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IZT
Innovationszentrum
Telekommunikationstechnik

IZT R3410 / IZT R3411
Ruggedized Monitoring Receiver and RF Recorder

- Portable & rugged design for harsh environments
- Excellent RF performance
- 9 kHz to 18 GHz frequency range
- 25 MHz real-time bandwidth
- Many hours of continuous RF recording

IZT R3410 / IZT R3411
Ruggedized Monitoring Receiver and RF Recorder

IZT R3410 / IZT R3411 ist 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.

Offering the same RF performance as the IZT R3000 Receiver Family the IZT R3410 / IZT R3411 is further optimized for the usage in rough mobile environments. 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.

FIGURE 1: IZT R3411 RUGGEDIZED RF RECEIVER AND RF RECORDER

Overview

The IZT R3410 / IZT R3411 is suitable for outdoor operation in a temperature range of 0°C to + 55°C. The device operates with 24 VDC or even 7.5 VDC to 30 VDC with option R3410-DCW and can also be supplied by an external AC adapter.
The power consumption in standard I/Q recording operation at full bandwidth is approximately 85 watts. With its weight and compact size the IZT R3410 / IZT R3411 is the preferred means for recording RF signals in the field and in frequently changing environments.
One terabyte storage space can record 25 MHz bandwidth on the built-in 2.5" 1TB SSD for more than two hours with 16 bit resolution. Multiple narrow band channels can be recorded as well.
The IZT R3410 / IZT R3411 RF receiver perfectly fits to various external hardware equipment and software features. Examples are the IP Camera Kit or the External GPS Receiver for NMEA location information.

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 R3410/P1010 and IZT R3411/P1010 sensor is characterized as follows:

- Portable, rugged receiver design:
  IZT R3410: 423.5 mm x 233.0 mm x 79.0 mm, approx. 7 kg
  IZT R3411: 300.0 mm x 233.0 mm x 79.0 mm, approx. 5 kg
- High-end IZT R3000 receiver technology
- Supporting continuous I/Q data recording with up to 25 MHz
- Data storage system for about 2 hours continuous recording @ 30 MS/s (2.5 hours @ 24MS/s) in 1TB storage configuration
- 24 V DC or AC power supply
  (optional 7.5 V to 30 V DC power supply for IZT R3410)
- Low RF emissions

Monitoring and configuration of the system can be carried out remotely from an externally connected PC via Windows Remote Desktop (RDP) by connecting to a second 1Gbit Ethernet interface at the sensor controller notebook.

FIGURE 2: IZT R3410 WITH EXTERNAL SENSOR CONTROLLER SHOWING MULTIPLE DAB SIGNALS

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 6 GHz or 18 GHz
- Real-time bandwidth up to 25 MHz (30 MS/s)
- Very low phase noise
- Highly linear RF frontend for excellent IP3 performance
- Pre-selector filter bank guaranties best IP2 performance
- Additional high-class digital filtering
- IF Filter bandwidth: 6.25 kHz to 25 MHz
- 1 Hz tuning resolution
- PSD spectrum with adjustable averaging
- I/Q data with embedded Metadata (Rx configuration & status information)
- Multi-signal recording of up to 4 different vRx sub-bands simultaneously

RUGGED AND MOBILE

The portable design of the IZT R3410 / IZT R3411 enables usage in different environments and an easy transportation to various applications in open fields. If there are use cases which require high robustness, the display-less rugged IZT R3410 / IZT R3411 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.

COMPACT AND LIGHT-WEIGHT

The compact variant of the sucessfull IZT R3000 series combines a limited weight of under 7 kg with a fanless design suited for harsh environments while maintaining the excellent RF performance. Additionally the power consumption of the IZT R3410 / IZT R3411 stands out. The receivers need only 24 to 72 watts, depending on hardware options.

GPS LOCATION TRACKING

The external GPS receiver IZT A1000-GPS can be used for location tracking as part of the recorded I/Q metadata and as reference time source.

FIGURE 3: EXTERNAL IZT R3410 INTERFACES FOR RF CONNECTORS, SYNCHRONIZATION, SERVICE, POWER SUPPLY AND ETHERNET

FIGURE 4: EXTERNAL GPS RECEIVER FOR NMEA LOCATION INFORMATION

Applications

COMPATIBLE WITH IZT SIGNAL SUITE APPLICATIONS

The IZT R3410 / IZT R3411 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, decoding and 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 R3410 / IZT R3411 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 'IZT Viewer' or 'IZT 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 R3410 / IZT R3411 based sensors can be synchronized for handling 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.

