Voyantic

Ensurance™ RAIN Encoder

Hardware setup guide

Ensurance™

Version 11/2019

1 Important Information

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2 Table of Contents

About Ensurance

Ensurance is a software used to manage tag personalization process activities in smart label production, including memory programming, data printing, quality testing, and data verification. The software provides a graphical user interface (GUI) for the machine operator, the necessary tools for production engineers to create and edit process definitions, and it manages processing equipment and in-process dataflow.

The Ensurance personalization system is intended to be used in production environment as a part of a machine, and operated by professional personnel. It should be noted that if antennas or other radiating elements are used with the system, local regulations may limit the frequency range and transmit power that can be used. Particularly, related to RAIN/UHF reader, regulations related to features, such as channel-hopping and dwell time are specific to country. If the device is transported to different region, please check that settings and reader type comply with the local regulations.

About this document

Ensurance system can be added with a reader for programming smart labels and reading data for the purpose of traceability, for example. Ensurance supports Ensurance RAIN encode for this purpose. This document describes how to set up and use the product with Ensurance, the key specifications related to personalization, and typical troubleshooting scenarios.

Related documentation

Manufacturer's technical documentation. This manual includes information on the process options and relevant performance data related to Reelsurance Pro platform. Ensurance RAIN encoder is a Zebra FX7500 reader with special Voyantic application code. Refer to the manufacturer's documentation for more technical information on the reader.

3 Technical information

3.1 Supported models

Ensurance supports UHF smart label encoding only with a version of Zebra FX7500 reader with Voyantic application code.
Ensurance RAIN encoder is provided as three continental versions (ETSI, FCC, JPN). Standard model reader cannot be used with Ensurance and FX7500 with the custom application code cannot be used in typical reader applications due to special application code.

3.2 Functions and performance

The Ensurance RAIN encoder supports the EPC Gen2 v1 reading, writing, and locking commands as well as performing the kill procedure. This enables programming tag memory, verification of programmed data, and collecting tag information to enable traceability. Reader is operated through Ensurance software and the encoding activities are defined in the Ensurance personalization recipe.

Key specification for Ensurance RAIN encoder is listed in table below, and more detailed technical information is available from base product datasheet and manuals. Ensurance RAIN encoder is used with the Snoop Pro coupling element, information of which is provided in the licencing and options chapter.

Table 1. Technical information of Ensurance RAIN encoder

Supported models	**Zebra FX7500 mod. (ETSI)** **Zebra FX7500 mod. (FCC)** **Zebra FX7500 mod. (JPN)**
Functions	Read, Write, BlockWrite, Lock, Kill
Supported protocols	ISO 18000-63
Read area	RAIN encoder is used together with Snoop Pro antenna which limits the maximum size of the tag. Moreover, label pitch and material movement during encoding further limit the possible tag sizes in the direction of movement.
Performance	Encoding supports standard communication modes and does not add extra delay on top of the communication protocol. Encoding time depends on the IC and the tasks to be performed, and has to be verified case-by-case. Encoding time can be reduced by using multi word blockWrite instead of word-by-word encoding with mandatory write command, but support for blockWrite is specific to label IC. **Example.** EPC-96 encode + access password setting + lock takes 50-100ms depending on the IC-type and write strategy.

3.3 Licensing and options

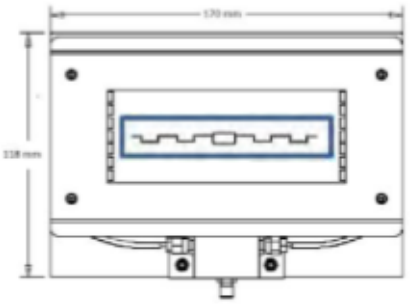
RAIN encode and read option for Ensurance includes Ensurance RAIN encoder device, the necessary hardware, adapters, and cables for the reader, and a Snoop Pro kit including appropriate coupling element, antenna cable, and a selection of shielding plates. List of parts is provided in Chapter 4.1 and available Snoop Pro coupling elements presented in Fig 1.

