

All-in-One *Bluetooth*[®] Protocol Analysis System

Ellisys *Bluetooth*[®] Explorer 400

UART/SPI HCI,
WCI-2, Audio I2S, Logic

Wideband
BR/EDR/LE
Spectrum



USB HCI

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Better Analysis.

Key Points:

- **All-in-One:** wireless and wired, at the same time, perfectly synchronized
- **Dual-Mode Whole-Band Capture:** easy and rock-solid capture of BR/EDR and Low Energy
- **Reprogrammable Digital Radio:** ready today for tomorrow's specifications
- **Multi-Piconet Support:** inspect multiple piconets and scatternets, without limitations
- **All Protocols and Profiles:** best-of-breed protocol decoding
- **Integrated Audio Analysis:** listen to captured audio live
- **Spectrum Display:** characterize the wireless environment and visualize coexistence issues
- **Message Sequence Chart:** create charts automatically from captured traffic
- **Free Maintenance:** free lifetime updates, free fully-featured viewer



Ellisys Bluetooth Explorer 400
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Whole-band BR/EDR and Low Energy sniffer, with concurrent capture of spectrum, HCI (USB, UART, SPI), WCI-2, logic signals, and Audio I2S

Innovative Tool for Demanding Users

Traffic analysis is one of the key day-to-day activities for *Bluetooth* engineers looking to rapidly test and debug their prototypes and products. Unfortunately, *Bluetooth* over-the-air sniffing has long been difficult to master. **Legacy sniffing methods suffered from major technological drawbacks**, making them unreliable and even unusable in several circumstances, making *Bluetooth* engineers' tasks much more difficult than required.

With its **revolutionary whole-band Digital Radio**, Ellisys lifts protocol capture and analysis to new heights, radically overcoming the drawbacks of those legacy approaches to *Bluetooth* sniffing. The Ellisys all-in-one whole-band sniffer robustly records any packet, at any time, from any neighboring piconet, with zero-configuration and without being intrusive.

Industry's Only Reconfigurable Bluetooth Digital Radio

With its innovative reconfigurable radio, the Ellisys sniffer can uniquely be **updated by software to support changes in the specification**, without any change to the hardware, and even without any interaction from the user.

For instance, this flexibility allowed for the addition of next generation *Bluetooth* baseband features (such as enhanced AES security and Connection-less Broadcast) several months before the specification was officially released. Additionally, the Ellisys BEX400 comes with free lifetime updates, so all customers can benefit from these great additions free-of-charge!

Industry's Only Whole-Band Capture

Bluetooth wireless technology was originally designed to be robustly impervious to interference on the much-used 2.4 GHz ISM band. It was also designed to be difficult to sniff, for security reasons. To meet these criteria, a *Bluetooth* radio uses 79 channels randomly chosen according to a hopping sequence dynamically defined before and after the piconet's connection time.

Legacy hopping sniffers try to actively synchronize on a specific hopping sequence, and capture packets only after successful synchronization. This kind of sniffer has several inherent limitations, making it more difficult to use, less reliable, and usable only in a limited set of scenarios.

Ellisys has created a revolutionary sniffer that overcomes all of these drawbacks and adds innovative and ground-breaking features, opening new horizons for *Bluetooth* debugging and interoperability testing. The whole-band capture approach is as simple as it is powerful: instead of listening to just a few channels, the sniffer captures all channels concurrently. The sniffer thus does not need to synchronize to a piconet; it will listen passively to all nearby *Bluetooth* piconets and scatternets, without any required configuration.

Industry's Only All-in-One Sniffer

Capturing wireless traffic is a very important aspect of *Bluetooth* debugging, but other information is equally important for understanding the big picture. This is another aspect where the Ellisys sniffer excels.

The Ellisys *Bluetooth* Explorer 400 sniffer supports one-click concurrent capture of:

- Classic *Bluetooth* BR/EDR
- Low Energy *Bluetooth*
- 2.4 GHz Spectrum [PRO]
- USB HCI, UART HCI and SPI HCI [PRO]
- Logic signals [PRO]
- Audio I2S [PRO]
- Wireless Coexistence Interface 2 [PRO]



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Unique Ellisys Features

- **All-in-One:** concurrent capture of BR/EDR, Low Energy, spectrum, HCI, logic, Audio I2S, and WCI-2, all synchronized to nanoseconds precision
- **Dual-Mode Whole-Band Capture:** easy and rock-solid capture of any BR/EDR and Low Energy traffic, including discovery / connection traffic and SSP pairing
- **Reprogrammable Digital Radio:** ready today for tomorrow's specifications with a software update and without hardware change
- **Multi-Piconet Support:** inspect multiple piconets and scatternets, without limitations
- **All Protocols and Profiles:** best-of-breed protocol decoding
- **Integrated Audio Analysis:** listen to captured audio live, including HCI audio and I2S, within the software, in sync with all other traffic
- **Spectrum Display:** characterize the wireless environment and visualize coexistence issues
- **Message Sequence Chart:** create charts automatically from the powerful Ellisys protocol display
- **Free Maintenance:** free lifetime updates as well as free fully-featured viewer software with unlocked hardware that can be used on any computer

