

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	



## IZT RecPlay

### Options

Version 1.10



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IZT_RecPlay_Options_0100.doc by Stefan Heindel	

## Revision History

Date	Version	Description	Author
2010-03-03	1.0	Initial version	hdl
2010-03-03	1.1	Introduction	hdl

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

## Content

1.	IZT RecPlay System .....	4
1.1.	Applications .....	4
1.2.	RecPlay System .....	5
1.3.	Recording System .....	7
1.4.	Replay System.....	9
1.5.	Post-Processing Software .....	11
2.	Options Structure.....	12
2.1.	IZT R3301 Options .....	12
2.2.	IZT S1000 Options.....	12
2.3.	IZT P1000 Options.....	13
2.4.	IZT RecPlay Options.....	13
3.	IZT R3301 Hardware Options.....	14
3.1.	IZT R3301 RF Recorder .....	14
3.2.	IZT R3301-TCS .....	14
3.3.	IZT R3301-SNC.....	15
3.4.	IZT R3301-CAL.....	15
3.5.	IZT R3301-OLC .....	15
4.	IZT R3301 Software Options .....	16
4.1.	IZT R3301-120.....	16
4.2.	IZT R3301-121.....	16
5.	IZT S1000 Options.....	17
6.	IZT P1000 Hardware Options .....	18
6.1.	IZT P1100-SRV .....	18
6.2.	IZT P1200-SRV .....	18
6.3.	IZT P1300-SRV .....	19
6.4.	IZT P1000-RCK .....	19
6.5.	IZT P1000-CNS .....	19
7.	IZT RecPlay Options.....	20
7.1.	IZT RecPlay-100.....	20
7.2.	IZT RecPlay-105.....	20
7.3.	IZT RecPlay-106.....	20
7.4.	IZT RecPlay-107.....	20
7.5.	IZT RecPlay-110.....	21
7.6.	IZT RecPlay-200.....	21
8.	Service.....	22
8.1.	R3301-WE2 .....	22
8.2.	R3301-WE3 .....	22
8.3.	P1000-WE2 .....	22
8.4.	P1000-WE3 .....	22

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

# 1. IZT RecPlay System

## 1.1. Applications

The rf recorder is suitable for recording typical receive scenarios in different countries with only minimum degradation of signal quality. The recordings can be stored in a library for functional testing of receivers. It is possible to record and replay the signals from two or more antennas.

The recorder covers the frequency range from 9kHz to 3GHz with a bandwidth selectable up to 20.5MHz, which is also sufficient for the FM broadcast band.

The replay generator covers the frequency range from 9kHz to 3GHz with a bandwidth of 120MHz, which allows to combine different recorded and calculated scenarios inside this bandwidth.

The IZT RecPlay System consists of three components: a recording system, a server with software for off-line editing and signal sources to replay the signals (figure 1).



**figure 1: IZT RecPlay one channel system setup**

The benefits of such a system are greatly reduced costs for field testing, repeatable tests in the lab and fidelity in reproducing real RF environment which allows a faster time to market.

The record and replay system IZT RecPlay is the ideal platform for rf receiver design validation for radio, video and GNSS applications.

## 1.2. RecPlay System

The IZT RecPlay record and replay system consists of at least one IZT R3301 RF Recorder with integrated high performance rf receiver and built-in server, an external server for data streaming and one IZT S1000 signal generator for replay of the recorded I/Q data (figure 2).

