RF RECORD & PLAYBACK
Wideband Signal

IQC91000A

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Detect. Analyze. Defeat.

Validate performance on the bench, in the chamber, or on the range with the IQC91000A Wideband RF Record & Playback system. Designed to record modern waveforms, the IQC91000A can continuously record 90 minutes of 1000 MHz wide waveforms with 12-bit fidelity.

Employing a holistic approach, the IQC91000A was designed to ensure the highest fidelity when recording RF signals by using top performing RF converters, digitizers and processing tools.

PRODUCT FEATURES

- 1000 MHz IQ record and playback bandwidth.
- 1 GHz to 18 GHz frequency coverage, 26.5 GHz and 40 GHz options available.
- 90 minutes of continuous record and playback time.
- High-speed data offload for post-processing in MATLAB® or other VSA tools.
- Sophisticated triggers and markers to time-tag and geo-tag signal events.
- Record only signals of interest and eliminate gaps with gated triggers.

APPLICATIONS

- Interference analysis
- Electronic warfare
- Surveillance
- Spectrum management
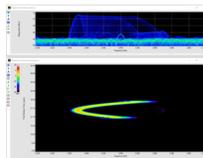- Forensics
- Design validation

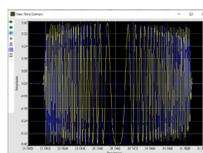| RECORD	SEARCH	ANALYZE	SIMULATE	PLAYBACK
100% capture, trigger, mark signals of interest	ID unique signatures and signal anomalies	Perform detailed signal analysis	Create new signal scenarios from real-world waveforms	Regenerate signals at carriers up to 44 GHz
IQC91000A	**SPECTRO-X**	**SPECTRO-X**	**RF EDITOR**	**IQC91000A**

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System Friendly Interfaces

Providing robust performance in the most complex environments.

High-speed recording systems create vast amounts of IQ data. The complexity of modern defense systems demands that test equipment integrate well into the test environment to verify performance under all modes of operation. This is especially true during early design phases where test equipment must act as surrogate prior to actual hardware availability.

The IQC91000A is designed to integrate into your test environment to record both metadata along with IQ data during system tests. This includes triggers to initiate and terminate recordings plus markers to time-tag and geo-tag signal events of interest. Additionally, you can leverage gated trigger capability to eliminate gaps and only record signals of interest. The PCIe Gen2 x8 interface allows rapid offload of recordings so you can begin post-processing in MATLAB® and other popular VSA tools.
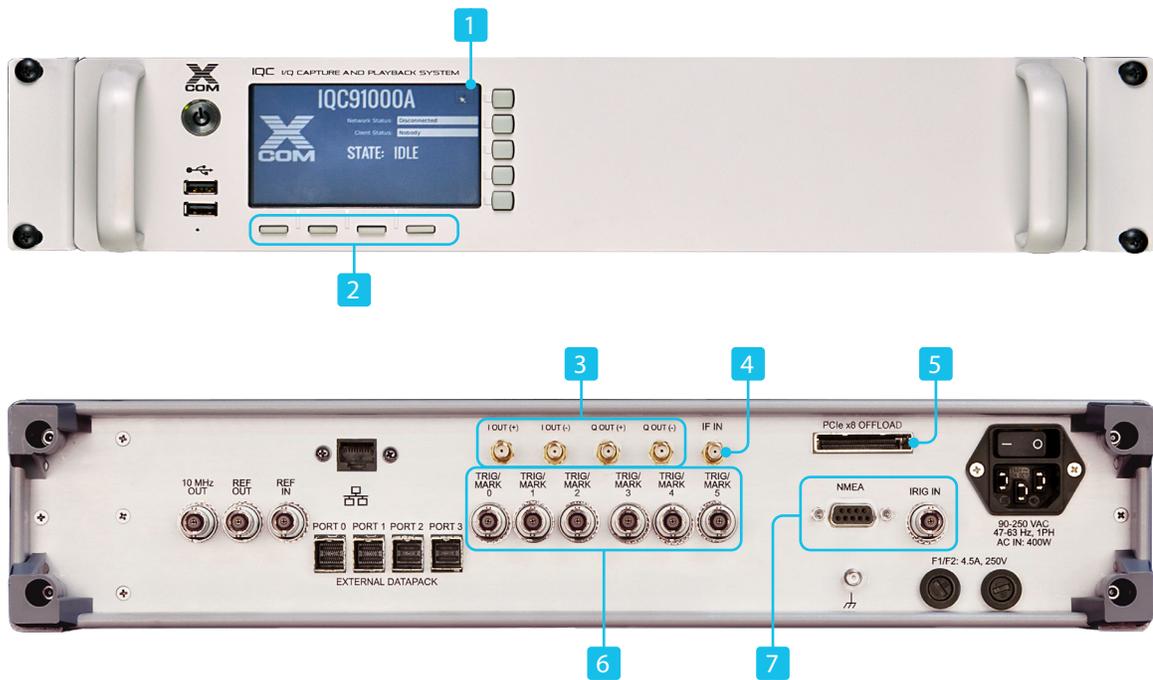
FRONT PANEL

