

N2099A
PXIT Synthesizer Module

Version 1.01

User's Guide

Notice

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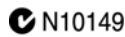
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Introduction

The N2099A Synthesizer is a dual-output tunable RF clock output module, with both outputs operating at the same frequency. It has a 2 GHz range and is available over two frequency range options. The N2099A is designed to be used in conjunction with other Agilent N2000-series PXI modules. For example, it can provide the clock source to a N2102B Pattern Generator or a N2101B Bit Error Ratio Tester. It can also supply the corresponding 10 MHz reference signal to the N2100B DCA to view the signals created by the pattern generators.

The N2099A and its accompanying software fully comply with PXI specifications. The software includes an ActiveX API and a Windows application described in [“Using the Control Panel” on page 10](#). For programming information, refer to [“Programming the N2099A” on page 12](#).

General Safety Considerations

This product has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

CAUTION

The N2099A is shipped in materials which prevent damage from static. The module should only be removed from the packaging in an anti-static area ensuring that correct anti-static precautions are taken.

WARNING

Install the plug-in module according to the enclosure protection provided and placing filler panels in empty slots. This instrument does not protect against the ingress of water. This instrument protects against finger access to hazardous parts within the enclosure.

WARNING

If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.

WARNING

No operator serviceable parts inside. Refer servicing to qualified service personnel. To prevent electrical shock do not remove covers.

WARNING

Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

CAUTION

This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

WARNING

This product is NOT tested for use in medical or clinical applications.

Electrostatic Discharge Information

CAUTION

Electrical channel input circuits and the trigger input circuit can be damaged by electrostatic discharge (ESD). Therefore, avoid applying static discharges to the front-panel input connectors. Prior to connecting any coaxial cable to the connectors, momentarily short the center and outer conductors of the cable together. Avoid touching the front-panel input connectors without first touching the frame of the instrument. Be sure that the instrument is properly earth-grounded to prevent buildup of static charge. Wear a wrist-strap or heel-strap.

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe work station. The following figure shows an example of a static-safe work station using two types of ESD protection:

- Conductive table-mat and wrist-strap combination.
- Conductive floor-mat and heel-strap combination.

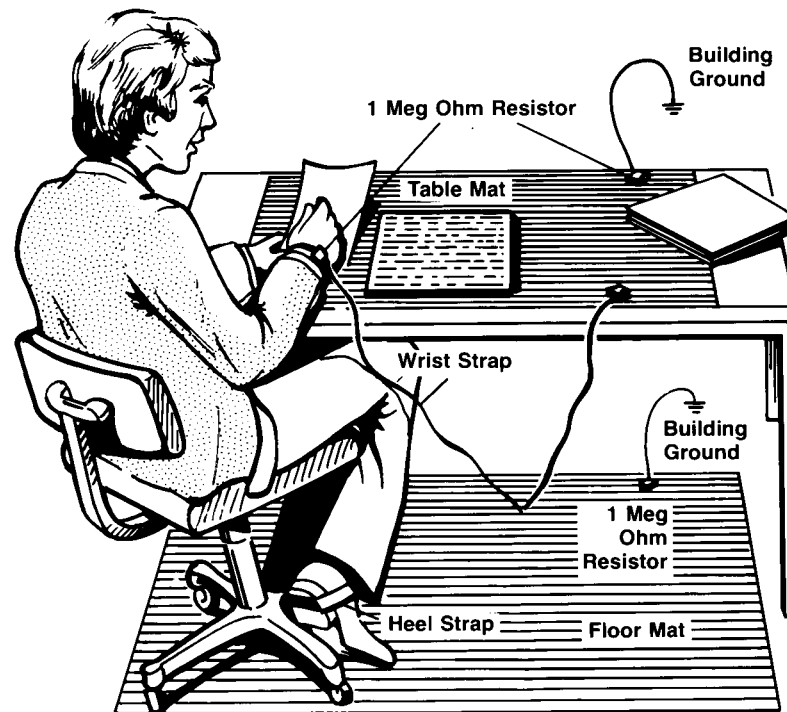


Figure 1. Static-safe Work Station

Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone. To ensure user safety, the static-safe accessories must provide at least 1 M Ω of isolation from ground.

