
Keysight N2125A/6A/7A and N2136A Optimization Modules

Notices

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CAUTION

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WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

Contents

1 Optimization Module Overview

- Optimization Module Models / 6
- What Is a Frame Adjustment (or Calibration)? / 9
- When to Perform a Frame Adjustment (or Calibration) / 9
- Inspecting the Package Contents / 10
- Safety and Regulatory Information / 11
- Cleaning and Handling the Optimization Module / 12

2 Using the Optimization Modules

- Performing Frame Adjustment on an Infiniium UXR-Series Oscilloscope / 14
 - Additional Equipment Required / 14
 - Optimization Module Components / 15
 - Applying Torque / 16
 - Frame Adjustment Time / 17
 - Frame Adjustment Procedure / 17
- Calibrating an M8131A Digitizer / 20
 - Calibration Time / 20
 - Calibration Procedure / 20

1 Optimization Module Overview

Optimization Module Models /	6
What Is a Frame Adjustment (or Calibration)? /	9
When to Perform a Frame Adjustment (or Calibration) /	9
Inspecting the Package Contents /	10
Safety and Regulatory Information /	11
Cleaning and Handling the Optimization Module /	12

This chapter introduces the four optimization modules used to perform frame adjustment on the Keysight Infiniium UXR-Series real-time oscilloscopes and calibration on the M8131A digitizer module.

Optimization Module Models

The N2125A, N2126A, and N2127A optimization modules are used to perform frame adjustment on Infiniium UXR-Series oscilloscopes.

N2125A 1.0 mm	N2126A 1.85 mm	N2127A 3.5 mm
UXR1104A/B, UXR1102A/B	UXR0704A/B, UXR0702A/B	UXR0334A/B
UXR1004A/B, UXR1002A/B	UXR0594A/B, UXR0592A/B	UXR0254A/B
UXR0804A/B, UXR0802A/B	UXR0504A/B, UXR0502A/B	UXR0204A/B
UXR0704AP/BP, UXR0702AP/BP	UXR0404A/B, UXR0402A/B	UXR0164A/B
UXR0594AP/BP, UXR0592AP/BP		UXR0134A/B
UXR0404AP/BP, UXR0402AP/BP		
UXR0254AP/BP, UXR0252AP/BP		

The N2136A optimization module is used to calibrate M8131A digitizers. The M8131A digitizers can be ordered in following configurations:

Description	Product Number
1 channel, 4 GSa/s, 1.6 GHz bandwidth, single ended	M8131A-011*
2 channel, 4 GSa/s, 1.6 GHz bandwidth, single ended	M8131A-012*
4 channel, 4 GSa/s, 1.6 GHz bandwidth, single ended	M8131A-014*
1 channel, 16 GSa/s, 6.5 GHz bandwidth, single ended	M8131A-061*
2 channel, 16 GSa/s, 6.5 GHz bandwidth, single ended	M8131A-062*
4 channel, 16 GSa/s, 6.5 GHz bandwidth, single ended	M8131A-064*
1 channel, 32 GSa/s, 12.5 GHz bandwidth, single ended	M8131A-131*
2 channel, 32 GSa/s, 12.5 GHz bandwidth, single ended	M8131A-132*
1 channel, 16 GSa/s, differential input	M8131A-FD1**
2 channel, 16 GSa/s or 1 channel, 32 GSa/s, diff. input	M8131A-FD2**
4 channel, 16 GSa/s or 2 channel, 32 GSa/s, diff. input	M8131A-FD4**

* Options -011, -012, -014, -061, -062, -064, -131, -132 require the N2136A for calibration.

** Options -FD1, FD2, FD4 do NOT require the N2136A for calibration.



Figure 1 N2125A 1.0 mm Optimization Module



Figure 2 N2126A 1.85 mm Optimization Module



Figure 3 N2127A 3.5 mm Optimization Module

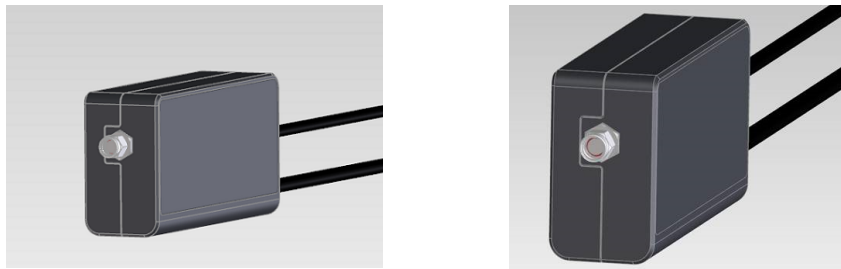


Figure 4 N2136A 2.92 mm Optimization Module

What Is a Frame Adjustment (or Calibration)?