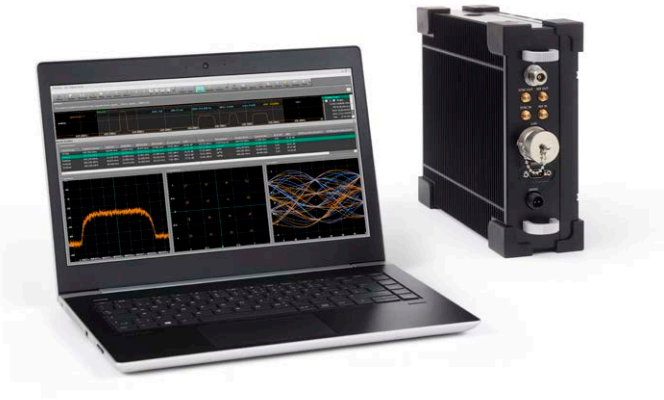

FIGURE 5: IZT R3410 WITH EXTERNAL SENSOR CONTROLLER SHOWING MODULATION ANALYZER RESULTS

Specifications IZT R3410 / IZT R3411

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	$< 1 \cdot 10^{-7}$
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
		-92 dBm @ 500 kHz BW
Oscillator phase noise	HF	-130 dBc/Hz typical @ 1 kHz offset
		-140 dBc/Hz typical @ 10 kHz offset
	VUHF	-120 dBc/Hz typical @ 10 kHz offset
Sweep time	HF, VUHF	< 3 ms typical
Scanning speed	HF, VUHF	> 4 GHz/s, linear
		> 175 GHz/s, within 25 MHz bandwidth
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	> 120 dB typical
Oscillator reradiation at antenna input	HF	not applicable
	VUHF	< -110 dBm
Preselector	HF	12-band
	VUHF	11-band
IF bandwith	HF, VUHF	6.25 kHz – 25 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
Recording modes	Stand-alone and multi-frequency (with second unit and External Synchronization Interfaces)
Gain control	AGC fast/medium/slow with adjustable ADC backoff and deadband, MGC

Interfaces		
Antenna input	RF1 to RF3 [3]	N, female, 50 Ω
Trigger pulse [3]	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
Reference output	10 MHz	SMA, female, 50 Ω

General data	IZT R3410	IZT R3411 VUHF	IZT R3411 HF
Operating temperature	0°C to +55°C	0°C to +55°C	0°C to +55°C
Storage temperature	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C
Humidity	max. 85%, non-condensing	max. 85%, non-condensing	max. 85%, non-condensing
EMI / EMC	EN 61010-1:2002	EN 61010-1:2002	EN 61010-1:2002
	EN 61000-6-2:2002	EN 61000-6-2:2002	EN 61000-6-2:2002
	EN 61000-6-3:2002	EN 61000-6-3:2002	EN 61000-6-3:2002
Power supply	90 V – 264 V	90 V – 264 V	90 V – 264 V
	DC: 24 V or DC: 7.5 to 30 V with option R3410-DCW	DC: 24 V	DC: 24 V
	Max. power input: 72 W [4] Typ. power input: 55 W [5]	Max. power input: 43 W	Max. power input: 24 W
	External AC/DC adapter included	External AC/DC adapter included	External AC/DC adapter included
Dimensions (WxHxD)	423.5 mm (excl. grips) x 233.0 mm x 79.0 mm	300.0 mm (excl. grips) x 233.0 mm x 79.0 mm	300.0 mm (excl. grips) x 233.0 mm x 79.0 mm
Weight	6.8 kg [3]	4.9 kg	4.5 kg

[3] DEPENING ON OPTIONS
[4] ONLY WITH FULLY EQUIPPED FRONTENT COVERING 9 KHZ TO 18 GHZ
[5] WITH FRONTEND COVERING 9 KHZ TO 3 GHZ @ 230 V

Frequency Range Extension	IZT R3000-RF6	IZT R3000-RF18
Frequency range	3 GHz – 6 GHz	3 GHz – 18 GHz
RF input	50 Ohm [6]	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

Sensor Controller	IZT P1010	
Operating system	Windows 10 (64 bit)	
Integrated system disk	SSD 512 GB	
Data storage	Built-in 2.5” SATA storage	1 TB SSD by default (optional 2 TB or 4 TB)
Internal memory	16GB	
CPU	Intel Core i7-8565U	
Graphic	Intel UHD Graphics 620	
Interfaces	Ethernet	1x 1 Gbit Ethernet RJ45 1x 1 Gbit Ethernet RJ45 via USB 3.0-to-Ethernet connector
	USB	1 x USB 2.0, 2 x USB 3.0, 1 x USB-C
	Display interface	1x HDMI
	Audio Connections	combined audio
	Card Reader	3-in-1 card reader
Power supply	AC: 100 V – 240 V DC: 19,5 V Max. power input: 65 W Typ. power input: 15 W [7] to 25 W [8]	
Dimensions (WxHxD)	324.2 mm x 18 mm x 237.7mm	
Weight	1.555 kg (+ power supply: 339 g)	

[6] THE RECEIVER’S VUHF ANTENNA INPUT IS USED VIA ELECTRONIC RF INPUT SWITCH
[7] SPECTRUM AND SPECTROGRAM DISPLAY
[8] 25 MHZ I/Q RECORDING

SPECIFICATION SUBJECT TO CHANGE WITHOUT FURTHER NOTICE.

Ordering Guide

Hardware options		
IZT R3410 / IZT R3411	**IZT R3410-CHS**	Ruggedized Receiver Chassis
	IZT R3410-DCW	Wide DC Input (7.5 V – 30 V)
	IZT R3411-CHS	Ruggedized Receiver Chassis [9]
	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-TRIG	Trigger
	IZT R3000-BST	Bias-T [10]
	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 P1010	Portable Sensor Controller notebook selected and configured for running IZT Signal Suite for IQ recording of up to 30 MS/s, including 1TB SSD data storage, SD-Card Dongle and 2nd Ethernet interface via USB adapter; Win10 (EN)
	IZT P1000-SDD-2	Solid State Data Disk 2 TB SSD
	IZT P1000-SDD-4	Solid State Data Disk 4 TB SSD
IZT A1000 External accessories	**IZT A1000-CAM**	IP Camera Kit (requires IZT SignalSuite-274)
	IZT A1000-GPS	External GPS Receiver for NMEA location information

[9] MODEL IZT R3411 CAN BE EQUIPPED ONLY WITH FRONTEND R3000-HF OR R3000-RF3; OPTION R3000-RF6 AND R3000-RF18 NOT AVAILABLE FOR MODEL IZT R3411
[10] 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 R3410 / IZT R3411

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STUMPF.POOL-X.DE REV.1.0 05/2019

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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