



THE PHS 8400 FAMILY OF HIGH PERFORMANCE MICROWAVE SYNTHESIZERS



BENCHTOP



MODULAR



HANDHELD



The PHS 8400 Family

Features:

- Standard Range : 700 MHz to 18 GHz
- Extendable to 10 MHz to > 24 GHz
- Phase Noise -110 dBc/Hz, 100Khz offset, at 24 GHz
- Step sizes to .01 Hz
- +5 dBm min at 24 GHz with multiple higher power options
- >10 dB power variation capability
- 0 – 55 C temp range with -20 to +70 C option
- Modulation options (call factory)
- <100 μ Sec switching in List Mode
- Single Supply 7.5 V, < 1Amp
- Power Saver and Quick Start Modes
- 100 MHz internal reference
- 10/100 MHz external reference
- Ability to do “Specials” with lower Phase Noise in smaller ranges (e.g. octave)
- USB / SPI / LAN Interfaces
- IVI, SCPI, LabView® and MATLAB® compatibility. GPIB interface option

The **8400 Family** is available in the Modular 8400M and the Benchtop 8400B Single Output and Multiple output formats. The Handheld version is available with Battery Option in certain Models. Please contact Pronghorn with your specific requirement.

CHOOSING YOUR SYNTHESIZER

Unlike other suppliers, PHS would like to make your choice of synthesizer fit your needs. Please refer to our [Synthesizer Selection Guide](#) on the web site to assist you in your selection.

CUSTOM DESIGNS

Pronghorn welcomes custom design requirements. We can add items such as a closed loop control of power, modulation capabilities, or different power supplies or mechanical configurations. Please refer to our [Design Capabilities](#) section on the web site and contact us.

A BRIEF DESCRIPTION OF PHS MODELS

Our synthesizer product families are the 8300, 8340, 8400, and 8500. The 8300 and the 8340 are Fractional – N Phase Locked Loop (PLL) models, and the 8400 and 8500 are Integer – N PLL models, which results in no so called fractional spurs. Our instruments are protected under US Patents 8611845, 8749282, and 9134355, and a number of other patents that are pending.

As can be seen from the Summary Parameters our instrument families represent a wide range of performance. In addition, each instrument is available in one or more of three *models*, the M for modular, with lowest power consumption, the B for Benchtop, which allows addition of higher power and closed loop leveling capabilities, and the H for Handheld, which allows for Field use, especially when equipped with the available optional battery.

INTEGER PROGRAMMING

The PHS 8400 M, B, and H are INTEGER SYNTHESIS based PLL Synthesizers. They do not exhibit any fractional spurious outputs such as Fractional-N based synthesizers do.



SPECIFICATIONS

Frequency Range 700 MHz – 20GHz
Low End Option specifiable 10 MHz, 1 GHz, 2 GHz
High End Options specifiable to 24 GHz

Frequency Resolution (Step Size) 1 KHz
Options 1 Hz, .01 Hz

Frequency Reference (Internal) 100 MHz, 10 ppm
Options 10 MHz Frequency & 1 ppm
External reference 10 MHz / 100 MHz specifiable
Phase Noise and stability are reference related

Frequency Switching Time in List Mode <100 µSecs

Frequency Sweep No of Points up to 1000

Frequency Sweep Dwell time 1 µSec to 1 Sec

Continuous sweep and Optional Triggered sweep available

Power Output < 15 GHz >10 dBm
>15 GHz > 5 dBm

Higher Power Output Options Contact Factory

Power Control Range > 10 dB

Power Control Step Size 1.0 dB

Power Level Accuracy ± 2 dB

Power Sweep Number of points 1 dB Steps

Power Sweep Dwell Time 1 µSec to 1 Sec

Continuous sweep and Optional Triggered sweep available

Operating Temperature Range 0 to 50C
Optional -20 to + 70 C range available

Storage Temperature Range -20 to + 80 C

Spectral Purity

Phase Noise... See attached charts

Spurious < 60 dBc Typical

The 8400 Series is Integer Programmed. There are no fractional spurious outputs.

Programming/Interface Options

All PHS models are available with a variety of interface options, including Keypad Input via front panel in the B and H models, and

C# Based USB Programming with Pronghorn GUI in the M, B, and H models, and

IVI and SCPI Compatible and compliant interface with

- LabVIEW®
- MATLAB®

SPI and USB Interfaces

LAN and GPIB add on options available

Interfaces Available

Modular – “M” Series

- USB
- SPI
- LAN/ GPIB extension Options

Benchtop – “B” Series

- USB
- SPI
- LAN / GPIB options
- Multiple unit Option (in one box)