Frame adjustment of an oscilloscope or calibration of a digitizer is simply a self-adjustment. The purpose of running a frame adjustment is to reach performance optimization. Running a frame adjustment performs a complete adjustment of the entire oscilloscope or digitizer, including all channels installed in it, so it can be referenced back to NIST-characterized standards.

Frame adjustment of UXR-Series oscilloscopes

The frame adjustment of a UXR-Series oscilloscope is a rigorous, complete set of self adjustments. It includes interleave correction, time scale, and 50 Ω input resistance adjustments, among others. To perform a frame adjustment, the N2125A, N2126A, or N2127A optimization module is required.

NOTE

Frame Adjustment utilizes the Oscilloscope Optimization Module to align internal correction constants for best performance. Metrological traceability of warranted specifications is achieved only after completing the procedures described in the “Testing Performance” chapter of the oscilloscope user’s guide.

All of the oscilloscope’s adjustment factors are stored into flash memory (NAND) on the backplane board.

Calibration of M8131A digitizers

Calibration of M8131A digitizer modules is required to compensate certain hardware distortions as well as calibrate the DC levels.

When to Perform a Frame Adjustment (or Calibration)

For UXR-Series oscilloscopes, you need to perform a frame adjustment:

- When it has been more than 1 year since the last frame adjustment.
- When the oscilloscope’s operating temperature (after a 30-minute warm-up period) is more than ± 5 °C different from that of the last frame adjustment.

For M8131A digitizers, you need to perform a calibration:

- When it has been more than 1 year since the last calibration.
- When the digitizer’s operating temperature (after a 15-minute warm-up period) is more than ± 10 °C different from that of the last calibration.
- When the digitizer's number of available channels gets increased by a new license/option.

Inspecting the Package Contents

Verify that you received the items listed below for your optimization module.

Description	N2125A	N2126A	N2127A	N2136A	Part /Model No.
Optimization module assembly, 1.0 mm	X				N2125A
Optimization module assembly, 1.85 mm		X			N2126A
Optimization module assembly, 3.5 mm			X		N2127A
Optimization module assembly, M8131A				X	N2136A
Adapter, 3.5 mm (f) to (f)	X	X	X	X	5061-5311
Calibration cable, coaxial 50-ohm	X	X	X		8121-3052
Torque wrench, 8 in-lbs, 5/16 inch				X	8710-1765
Functional Test Certificate	X	X	X	X	9320-6636
Finding Product Manual sheet	X	X	X	X	9320-6794
Keysight safety leaflet	X	X	X	X	9320-6797
China RoHS addendum	X	X	X	X	9320-6679
South Korean Class A EMC declaration	X	X	X	X	5061-7383

Safety and Regulatory Information

Familiarize yourself with safety markings and instructions before you use the optimization module. This product has been designed and tested in accordance with international standards.

These symbols may be used on your optimization module or its packaging.

Symbol	Description
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
	The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives. ICES/NMB-001 indicates that this ISM device complies with the Industry Canadian Interference-Causing Equipment Standard (ICES-001). Cet appareil ISM est conforme a la norme NMB-001 du Canada. ISM GRP.1 Class A indicates that this is an Industrial Scientific and Medical Group 1 Class A product.
	The crossed out wheeled bin symbol indicates that separate collection for waste electric and electronic equipment (WEEE) is required, as obligated by the EU DIRECTIVE and other National legislation. Please refer to keysight.com/go/takeback to understand your Trade in options with Keysight in addition to product takeback instructions.
	This symbol indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.
	The symbol on all primary and secondary packaging indicates compliance to China standard GB 18455-2001. To return unwanted products, contact your local Keysight office.
	South Korean Certification (KC) mark; includes the marking's identifier code.
	This mark denotes compliance with the essential requirements of the following applicable UK regulations: ▪ Electromagnetic Compatibility Regulations 2016 No. 1091 (as amended) ▪ Electrical Equipment (Safety) Regulations 2016 No. 1101 (as amended) ▪ The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 No. 3032 (as amended)