Regarding functionality, Ensurance license for Rain encoding is included and there are no extra license options directly linked to encoding functionality. However, additional Ensurance software license options may be required if specific in-process data processing functionality is required for the application. Ensurance licensing is discussed in the Ensurance software manual. Moreover, enabling support for non-supported programming functions may require new license features or involve engineering costs.

Standard options	**Hardware:** - RAIN Encoder Unit, ETSI/FCC/JPN - Power supply, ethernet data cable, IO-connector and adapter, - Mounting plate - Snoop Pro, shielding plates kit, antenna cable and adapter - USB drive installation media **Encoding capability** - Encoding with Read, Write, BlockWrite, Lock - Kill **Data management**: - static data or data reading from file - basic in-process data conversions
Optional features	Special data conversions and encoding functions Support for non-supported chips and functions

Snoop Pro UHF

AN-SP-D10

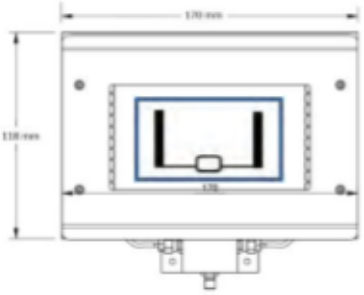


The standard Snoop Pro model is suitable for most dipole antenna tag designs. Tagsurance Starter Kit and Manual Test Station Kit are delivered with this Snoop Pro version unless otherwise requested.

Maximum tag antenna dimension:
50 mm x 100 mm

Snoop Pro UHF rev. W

AN-SP-D1W

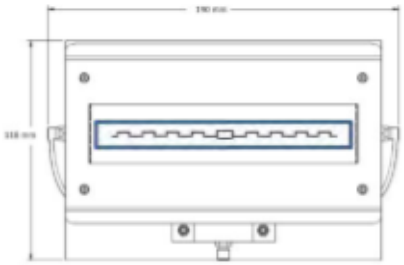


The W revision of the Snoop Pro antenna is used for wide dipole tag designs.

Maximum tag antenna dimension:
73 mm x 100 mm

Snoop Pro UHF rev. C

AN-SP-D1C



The C revision of the Snoop Pro antenna is used for long dipole tag designs.

Maximum tag antenna dimension:
26 mm x 130 mm

UHF Loop Snoop

AN-LS-L10

The Loop Snoop coupling element is used with loop type UHF RFID tags.

Maximum tag antenna dimension:
32 mm x 32 mm

Fig 1. Available Snoop Pro models to be used with Ensurance RAIN encoder.

4 Setup instructions

4.1 Ensurance RAIN encoder system parts

Ensurance RAIN encoder setup for Ensurance includes the reader with accessories needed for operating the reader with the Ensurance system. Normal delivery kit contents are listed below. Check that everything is available before going on with the set-up process.

Hardware

- Ensurance RAIN encoder unit with power supply and Ethernet data cable
- IO-adapter module for connecting 15-pin IO-cable to the reader
- IO-connector (D15 screw terminal breakout connector, straight)
- Antenna cable (N-SMA, 1.8m) with R-TNC adapter
- Mounting plate (Plastic mounting plate with screws)
- Snoop Pro antenna with shielding plates kit

Software

- Ensurance GUI is available in Ensurance installation media (license for UHF encoding included)
- Manuals and other documentation provided on the USB stick

Fig 2. Ensurance RAIN encoder parts as provided with Reelsurance Pro.

4.2 Initial settings

Ensurance RAIN encoder is delivered read-to-use. Antenna cable, data cable, and IO cable need to be connected and machine configured to provide triggering for the device. The reader connectors, the pinout for the IO-connector, and IO signal types are described below.