Testimonials

"Test and characterization of new *Bluetooth* silicon and end-products is a comprehensive process requiring a diverse set of engineering expertise and an array of specialized, analytical tools," said Muthu Kumar, Wireless Firmware Engineer, Intel Corporation. "The Ellisys *Bluetooth* Explorer plays an important role in this process by delivering a clear and complete understanding of the behavior of the ever-evolving *Bluetooth* technology from both hardware and software perspectives, all while providing exceptional ease of use."

"The new advanced features provided by Ellisys provide our teams with tools that substantially increase visibility into the workings of *Bluetooth* technology," said Miles Louis Smith, Senior R&D Engineer, Test Group, Nordic Semiconductor. "We use the sniffer to diagnose complex timing issues that other sniffers might not be able to capture. Due to the unique radio architecture of the Ellisys sniffer we can capture all packets regardless of the timing. The reconfigurable hardware is very flexible, and the Ellisys team provides great support to help us get products to market sooner."

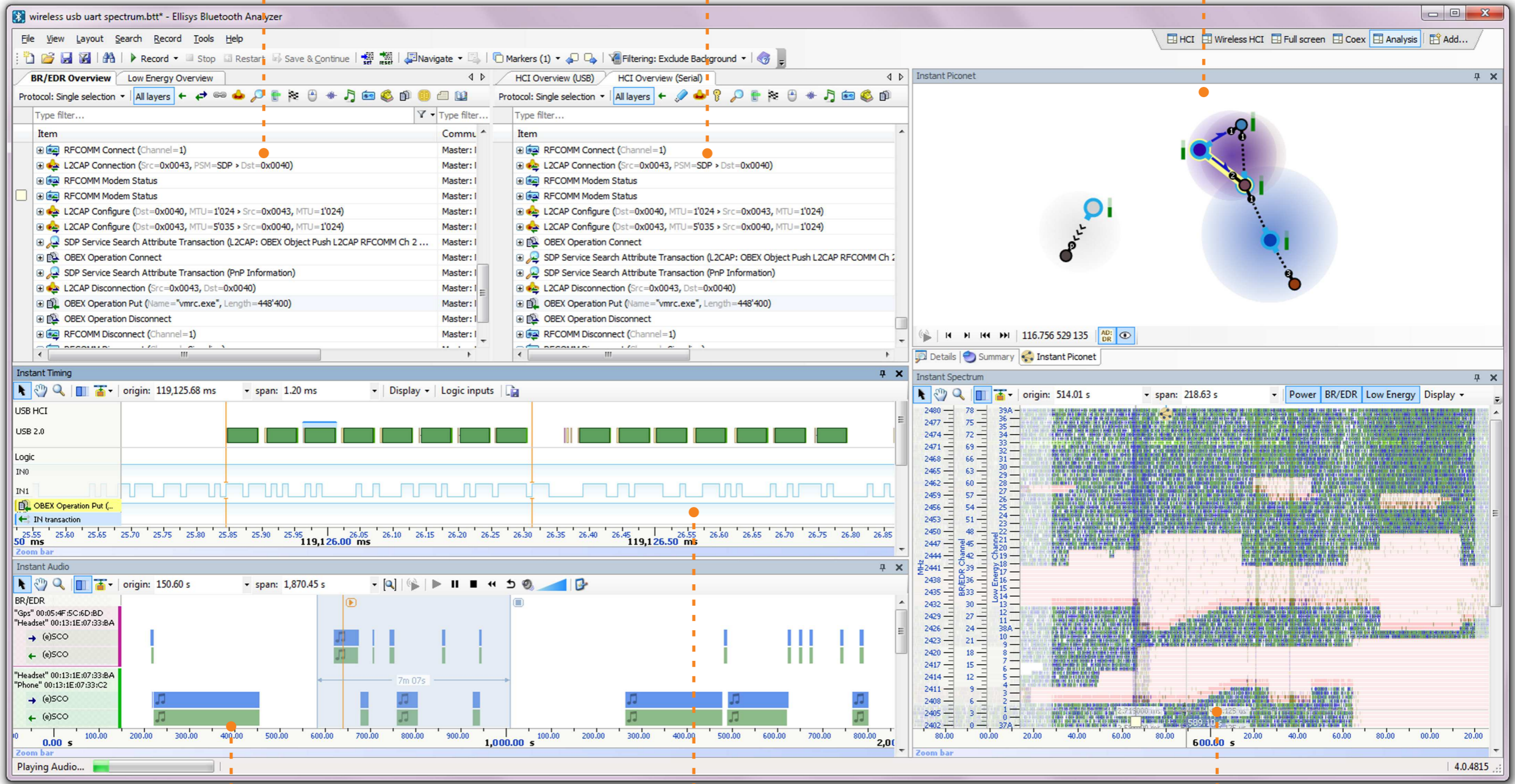


Ellisys Bluetooth Explorer 400
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Protocol & Profiles Analysis