Cleaning and Handling the Optimization Module

WARNING

Keep isopropyl alcohol away from heat, sparks, and flame. Store in a tightly closed container. It is extremely flammable. In case of fire, use alcohol foam, dry chemical, or carbon dioxide; water may be ineffective.

Use isopropyl alcohol with adequate ventilation and avoid contact with eyes, skin, and clothing. It causes skin irritation, may cause eye damage, and is harmful if swallowed or inhaled. It may be harmful if absorbed through the skin. Wash thoroughly after handling.

In case of spill, soak up with sand or earth. Flush spill area with water.

Dispose of isopropyl alcohol in accordance with all applicable federal, state, and local environmental regulations.

Inspect the optimization module regularly to prevent any surface contamination. If the module requires cleaning:

- 1** Disconnect the optimization module from the oscilloscope.
- 2** Gently clean the external parts of the module with a soft cloth dampened with isopropyl alcohol, preferably 99.5%. Do not try to clean internal parts.

To keep the optimization module in top condition:

- Store the module in its protective case when not in use.
- Be careful not to stretch any cables when using the module.
- Use the wrench that came with the oscilloscope or optimization module to torque connections as instructed.
- Do not bend or twist the cables.

2 Using the Optimization Modules

Performing Frame Adjustment on an Infiniium UXR-Series Oscilloscope / 14
Calibrating an M8131A Digitizer / 20

Performing Frame Adjustment on an Infiniium UXR-Series Oscilloscope

The N2125/26/27A optimization modules are hot-swappable. That is, they can be connected and disconnected while the UXR-Series oscilloscope is powered.

Additional Equipment Required

In addition to the optimization module and the accessories that came with it, you need the following equipment to perform frame adjustment on a UXR-Series oscilloscope. The adapters were included with the UXR-Series oscilloscope.

Description	Critical specifications	Recommended part number or product
Adapter: 3.5 mm (f) to (f)	No substitute	5061-5311
Adapter: 1.0 mm ruggedized (f) to 2.92 mm (f) for models with 1.0 mm connector types	No substitute	5067-1393
Adapter: 2.92 mm to 2.40 mm 50 Ω for models with 1.85 mm connector types	No substitute	1250-3782
GPS 10 MHz frequency reference	Output Frequency: 10 MHz, < ± 0.1 ppb with no aging	GPS or equivalent 10 MHz reference

Optimization Module Components

The N2125A and N2126A optimization modules consist of an AutoProbe pod, a remote head, a main cable, and an RF cable.

