

# 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.

Test equipment Solutions Ltd  
Unit 8 Elder Way  
Waterside Drive  
Langley  
Berkshire  
SL3 6EP

T: +44 (0)1753 596000  
F: +44 (0)1753 596001

Email: [info@TestEquipmentHQ.com](mailto:info@TestEquipmentHQ.com)  
Web: [www.TestEquipmentHQ.com](http://www.TestEquipmentHQ.com)



## VECTOR NETWORK ANALYZERS 37100C, 37200C, 37300C Series 22.5 MHz to 65 GHz



*For Fast and Accurate S-Parameter Measurements*



The 37200C and 37300C series microwave vector network analyzers (VNAs) are high performance tools designed to make fast and accurate S-parameter measurements across the 40 MHz to 65 GHz range. These network analyzers integrate a synthesized source, S-parameter test set, and tuned receiver into a single compact package that is ideal for benchtop testing.

Code named Lightning, the 37200C and 37300C offer new levels of measurement capabilities to speed manufacturing test and increase throughput. Choose the instrument model and options that best suit your application and budget.

The 37200C series is designed for passive device measurements, while the 37300C series adds active device measurement capabilities. Five microwave models are available from 40 MHz to 13.5, 20, 40, 50, or 65 GHz.

The 37100C series microwave vector network analyzers are configured as direct-access receivers for antenna, frequency conversion, and multiple output device measurements. The 37100C offers ultimate flexibility to meet most receiver measurement needs while maintaining the ability to measure all four S-parameters with the addition of a reflectometer setup at the front end of the receiver.

The 37100C series offers two wide-band microwave models covering the 22.5 MHz to 20 GHz or 40 GHz ranges.

### Features

#### • High speed data transfer and control

For maximum efficiency, dual GPIB ports are standard on every 37100C/37200C/37300C series VNA. High-speed transfers across the analyzer's IEEE 488.2 GPIB bus minimize data collection times. The second GPIB port is dedicated to control of peripheral devices such as printers, plotters, power meters, and frequency synthesizers. The 37100C/37200C/37300C series maximizes throughput by combining fast, error-corrected sweeps with high-speed data transfers.

#### • Compact size

The 37200C/37300C series analyzers integrate a fast sweeping synthesized source, auto-reversing S-parameter test set, and four-channel receiver into a single compact package. The 37100C series analyzers integrate a fast sweeping synthesized source and four-channel receiver into a single compact package and provides direct access to all four receiver samplers via the front panel. Components within the analyzer have been integrated to reduce cost and weight and improve the instrument's long-term reliability.

#### • Built-in mass storage

Testing devices with multiple setups is now easier. A built-in hard disk drive rapidly stores and recalls frequently used front panel setups and calibrations. Store your complete test setup including limit lines and frequency markers. Create descriptive file names to assist multiple users or device types. The high storage capability of the internal hard disk means there is space for literally hundreds of calibrations, front panel setups, and data traces. In secure environments, the internal hard disk can be removed and either an external drive on the SCSI port or the internal 1.44 MB floppy drive can be used for uploading proprietary setups.

#### • Fast synthesized sweeps

Measurement update rates of less than 2 ms per point are possible with the 37100C/37200C/37300C series analyzers. Each data point is fully phase-locked and vector-error-corrected for optimum accuracy. Realize near real-time updates with the instrument's tune mode. The internal source frequency resolution of 1 Hz facilitates narrow-band device measurements.

#### • Time domain analysis

Analyze impedance discontinuities as a function of time or distance with the 37100C/37200C/37300C's high-speed time domain (Option 2A). Isolate individual reflections in time and evaluate their effects in the frequency domain. Remove the effects of device packages and fixturing with time domain gating to see the actual performance of your designs. Use the independent display channels to view the response of your designs before, during, and after time domain processing. The software provides four different windowing functions to optimize dynamic range and resolution. The exclusive phasor impulse mode will show you the true impedance characteristics of mismatches in waveguide, microstrip, and other band-limited media.

#### • Multiple source control and set-on receiver mode

Separately control the frequency of two sources and a receiver without the need for an external controller. Independently specify the sweep ranges and output powers of the sources and the sweep range of the receiver to accommodate swept IMD, TOI, and harmonic measurements. The 37100C/37200C/37300C's set-on receiver mode allows it to operate as a tuned receiver by phase locking all of its local oscillators to its internal crystal reference oscillator.

