

Keysight Basic Instruments

May 2021



Test, Analyze, and Share Results Remotely With the New Smart Bench Essentials Series



Four Tips to Get an Edge Over the Competition

Small-scale manufacturers and developers do not always have the luxury of purchasing state-of-the-art, high-end, and high-performance manufacturing and test equipment.

The following are four tips to keep in mind when purchasing your manufacturing and test equipment:

TIP 1

Find a vendor that provides a complete portfolio of manufacturing and test equipment.

As much as possible, avoid mix-and-match solutions from various vendors.

Using solutions from different vendors can lead to long-term compatibility issues and challenges in managing your assets and scaling up or upgrading your equipment. A complete solution portfolio from the same vendor ensures an easy transition to higher-performance test equipment.

TIP 2

Look for equipment with intuitive interfaces so engineers can quickly get up to speed with the instruments.

Some vendors have equipment with smart test connectivity and a software test solution that enables you to graphically and intuitively configure and integrate multiple instruments. You can execute test sequences from a single computer remotely, then store data or export it into common readable formats for post-analysis work. When coupled with advanced analytics and data visualization, this setup gives engineers insights needed to accelerate innovation. They can complete product development work seamlessly and productively.

TIP 3

Purchase a software solution that lets you manage your manufacturing or research and development (R&D) lab assets to track maintenance and ensure that you fully utilize equipment and minimize unplanned downtime.

Some software solutions can perform mass updates of firmware and software to improve lab productivity automatically.

TIP 4

Address workforce transformation by adding a software solution that provides remote lab accessibility.

Software is available to remotely perform product design, R&D, testing, manufacturing, production tracking, and diagnostic troubleshooting. Many companies rely on software to support a remote workforce by leveraging the cloud and providing advanced computation abilities.

Figure 1 shows the recently launched Keysight Smart Bench Essentials Series. It harnesses the power of four unique test instruments through one powerful graphical interface with integrated data management and analysis.



Figure 1. Keysight Smart Bench Essentials Series test instruments and PathWave BenchVue application software

The Smart Bench Essentials Series comes with Keysight PathWave BenchVue application software so you can quickly configure your instruments and operate all of them from the same PC.

Optional Keysight PathWave Remote Access Lab enables engineers to remotely access their lab setups through the PathWave cloud and perform lab work through a web browser. The optional Keysight PathWave Lab Manager software enables you to effectively manage lab assets to enhance your lab experience and productivity. (See Figure 2.)



Figure 2. PathWave Lab Manager software for lab asset management



What's New



KeysightCare 24/7 Technical Support



EL30000

The EL30000A programmable DC electronic loads provide superior performance in a compact bench form factor with advanced features of a scope view, data logging, and sequencing to measure, capture, and quickly display results.



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B2900

Multiple improvements in the B2900 precision instrument family help measurement performance with broad application coverage from R&D and education to industrial development, production test, and automated manufacturing.



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Signal Generators X-Series signal generators

The X-Series creates signals capable of testing your very best devices. From the pure and precise MXG to the cost-effective EXG and general-purpose CXG, the X-Series helps you generate true performance.

	MXG-ANALOG	EXG-ANALOG	CXG-VECTOR	
Model number N5181B		N5171B	N5166B	
Frequency range	9 kHz to 6 GHz	9 kHz to 6 GHz	9 kHz to 6 GHz	
Max. output power	+24 dBm	+21 dBm	+18 dBm	
Frequency switching (list mode)	800 µs	800 µs	5 ms	
Level accuracy	±0.6 dB	±0.6 dB	±0.6 dB	
SSB phase noise (1 GHz, 20 kHz offset)	-146 dBc/Hz	-122 dBc/Hz	-119 dBc/Hz	
Harmonics (at 1 GHz)	-35 dBc	-35 dBc	-35 dBc	
Analog modulation AM, FM, PM, a pulse modulati		AM, FM, PM, and pulse modulation	AM, FM, PM, and pulse modulation	
Digital modulation	N/A	N/A	120 MHz bandwidth	



- X-Series RF Signal Generators Technical Overview
- X-Series Signal Generators Website
- PathWave Signal Generation Software Website

