

Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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VECTOR NETWORK MEASUREMENT SYSTEMS (VNMS)
MS4622A/B/D, MS4623A/B/D, MS4624A/B/D

Ethernet / GPIB

10 MHz to 3 GHz

10 MHz to 6 GHz

10 MHz to 9 GHz

Innovative Manufacturing Solutions for Measuring S-Parameters, NF, P_{1dB}, IMD, and 3 and 4-Port Devices



Anritsu's family of RF Vector Network Measurement Systems include the MS462XA, MS462XB, and the new MS462xD. Code named Scorpion®, the MS462XX line is much more capable than traditional VNAs. With Scorpion's all new measurement options of vector error-corrected Noise Figure, Intermodulation Distortion, Fourth Measurement Port, and Harmonics, they create a total test solution. When you add the standard benefits of outstanding dynamic range and blazing fast measurement speed, you have a truly innovative solution for a manufacturing test environment!

Key Benefits

- See the true performance of all your passive and active components including antennas, isolators, filters, duplexers, couplers, SAW filters, baluns, amplifiers, mixers, and multi-port components
- With a single connection perform S-parameter, Harmonics, Time Domain, Compression, Intermodulation Distortion (IMD), Noise Figure (NF), and Frequency Translated Group Delay for accurate and thorough device characterization
- Optimized for your manufacturing process with features like 2 & 4 port AutoCal® modules which simplify calibrations, sequences for automating repetitive keystrokes, enhanced markers simplify data collection, and external SCSI interface for massive storage
- Measurement speeds of 150 µsec/point and dynamic range of 125 dB

Scorpion's AutoCal® feature also provides the capability to achieve fast, accurate, and highly repeatable calibrations without the need for an external controller. By using AutoCal® standard connector types or test port cable converters, you can calibrate directly using Type N, K, 3.5 mm, or SMA connectors. Planned upgrades include adapter characterization with the ability to calibrate using 7/16 or TNC type connectors.

4-Port Balance/Differential Measurements

The MS462xD series of Vector Network Measurement Systems (VNMS) allow you to characterize devices like SAW filters and integrated circuits using powerful features like mixed-mode S-parameters, embedding/de-embedding, and arbitrary impedance. De-embedding utilities provide compensation techniques for typical test fixture environments to further enhance the measurement accuracy, while integrated embedding utilities, consisting of an extensive library of circuit primitives, increases time-to-market and yield when simulating the final matched behavior of components. The Scorpion's arbitrary impedance transformations also accurately handle non-50 Ω measurement scenarios typically associated with balanced devices, making the VNMS well suited for applications requiring ripple, insertion loss and amplitude imbalance measurements on the order of 0.1 dB.



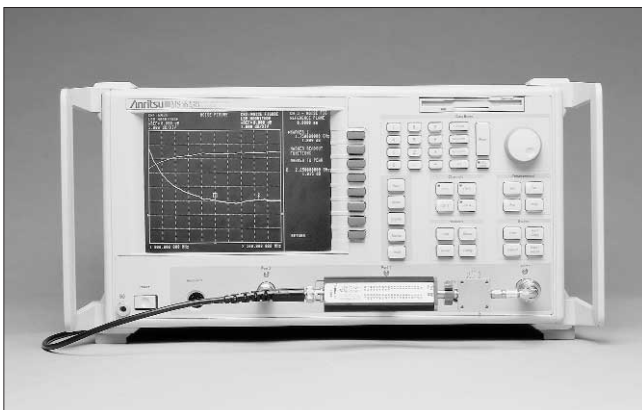
• Amplifier Measurements

Some of today's most demanding VNA measurements involve the characterization and tuning of multiple port devices such as duplexers, combiners, couplers, etc. In a traditional 2-port VNA, the full characterization and tuning of such devices presents significant challenges in terms of measurement speed, calibration, and the switching of input signals and measurement ports. With the addition of the third measurement port, the simplicity and speed with which these devices can be tested is greatly enhanced. The MS4622B, MS4623, and MS4624B network analyzers not only offer the option of adding a third measurement port, they also offer the industry's first ever second internal source. This second source is completely independent from the main source that switches between ports 1 and 2. By the addition of this second source, the potential now exists for replacing the signal generators and spectrum analyzers currently needed to characterize the non-linear effects that occur when multiple tones are simultaneously present in the pass-band of an active device.



