probe compensation.
4. If any external attenuation is connected to any channel, then set the attenuation value on the **Atten icon of Vertical Setup**, as shown in [Figure 22](#) on page 26.

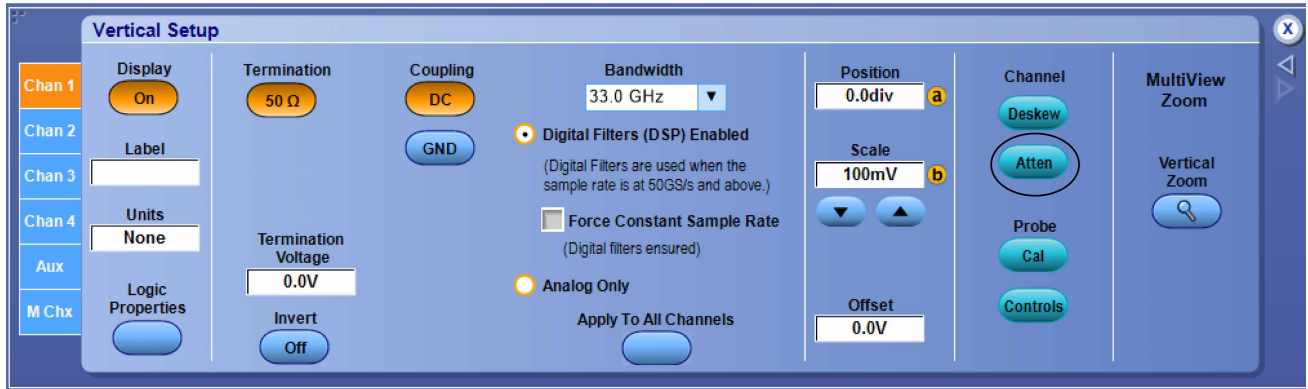


Figure 22: Vertical Setup showing Atten icon

5. Make sure all the setup connections are done as per test-MOI/ procedure.
6. Recall the MOI Setup file or perform the **Autoset** so that the signal occupies a minimum of 8 divisions of the graticule.
7. Start the **Scop Noise Characterization** application from Analyze menu.
8. Go to the **Characterize** tab. Select required live/math channels for noise to be characterized.
9. If probe should be considered along with the oscilloscope for the noise characterization, select **Include Probe and Probe tip** check box.
10. Select the characterization mode as **Current Scope Settings**, as shown in [Figure 23](#) on page 27.

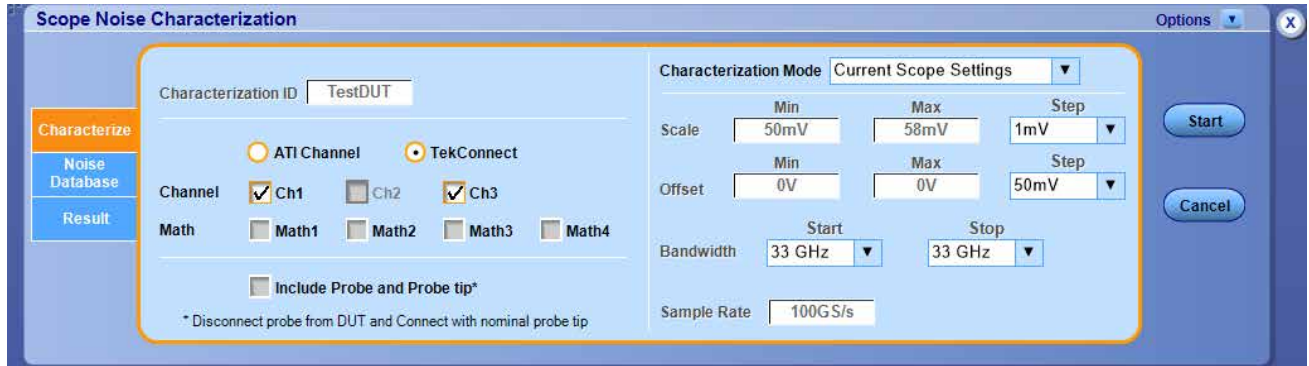


Figure 23: Characterize tab when "Current Scope Setting mode" is selected

11. Click **Start** and wait for characterization to complete. .
12. If probes are connected and probe compensation was not performed earlier, the below pop-up is shown in [Figure 24](#) on page 27. Click **No** and perform the probe compensation.