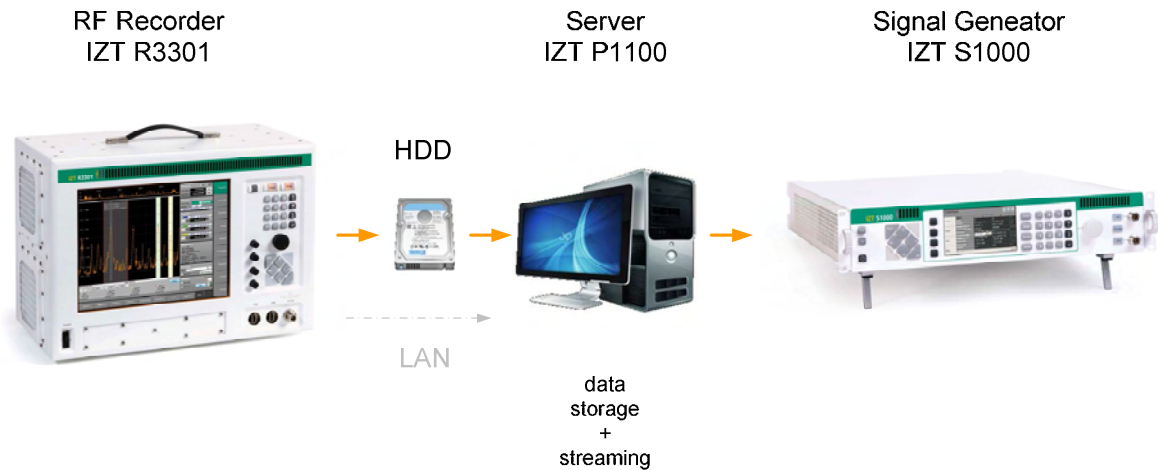


figure 2: example for a one channel IZT RecPlay setup

An IZT RecPlay system for diversity recording consists of one IZT R3301 RF Recorder per antenna and is synchronized by an external clock distribution (figure 3).

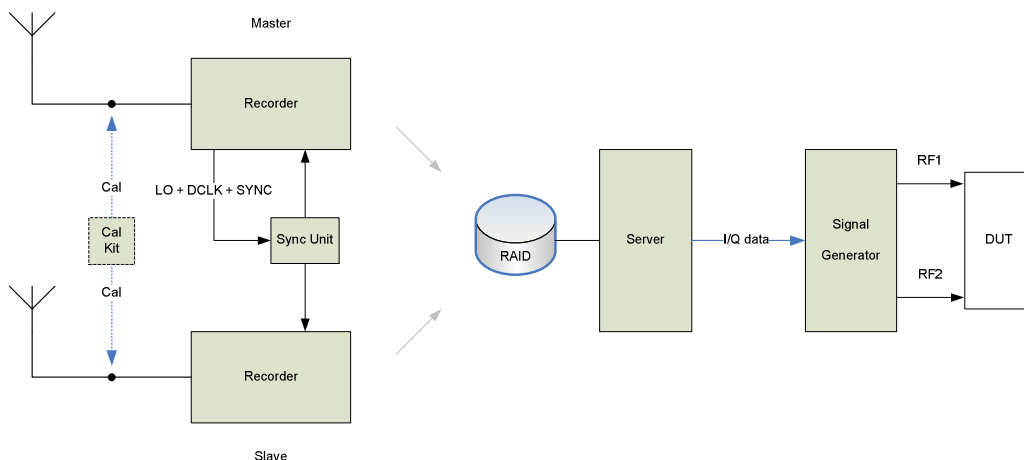


figure 3: block diagram for a IZT RecPlay setup for two channel diversity

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

In order to ensure all receivers operate phase synchronous a common reference clock (for example 10MHz) is not sufficient. Therefore one master IZT R3301 creates all necessary clock signals, like system clock (DCLK) and both VHF-UHF local oscillators (LO) and sends them to a central clock distribution, which amplifies the signals and passes them on to all receivers. An additional trigger impulse (SYNC) starts the sample synchronous recording of the system. Intercommunication between master and slaves of the built in servers is controlled via optical LAN interface to minimize EMI. The built in GPS receiver of the master serves as time and location reference.

If necessary, a calibration signal can be coupled into the antenna feeds, which allows to establish zero phase shift between the antenna inputs.

The captured data streams of up to approximately 115MByte/sec are sent via internal Gigabit Ethernet to each built in server and is stored on an integrated 2TB RAID system.

figure 4 shows the block diagram of the recording system configured for two diversity signals. The system is modular and can be extended to up to six antenna signals.