WARNING

These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.

Connector Care

Advances in measurement capabilities make connectors and connection techniques more important than ever. Observing simple precautions can ensure accurate and reliable measurements.

Handling and storage

- Keep connectors clean.
- Extend sleeve or connector nut.
- Use plastic endcaps during storage.
- Do not touch mating plane surfaces.
- Do not set connectors contact-end down.

Visual inspection

- Inspect all connectors carefully before every connection.
- Look for metal particles, scratches, and dents.
- Do not use damaged connectors.

Cleaning

- Clean with compressed air first.
- Clean the connector threads.
- Do not use abrasives.
- Do not get liquid onto the plastic support beads.

Making connections

- Use a connector saver.
- Align connectors carefully.
- Make preliminary connection lightly.
- To tighten, turn connector nut only.
- Do not apply bending force to connection.
- Do not over tighten preliminary connection.
- Do not twist or screw in connectors.
- Use a torque wrench, and do not tighten past the "break" point of the torque wrench.

3.5 mm and SMA Connectors

Precision 3.5 mm microwave connectors are compatible with an SMA connector within its specification. Due to the variable quality of the SMA connector, mating with an SMA can sometimes cause severe damage to the 3.5 mm connector. You can use SMA connectors if special care is taken when mating the connectors, and all connectors are undamaged and clean. Before each use, check the mechanical dimensions of all connectors with a connector gauge to make sure that the center conductors are positioned correctly.

CAUTION

A male SMA connector pin that is too long can smash or break the delicate fingers on the precision 3.5 mm female connector.

CAUTION

Some precision 3.5 mm female connector fingers are very tight and can pull the center pin of their mates out past specifications when the connectors are disconnected. If such a male pin is inserted into a female connector, it can cause considerable damage by pushing the female center conductor back too far. Be aware of this possibility and check all connectors before mating them again.

Returning the N2099A to Agilent

The instructions in this section show you how to properly package the instrument for return to an Agilent Technologies service office. If the instrument is still under warranty or is covered by an Agilent maintenance contract, it will be repaired under the terms of the warranty or contract. If the instrument is no longer under warranty or is not covered by an Agilent maintenance plan, Agilent will notify you of the cost of the repair after examining the unit.

When an instrument is returned to an Agilent service office for servicing, it must be adequately packaged and have a complete description of the failure symptoms attached.

When describing the failure, please be as specific as possible about the nature of the problem. Include copies of any instrument failure settings, data related to instrument failure, and error messages along with the instrument being returned.

Please notify the service office before returning your instrument for service. Any special arrangements for the instrument can be discussed at this time. This will help the Agilent service office repair and return your instrument as quickly as possible.

Call Center

For technical assistance, contact your local Agilent Call Center. In the Americas, call 1 (800) 829-4444. In other regions, visit <http://www.agilent.com/find/assist>. Before returning an instrument for service, you must first contact your local Agilent Call Center.

Preparing the product for shipping

- 1 Write a complete reason for returning the product and attach it to the instrument. Include any specific performance details related to the problem.
- 2 Pack the product. Use original packaging or comparable. Original materials are available through any Agilent office. Or, follow these recommendations:
 - Insert the product in an anti-static bag.
 - Use a double-walled, corrugated cardboard carton of 159 kg (350 lb) test strength. The carton must allow approximately 7 cm (3 inches) on all sides of the kit for packing material and be strong enough to accommodate the weight of the kit.
 - Surround the kit with approximately 7 cm (3 inches) of packing material, to protect the kit and prevent it from moving in the carton. If packing foam is not available, the best alternative is S.D-240 Air Cap™ from Sealed Air Corporation (Commerce, California 90001). Air Cap looks like a plastic sheet filled with air bubbles. Use the pink (antistatic) Air Cap™ to reduce static electricity. Wrapping the kit several times in this material will protect the kit and prevent it from moving in the carton.
- 3 Seal the carton with strong nylon adhesive tape.
- 4 Mark the carton "FRAGILE, HANDLE WITH CARE".
- 5 Retain copies of all shipping papers.

