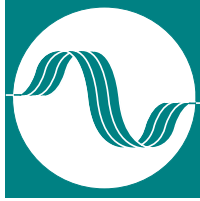


1313B



Phase Matrix, Inc.TM
Instruments You Can Count On

VXIbus Microwave Downconverter

**High-Performance Downconversion
For Analysis of Microwave Signals**



- 1 MHz to 26.5 GHz Frequency Range
- -135 to +30 dBm Dynamic Range
- Up to 350 MHz Wide IF Bandwidth
- <-135 dBm Average Noise Density
- 21.4 MHz Auxillary IF Option
- NIST Traceable Power Meter Option

Phase Matrix Model 1313B VXIbus Microwave Downconverter

High-Performance Downconversion For Analysis of Microwave Signals

Model 1313B Specification Summary

- 1 MHz to 26.5 GHz Frequency Range
- 1 Hz Frequency Resolution (with appropriate external LO)
- <-135 dBm Noise Floor
- +30 dBm Input Power Protection
- 20dB Maximum Noise Figure (<8.5 GHz)
- Auxillary IF Output
- 3 LO inputs for multiple downconversion
- Onboard Power Meter Option
- Onboard 1mW 50MHz Power Reference
- Agilent 8480 Power Sensor Compatible
- VXIbus Revision 1.3/1.4
- C-Size, 1 Slot Wide
- SCPI Version 1993.0

1313B - Overview

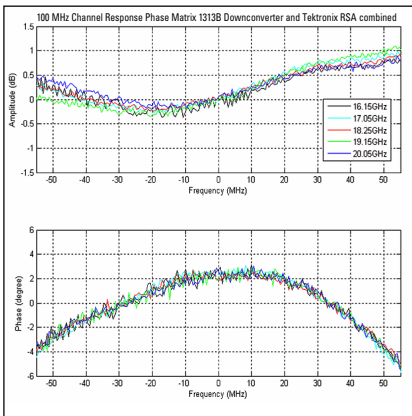
The Phase Matrix Model 1313B microwave downconverter translates microwave signals to RF frequencies with minimal distortion. The 1313B is the latest generation of modular, VXIbus based, broadband, downconverters optimized for synthetic instrumentation applications. The Model 1313B provides the user with basic microwave front end conditioning building blocks to extend VXIbus signal analysis into the microwave range. In conjunction with an appropriate external local oscillator module and commercially available digitizer, this single slot downconverter solution can provide the functions of several stand-alone instruments.

- Spectral Analysis
- Power Measurement
- Frequency Measurement
- Modulation Analysis
- Pulse Parameter Analysis

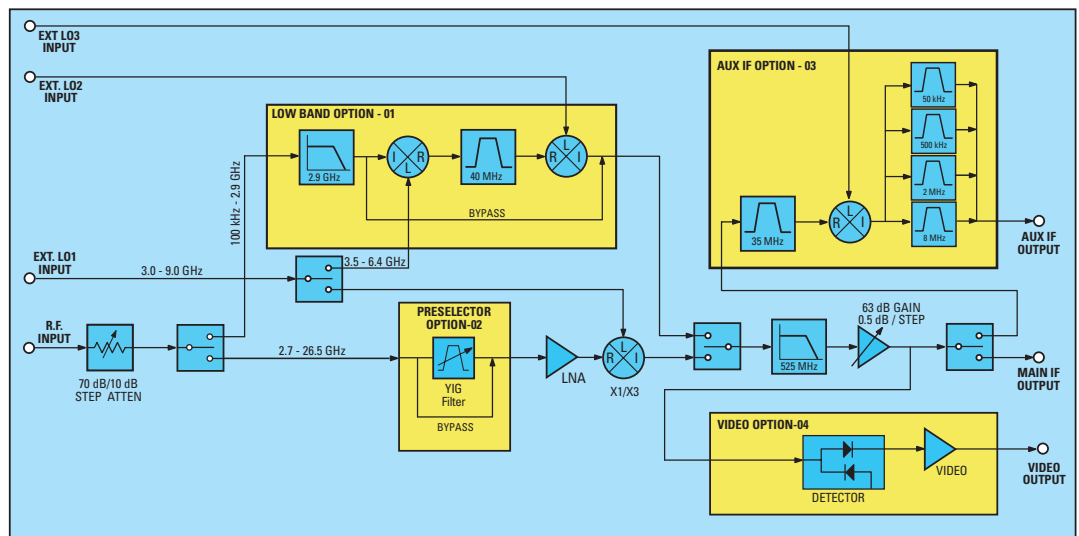
With instantaneous IF Bandwidths of up to 350 MHz the 1313B can assure the integrity of even the most complex modulated signals through the downconversion process. The standard I.F. output of 250 MHz (other options available) makes the Model 1313B ideally suited for extending the input frequency range of several lower frequency test systems such as the Tektronix RSA Spectrum Analyzers, NI PXI Signal Analyzer and Agilent 89600 series of vector signal analyzers.