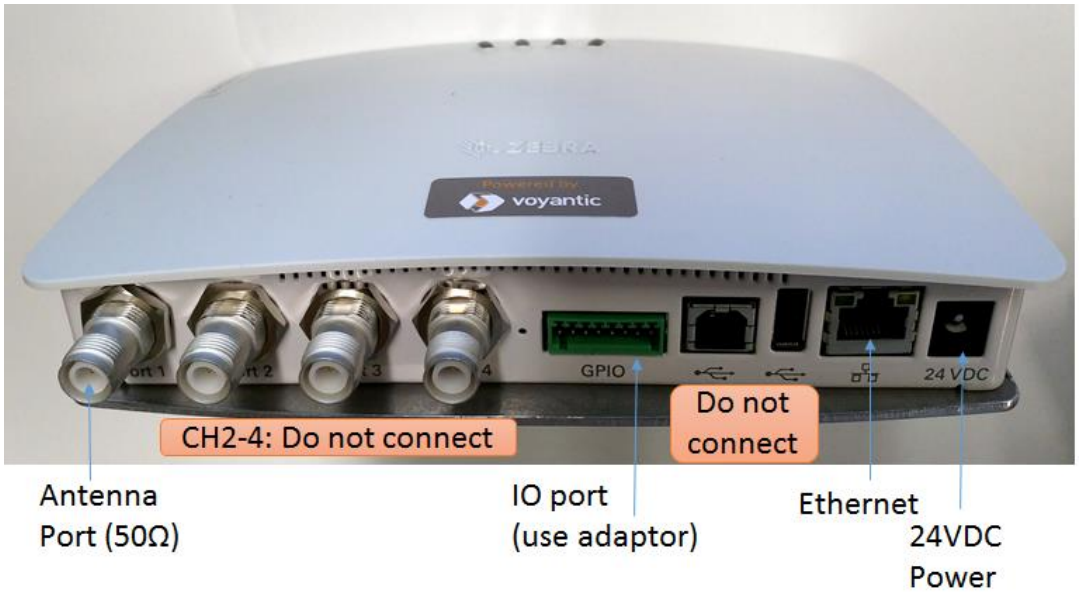


Fig 3. Ensurance RAIN encoder connectors.