Installing the N2099A

The PXI chassis can be controlled using either an embedded PXI controller or an external PC using a PCI - cPCI/PXI remote bridge (such as the NI MXI-4 product). If an external PC is used, the PC must meet the following specification:

- Windows 2000 or XP operating system
- 1 GB RAM
- Pentium, 133 MHz or greater
- NI-VISA

NOTE

When using an external PC as the controller, you must follow the installation steps in the sequence described for the PC BIOS to locate the instruments in the PXI chassis.

Step 1. Inspect the Shipment

- 1 Inspect the shipping container and kit for damage. Keep the shipping container and cushioning material until you have inspected the contents of the shipment for completeness and have checked the kit mechanically and electrically.
- 2 Locate the shipping list. Verify that you have received all of the items listed.

To contact Agilent Technologies for technical assistance, contact your local Agilent Call Center. In the Americas, call 1 (800) 829-4444. In other regions, visit <http://www.agilent.com/find/assist>. Before returning an instrument for service, you must first contact your local Agilent Call Center.
- 3 Verify that the following environmental conditions exist before proceeding with the installation procedure.

WARNING

Ensure that the PXI chassis is connected to the specified power source using the correct power cord (noting country of use).

WARNING

Ensure that the PXI chassis provides adequate earth grounding.

WARNING

Ensure that the air supply to the chassis is working correctly. The N2099A requires an optimal air flow within the chassis. It is recommended to regularly change filters on PXI Chassis.

Step 2. Install the Instrument Driver Software

NOTE

This procedure assumes that NI-VISA has already been installed.

- 1 Log onto the PC with administrator privileges, so that you can install the software.
- 2 Go to the Agilent website: www.agilent.com/find/pxit.
- 3 Click on the Technical Support link and then the Drivers link.

- 4 Download the latest version of the following driver:
Agilent N2099A Synthesizer Driver
- 5 Once the download has completed, run the N2099A installation file.
 - a During the installation, you will enter the user name and organization.
 - b Select the all users option to ensure the software is available to all users of the PC. Click **Next**.
- 6 When installation process is finished, click **Finish**. The N2099A control software is now installed.
- 7 To ensure that the PC BIOS will be able to locate the instruments in the PXI chassis, follow this step according to the controller that you are using:
 - a If you are using an external PC and remote bridge, turn the PXI chassis and PC power off.
 - b If you are using an embedded controller, turn the PXI chassis and PC power off and remove all N2099A modules from the chassis.

NOTE

As part of the installation, the N2099A User's Guide is made available on the Windows Start menu.

Step 3. Install the N2099A

- 1 With the PC and chassis powered off, install the N2099A module in an available slot in a PXI chassis.
- 2 Power on the PXI chassis and wait for the power up sequence to complete.
- 3 Turn on the PC.

If the software is correctly installed, you will see an indication that new hardware is detected and that the system is attempting to locate the associated software driver. When this process is complete, a notification appears indicating that the hardware is ready for use.

If needed, you can use Windows Device Manager to determine if the instruments have been correctly identified by the BIOS. There should be an NI-VISA PXI Devices entry with your N2099A instrument.

Using the Control Panel

This section describes how to start and configure the N2099A using the Control Panel. All aspects of the N2099A can be managed through the Control Panel. If only the N2099A is installed in the system, the N2099A is automatically selected, and you will see the synthesizer's tuning range displayed in the Control Panel's title bar.

