



NS-3

RF Noise Source



Operation Manual

Version 1.0

Aug 11, 2004

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1. Introduction

The Applied Instruments Model NS-3 RF Noise Source generates a high quality RF noise signal for laboratory and field use.

Features

- 5 MHz to 2 GHz frequency range
- Usable from 2 MHz to 2.2 GHz
- 30 dB of adjustment range in 0.1 dB steps
- Adjustable step size in addition to direct numeric entry
- On/off pulsed modulation modes in three speeds
- Settable reference point
- Remote control via RS232 port

Standard Accessories

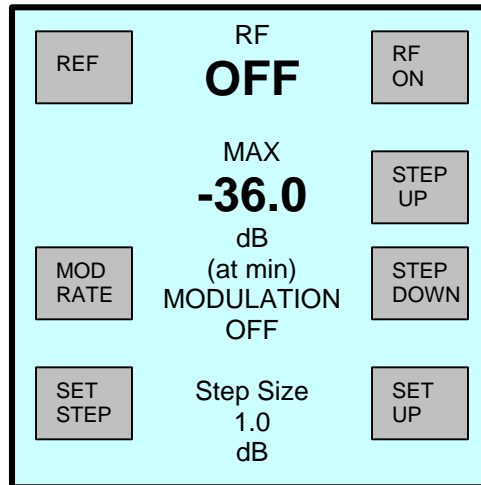
- AC Line cord
- 30" 75 Ohm male BNC patch cable

Options

- Rack mount kit
- Rear panel N connector
- BNC 50 ohm matching pad
- External amplifier, 35 dB gain
- External band-pass filters, inquire for frequencies
- Rechargeable battery (NiMH)
- Padded carrying case with shoulder strap

2. Front Panel Operations

After a brief start-up message indicating the firmware version number, the main screen is displayed:



The “soft keys” displayed on the LCD screen are positioned next to their corresponding buttons. The screen is NOT a touch screen, you have to press the button next to the function shown on the screen.

RF ON/OFF

Press the RF ON soft key to turn the RF output on. The key label will change to “RF OFF” to indicate the action when the button is pressed a second time. The present state is shown in the center of the screen.

REFERENCE MODE

The RF level is displayed in dB in one of three ways:

- 1) dB down from the maximum output
- 2) dB up from the minimum level
- 3) dB up or down from a set reference level

You select the reference mode by pressing the “REF” soft key. The selected mode appears just above the level number in the middle of the screen. When changing the reference mode, the level itself does not change, but the displayed number will change according to the new mode.

REFERENCE LEVEL

When the “REF” reference mode is selected, you can set the reference level by pressing the “SET REF” key. This key is not available or displayed when either the “MIN” or the “MAX” modes are selected.

When you press the “SET REF” key, the displayed level changes to zero (the actual output level does not change). Now you can adjust the level either up or down from this new reference level.

LEVEL ADJUSTMENT

There are several ways to change the RF output level:

If you know what numeric value you want, you may use the numeric keypad to enter the number and press the “ENTER” key when finished.

Or, you may use the arrow keys to adjust any digit of the displayed number either up or down. Use the left and right keys to move the cursor between the digits. The level will change as you press the up and down arrow keys. This method allows easy adjustment in 10 dB, 1 dB or 0.1 dB steps.

Finally, you may use the “STEP UP” and “STEP DOWN” soft keys to step up or down at the defined step size.

STEP SIZE

The step size is shown at the bottom of the screen and may be set by pressing the “SET STEP” key, entering the step size with numeric keys and pressing “ENTER”.

MODULATION

The modulation feature cycles the RF on and off at a 50% duty cycle at three selectable rates:

SLOW – 10 seconds per cycle

MED – 1 second per cycle

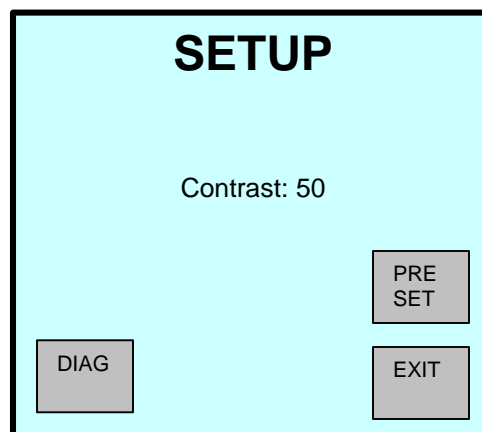
FAST – 50 cycles per second

NONE – no cycling

Press the “MOD RATE” soft key to select the desired rate.

SETUP

Press the “SET UP” soft key to display the setup screen. This screen lets you enter the desired screen contrast value with the numeric pad or press ENTER and adjust with the arrow buttons. Press ENTER when finished.



The contrast is temperature compensated and should be legible at any operating temperature once it is set.

Press PRESET to return all settings to the factory default settings.
Press EXIT to return to the main screen.

The “DIAG” soft key allows access to a diagnostic screen intended for service technicians only.

BACKLIGHT

The screen backlight has four settings: off, low, medium and high. When turned on with AC power applied, the backlight is set to high. When turned on under battery power, the backlight is set medium.

The backlight is a significant drain on the battery; setting the backlight to off or low power will increase the time before a recharge is needed.

NOTE: the battery pack is an optional feature.