PathWave	signal generation sof	tware available for CXG N5166B		
	Model	Communications standard		
	N7631C	5G New Radio (NR)		
	N7626C	V2X		
	N7625C	LTE/LTE-A TDD		
Cellular	N7624C	LTE/LTE-A FDD		
communications	N7612C	TD-SCDMA/HSPA		
	N7602C	GSM/EDGE/Evo		
	N7601C	cdma2000 [®] /1xEV-DO		
	N7600C	W-CDMA/HSPA+		
	N7617C	WLAN 802.11 a/b/g/j/p/n/ac/ah/af/ax		
NA72 - 1	N7610C	loT (Wi-SUN, ZigBee, Z-Wave, LoRa, and UWB)		
Wireless connectivity	N7607C	DFS Radar Profiles		
CONTECTIVITY	N7606C	Bluetooth®(BR, EDR, 4.0/4.2, BT5)		
	N7609C	Global navigation satellite systems (GNSS)		
Coporal purposo	N7608C	Custom modulation		
General purpose	N7622C	IQ toolkit		

PathWave signal generation software

To simplify the creation of standards-based or customized signals, equip yourself with PathWave signal generation software. It's the fast, flexible way to realize application-specific signals with your X-Series vector signal generator. In simulation, development and production test, PathWave signal generation accelerates waveform creation and lets you focus on your device.

Signal Analyzers N9322C Basic Spectrum Analyzer (BSA)*

The N9322C basic spectrum analyzer defines value-priced, general-purpose instruments for the 9 kHz to 7 GHz frequency range. You can rely on the N9322C for proven testing efficiency, usability, and the flexibility to adapt to new requirements.

- Uncover key insights through fast performance from 9 kHz to 7 GHz with -152 dBm DANL at 1 GHz and ±0.6 dB overall amplitude accuracy.
- Achieve straightforward and efficient operation with marker demodulation, one-button optimization, and user-definable soft keys.
- Implement up to 20 predefined measurements automatically and reduce test setup time by 95% with the task planner feature.
- Enjoy industry-standard SCPI language support and USB and LAN connectivity.
- Get -90 dBc/Hz phase noise at 1 GHz (10 kHz offset) and a maximum analysis bandwidth of 1 MHz.



Signal Analyzers N9320B RF Spectrum Analyzer (BSA)*

In electronics manufacturing, R&D, or a university lab, you need measurement details about your products and designs. The Keysight N9320B RF spectrum analyzer simplifies common measurement tasks and quickly provides the answers you need.

- Cover frequencies from 9 kHz to 3 GHz with fast RF spectrum analysis.
- Employ efficient AM / FM, ASK / FSK demodulation analysis suites for Internet of Things transmitter characterization.
- Measure stimulus-response for component characterization using the 3 GHz tracking generator.
- Achieve overall amplitude accuracy of 0.5 dB.
- Enjoy automation and communication interface with industry-standard SCPI language support and USB / GPIB / LAN connectivity choices.
- Get -145 dBm DANL at 1 GHz, -90 dBc/Hz phase noise at 1 GHz (10 kHz offset), and a maximum analysis bandwidth of 1 MHz.



N9320B Data SheetN9320B Website

* From selected distributors only

Oscilloscopes InfiniiVision oscilloscopes

- Up to 1,000,000 waveforms/sec update rate
- MegaZoom IV responsive, uncompromised smart memory
- Multiple instrument functionality
- Upgradable: bandwidth, MSO, serial analysis, built-in WaveGen function generator

- www.keysight.com/find/infiniivision
- PathWave BenchVue software included with instrument
- NEW Keysight University Course: Oscilloscope Triggering Fundamentals





Oscilloscopes InfiniiVision oscilloscopes (continued)