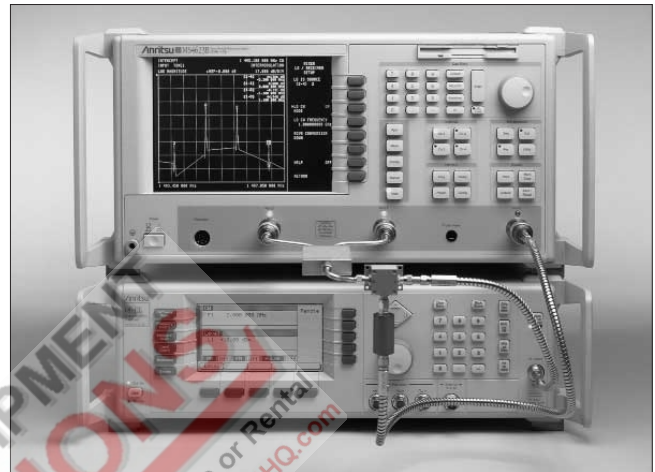
• Vector error-corrected noise figure measurements

The MS4622B, MS4623B, and MS4624B Vector Network Measurement Systems deliver the industry's first ever capability for making vector error-corrected noise figure measurements on active devices in today's hottest market – wireless communications. The Noise Figure options covering the frequency ranges of 50 MHz to 3 GHz and 50 MHz to 6 GHz, give you the functionality for making noise figure measurements much more accurately than has ever before been possible. This option allows for making S-parameter measurements and noise figure measurements with a single test connection. The measurement setup can be configured to make measurements with the noise source set in either an internal or an external mode. In the external mode, the noise source is connected directly to the DUT similar to traditional scalar noise figure measurements. In the internal mode, the noise source is connected to the VNA rear panel and internally routed to port 1. Therefore, when a 12-term calibration is applied concurrently with the noise figure calibration, you can make vector error-corrected noise figure measurements.



• Mixer measurements

Scorpion can also accurately characterize your mixers and other frequency-translating devices (FTDs) for isolation, match, conversion loss, noise figure and frequency translated group delay (FTGD). Without changing cables or instruments, Scorpion can make all these measurements quickly, easily and accurately. Add an external synthesizer and Scorpion can easily orchestrate swept frequency and swept power mixer IMD measurements. You no longer have to buy and integrate five separate instruments to perform these everyday measurements. With the integrated measurement flexibility of Scorpion, you can design and manufacture all of your passive, active, and frequency translating devices using a single instrument.



• AutoCal® Automatic Calibrators

One source of potential errors and inaccuracies in any measurement system is its calibration. A great deal of time can be wasted in a busy manufacturing environment trying to verify calibration accuracy, especially when multiple shifts run on several different test stations for the same product line. For this situation, you need a calibration system in place that offers the highest possible degree of assurance that every station on every shift is calibrated for identical results. With the Anritsu AutoCal® automatic calibrator, you get just that. Simply connect a serial cable between the AutoCal® and the rear panel of the VNA and you're ready to go. If adapters become necessary, AutoCal® can handle them with its revolutionary approach to adapter removal. This approach avoids the necessity of multiple calibrations commonly used in adapter removal calibrations. By using the AutoCal® adapter characterization process, you can calibrate in a SMA, Type N, 3.5mm, TNC, or 7/16 environment with confidence.