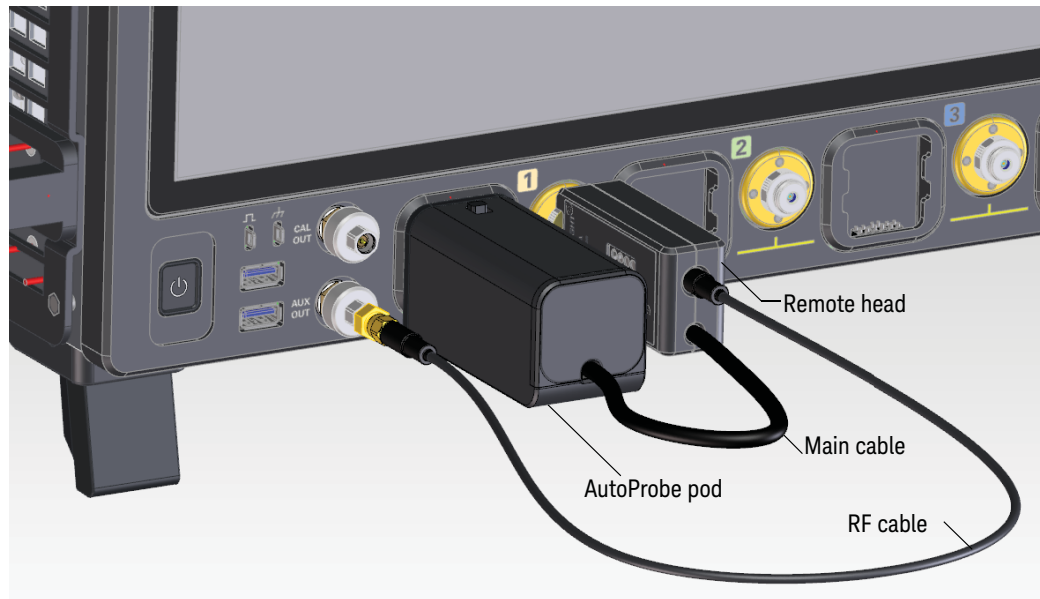


Figure 5 N2125A optimization module connected to UXR-Series oscilloscope with 1.0 mm connector types

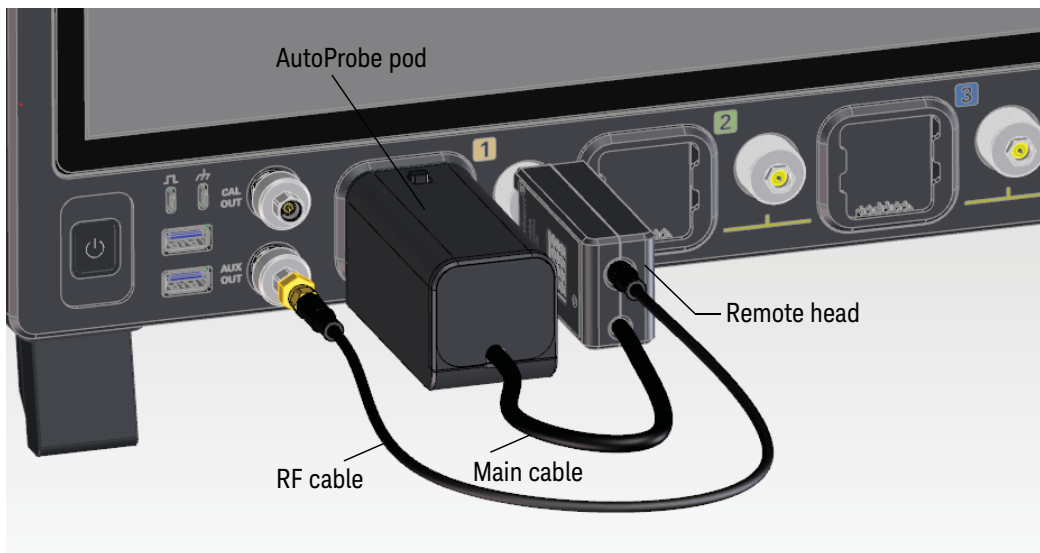


Figure 6 N2126A optimization module connected to UXR-Series oscilloscope with 1.85 mm connector types

The N2127A optimization module is a single unit.

