

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 1 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, presenting flexible technical + commercial solutions and supplying a loan unit during warranty repair, if available.

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 at Aldermaston 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 40GHz 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 3 Zodiac House
Calleva Park
Aldermaston
Berkshire
RG7 8HN

T: 01183 800 800
F: 01183 800 804

Email: info@TestEquipmentHQ.com
Web: www.TestEquipmentHQ.com



Signal Generation

I/Q Modulation Generator R&S AMIQ03, AMIQ04, Simulation Software R&S WinIQSIM™

R&S AMIQ03: 4 M samples,

R&S AMIQ04: 16 M samples

**New approaches in the
generation of complex**

I/Q signals

Photo 43419-3



Brief description

I/Q Modulation Generators R&S AMIQ03, R&S AMIQ04 and Simulation Software R&S WinIQSIM™ open up new dimensions for the generation of I/Q signals. R&S AMIQ is a dual-channel modulation generator that has consequently been designed for use as an I/Q source. It is programmed and set with Software R&S WinIQSIM™. Alternatively, R&S AMIQ can be operated from a Vector Signal Generator SMIQ.

Each channel can store 4000000 (R&S AMIQ03) or 16000000 samples (R&S AMIQ04) respectively. Even at high symbol rates sequences of sufficient length can thus be generated. With clock frequencies of up to 100 Msample/s and a high amplitude resolution of 14 (up to 16 bits via digital I/Q output) bits, R&S AMIQ is the ideal source for any signal in the world of digital modulation.

An automatic amplitude/offset alignment as well as fine adjustment of the skew provide excellent symmetry of the two channels which previously was extremely difficult to attain with dual-channel ARB generators. The error vector can thus be minimized.

A typical application of R&S AMIQ and R&S WinIQSIM™ is not only to drive the I/Q inputs of a vector signal generator. This combination is also ideal for direct applications in the baseband, e.g. for testing I/Q modulators/demodulators.

Main features

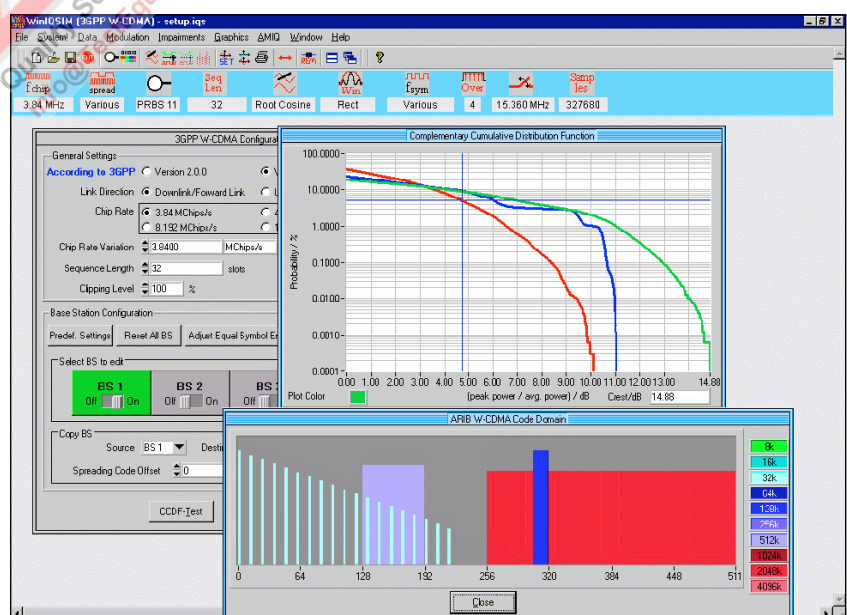
R&S AMIQ

- ◆ 14-bit resolution (up to 16 bits via digital I/Q output) or 16000000 samples (R&S AMIQ04) respectively
- ◆ 4000000 samples memory depth (R&S AMIQ03)
- ◆ 100 MHz sample rate

- ◆ Integrated hard disk and floppy disk drive
- ◆ Optional BER measurement
- ◆ Optional differential I/Q outputs
- ◆ Optional digital I/Q output

R&S WinIQSIM™

- ◆ Calculation of digitally modulated I/Q and IF signals
- ◆ Single-carrier, multicarrier and CDMA and WCDMA 3GPP signals
- ◆ Import of I/Q signals via DDE interface
- ◆ Versatile data editor
- ◆ Superposition/simulation of impairments
- ◆ Graphic display



Signal Generation

I/Q Modulation Generator R&S AMIQ03, AMIQ04, Simulation Software R&S WinIQSIM™

I/Q simulation software

Modulation methods like GMSK or $\pi/4$ DQPSK are used in mobile communication systems such as GSM (Global System for Mobile Communications) or NADC (North American Digital Cellular). These complex modulation modes are usually generated with the aid of an I/Q or vector modulator. The calculation and generation of the required baseband signals is of course quite complex.