Specifications

Test port characteristics	Standard connector type	N female											
	Optional connector types	3.5 mm female, 3.5 mm male, GPC-7, N male											
	Measurement port characteristics	3.5 mm (MS4600/11S) (MS4600/11SF)	Connector	Configuration	Frequency (MHz)	Directivity (dB)	Source match (dB)	Load match (dB)					
			Ports 1 and 2 MS462xB MS462xD	10 to 1000 1000 to 3000 3000 to 6000 6000 to 9000	>46 >44 >38 >37	>44 >41 >39 >36	>46 >44 >38 >37						
		N-Type Standard N(F) (MS4600/11NM)	Ports 3 and 4 MS462xB/Opt3x MS462xD	10 to 1000 1000 to 3000 3000 to 6000 6000 to 9000	>44 >42 >37 >36	>42 >40 >37 >35	>44 >42 >37 >36						
			Ports 1 and 2 MS462xB MS462xD	10 to 1000 1000 to 3000 3000 to 6000 6000 to 9000	>46 >44 >38 >37	>44 >41 >39 >36	>46 >44 >38 >37						
		GPC-7 (MS4600/11A)	Ports 3 and 4 MS462xB/Opt3x MS462xD	10 to 1000 1000 to 3000 3000 to 6000 6000 to 9000	>44 >42 >37 >36	>42 >40 >37 >35	>44 >42 >37 >36						
			Ports 1 and 2 MS462xB MS462xD	10 to 1000 1000 to 3000 3000 to 6000 6000 to 9000	>46 >44 >38 >37	>44 >41 >39 >36	>46 >44 >38 >37						
		Frequency range	MS4622A/B/D, 10 MHz to 3 GHz MS4623A/B/D, 10 MHz to 6 GHz MS4624A/B/D, 10 MHz to 9 GHz										
		Frequency resolution	1Hz										
		Frequency stability (with internal time base) – aging	<5x10 ⁻⁶ / year										
		Temperature	<5x10 ⁻⁶ over +15°C to +50°C										
Source specifications		Power output range	MS4622A Transmission/Reflection Test Set			+10 to –85 dBm							
			MS4622B Active Reversing Test Set			+10 to –85 dBm							
	MS4622B (Opt 3) w/ 2nd Source, 3rd Test Port & S/A			+10 to –85 dBm									
	MS4622B (Opt 4) w/ Noise Figure			+7 to –85 dBm									
	MS4622B (Opt 6) w/ 3rd Test Port			+10 to –85 dBm									
	MS4622D Balanced/Differential 4-Port			+10 to –85 dBm									
	MS4623A Transmission/Reflection Test Set			+10 to –85 dBm									
	MS4623B Active Reversing Test Set			+7 to –85 dBm									
	MS4623B (Opt 3) w/ 2nd Source, 3rd Test Port & S/A			+7 to –85 dBm									
	MS4623B (Opt 4) w/ Noise Figure (3 GHz only)			+5 to –85 dBm									
	MS4623B (Opt 6) w/ 3rd Test Port			+7 to –85 dBm									
	MS4623D Balanced/Differential 4-Port			+7 to –85 dBm									
Source specifications	Power control range	≥ 20 dB. The minimum absolute level for power sweep is –15 dBm while the maximum power output for a unit is +10 dBm.											
		Source power level	The source power (dBm) may be set from the front panel menu or via GPIB. Port 1 power level is settable from +10 dBm (on the simpler test sets, ranging to +5 dBm on the most complex) to –15 dBm with 0.01 dB resolution. In addition, the Port 1 (& Port 3) power may be attenuated in 10 dB steps using the internal 70 dB step attenuator. Port 3 step attenuator is not available in D models. Port 1 step attenuator is optional in A models.										
			Power level accuracy	±1 dB to 6 GHz, ±1.5 dB to 9 GHz (no flat power calibration applied; full-band frequency sweep at –15 dBm, 0 dBm, and maximum rated power).									
				Level test port power	The power at all sweep frequencies is leveled to within ±1 dB. Only port 1 and port 3 (if installed) can be externally leveled.								
					Harmonics and spurious	<–30 dBc at maximum rated power (MS4622x and MS4623x) <–25 dBc at maximum rated power (MS4624x)							
						Sweep type	Linear, CW, Marker, or N-Discrete point sweep						
							Power sweep range	20 dB (minimum)					
								Source #2 (optional)	Frequency range	10 MHz to 3 GHz (6 GHz or 9 GHz)			
									Frequency resolution	1 Hz			
									Power level accuracy	±1 dB to 6 GHz, ±1.5 dB to 9 GHz (no flat power calibration applied; full-band frequency sweep at –15 dBm, 0 dBm, and maximum rated power).			
									Harmonics and spurious	<–30 dBc at maximum rated power (MS4622x and MS4623x) <–25 dBc at maximum rated power (MS4624x)			
									Sweep type	Linear, CW, Marker, or N-Discrete point sweep			
Power sweep range	20 dB (minimum)												

