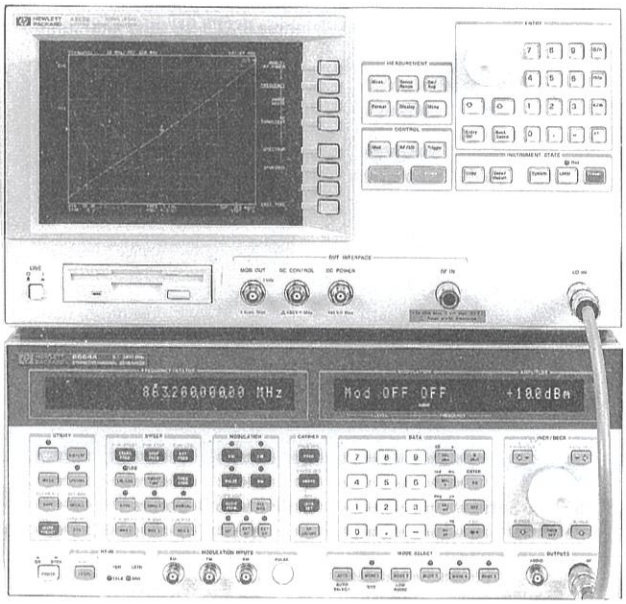
VCO/PLL Signal Test System, 10 MHz to 12.6 GHz

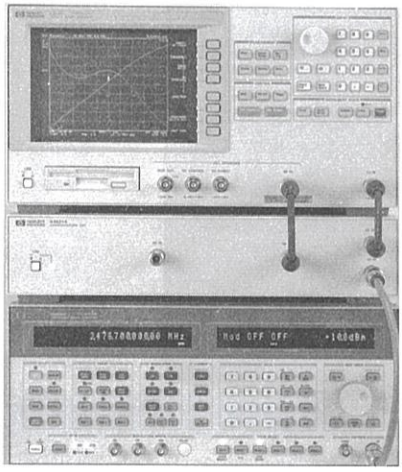
HP 4352S

NEW

- Dedicated VCO and PLL parameters test system
- Excellent solution for LAB and production line
- Simple configuration and multifunctional system
- VCO tuning characteristics evaluation
- Outstanding phase noise measurement capability
- High resolution frequency transient measurement
- Automatic measurement capability and powerful analysis functions



Simple 3GHz Standard System



12.6 GHz System

HP 4352S VCO/PLL Signal Test System

GPIB

The HP 4352S test system can evaluate the characteristics of VCOs and PLLs that are essential to designing local oscillators used in RF wireless communication equipment. This system can provide both powerful analyzing capability for design evaluation in LAB and high speed measurement capability for production line test with 2 operating modes, "Signal Analyzer" and "VCO Tester" mode. The HP 4352S, which consists of the HP 4352B VCO/PLL Signal Analyzer and Hewlett-Packard low-noise signal generator controlled by the HP 4352B, covers up to 3 GHz and can measure the main VCO/PLL evaluation parameters, RF power, frequency, phase noise, spectrum, frequency transient, DC consumption current and FM deviation. In addition, the HP 4352B provides and controls the DC power supply, the low-noise DC control voltage source and the 1 kHz signal source necessary for VCO tuning characterizing.

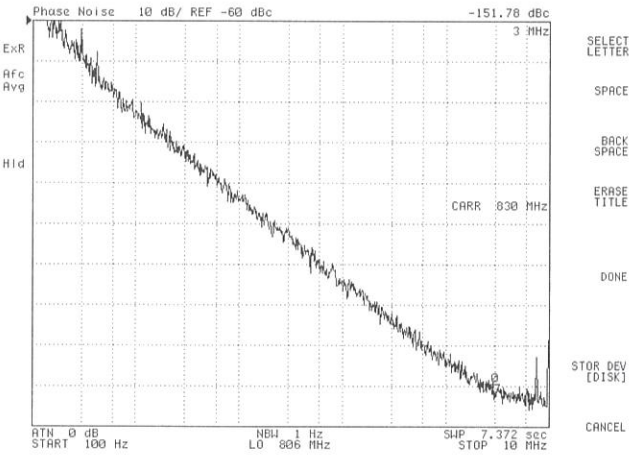
When configured with the HP 43521A downconverter unit, the HP 4352S offers a dedicated and comprehensive VCO/PLL design and production measurement solution for manufacturers that must test at frequencies over 3 GHz. The enhanced HP 4352S is a complete system that offers a frequency range from 10MHz to 12.6GHz and is capable of measuring phase noise, RF power, transients, settling time, and many more parameters required for VCO/PLL evaluations.