1. Monitor spectrum events while recording
2. Configure network and instrument settings

BACK PANEL

3. Differential IQ outputs for vector up-conversion
4. IF Input from Bird® or 3rd party converters
5. Cabled PCIe interface for high speed offload to workstation
6. Synchronize operation with other system events
7. Correlate data to IRIG-B and GPS time and location

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## Compatibility with Third Party Converters

Designed for seamless operation with existing test equipment.

Base configuration of the IQC91000A comes with a microwave down converter to cover 1 GHz to 18 GHz, with options up to 40 GHz. However, the system is compatible with the Keysight® X-Series signal analyzers for down-conversion of signals up to 110 GHz. Replay of high-fidelity recordings is accomplished via industry-leading microwave upconverters such as the vector signal generator from Keysight Technologies® (E8267D). This product offers streaming RF up-conversion via their wideband IQ inputs to replay recordings at carriers up to 44 GHz.

Turning Data Into Action

Convert hours of attended spectrum monitoring into fast post-acquisition search, mark and measurement tasks-without programming.

Spectro-X can accelerate your time-to-insight by rapidly characterizing emitters and generating PDWs with its built-in search tools. For MATLAB® users, our 'xdatfile' class definition allows you to efficiently process blocks of IQ data and metadata without having to load the entire recording into the computing environment.
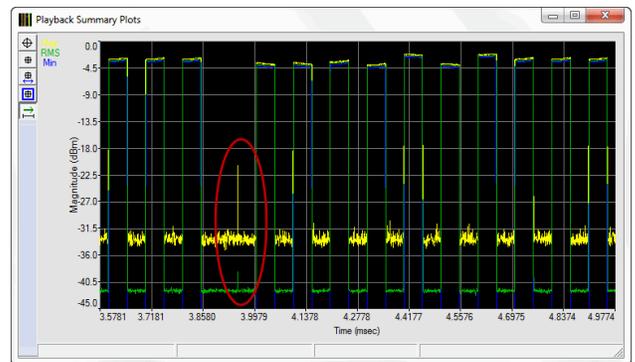
100% signal capture means users can identify design issues such as LO feedthrough, image responses and switching transients as shown in this photo.
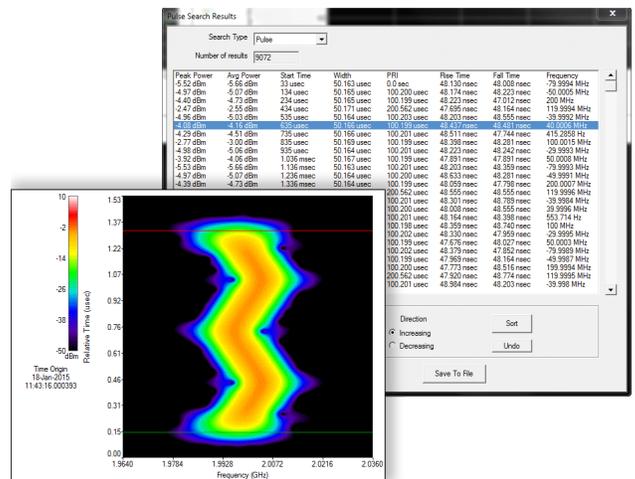
Spectro-X includes three search engines for locating and characterizing signals of interest. Shown here are the results of a Pulse Search with each of the PDWs computed along with the Spectrogram plot of each result.

IQC91000A

Specifications

RF RECORD INTERFACE - I&Q INPUTS

Each IQC91000A system includes:
(1) IQC91000A single channel signal recorder
(1) IQC90000A-101 analog differential baseband IQ outputs
(1) IQC90000A-DC5 down converter
(4) IQC90000A-MEM interface adapters to external disk storage units
(2) IQC90000A-S15 external RAID0 SSD external storage disks

SIGNAL RECORD

Recording Channels	1
Center Frequency	1 to 18 GHz
Record Bandwidth	1000 MHz @ 4 dB max
Frequency Tuning Resolution	1 kHz
Record Sample Rate	3.2 GS/s
Record Resolution	12 bits
Gain Adjustment Range	10 to 30 dB
Gain Adjustment Resolution	1.0 dB
Full-Scale Amplitude	+3 dBm, (input signal + gain)
1 dB Compression Point	-5 dBm typical, at + 15 dB gain
3rd Order Intercept Point	-5 dBm typical, at + 15 dB gain
Amplitude Flatness	±2 dB