Modular Construction

The Model 1313B is designed to offer the user the most flexibility in configuring a microwave Automated Test System (ATE) system. Whether you require wideband signals for fast acquisition or narrowband, high dynamic signal analysis, the modular architecture, built on our years of experience in designing downconverters, allows you to configure an ATE solution and optimize speed, space and cost at the same time. By removing the Local Oscillator (LO) function in a separate module the user can choose parameters important to the application at hand. Standard LO configuration uses a YIG based, 3-9 GHz synthesized LO (Model 20309) for X1 and X3 harmonic mixing. If switching speed is critical, VCO based sources can be substituted or custom, user provided, LO configurations can be utilized. Microwave performance is not compromised for VXIbus compliance. Modular shielding and double regulation is used to ensure outstanding performance and >80dB typical spur free dynamic range.



Amplitude and phase flatness for a Phase Matrix Model 1313B/RSA 100MHz bandwidth solution.



Simplified Block Diagram of the Phase Matrix Model 1313B



RF Input

The 1313B can be utilized to acquire and analyze a wide range of conventional as well as complex signals from $<-135\text{dBm}$ to $+30\text{dBm}$ (digitizer dependent), and provides 70dB of input attenuation that is selectable in 10dB steps. In addition, when multi-signal environments are encountered, YIG tuned front end pre-selection can be used to eliminate image frequency and erroneous measurements; similar to conventional spectrum analyzer architectures. With the standard microwave LNA, signals below -135dBm can be brought out off the noise.

LO Input

By having the LO externally provided, the 1313B allows for the most flexibility in configuring your microwave ATE system. The standard configuration uses the classic X1/X3 LO input for harmonic, heterodyne conversion to a 250 MHz 1st Intermediate Frequency (IF). Additional LO's for low-end coverage and auxiliary low frequency IF outputs are also externally provided. The LO sources can be provided by Phase Matrix or the user from other resources within the ATE system.

IF Output

Flexible IF architecture assures your downconverter choice can work with today's as well as tomorrow's leading edge digitizers. Precision 0.5 dB variable IF step attenuation is temperature stabilized and compensated to correct for frequency dependent conversion loss variations. In addition to the wideband (1st IF) and optional (2nd IF) a video option is provided for video/level triggering, RSSI measurements and AM/Pulse demodulation analysis.

Accuracy

Let the 1313B help improve the accuracy of the rest of your test system. By adding up to five sets of correction curves versus frequency (main path loss, step attenuator loss, YIG loss, residual IF loss, IF filter shape loss) Amplitude correction can be used to compensate for gains, losses in cables, antennas, amplifiers etc. Every 1313B is factory calibrated with N.I.S.T. traceable and certified equipment. Corrections are provided in electronic format for embedding within the control software.