This system can make high-speed measurements thanks to the dedicated firmware and "carrier lock multi-mode PLL" technology for phase noise measurement that enables the system lock unto the carrier of the measured signal automatically. In addition, the HP 4352B has excellent phase noise performance such as –157 dBc/Hz at 1 MHz offset typically, so that this test system can make reliable and repeatable phase noise measurement with up to 10 times reduction in measurement time. Actually it can measure 801 measurement points from 100 Hz to 10 MHz offset in 7.4 seconds/sweep. Besides the powerful phase noise measurement capability, the HP 4352S can measure frequency transient with 50 Hz frequency resolution and 12.5 micro seconds time resolution.

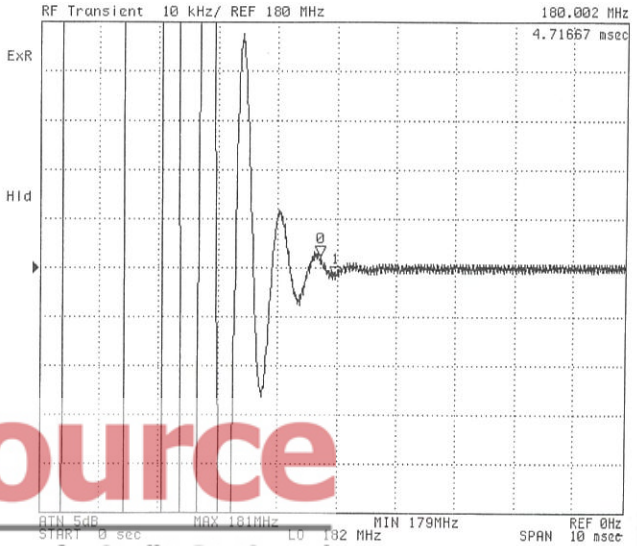
When the HP 71707A Microwave Downconverter is added to the standard system, the phase noise measurement can be performed up to 26.5GHz.

The HP 4352S improves your VCO and PLL evaluation efficiency and testing productivity dramatically.

Measurement Display Examples



VCO phase noise measurement



VCO frequency lock time measurement

Efficient Evaluation in Oscillator Circuit Design

The HP 4352S can measure the following characteristics:

For VCO evaluation

- RF power vs. tuning voltage
- Frequency vs. tuning voltage
- Tuning sensitivity
- Phase noise (Carrier-to-Noise)
- Harmonics
- FM deviation
- DC power consumption current

For PLL evaluation

- RF power
- Phase noise (Carrier-to-Noise)
- Frequency and Frequency transient
- Spurious
- Harmonics

Each parameter can be measured without changing any cable connections. So, you can easily evaluate a VCO/PLL with powerful analysis functions such as marker or limit line.

High Throughput and Easy Test Automation

Thanks to the high-speed phase noise measurement capability, it only takes about 2.5 seconds to measure five VCO parameters (RF power, frequency, phase noise, DC power consumption current and FM deviation) by using "VCO Tester" mode. The HP 4352S has the HP Instrument BASIC programming functions, built-in 3.5 inch disk drive (LIF/DOS format) and a 24-bit I/O. These capabilities allow you to interface to an automatic handler so that you can achieve automatic production-line testing without an external computer.

Specifications Summary

Source Characteristics
DC Power Voltage: 0 to +15.5 V with 1 mV step, 50 mA max.
DC Control Voltage: 0 to +20 V with 100 μV step, 20 mA max.
Option 001: –15 to +35 V
Accuracy: ± (0.1% + 2 mV)
Settling Time: < 20 ms @ 0.1% error (typical)
Noise Density: <1 nV√Hz @ 10 kHz offset
FM Signal: 1 kHz, 0 to 1 Vrms with 1 mV step @ open

Receiver Characteristics
Measurement Frequency Range: 10 MHz to 3 GHz/26 GHz
Input Power Level: –10 to +20 dBm
Input Impedance: 50Ω
SWR: <1.2 (@ < 2 GHz); <1.3

RF Power Measurement
Accuracy @ Peak Voltage Responding
±0.2 dB (@ 1 GHz, –5 dBm, typical); ±1 dB
Resolution: 0.01 dB

Frequency Measurement
Frequency Resolution: 1 kHz

Frequency Transient Measurement
Highest Accuracy: ± 2 kHz
Highest Measurement Resolution: 50 Hz
Maximum Sweep Time: 10 sec.
Minimum Time Resolution: 12.5 μsec.