Average Noise Level
  @ 1 GHz
  @ 4 GHz
  @ 10 GHz
  @ 16 GHz
	
	-160 dBm/Hz, with 30 dB gain
	-162 dBm/Hz, with 30 dB gain
	-160 dBm/Hz, with 30 dB gain
	-160 dBm/Hz, with 30 dB gain

Spurious Free Dynamic Range	>50 dB, with 0 dB gain
Noise Figure, **with 30 dB gain**	13 dB, 500 MHz – 7.9 GHz, 14 dB, 7.901 – 10.1 GHz 13 dB, 10.101 – 17.499 GHz 16 dB, 17.5 – 18.5 GHz
Input Connector	SMA Female
Input impedance	50 ohms
Input VSWR	<2.5:1
Recording modes	Manual, Timed, Triggered, Time of Day, Gated Record

DATA STORAGE

Capacity	30 TB, configured as two 15 TB RAIDs
Storage Time	90 minutes @ 1000 MHz BW
Data Format	Binary packed 12 bit signed integers, RAIDO formatted as EXT4
Data Offload Speed	>500 MB/s, subject to source computer and storage device
Data Offload Format	16 bit signed integers
Data Upload Speed	>150 MB/s via PCIeGen2 x8, subject to source computer and storage device
Data Upload Format	16 bit signed integers

SIGNAL PLAYBACK

Output Signal	TTL Logic Levels: 0 to 3.3, 5 maximum
Playback Bandwidth	1000 MHz, 500 MHz for I and 500 MHz for Q
Playback Sample Rate	1.6 GS/s each I and Q
Playback Resolution	12 bits
Amplitude, Full Scale	500 mVp-p differential
Amplitude Flatness	±2 dB
Number of Channels	1000 per marker input per marker edge
Output Connectors	SMA Female x4
Output Impedance	100 ohm differential
Playback Modes	Manual, Triggered

INPUTS & OUTPUTS

IF Input
  Connector
  Amplitude
  Center Frequency
	
	SMA Female
	+3 dBm full scale
	800 MHz

Reference Input
  Connector
  Amplitude
  Center Frequency
	
	BNC Female
	0 to +13 dBm
	10 MHz ± 100 Hz

Reference Output
  Connector
  Amplitude
  Center Frequency
	
	BNC Female
	+3 dBm nominal
	Equivalent to Reference Input

10 MHz Output
  Connector
  Amplitude
  Center Frequency
	
	BNC Female
	0 dBm, nominal
	10 MHz ± 20 Hz

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Specifications

TRIGGER

Connector	SMA Female
Functions	Start/Stop Record Start/Stop Playback
Impedance	10 kOhms
Input Level Range	0 to 5 V VIH (input on threshold) = 1.7 V (min) and VIL (input off threshold) = 0.7 V (max)
Over Voltage Protection	Overvoltage protection of +11 Volts and max undervoltage of -6 Volts
Record Latency	-25 ns
Record Uncertainty	±8 samples (±5 ns at full rate)
Gated Trigger Re-arm Time	20 ns

MARKER

Connector	SMA Female, can be used in either record or playback modes
Impedance	10 kOhms
Input Level Range	0 to 5 V VIH (input on threshold) = 1.7 V (min) and VIL (input off threshold) = 0.7 V (max)
Over Voltage Protection	Overvoltage protection of +11 Volts and max undervoltage of -6 Volts.
Latency	-25 ns @ 2.001 to 18 GHz -37 ns 0.5 to 2.0 GHz
Uncertainty	±8 samples (±5 ns at full rate) at all frequency bands
Marker Re-arm Time	20 ns
Total Available Per File	100000
Content	Date, time of day, latitude, longitude, elevation sample number
Timing Sources	IRIG-B122, GPS via NMEA sentences w/1 PPS Marker input, PC-Time

IRIG

Connector	BNC Female, can be used in either record or playback modes
Standard	IRIG-B122
Voltage Levels	Amplitude modulated, 3 Vpp, sine wave carrier
Over Voltage Protection	Overvoltage protection of +11 Volts and max undervoltage of -6 Volts.

