Keysight Technologies
M9502A and M9505A
2 and 5-Slot AXIe Chassis

Data Sheet

KEYSIGHT TECHNOLOGIES

Product description

The Keysight Technologies, Inc. M9502A and M9505A AXIe chassis are fully compatible with the AXIe 1.0 specification. They provide 2 or 5 slots for AXIe instrument modules, and have an embedded system module that does not take up an instrument slot. The embedded system module (ESM) provides Gigabit LAN and Gen 2 x8 PCIe® interfaces for connecting the chassis to an external controller. To minimize rack space, the instrument module slots are arranged horizontally. In addition, the chassis are designed to be easily maintained. Both the power supply and fan tray can be removed with modules installed while the chassis remains in the rack.

Applications

- Aerospace and defense
- Computation
- Communications
- Electronics test
- Semiconductor testing
- High-energy physics

Features

- AXIe 1.0 compliant
- Embedded system module with Gen 2 PCIe x8 and Gigabit LAN interfaces for connecting to host computer
- Keysight-exclusive, built-in inter-chassis synchronization for multi-chassis systems
- 62 differential local bus lines provide very large data path between adjacent modules
- High power with 200W cooling per slot
- Front-removable fan tray

Customer values

- AXIe chassis provide a high-performance platform to compliment PXI-based systems
- The compact, 2-slot chassis is ideal for transportable applications, but is also rack-mountable
- The 5-slot chassis provides a cost-effective solution when more AXIe slots are required
- The embedded AXIe system module and horizontal module placement save rack space, requiring only 2U or 4U, depending on model
- With the innovative cooling design, no additional rack space is required to meet cooling specifications

Hardware platform

Compliance

The M9502A and M9505A chassis are fully compliant with the AXIe 1.0 specification. In addition, the chassis complies with AdvancedTCA (ATCA) PICMG 3.0 R2.0 specifications, and is electrically compatible with standard ATCA modules.

An additional half-height slot is built into the chassis and reserved for the embedded system module. This slot is not compatible with AXIe instrument modules or embedded computers. Embedded controllers must be installed in one of the instrument module slots.

Backplane configuration

The AXIe backplane in the Keysight M9502A and M9505A chassis include all of the following AXIe backplane lines:

- Timing and triggering signals including: 100 MHz clock, 100 MHz PCIe clock (FCLK), point-to-point star trigger from ESM (SYNC), bi-directional point-to-point star trigger (STRIG), and 12 signal parallel trigger bus (TRIG)
- Distributed PCIe Gen 2 data fabric from ESM (x4 to each slot) plus a secondary PCIe data fatbric
- Distributed gigabit Ethernet LAN to each slot
- 62-pair local bus for adjacent module signaling or data transfer (AXIe only requires 18 pairs)
- DC power rail (normally 45-53 VDC)
- Intelligent Platform Management Bus (IPMB) for chassis control, including module power-up

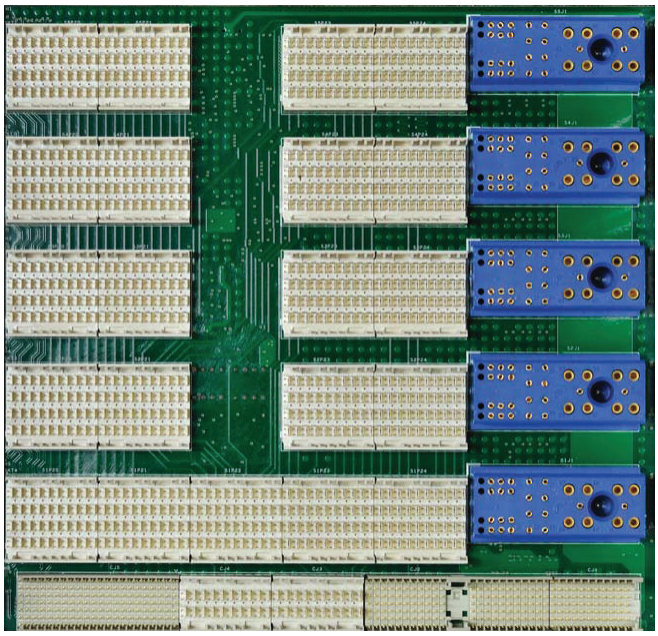


Figure 1. 5-slot AXIe backplane

Hardware platform (continued)