MODEL	DESCRIPTION	BANDWIDTH	CHANNELS	Sample Rate	MEMORY DEPTH	Standard Warranty	Calibration Period	BUILT-IN INSTRUMENTS
1000 X-Series ∷≡ 1000X Data Sheet ♥Videos	Basic R&D bench – 200,000 wfms/s update rate – 7-inch display – protocol analysis	50 MHz to 200 MHz	2, 4	Up to 2 GSa/s	Up to 2 Mpts and segmented memory standard	3 years	5 years	DVM, frequency counter, frequency response analyzer, 20 MHz FG
2000 X-Series	Basic R&D bench – 200,000 wfms/s update rate – 8.5-inch display – serial bus options	70 MHz to 200 MHz	2, 2+8, 4, 4+8	Up to 2 GSa/s	Up to 1 Mpts and segmented memory standard	5 years	2 years	20 MHz FG, 5-digit counter*
3000T X-Series ≅ 3000X Data Sheet ♥Videos	Everything the 2000X has plus - 1,000,000 wfms/s update rate - advanced math and power analysis - capacitive touch screen	100 MHz to 1 GHz		Up to			3 years	20 MHz AWG, 8-digit counter
4000 X-Series ≅ 4000X Data Sheet ♥Videos	Everything the 3000T has plus - 12.1-inch capacitive touch screen - FFT, USB 2.0 pre-compliance - up to four active probes	200 MHz to 1.5 GHz	2, 2+16, 4, 4+16	5 GSa/s	4 Mpts and segmented memory standard	3 years		Dual 20 MHz AWG, 5-digit counter and frequency response analyzer*
6000 X-Series ∷≡ 6000X Data Sheet ●Videos	 Everything the 4000X has plus 450,000 wfms/s update rate multi-touch display Voice control jitter and real-time eye diagram analysis 	1 GHz to 6 GHz		Up to 20 GSa/s			2 years	Dual 20 MHz AWG, 10-digit counter
Infiniium S-Series ∷ Data Sheet ♥ Videos	 R&D Analysis Bench 10-bit ADC for highest signal integrity deep analysis toolkit for power, serial data, jitter support for >100 probes Up to 40 analog channels with MultiScope app 	500 MHz to 8 GHz	4, 4+16	Up to 20 GSa/s	Up to 800 Mpts	3 years	1 year	Digital channels, digital signal analysis (DSA)
₩₩ Infiniium EXR-Series ₩ Data Sheet	Basic R&D Bench - >200,000 wfm/s update rate - 15.6" touchscreen - 25% lower noise than S-Series - new Fault Hunter feature - MultiScope app (coming soon)	500 MHz to 2.5 GHz	4, 4 + 16, 8, 8 + 16	Up to 16 GSa/s	Up to 3.2 Gpts	3 years, KeysightCare technical support included	1 year	10-digit counter, DVM, logic and protocol analyzers

* All X-Series models have built-in protocol analyzer and 3-digit DVM.



NEW Added	value software packag	es - now get more functionality	Ι.				
	AUTOMOBILE	AEROSPACE & DEFENSE	EMBEDDED	POWER		NFC	ULTIMATE BUNDLE
1000X	Standard (DSOX)	NA	Standard	NA	NA	NA	NA
2000X	D2000AUTB	NA	D2000GENB	NA	NA	NA	D2000BDLB
3000X/T	D3000AUTB	D3000AERB	D3000GENB	D3000PWRB	D3000USBB	D3000NFCB	D3000BDLB
4000X	D4000AUTB	D4000AERB	D4000GENB	D4000PWRB	D4000USBB	D4000NFCB	D4000BDLB
6000X	D6000AUTB	D6000AERB	D6000GENB	D6000PWRB	D6000USBB	NA	D6000BDLB
P9240A	P9240AUTC	P9240AERC	P9240GENC	NA	NA	P9240NFCC	P9240BDLC
M9240A	M9240AUTB	M9240AERB	M9240GENB	M9240PWRB	NA	M9240NFCB	M9240BDLB
						ftware is downloadat ht.com/find/software	

Data Acquisition / Switch Units DAQ970A and DAQ973A data acquisition system

Get the next-generation data acquisition (DAQ) system with a three-slot mainframe and your choice of nine plug-in modules. Interface with the DAQ using Keysight BenchVue DAQ software, the intuitive graphical front panel with task-oriented, self-guiding menus, or a web browser.