GPS NMEA

Connector	9 pin D Female, can be used in either record or playback modes
Speed	4800 and 9600 baud
Supported Sentences	GPGGA, GPVTG, GPZDA
Protocol	ASCII, 8-bit data, one start and one stop bit, no parity

SYSTEM CONTROL & SYNCHRONIZATION

System Requirements (minimum)	Windows 7, 8, 8.1, 10, Server 2012, 64 bit, 8 GB RAM
System Requirements (recommended)	Option IQC90000A-WS1: Rack-mounted SigAnalyst Workstation, Dual Xeon, Quad-Core Workstation, 64GB RAM with 128 TB HDD Storage Archive (96 TB usable). RAID60.
Communication Interface Standard	LAN TCP/IP Interface
Communication Interface Speed	1000 Base-T
System Re-Arm Time	4 Seconds (without markers) when using API
Trigger Timing Uncertainty Between any Two IQC91000A Systems	±7.8ns Same 10 MHz reference and trigger signals must be applied to all IQC91000A systems

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Specifications

ENVIRONMENTAL

Conformity	Designed for compliance with test methods aligned with IEC 60068-2 and have humidity, shock, vibration, altitude, and power line condition levels similar to MIL-PRF-28800F Class 3.
Operating Temperature Range	0 ℃ to 35 ℃
Storage Temperature Range	-20 ℃ to +70 ℃
Altitude	Max 2000 m above sea level
Humidity	Max 80% non-condensing

DIMENSIONS

IQC91000A	3.5 in H x 16.5 in W x 19.5 in D
option IQC90000A-DC5	1.75 in H x 17 in W x 21.25 in D
option IQC90000A-MEM	1.75 in H x 12 in W x 10.5 in D
option IQC90000A-S15	3.5 in H x 16.5 in W x 17.75 in D
option IQC90000A-UC1	7 in H x 16.8 in W x 20.3 in D

WEIGHT

IQC91000A	22 lb
option IQC90000A-DC5	13.5 lb
option IQC90000A-MEM	5 lb for each unit
option IQC90000A-S15	14 lb for each unit
option IQC90000A-UC1	54 lb

POWER

System Warm Up Time	30 minutes
IQC91000A	100/120 or 220/240 VAC, 50/60 Hz, 400 W max
option IQC90000A-DC5	100/120 or 220/240 VAC, 50/60 Hz, 30 W max
option IQC90000A-MEM	100/120 or 220/240 VAC, 50/60 Hz, 72 W max for each unit
option IQC90000A-S15	100/120 or 220/240 VAC, 50/60 Hz, 130 W max
option IQC90000A-UC1	100/120 or 220/240 VAC, 50/60 Hz, 650 W max

Ordering Information

IQC91000A MODEL OPTIONS

IQC91000A	1000 MHz single channel signal recorder with 800 MHz IF input and maximum digital IQ output rate of 4.8 GB/sec. Includes 4ea IQC90000A-MEM adapters with rack mounts, Control SW and documentation on CD.
IQC90000A-DC2	3.6 GHz to 26.5 GHz down-converter with 700 MHz bandwidth centered at 800 MHz IF output.
IQC90000A-DC5	1 GHz to 18 GHz down-converter with 1000 MHz bandwidth centered at 800 MHz IF output.
IQC90000A-101	Adds analog differential baseband IQ outputs for playback (4ea SMA female), 1000 MHz IQ bandwidth.

MEMORY INTERFACE MODULE

IQC90000A-MEM	Interface Adapter to RAID0 external disk storage units. Four option MEM units are required per IQC90000A system

STORAGE OPTION

IQC90000A-S15	External RAID0 SSD external disk storage. Two data packs required per system for a total of 90 minutes storage at 1000 MHz bandwidth.

CONVERTER OPTIONS

IQC90000A-UC1	500 MHz to 18 GHz up-converter with differential IQ inputs for 1000 MHz output at carriers up to 18 GHz. Includes rack mount kit.
IQC90000A-UC2	500 MHz to 40 GHz up-converter with differential IQ inputs for 1000 MHz output at carriers up to 40 GHz. Includes rack mount kit.

WARRANTY OPTIONS

IQC90000A-EX1	Extends factory warranty of IQC90000A by one additional year
IQC90000A-EX2	Extends factory warranty of IQC90000A by two additional years
IQC90000A-EX3	Extends factory warranty of IQC90000A by three additional years
IQC90000A-EX4	Extends factory warranty of IQC90000A by four additional years

WORKSTATION OPTIONS

IQC90000A-WS1	Rack-mounted SigAnalyst Workstation -Dual Xeon, Quad-Core Workstation, 64GB RAM with 128 TB HDD Storage Archive (96 TB usable).
IQC90000A-WS2	Rack-mounted SigAnalyst Workstation - Dual Xeon, Quad-Core Workstation, 64GB RAM with 128 TB HDD Storage Archive (96 TB usable), Spectro-X and RF Editor software packages.
IQC90000A-ENL	Rack enclosure to house IQC90000A, down converter, 2ea solid state data packs, upconverter, workstation, storage archive and power distribution.

SOFTWARE OPTIONS

WC-RF-EDITOR	RF Editor Signal Generation software
Spectro-X	Spectro-X Advanced Signal Analysis software

TRAINING OPTION

IQC90000A-TRN	Daily rate for onsite training and consulting by Bird Applications Engineer

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