R&S WinIQSIM™ is a Windows software allowing calculation of I and Q baseband signals. Its capabilities range from single-carrier modulation, generation of multi-carrier, CDMA and WCDMA signals through to TDMA frame configurations with the help of a convenient data editor. All modulation parameters and impairments can be simulated for single-carrier and multi-carrier as well as for CDMA signals. To put it in a nutshell: R&S WinIQSIM™ is an indispensable tool for anyone engaged in modern digital modulation.

Specifications in brief

R&S AMIQ

Output memory

Waveform length (data and markers)	
Clock rate mode 1 (10 Hz to 4 MHz)	24 to 4000000 samples in steps of one
Clock rate mode 2 (2 MHz to 100 MHz)	24 to 4000000 samples in steps of four
Amplitude resolution	14 bits (up to 16 bits via digital I/Q output) usable as marker or trigger
Marker channels	4
Marker outputs	4

Clock

Clock rate	internal/external 10 Hz to 100 MHz
Setting range (internal)	10 Hz to 105 MHz ¹⁾
Resolution (internal)	1×10^{-7}

Reference frequency

Internal reference output	
Frequency	10 MHz
Aging (after 30 days of operation)	1×10^{-5} /year
Temperature effect (0°C to 45°C)	$< 2 \times 10^{-6}$ /°C

Signal output

Number of outputs	2 (I and Q), 4 in conjunction with R&S AMIQ-B2 (I and Q additional)
Output impedance	50 Ω
Output voltage (V_p into 50 Ω)	
Fix mode	0.5 V, same for both channels
Variable mode	0 mV to 1 V, separately adjustable for each channel

Skew between I and Q channel (filter off, clock rate 10 MHz, fix mode)

Fine variation	± 1 ns typ.
Resolution	< 10 ps

Effective bits (sinewave 5 MHz, clock frequency 50 MHz, fix mode)	11 typ.
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Filters

Operating modes	off (no filter), internal or external
Internal filters	
25 MHz, elliptic, 7th order + delay equalizer	
Freq. response Amplitude	0.15 dB typ. up to 25 MHz
Group delay	500 ps typ. up to 20 MHz
2.5 MHz, elliptic, 7th order + delay equalizer	
Freq. response Amplitude	0.15 dB typ. up to 2.5 MHz
Group delay	5 ns typ. up to 2 MHz

Trigger

CONT mode	repetitive output of loaded waveform after occurrence of trigger
SINGLE mode	single output of loaded waveform after occurrence of trigger
GATED mode	start of (repetitive) waveform output after occurrence of trigger until end of trigger event
Trigger signal	via remote control or trigger input
Trigger input	BNC connector, selectable polarity
Input level	TTL
Marker outputs	4, BNC connectors
Level	TTL, terminatable with 50 Ω , high > 2 V

BER (option R&S AMIQ-B1)

Data supplied by the DUT can be compared with a nominal random bit sequence; the results are transferred to the host computer (via the currently used remote control)

Pseudo random bit sequences

2^9-1 , $2^{11}-1$, $2^{15}-1$, $2^{16}-1$, $2^{20}-1$,
 $2^{21}-1$, $2^{23}-1$

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I/Q Modulation Generator R&S AMIQ03, AMIQ04, Simulation Software R&S WinIQSIM™

Differential Outputs (Option R&S AMIQ-B2)

Supports additional inverted signals to I and Q and allows simultaneous overlapping of output signals with a DC level.