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Receiver specs	Average noise level	-100 dBm in 10 Hz IF Bandwidth (< 3 GHz); Typically > -110 dBm in narrowband sweep -90 dBm in 10 Hz IF Bandwidth (> 3 GHz); Typically > -100 dBm in narrowband sweep				
	Maximum input level	+27 dBm, +20 dBm noise figure mode				
	Damage level	> +30 dBm, > +23 dBm noise figure mode				
Measurement speed summary	Measurement times are measured using a single trace (S ₂₁) display and one average. The measurement speeds for the communications band are measured in a 25 MHz band from 824 – 849 MHz. The typical measurement times displayed are as follows:					
	Data points	IF bandwidth (Hz)	10 MHz to 3 GHz (ms)	10 MHz to 6 GHz (ms)	10 MHz to 9 GHz (ms)	Communications band (ms)
	51	30 kHz	16	18	31	11
		10 kHz	21	23	35	16
		3 kHz	32	35	46	27
		1 kHz	66	69	76	61
		300 Hz	187	189	203	184
	101	30 kHz	26	28	40	20
10 kHz		35	38	48	28	
3 kHz		57	60	71	50	
1 kHz		126	129	138	120	
300 Hz		366	370	380	368	
201	30 kHz	44	48	64	37	
	10 kHz	61	65	81	52	
	3 kHz	106	110	126	98	
	1 kHz	242	246	262	234	
	300 Hz	716	720	740	712	
401	30 kHz	80	87	110	70	
	10 kHz	114	121	146	104	
	3 kHz	206	212	236	196	
	1 kHz	480	484	508	468	
	300 Hz	1424	1432	1448	1408	
801	30 kHz	150	161	202	130	
	10 kHz	218	230	270	198	
	3 kHz	400	412	456	380	
	1 kHz	952	960	1000	928	
	300 Hz	2820	2840	2900	2800	
Measurement capabilities	Parameters	S ₁₁ , S ₂₁ , S ₂₂ , S ₁₂ , S ₃₃ , S ₂₃ , S ₃₂ , S ₁₃ , S ₃₁ , S ₁₄ , S ₂₄ , S ₃₄ , S ₄₁ , S ₄₂ , S ₄₃ , Harmonics, Noise Figure, Intermodulation Distortion (IMD), and user-defined combinations of a ₁ , a ₂ , a ₃ , a ₄ , b ₁ , b ₂ , b ₃ , and b ₄ . Mixed-Mode terms, too.				
	Measurement frequency range	Frequency range of measurement can be narrowed within the calibration range without recalibration. CW mode permits single frequency measurements, also without recalibration. In addition, the system accepts N discrete frequency points where 2 < N < 1601.				
	Domains	Frequency Domain, CW Draw, and optional High Speed Time (Distance) Domain				
	Formats	Log Magnitude, Phase, Log Magnitude & Phase, Smith Chart (Impedance), Smith Chart (Admittance), Linear Polar, Log Polar, Group Delay, Linear Magnitude, Linear Magnitude and Phase, Real, Imaginary, Real & Imaginary, SWR, and Power				
	Data points	1601 maximum. Number of data points can be switched to a value of 801, 401, 201, 101, 51, 15, or 3 points without recalibration (if 1601 points were used in the calibration). In addition, the system accepts an arbitrary set of N discrete data points where 2 ≤ N ≤ 1601. CW mode permits selection of a single data point without recalibration.				
	Reference delay	Can be entered in time or in distance (when the dielectric constant is entered). Automatic reference delay feature adds the correct electrical length compensation at the push of a button. Software compensation for the electrical length difference between reference and test is always accurate and stable since measurement frequencies are always synthesized. In addition, the system compensates reference phase delay for dispersive transmission media such as microstrip.				
	Alternate sweep	Allows the ability to decouple channel 1 and 2 from channel 3 and 4 for the following parameters: correction type, start and stop frequencies, number of data points, markers, sweep time, averaging, smoothing, and IF bandwidth.				
	Markers	Twelve independent markers can be used to read out simultaneous measurement data. In alternate sweep mode there are sets of markers for each frequency sweep. In delta reference marker mode, any one marker can be selected as the reference for the other eleven. Markers can be directed automatically to the minimum or maximum of a data trace.				
	Enhanced markers	Marker search for a level or bandwidth, displaying an active marker for each channel, and discrete or continuous (interpolated) markers. Identifies the X dB bandwidth of amplifiers, filters, and other frequency sensitive devices.				
	Marker sweep	Sweeps upward in frequency between any two markers. Recalibration is not required during the marker sweep.				
	Limit lines	Either single or segmented limit lines can be displayed. Two limit lines are available for each trace.				
	Single limit readouts	Interpolation algorithm determines the exact intersection frequencies of data traces and limit lines.				
	Segmented limit lines	A total of 20 segments (10 upper and 10 lower) can be generated per data trace. Complete segmented traces can be offset in both frequency and amplitude.				
	Test limits	Both single and segmented limits can be used for PASS/FAIL testing. PASS or FAIL status is indicated on the display after each sweep. In addition, PASS/FAIL status is output through the rear panel I/O connector as selectable TTL levels (PASS=0V, FAIL=+5V, or PASS=+5V, FAIL=0V).				
	Tune mode	Tune Mode optimizes sweep speed in tuning applications by updating forward S-parameters more frequently than reverse ones. This mode lets users select the ratio of forward sweeps to reverse sweeps after a full 12-term calibration. The ratio of forward sweeps to reverse sweeps can be set anywhere between 1:1 to 10,000:1.				
	Power sweep measurements	Both Swept Power Gain Compression and Swept Frequency Gain Compression modes are available.				
Sequencing	Seven measurement sequences can be created, stored, edited, and run from the front panel. Sequences can include front-panel functions as well as user-definable control statements. Sequences can be run from either the unit front panel, via GPIB, or from an AT-style keyboard plugged into the front panel.					
Harmonic measurement	Measurement/display of fundamental, 2 nd , 3 rd , 4 th , 5 th , 6 th , 7 th , 8 th , & 9 th harmonic					