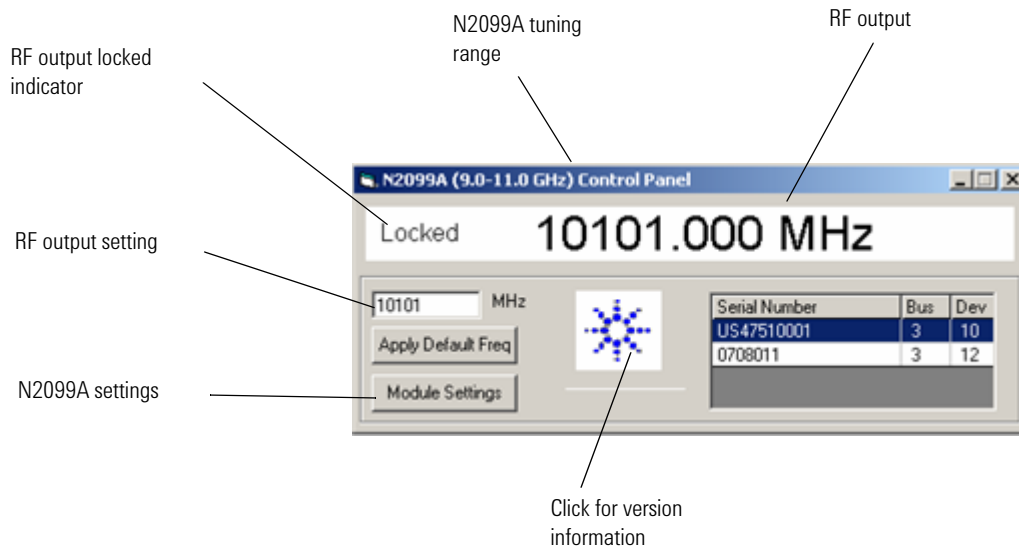


Figure 2. N2099A Control Panel

If multiple modules are installed, use the drop-down list to select the correct module. If desired, you could also open a Control Panel for each module.

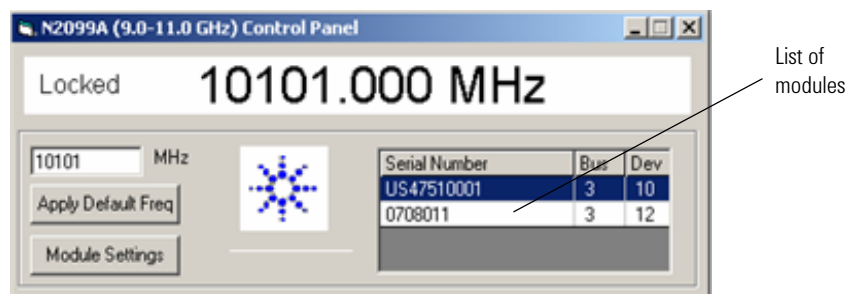


Figure 3. Module Drop-down List

To start the Control Panel application

- 1 Click the Windows **Start** menu.
- 2 Click **All Programs > Agilent > N2099A**.
- 3 Click **N2099A Control Panel**.

Setting the RF output frequency

You can set the RF output frequency to any value that is supported by the synthesizer.

- 4 Click **Module Settings** to configure a default frequency.

The N2099A sets to the default frequency as the Control Panel connects to the module for the first time in a particular system. All subsequent connections to the Control Panel set the N2099A output to the last set frequency.

- 5 Click **Apply Default Freq** to set the module to the default frequency at any time.
 - If the N2099A displays a locked status in the Control Panel, it successfully locked to a frequency.
 - If the N2099A does not display a locked status in the Control Panel, the output is at an unknown signal. This may happen if the N2099A is set to a value that is at one of edges of the tuning range, or if the air flow in the chassis not optimal.

NOTE

To see the Control Panel version information, click the logo on the Control Panel title bar.

Programming the N2099A

In addition to using the Control Panel, the DCA can be controlled automatically through the following two methods:

- Application Programming Interface (API)
- ActiveX Control

The ActiveX Control extends programmability to any ActiveX container application or COM compliant programming environment. This includes Visual C++, Visual Basic, C#, LabView and many other environments. The Active X API includes properties, methods, and events.

NOTE

There are no events associated with the N2099A; the instrument is controlled by properties only. Some of these parameters are read only (indicators) while others can also be written to (Controls).

To Program the N2099A

- 1 Obtain the module instrument descriptor.

All calls to the Synthesizer require that the instrument descriptor is first passed into the ActiveX call Descriptor. In order to obtain the required instrument descriptor, a VISA search call of the system is required. The call needed is **VISA Find Resource**. Use one or both of the following search strings:

```
PXI?*INSTR{VI_ATTR_MANF_ID == 0x15BC && VI_ATTR_MODEL_CODE == 0x2099}  
PXI?*INSTR{VI_ATTR_MANF_ID == 0x157F && VI_ATTR_MODEL_CODE == 0x0338}
```

NOTE

The first search string finds all N2099A modules; the second finds all PXIT-338 modules.