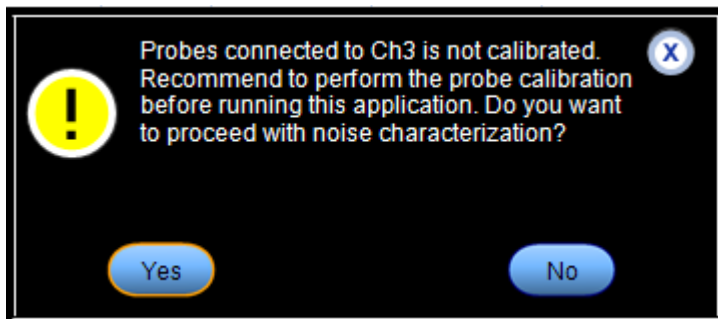


Figure 24: Probe Calibration Pop-up

13. If probe compensation was already performed, below pop-up, as shown in [Figure 25](#) on page 27 will be displayed.

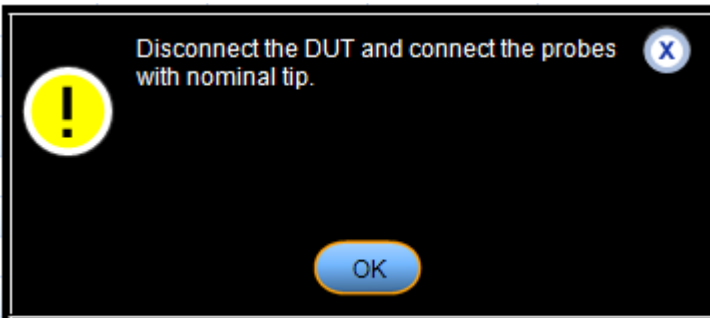


Figure 25: Disconnect DUT and connect probe with nominal tip

14. Either turn off the DUT or disconnect the probe tip from the DUT. Suppose if the probe tip cannot be disconnected from the DUT, terminate the probe with a nominal tip. Click **OK**.
15. If any ATI channels are selected, a pop-up will appear, as shown in [Figure 26](#) on page 28. Ensure 50 Ω termination to the channel and click **OK**.

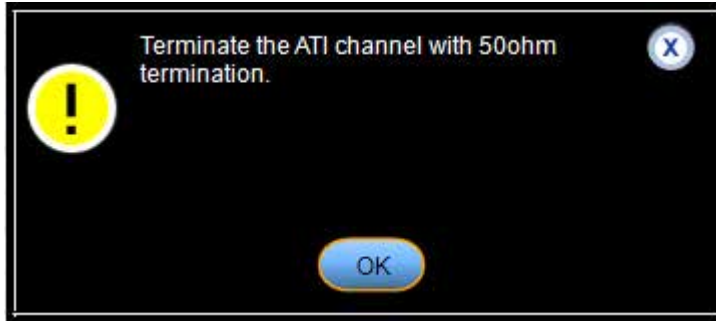


Figure 26: Pop-up for 50 Ohm termination for channel

- Once the characterization is complete a pop-up will appear, as shown in [Figure 27](#) on page 28. Connect the probes back to DUT, if any.