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Display capabilities	Display channels	Four, each of which can display any S-parameter or user-defined parameter in any format with up to two traces per channel for a maximum of eight traces simultaneously. Each channel is also capable of displaying harmonics, noise figure, intermodulation distortion, or time domain trace. A single channel, two channels (1 and 3, or 2 and 4), or all four channels can be displayed simultaneously. Channels 1 and 3, or channels 2 and 4, can be overlaid for rectilinear graph types.	
	Trace overlay	Displays two data traces on the active channel's graticule simultaneously. The overlaid trace is displayed in yellow and the primary trace is displayed in red.	
	Trace memory	A separate memory for each channel can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data.	
	Blank frequency information	Blanking function removes all references to displayed frequencies on the LCD. Frequency blanking can only be restored through a system reset or GPIB command.	
Measurement enhancements	Data averaging	Averaging of 1 to 4096 averages can be selected. The data averaging function is performed at each data point during the frequency sweep. Averaging can be toggled on or off via the front panel; a front-panel LED indicates that the data averaging function is enabled.	
	IF bandwidth	Soft Key selection of IF bandwidth (30 kHz, 10 kHz, 3 kHz, 1 kHz, 300 Hz, 100 Hz, 30 Hz, 10 Hz)	
	Trace smoothing	Computes an average over a percentage range of the data trace. The percentage of trace to be smoothed can be selected from 0 to 20% of trace.	
	Group delay characteristics	Group delay	Group delay is measured by computing the phase change in degrees across a frequency step by applying the formula: $T_g = \frac{-1/360 \cdot d(\text{phase})}{d(\text{frequency})}$
		Aperture	Defined as the frequency span over which the phase change is computed at a given frequency point. The aperture can be changed without recalibration. The minimum aperture is the frequency range divided by the number of points in calibration and can be increased to 20% of the frequency range without recalibration. The frequency width of the aperture and the percent of the frequency range are displayed automatically.
		Range	The maximum delay range is limited to measuring no more than $\pm 180^\circ$ of phase change within the aperture set by the number of frequency points. A frequency step size of 100 kHz corresponds to 10 microseconds.
		Measurement repeatability (sweep to sweep)	For continuous measurement of a through connection, RSS fluctuations due to phase and FM noise are: $\frac{1.41 \{(\text{Phase Noise})^2 + (T_g \times \text{Residual FM Noise})^2\}^{.5}}{360 (\text{Aperture in Hz})}$
		Accuracy	Error in $T_g = \frac{\text{Error in phase}}{360} + (T_g \times \text{Aperture Freq. Error (Hz)}) / \text{Aperture}$
	Frequency Translating Group Delay (FTGD)	Allows the measurement of group delay of mixers and other translating devices by analyzing the phase shift experienced by a modulated signal (generated internally). The above Group Delay equation applies, except that the phase change is measured across the modulating bandwidth of the test signal instead of across frequency points. The aperture is fixed at about 900 kHz and the range is limited to about 1 μ s. The use of angle modulation keeps the measurement relatively immune from compression and other non-linearities.	
	LRL/LRM calibration capability	The LRL calibration technique uses the characteristic impedance of a length of transmission line as the calibration standard. A full LRL calibration consists merely of two transmission line measurements, a high reflection measurement, and an isolation measurement. The LRM calibration technique is a variation of the LRL technique that utilizes a precision termination rather than a second length of transmission line. A third optional standard, either Line or Match may be measured in order to extend the frequency range of the calibration. This extended calibration is achieved by mathematically concatenating either two LRL, two LRM, or one LRL and one LRM calibration(s). Using these techniques, full 12-term error correction can be performed on the MS462XX VNA.	
Dispersion compensation	Selectable as Coaxial (non-dispersive), Waveguide, or Microstrip (dispersive)		
Reference plane	Selectable as Middle of line 1 or Ends of line 1		
Corrected impedance	Determined by Calibration Standards		
AutoCal [®]	The Scorpion™ family incorporates internal control of the 3658X-series AutoCal [®] modules.		
FlexibleCal™	Optimize throughput by performing only the sweeps required to characterize multi-port devices. Also enables convenient switching between 2, 3 and 4 port calibration without recalibration.		
Hard copy	Printer	Scorpion™ supports the HP 2225C InkJet, HP QuietJet, HP DeskJet, HP LaserJet II, III, IV, & V Series, and Epson compatible printers with parallel (Centronics) interfaces. They are also compatible with the ANRITSU "VNA Capture" program (outputs bitmap file over GPIB) and provide bitmap output over front panel to disk.	
	GPIB plotters	Scorpion™ supports the HP Models 7440A, 7470A, and 7475A and Tektronix Model HC100 plotters.	
Storage	Internal memory	Ten front panel states (setup/calibration) can be stored and recalled from nonvolatile memory locations. The current front panel setup is automatically stored in nonvolatile memory at instrument powerdown. When power is applied, the instrument returns to its last front-panel setup. The system will be able to exchange two stored calibrations in <0.5 s.	
	Internal nonvolatile memory	Used to store and recall measurement and calibration data and front panel setups. All files are MS-DOS compatible.	
	Internal floppy disk drive	A 3.5 inch diskette drive with 1.44 Mb formatted capacity is used to load measurement programs and to store and recall measurement and calibration data and front panel setups.	
	Measurement data	102.8 kb per 1601 point S-parameter data file	
	Calibration data	187.3 kb per 1601 point S-parameter data file (12-term cal plus setup)	
	Trace memory file	12.8 kb per 1601 point channel	
GPIB	GPIB interfaces	2 ports	
	System GPIB (IEEE-488.2)	Connects to an external controller for use in remote programming of the network analyzer. Address can be set from the front panel and can range from 1 to 30.	
	Dedicated GPIB	Connects to external peripherals for network analyzer controlled operations (e.g., GPIB plotters, frequency counters, frequency synthesizers, and power meters).	