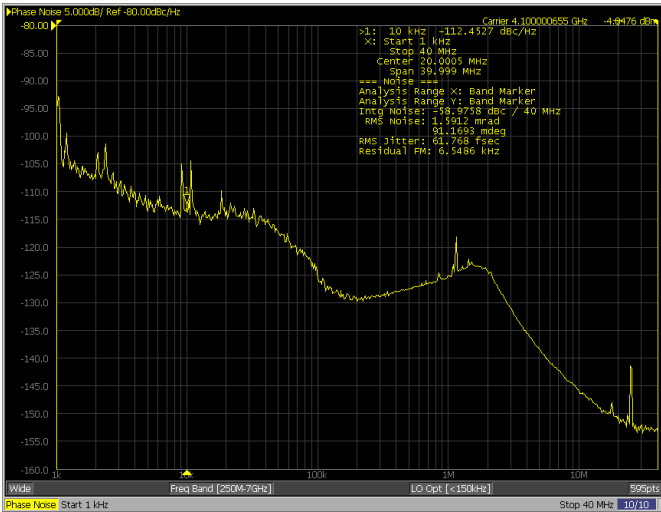
Handheld – “H” Series

- USB Interface
- LAN / SPI Options

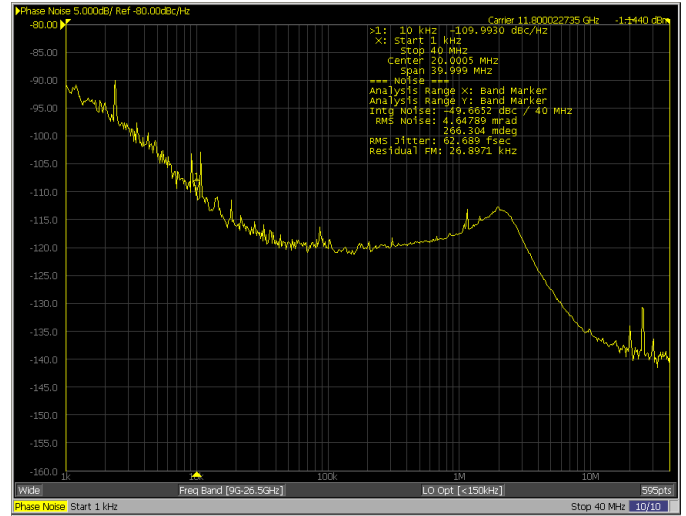
The 8400 “H” series is available only as a non-standard special at this time. Please contact your representative of PHS Office for availability, specifications, and pricing.



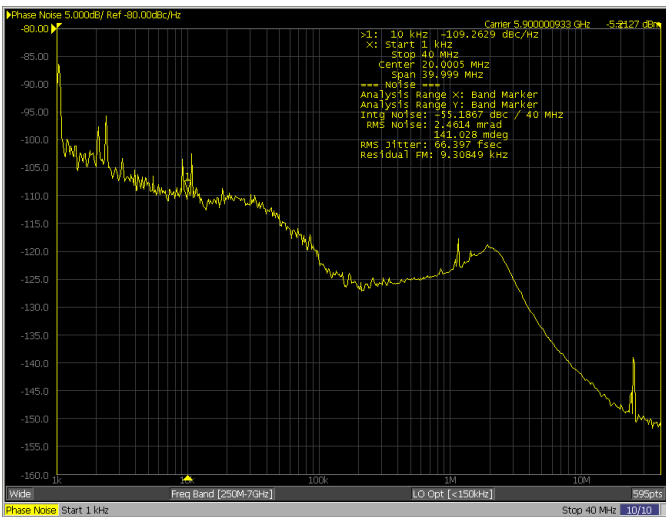
PHASE NOISE



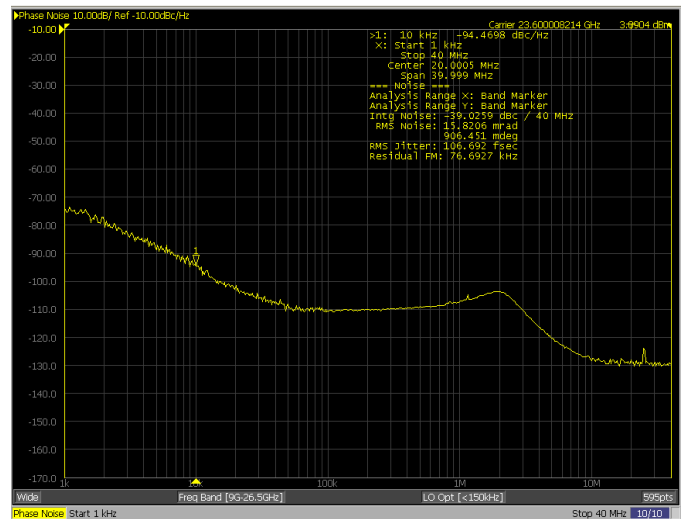
Phase Noise at 4.1 GHz



Phase Noise at 11.8 GHz



Phase Noise at 5.9 GHz



Phase Noise at 23.6 GHz

IMPORTANT NOTE:

The Phase Noise data displayed is a function of the Reference Phase Noise. Please contact PHS for options that would provide significant improvement in the 100 Hz to 10 KHz offset range.