Power Meter Option

In addition to the spectrum analysis and downconverter functions, the 1313B downconverter series features an optional integral power meter compatible with the Agilent 8480 power sensor series. The power meter option will interface to your already-fielded power sensors and transfer the NIST traceable power measurement results over the VXIbus. NIST traceability is maintained via the integral 50 MHz calibrator, factory set to within $\pm 0.7\%$. The built-in power measurement also allows for field calibration of the spectrum analyzer display and power measurements below -100dBm at 26.5 GHz, utilizing the power meter/receiver transfer method. The combination of these capabilities in a 1-wide VXI package offers unparalleled signal analysis computing power in a small package that is ideal for field or factory operation.

Programming

The 1313B is fully compliant with VXIbus Specification Revision 1.3/1.4. Register based communication through plug & play drivers allows for the fastest data transfer and control. Phase Matrix supports the 1313B with software drivers for most popular development environments. In addition, LabView compatible analysis tools are provided to quickly come up to speed on basic spectral analysis and downconverter controls.

Accessory Modules Enhance the 1313B's Capability

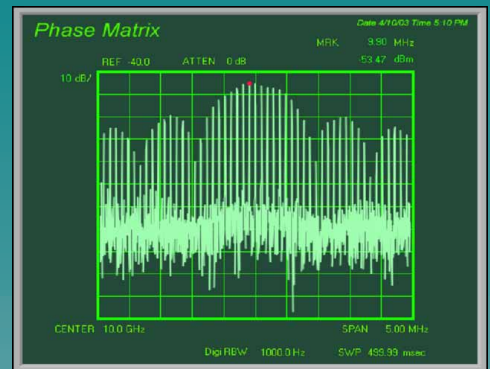
A host of accessory modules, including pulse generators, microwave synthesizers, frequency counters, power meters and power amplifiers, are readily available to compliment the 1313B downconverter. Phase Matrix, in partnership with other proven manufacturers of high quality, industry standard VXIbus equipment, can supply all of your automated microwave testing needs.



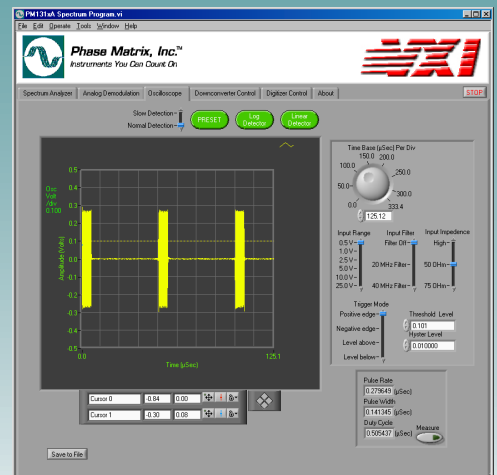
The Phase Matrix Model 1313B series of downconverters can be configured with an optional integral power meter option function compatible with the Agilent 8480 power sensor series.



The addition of multiple IF outputs adds flexibility for an optimum combination of sampling and digitizing bandwidths for any measurement combination.



With Phase Matrix's suite of personal computer software tools, utilizing the LabView™ Analysis Suite and commercially available digitizers, the designer can leverage the increasing power associated with consumer based technologies.



1313B SPECIFICATIONS

Input Specifications

RF Input Frequency Range	1 MHz to 26.5 GHz (OPT-01) (useable to 100 kHz)
RF Input Compression Point (@0dB Atten.)	-30dBm min.
RF Input Level, continuous, without damage	+30dBm min. (@10dB Atten)
RF Input Return Loss (50 Ohms)	0.1 - 1 MHz <-10dB 1 MHz - 12 GHz <-14dB 12.5 GHz - 18 GHz <-10dB 18 GHz - 26.5 GHz <-8dB
Noise Figure (no preselection)	<8.5 GHz, 20dB max. <26.5 GHz, 30dB max.
Noise Figure (preselection)	<8.5 GHz, 28dB max. <26.5 GHz, 38dB max.
RF Input IP3 (@0dB Atten.)	-10dBm min (1.0 MHz test signal spacing)
Spurious Single Tone Signals @ Input (LO leakage at input)	-90 dBm max. (preselection) -50 dBm max. (no preselection)
Input Step Attenuator	0 to 70 dB in 10dB Steps