Phase Noise (Carrier-to-Noise Ratio) Measurement
Offset Frequency Range: 100 Hz to 10 MHz

System Noise Level

Offset	Specification (dBc/Hz)	Typical (dBc/Hz)
100 Hz	–85	–90
1 kHz	–110	–117
10 kHz	–130	–137
100 kHz	–140	–147
1 MHz	–150	–157

Spectrum Measurement
Absolute Level Accuracy: 2 dB (–5 dBm input, @ ATT=0 dB, typical)
Relative Level Accuracy: 0.5 dB (typical)

FM Deviation Measurement
Measurement Range: 0 to 200 kHz (peak)
Accuracy: ±(2% + 0.1% of measurement range) @1 kHz FM rate; ±0.8% (typical)
Residual FM: < 3 Hzrms (@ 300 Hz – 3 kHz BW)

DC Consumption Current Measurement
Measurement Range: 0 to 50 mA
Accuracy: ±(0.2% ± 100 μA)

Storage
3.5-inch FDD: LIF/DOS format, 2DD/2HD
Internal RAM Disk: LIF/DOS format, 512 kB max.

Interfaces
GPIB I/F, 24-bit parallel I/O I/F

General Characteristics

Display: 9-inch color LCD
Operating Temperature: 0 to +40° C
Operating Humidity: 15 to 95% RH
Storage Temperature/Humidity: 0 to +40° C/15 to 95% RH
Power Requirements: 90 to 132 V or 198 to 264 V, 47 to 66 Hz, 300 VA max.
Size: 235 mm H x 425 mm W x 553 mm D
Weight (typical): 21.5 kg

Key Literature

HP 4352S VCO/PLL Signal Test System Product Overview, p/n 5966-0805E
Signal Generator Selection Guide, p/n 5091E-7274E
HP 71707A Microwave Downconverter Technical Data, p/n 5091-4435E

Ordering Information

	Price
HP 4352S VCO/PLL Signal Test System	$0
HP 4352B VCO/PLL Signal Analyzer	$50,500
Opt 001 Expand DC Control Voltage	$3,030
Opt 1A2 Delete Keyboard	–$111
HP 43521A Downconverter Unit	$35,600
Recommended Signal Generators	
HP 8664A Synthesized Signal Generator with Option 004	$31,500
HP 8665A Synthesized Signal Generator with Option 004	$41,700
HP 8665B Synthesized Signal Generator with Option 004	$42,750
HP 8644B Synthesized Signal Generator with Option 002	$24,600
HP 8657B Synthesized Signal Generator	$14,700
HP 71707A 26 GHz Microwave Downconverter	$77,900
HP 70422A 18 GHz Downconverter Module	$46,700

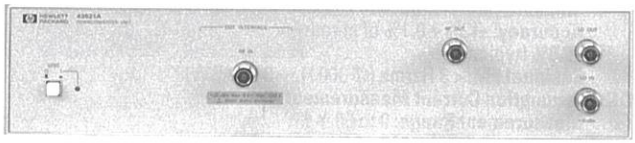
See Signal Sources section for more details.
When using the other signal generators, please contact the HP Call Center in your region for details.

HP 43521A

NEW

HP 43521A Downconverter Unit

The HP 43521A Downconverter Unit is designed to operate with the HP 4352S VCO/PLL signal test system. When configured with the HP 43521A downconverter unit, the HP 4352S offers a dedicated and comprehensive VCO/PLL design and production measurement solution for manufacturers that must test at frequencies above 3GHz. The enhanced HP 4352S is a complete system that offers a frequency range from 10MHz to 12.6GHz and is capable of measuring phase noise, RF power, transients, settling time, and many more parameters required for VCO/PLL evaluations.



