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Features

- Enables simultaneous recording of up to twelve (12) uncompressed video camera inputs and the data from various in-vehicle networks
- Inserts between cameras and ECUs to ensure noninvasive low-latency video capture from the real vehicle’s camera installation (As Is!)
- Simulates the complete vehicle camera system by playing back the recordings in Hardware-in-the-Loop HIL tests on the developer’s desk
- The playback saves original video frame rates, resolutions and phase relations
- The default video interface can be modified:\footnote{Users can change SW initialization scripts. For HW changes through design services, please contact info@logicbricks.com}
  - TI® FPD Link-III (DS 913/914 RX/TX);
    resolution 1280x800@30fps, YCbCr 4:2:2
  - aux HDMI input 1280x1024@60fps
- Records automotive network data parallel to video: CAN, LIN, FlexRay, UART, DIG I/O, GPS
- Recordings are stored with a central timestamp
- User-friendly PC application enables full control of the HW configuration, recording and playback
- Can be configured for the self-standing operation in the test vehicle
- Supports standard and event-triggered recording of video and data before and after the trigger
- Triggers and filters can be setup as signals and messages from the vehicle databases
- Currently supported vehicle databases: CAN XML DBC, LIN LDF, FlexRay FIBEX
- Industry standard formats of the log files:
  - video in the YUY2 AVI format
  - networks data in ASC file formats
- External trigger IOs enable integration with third-party test equipment in the test vehicle
- Enables control HDMI monitor output while recording and during the playback
- Four (4) portable SSD Disks (FAT32, up to 8 TB combined\footnote{The standard logger configuration includes x4 512 MB SSDs. For SSDs with higher storage capacity, please contact Xylon.}) enable hours of recordings
- The removable SSD SATA disks can be plugged in a PC for easy video and network data transfer
- Rugged and actively cooled housing enables reliable test vehicle installations
- Integrates separated video inputs and outputs to avoid constant re-cabling
- Modular architecture based on the Xilinx® FPGA/SoC enables customizations\footnote{Documentation and tech support (e-mail)}
Applications

- Non-invasive test and validation of Advanced Driver Assistance and Autonomous Driving (ADAS/AD) systems in real traffic situations
- Recording of the real-world road conditions for use in the laboratory, i.e. in the HIL simulations
- Development of new ADAS/AD algorithms and systems

Technical Specifications (-20 version¹)

Data Processing

- Xilinx Zynq®-7000 AP SoC and Artix®-7 FPGAs
- High performance and flexible customizations

Video

- Inputs (from cameras):
  - x12 TI FPD Link-III¹ (914 RX)
  - x1 HDMI auxiliary input
- Outputs (to ECUs):
  - x12 TI FPD Link-III¹ (913 TX)
  - x1 HDMI to control display
- User scripts for custom camera initializations
- Aggregate 1.5 GB/s throughput² enables various camera combinations (through customization):
  - x12 1MP@30fps YUV 16-bit
  - x4 2MP@60fps YUV 16-bit...
- Uncompressed .AVI video format
- Video input to video output latency max 5 μs
- Cameras can be initialized and powered-up either by ECUs or by the logiRECORDE

Networks & Interfaces

- Automotive interfaces:
  - x4 CAN
  - x2 FlexRay
  - x12 LIN
  - x1 GPS
  - x1 UART
  - x2 DIG IN
  - x1 DIG OUT

- Network data in industry standard ASC format
- Supported vehicle databases:
  - XML DBC for CAN
  - LDF for LIN
  - FIBEX for FlexRay
- Control and diagnostic interfaces:
  - x1 Ethernet 1 Gbps
  - x1 LED
  - x1 Buzzer (programmable)
  - x1 UART (factory use only)
  - x1 JTAG (factory use only)

PC Control Application

- Controls all logger aspects (all-in-one):
  - HW configuration
  - Recording setup (triggers and filters)
  - Playback and analysis
- Requires Microsoft® Windows® 7 and later

Storage Media

- x4 SSD SATA (up to 8 TB combined³)
- Portable and FAT32 formatted
- Min. 3 hours of the uncompressed video⁴

General

- 12 VDC nominal in the 9-24 VDC range (100W)
- Timestamp 1 μs tick, average deviation < 10 μs
- Low power consumption enables comfortable work when powered-by the UPS
- Protected power supply controlled by a microcontroller; graceful shutdown, etc.
- Actively cooled and robust aluminum housing
- Dimensions (app. LxHxD): 25.8x32.8x10.2 cm
- Temperature range: 0°C - 50°C
- Optional side mounting brackets