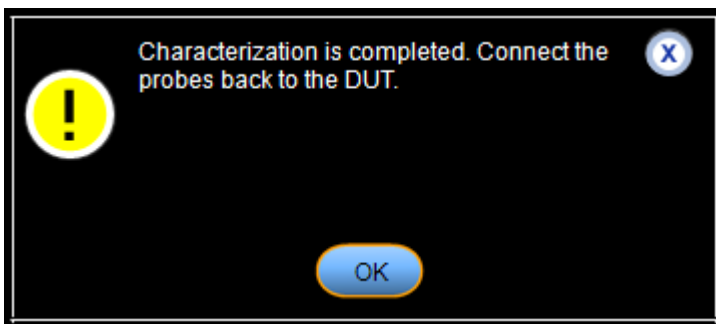


Figure 27: Characterization completed pop-up

Compensating noise value

- Connect back the signal.
- Go to result tab.
- Select **Use current scope settings** option.
- Select the real-time channel or math channels on which the measurement should be done.

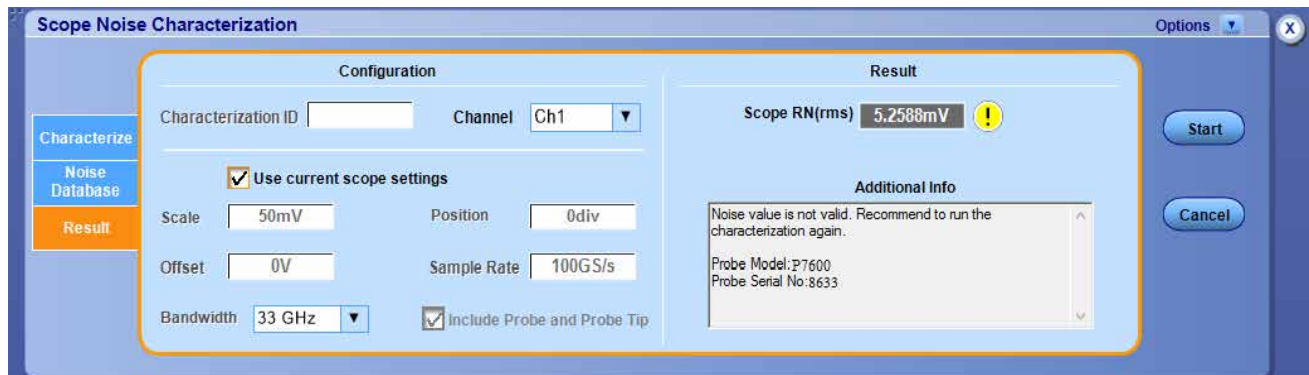



Figure 28: Result tab showing probe model and SL no.

- The noise result appears on the **Scope RN (rms)**.
- The warning icon  may appear beside ScopeRN value and the error/warning message is described in the Additional Info box. The Math function will also appear if a math channel is selected for the noise query, as shown in [Figure 29](#) on page 29