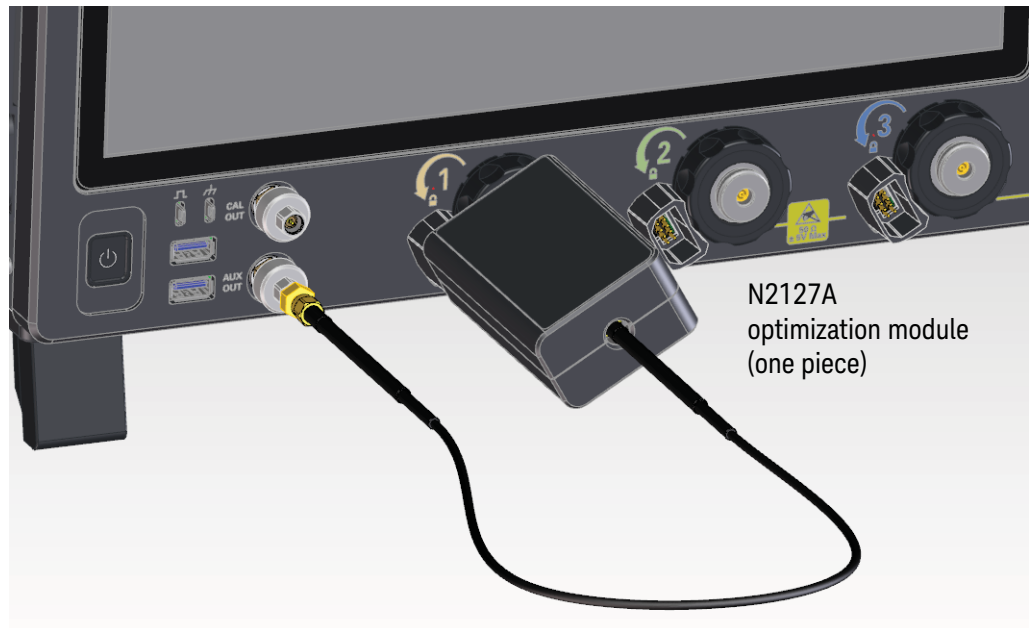


Figure 7 N2127A optimization module connected to UXR-Series oscilloscope with 3.5 mm connector types

Applying Torque

CAUTION

Over-tightening cables can damage the input connectors on the UXR-Series oscilloscope.

For UXR-Series oscilloscope models with 1.85 mm connector types, use the 5/16-inch torque wrench to tighten the connections to 8-in-lbs. Use the dual-ended 6 mm and 7 mm wrench to hold the mating connections in place while turning the connector.

For UXR-Series oscilloscope models with 1.0 mm connector types, use the dual-ended torque wrench. One end is calibrated to 4 in-lbs for use when mating to standard 1.0 mm connectors; the other end is calibrated to 10 in-lbs for use only when mating to Keysight ruggedized 1.0 mm connectors. The N2125A has a ruggedized connector, so be sure to use the ruggedized end of the wrench. Follow the usage instructions in the *Keysight Infiniium UXR-Series Real-Time Oscilloscopes User's Guide*.

Frame Adjustment Time

It takes about 1-1/2 hours to perform frame adjustment on the first channel, and about an hour per each additional channel, including the time required to change cables from channel to channel.

Frame Adjustment Procedure

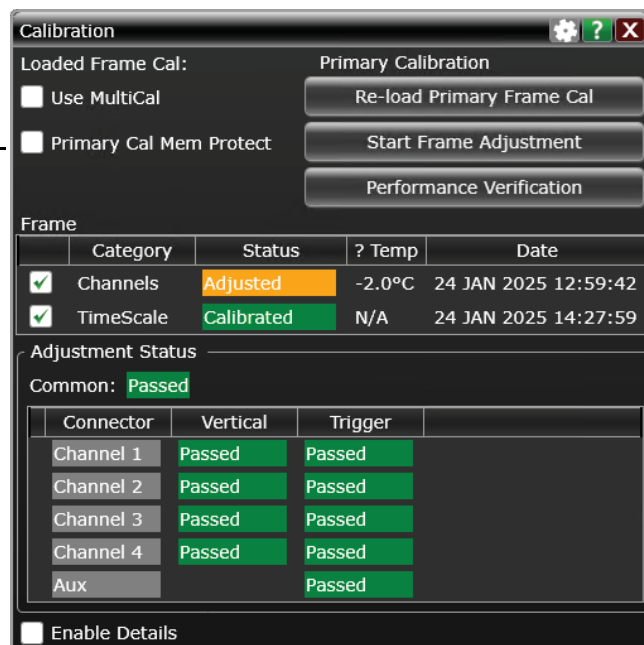
- 1 Remove the connector savers from all channels.
- 2 Connect the optimization module to the oscilloscope. For N2125A and N2126A optimization modules, connect the components in this order:
 - a Attach the AutoProbe pod to the AutoProbe 3 interface for channel 1.
 - b Connect the RF cable to Aux Out.
 - c Attach the remote head to channel 1, using the wrench to apply proper torque.
- 3 Let the oscilloscope and optimization module warm up at least 30 minutes.

NOTE

Both the optimization module and the oscilloscope must be warmed up (with the Infiniium application running) for at least 30 minutes at ambient temperature before starting the frame adjustment procedure. Failure to allow warm up may result in inaccurate frame adjustment.