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General	Power requirements	85-240V, 48-63 Hz, 540 VA maximum
	Dimensions	222H x 425W x 450D mm (8.75 x 16.75 x 17.75 in)
	Weight	< 23kg. (52 lb.)
Environmental	Storage temperature range	-40°C to +75°C.
	Operating temperature range	0°C to +50°C (specifications apply at 23°C ±3 °C).
	Relative humidity	5% to 95% at +40°C.
EMC	Meets the emissions and immunity requirements of	EMC Directive - 89/336/EEC EN50081-1:1992 CISPR-11:1990/EN55011:1991 Group 1 Class A EMC Directive - 89/336/EEC per EN61326
		EMMISSIONS Standard EN55011:1991 IEC 61000-3-2 IEC 61000-3-3
		IMMUNITY Standard IEC 1000-4-2:1995/prEN50082-1:1995 - 4kV CD, 8kV AD IEC 1000-4-3:1995/ENV50140:1994 - 3V/m IEC 1000-4-4:1995/prEN50082-1:1995 -500V SL; 1000V PL IEC 1000-4-5:1995/prEN50082-1:1995 - 2kV L-E, 1kV L-L IEC 1000-4-6:1995/ENV50141:1994 IEC 1000-4-8:1995/prEN50082-1:1995 IEC 1000-4-11:1995/prEN50082-1:1995
	Safety	Meets safety requirements of Low Voltage/Safety Standard 72/23/EEC - EN61010-1:1993

Ordering information

Please specify model/order number, name, and quantity when ordering.