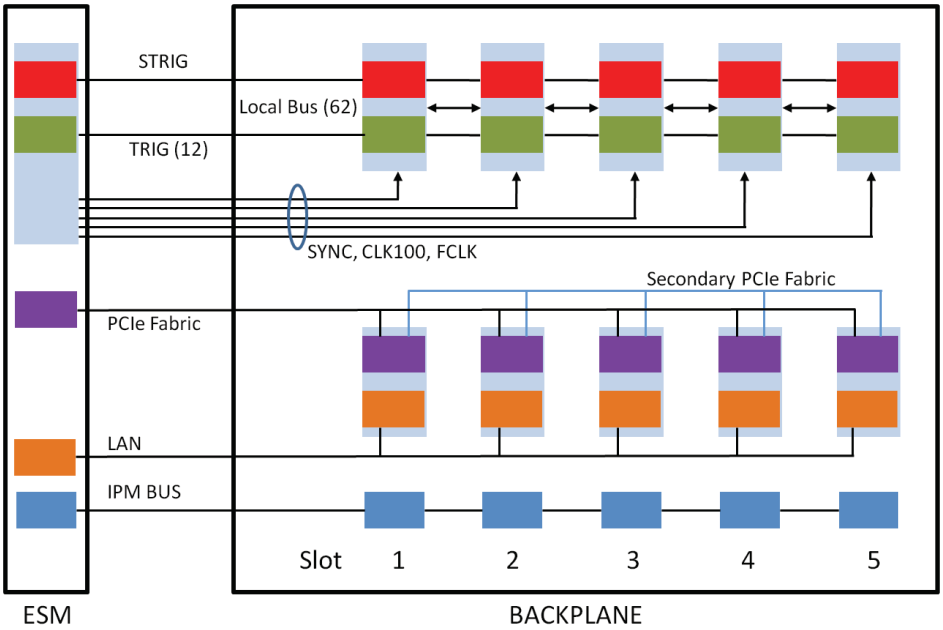
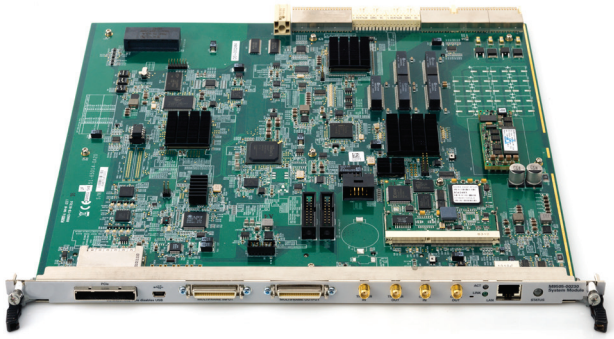


Figure 2. M9505A backplane block diagram

Embedded system module (ESM)



Both the M9502A and M9505A chassis contain an embedded system module that does not take up an instrument slot. This module performs the chassis management functions contained in the AXIe specification, including:

- Managing trigger and clock busses
- Managing clocks, including internal or external reference sources
- Gigabit LAN switching with a front panel RJ45 LAN connection (see module documentation to determine if it is supported for LAN communications)
- AXIe Fabric 1 switching (Gen 2 x4 lanes to each module slot)
- Monitoring the health of the chassis subsystems and modules
- Controlling the chassis cooling fans, and managing the chassis power-up sequence

In addition to the required functions, the system module also provides:

- Ability to synchronize multiple chassis with trigger and clocking signals (MultiFrame In/Out connectors)
- SMA connectors for external clock in/out and trigger in/out
- Gen 2 x8 PCIe cable connector for connecting the chassis to an external computer
- USB 2.0 option provides USB connectivity for some AXIe modules. Only supported on a limited set of Keysight modules. See module documentation to determine if it supported for USB control.

Hardware platform (continued)

Innovative cooling

The AXIe chassis utilize a cooling design that does not require additional rack space to cool the modules. This allows the chassis to fit into 2U or 4U of rack space.

The cooling design uses auto-speed fans to pull in cool air. Air flows from right-to-left within the chassis. The ESM provides intelligent control of the power supplies and fans and ensures there is sufficient power/cooling for each module.

Lower maintenance costs

The chassis were designed to reduce maintenance costs. The innovative air-flow design does not require air filters to replace. In addition, the power supply and fans can be removed while the chassis is mounted in a rack, allowing the chassis to be serviced while keeping DUT cabling in place.