HP 43521A

Specifications

RF-in Port:
- **Connector:** N(f)
- **Frequency:** 10MHz to 12.6GHz

RF Power (Heterodyne Path):
- **Input VSWR:** <1.5
- **Frequency:** 2.4GHz to 12.6GHz
- **Level:**
  - **@ATT=0dB:** –20dBm to 0dBm
  - **@ATT>0dB:** –20dBm to +20dBm
- **Resolution:** 0.01dBm
- **Accuracy:** (@23°C±10°C)
  - **@≤15dBm:**
  - ±1.5dB @≤4GHz
  - ±2.0dB @≤8GHz
  - ±2.5dB @≤12.6GHz
  - **@≤20dBm:**
  - ±1.5dB @≤4GHz(SPC*)
  - ±2.0dB @≤8GHz(SPC*)
  - ±2.5dB @≤12.6GHz(SPC*)
  - **@-5dBm:** ±0.8dB @6GHz(Typical)
  - **@-5dBm:** ±1.0dB @12GHz(Typical)

Heterodyne Path Gain: 20dB @6GHz(SPC*)
Direct Path Insertion Loss: 0.5dB @3GHz(SPC*)
LO-in Port:
- **Connector:** N(f)
- **Input Level:** +10dBm Nominal
- **Frequency Range:** 10MHz to 6GHz

LO-out Port:
- **Connector:** N(f)
- **600MHz Output Level:** ≥+8dBm (SPC*)
- **600MHz Accuracy:** 600MHz±50ppm (SPC*)

Power Requirements: 90V to 132V or 198V to 264V, 47 to 63Hz, 100VA max
Size: 425 mm (W) x 101 mm (H) x 553mm (W)
Weight: 8 kg (Typical)

*SPC = Supplemental Performance Characteristics

System Performance with HP 43521A

The system performance is the capacity achieved by the combination of the HP 4352B, the Signal Generator, and the HP 43521A when the HP 43521A is phase-locked to the 40 MHz on the HP 4352B. All data except for RF Power measurement are typical.

The operating frequency depends on the synthesized signal generator as follows.

Signal Generator	HP 4352S Frequency Range
HP 8664A	10MHz to 6.6GHz
HP 8665A	10MHz to 9GHz
HP 8665B	10MHz to 12.6GHz

Direct Path (10MHz to 3GHz)
RF Power: Add ±0.1dB to 4352B spec. (@≤2GHz)
Add ±0.2dB to 4352B spec. (@2GHz<Freq.≤3GHz)
Other Parameters: Same as the 4352B spec.

Heterodyne Path (2.4GHz to 12.6GHz)
Tester Mode
RF Power: Same as 43521A spec.
Frequency
- **Frequency Range:** 2.4GHz to 12.6GHz
- **Resolution:** Same as 4352B spec.
- **Accuracy:** Same as 4352B spec.

FM Deviation
- **Measurement Range:** Same as 4352B spec.
- **Resolution:** Same as 4352B spec.
- **Accuracy:** Same as 4352B spec.

Residual FM: Same as 4352B spec.
Phase Noise: (C/N ratio)
- **Offset Frequency Range:** 100Hz to 10MHz
- **Noise Floor:**
  (when equipped with the HP 8665B** up to 12.6GHz)
  ≤6GHz when equipped with the HP8664A**
  ≤9GHz when equipped with the HP 8665A**

**with Opt 004

Offset Frequency (Hz)					
RF Freq.	100	1k	10k	100k	1M
3GHz	–68	–93	–125	–137	–150
6GHz	–63	–88	–119	–131	–147
9GHz	–57	–84	–114	–125	–143
12GHz	–58	–81	–113	–125	–142

Accuracy: Same as 4352B spec.

Analyzer Mode
RF Power: Same as the 43521A spec.
Frequency: Same as the tester mode spec.
Phase Noise: (C/N ratio) Same as the tester mode spec.
Frequency Transient
- **Frequency Range:** 2MHz, 20MHz, 512MHz
- **Frequency Accuracy:** ±(Measurement Range x 0.1% + Time Base Accuracy of the External Signal Generator)
- **Resolution:** 50Hz, 500Hz, 12.8kHz

Spectrum
- **Absolute Accuracy:** ±3dBm@–10dBm, RF ATT=10dB
- **Relative Accuracy:** Same as the 4352B spec.

Ordering Information

	Price
HP 43521A Downconverter Unit	$35,600
Opt 1CM Rackmount Kit	$33
Opt 1CN Handle Kit	$53
Opt 1CP Rackmount Kit & Handle Kit	$76
Opt ABA English Localization	$0
Opt ABJ Japanese Localization	$0
Opt 0B0 Delete Operation Manual	-$20
Opt 0B1 Add Operation Manual	$20
Opt UK6 Commercial Cal.Certificate with Test Data	$330
Recommended Signal Generators when configured with the HP 43521A	
HP 8664A Synthesized Signal Generator with Option 004	$31,500
HP 8665A Synthesized Signal Generator with Option 004	$41,700
HP 8665B Synthesized Signal Generator with Option 004	$42,750