Suggested Step Atten. Setting for linear operation. ^{Note1}

RF Input	Input Step Atten. Setting
+30dBm	70dB
+20dBm	60dB
+10dBm	50dB
0dBm	40dB
-10dBm	30dB
-20dBm	20dB
-30dBm	10dB
-40dBm	0dB

Note 1: Unit can be operated at higher input levels by adjusting the IF attenuation accordingly. However, the -2dBm(500mVp-p) IF output should always be maintained for linear response.

Output Specifications

RF to IF Gain (0dB Atten.)	40dB typical										
IF Output Levels (0dB Step Atten)	<table> <thead> <tr> <th>RF Input</th> <th>IF Output (50 Ohms) minimum</th> </tr> </thead> <tbody> <tr> <td>-40dBm</td> <td>-2dBm (500mVp-p)</td> </tr> <tr> <td>-60dBm</td> <td>-22dBm (50mVp-p)</td> </tr> <tr> <td>-80dBm</td> <td>-42dBm (5mVp-p)</td> </tr> <tr> <td>-100dBm</td> <td>-62dBm (0.5mVp-p)</td> </tr> </tbody> </table>	RF Input	IF Output (50 Ohms) minimum	-40dBm	-2dBm (500mVp-p)	-60dBm	-22dBm (50mVp-p)	-80dBm	-42dBm (5mVp-p)	-100dBm	-62dBm (0.5mVp-p)
RF Input	IF Output (50 Ohms) minimum										
-40dBm	-2dBm (500mVp-p)										
-60dBm	-22dBm (50mVp-p)										
-80dBm	-42dBm (5mVp-p)										
-100dBm	-62dBm (0.5mVp-p)										
Output IF Center Frequency	250 MHz (settable via LO1)										
Output IF Frequency BW	350 MHz minimum (1dB BW)										
Output IF Level Variation	±1 dB max.										
Output IF Second Harmonic Distortion	Main IF (250 MHz) >60dB Aux IF (21.4 MHz) >80dB										
LO2 Leakage@Main IF (250 MHz)	+10dBc max. (RF In <80 MHz)										
Output Level Variation (any 50 MHz IF segment)	0.7 dB max.										
IF Gain Control	63 dB in 0.5 dB steps										
Spurious Single Tone Signals @ IF	-80dBm max. (residual spurs, input terminated, measured with SA)										

Local Oscillator Specifications

Ext LO1	3-9 GHz, +10 dBm min.
Ext LO2	3.25 GHz (factory set), 0 dBm min.
Ext LO3 (OPT-03)	228 MHz (factory set), 0 dBm min.

Downconverter Available Options

OPT01	Low Band Input Frequency Range	1 MHz to 2.9 GHz (useable to 100 kHz)
	Low Band Input BW (Instantaneous)	40 MHz (1dB) min.
OPT02	YIG Preselector Frequency Range	2.7-26.5GHz
	3dB BW	40MHz min., 120MHz max
	Topology	4 pole, nominal 24dB/oct
	Tuning speed	< 5mS @ 50MHz step
	Tuning accuracy	± 35MHz uncorrected
OPT03	Aux IF Output Center Frequency	21.4 MHz
	Aux IF Frequency BW (0.5 dB)	50kHz / 500kHz / 2MHz / 8MHz (user selectable)
	Aux. IF level	same as main IF
	Aux. IF Filter - Filter Level Variation	1.0 dB max.
	Topology	5 Pole min.

1313B SPECIFICATIONS

Downconverter Options (Continued)

OPT04	Video detected output	
	Input frequency bandwidth	50 MHz min
	Output bandwidth (no preselection)	10 nSec. risetime minimum at >250 MHz IF input to detector
	Output IF level	Det. Sens. to 0dBm
	D/C Output level @ -2dBm IF out	1Vmin. polarity positive
	D/C Output level error over temperature	1 dB maximum (0 to +55° C)

OPT10 Power Meter Specification

The power meter option adds National Institute of Standards and Technology (NIST) traceable power measurement capability to the Downconverter module. The option contains all the necessary interfaces as well as reference standard for interfacing to the Agilent² 8480 series of power sensors. The power and frequency ranges of the power measurement option are dependent on the power sensor model used.

