

IZT R3301

Portable Monitoring Receiver and RF Recorder

- Portable design with touch display
- Excellent RF performance
- 9 kHz to 18 GHz frequency range
- 25 MHz real-time bandwidth
- Many hours of continuous RF recording
- Swappable data storage
- Wide range power supply with built-in UPS
- Built-in GPS reference time source



IZT R3301

Portable Monitoring Receiver and RF Recorder

The IZT R3301 RF sensor is a portable receiver with built-in sensor controller for running software applications and storing signal data. It is optimized for recording RF signals in mobile and portable applications. The outstanding RF performance and signal processing matches the professional IZT R3000 receiver series.

The IZT R3301 has an integrated sensor controller, data storage, a wide range DC supply with UPS and a built-in GPS module.

The frequency range is scalable from 9 kHz to 18 GHz and its real-time bandwidth is supporting continuous I/Q recording of up to 25 MHz.

The system is designed to produce good signal quality under challenging dynamic range conditions and has successfully passed many rigorous technical evaluations.

Overview

The IZT R3301 is suitable both for mobile operation and in the lab. The device operates with both 11 VDC to 30 VDC and AC power supply. The power consumption in standard I/Q recording operation at full bandwidth is approximately 125 watts. An integrated uninterruptible power supply supports continuous operation for up to one hour. With its weight and compact size the IZT R3301 is the preferred means for recording RF signals in mobile applications.

Four terabytes of storage space can record up to 25 MHz bandwidth over eight hours with 16 bit resolution on four 2.5" HDDs or SSDs. Multiple narrow band channels can be recorded as well. The equipment is shielded for minimum RF emissions and optimized for operation onboard a vehicle.

The IZT R3301 RF sensor integrates one 1 Gbit Ethernet interface, one 10 Gbit optical Ethernet interface and a SSD system drive with additional four 2.5" storage media slots for signal recordings. It can be fully synchronized and provides an integrated GPS receiver.

Multiple units can be interconnected for synchronous multi-channel recording or reception with the Synchronization Kit R3301-SNC. In this case multi-channel signals could be either coming from different antennas at the same phase coherent center frequency and bandwidth or coming from different frequency bands.

Key Features

SENSOR HARDWARE

With its very high dynamic range and excellent phase noise this RF sensor platform is the ideal solution for the needs of modern digital modulation standards.

The IZT R3301 is characterized as follows:

- Portable design
- Continuous I/Q data recording
- Swappable RAID system (Figure 5)
- Built-in GPS for embedded location information
- 10 V DC to 30 V DC power supply
- 100 V AC to 240 V AC supply with built-in UPS
- Touch screen control
- Synchronization interface (Figure 6)
- Low RF emissions
- Built-in high-end IZT R3000 Receiver technology)

Monitoring and configuration of the unit can be carried out remotely with Windows Remote Desktop (RDP) via 1 Gbit Ethernet interface from an externally connected PC or Notebook.



FIGURE 1: IZT R3301 RF SENSOR

Your Benefits

HIGH QUALITY RECEIVER TECHNOLOGY

The outstanding RF performance of the integrated IZT R3000 receiver technology is based on a very modern and market proven receive system with excellent reception at very good signal quality.

The integrated IZT R3000 receiver is characterized as follows:

- 9 kHz to 3 GHz frequency range
- Frequency range upgradeable up to 18 GHz
- Real-time bandwidth up to 25 MHz
- Very low phase noise
- High linear RF frontend for excellent IP3 performance
- Pre-selector filter bank guarantees best IP2 performance
- Additional digital filtering
- IF Filter bandwidth: 6.25 kHz to 25 MHz
- 1 Hz tuning resolution
- Multi-channel recording of up to 4 different sub-bands



FIGURE 2: EASY RAID STORAGE SWAPPING

MOBILE

The portable design of the R3301 enables usage in different environments and an easy transportation to various applications in open fields. If there are use cases which require high mobility and easy carrying, the compact IZT R3301 will be the perfect choice.

25 MHZ REAL-TIME BANDWIDTH

The innovative IZT Signal Suite software for the IZT R3000 receiver family allows continuous I/Q recording of up to 25 MHz real-time bandwidth, including smooth spectrum/spectrogram display and storage of the PSD spectrum and the CBB I/Q data stream to files. The 25 MHz real-time bandwidth is fully supported by IZT signal analysis modules and post-processing applications such IZT Viewer and IZT Data Processor.