Software platform

Drivers

The M9502A and M9505A chassis come complete with IVI-COM, IVI-C, and LabVIEW drivers. Windows XP, Windows Vista, and Windows 7 operating systems are supported and applications can be completed using many different software tools including LabVEW, LabWindows/CVI, MATLAB, VEE, VisualStudio.NET (C/C++, C#, VB.NET).

Chassis Web server

Both AXIe chassis include a built-in Web server for configuration, control, and monitoring of the chassis.

This Web server can be accessed by either LAN or PCIe.

The following functions are provided:

- Chassis information
- Chassis LAN configuration
- Instrument module inventory
- Trigger routing setup
- Chassis health (temperature, fan, power supply)

Soft front panel

A soft front panel interface is also provided to monitor and control the AXIe chassis. It has some of the basic functionality of the chassis Web page and communicates to the chassis using the IVI drivers. The soft front panel has two screens: trigger routing and chassis monitor.

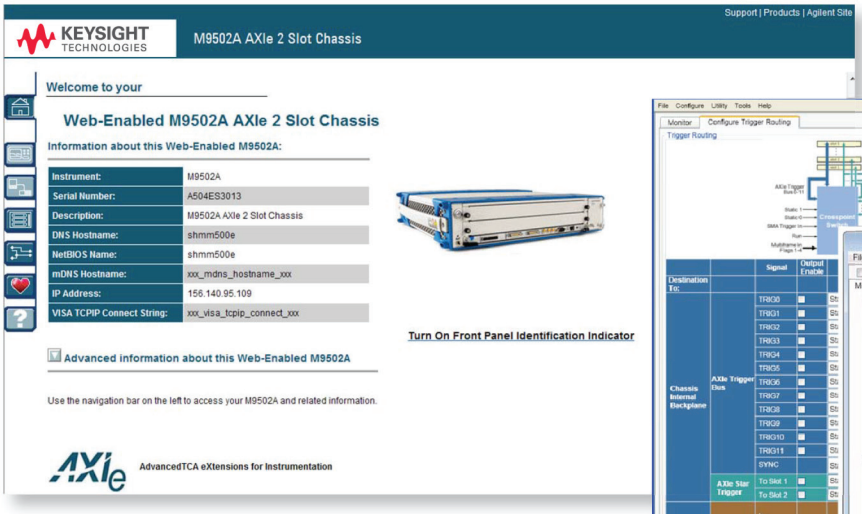


Figure 3. Chassis Web page

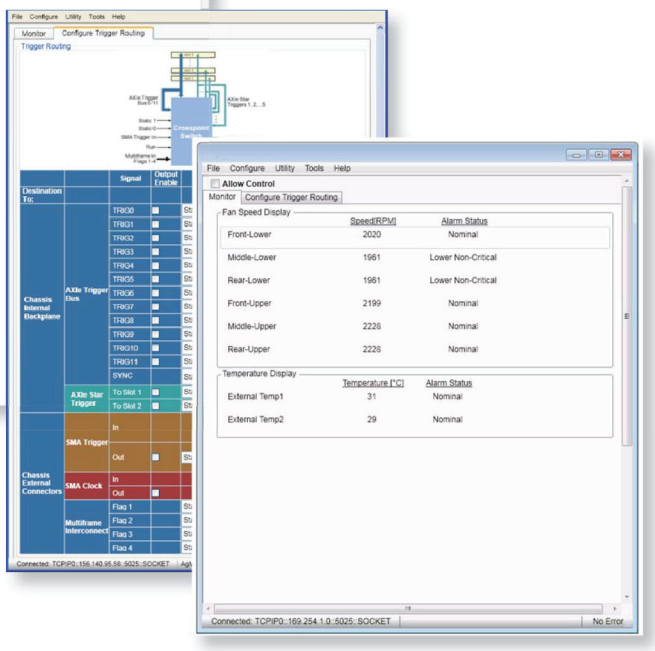


Figure 4. Chassis soft front panel interface

Technical Specifications and Characteristics

Chassis characteristics					
Standards compliance					
AXIe 1.0 Base Architecture specification					
AdvancedTCA PICMG 3.0 R2.0 specification					
Backplane					
	M9502A		M9505A		
Total slots	2		5		
Instrument module slots	2		5		
System module	Embedded		Embedded		
Power supply characteristics					
AC input					
	M9502A		M9505A		
Operating voltage range	100-240 VAC		100-240 VAC		
Input frequency range	50-60 Hz		50-60 Hz		
Input power consumption	800 VA		1280 VA		
Overcurrent protection	Auto-recovery		Auto-recovery		
Efficiency (typical)	85-90%		85-93%		
DC supply					
Model	DC output	Total DC module power	Total max module current	Load regulation	Maximum ripple and noise (20 MHz BW)
M9502A	50 V	400 W	8 A	2%	1% pk-pk
M9505A	52 V	1000 W	19.2 A	2%	500 mV pk-pk
Chassis cooling and power dissipation					
Slot airflow direction	Right to left				
Chassis cooling intake	Right side of chassis				
Chassis cooling exhaust	Left side of chassis				
Chassis cooling fans					
M9502A	Three 90.0 cfm fans on fan tray with HIGH/AUTO speed selector				
M9505A	Six 90.0 cfm fans on fan tray with HIGH/AUTO speed selector				