[DC Power Requirements](#)

The 8400 Series is powered by 7.5 V DC Voltage drawing <1.5 A of current. The B and H Series are supplied with 120 – 220 V AC to 8.4 V DC dongles. The Modular M series is powered by a pin in the SPI interface.

[Power Saver Mode and Quick Start](#)

The 8400 series have an option for a “Power Saver Mode” available. In this mode, all the circuits that are capable of quick recovery are turned off. The power dissipation in this mode is approximately 10% of the power dissipation under normal operation. The “Quick Start” feature allows the unit to be fully functional in milliseconds, and capable of its normal <100 microsecond switching performance.

[Multiple Unit Operation](#)

The 8400 B and 8400 M are designed to operate in multiple unit format with an external reference oscillator. In this capacity, one can practically switch between frequencies below 1 GHz to above 30 GHz in a phase coherent fashion at extremely high speed. The 8400 B in particular is designed to control 5 - 6 synthesizers from a common interface, and provide a single combined output or multiple outputs based upon system needs. In such a system, phase coherent switching between multiple frequencies can occur at the speed of a microwave switch, typically microseconds. Furthermore, multiple 8400 B's with a common reference frequency can be ganged together to provide 10 – 100 phase continuous and coherent outputs in a space that is a fraction of and at a cost that is a fraction of alternative solutions, with a speed that is superior to these alternative solutions. Please see Pronghorn AN – 6001, [Phase coherent and phase continuous switching possibilities at our web site](#).

The PHS 8400 series is also very useful in applications that need multi tone testing, especially when coupled with our closed loop power control add on units. **The Multi Tone frequencies in our applications are not limited to a 90 or 120 MHz bandwidth as in the case of so called Vector Signal Generators.**

[SUPPORTING DOCUMENTATION](#)

Our web site contains all the relevant documentation relating to the sizes, mounting configurations, and recommendations relating to the M, B, and H series.

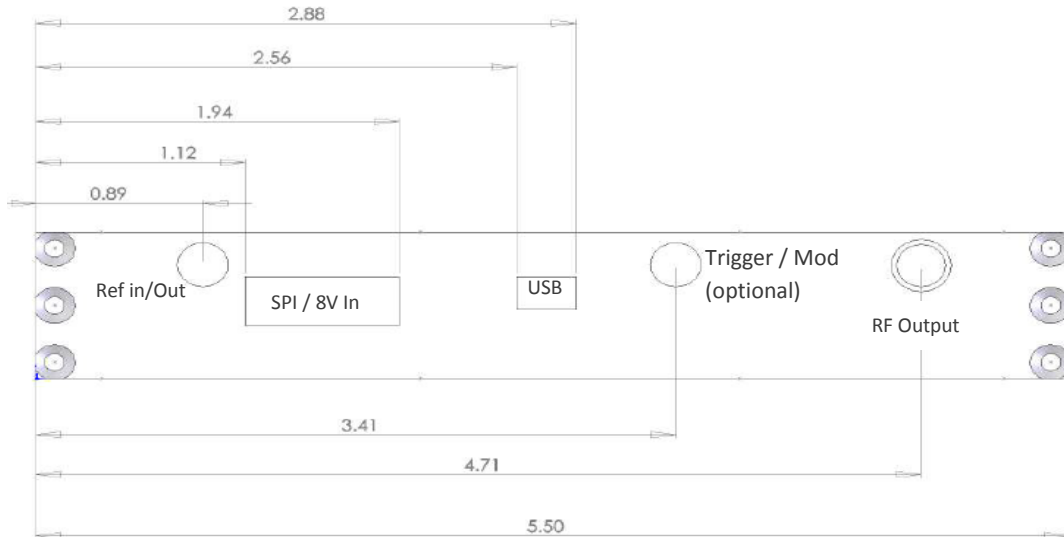
In addition, Operating, USB and SPI programming manuals and details are available on the web in the documentation section.

A variety of Application Notes and Comparison Tables are also available.





“M” MODELS CONNECTIONS (Single Sided Inputs and Outputs)



Size : 3.5" X 5.5" X 1.0"

SPI Connections – M and B Models

<u>Pin No.</u>	<u>Function</u>
1 – 5,8	N/C
6	Lock Indicator
7	Pulse / Trigger (Option)
20	SPI SCLK
18	SPI SS
16	SPI SDI – Data Input
14	SPI SDO – Data Output
13, 15	RX/TX option. Normally N/C
17	SWP Trigger Option
19	Control Option (e.g. List Trigger)
11,12	8V DC In (M models)
9,10	Ground (M Models)



Detailed M, B, and H package drawings can be found in the [Documentation](#) section of the web site