DAQ970A/DAQ973A Data Sheet

www.keysight.com/find/DAQ970A www.keysight.com/find/DAQ973A

PathWave BenchVue software included with instrument

- advanced 61/2 digit internal DMM with improved accuracy and faster measurement speed (50,000 readings/sec)
- ability to measure very low current ranges (1 μA DC and 100 μA AC) and higher resistance range (1000 MΩ)
- new auto-calibration that compensates for internal drifts caused by time and temperature changes
- 3497XA compatible, program and configuration
- LAN and USB for easy connectivity to your PC (DAQ973A comes with additional GPIB)

PLUS

- all modules updated with improved switching speeds and accuracies
- DAQM900A solid state multiplexer with scan rate speed of up to 450 channels/sec
- new DAQM909A 4-channel simultaneous sampling digitizer module with a sampling rate of up to 800 kSa/sec

DESCRIPTION	DAQ970A/73A MODULES	KEY SPECIFICATIONS
20-channel solid-state multiplexer	DAQM900A	Up to 450 ch/s
20-channel multiplexer + 2 current channels	DAQM901A	Armature 2/4 wire, 80 ch/s with DAQ970A/DAQ973A, up to 300 V, 1 A
16-channel multiplexer	DAQM902A	Reed 2/4 wire, 250 ch/s, up to 300 V, 50 mA
20-channel actuator/GP switch	DAQM903A	SPDT/Form C, 120 ch/s, up to 300 V, 1 A
4 x 8 matrix	DAQM904A	Armature 2-wire, 120 ch/s, up to 300 V, 1 A
2 GHz, dual 4-channel, RF mux, 50Ω	DAQM905A	Common low (not terminated), 60 ch/s up to 42 V, 0.7 A
Multifunction module	DAQM907A	Two 8-bit digital I/O ports, up to 42 V, 400 mA 26-bit 100 kHz event counter, up to 42 V Two 16-bit analog outputs, up to ±12 V, 10 mA
40-channel single-ended multiplexer	DAQM908A	Common low (no 4-wire meas.) 60 ch/s, up to 300 V, 1 A
4 channel simultaneous sampling digitizer	DAQM909A	Differential inputs, up to 800 kSa/s sampling rate, 24-bit resolution



DC Power Supplies N6700 modular power system



N6700: Ideal DC power supply solution for automated test systems

- small 1U mainframe (400, 600, 1200 W); holds up to four output modules per mainframe
- over 30 programmable DC modules Each offers unique capabilities, performance, voltage, and current combinations
- DC electronic load modules, 100 and 200 W, allow current to be sourced and sinked in the same mainframe

N6705C: Deep insight into DUT power consumption — without assembling a complex test system

- integrated benchtop unit holds up to four N6700 Series modules (600 W total)
- DMM, scope, arb, and data logger features
- characterize and improve battery run time with a source/measure unit (SMU) and BV9200B analysis software
- N6705C Data Sheet

N6700C, N6701C, and N6702C Data Sheet

- www.keysight.com/find/n6700
- PathWave BenchVue software included with instrument

EL30000 Series bench DC electronic loads



The EL30000 Series bench DC electronic loads provide superior performance in compact bench form factor.

- Test up to 600 W, 1 or 2 inputs
- Operate in constant current (CC), constant voltage (CV), constant resistance (CR), or constant power (CP) modes
- Make accurate measurements with excellent programming/ feedback accuracy
- Perform static and dynamic tests
- View measurements on a 4.3-inch LCD color display
- Transfer data via USB drive, LAN, USB, or GPIB

EL30000 Series Bench DC Electronic Loads Data Sheet

- www.keysight.com/find/EL30000
- 🕮 Electronic Load Fundamentals

MODEL	NUMBER OF INPUTS	INPUT POWER	DC INPUT VOLTAGE	DC INPUT CURRENT
EL34143A	1	350 W	150 V	60 A
EL34243A	2	600 W	150 V	60 A (120 A with parallel inputs)

Need more power? See the E36200 Series 200 and 400 W autoranging power supplies.

DC Power Supplies E36300 Series triple-output DC power supplies



- large display with voltages and currents for all three outputs
- programming / readback accuracy as low as 0.03%
- low output ripple and noise less than 2 mVpp/350 uVrms
- data logging plus output sequencing and coupling
- front and rear output terminals
- color-coded outputs and individual knobs for voltage and current
- LAN (LXI Core), USB, and GPIB (optional)



www.keysight.com/find/e36300

PathWave BenchVue software included with instrument

Keysight University Course: Bench Power Supply Basics

MODEL	E36311A				E36312A			E36313A		
	Economy model			Most popular			Twice the current			
Power		80 W		80 W			160 W			
Channels	1	2	3	1	2	3	1	2	3	
DC output	0 to 6 V	0 to +25 V	0 to –25 V	0 to 6 V	0 to 25 V	0 to 25 V	0 to 6 V	0 to 25 V	0 to 25 V	
Rating (0 to 40 °C)	0 to 5 A	0 to 1 A	0 to 1 A	0 to 5 A	0 to 1 A	0 to 1 A	0 to 10 A	0 to 2 A	0 to 2 A	