- 2 Open the device.

Set the Active-X control's *Descriptor* property to the instrument descriptor that corresponds to the desired synthesizer module.

- 3 Confirm that the output is valid.

Check the LockStatus Property to confirm the output. This is a Boolean value. A true value indicates that the synthesizer has achieved **Locked** status, indicating that the synthesizer is locked at a particular frequency. The locked status indication does not explicitly state that the instrument is locked at the last requested rate, but it is a very good indicator. It is also possible to read the frequency that is set. This also gives a strong indication that this particular frequency is being output by the synthesizer.

- 4 Determine the valid operational ranges.

The synthesizer has a 2 GHz tuning range. The software records the maximum and minimum operational ranges of each module. There are two ActiveX properties that return the following values: **MaximumFrequency** and **MinimumFrequency**.

5 Set the RF rate.

Set the **Frequency** property to set the output. Enter the value in MHz with a resolution down to 0.25 MHz. This property is both an **indicator** and a **control**. Its value can also be read and written.

Active X Properties

DefaultFrequency	Each time the GUI or ActiveX is used to connect to a device, the previous set frequency is applied. However, it is possible to store a default frequency. You can use this to ensure the module starts up in a known state. You should perform a read of the default frequency and then apply this to the set frequency. The DefaultFrequency can be both set and read so it can be a control or an indicator.
Descriptor	An instrument descriptor is required to control any PXI instrument. In the ActiveX API for this instrument, the descriptor is simply called descriptor. A Visa call is required to search for all available instruments. The appropriate descriptor then needs to be passed into this ActiveX property. This property can be both an indicator and a control.
Frequency	This ActiveX property sets the frequency that is required to be output. This property can be both a method and a control.
LockStatus	Each time a frequency is set correctly, a status is returned indicating that the frequency being output is valid. If a frequency is set outside of the valid range, locking will not occur.
MaximumFrequency	This is an indicator property (read only). This indicates the maximum frequency value allowed for the instrument output.
MinimumFrequency	This is an indicator property (read only). This indicates the minimum frequency value allowed for the instrument output.
SerialNumber	Every N2000-series PXI module has a corresponding serial number. This property is an indicator (read only).
SessionStatus	This property is a Boolean indicator. It returns a value of True if a device is connected. If no device is connected the value returned is False.
Version	This version number returns the ActiveX version number.

ActiveX Methods

AboutBox	The AboutBox method enables an about box to appear on the screen that contains the version information.
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Specifications

The distinction between specifications and characteristics is described as follows:

- Specifications describe warranted performance. All specifications apply after the temperature of the probe and the probe adapter has been stabilized after 30 minutes of continuous operation.
- *Characteristics* provide useful information by giving functional, but non-warranted, performance parameters. *Characteristics are printed in italics.*

This product complies with the Electrostatic Discharge immunity requirement in IEC/EN 61326 using performance criterion B. Degradation of some product specifications can occur during the instance of an electrostatic discharge. The product self-recovers and operates as specified after the discharge.”

Table 1. RF Output

Output Frequency (center)	5.25 and 10.5 GHz
Tuning Range	±1.0 GHz
Output Power	
Option052, 5.25 GHz	+9 dBm (characteristic)
Option105, 10.5 GHz	+6 dBm (characteristic)
Power Variation Over Temperature and Frequency	
Option052	+6 dBm minimum to +12 dBm maximum(characteristic)
Option105	+3 dBm minimum to +9 dBm maximum(characteristic)
Step Size (minimum)	
Option052	100 kHz
Option105	250 kHz
Switching speed (100 MHz step)	100 ms (<i>characteristic</i>)
Output Impedance	50 Ohms
External Reference Oscillator Output Frequency (TCXO)	10 MHz

Table 2. Environmental Specifications

Operating Temperature	10°C to 40°C
Dimensions	Two-slot PXI module