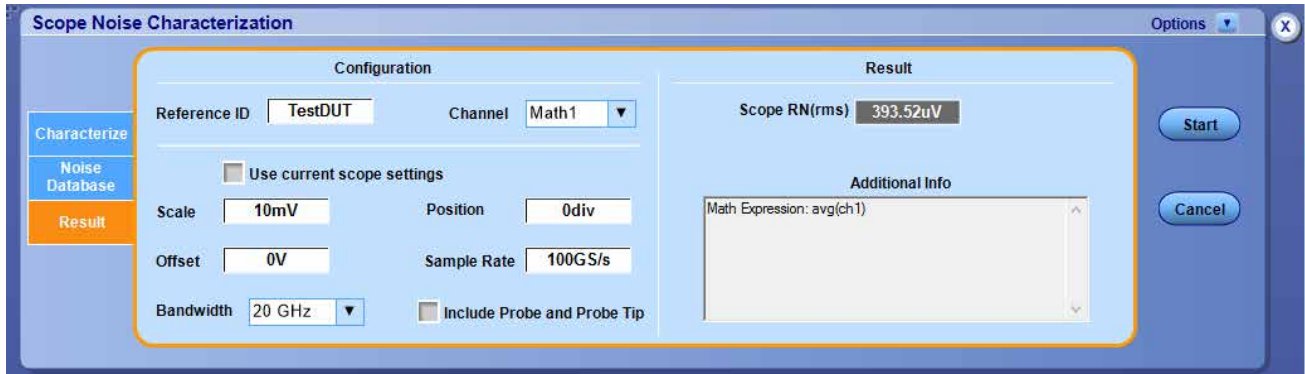


Figure 29: Showing Math expression in "Additional Info" box

7. Compensate the noted Scope RN value from **Scope Noise Characterization** application into Noise Compensation in **RnDn** and **TN@BER** configuration of DPOJET measurement. As shown in [Figure 30](#) on page 29 and [Figure 31](#) on page 29.

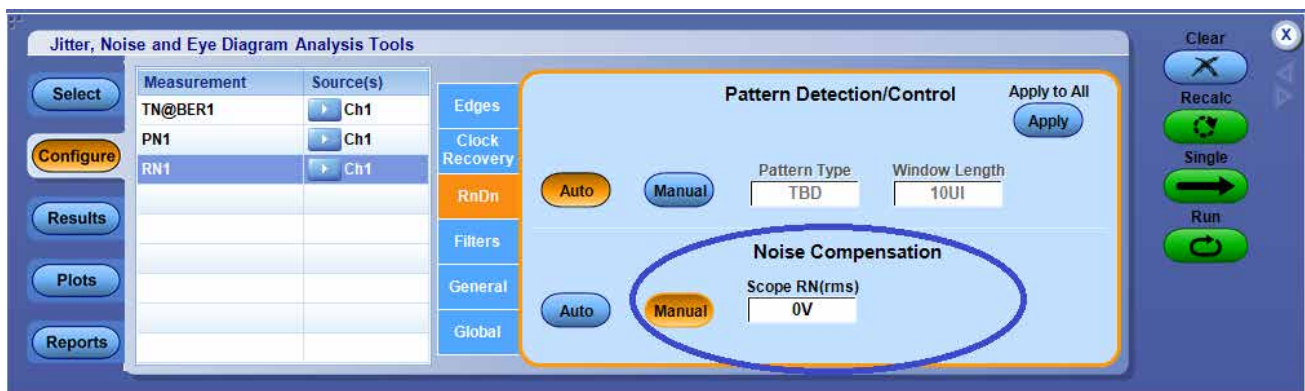


Figure 30: Noise Compensation for RN measurement in the configuration panel DPOJET

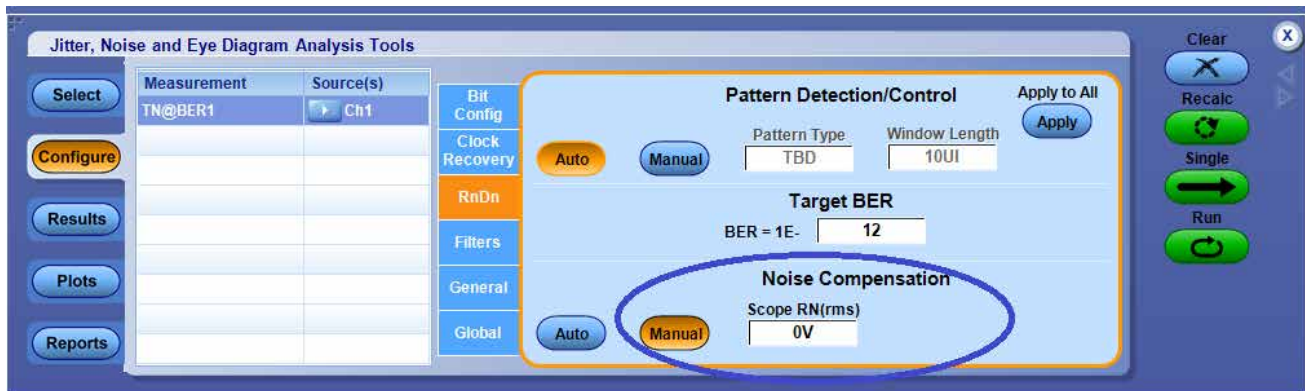


Figure 31: Noise Compensation for TN@BER measurement in the configuration panel DPOJET

Parameters

About Parameters

This section describes the Scope Noise Characterization application parameters and includes the menu default settings. Refer to the user manual of your oscilloscope for operating details of other controls, such as front-panel buttons.