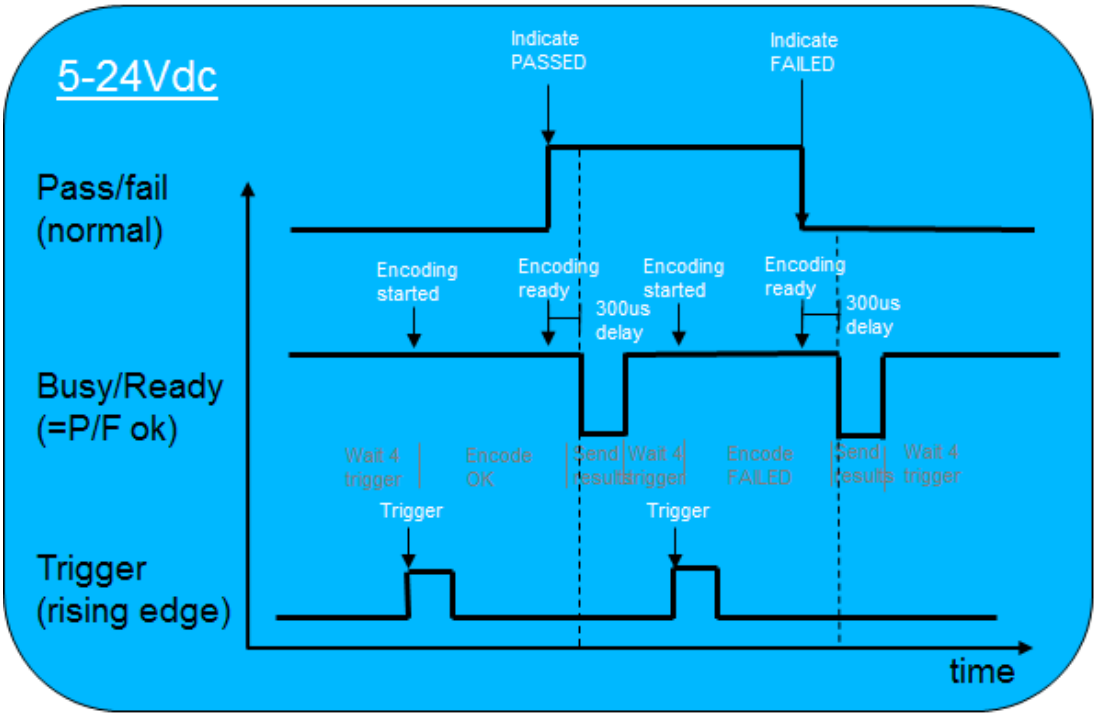


Fig 4. Ensurance RAIN encoder signals (default settings at GPIO connector). Pass/fail and busy/ready signal polarity can be inverted, and their signal level is defined by the external reference voltage on IO-adapter (pin 13).

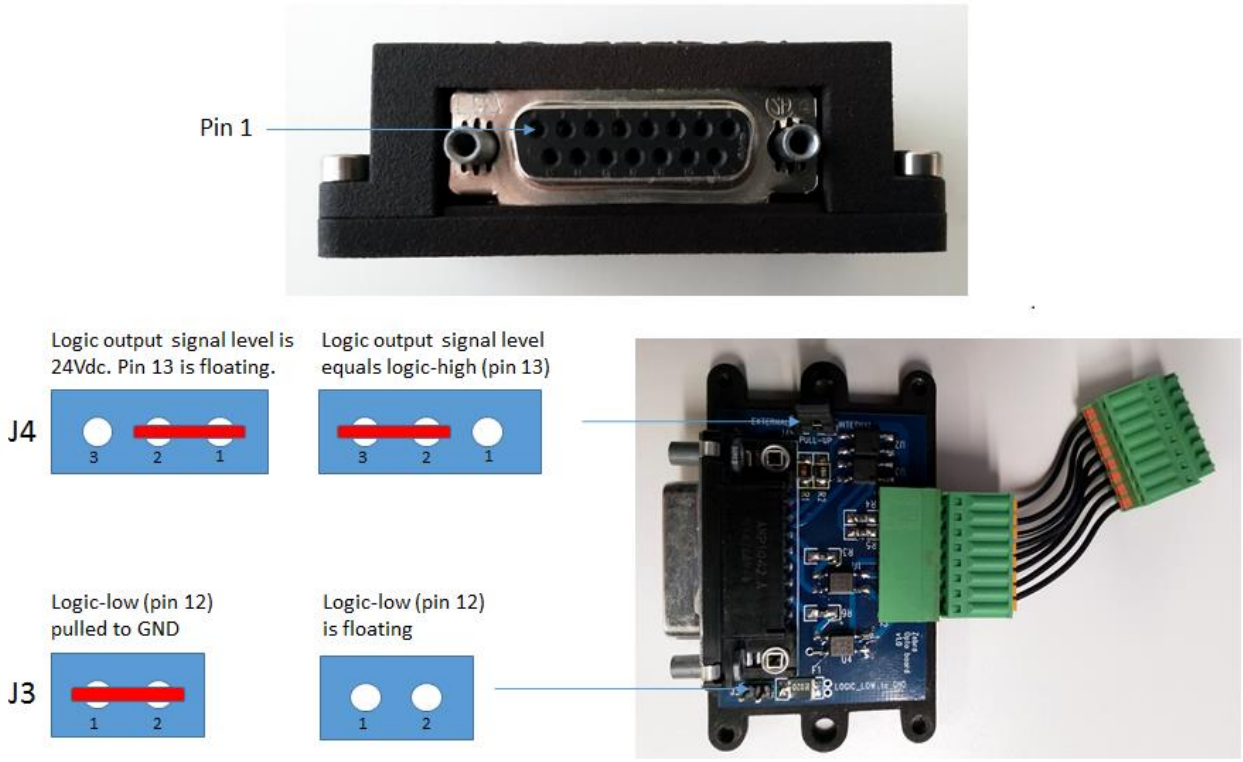


Fig 5. Ensurance RAIN encoder IO-adapter pinout and internal connection options.