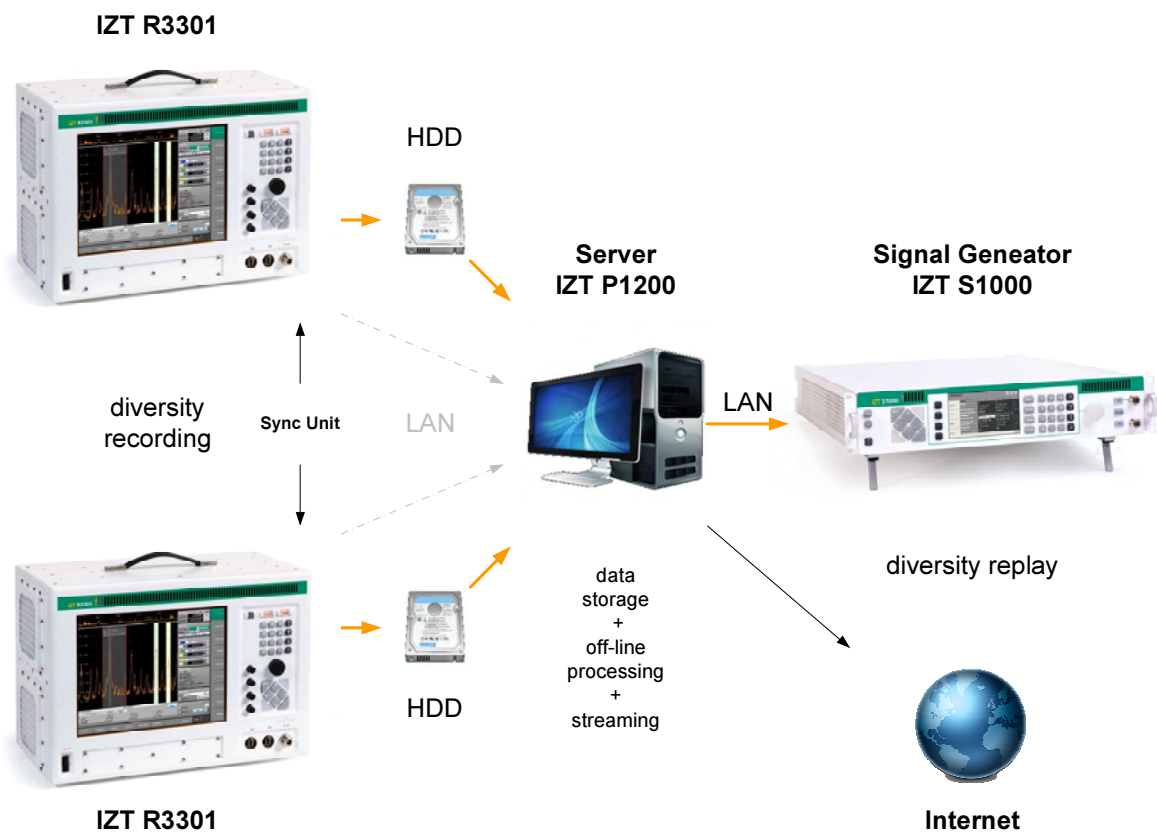


figure 4: IZT RecPlay diversity setup with server for data post processing

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

### 1.3. Recording System

The IZT R3301 RF Recorder (figure 5) is a portable receiver with integrated server for data recording. It is optimized for recording rf signals in mobile and portable applications.

The outstanding rf performance and signal processing is identical to the professional IZT R3000 receiver series. These receivers were developed for applications of regulatory agencies, military and civilian radio surveillance and as lab test equipment. They are designed to produce good signal quality under extreme dynamic range and have passed many rigorous technical evaluations with civilian and military customers very successfully. With its very high dynamic range and excellent phase noise this receiver platform is the ideal solution for the needs of modern digital modulation standards.

With its front panel control, touch screen and integrated processing hardware the IZT R3301 RF Recorder is the perfect portable rf recording system. While having a compact and rugged design, it also meets CISPR 25 for extremely low RF emissions. The wide range AC and DC power supply is completed by an uninterrupted power supply (UPS) for surge & sub voltage protection against DC supply fluctuations. An internal GPS module adds location information to the received signals.

