

N2099A Option H10 Synthesizer

User's Guide

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Manual Part Number

N2099-90001

Edition

February 2007

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Introduction

The N2099A is a dual-output tunable RF clock output module, with both outputs operating at the same frequency. It has a 2 GHz range between a lower limit of 3 GHz and an upper limit of 11 GHz. 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 N2102A pattern generator or to the N2101A bit error rate tester. It can also supply the corresponding 10 MHz reference signal to the N2100A DCA which can be used 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 7](#). For programming information, refer to [“Programming” on page 9](#).

The N2099A displays a locked status in the Control Panel ([refer to “Using the Control Panel” on page 7](#)) when it successfully locks to a frequency. If the locked status is not displayed, the output is at an unknown signal. This can happen at the border edges of the tuning range or if the air flow in the chassis not optimal.

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.

NOTE

Please note that this former PXIT product PX2000-338 is now part of Agilent Technologies. Although most references have been changed to Agilent Technologies, this manual may contain some references to PXIT Inc.

WARNING

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

WARNING

No operator serviceable parts inside. Refer servicing to qualified service personnel.

Installing

The PXI chassis can be controlled using either 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
- 128 MB RAM
- Pentium, 133 MHz or greater

NOTE

When using an external PC, if the sequence of the following installation steps is not followed, the PC BIOS will not be able 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 call the Call Center at 1 (800) 829-4444.

- 3 Do not install the N2099A in the PXI chassis at this time.

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 containing the N2099A 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

- 1 If using an external PC and remote bridge, turn the PXI chassis power off. If using an embedded controller, remove all N2099A modules from the chassis.

NOTE

This step ensures that the PC BIOS will be able to locate the instruments in the PXI chassis.

- 2 Log onto the PC with administrator privileges, so that you can install the software.
- 3 Go to the Agilent website: www.agilent.com/find/pxit

Installing

- 4 Click on the Technical Support link and then the Drivers link.
- 5 Download the latest version of the following driver:
Agilent N2099A (PX2000-338) Synthesizer Driver
- 6 Once the download has completed, run the file, N2099AInstall.exe. During the installation, you will enter the user name and organization. Select the all users option to ensure the software is available to all users of the PC. Click **Next**.
- 7 When install is finished click **Finish**. The N2099A control software is now installed.

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 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/PX2000 series instrument as shown in the following figure.

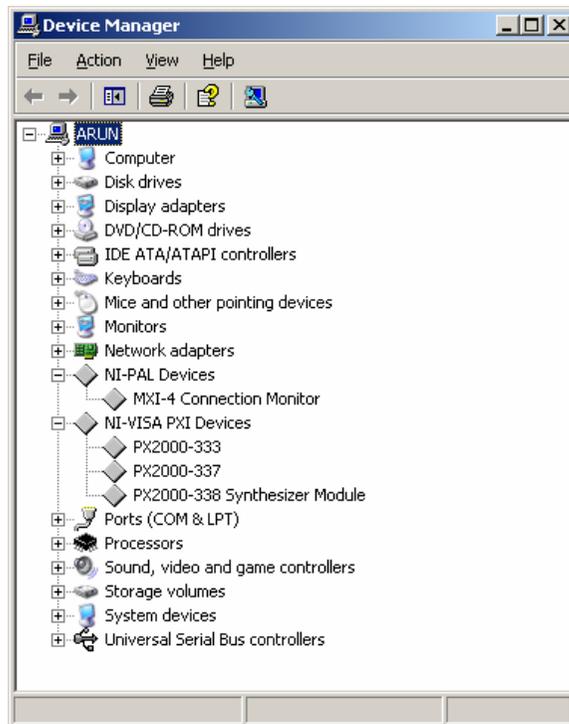


Figure 1. Windows Device Manager

Using the Control Panel

The N2099A Control Panel is used to control the N2099A. 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.