Refer to the [GPIB Commands](#) on page 32 for a complete list of the GPIB Command Syntax. The topics include a complete list of GPIB commands along with their arguments, variables, and variable values that correspond to the Scope Noise Characterization parameters.

The following tables list the option, parameters, and the default values for Characterize and Result tabs, respectively.

Characterize tab parameters

Table 7: Characterization tab options, parameters with default values

Option	Parameters	Default
Reference ID	String	""
ATI Channel ¹	Set, Clear	Clear
TekConnect	Set, Clear	Set
Ch1 to Ch4	Set, Clear	Clear
Math1 to Math4	Set, Clear	Clear
Include probe and Probe tip	Set, Clear	Clear
Mode	Automatic ² , Custom, Current oscilloscope Setting	Depends upon oscilloscope model ³
Scale		
Min	Depends upon oscilloscope model	Depends upon oscilloscope model
Max	Depends upon oscilloscope model	Depends upon oscilloscope model
Step	1 mV, 2 mV, 5 mV, 10 mV, 20 mV, 30 mV, 40 mV, 50 mV	1 mV
Offset		
Min	-3.4 V to 3.4 V	-50 mV
Max	-3.4 V to 3.4 V	50 mV
Step	1 mV, 2 mV, 5 mV, 10 mV, 20 mV, 30 mV, 40 mV, 50 mV	50 mV
Bandwidth		
Start	Depends upon oscilloscope model ⁴	Depends upon oscilloscope model ⁵
Stop	Depends upon oscilloscope model	Depends upon oscilloscope model

Table continued...

¹ Available only for standalone SX oscilloscopes

² Automatic mode is available only for SX oscilloscopes

³ Refer section 'Mode' of [Characterize tab](#) on page 16

⁴ Bandwidth start and stop values depend upon oscilloscope model and the configuration (i.e ATI or TekConnect)

Option	Parameters	Default
Sample Rate	10 kS/s to 200 GS/s	Depends upon oscilloscope model ⁶

Result tab parameters

Table 8: Result tab options, parameters with default values

Option	Parameters	Default
Reference ID	String	""
Channel	Depends upon oscilloscope model and configuration	Ch1
Use current oscilloscope settings	Set, Clear	Clear
Scale	Depends upon oscilloscope model	Depends upon oscilloscope model
Position	-5 div to 5 div	0 div
Offset	-3.4 V to 3.4 V	0 V
Sample Rate	10 KS/s to 200 GS/s	Depends upon oscilloscope model
Bandwidth	Depends upon oscilloscope model ⁷	Depends upon oscilloscope model ⁸
Include probe and Probe tip	Set, Clear	Clear
Scope RN (rms)	0 mV to 50 mV	0 V

Status / Message	Description
"Characterizing"	Noise characterization is in-progress for the specified mode / configuration.

⁵ Default start and stop bandwidth values is set as the highest value available.

⁶ Highest sample rate supported by the oscilloscope

⁷ Bandwidth values depend upon oscilloscope model and the configuration (i.e ATI or TekConnect channel)

⁸ Default bandwidth value is set as the highest value available.

GPIB Commands

This section contains information on the Standard Commands for Programmable Instruments.

About the GPIB program

You can use remote General Purpose Interface Bus (GPIB) commands to communicate with the Scope Noise Characterization application.

GPIB commands can be used to perform the following tasks:

- Start the application.
- Save / Recall a setup.
- Recall default setup.
- Configure settings to perform noise characterization.
- Perform noise characterization.
- Query the “Scope RN(rms)” value for a particular configuration.
- Exit the application.