## ● LabVIEW® compatibility

Standard with every 37100C/37200C/37300C series analyzer is National Instruments LabVIEW® instrument driver. Create custom test programs (virtual instruments) in less time with LabVIEW's graphical programming environment. Take advantage of the network analyzer's high data throughput for tuning operations. Fast data transfers over GPIB permit near realtime updates on your PC's display. Customize programs to automatically display, test, and document measurement results. Reuse virtual instruments in other test routines to minimize program development time. LabVIEW gives you full access to more than 900 mnemonics in the 37100C/37200C/37300C analyzer's command set for complete automated data collection and analysis.

## ● Internally controlled AutoCal®

One source of potential errors and inaccuracies in any network analyzer system is the calibration of that system. The Anritsu AutoCal automatic calibrator is designed to speed and simplify the calibration of your 37200C/37300C VNA. Using the built-in software support and an AutoCal module connected to the serial port on the rear panel of the instrument, you are ready to make fast, accurate, and repeatable calibrations.

## ● Three-year factory warranty

All 37100C/37200C/37300C series VNAs are backed with a no-questions-asked three-year warranty.

## ● Upgradeability

The 37100C/37200C/37300C series analyzers are designed to accommodate higher frequency ranges and more powerful features as your requirements grow. Any 37100C/37200C/37300C series VNA can be upgraded to any other model in the instrument family, or any other series, to fit your changing requirements. Contact Anritsu Customer Service to request an upgrade and an Anritsu service engineer will install the added capability and verify your system's total performance. Upgradeability is a cost-effective approach to satisfying today's production needs while providing the flexibility to meet tomorrow's demands. System software upgrades are as easy as inserting new discs into the instrument's floppy drive.

## Applications

### ● Filters

Let the analyzer's wide dynamic range show you filter rejection and input match on the same display. Overlay traces and tune for optimum transmission and group delay responses without reduction in sweep speed.

Further speed improvements are possible using the instrument's tune mode. This unique feature helps users optimize sweep times in one direction for better hand-to-eye tuning while maintaining a 12-term corrected S-parameter display. Anritsu's tune mode maximizes sweep speed and accuracy, simultaneously, by allowing you to choose when reverse parameters are updated.

Automatically locate filter center frequency, 3 dB bandwidth, max/min insertion loss, Q, and shape factor. Instantly measure passband phase distortions with Anritsu's automatic reference plane extension capability. A single key press quickly identifies filter non-linear phase responses.

### ● Amplifiers (available on 37300C series only)

Easily measure amplifier gain compression vs. input power or frequency. Power meter assisted linearity and flat output power calibration combined with a receiver port calibration provides capability to measure output power in dBm. A 1 watt, 70 dB (60 dB on >40 GHz models) step attenuator in the port 1 path, and a 40 dB step attenuator in the port 2 path, coupled with 20 dB ALC range, give complete control to characterize virtually any amplifier. This range is reduced to 12 dB at frequencies >50 GHz. Internal bias tees simplify DC biasing of your active designs. A front panel loop allows external amplifier insertion, increasing port 1 power up to 1 watt maximum for high input power amplifiers.

### ● Mixers

Perform absolute and accurate S-parameter measurements (magnitude and phase) of frequency translation devices. Make error corrected conversion loss, group delay, and port match measurements of mixers and up/downconverters. Anritsu's Mixer (NxN) Calibration Assistant software adjusts the VNA's 12-term calibration for the second mixer, BPF, and attenuators in the measurement path. No reference mixer is required for VNA phase locking since the frequency range of the receiver is set to the same range as the source.

### ● Multiport and Balanced/Differential

Measure single-ended and mixed-mode S-parameters with the 37200C/37300C series VNA, a 4-port test set, and an external PC running Anritsu's Multiport Navigator™ software. Characterize single-ended multiport components (diplexers, couplers, power dividers, etc.) or balanced/differential components. Anritsu's easy-to-use Navigator software provides full step-by-step direction, simplifying calibrations and measurements.

### ● Microstrip devices

The 37200C/37300C series offers complete substrate measurement solutions for both microstrip and coplanar waveguide (CPW) designs. The 37200C/37300C series analyzers accommodate the model 3680 series Universal Test Fixtures (UTF), calibration kits, and verification kits. Guaranteed system specifications provide assurance that your test results are accurate and verifiable.