BUILT-IN UPS AND GPS

The wide range DC power supply provides easy connection to electrical systems in the field or in mobile applications. With its built-in uninterruptable power supply (UPS) it is robust against undervoltage and surge problems caused by the power source, for example from the electrical system of a vehicle.

Depending on options a built-in GPS receiver can be used for location tracking and as a reference time source.



FIGURE 3: EXTERNAL INTERFACES FOR POWER SUPPLY, LAN, GPS ANTENNA AND SYNCHRONIZATION

Applications

COMPATIBLE WITH IZT SIGNAL SUITE APPLICATIONS

The IZT R3301 perfectly works together with IZT Signal Suite software solutions. Various plug-in modules such as Panorama Scan, Persistence Display, Mask Triggered Recording, Long-term Spectrogram Recording, Time Scheduled Recording, signal analysis and decoding or Modulation Recognition of various modulation schemes can be added to the I/Q wideband recorder application 'RF Recorder R3000'.

UNATTENDED MONITORING AND RECORDING

Typical applications for the IZT R3301 are continuous RF recording to storage with FIFO buffer, spectrum monitoring for broadcast stations and mobile communication measurements (e.g. DAB or Cellular standards).

GNSS MONITORING AND INTERFERER CAPTURE

The system is a perfect platform for long-term GNSS (Global Navigation Satellite System) spectrum band monitoring and automated selective high-dynamic range I/Q data capture: trigger events caused by interferers defined by spectrum mask criteria are automatically starting the wideband I/Q recording process of both the interferer itself and the GNSS services.

MODULATION RECOGNITION

IZT Modulation recognition (ModRec) is an innovative software feature of IZT Signal Suite for signal analysis. Segmentation, which means dividing the broadband spectrum up into individual signals, can be done either manually by the user or automatically by the software.

In radio monitoring and intelligence there is a demand for sophisticated signal analysis techniques in order to detect, classify or demodulate radio signals. For the purpose of achieving this goal, IZT ModRec provides powerful signal analysis techniques for detecting and classifying known and unknown signals.

TRIGGER-CONTROLLED SIGNAL CAPTURE

Triggered recording allows capturing signals with adjustable pre-recording and adjustable follow-up time. The trigger event can be defined by power limits exceeding spectrum masks, captured reference traces with adjustable offset, manually by pressing the recording button or by an external trigger pulse.

GPS AND VIDEO CAMERA INTERFACE

A GPS Interface gives access to NMEA location information which is part of the embedded metadata inside the recorded I/Q data streams. This allows visualization of the sensor setup in a map while post-processing the recording with 'Viewer' or 'Data Processor' application.

A Video Camera Interface supports synchronous recording and replay of IP based video camera data. This allows capturing additional terrain information like traffic situation, building density, and weather conditions in addition to the GPS location information.

MULTI-SENSOR SETUPS

Multiple IZT R3301 sensors can be synchronized for handling phase coherent and frame synchronous recordings from multiple antenna channels at the same center frequency or synchronous recording from multiple antenna inputs at different center frequencies. A synchronized setup can also be arranged with a combination of different RF sensors based on the IZT R3000 receiver family or the IZT R4010.



FIGURE 4: IZT R3302 SENSORS AND IZT R4010 ARE COMPATIBLE WITH R3301 SENSORS

Specifications IZT R3301 RF Recorder

Technical Specifications		
Frequency range	HF	9 kHz – 30 MHz ¹⁾
	VUHF	20 MHz – 3 GHz ²⁾
Conversion concept	9 kHz – 30 MHz ¹⁾ (HF)	Direct sampling
	20 MHz – 3 GHz ²⁾ (VUHF)	Double superheterodyne conversion
RF input	Impedance	50 Ohm
Maximum input power	HF	+20 dBm, +30 dBm with input attenuator active
	VUHF	+15 dBm
Tuning resolution	HF, VUHF	1Hz
VSWR	HF, VUHF	< 2.1
Tuning accuracy	HF, VUHF	< 0.2 Hz
Reference frequency	HF, VUHF	10 MHz internal/external
Internal reference frequency	HF, VUHF	< 1 · 10 ⁻⁷
Input sensitivity	HF: 100 kHz – 30 MHz	-120 dBm @ 3 kHz BW
	@ S/N = 10 dB	-111 dBm @ 25 kHz BW
	VUHF: 20 MHz – 3 GHz	-114 dBm @ 3 kHz BW
	@ S/N = 10 dB	-105 dBm @ 25 kHz BW
Oscillator phase noise	HF	-92 dBm @ 500 kHz BW
		-130 dBc/Hz typical @ 1 kHz offset
		-140 dBc/Hz typical @ 10 kHz offset
Sweep time	HF, VUHF	< 3 ms typical
	Scanning speed	HF, VUHF
Input IP3	HF	+40 dBm, typical
	VUHF	+24 dBm, typical (low distortion mode)
		+13 dBm, typical (normal mode)
Noise figure	HF	9 dB typical
	VUHF	10 dB, typical (low noise mode)
		15 dB, typical (normal mode)
IF rejection	HF	not applicable
	VUHF	> 120 dB typical
Image rejection	HF	not applicable
	VUHF	> 110 dB typical
Oscillator reradiation at antenna input	HF	not applicable
	VUHF	< -110 dBm
Preselector	HF	12-band
	VUHF	11-band
IF bandwidth	HF, VUHF	6.25 kHz – 24 MHz