Argument types

The syntax shows the format that the instrument returns in response to a query. This is also the preferred format when sending the command to the instrument though any of the formats will be accepted. This documentation represents these arguments as follows:

Table 9: Argument types

Symbol	Meaning
<NR1>	Singed integer value.
<NR2>	Floating point value without an exponent.
<NR3>	Floating point value with an exponent.
double	Double precision floating point with exponent.

SNC:CHARacterize

Use this command to start or stop the characterization or to query the noise characterization status.

Syntax

```
SNC:CHARacterize { START | STOP }
```

```
SNC:CHARacterize?
```

Inputs

```
{ START | STOP }
```

Outputs

```
{ RUNNING | STOPPED }
```


SNC:CHARacterize:REFID

This command sets or queries the reference ID in characterize tab.

Syntax

```
SNC:CHARacterize:REFID <string>
```

```
SNC:CHARacterize:REFID?
```

Inputs

<string>

Outputs

<string>

SNC:CHARacterize:ATChannel

Use this command to switch between ATI and TekConnect channels in applicable oscilloscope models.

Syntax

```
SNC:CHARacterize:ATChannel { 1|0 }
```

```
SNC:CHARacterize:ATChannel?
```

Inputs

{ 1|0 }

1 indicates ATI mode is selected.

0 indicates TekConnect mode is selected.

Outputs

{ 1|0 }

1 indicates that ATI mode selected.

0 indicates that TekConnect mode is selected.

SNC:CHARacterize:CH<x>

This command sets or queries channels that should be included for noise characterization.

Syntax

```
SNC:CHARacterize:CH<x> { 1|0 }
```

```
SNC:CHARacterize:CH<x>?
```

Inputs

{ 1 | 0 }

1 indicates the channel is selected.

0 indicates the channel is not selected.

Outputs

{ 1|0 }

1 indicates the channel is selected.

0 indicates the channel is not selected.

SNC:CHARacterize:MATH<x>

This command sets or queries math channels that should be considered for noise characterization.

Syntax

SNC:CHARacterize:MATH<x> { 1 | 0 }

SNC:CHARacterize:MATH?

Inputs

{ 1 | 0 }

1 indicates the math channel is selected.

0 indicates the math channel is not selected.

Outputs

{ 1|0 }

1 indicates the math channel is selected.

0 indicates the math channel is not selected.

SNC:CHARacterize:INCLUDEPRobe

Use this command to include probe and probe tip as part of noise characterization.

Syntax

SNC:CHARacterize:INCLUDEPRobe { 1 | 0 }

SNC:CHARacterize:INCLUDEPRobe?

Inputs

{ 1 | 0 }

1 indicates the channel is selected.

0 indicates the channel is not selected.

Outputs

{ 1 | 0 }

1 indicates the channel is selected.

0 indicates the channel is not selected.

SNC:CHARacterize:MODE

This command sets or queries modes for characterization.

Syntax

```
SNC:CHARacterize:MODE { AUTOMATIC | CUSTOM | SCOPESETTING }
```

```
SNC:CHARacterize:MODE?
```

Inputs

```
{ AUTOMATIC | CUSTOM | SCOPESETTING }
```

Outputs

```
{ AUTOMATIC | CUSTOM | SCOPESETTING }
```



Note: For more information about characterization modes, please refer the section [Characterize tab](#) on page 16.

SNC:CHARacterize:SCALEMax

This command sets or queries maximum scale value.

Syntax

```
SNC:CHARacterize:SCALEMax <NR3>
```

```
SNC:CHARacterize:SCALEMax?
```

Inputs

```
<NR3>
```

Outputs

```
<NR3>
```

SNC:CHARacterize:SCALEMin

This command sets or queries minimum scale value.

Syntax

SNC:CHARacterize:SCALEMIn <NR3>

SNC:CHARacterize:SCALEMIn?

Inputs

<NR3>

Outputs

<NR3>

SNC:CHARacterize:SCALEStep

This command sets or queries scale step value.