Completely characterize connectorless devices with the 37200C/37300C's Line-Reflect-Line (LRL) and Line-Reflect-Match (LRM) calibration capability. The four channel design provides true LRL/LRM error-correction giving you the highest performance available for in-fixture measurements. Highly reflective devices, along with well matched ones are measured with the same degree of ease. Automatic dispersion compensation improves measurement accuracy to help you determine phase distortions in all your microstrip designs. The result is quality measurements you can count on for your connectorless devices.

### ● E/O and O/E devices

The 37200C/37300C series incorporates a de-embedding function that simplifies VNA calibration when measuring E/O and O/E devices. Characterize the transfer function, group delay, and return loss of optical modulators (E/O) and photoreceivers (O/E).

An MN4765A O/E calibration module and a laser source are required to complete the test set-up. The internal VNA application de-embeds the response of the O/E calibration module to allow direct measurement of the modulator. For O/E measurements, use the O/E calibration module to characterize a modulator first, then use the modulator as the characterized reference to measure another photoreceiver.

### ● Antennas

Far field measurements are enhanced with the speed of taking data over GPIB, using the 37100C/37200C/37300C in fast CW mode. Rates of 0.8 ms/point can be achieved using internal triggering, 1.2 ms/point with external triggering, and 1.5 ms/point with GPIB triggering.

For near field measurements, internal buffer data collection is provided to allow saving active channel measurement data from multiple sweeps without having to synchronize and collect data at the end of each sweep. The 37100C/37200C/37300C can store up to 50,000 data point measurements, each consisting of two real and imaginary IEEE 754 4-byte floating point numbers.

## Specifications

Measurement capabilities	Number of channels	Four measurement channels
	Parameters	S <sub>11</sub> , S <sub>21</sub> , S <sub>12</sub> , S <sub>22</sub> , or user defined; analog voltage input; complex input and output impedance; complex input and output admittance; complex forward and reverse transmission
	Domains	Frequency domain, CW draw, and optional high speed time domain (Option 2A)
	Formats	Log magnitude, phase, log magnitude and phase, Smith chart (impedance), Smith chart (admittance), linear polar, log polar, group delay, linear magnitude, linear magnitude and phase, real, imaginary, real and imaginary, and SWR
	Data points	1601 maximum. System also accepts an arbitrary set of N discrete data points where $2 \leq N \leq 1601$ . CW mode permits selection of a single point.
	Reference delay	Can be entered in time or in distance. Automatic reference delay adds the correct electrical length compensation at the push of a button. Software compensation for the electrical length difference between the reference and test is accurate and stable since measurement frequencies are always synthesized.
	Reference offset	Magnitude and phase
	Markers	Six independent markers can be used to read out measurement data. In delta-reference mode, any one marker can be selected as the reference for the other five. Markers can automatically find critical filter parameters i.e. 3 dB bandwidth, loss, center frequency, shape factor and Q.
	Marker sweep	Sweeps upward in frequency between any two markers. Recalibration is not required during the marker sweep.
	Limits	Two limit lines per data trace to indicate test limits. Limits can be either single or segmented limits for testing devices pass-fail.
	Measurement dynamic range	Table 1 gives receiver dynamic range as the ratio of maximum signal level at Port 2 (or individual sampler input) to the noise floor.
	Data averaging	Averaging of 1 to 4096 averages per data point can be selected.
	IF bandwidth	Front panel switch selects four levels of IF bandwidth: 10 kHz, 1 kHz, 100 Hz and 10 Hz
Display capabilities	Display channels	1, 2, 3 or 4 channels can be displayed. Each channel 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.
	Display type	Color LCD, 8.5" diagonally, VGA display. Color of graticule, trace data and text are user definable.
	Trace overlay	Overlays two traces with the same graticule type on the same display
	Trace memory	A separate memory for each channel can be used to store measurement data for later display or subtraction, addition, multiplication or division.
	Scale resolution	Log mag: 0.001 dB, linear mag: 1 pU Phase: 0.01°, group delay: 0.001 ps Time: 0.001 ms, distance: 0.1 mm SWR: 1 pU Power: 0.05 dB
	Autoscale	Automatically sets resolution and offset to display measurement data on the full display
	Reference position	Settable to any graticule line
	Annotation	Type of measurement, vertical and horizontal scale resolution, start and stop frequencies and reference position
Vector error correction	Error correction models	Full 12-term, one-path two-port, reflection only, transmission response
	LRL/LRM	Line-Reflect-Line and Line-Reflect-Match calibration models are available for coaxial, microstrip and waveguide transmission lines.
Signal source capabilities	Source power level	Source power may be set from the 37100C/37200C/37300C front panel menu. Check table 2 for levels.
	Flat power correction	The 37100C/37200C/37300C corrects for test port power variations using an external power meter. Once the port power has been flattened, the power meter is removed and the signal source power level may be changed within the remaining power adjustment range.
	Multiple source control	Allows a user to separately control the frequency of two sources and receiver without need for an external controller. Source #1: 37200C/37300C internal source, or any 68000C, 69000B, or MG3690A synthesizer Source #2: Any 68000C, 69000B, or MG3690A synthesizer Receiver: 37200C/37300C internal receiver
	Internal 10 MHz time base stability	Standard (1 Hz resolution) With aging: $<1 \times 10^{-9}$ /day With temperature: $<5 \times 10^{-9}$ over 0° to 55°C
Hard copy	Printers	Select full screen, graphical, tabular data, and printer type. Compatible with most HP and Epson printers with a parallel (Centronics) interface
	GPIB plotters	Compatible with most HP and Tektronix plotters
	Disk file	Bitmap, S2P, text, tabular data, and HPGL
Storage	Internal memory	Ten front panel states (setup) can be stored and recalled from non-volatile memory locations.
	Internal hard disk drive	Store and recall instrument setups, calibration files and trace data files. All files are MS-DOS compatible.
	Internal floppy disk drive	Store and recall instrument setups, calibration files and trace data files from 3.5 inch 1.44 MB floppy disks. All files are MS-DOS compatible.
Remote programming	Interface	GPIB (IEEE 488.2)
	Addressing	Address can be set from the front panel and can range from 1 to 30.
	Transfer formats	ASCII, 32-bit floating point and 64-bit floating point
	Speed	150 kB/sec
	Interface function codes	SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP1, DT1, DC0, C0
General	Test ports	GPC-7, 3.5 mm, N-type, K, and V connectors supported
	Power requirements	85 to 240 V, 48 to 63 Hz, 540 VA maximum
	Dimensions	432 (W) x 267 (H) x 585 (D) mm (10.5 x 17 x 23 in)
	Mass	27 kg (60 lbs)
	Temperature	0° to 50°C (operate), -40° to 75°C (storage)