Digital I/Q Output (Option R&S AMIQ-B3)

Supports digital data for both channels I and Q (either 8 or 16 bits resolution)

Remote control and memory	IEC 625-2 (IEEE 488) and RS-232-C
Command set	SCPI 1996.0 with extensions
Mass memory	floppy disk drive (3.5", 1.44 MB), hard disk >3 GB

General data

Rated temperature range	0°C to +45°C; to IEC68-2-1 and IEC68-2-2
Storage temperature range	-40°C to +70°C
Power supply	90 V to 132 V (AC), 47 Hz to 63 Hz, 180 V to 264 V (AC), 47 Hz to 63 Hz, autoranging of AC supply, 150 VA
Dimensions (W x H x D)	427 mm x 88 mm x 450 mm
Weight	8.4 kg

R&S WinIQSIM™

User interface	Windows interface with context-sensitive help
Systems	single-carrier, IF signals up to 25 MHz, multicarrier, multicarrier mixed signal, up to 512 carriers with or without modulation, with variable power, WCDMA, IS-95
Modulation modes	
PSK	BPSK, QPSK, offset QPSK, $\pi/4$ DQPSK, 8PSK, 8PSK-EDGE; parameter: reference level, PSK rotation
QAM	16/32/64/256 QAM; parameter: reference level
FSK	MSK, 2FSK, 4FSK, GTFM; parameter: modulation index
User-specific modulation	0.1 to 12 GTFM, $b = 0$ to 1
Data editor	definition of TDMA data structures with power-time templates
Sequence length	1 to max. 4 M symbols/16 M symbols
Simulation of impairments and transfer characteristics	I/Q impairments, phase noise, band-pass, amplifier models, power ramping, multipath propagation, offset, additive interferers, receiver filters, quantization, smoothing
Graphic output	user-selectable scaling, zoom function, delta marker; display modes: i(t), q(t), r(t), phi(t), r(t), f(t), eye I, eye Q, eye F, vector diagram, constellation diagram, magnitude/phase/group delay spectrum, additional CCDF and ACP; display of code domain at WCDMA 3 GPP
Remote control of R&S AMIQ	download and starting of waveforms, hardware configuration, alignment and fine adjustment, file management

Digital standard IS-95 and CDMA2000

See also „Supplements to R&S SMIQ, R&S AMIQ and R&S WinIQSIM™, Digital standards IS-95 and CDMA2000“, PD 0757.5908

Simulation CDMA signals to North American standard IS-95 A and CDMA2000, available as software option R&S AMIQ11 of R&S AMIQ or software option SMIQK11 in conjunction with option SMIQB60 (arbitrary waveform generator of SMIQ)

IS-95

Chip rate	1.2288 Mcps
Standard	R&S AMIQ: 10 cps to 100 Mcps
Range	SMIQB60: 1 kcps to 40 Mcps

cdma2000

Chip rate	1.2288 Mcps (1X), 3.6864 Mcps (3X)
Standard	R&S AMIQ: 10 cps to 100 Mcps
Range	SMIQB60: 1 kcps to 40 Mcps
WCDMA TDD mode (3GPP)	Option R&S AMIQK13
	see www.rohde-schwarz.com

Carrier spacing	1.25 MHz
Standard	R&S AMIQ: 0 to 10 MHz
Variable	SMIQB60: 0 to 2 MHz

Ordering information

I/Q Modulation Generator

4 M samples	R&S AMIQ	1110.2003.03
16 M samples	R&S AMIQ	1110.2003.04

Accessories supplied

R&S WinIQSIM™, version for Windows 3.x and Windows 95/98/NT on CD; manual, power cable, operating manual

Options

BER Measurement	R&S AMIQ-B1	1110.3500.02
Differential I/Q Outputs	R&S AMIQ-B2	1110.3700.03
Digital I/Q output	R&S AMIQ-B3	1122.2103.02
Rear I/Q Outputs	R&S AMIQB19 ²⁾	1110.3400.02
IS-95 CDMA	R&S AMIQK11 ³⁾	1122.2003.02
Digital Standard CDMA2000	R&S AMIQK12 ³⁾	1122.2503.02
Digital Standard WCDMA TDD mode (3GPP)	R&S AMIQK13 ³⁾	1122.2603.02
Digital Standard TD-SCDMA	R&S AMIQK14 ³⁾	1122.2703.02
OFDM Signal Generation HIPERLAN/2	R&S AMIQK15 ³⁾	1122.2803.02
Digital Standard IEEE802.11B	R&S AMIQK16 ³⁾	1122.2903.02
Digital Standard 1XEV-DO	R&S AMIQK17 ³⁾	1122.3000.02

Extra

19" Rack Adapter	R&S ZZA-211	1096.3260.00
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- 1) Data at clock >100 MHz are not warranted, max. environment temperature 35 °C.
- 2) Marker outputs 3 and 4 not provided if this option is fitted, R&S AMIQ-B19 not suitable in conjunction with R&S AMIQ-B2.
- 3) WINIQSIM™ required.