Syntax

SNC:CHARacterize:SCALEStep <NR3>

SNC:CHARacterize:SCALEStep?

Inputs

<NR3>

Outputs

<NR3>

SNC:CHARacterize:OFFSETMIn

This command sets or queries minimum offset value.

Syntax

SNC:CHARacterize:OFFSETMIn <NR3>

SNC:CHARacterize:OFFSETMIn?

Inputs

<NR3>

Outputs

<NR3>

SNC:CHARacterize:OFFSETMAx

This command sets or queries maximum offset value.

Syntax

SNC:CHARacterize:OFFSETMAx <NR3>

SNC:CHARacterize:OFFSETMAx?

Inputs

<NR3>

Outputs

<NR3>

SNC:CHARacterize:OFFSETStep

This command sets or queries offset step value.

Syntax

SNC:CHARacterize:OFFSETStep <NR3>

SNC:CHARacterize:OFFSETStep?

Inputs

<NR3>

Outputs

<NR3>

SNC:CHARacterize:BANDWIDTHSTArt

This command sets or queries start value of bandwidth.

Syntax

SNC:CHARacterize:BANDWIDTHSTArt <NR3>

SNC:CHARacterize:BANDWIDTHSTArt?

Inputs

<NR3>

Outputs

<NR3>

SNC:CHARacterize:BANDWIDTHSTOp

This command sets or queries stop value of bandwidth.

Syntax

SNC:CHARacterize:BANDWIDTHSTOp <NR3>

SNC:CHARacterize:BANDWIDTHSTOp?

Inputs

<NR3>

Outputs

<NR3>

SNC:CHARacterize:SAMPLERate

This command sets or queries sample rate.

Syntax

SNC:CHARacterize:SAMPLERate <NR3>

SNC:CHARacterize:SAMPLERate?

Inputs

<NR3>

Outputs

<NR3>

SNC:CHARacterize:MESSAGEtimer

This command sets or queries message timer. This can be used to configure the timer for popup messages as shown in following table.

Table 10: Message Timer command NR3 Value

NR3 Value	Behavior
0	Characterization will continue without showing any popup messages
-1	Timer is disabled and the popup is shown indefinitely
Any positive value t	Waits for 't' seconds

Syntax

SNC:CHARacterize:MESSAGEtimer <NR3>

SNC:CHARacterize:MESSAGEtimer?

Inputs

<NR3>

Outputs

<NR3>



Note: NR3 value is in-terms of seconds

SNC:CHARacterize:RECORDLength

This command sets or queries record length.

Syntax

```
SNC:CHARacterize:RECORDLength <NR3>
```

```
SNC:CHARacterize:RECORDLength?
```

Inputs

<NR3>

Outputs

<NR3>

SNC:CHARacterize:MEASREPEATcount

This command sets or queries number of times AC-RMS measurement is repeated for every configuration. This can be used to measure AC-RMS over a larger record length.

Syntax

```
SNC:CHARacterize:MEASREPEATcount <NR3>
```

```
SNC:CHARacterize:MEASREPEATcount?
```

Inputs

<NR3>

Outputs

<NR3>



Note: The final noise value is calculated as the average noise value of all the repetitions for that configuration.

SNC:NOISEDDB:CLEARDatabase

This set only command clears the noise database.

Syntax

SNC:NOISEDB:CLEARDatabase



Note: All the previously characterized noise values will be lost on clearing the database.

Input

N/A

SNC:NOISEDB:CSVEXPort <path>

This set only command exports the noise database in CSV format to the given path.

Syntax

SNC:NOISEDB:CSVEXPort <path>

Input

<string>

SNC:NOISEDB:HTMLEXPort <path>

This set only command exports the noise database in HTML format to the given path.

Syntax

SNC:NOISEDB:HTMLEXPort <path>

Input

<string>

SNC:Result:REFID

This command sets or queries reference ID from result tab.