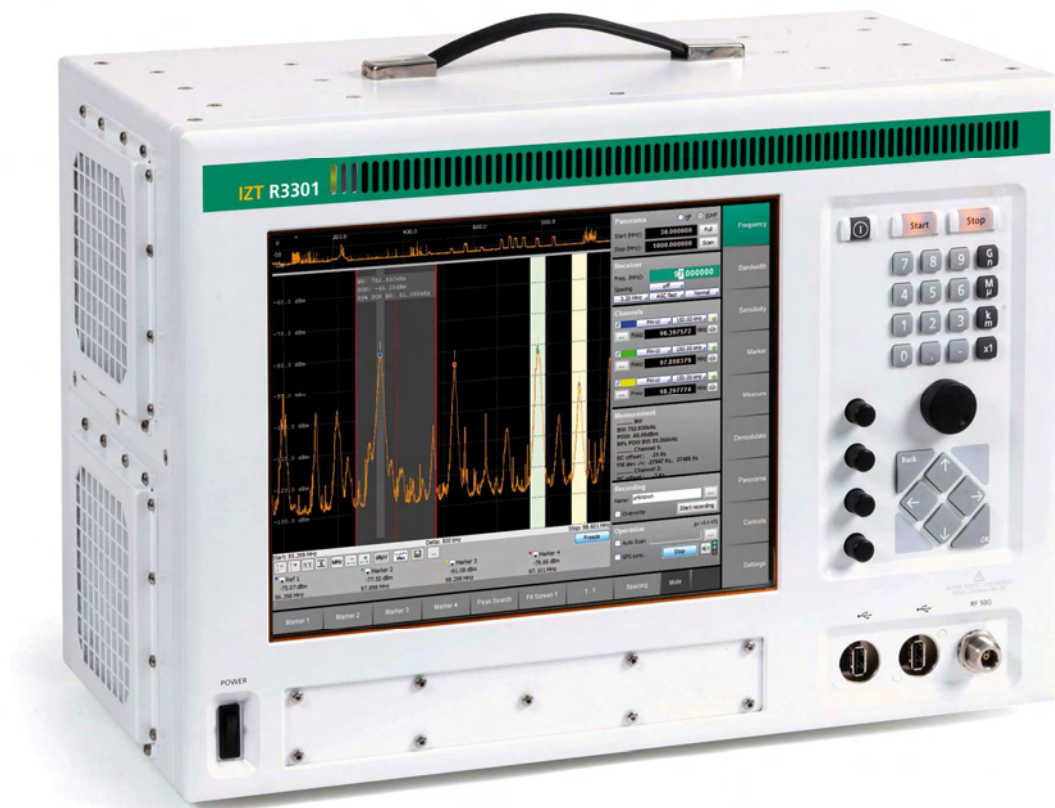


figure 5: IZT R3301 RF Recorder

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

Using the multichannel feature up to four independent bandwidth channels – each capable of providing I/Q and PSD data – can be extracted from the wideband input signal. All channels can be set to independent center frequencies, bandwidths and averaging factors, but must be placed within the maximum real-time bandwidth of up to 24MHz.

The IZT R3301 can be characterized as follows:

- portable, rugged design: 45 x 35 x 240 cm, approx. 17kg
- continuous I/Q data recording with up to 24MSPS (~ 20.5MHz BW)
- swappable 2TB RAID system for about 6 hours of full bandwidth recording
- built-in GPS for embedded location information
- 10...30V DC power supply, approx. 150W
- 100...240V AC supply with built-in UPS (approx. 15min)
- control via touch screen
- synchronization interface for diversity recording
- low rf emissions, meets EN55025 / CISPR 25
- built in high-end IZT R3000 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 with very good signal quality. It is highly insensitive to strong adjacent band interference due to sub-octave preselector filters and high first intermediate frequency.

The integrated IZT R3000 receiver can be characterized as follows:

- 9kHz to 3GHz frequency range
- real-time bandwidth up to 24MHz
- very low phase noise
- high linear RF frontend for excellent IMD performance
- preselector filter-bank guarantees best IP2 performance
- additional digital FPGA filtering
- IF Filter bandwidth: 6.25kHz - 24MHz
- 1Hz tuning resolution
- multichannel recording of up to 4 different bandwidths simultaneously



IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

## 1.4. Replay System

Replay of the rf signals is done with signal generator IZT S1000 (figure 6). Contrary to most signal generators on the market, the IZT S1000 has been specifically designed to replay complex signals comprising a large number of individual carriers.

The IZT S1000 can be characterized as follows:

- 9kHz...3GHz frequency range
- 120MHz bandwidth
- 31 virtual signal generators (independent VSG channels)
- dual rf outputs support diversity replay for two antennas
- phase synchronous replay of diversity signals
- continuous streaming up to 2x 24MSPS data from external server
- real-time impairment simulation
- modulators for DAB, DAB+, DMB, XM, Sirius, HDRadio
- universal ARB function with up to 8GB RAM
- easy to use compact setup



figure 6: IZT S1000 Multichannel Signal Generator

Figure 7 shows a setup for playing two diversity signals with a maximum bandwidth of 120MHz. The setup can be expanded to a system with up to four or more diversity channels by combining multiple external synchronized IZT S1000 signal generators.

