ES720
Drive Recorder

The ES720 module is a universal Drive Recorder which can be used for a variety of measurement tasks in the development, calibration, and validation of automotive electronic systems. The rugged, PC-based unit is suitable for use in vehicles and offers various extension options.

The ES720 Drive Recorder is fully compatible with INCA, the standard tool for measurement, electronic control unit (ECU) calibration and diagnostics. All ETAS Ethernet interface and measurement modules can be connected to the drive recorder. For measurements, the ES720 replaces the laptop with INCA software. The selection of measurement signals, the setting of data acquisition rates and the configuration of triggers, communication and diagnostic protocols are directly transferred from INCA. The ES720 module provides for unattended data recording. Once configured, operation of the unit is straightforward, even for untrained personnel.

Versatile

In the development, calibration, and validation of automotive electronic systems, data from ECUs, networks, and the vehicle environment has to be acquired, evaluated and analyzed with high efficiency. The logging of communication on the serial vehicle buses is a standard drive recorder task. In ECU development and calibration, serial bus interfaces in combination with appropriate communication protocols are also used to collect data directly from the ECU. With connection options for Ethernet, FlexRay, CAN, LIN and K-Line, the ES720 Drive Recorder supports all relevant serial interfaces and buses in the vehicle, as well as related protocols. For more sophisticated measurement tasks, more powerful connections enabling high data rates are used instead of serial interfaces. Using the ETAS universal ETK and XETK ECU interfaces, the ES720 module can record several hundred signals simultaneously.

At a Glance

Universal drive recorder for development and measurement

Powerful, compact and suitable for use in vehicles

Fully compatible with INCA

Synchronized data acquisition from ECUs, vehicle buses and measurement modules

Quick start from fast boot standby mode

Various extension options

Optional WLAN

Based on the signals of only a few sensors and aided by mathematical models, the electronic controls calculate a number of control variables. Measurements are used to calibrate and validate the models, using additional sensors from test vehicles. The ES720 drive recorder – in combination with different measurement models – captures analog voltages of active and passive sensors, temperatures, lambda values and digital signals such as frequencies, counter results, or times – synchronous to the signals coming from the ECU. Based on the precisely synchronized measurement data, the dynamic behavior of the electronic system can be closely analyzed. New controls are tested as prototypes in real-life operation. To validate the correct behavior of new ECU functions, the ETAS ES910 prototyping system can be connected to the ES720 module alongside the other signal sources.

In addition to the control functions, the ECU on-board diagnostics has to be examined carefully. The ES720 module supports the standard diagnostic interfaces and protocols and is able to access the complete diagnostic system of the vehicle on the basis of ODX descriptions. Using diagnostic data recorded simultaneously to signals from sensors, buses and ECUs, it is possible to analyze errors in diagnostics in correlation to the behavior of the remaining system.

Integral part of the measuring system

The ES720 module integrates seamlessly with the ETAS in-vehicle measuring system (Fig. 1). For this purpose, ECU and bus interface modules of the ES59x series as well as measurement modules of the ETAS ES400 and ES600 product families are linked via Ethernet and connected to the drive recorder. A single ECU with an XETK XCP-on-Ethernet interface can be connected directly to the drive recorder.

In addition to an Ethernet port, four digital, TTL-compatible inputs and outputs and four USB ports are onboard the ES720 module. In a simple set up, the unit can be connected to the vehicle network with ES581 USB CAN bus interfaces.