Syntax

SNC:Result:REFID <string>

SNC:Result:REFID?

Inputs

<string>

Outputs

<string>

SNC:Result:CHannel

This command sets or queries channel in result tab.

Syntax

```
SNC:Result:CHannel {CH1-CH4 | MATH1-MATH4}
```

```
SNC:Result:CHannel?
```

Inputs

```
{CH1-CH4 | MATH1-MATH4}
```

Outputs

```
{CH1-CH4 | MATH1-MATH4}
```



Note: CH4 cannot be selected for oscilloscopes with bandwidth greater than or equal to symbol 50 GHz.

SNC:Result:SCOPESETting

Use this command to choose current oscilloscope settings to get the noise value.

Syntax

```
SNC:Result:SCOPESETting { 1|0 }
```

```
SNC:Result:SCOPESETting?
```

Inputs

```
{1|0}
```

1 indicates the channel is selected.

0 indicates the channel is not selected.

Outputs

```
{1|0}
```

1 indicates the channel is selected.

0 indicates the channel is not selected.

SNC:Result:SCALE

This command sets or queries the scale in result tab.

Syntax

```
SNC:Result:SCALE <NR3>
```

```
SNC:Result:SCALE?
```

Inputs

<NR3>

Outputs

<NR3>

SNC:Result:OFFSET

This command sets or queries the offset value in result tab.

Syntax

SNC:Result:OFFSET <NR3>

SNC:Result:OFFSET?

Inputs

<NR3>

Outputs

<NR3>

SNC:Result:POStion

This command sets or queries position value in result tab.

Syntax

SNC:Result:POStion <NR3>

SNC:Result:POStion?

Inputs

<NR3>

Outputs

<NR3>

SNC:Result:SAMPLerate

This command sets or queries sample rate value in result tab.

Syntax

SNC:Result:SAMPLerate <NR3>

SNC:Result:SAMPLerate?

Inputs

<NR3>

Outputs

<NR3>

SNC:Result:BANDWIDTH

This command sets or queries bandwidth value in result tab.

Syntax

```
SNC:Result:BANDWIDTH <NR3>
```

```
SNC:Result:BANDWIDTH?
```

Inputs

<NR3>

Outputs

<NR3>

SNC:Result:INCLUDEPRobe

Use this command to include probe and probe tip while obtaining the result.

Syntax

```
SNC:Result:INCLUDEPRobe {1|0}
```

```
SNC:Result:INCLUDEPRobe?
```

Inputs

{1|0}

1 indicates the channel is selected.

0 indicates the channel is not selected.

Outputs

{1|0}

1 indicates that probe and probe tip are included.

0 indicates that probe and probe tip are not included.

SNC:Result:SCOPERNrms

This query only command gets the scope noise value.

Syntax

`SNC:Result:SCOPERNrms?`

Outputs

<NR3>

SNC:Result:ADDITIONALInfo

This query only command returns the additional information.

Syntax

`SNC:Result:ADDITIONALInfo?`

Outputs

<string>



Note: Additional Info contains details about:

1. Error/warning messages.
2. Probe model and Probe serial number if Probe is included.
3. Math Expression.
4. Filter file name and path, if present.

SNC:RECALLDEFAULTSetup

This set only command recalls the default setup.

Syntax

`SNC:RECALLDEFAULTSetup`

SNC:RECALLSetup

This set only command recalls the setup from the specified path.

Syntax

`SNC:RECALLSetup <string>`

Inputs

<string>

SNC:SAVESetup

This set only command saves the setup to the specified path.

Syntax

SNC:SAVESetup <string>

Inputs

<string>

SNC:LASTError?

This query-only command returns the contents of last error encountered. If no errors have occurred since startup, or since the last call to SNC:LASTError?, this command returns an empty string.

Syntax

SNC:LASTError?

Outputs

<string>

SNC:VERsion

This query command returns version of Scope Noise Characterization application.

Syntax

SNC:VERsion?

Outputs

<string>

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