Model/Order No.	Name	Model/Order No.	Name
MS4622A	Main frame 10MHz – 3GHz transmission/reflection	NC346A	Noise sources 5 dB ENR noise source (3.5 mm)
MS4622B	10MHz – 3GHz active reversing	NC346B	15 dB ENR noise source (3.5 mm)
MS4622D	10MHz – 3GHz Balanced / Differential 4-Port		
MS4623A	10MHz – 6GHz transmission/reflection		Calibration kits
MS4623B	10MHz – 6GHz active reversing	3750R	SMA/3.5 mm RF Cal Kit ≤9 GHz
MS4623D	10MHz – 6GHz Balanced / Differential 4-Port	3750R/1	Adds a set of five Phase Equal Insertables (PEIs)
MS4624A	10MHz – 9GHz transmission/reflection	3750R/3	Adds additional 3.5 mm (female) and 3.5 mm (male) terminations required for four port calibrations.
MS4624B	10MHz – 9GHz active reversing	3751R	GPC-7 RF Cal Kit ≤9 GHz
MS4624D	10MHz – 9GHz Balanced / Differential 4-Port	3751R/2	Adds a third GPC-7 termination required for three port calibrations.
Option 1	Options Rack mount kit with slides	3751R/3	Adds two additional GPC-7 terminations required for four port calibrations.
Option 2	Time domain	3753R	50 Ω, Type N, RF Cal Kit ≤9 GHz
Option 3A	Adds to MS4622B a 2nd internal source (3 GHz source) + 3rd port	3753R/1	Adds a set of five Phase Equal Insertables (PEIs)
Option 3B	Adds to MS4623B a 2nd internal source (6 GHz source) + 3rd port	3753R/3	Adds additional N (female) and N (male) terminations required for four port calibrations.
Option 3E	Adds to MS4624B a 2nd internal source (9 GHz source) + 3rd port	3753-75R	75 Ω, Type N, RF Cal Kit ≤9 GHz
Option 4*1	Noise figure 50 MHz to 3 GHz (only for B models)	3753-75R/3	Adds additional N (75 Ω female) and N (75 Ω male) terminations required for four port calibrations.
Option 4B*1	Noise figure 50 MHz to 6 GHz (only for B models)		
Option 4F*1	Noise figure 50 MHz to 3 GHz (only for D models)		
Option 4G*1	Noise figure 50 MHz to 6 GHz (only for D models)		
Option 5	Frequency translation group delay	3663R	Verification kits Type N verification kit
Option 6*2	3rd test port (B models; for use with external synthesizer)	3666R	SMA/3.5 mm verification kit
Option 7	T/R step attenuator (only for A models, standard on B)	3667R	GPC-7 verification kit
Option 8	Harmonic measurement		
Option 11*3	Test Port connector		
Option 13	Intermodulation distortion		
36581NNF/2	AutoCal® AutoCal®, Type N, 10 MHz to 9 GHz	15LL50-0.3A	Accessories 3.5 mm Male-Male Cable, 30 cm
36581KKF/2	AutoCal®, Type K, 10 MHz to 9 GHz	15LL50-0.6A	3.5 mm Male-Male Cable, 60 cm
36584KF	AutoCal®, 4-Port Type K, 10 MHz to 9 GHz	15LLF50-0.3A	3.5 mm Male-Female Cable, 30 cm
36584NF	AutoCal®, 4-Port Type N, 10 MHz to 9 GHz	15LLF50-0.6A	3.5 mm Male-Female Cable, 60 cm
		15NN50-0.3B	Type N Male-Male Cable, 30 cm
		15NN50-0.6B	Type N Male-Male Cable, 60 cm
		15NNF50-0.3B	Type N Male-Female Cable, 30 cm
		15NNF50-0.6B	Type N Male-Female Cable, 60 cm

*1: Does not include noise source.

*2: Port 3 is a receiving port only, unless using an external synthesizer.

*3: Standard connector is N-female, no cost option for 3.5 mm (male), 3.5 mm (female), N-male, or GPC-7.