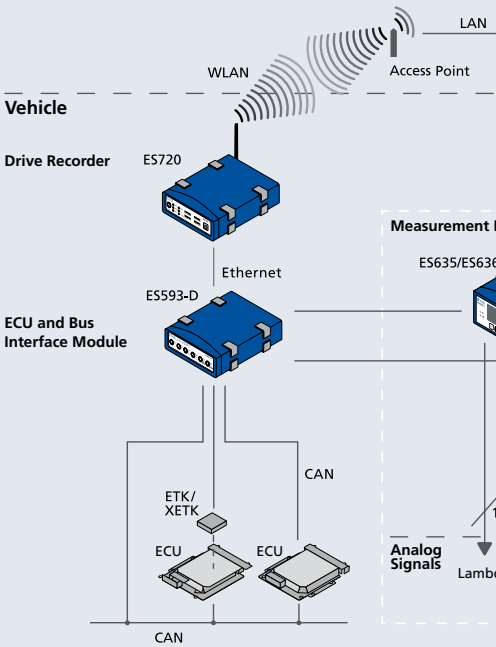
In fast boot standby mode, the ES720 module is ready to measure within about 10 seconds. Switching between standby and measurement mode is done either manually using the button on the unit, on a time-controlled or remote-controlled basis by TTL signal – for example using "terminal 15", – or by switching a connected PC or Ethernet module on or off.

Monitoring the CAN

If messages have to be logged on a CAN bus immediately after the start of the communication, the ES593-D ECU and bus interface provides the ideal complement to the drive recorder (Fig. 2). In addition to one ETK and two XETK/Ethernet interfaces, the ES593-D module provides four CAN ports. Once the unit receives messages on a CAN port, it automatically turns on and also switches on the drive recorder and all other ETAS modules in the measuring system. The ES593-D module buffers the received CAN messages until the drive recorder starts recording data. The wake-up and buffering functions are supported by two of the four ES593-D CAN interfaces and provide for the logging of CAN messages within 1 second after start of CAN communication.

Multi-recorder with versatile trigger modes

The drive recorder records all the data it collects from the connected modules to a common file. The recorded data is stored in the ASAM standard format MDF (Measure Data Format). Even in case of high data volumes, the recorded measure-



ES720 Drive Recorder

- 100 % INCA compatible
- 4 x USB
- 1 x Ethernet
- 1 x WLAN (optional)
- 1 x VGA
- 1 x Multi-I/O
- Fast logging of ECU (10 sec after power on)

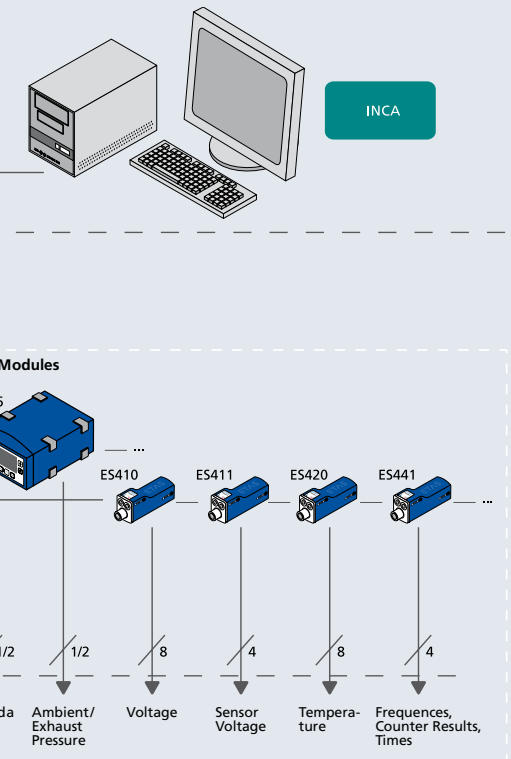


Figure 1: The ES720 module records signals from ECUs, vehicle busses, and sensors. The data is acquired by peripheral interface and measurement modules and synchronized with µs accuracy.

ES593-D ECU and Bus Interface Module

- 1 x ETK
- 4 x CAN
- 2 x Ethernet
- Wakeup on CAN
- Fast start of CAN monitoring (1 sec after power on, 2 CAN ports supported)

Figure 2: The ES720 Drive Recorder can be combined with the ES593-D ECU and bus interface module in a compact unit. During ES720 power-up, the ES593-D module logs CAN frames until the drive recorder starts data acquisition.

ments can be evaluated conveniently using the ETAS MDA Measure Data Analyzer and compared easily to INCA reference measurements.