HCI Analysis

Topology Analysis



Integrated Audio Analysis

Timing & Logic Analysis

2.4 GHz Spectrum Analysis

Protocol & Profiles Analysis

Topology Analysis



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Technical Specifications

Analyzer RF Characteristics

- Ellisys Rainbow™: Wide-band, concurrent capture of all BR/EDR/LE channels
- Frequency band: 2.402-2.480 GHz
- Sensitivity range: From -90 to +15 dBm
- Gain: Programmable from -30 to +15 dB
- Modulations: All BR/EDR/LE modulations (GFSK, π/4-DQPSK, 8-DPSK)
- Baseband: Support of Bluetooth 4.0, upgradeable by software

Logic Capture Characteristics

- Maximum bandwidth: 50 MHz
- Sampling precision: 5 ns
- Supported input voltage: 1.8 to 7V

HCI Capture Characteristics

- USB transport: Low, Full, and High Speed, with automatic detection
- UART transport: Up to 8 Mbit/s, automatic detection of all parameters
- SPI transport: Up to 8 Mbit/s, automatic detection of all parameters

Embedded Memory

- 128 MB of FIFO memory
- Data is stored in highly optimized format
- Analyzed data is uploaded in real time through USB 2.0 connection

Timing

- Clock: ±1ppm frequency accuracy over -10 to +60 degrees Celsius range
- BR/EDR/LE timestamp accuracy: 125ns
- USB HCI timestamp accuracy: 16.7ns
- Logic timestamp accuracy: 5ns

Front-Panel Indicators

- Power: unit powered on
- Operating: unit performing requested task
- Trigger: trigger event detected
- Capture: BR/EDR and/or LE packet captured
- HCI: HCI packet captured

Front-Panel Connectors

- Capture: Standard SMA female
- HCI: USB 2.0 Standard-A and Micro-B

Rear-Panel Connectors

- Computer: USB 2.0 Standard-B
- Power: 12-17 VDC, max 18 W
- Trigger: SMA in and out, 50 Ω, max 5 VDC
- IO Probe: supports HCI and logic analysis
- Inter-equipment: in and out, supports interconnection of several units

Power Supply

- Universal 100-240 VAC, 50-60 Hz
- 12 VDC, 18 W

Enclosure

- 174 x 111 x 58 mm (6.9 x 4.4 x 2.3")
- 0.9 kg (2.0 lbs)

Hardware Upgrade

- The Ellisys Rainbow™ engine is automatically updated with each software release (no user intervention required)

Maintenance and Licensing

- Free lifetime updates – no maintenance fees
- Free full-featured viewer application – easily share annotated traces between computers and colleagues and replay captured traffic
- Use Ellisys hardware on any computer – no additional licenses needed

Warranty

- Two-year limited warranty

Ordering Information

Description	Code
Ellisys Bluetooth Explorer 400 Standard BR/EDR (hardware unit with Classic BR/EDR capture)	BEX400-STD-EDR
Ellisys Bluetooth Explorer 400 Standard Low Energy (hardware unit with Low Energy capture)	BEX400-STD-LE
Ellisys Bluetooth Explorer 400 Standard Dual Mode (hardware unit with concurrent Dual Mode BR/EDR and Low Energy capture)	BEX400-STD-DUAL
Ellisys Bluetooth Explorer 400 PRO BR/EDR (hardware unit with Classic BR/EDR capture and PRO features set)	BEX400-PRO-EDR
Ellisys Bluetooth Explorer 400 PRO Low Energy (hardware unit with Low Energy capture and PRO features set)	BEX400-PRO-LE
Ellisys Bluetooth Explorer 400 PRO Dual Mode (hardware unit with concurrent Dual Mode BR/EDR and Low Energy capture and PRO features set)	BEX400-PRO-DUAL
Ellisys Bluetooth Explorer 400 Dual Mode Upgrade (upgrade to add concurrent Dual Mode BR/EDR and Low Energy capture)	BEX400-DUAL-UPG
Ellisys Bluetooth Explorer 400 PRO Mode Upgrade (upgrade to add optional features such as HCI capture, logic analysis and spectrum capture)	BEX400-PRO-UPG

Configurations

Radio Configuration	EDR	LE
BR/EDR configuration	x	
Low Energy configuration		x
Dual Mode configuration	x	x

Editions	STD	PRO
Whole-Band Wireless capture	x	x
HCI capture		x
Logic capture		x
Spectrum capture		x
Audio I2S capture		x
WCI-2 capture		x

More information on: www.ellisys.com/bluetooth