The backlight setting may be changed with the +/- key. You must press the key *twice* to change the backlight. The first press is interpreted as either the + or the – and used to change the sign of number being entered. Press it repeatedly until the desired backlight setting is obtained.

3. Rear Panel Functions

The rear panel contains the following items:

- 1) AC power input jack
- 2) RS232 DB-9 connector
- 3) USB connector
- 4) Power option switch
- 5) N connector hole

AC Power Input

The AC power input jack accepts a standard IEC power cord and may be plugged into 120V or 240V AC power, 50 or 60 Hz. A United States cord is standard; other cords are available on request.

RS232 Connection

A standard PC style serial cable with a DB-9 connector may be used to connect a PC to the RS232 port of the NS-3. This enables the remote control functions to be used.

USB Connector

The USB connector is provided for future implementation of a USB interface to a PC. This is not functional at this time.

Power Option Switch

For use in automated test applications, the power option switch enables the instrument to automatically power up whenever AC power is applied. This is useful when installing the NS-3 as part of an equipment rack: the unit will power up when the rack is turned on.

N Connector

A rear panel N connector is available as an option instead of the front panel BNC connector for the RF output. This is also useful in automated test applications.

Remote Operations

The NS-3 may be controlled remotely through the RS232 serial port. The command set conforms to the SCPI standard and is described below. See www.scpiconsortium.org for more information on the SCPI standard.

The commands are described below in the standard SCPI notation. Commands are terminated with a carriage return character. Most commands have a query form (trailing question mark) that returns the present value.

3.1. RF On/Off

OUTPut[:]STATe] <Boolean> Turns the RF output on or off.
 OUTPut[:]STATe]? Returns 0 or 1.

3.2. Level Control

[OUTPut:]ATTenuation <value> Sets the attenuation in dB
 [OUTPut:]ATTenuation? Returns the attenuation in dB

The output power level is set to the maximum output minus the attenuation value used here. This corresponds to the MAX reference type on the front panel operations. The MIN and REF types are not supported via remote commands. The step size and stepping functions are also not supported by the remote commands.

Because the NS-3 is not a calibrated instrument, the settings are somewhat approximate.

3.3. Modulation

[SOURce:]PULM[:]STATe] <Boolean> Turns the modulation on or off
 [SOURce:]PULM[:]STATe]? Returns the modulation state (0 or 1).
 [SOURce:]PULM[:][INTernal:]FREQuency <value> Sets the modulation frequency in Hz.
 [SOURce:]PULM[:][INTernal:]FREQuency? Return the modulation frequency in Hz.

The NS-3 supports only three pulse frequencies: slow=0.01 Hz, med=1 Hz and fast=50 Hz. The SCPI command uses a numeric value; the NS-3 translates the given frequency into the closest supported frequency.

3.4. Error Reporting

The system error query command is supported for a few types of errors:

SYSTem:ERRor?

Returns one of the following:

0, "No error"
 -100, "Command error"
 -350, "Queue overflow"

3.5. SCPI Required Commands

The following commands are implemented as required by the SCPI standard but have no real function in the NS-3.

*CLS	Clear Status Command
*ESE	Standard Event Status Enable Command
*ESE?	Standard Event Status Enable Query
*ESR?	Standard Event Status Register Query
*IDN?	Identification Query
*OPC	Operation Complete Command
*OPC?	Operation Complete Query
*RST	Reset Command
*SRE	Service Request Enable Command
*SRE?	Service Request Enable Query
*STB?	Read Status Byte Query
*TST?	Self Test Query
*WAI	Wait to continue Command

The NS-3 has no overlapped commands so the *OPC, *WAI and *OPC commands are not needed.

3.6. Multiple Commands

SCPI allows multiple commands to be strung together on the same line separated by semi-colons. This feature is not implemented in the NS-3.

Battery Option

If installed, the battery option consists of a Nickel Metal Hydride (NiMH) battery pack and associated charging circuitry. The battery pack will last for 500 to 1000 charge-discharge cycles, if properly cared for.

The NS-3 has a fast battery charge circuit that charges the battery in approximately 4 hours. An overnight charge (6 to 8 hours) will continue charging until the battery is completely full.

The charger is automatically turned on whenever AC power is applied and the battery is not fully charged. The unit may be operated while the battery is being charged.

3.7. Low Battery Indicator

An LED marked "Lo Bat" in the lower left corner of the front panel will flash when a low battery condition is detected. When this LED is illuminated, the unit should be recharged. If the battery becomes too low to safely operate, the instrument will shut off after 5 seconds.

3.8. Battery Charge LED

The LED in the lower left of the front panel marked "Chg" shows the status of the battery charging circuit:

- OFF charger is not connected
- YELLOW charging
- GREEN battery nearly full and in a trickle-charge mode
- FLASHING problem

When the LED is flashing between green and yellow, it indicates a charging problem of some type. Possible causes are:

- 1) The battery was too cold when starting to charge
- 2) The battery was too hot when starting to charge
- 3) The battery is drained below the point where the fast charge can be used
- 4) The battery has failed

If the battery was too hot or too cold, just wait an hour with the unit at room temperature and try again. If the battery was drained too far, which is possible if not used for a long period, leave the unit plugged in for several hours so it can trickle charge. If the LED stays on after several hours, the battery should be replaced.