¹⁾ DEGRADED PERFORMANCE: 9 KHZ – 500 KHZ

²⁾ DEGRADED PERFORMANCE: 20 MHZ – 30 MHZ

Signal processing	
Data representation	Data format: 16/32 bit I/Q with embedded IZT CBB metadata information
Output sample rate	variable up to 30 MS/s
Data storage	4 x 2.5" SATA HDD or SSD, removable tray; 4 TB RAID system by default
Recording modes	Stand-alone / diversity and multi-frequency (with second unit and Synchronisation Kit)
Gain control	AGC fast/slow with adjustable ADC backoff and deadband, MGC

Interfaces		
Antenna input	HF, VUHF	N, female, 50 Ω
Data storage system	SATA tray	4 x 2.5" HDD or SSD, 9.5 mm height, removable
Ethernet	1 Gbit Ethernet	RJ45, CAT 6
	10 Gbit Ethernet, optical	LC-Duplex , 10 Gbit fiber optical
USB	2 x USB 3.0	
GPS antenna	Input	SMA, female, 50 Ohm
	Active biasing	< 60 mA @ 3 V DC
Synchronization	Input	3 x SMA, female, 50 Ω (DCLK, 2 VUHF LO)
	Output	3 x SMA, female, 50 Ω (DCLK, 2 VUHF LO)
Trigger pulse	Input	SMA, female, CMOS 3.3 V (5 V tolerant input)
	Output	SMA, female, CMOS 3.3 V
Reference input	10 MHz	SMA, female, 50 Ω
Remote control	Proprietary Connector	D-SUB 9, female

General data	
Operating temperature	5°C to +40°C
Storage temperature	-20°C to +60°C
Humidity	Max. 85%, non-condensing
EMI / EMC	CISPR 22 / CISPR 25 (EN 55022 / EN 55025)
MTBF	> 70.000 hrs
Power supply	AC: 100 V – 240 V, 47 Hz – 63 Hz, 240 VA, DC: 10 V – 30 V, approx. 125 W
	UPS: Li-Ion, 99,9 Wh; approx. 25 min. recording, 40 min. measurement
Dimensions (WxHxD)	450 mm x 347 mm x 234 mm
Weight	Approx. 17 kg
Operating system	Windows 10 (64 bit)
Integrated hard disk	System disk SSD 250 GB
Internal memory	16 GB

Frequency Range Extension	IZT R3301-RF6	IZT R3301-RF18
Frequency range	3 GHz – 6 GHz	3 GHz – 18 GHz
RF input	50 Ohm ³⁾	50 Ohm
Maximum input power	+15 dBm	+10 dBm
VSWR	< 2.1	< 2.1
Oscillator phase noise	-120 dBc/Hz typical @ 10 kHz offset	-114 dBc/Hz typical @ 10 kHz offset
Sweep time	< 3 ms typical	10 ms
Scanning speed	> 4 GHz/s, linear	> 1.5 GHz/s, linear
	> 175 GHz/s, within 25 MHz bandwidth	> 175 GHz/s, within 25 MHz bandwidth
Input IP3	+18 dBm (normal mode)	+25 dBm (low distortion mode)
	+2 dBm (low noise mode)	+15 dBm typical (low noise mode)
Noise figure	7 dB, typical (low noise mode, LNA on, maximum gain)	15 dB typical (low noise mode)
	17 dB, typical (normal mode, LNA off, maximum gain)	23 dB, typical (normal mode, LNA off, maximum gain)
IF rejection	> 120 dB typical	> 120 dB typical
Image rejection	> 110 dB typical	> 110 dB typical
Oscillator reradiation	< -110 dBm	< -110 dBm
Preselector filter	8-band	Tracking bandpass filter

³⁾ THE RECEIVER'S VUHF ANTENNA INPUT IS USED, ELECTRONIC RF INPUT SWITCH. SPECIFICATION SUBJECT TO CHANGE WITHOUT FURTHER NOTICE.