Power dissipation, instrument slot	200 W max				

Technical Specifications and Characteristics (continued)

Clocks and triggers		
100 MHz system clock (CLK100)		
Accuracy	± 20 ppm	
Duty cycle	45/55%	
Maximum slot-to-slot skew	100 ps	
External clock in (SMA)		
Input frequency	10 MHz ± 100 ppm	
Input level	± 5 V, AC coupled	
Minimum swing	250 mV	
External clock out (SMA)		
Output frequency	10 MHz	
Output level	3.3 V CMOS	
Output load	50 ohm	
AXIe differential star trigger (STRIG)		
Maximum slot-to-slot skew	100 ps	
External trigger out (SMA)		
Output level	3.3 V CMOS	
Output load	50 ohm	
External trigger in (SMA)		
Input level	± 5 V, adjustable threshold	
Input impedance	4 kohm (pulled up to 2.5 V)	
Minimum swing	250 mV	
Environmental characteristics [1,2]		
Operating and storage conditions		
	Operating	Storage
Temperature	0°C to 50°C	-25°C to 60°C
Humidity	Type tested at 95%, +40°C (non-condensing)	Type tested at 95%, +40°C (non-condensing)
Altitude	up to 3000 meters	up to 4600 meters
Shock and vibration		
Operating random vibration: type tested at 5 to 500 Hz, 0.21 g rms		
Survival random vibration: type tested at 5 to 500 Hz, 2.09 g rms		
Acoustical sound power (LWA dB, ref 1pW)		
	Worst case	Normal operation (25°C air intake)
M9502A	74.3	55.2
M9505A	77.6	62.8

1. Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include but are not limited to temperature, humidity, shock, vibration, altitude, and power line conditions.
2. Test methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3

Technical Specifications and Characteristics (continued)

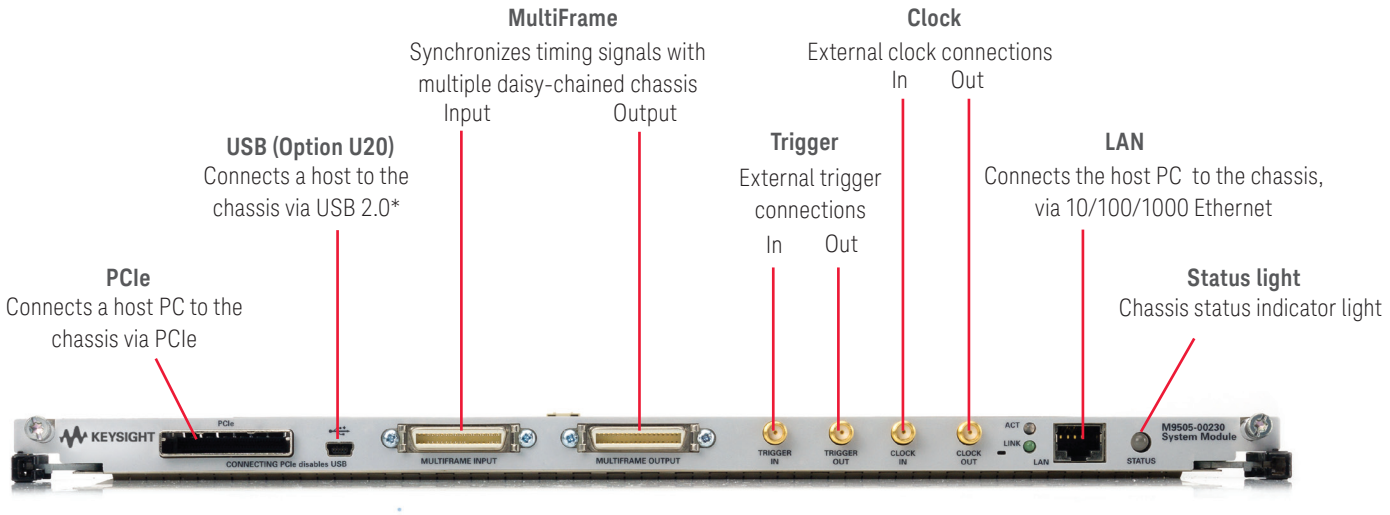
Regulatory characteristics		
Safety		
Complies with European Low Voltage Directive 2006/95/EC		
IEC/EN 61010-1, 2nd Edition		
Canada: CSA C22.2 No. 61010-1-04		
USA: UL std no. 61010-1, 2nd Edition		
German Acoustic statement		
Acoustic noise emission LpA < 70 dB Operator position Normal position Per ISO 7779		Geraeuschemission LpA < 70 dB Am Arbeitsplatz Normaler Betrieb Nach DIN 45635 t.19
EMC		
Complies with European EMC Directive 2004/108/EC		
IEC/EN 61326-1		
Canada: CSA C22.2 No. 61010-1-04		
CISPR Pub 11 Group 1, Class A		
AS/NZS CISPR 11		
ICES/NMB-001 This ISM device complies with Canadian ICES-001; cet appareil ISM est conforme a la norme NMB-001 du Canada		
General characteristics		
Mechanical		