¹ Xylon will support other video interfaces, such as the GMSL from Maxim Integrated™. Please contact info@logicbricks.com.
² Such data throughput enables simultaneous work with x20 1MP@30fps uncompressed video channels!
³ The standard logger configuration includes x4 512 MB SSDs. For SSDs with higher storage capacity, please contact us.
⁴ Assuming 8 TB storage capacity and parallel recording of x12 1MP 1280x800@30fps video camera inputs
General Description

The logiRECORDER Automotive Video Data Logger is a user-friendly, all-in-one automotive video and network data logger that sets the new standard for design and validation of vision-based Advanced Driver Assistance and Autonomous Driving (ADAS/AD) systems. It operates by tapping (Figure 2) between the real vehicle’s camera installation and the Electronic Control Units (ECUs) to enable noninvasive and low-latency recording of camera video, and network sensory and ECU data.

Testing and validation of vision-based ADAS/AD systems traditionally require lots of real tests in different driving situations encountered under different road conditions. These time-consuming, costly, and due to the limited number of executed test scenarios unreliable road tests, can be largely substituted with the Hardware-In-the-Loop (HIL) simulations.

The logiRECORDER is designed to support highly efficient and highly precise HIL simulations. It can realistically simulate the vehicle’s camera installation on a developer’s desk by playing back the recorded videos with preserved frame rates, video resolutions and phase relations between video channels.
Along with the video, the logiRECORDER records sensory data from multiple CAN, LIN, FlexRay, GPS, and UART vehicle networks. The integrated digital inputs and the digital output can be used for easy system control, for example push-button initiated measurements, or markings, as well as for the synchronized clustering with the third-party test and validation equipment. The recorded network traffic data, in combinations with video from the vehicle’s cameras, enable new and deep insights into operation of the tested ADAS/AD systems.

The logiRECORDER User Interface (UI) PC application (Figure 3) enables centralized logger control, data analysis and event-triggered recordings. Triggers and filters can be setup as signals and messages from vehicle XML DBC, LDF and FIBEX databases. The user interface application can be used for selecting video inputs for recording, switching between display views, swapping continuous and event-triggered recording modes, controlling video playback directly from the logiRECORDER system, power supply (graceful shutdown) setups, etc. The selected logiRECORDER views can be continuously displayed on the attached monitor (Figure 2).

The logiRECORDER stores logged data on four (4) FAT32 formatted and removable SSD SATA disks (up to 8 TB) that plugs in the PC for easy archiving and use in the lab. Virtually any media player and any integrated software framework for multi-sensor ADAS/AD development can use the logiRECORDER video recordings due to their standard .AVI formatting. Network data recorded in industry standard ASC format can be also analyzed in third-party software tools.

Xylon offers customization of the presented hardware and software products through design services. If the logiRECORDER-20 Automotive Video Data Logger needs to be changed to fully fit your specific needs, please contact info@logicbricks.com.

**Deliverables**

- logiRECORDER Main Box
- Power supply for use in the lab
- Connectors for the power supply and digital IO cabling
- USB memory stick with software and documentation
Related Xylon Products

The logiADAK is a great development platform for ADAS applications that require intensive real-time video processing, parallel execution of multiple algorithms and versatile interfacing with sensors and vehicle's communication backbones. The abundant performance and re-programmability of the Xilinx Zynq-7000 AP SoC enables ADAS designers to design custom SoCs that outperform competing solutions and achieve a new level of system differentiation. To learn more about this product, please contact Xylon or visit:

Email: support@logicbricks.com
URL: https://www.logicbricks.com/Solutions/Xylon-ADAS-Development-Kit.aspx

Ordering Information

The logiRECORDER-20 product is available directly from Xylon. Please visit our web shop or contact Xylon for pricing and additional information:

Email: sales@logicbricks.com
URL: http://www.logicbricks.com/Products/logiRECORDER-20.aspx

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Revision History

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<tr>
<th>Version</th>
<th>Date</th>
<th>Note</th>
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<tbody>
<tr>
<td>1.00</td>
<td>26.01.2016</td>
<td>Initial public release of the logiRECORDER-BASE logger.</td>
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<tr>
<td>2.00</td>
<td>29.05.2017</td>
<td>logiRECORDER-20: re-designed device with extensively expanded features set, non-invasive video recording, data logging from many automotive networks, video playback through automotive serial links, new control application, etc.</td>
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