Ordering Guide

Hardware options		
IZT R3301	IZT R3301-CHS	Receiver Chassis with built-in Sensor Controller
	IZT R3301-SNC	Synchronization Kit for synchronizing two IZT R3301 recording units
	IZT R3301-TCS	Transport Case for shipping with trolley function
	IZT R3300-SDD	Solid State Data Disk 1 TB SSD, up to 4x for IZT R3301/R3302
	IZT R3300-GSR	GPS Synchronous Reference Clock
	IZT R3000-HF	HF Frontend frequency range 9 kHz – 30 MHz
	IZT R3000-RF3	VUHF Frontend frequency range 20 MHz – 3 GHz
	IZT R3000-RF6	Frequency Range Extension 3 GHz – 6 GHz for VUHF Frontend
	IZT R3000-RF18	Frequency Range Extension 3 GHz – 18 GHz for VUHF Frontend
	IZT R3000-OCX	Oven Stabilized Reference Oscillator
	IZT R3000-BST	Bias-T ¹⁾
	IZT R3000-AAI-RF5	3x3 Antenna Switch (one of up to three RF inputs is switched electronically to one of the built-in RF front-ends by software)
IZT A1000 External accessories	IZT A1000-CAM	IP Camera Kit (requires IZT SignalSuite-274)

¹⁾ CAN NOT BE COMBINED WITH OPTION R3000 AAI-RF5

IZT RF Recorder Software options		
Applications	IZT SignalSuite-800	GUI Base R3000
	IZT SignalSuite-810	RF Recorder R3000 – 25 MHz
	IZT SignalSuite-820	Viewer
	IZT SignalSuite-830	Data Processor
Enhanced software options	IZT SignalSuite-130	Panorama Scan
	IZT SignalSuite-190	COM-SDK
	IZT SignalSuite-220	Time Scheduled Recording
	IZT SignalSuite-230	Long-term Spectrogram Recording
	IZT SignalSuite-240	Mask Triggered Recording
	IZT SignalSuite-242	Pre-recording
	IZT SignalSuite 250	Persistence Display
	IZT SignalSuite-260	Signal Import/Export
	IZT SignalSuite-262	Signal Extraction
	IZT SignalSuite-270	GPS Interface
	IZT SignalSuite-274	Video Camera Interface
	IZT SignalSuite-310	Time Shift Signal Access
	IZT SignalSuite-510	Sensor Synchronization
	IZT SignalSuite-520	Communication Interface
Analysis & demodulator plug-ins	IZT SignalSuite-600	RDS Demodulator
	IZT SignalSuite-610	DAB/DAB+ Demodulator
	IZT SignalSuite-630	CellularBase Analysis – bundle (GSM/UMTS/LTE)
	IZT SignalSuite-650	Signal Segmentation
	IZT SignalSuite-660	Modulation Analyzer
License Management	IZT A1000-CMB	Metal Case USB Dongle for using IZT Signal Suite options on Win7 or Win10 based systems
	IZT A1000-CMC	Compact Robust USB Dongle for using IZT Signal Suite options on Win7 or Win10 based systems

IZT Service	
IZT WE2	Warranty Extension to 2 years
IZT WE3	Warranty Extension to 3 years
IZT Software Support Contract	Support for IZT software options
IZT Training	IZT Training Course
IZT R3000-CLC	Factory Calibration
IZT R3000-CAL	Accredited ISO Calibration

IZT R3301

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About IZT The Innovationszentrum fuer Telekommunikationstechnik GmbH IZT specializes in the most advanced digital signal processing and field programmable gate array (FPGA) designs in combination with high frequency and microwave technology.

The product portfolio includes equipment for signal generation, receivers for signal monitoring and recording, transmitters for digital broadcast, digital radio systems, and channel simulators. IZT offers powerful platforms and customized solutions for high signal bandwidth and real-time signal processing applications. The product and project business is managed from the principal office located in Erlangen/Germany. IZT distributes its products worldwide together with its international strategic partners. The IZT quality management system is ISO 9001:2015 certified.

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