- 4 Click **Utilities > Calibration....**
- 5 In the Calibration dialog box, there are controls for performing both primary and secondary frame adjustments.

Clear this check box
before beginning
primary frame
adjustment



- 6 Secondary frame adjustments are supported by the MultiCal feature that lets you easily switch frame adjustment values when moving the oscilloscope between different temperature environments.
 - For a primary frame adjustment:
 - a Clear the **Use MultiCal** check box.
 - b Clear the **Primary Cal Mem Protect** check box.

To confirm memory protect disable, enter the password "Calibrate" in the confirmation dialog box.
 - For a secondary frame adjustment:
 - a Select the **Use MultiCal** check box.

The **Primary Cal Mem Protect** check box is automatically selected (and disabled to show that the primary frame adjustment will remain protected during secondary frame adjustment/use).
- 7 To run a frame adjustment without a time scale adjustment, select only the **Channels** check box. If you also want to run a time scale adjustment, you will also need the GPS 10 MHz frequency reference.
- 8 Click **Start Frame Adjustment** and follow the step-by-step instructions on your oscilloscope.
 - You must use the appropriate optimization module for your oscilloscope, and use the appropriate cable with adapters when prompted by the software. Failure to use the appropriate parts will result in an inaccurate frame adjustment.
 - As you move to a new channel, connect the remote head first, then the AutoProbe pod.
 - A Passed/Failed indication appears for each frame adjustment section.
 - If any section has failed, wait until the frame adjustment is complete and then select the **Enable Details** check box for information on the failures. Also check the cables.
 - When a primary frame adjustment completes, the adjustment factors are saved to the disk location (\ProgramData\Infiniium\cal) and is loaded into oscilloscope non-volatile memory for immediate use.
 - When a secondary frame adjustment completes, a folder selection dialog box appears where you can specify the disk location for the secondary frame adjustment data. Secondary frame adjustment data is also loaded for immediate use (but not into oscilloscope non-volatile memory).

- 9 If it is important that the status shown in this dialog box be "Calibrated" instead of "Adjusted":
 - a Verify the oscilloscope's performance as described in the "Testing Performance" chapter of the oscilloscope user's guide.
 - b After the performance is verified, return to this dialog box, and click **Performance Verification**.
 - c In the Performance Verification dialog box, click **Yes**.

The status shown in the Calibration dialog box will be changed from "Adjusted" to "Calibrated".

Calibrating an M8131A Digitizer

The N2136A optimization module is hot-swappable. That is, it can be connected and disconnected while the M8131A digitizer is powered.

Calibration Time

The time it takes to calibrate the M8131A digitizer module depends on the model:

- 4 GSa/s digitizer with single-ended input (options -011, -012, -014) takes about 20 minutes per channel.
- 16 GSa/s digitizer with single-ended input (options -061, -062, -064) takes about 20 minutes per channel.
- 32 GSa/s digitizer with single-ended input (options -131, -132) takes about 40 minutes per channel.