Note: The IO-adapter will invert the input signals, that should be taken into account when creating the device configuration for the Ensurance RAIN encoder. *Pass/Fail* and *Busy/Ready* signals remain original.

Table 2. Ensurance RAIN encoder IO-adapter pinout.

Pin	Signal type	Pin	Signal type
1	< not connected >	9	< not connected >
2	< reserved for future use >	10	< not connected >
3	GND	11	< not connected >
4	GND	12[2]	IN: logic low (internal pull-down available, J3)
5	IN: Trig-	13[3]	IN: logic high OR floating (J4)
6	IN: Trig+	14	< not connected >
7[1]	OUT: Busy/Ready output	15	< not connected >
8[1]	OUT: Passed/failed output	-	

[1] J4: Internally connected to +24VDC reference level or to Logic-high pin (pin 13)
[2] J3: Internally connected as floating or pulled to GND
[3] J4: Internally connected as logic reference or left floating

4.3 Preparation for job

Preparation of the device for a production job requires two steps:

1. Generate encoding task list and define appropriate device settings

   Task list and device settings are managed and occupied by Ensurance software and they're included as part of personalization recipe, i.e. collection of files which define what processes are involved in the production job, what is done in each step, and how to manage data. Moreover, also the generic reader operational settings are included in the case files. Available settings are listed in the table below. Recipe files are can be done either manually or by using Ensurance case builder software. Instructions on how to do this are described in Ensurance case builder manual.

2. Choose appropriate shielding plate and Snoop Pro coupling element

   Selection of the Snoop Pro coupling element defines maximum size for a label to be processed, and the area is further narrowed down by choosing a shielding plate with an appropriate opening size. In addition to physical dimensions of the tag also movement must be taken into account, as the label needs to stay in the field of view, i.e. shielding plate opening, throughout the whole encoding process. Moreover, it's recommended that there's at least 5mm clearance from the edges of the opening while programming, and there should only be a single label in the opening when the encoding process is started. Some tags will require application of Snoop Pro electrode extension to be able to communicate reliably with the tag.

Table 3. Ensurance RAIN encoder settings available for the operator.

SETTING	VALUE
Transmit power level can be adjusted. Level needs to be high enough to allow enough power for the IC to wake-up and operate. Excessive carrier level is not recommended due to risk of overhearing and possible deterioration of signal quality. Local legislation may also set limits to the amount of radiation transmitted.	Range: 0 – 27dBm Nominal resolution: 0,1dBm
Trigger level defines the polarity of trigger signal.	Falling edge (default) or Rising edge
Busy/ready signal polarity defines whether busy state is indicated with high level (normal) or low level (inverted)	Busy = HIGH (default) or Busy = LOW
Pass/fail signal polarity defines whether passed state is indicated with high level (normal) or low level (inverted)	Pass = HIGH (default) or Pass = LOW
RF Link settings (optional) allow different communication profiles affecting e.g. up- and downlink data rates. Refer to Ensurance case builder manual for more information.	Profile: 0,1,2,3 Default value: 3
BlockWrite words (optional) defines the amount of words written per single blockWrite command. Most chips support blockWrite with single word, but more rules may apply with higher word count. Refer to the tag/chip datasheet for more information.	1 – 255

5 Maintenance and troubleshooting

5.1 Maintenance

Ensurance RAIN encoder is maintenance free hardware but it's recommended to take care of the cleanliness of the connectors and handle and use the device with care and according to the user instructions. In case of issues, contact technical support through support@voyantic.com.