To limit data recording to relevant information, it is necessary to distinguish between normal and incorrect behaviors in varying situations. Certain measurements are to be started only after the occurrence of specific conditions, for example, if the values of variables and sensor signals calculated in the ECU differ. Appropriate trigger conditions allow for the intelligent control of data recording using the ES720 module. For this purpose, all trigger options offered by INCA are supported.

During test runs, several vehicle functions are normally tested at the same time. The different experiments are usually monitored by various experts. The ES720 Drive Recorder supports simultaneous recording of different measurements (multi-recording). Different start and stop triggers can be assigned to each of the individual recorders.

Interactive configuration

Before putting the ES720 Drive Recorder into operation, the measurement system and the triggers can be tested and adjusted interactively with exactly the same behavior using INCA. The same experiment can be used by INCA and by the drive recorder. With INCA, many different experiments can be prepared and exported afterwards.

With the drive recorder, a standalone configuration tool is delivered. It allows offline adjustment of unit-specific properties such as turn-on/turn-off behavior, directory paths, and parameters for transferring measurement and configuration data. The tool lets you manage the configurations together with the experiments and distribute them to the drive recorders. The ES720 module provides for swapping experiments triggered by events. For this purpose, complex trigger conditions can be defined. When the unit is connected, it is possible to start and stop measurements manually or to retrieve status information of current measurements.

Flexible data transfer

The ES720 module supports a variety of data transfer methods. Using the Windows-based operating system, it is easy to perform customized applications such as the automated transfer of encrypted and compressed data to file servers over the network.

The data transfer takes place via LAN or wirelessly via WLAN or mobile radio communications. Drive recorders with integrated WLAN module are available as an option. Appropriate mobile radio interfaces such as UMTS, GPRS or GSM can be connected to the ES720 module using USB.

Technical Data

Item	Characteristics	Features
Size and Weight	Dimensions (H x W x D)	45 x 126 x 160 mm / 1.75 x 4.9 x 6.3 in
	Weight	Approx. 800 g / 1.8 lbs
Computing unit	Processor	1.6 GHz Single Core CPU
	RAM	1 GB RAM
Memory	CF card	8 GB (5.5 GB free space for data) or 16 GB (12.5 GB free space for data). External storage media can be connected via USB
Environment	Temperature range	–40 °C to +70 °C (–40 °F to +158 °F) (operation without WLAN)
	Tested for	Mechanical shock, vibration, fall, temperature shock, temperature alteration, according to EN 60068 resp. ISO 16750
Power supply[1]	Operating voltage	5 V to 32 V DC
	Power consumption (at 14.4 V)	500 mA (operation), 50 mA (fast boot standby), 10 mA (low power standby)
	Power management (wake-up/stand-by)	Time triggered, remote by TTL signal, or when Ethernet traffic starts/stops (PC or ES593-D module on/off)
	Protection	Reverse voltage protection, load dump protection
Readiness to measure	In operation	Immediately without delay
	In fast boot stand-by	Approx. 10 seconds after power-up (depending on the experiment)
	In low power stand-by	Approx. 60 seconds after power-up (depending on the experiment)
	CAN monitoring with ES593-D	Approx. 1 second after start of CAN activity
Data transfer	Ethernet	1 Port (10/100 Base-T)
I/O interfaces	Analog input	Monitoring of operating voltage
	Digital I/O	Each 4 x TTL inputs and outputs
	Operation status	TTL outputs, signals relate to LED display
PC interfaces	USB	4 x USB 2.0 Typ A
	WLAN	IEEE 802.11a/b/g/l integrated (optional)
	VGA	SUB-D connector
Compatible ETAS hardware	Ethernet	ES51x, ES59x, and ES9xx Network, Interface, and Prototyping Modules, ES4xx and ES6xx Measurement Modules, XETK
	USB	ES581 CAN Bus Interface USB Module
Support by ETAS software	INCA	INCA V6.2.1 and up

[1] Power supply cables for ES720 and ES59x modules are identical.

For ordering information and accessories for the ES720 module, please refer to *www.etas.com/ES720*.

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