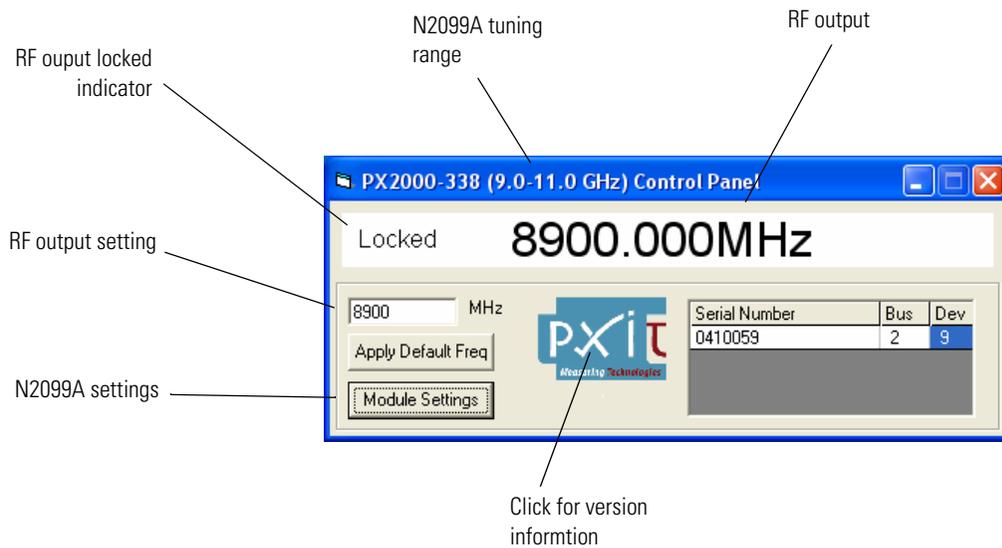


Figure 2. N2099A Control Panel

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.

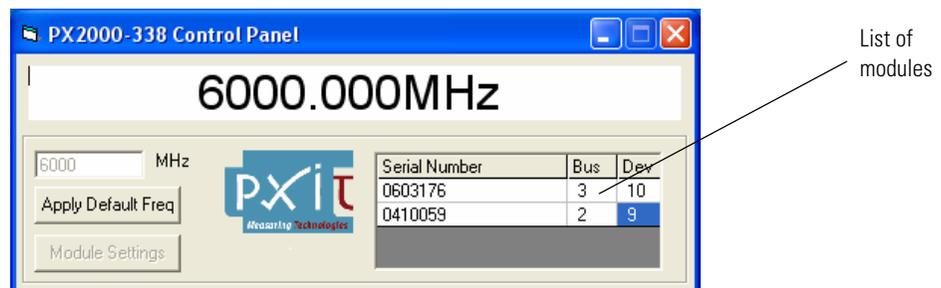


Figure 3. Module Drop-down List

Using the Control Panel

You set the RF output frequency to any value that is supported by the synthesizer. To configure a default frequency, click Module Settings. The N2099A will set to the default frequency as the Control Panel connects to the module for the first time in a particular system. Every subsequent time the Control Panel connects to an instrument the last set frequency is output. Click Apply Default Freq to set the module to the default frequency at any time. The N2099A displays a locked status in the Control Panel when it successfully locks to a frequency. If the locked status is not displayed, the output is at an unknown signal. This can happen at the border edges of the tuning range or if the air flow in the chassis not optimal.

To version information on the Control Panel, click on the logo on the Control Panel.

To start the Control Panel application

- 1 Click the Window's Start menu.
- 2 Click **All Programs**, **PXIT**, and then **PX2000-338**.
- 3 Click **PX2000-338 Control Panel**.

Programming

You can use ActiveX Control to access the N2099A. 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. 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 VISA handle.

All calls to the Synthesizer require that the instrument descriptor is first passed into the ActiveX call Descriptor. In order to obtain the required VISA handle or instrument descriptor a VISA search call of the system is required. The call needed is VISA Find Resource. The search string to be used is:

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

- 2 Open the device.

This will find all N2000-series modules using the search for manufacturer ID - then the subsequent search finds all modules that have a 338 in their product code name. This search will return an array of strings. If there is only one synthesizer in the system then only one item will be in the array. Index this out and pass it as an input to the Descriptor call.

- 3 Set the RF rate.

The output is set using the Frequency ActiveX call. The value is entered in MHz with a resolution down to 0.5 MHz. This property is both an indicator and a control. Its value can be read and written to.

- 4 Confirm that the output is valid.

The output can be confirmed using the status call. This is a Boolean call. A true value indicates that the synthesizer has achieved Locked status. This means that the synthesizer is locked at a particular frequency. It does not explicitly indicate that it 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 indicator that this particular frequency is being output by the synthesizer.

- 5 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 calls that return these values. The properties are: MaximumFrequency and MinimumFrequency.