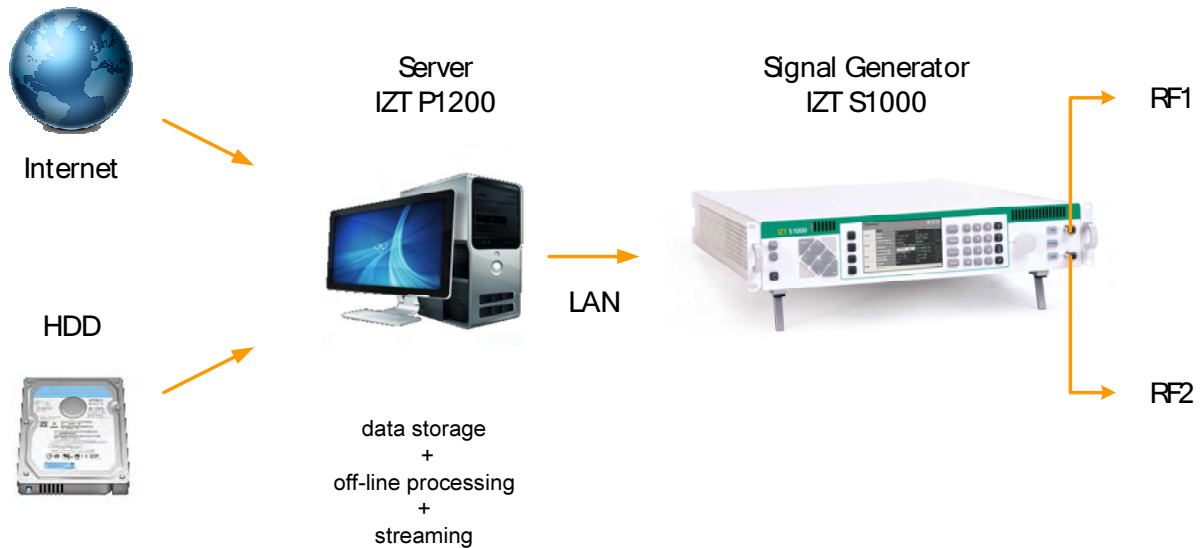


figure 7: Player for diversity signals, using a single IZT S1000 with two rf outputs

For diversity streaming bandwidth is divided up into 2x 24MSPS allowing to stream two independent signals with 20.5MHz bandwidth each (figure 8). Additional signals can be generated from the 8GByte internal IZT S1000 memory. An optional calibration kit can be used to preserve the absolute phase difference between the two antennas of the diversity recording setup up to the DUT inputs.

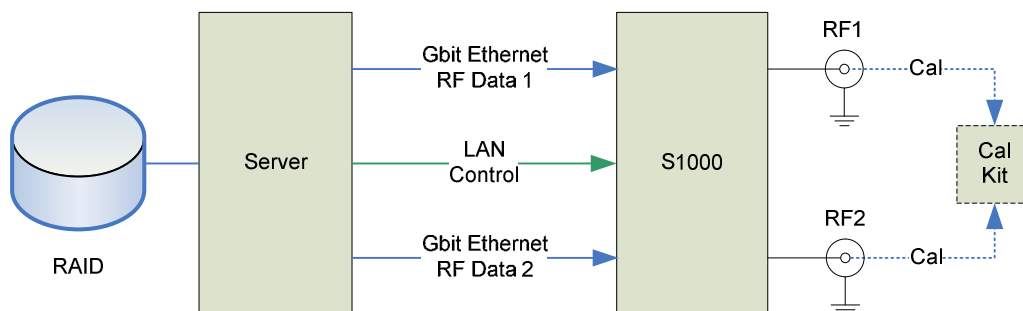


figure 8: IZT S1000 data & control interface for 2x 24MSPS streaming

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

## 1.5. Post-Processing Software

The IZT Signal Suite RecPlay Data Processor is a powerful unique data processing software which allows review and editing of recorded data in off-line mode:

- display of spectrum and time domain signal
- spectrogram and PSD for fast preview
- display of meta data information

Furthermore the IZT Signal Suite RecPlay Data Processor can be used to extract or combine individual signals from a recording which means easy to use cut, copy, paste & merge functionality of RF signals in time and frequency domain:

- extraction of signals in spectrogram (time and frequency) and conversion of the signal into a player file with adequate sample rate
- concatenation of recordings in time domain
- concatenation of recordings in the frequency domain

Moreover this concatenation of single recordings in the frequency domain allows to record frequency bands wider than 20.5MHz (e.g. DVB-T) in several adjacent frequency intervals and combine these recordings to a single file with large bandwidth of up to 120MHz to replay it with IZT S1000 signal generator platform.

Several additional plug-in interfaces are available for the IZT Signal Suite RecPlay Data Processor:

- streaming interface for up to 2x 24MSPS data streaming
- client interface for easy data synchronization with IZT RecPlay Database
- encryption interface for key based IZT S1000 streaming
- map visualization interface for embedded GPS streaming data

The post processing software includes an export function for Averta (NI) and R&S I/Q compatible data format.