**Table 1a Dynamic range (37100C)**

Model	Frequency (GHz)	Max. signal into a <sub>x</sub> , b <sub>x</sub> (dBm)	Noise floor (dBm)	Receiver dynamic range (dB)	Source power (dBm, typical)
37147C	0.0225	-18	-122	104	10
	2	-12	-106	94	8
	20	-12	-103	91	5
37169C	0.0225	-18	-122	104	10
	2	-12	-106	94	8
	20	-12	-103	91	3
	40	-15	-100	85	-3

**Table 1b Dynamic range (37200C/37300C)**

Model	Frequency (GHz)	Max. signal into port 2 (dBm)	Noise floor (dBm)	Receiver dynamic range (dB)	Port 1 power (dBm, typical)	System dynamic range (dB)
37225C	0.04	+20	-70	90	0	70
	2	+3	-98	101	0	98
	13.5	+3	-98	101	0	98
37247C	0.04	+20	-70	90	0	70
	2	+3	-98	101	0	98
	20	+3	-96	99	0	96
37269C	0.04	+20	-70	90	0	70
	2	+3	-98	101	0	98
	20	+3	-95	98	-5	90
	40	+3	-93	96	-15	78
37277C	0.04	+20	-77	97	0	77
	2	+3	-105	108	+5	110
	20	+3	-97	100	-2	95
	40	+3	-95	98	-7	88
	50	+3	-87	90	-2	85
37297C	0.04	+20	-77	97	0	77
	2	+3	-105	108	+5	110
	20	+3	-97	100	-2	95
	40	+3	-95	98	-7	88
	50	+3	-87	90	-2	85
	65	+3	-77	80	-2	75
37325C	0.04	+30	-65	95	+5	70
	2	+30	-93	123	+5	98
	13.5	+30	-93	123	+5	98
37347C	0.04	+30	-65	95	+5	70
	2	+30	-93	123	+5	98
	20	+30	-91	121	+5	96
37369C	0.04	+30	-65	95	0	70
	2	+30	-93	123	+5	98
	20	+30	-90	120	0	90
	40	+30	-83	113	-7	76
37377C	0.04	+30	-77	107	0	77
	2	+30	-105	135	+5	110
	20	+30	-97	127	-2	95
	40	+30	-95	125	-7	88
	50	+30	-87	117	-2	85
37397C	0.04	+30	-77	107	0	77
	2	+30	-105	135	+5	110
	20	+30	-97	127	-2	95
	40	+30	-95	125	-7	88
	50	+30	-87	117	-2	85
	65	+30	-77	107	-2	75