	Weight (nom)[1]	Size with bumpers	Size without bumpers
M9502A	7.7 kg (17 lbs)	462mm W x 102mm H x 414mm D	432mm W x 87mm H x 414mm D
M9505A	13.3 kg (29.3 lbs)	462mm W x 193mm H x 436mm D	432mm W x 177mm H x 436mm D

1. Without modules

Technical Specifications and Characteristics (continued)

ESM front panel connectors



* USB port is only supported for a very limited set of Keysight AXIe modules. Check module documentation or go to: **www.keysight.com/find/axie-chassisusb** for compatibility information.

System requirements

Operating systems	Windows XP, Service Pack 3 or later (32-bit)	Windows Vista, SP1 and SP2 (32-bit and 64-bit), Business, Ultimate, Enterprise, Home Basic, and Home Premium	Windows 7 (32-bit and 64-bit) Starter, Home Basic, Home Premium, Professional, Ultimate, Enterprise
Processor speed	600MHz or higher required 800MHz recommended	1GHz 32-bit (x86), 1GHz 64-bit (x64), no support for Itanium 64	1GHz 32-bit (x86), 1GHz 64-bit (x64), no support for Itanium 64
Available memory	256 MB minimum (1 GB or greater recommended)	1 GB minimum	1 GB minimum
Available disk space[1]	1.5 GB available hard disk space, includes: – 1GB available for Microsoft .NET Framework 3.5 SP1[2] – 100MB for Keysight IO Libraries Suite	1.5 GB available hard disk space, includes: – 1GB available for Microsoft .NET Framework 3.5 SP12 100MB for Keysight IO Libraries Suite	1.5 GB available hard disk space, includes: – 1GB available for Microsoft .NET Framework 3.5 SP12 100MB for Keysight IO Libraries Suite
Video	Super VGA (800x600) 256 colors or more	Support for DirectX 9 graphics with 128MB graphics memory recommended (Super VGA graphics is supported)	Support for DirectX 9 graphics with 128MB graphics memory recommended (Super VGA graphics is supported)
Browser	Microsoft Internet Explorer 6.0 or greater	Microsoft Internet Explorer 7 or greater	Microsoft Internet Explorer 7 or greater

1. Because of the installation procedure, less memory may required for operation than is required for installation.
2. NET Framework Runtime Components are installed by default with Windows Vista and Windows 7. Therefore, you may not need this amount of available disk space.