B2900 precision instrument family





PathWave BenchVue Software

B2900B Series precision SMU

- minimum source resolution: 10 pA /1 $\mu\text{V};$ minimum measurement resolution: 1 pA/100 nV
- maximum output: 21 V, 1.5 A DC
- arbitrary waveform generation and digitizing capabilities from 200 µs interval
- integrated 4-quadrant source and measurement capabilities
- 4.3-inch color display supports graphical and numerical view modes
- free application software to facilitate PC-based instrument control
- high throughput and SCPI command supporting conventional SMU command set

B2960B Series low-noise power source

- 6.5 digit 1-channel, wide and bipolar voltage / current sourcing (100 nV - 210 V / 10 fA - 10.5 A, 31.8 W)
- best-in-class noise performance (10 $\mu Vrms,$ 1nVrms / ${\sc /}{Hz}$) with external filter
- precision arbitrary waveform capability with support for seven built-in functions and user-defined waveforms (1 MHz – 10 kHz)
- 4.3-inch color display supports both graphical and numerical view modes
- free application software to facilitate PC-based instrument control
- high throughput and SCPI command supporting conventional SMU command set

Waveform Generators

33500B and 33600A Series waveform generators

- Generate Trueform arbitrary waveforms with high fidelity and less jitter and harmonic distortion
- Access ease-of-use features, such as modulation, sweep, burst, dual-channel coupling, and IQ baseband signal player
- 33500B and 33600A Data Sheet
- www.keysight.com/find/function-generators
- PathWave BenchVue software included with instrument





					ARBITRARY WAVEFORMS			S
MODEL	DESCRIPTION	CHANNELS	FREQUENCY RANGE	PULSE	STD/OPT ARB	# BITS	SAMPLE RATE	MEMORY/CHANNEL
33509B 33510B		1 2	20 MHz	20 MHz	Optional		160 MSa/s	
33511B 33512B	Exclusive True <i>form</i> waveform	1 2	20 MINZ	20 IVIAZ	Standard	16	100 103875	1 M Standard,
33519B 35520B	technology with < 40 ps jitter and < 0.04% THD.	1 2	00 MU-	20 MU-	Optional	- 10	250 MSa/s	16 M Optional
33521B 33522B		1 2	30 MHz	30 MHz	Standard			
33611A 33612A	Exclusive True <i>form</i> waveform technology at higher frequency	1 2	80 MHz	80 MHz	Stondard	14	660 MSa/s	4 M Standard,
33621A 33622A	ranges with < 1 ps jitter < 0.03% THD.	1 ps jitter 1 Standard	Standard	14	1 GSa/s	64 M Optional		

Digital Multimeters Truevolt digital multimeters

- 34460A, 34461A, 34465A, 34470A Data Sheet
- www.keysight.com/find/truevolt
- PathWave BenchVue software included with instrument
- 61/2- and 71/2-digit performance
- graphical capabilities such as trend and histogram charts
- measure very low current, 1 µA range with pA resolution, allowing measurements on very low power devices
- auto-calibration to compensate for temperature drift
- basic measurements: DCV, ACV, DCI, ACI, 2- and 4-wire resistance, frequency, period, continuity, diode, temperature, capacitance





MODEL	DESCRIPTION	DIGITS OF RESOLUTION	MAX READING RATE AT 4½ DIGITS (RDGS/S)	BUILT-IN PC INTERFACES	
34460A	New Industry standard. Display DMM results in ways you never		300	USB; optional GPIB, LAN	
34461A			1,000	USB, LAN; optional GPIB	
34465A	More measurements, higher speed, better accuracy, and more memory	6½	50.000	USB, LAN; optional GPIB	
34470A	than the 34461A. Comes with digitizer and advanced triggering capability.	7½	50,000	USD, LAN, UPUUIIAI GPID	