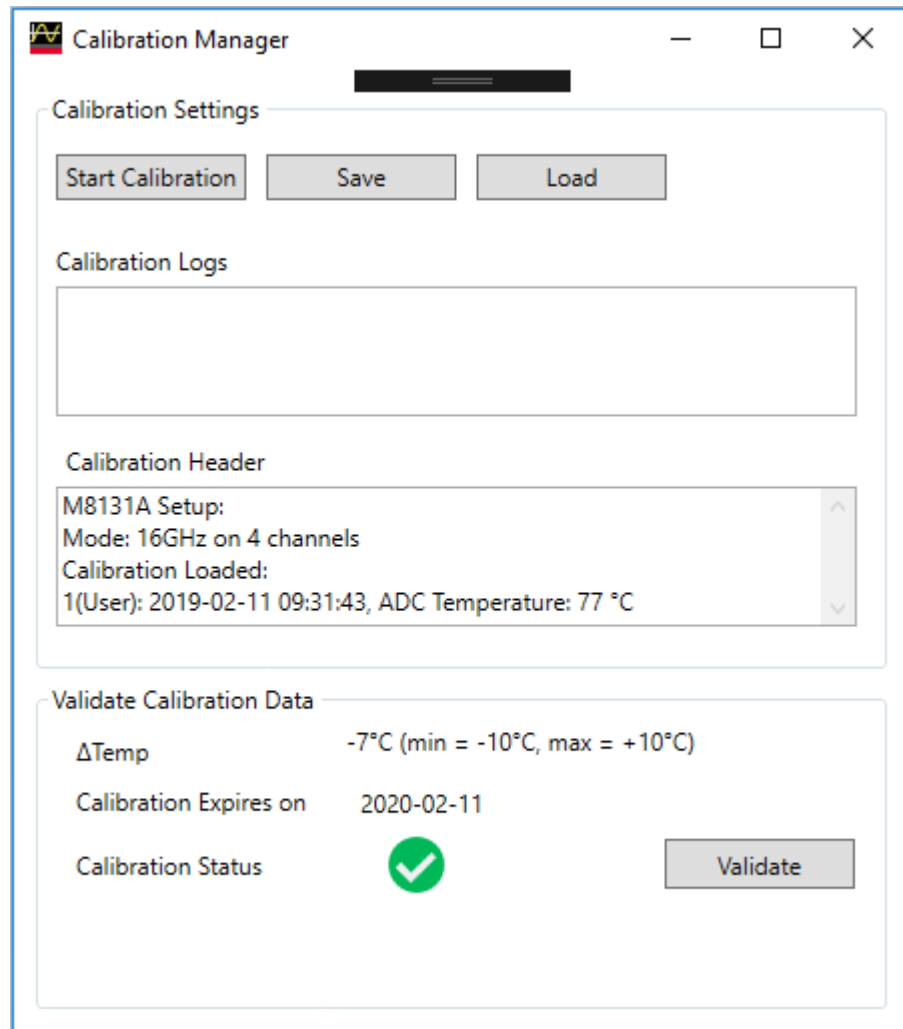
NOTE

The M8131A 16/32 GSa/s digitizer with differential input (options -FD1, -FD2, -FD4) does not require an optimization module. Refer to the *M8131A User's Guide* for calibration information.

Calibration Procedure

- 1 Disconnect all cables from the M8131A digitizer.
- 2 Let the digitizer warm up for 15 minutes before running the calibration.

- 3 Open the Calibration dialog box (**Utilities > Calibration**).

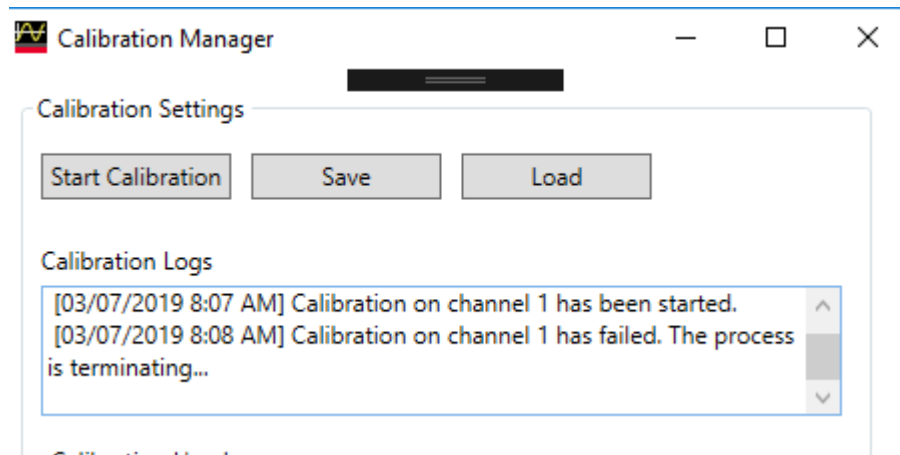


- 4 Click **Start Calibration**, then follow the instructions on the screen.

The Process Result field will indicate that the calibration has been started. You can click **Abort** at any time. If the optimization module is not properly connected, a dialog box will appear, requesting you to verify the connection.

- 5 When calibration is complete for the first channel, follow the on-screen instructions for calibrating the remaining channels.

If any calibration fails, the calibration terminates with the following message (in Calibration Logs):



- 6 When all channels have completed calibration, click **Save** to save the calibration data to a text file.