For post processing and streaming IZT provides several server solutions with special selected components for optimum performance in low noise lab environment: the cost effective streaming server IZT P1100-SRV and a high performance off-line data processing and dual-streaming server IZT P1200-SRV for diversity signals.

The IZT P1300-SRV is a data storage server for IZT database solution; moreover it can be used for off-line data processing and signal streaming.

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

## 2. Options Structure

### 2.1. IZT R3301 Options

ordering code	description	standard qty.	two channel qty.
IZT R3301	IZT R3301 RF Recorder	1	2
IZT R3301-TCS	transport case	1	2
IZT R3301-SNC	synchronization kit	0	1
IZT R3301-CAL	calibration kit	0	1
IZT R3301-OLC	optical Ethernet converter	1	1
IZT R3301-120	RDS demodulator	1	1
IZT R3301-121	RDS demodulator enhancement	1	1

### 2.2. IZT S1000 Options

The IZT S1000 Options are described in a separate Option Document IZT\_S1000\_Options\_0110.pdf.

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

### 2.3. IZT P1000 Options

ordering code	description	standard qty.	two channel qty.
IZT P1100-SRV	IZT P1100 server	1	1
IZT P1200-SRV	IZT P1200 diversity & data processing server	1	1
IZT P1300-SRV	IZT P1300 database & data processing server	1	1
IZT P1000-RCK	rack for IZT server	1	1
IZT P1000-CNS	rack mount terminal console	1	1

### 2.4. IZT RecPlay Options

ordering code	description	standard qty.	two channel qty.
IZT RecPlay-100	IZT Signal Suite RecPlay Data Processor	1	1
IZT RecPlay-105	database client	1	1
IZT RecPlay-106	streaming interface	1	1
IZT RecPlay-107	encryption interface	1	1
IZT RecPlay-110	GPS map visualization	1	1
IZT RecPlay-200	IZT Signal Suite RecPlay Database	1	1

IZT RecPlay	Version:	1.10
Options	Date :	2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel		

### 3. IZT R3301 Hardware Options

#### 3.1. IZT R3301 RF Recorder

The IZT R3301 RF Recorder is a portable HF-VHF-UHF receiver with an integrated server for data recording. The receiver is optimized for multichannel recording of RF signals in frequently changing environments. The RF characteristics of the IZT R3301 are identical to the IZT R3000 series.

The high performance RF receiver covers a frequency range from 9kHz ... 3GHz with an instantaneous bandwidth of 24MHz. The integrated server records I/Q data with data rates up to 24MSPS on an internal 2TB RAID storage, which allows recording of e.g. 20.5MHz RF bandwidth for approximately 6 hours. Location information received with a built-in GPS receiver is embedded into recorded IZT I/Q data stream as additional meta data. An uninterrupted power supply provides surge and sub voltage protection against DC car supply fluctuations and enables easy switching between wide range AC and DC power supply. The rugged, portable design and an integrated 12" touch screen display make this system ideal for mobile use in a vehicle and in the field. Additional interfaces like built in external clock synchronization capabilities and optical LAN for diversity recording, network and streaming interface via RJ-45 Gigabit LAN complete this powerful system.

To fulfill the needs of perfect signal quality even in automotive environments the IZT R3301 RF Recorder meets CISPR 25 for extremely low RF emissions.

The IZT R3301 RF Recorder includes the software packages R3000 GUI and IZT Signal Suite RecPlay Recorder.

#### 3.2. IZT R3301-TCS

The IZT R3301-TCS is a transport case for the IZT R3301 wideband recorder.

The case has dimensions of approx. 65 x 50 x 36 cm and includes a build in special foamed plastic inlay for mechanic shock protection. The inlay is made out of ESD protecting material.

The transport case has a weight of 11kg, including inlay and trolley function. To reduce the weight by about 3kg the trolley function with pull-out handhold can be removed.

IZT RecPlay	Version:	1.10
Options	Date :	2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel		

### **3.3. IZT R3301-SNC**

The synchronization kit IZT R3301-SNC is needed for IZT RecPlay diversity recording. It provides phase coherent clock distribution to multiple IZT R3301 wideband recorders in a diversity recording setup.

The synchronization kit consists of an external synchronization unit and selected RF cables.

This option is mandatory for diversity recording with the IZT R3301 wideband recorder.