**Table 2 Power range**

Model	Rated power (dBm)	Minimum power (dBm)	Resolution (dB)
37147C	+5	-15	0.05
37169C	-3	-23	
37225C	0	-20	
37247C			
37269C	-15	-27	
37277C	-7	-27	
37297C	-7	-19	
37325C	+5	-90	
37347C			
37369C	-7	-97	
37377C	-7	-87	
37397C	-7	-79	

## Ordering information

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

Model/Order No.	Name
	<b>Main frame</b>
37147C	Direct Access Receiver (22.5 MHz to 20 GHz)
37169C	Direct Access Receiver (22.5 MHz to 40 GHz)
37225C	Vector Network Analyzer (40 MHz to 13.5 GHz)
37247C	Vector Network Analyzer (40 MHz to 20 GHz)
37269C	Vector Network Analyzer (40 MHz to 40 GHz)
37277C	Vector Network Analyzer (40 MHz to 50 GHz)
37297C	Vector Network Analyzer (40 MHz to 65 GHz)
37325C	Vector Network Analyzer (40 MHz to 13.5 GHz)
37347C	Vector Network Analyzer (40 MHz to 20 GHz)
37369C	Vector Network Analyzer (40 MHz to 40 GHz)
37377C	Vector Network Analyzer (40 MHz to 50 GHz)
37397C	Vector Network Analyzer (40 MHz to 65 GHz)
	<b>Options</b>
Option 1	Rack mount kit with slides
Option 1A	Rack mount kit with handles
Option 2A	High-speed time (distance) domain capability
Option 4	External SCSI-2 hard disk drive compatibility (internal HDD removed)
Option 7A	Replaces universal K connector (standard) with universal GPC-7 (37200C/37300C only)
Option 7N	Replaces universal K connector (standard) with universal N-male (37200C/37300C only)
Option 7NF	Replaces universal K connector (standard) with universal N-female (37200C/37300C only)
Option 7S	Replaces universal K connector (standard) with universal 3.5 mm-male (37200C/37300C only)
Option 7K	Replaces universal V connector (standard) with universal K (m) (37277C/37297C/37377C/37397C models only)
Option 11	Reference loop extension cables (standard on 37300C series)
Option 12	Rear Panel IF Inputs (for 37x97C and 37x77C only). Required for upgrade to ME7808A Broadband VNA.
	<b>Calibration kits</b>
3650	SMA/3.5 mm Calibration Kit
Option 1	Adds sliding terminations
3651	GPC-7 Calibration Kit
Option 1	Adds sliding terminations
3652	K Connector Calibration Kit
Option 1	Adds sliding terminations
3653	Type N Calibration Kit
3654B	V Connector Calibration Kit with sliding terminations
36581NNF	AutoCal, N (m) to N (f), 40 MHz to 18 GHz
36581KKF	AutoCal, K (m) to K (f), 40 MHz to 20 GHz
36582KKF	AutoCal, K (m) to K (f), 40 MHz to 40 GHz

Model/Order No.	Name
	<b>Verification kits</b>
3663	Type N Verification Kit
3666	SMA/3.5 mm Verification Kit
3667	GPC-7 Verification Kit
3668	K Connector Verification Kit
3669B	V Connector Verification Kit
	<b>Test port cables</b>
3670A50-1	GPC-7 semi-rigid cable, 1 foot
3670A50-2	GPC-7 semi-rigid cable, 2 foot
3670K50-1	K connector semi-rigid cable, 1 foot
3670K50-2	K connector semi-rigid cable, 2 foot
3670V50-1	V connector semi-rigid cable, 1 foot
3670V50-2	V connector semi-rigid cable, 2 foot
3671A50-1	GPC-7 flexible cables, 25 in. (1 pair)
3671A50-2	GPC-7 flexible cables, 38 in.
3671S50-1	3.5 mm flexible cables, 25 in. (1 pair)
3671S50-2	3.5 mm flexible cables, 38 in.
3671K50-1	K connector flexible cables, 25 in. (1 pair)
3671K50-2	K connector flexible cables, 38 in.
3671V50-3	V connector flexible cable, 25 in. (1 pair)
3671V50-4	V connector flexible cable, 38 in.