Vector Network Analysis E5063A ENA vector network analyzer*

- various frequency options to suit your test needs and budget, upgradable at any time
- PCB manufacturing test capability with Option 011
- support for six languages via softkey and the embedded help manual in English / Simplified Chinese
- supports all Keysight calibration kits, including the N755xA economy ECal module

ENA SERIES E5063A HIGHLIGHTS
50 kHz to 500 M, 1.5, 3, 4.5, 6.5, 8.5, 14 or 18 GHz
2-port 50 Ω S-parameter test set
117 dB (spec.), 122 dB (typ.)
0.005 dBrms (spec.), 0.002 dBrms (typ.)
-20 to 0 dBm
Fixture simulator, Time domain analysis/Test Wizard option ¹ , Wireless power transfer analysis ¹ , and Materials measurement ²
LAN, USB (front 2, rear 4), USBTMC, GPIB ² , Handler I/O ²

1. Optional capability.

2. External software (Keysight N1500A Material Measurement Suite) required.

Keysight Streamline Series | USB Instruments Vector network analyzers and oscilloscopes

- multiple new compact, faceless, USB instruments
- common technology and measurement capabilities as benchtop and modular instruments
- perfect for component and subassembly test, R&D labs, and light manufacturing
- small footprint in size, weight, and power
- perfect for a rack at 1U high
- www.keysight.com/find/usb-vna
- www.keysight.com/find/usb-scope





* From selected distributors only



Compact form. Zero compromise.

	VECTOR NETWORK ANALYZER (VNA)*	OSCILLOSCOPE				
Models:	P9370A, P9371A, P9372A, P9373A, P9374A, P9375A	P9241A, P9242A, P9243A				
Bandwidth:	300 kHz to 26.5 GHz	200 MHz, 500 MHz, and 1 GHz				
Capabilities:	Full 2-port	2 analog channels				
	Ability to extend the	5 GSa/s				
	number of ports	1,000,000 wfms/s				
	Same calibration and metrology as all trusted	Zone triggering				
	Keysight VNAs	6-in-1 instrument: arbitrary waveform generator, frequency response analyzer, digital voltmeter, counter, protocol analyzer				

* From selected distributors only

PathWave BenchVue Software PC software to configure a wide range of instrument controls and measurements

- Easily connect instruments, record results, and visualize measurements.
- Save time with automated test sequences.
- Analyze and export data in multiple formats.

Control Multiple Instruments

Easily connect, record results, and visualize measurements across multiple instruments simultaneously, without the need for programming.

Access Integrated Apps

Choose from a wide array of apps with powerful features to simplify your test workflow — from measurement setups and automation to exporting data and analyzing in-depth results — in one software application. The apps support hundreds of Keysight instruments and are continually expanding.

Automate Test Sequences

Rapidly build custom test sequences with an intuitive interface to quickly create tests that used to require days of traditional programming. The integrated Test Flow app makes it simple to drag and drop controls or measurements into a sequence for rapid test development.

Analyze and Export Data

Get easy access to extensive data, screen captures, trace, and measurement logging capabilities. Export your data in multiple formats in just a few clicks.

Instrument Compatibility

- data acquisition units, digital multimeters, and electronic loads
- FieldFox handheld analyzers, function generators, and USB modular products
- universal counters, oscilloscopes, and photovoltaic array simulators
- power analyzers, power meters and power sensors, and power supplies
- signal generators, spectrum analyzers, and network analyzers



ΡΛΤΗ₩ΑνΈ

PathWave BenchVue Technical Overview

Download a free 30-day trial



Special Offers

Here's your chance to claim a free memory upgrade — up to US\$600 value — with your purchase of select Keysight digital multimeters and function / waveform generators.

LEARN MORE

KeysightCare Expert Technical Support

Get two-business-day committed technical response with KeysightCare Technical Support, available starting December 1, 2020, with Keysight products purchased through your Keysight distribution partner. You will receive three years of KeysightCare Technical Support in addition to your three-year warranty.

Mitigate risk and avoid project delays with technical support coverage. Get personalized technical support with KeysightCare Technical Support. Get 24/7 access to the KeysightCare support portal — a prolific knowledge center and self-service web portal. The knowledge center contains thousands of programming examples and detailed technical articles based on decades of R&D and test experience. The self-service web portal enables you to log support requests and track your cases for faster response.



Now Available for Distribution Products!



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