Parameter	Specification
Frequency Range	100 kHz to 50 GHz, sensor dependent (refer to Agilent sensor specification)
Power Range	-70 to +44 dBm
Power Sensors Supported	Agilent Models 8487A, 8485A, 8482A, 8481D, 8481A, 8481B, 8482B, 8481H, 8482H, 8485D, 8487D
Resolution	0.01 dB in log mode, 0.1% of full scale in linear mode
Data units	
Absolute	dBm or Watts
Relative	dB or %
Accuracy	
Instrumentation	±0.02dB or ±0.5%. add power sensor linearity specification to overall system accuracy
Zero Set	Sensor dependent (refer to Agilent sensor specification)
Power Reference Output	1.00mW, factory set to ±0.7%, traceable to NIST
Power Reference Accuracy	±1.2% worst case (±0.9% RSS) for one year
Power Reference Frequency	50 MHz nom.
Connector	N-Type female

Note 2: Agilent is a trademark of the Agilent Corporation.

General Specification

Temperature Range	
Operating	0° to +55° C
Non-Operating	-40° to +70° C
Relative Humidity	0 - 90%, Non Condensing
EMI	
Below 1 GHz	Complies with VXIbus Rev. 1.3/1.4
Above 1 GHz	Complies with RE02 of MIL-STD-461C
Weight	6 lbs./2.7kg. max. (all options installed)

VXIbus Specification

Module Size:	1 C-Size slot
Device type:	Register-Based (A24)
Protocol:	Not Used
Local Bus:	Not Used
ECLTRG	Not Used
TTLTRG	Not Used
CLK10 Utilization	Not Used
Cooling:	1mm H ₂ O @ 5 liters / second for 15° C rise in temperature.
Warm-up Time:	15 Min. max. @ +25° C ambient temperature.
Power Dissipation:	55W max., 40W typ. (all options installed)

Power Requirements

	Power	I _{peak} (Amperes)						
		+5V	+12V	+24V	-2V	-5.2V	-12V	-24V
1313B	<55 Watts	0.8	1.5	0.5	N/A	0.1	N/A	1.2

*Typical, means approximately 2/3 of all units will meet these characteristics. Specifications are subject to change without notice.

ORDERING INFORMATION

MODEL 1313B 1 MHz - 26.5 GHz VXIbus Microwave Downconverter

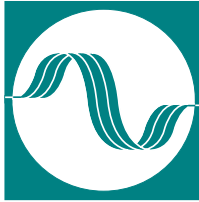
Options M1313B-OPT01 Low Band Frequency Extention 1 MHz - 2.9 GHz (useable to 100kHz)
M1313B-OPT02 YIG Tuned Preselector
M1313B-OPT03 Auxillary IF
M1313B-OPT04 Video Output
M1313B-OPT10 Power Meter

Related Products Model 20309 VXIbus Local Oscillator
Model 1140B Synthesized Microwave Signal Source

Warranty Phase Matrix, Inc. has a proven commitment to quality and reliability in instrumentation. This commitment is demonstrated in all VXIbus products with a full 1 year standard warranty. Parts, Labor, even shipping are all included at no cost to you.

During the life of electronic equipment, components may fail. When they do, you need the fastest, easiest, and least expensive repair possible. To meet this need, Phase Matrix offers a variety of services designed to minimize equipment down time. Please contact Phase Matrix's Customer Service Department for details. Quality, reliability and support, all designed to minimize your cost of ownership.

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Instruments You Can Count On



VXIbus Microwave Downconverter

**High-Performance Downconversion
For Analysis of Microwave Signals**

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