### **3.4. IZT R3301-CAL**

The calibration kit IZT R3301-CAL is needed to preserve the absolute phase difference between the two antennas of the diversity recording setup.

The calibration kit consists of a calibrated signal source which has to be connected directly at the junction plane of the antenna connectors and calibration software which is based on the diversity IZT R3301 units.

### **3.5. IZT R3301-OLC**

The IZT R3301-OLC is an external Ethernet converter kit which allows interfacing the IZT R3301 optical LAN connection (LAN2) to standard RJ-45 LAN connectors. It consists of the optical converter, a power supply and a corresponding optical fiber cable.

The IZT R3301-OLC option is needed, when the IZT R3301 is remotely controlled over longer distance with minimum EMI emission. It could be also used for streaming recorded data from the IZT R3301 wideband recorder directly to an IZT S1000 multichannel signal generator in the field.

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

## **4. IZT R3301 Software Options**

### **4.1. IZT R3301-120**

The IZT R3301-120 is a software plug-in for RDS demodulation of FM broadcast stations. The RDS demodulator works with both the IZT R3000 GUI working with the IZT R3301 wideband recorder and the IZT Signal Suite RecPlay Data Processor for off-line post-processing of the recorded IQ data.

### **4.2. IZT R3301-121**

The IZT R3301-121 option is an enhancement to the IZT R3301-120 RDS demodulator (which is pre-condition) for automatically generated RDS listing combined with memory scan and spectrum occupancy measurement functionality inside the R3000 GUI. The list can be sorted by frequency, signal strength and PI information and can be exported to an output file. Subsets like all frequencies with the same PI can be extracted and stored.

This option is useful e.g. to get detailed information about the most wanted PI channels when recording selected FM broadcast stations with the IZT R3301 wideband recorder in an unknown terrain.



IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

## 5. IZT S1000 Options

The IZT S1000 Options are described in a separate Option Document IZT\_S1000\_Options\_0110.pdf.

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

## 6. IZT P1000 Hardware Options

### 6.1. IZT P1100-SRV

The IZT P1100-SRV Streaming Server is used for continuous playback (up to 2x 24MSPS) of IZT R3301 recorded RF signals with the IZT S1000 signal generator.

It includes a 2x 4TB RAID-0 storage for dual data streaming, an additional Gigabit LAN interface for external data transfer and an external eSATA interface.

The IZT P1100-SRV is delivered with an installed multilingual Linux operation system, which makes it an ideal, cost effective platform for IZT S1000 streaming with option IZT S1000-120.

### 6.2. IZT P1200-SRV

The IZT P1200-SRV Diversity & Data Processing Server is used both for continuous playback (up to 2x 24MSPS) of IZT R3301 recorded RF signals with the IZT S1000 signal generator and as a high performance platform for off-line data processing with the IZT Signal Suite RecPlay.

Apart from its powerful multicore processing unit and 12GB main memory, the IZT P1200-SRV server includes a 2x 6TB RAID-0 storage for data streaming, a 1TB RAID-0 storage in 2x 2.5" hard drive trays and external eSATA ports to support fast IZT R3301 data import.

The system is build in a 19" rackmount 4U chassis with selected green power components to guarantee low noise emissions in lab environment.

The IZT P1200-SRV SRV is delivered with an installed multilingual Windows 7 / 64bit operation system, which makes it an ideal platform for running the IZT RecPlay Signal Suite Data Processor (IZT RecPlay-100) as well as IZT S1000 diversity streaming server with option IZT S1000-120.

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

### 6.3. IZT P1300-SRV

The IZT P1300-SRV Database & Data Processing Server can be used both as a high performance database server and as off-line data processing server with IZT Signal Suite RecPlay.

In addition to this it can be used for continuous playback (up to 2x 24MSPS) of IZT R3301 recorded RF signals with IZT S1000 signal generator.

Apart from its powerful multicore processing unit and 12GB main memory, the IZT P1300-SRV server includes a 14TB net RAID-5 storage with high reliable hardware RAID-5 controller (2TB redundancy), a 4TB RAID-0 storage for post-processing and data streaming, a 2x 1TB RAID-0 storage in 4x2.5" hard drive trays and external eSATA ports to support fast IZT R3301 system data import as well as diversity streaming.

The system is build in a 19" rackmount 4U chassis with selected green power components to guarantee low noise emissions in lab environment. All 3.5" RAID hard drives are installed in trays which are removable by the operator.