5.2 Troubleshooting

Typical issues related to the application of Ensurance RAIN encoder are related to carrier level applied, communication settings or programming procedure, or Snoop Pro settings and adjustment. If programming procedure is performed for the first time, it is likely that the issues are related to either reader settings (carrier level or data rate), or compatibility of the chip with the encoding procedure. Once the encoding setup is ready and tested, the programming should normally proceed without issues unless there are connectivity issues with the machine or Ensurance software. When facing issues, first check that cables are securely connected and then start troubleshooting communication issues by following the steps presented below.

1. Check that programming works in a static setup. Take a single label in the field of view of encoding antenna and try running the encoding operation there. If the process involves dynamically acquired data, fixed data contents can be used to perform this verification test. If there are issues with programming in the static setup, it might be caused either by wrong carrier setting or related to chip compatibility with the encoding procedure.

    a. In order to enable normal operation of the tag IC, enough carrier power needs to be provided for the label. Typically about 3-8dB over query threshold adequate to secure successful write performance. Although normally increasing the power usually helps solving encoding issues, too high carrier level can deteriorate signal-to-noise ratio and increase risk of overhearing. Local legislation may also set limitation to the allowed radiation.

    b. Using blockWrite to encode is faster than using standard write command, but rules for the use may apply. Most chips allow writing a single word, but writing two or more may be limited to certain addresses only, or not at all. Moreover, chips may also have special rules for programming, such as that the power must be recycled after every write to enable encoding of the next word.

    c. Some parts of the chip memory may be locked or need to be programmed in a certain order. Certain memory areas, such as TID memory, are permanently locked by the IC manufacturer and cannot be programmed by the user. There may also be areas that are secured with an access password and encoding such registers will require access with a certain access password.

2. Check Snoop Pro setup and trigger timing

    a. Check that Snoop Pro is installed with the correct shielding plate and verify that the opening size is large enough to allow enough space around the tag with at least 5mm of clearance throughout the whole programming procedure.

    b. Check that electrode extensions are in place in case they are needed.

3. Check trigger timing and verify that there is only a single tag in the field of view of the antenna when starting the encoding procedure. Neighboring tags need to be efficiently shorted by the shielding plate when reader inventories the tag-to-be-programmed. After inventory, this does not matter anymore unless there's a power re-cycle operation performed as a part of the procedure.

4. Check speed settings and verify that the tag remains in the field of view of the antenna throughout the whole programming procedure. There might be differences how tags tolerate the loading by the shielding plate, but to be sure, the it's recommended to set speed so that the that is all the time inside the shielding plate opening with a 5mm margin.

Table 4. Examples of troubleshooting topics and possible resolutions for solving the issues.

#	*DESCRIPTION*	*TROUBLESHOOTING*
1	Programming fails with blockWrite	BlockWrite is not a mandatory command dictated by ISO18000-63 and there is variance on how chips handle command. Check chip compatibility and rules for blockWrite command. Number of words written by single command can be adjusted from Ensurance RAIN encoder task configurations.
2	Programming of certain memory fails	Memory may be locked or programming may require following a specific procedure. Check chip datasheet and settings for more information.
3	Programming fails, although it worked fine before	If the programming procedure has been proven successful before, it's likely that either antenna setup or trigger timing is wrong. Check that Snoop Pro is installed with the correct shielding plate and that trigger position matches with the antenna positioning. Machine installation typically allows adjusting the antenna position and the tag-to-be-programmed needs to be in the field of view of the antenna throughout the whole encoding procedure. With Snoop pro the usable are is 5mm inside the shielding plate opening.
4	Programming works when tag stays still, but fails in continuous mode	When using Snoop Pro, movement of the tag is allowed, but the tag must stay in the field of view throughout the procedure.