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. This can be used to ensure the module starts up in a known state. The user 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 | To control any PXI instrument an Instrument Descriptor is required. 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 (or read only). This is the maximum frequency that this instrument is capable of. |
| MinimumFrequency | This is an indicator property (or read only). This is the minimum frequency that this instrument is capable of. |
| SerialNumber | Every N2000-series PXI module has a corresponding 7 digit serial number. This property is an indicator, for example, read only. |
| SessionStatus | This property is a Boolean indicator. It's 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 simply enables an about box to appear on the screen. The about box contains the version info. |
|-----------------|---|

Specifications

The distinction between specifications and characteristics is described as follows:

- Specifications describe warranted performance over the temperature range 0° C to +40° C and relative humidity <95% (unless otherwise noted). 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 nonwarranted, 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

| | | |
|---|--|--|
| Tuning Range | ± 2 GHz | |
| Ranges Available (center frequency) | 4 GHz to 11 GHz | |
| Output Power (minimum) 9 dBm at 4 GHz 9 dBm at 5 GHz 9 dBm at 6 GHz 7 dBm at 7 GHz 7 dBm at 8 GHz 7 dBm at 9 GHz 7 dBm at 10 GHz 7 dBm at 11 GHz | Minimum +7 dBm +7 dBm +7 dBm +7 dBm +7 dBm +7 dBm +7 dBm +7 dBm | Maximum +10 dBm +10 dBm +10 dBm +10 dBm +10 dBm +10 dBm +10 dBm — |
| Power Variation over Temperature & Frequency | ± 2 dB | |
| Step Size (minimum) | 1 kHz | |
| Switching Speed (100 MHz step) | 100 ms (characteristic) | |
| Phase Noise 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz | Minimum dBc/Hz -53 -65 -98 -122 -144 | Maximum dBc/Hz — -60 -87 -110 -133 |

Specifications**Table 2. 10 MHz External Reference Oscillator**

| | |
|------------------|------------------|
| Stability | ± 1.5 ppm |
| Aging | < 1 ppm-per-year |

Table 3. Environmental Specifications

| | |
|-------------------|---------------------|
| Use | indoor |
| Dimensions | Two-slot PXI module |

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.

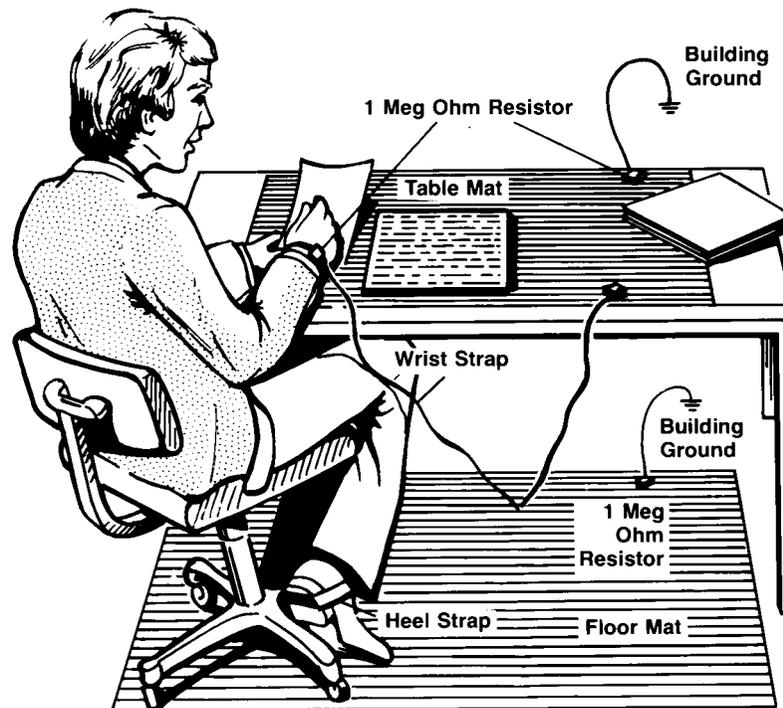


Figure 4. Static-safe Work Station

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. Refer to [Table 4](#) for information on ordering static-safe accessories.

Electrostatic Discharge Information

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.

Table 4. Static-Safe Accessories

| Agilent Part Number | Description |
|----------------------------|---|
| 9300-0797 | Static control mat, 0.6 m x 1.2 m (2 ft x 4 ft) and 4.6 cm (15 ft) ground wire. (The wrist-strap and wrist-strap cord are not included. They must be ordered separately.) |
| 9300-0980 | Wrist-strap cord 1.5 m (5 ft). |
| 9300-1367 | Wrist-strap, adjustable, without cord. |
| 9300-1126 | ESD heel-strap |

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.

Connector Care

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.

Contacting Agilent Technologies

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 call the Call Center at 1 (800) 829-4444.

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:
 - 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.