The IZT P1300-SRV SRV is delivered with an installed multilingual Windows 7 / 64bit operation system, which makes it an ideal platform for running the IZT RecPlay Database (IZT RecPlay-200) and the IZT Signal Suite Data Processor (IZT RecPlay-100). Besides it can be used as IZT S1000 streaming server with option IZT S1000-120.

### 6.4. IZT P1000-RCK

The IZT P1000-RCK is a 19" Rack for integration of IZT RecPlay servers like IZT P1200-SRV or IZT P1300-SRV in combination with one or more IZT S1000 multichannel signal generators.

The 15U rack has room for several additional 19" devices like the terminal server console IZT P1000-CNS. It allows easily integration of additional customized IZT RecPlay equipment like SCPI controlled 19" RF switching matrices for production testing, which could be individually adapted on customers request by IZT.

Ventilation inside the rack is supported by build in temperature controlled fan units.

### 6.5. IZT P1000-CNS

The IZT P1000-CNS is a 19" rack mount 1U server terminal console with swing open 17" TFT Display (1280x1024) with integrated keyboard (English layout) and touchpad.

IZT RecPlay	Version: 1.10
Options	Date : 2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel	

## **7. IZT RecPlay Options**

### **7.1. IZT RecPlay-100**

The IZT Signal Suite RecPlay Data Processor (option IZT RecPlay-100) is a powerful software package for monitoring of time domain signals, PSD and spectrogram, as well as post-processing of IZT RecPlay data with cut, copy, paste and merge functionality for RF signals in both time and/or frequency domain.

Several plug-in interfaces, like a database client, a streaming interface, an encryption interface and map visualization of GPS information embedded in the IZT I/Q meta data are available for IZT Signal Suite RecPlay.

It also supports export of Avera (National Instruments) and R&S I/Q compatible data format.

The IZT Signal Suite RecPlay Data Processor requires a Windows 7 / 64bit platform running on a powerful server platform to handle efficiently the sophisticated implemented algorithms, e.g. an IZT P1200-SRV server.

### **7.2. IZT RecPlay-105**

The IZT RecPlay-105 option is a database client plug-in for IZT Signal Suite RecPlay.

It has to be installed e.g. on IZT P1x00-SRV server or IZT R3301 wideband recorder for easy synchronization of recorded and post-processed IQ data with IZT RecPlay-200 data base application.

### **7.3. IZT RecPlay-106**

The IZT RecPlay-106 option is a streaming interface plug-in for IZT Signal Suite RecPlay.

It has to be installed e.g. on IZT P1x00-SRV server or IZT R3301 wideband recorder (IZT R3301-OLC is pre-condition) for IQ data streaming to the IZT S1000 multichannel signal generator.

Using the IZT RecPlay-106 option for IZT S1000 streaming requires software option IZT S1000-120.

### **7.4. IZT RecPlay-107**

The IZT RecPlay-107 option is an encryption interface plug-in for IZT Signal Suite RecPlay.

It has to be installed e.g. on IZT P1x00-SRV server or IZT R3301 wideband recorder for encrypted IQ data streaming on a key based IZT S1000 replay technique.

IZT RecPlay	Version:	1.10
Options	Date :	2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel		

## 7.5. IZT RecPlay-110

The IZT RecPlay-110 option is a GPS map visualization plug-in for IZT Signal Suite RecPlay. It has to be installed e.g. on IZT P1x00-SRV server to show embedded GPS meta data inside IQ data streams recorded with the IZT R3301 wideband recorder.

## 7.6. IZT RecPlay-200

The IZT Signal Suite RecPlay Database (option IZT RecPlay-200) is a database software package for administration of accumulating RecPlay data.

It manages both the storage of associated IQ data streams and automated synchronisation between database clients running with IZT Signal Suite RecPlay. Synchronization criteria like RF frequency range, bandwidth, sampling rate, country, GPS location, content (if specified by operator), single- or diversity source, original or post-processed data, etc. can be selected to extract special signal scenarios.

The IZT Signal Suite RecPlay Database requires a Windows 7 / 64bit platform, running e.g. on an IZT P1300-SRV server.

IZT RecPlay	Version:	1.10
Options	Date :	2010-03-18
IZT_RecPlay_Options_0100.doc by Stefan Heindel		

## **8. Service**

### **8.1. R3301-WE2**

Warranty extension to 2 years

### **8.2. R3301-WE3**

Warranty extension to 3 years

### **8.3. P1000-WE2**

Warranty extension to 2 years

### **8.4. P1000-WE3**

Warranty extension to 3 years