Configuration

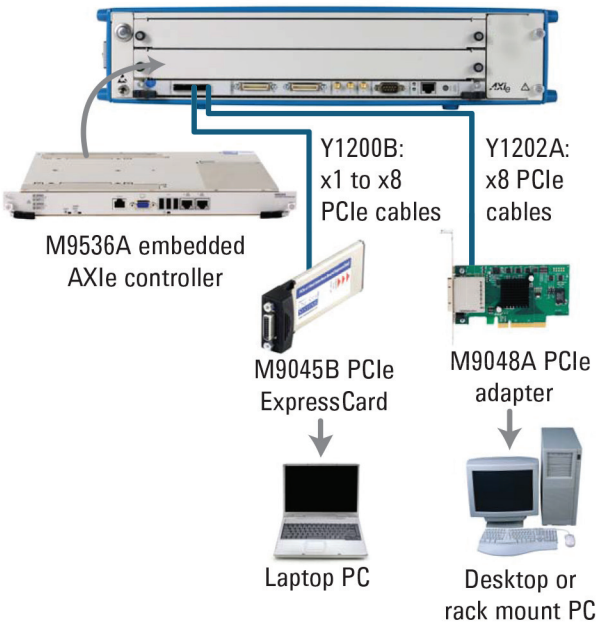


Figure 5. Configuration

Recommended configuration

Configure the Keysight M9502A and M9505A AXIe chassis, as follows:

1. 1. Configure the chassis connection to the host:
   - If you are using PCIe to connect an external computer, select an appropriate PC interface card; the Keysight M9048A is recommended
   - For a list of tested computers, see 5990-7632EN.
   - If the AXIe modules support USB (see www.keysight.com/find/axie-chassisusb) then you can use a USB cable to connect the AXIe chassis to the host. A PCIe interface card/cable is not required
2. Select an appropriate cable to connect the computer interface board to the system module; the Y1202A is recommended to connect the M9048A to the M9502A or M9505A
3. Select rack mount and MultiFrame cables as required

Hardware

Model	Description
M9502A	2-slot AXIe chassis with embedded system module
M9505A	5-slot AXIe chassis with embedded system module
Includes:	AXIe filler modules, getting started guide, drivers, and Keysight I/O libraries

Accessories

Model	Description
Y1225A	Rack mount kit for M9502A
Y1226A	Rack mount kit for M9505A
Y1223A	AXIe MultiFrame cable: 0.5m*
Y1224A	AXIe MultiFrame cable: 3m*
Y1232A	Soft carry bag for M9502A
N5650-00080	Single slot AXIe filler module

*Check module documentation to see if MultiFrame cables are supported

Related products

Model	Description
M9536A	Embedded AXIe PC controller
M9045B	PCIe ExpressCard adaptor: Gen 1
Y1200B	PCIe cable: x1 to x8, 2.0 m (used with M9045B)
M9048A	PCIe desktop PC adapter: Gen 2, x8
Y1202A	PCIe cable: x8, 2.0 m (used with M9048A)

Software

Model	Description
Supported operating systems	Microsoft Windows XP (32-bit), Microsoft Windows Vista (32/64-bit), Microsoft Windows 7 (32/64-bit)
Standard compliant drivers	IVI-COM, IVI-C, LabVIEW
Supported application development environments (ADE)	Visual Studio (VB.NET, C#, C/C++), Lab-VIEW, LabWindows/CVI, VEE
Keysight IO Libraries	Includes: VISA Libraries, Keysight Connection Expert, IO Monitor

Ordering

Model	Description
M9502A	AXIe chassis: 2-slot with embedded system module
M9505A	AXIe chassis: 5-slot with embedded system module
Opt 900-932	Optional power cords
Opt U20	ESM USB 2.0[1] Includes USB cable

1. USB port is only supported for a very limited set of Keysight AXIe modules. Check module documentation or go to: www.keysight.com/find/axie-chassisusb for compatibility information

Definitions for specifications

Specifications describe the warranted performance of calibrated instruments that have been stored for a minimum of 2 hours within the operating temperature range of 0 °C to 50 °C, unless otherwise stated, and after a 45 minute warm-up period. Data represented in this document are specifications unless otherwise noted.

Characteristics describe product performance that is useful in the application of the product, but that is not covered by the product warranty. Characteristics are often referred to as Typical or Nominal values.

- Typical describes characteristic performance, which 80% of instruments will meet when operated over a 20 °C to 30 °C temperature range. Typical performance is not warranted.
- Nominal describes representative performance that is useful in the application of the product when operated over a 20 °C to 30 °C temperature range. Nominal performance is not warranted.

Note: All graphs contain measured data from several units at room temperature unless otherwise noted.

Warranty and Calibration

Advantage services: Calibration and warranty	
Keysight Advantage Services is committed to your success throughout your equipment's lifetime.	
Warranty[1]	
Included	3-year warranty (return to Keysight), standard
R-51B-001-5Z	5-year return to Keysight warranty assurance plan

1. Options not available in all countries.

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