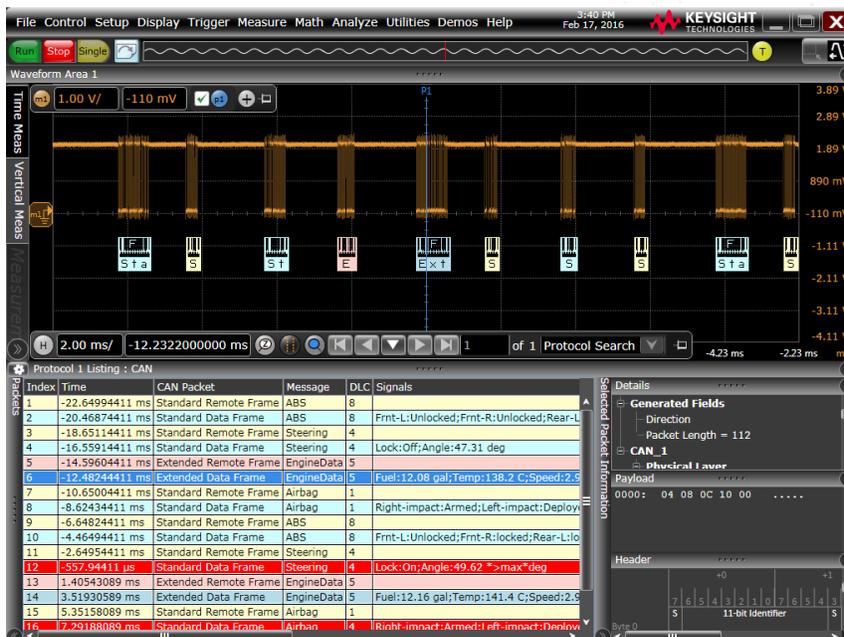


# D9010AOTP Automotive Protocol Trigger and Decode for Infiniium Oscilloscopes

The D9010AOTP software package for Infiniium oscilloscopes gives you the ability to trigger and decode on a large and ever-expanding suite of low speed automotive serial protocols: CAN, CAN-FD, LIN, FlexRay and SENT. This package applies to the Keysight 9000, 90000, S, V, Z, and UXR Series Infiniium Oscilloscopes.



## Table of Contents

Product overview .....	3
CAN .....	4
LIN .....	5
FlexRay .....	6
SENT .....	7
Ordering information and related literature .....	8
Flexible Software Licensing and KeysightCare Software Support Subscriptions .....	8
Selecting your license .....	9
Examples .....	9
Related literature .....	9

## Product overview

This document is designed to help you understand what is available in D9010AUTP. For assistance in using the software, please reference the latest user's guide, programmer's guides, and online help for Infiniium available on Keysight.com.

Keysight's D9010AUTP oscilloscope automotive option helps electronic system designers test and debug the physical layer of automotive serial buses faster. CAN, CAN-FD, LIN, FlexRay, and SENT serial buses are the backbone for communication among many separate controllers, sensors, actuators, and ECUs located throughout automotive and industrial designs. These serial bus interfaces provide content rich points for debug and test. However, since these protocols transfer bits serially, using a traditional oscilloscope has limitations. Manually converting captured 1s and 0s to protocol requires significant effort, cannot be done in real-time, and includes potential for human error. Also, traditional oscilloscope triggers are not sufficient for specifying protocol-level conditions. This software makes it easy to debug and test designs that include these buses using your Infiniium oscilloscope.

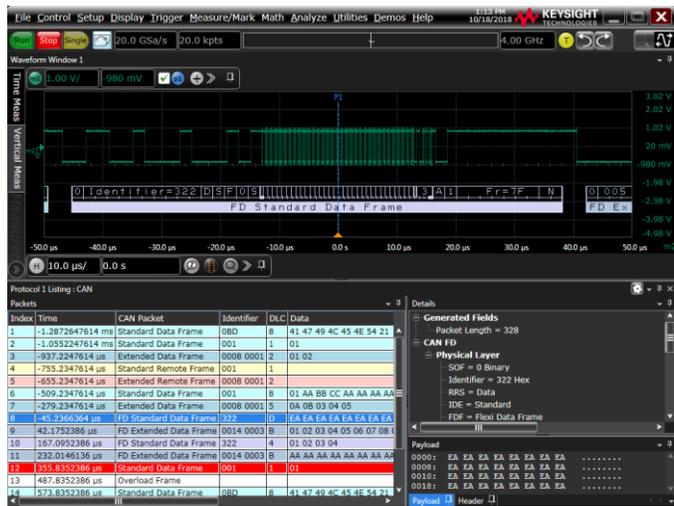
- Set up your oscilloscope to show CAN(FD), LIN, or FlexRay protocol decode in less than 30 seconds
- Get access to a rich set of integrated protocol-level software triggers
- Save time and eliminate errors by viewing packets at the protocol level
- Use time-correlated views to quickly troubleshoot serial protocol problems back to their timing or signal integrity root cause
- With the CAN-dbc symbolic trigger and decode capability, engineers can now test the physical layer of this differential bus at a higher abstraction level



# CAN

The differential Controller Area Network (CAN) bus is used extensively in all of today's automobiles for drive-train and body control. This protocol was developed by Bosch more than 30 years ago, and it is still considered the "workhorse" serial control bus of the automobile. The CAN bus has also been heavily adopted for industrial and medical equipment control applications.

D9010AUTP includes a suite of configurable protocol-level trigger conditions specific to CAN, CAN-dbc, and CAN-FD. When serial triggering is selected, the application uses software-based triggering or hardware-based serial triggering. With protocol triggering, the oscilloscope takes signals acquired using either a scope or digital channels and reconstructs protocol frames after each acquisition. It then inspects these protocol frames against specified protocol-level trigger conditions and triggers when the condition is met.

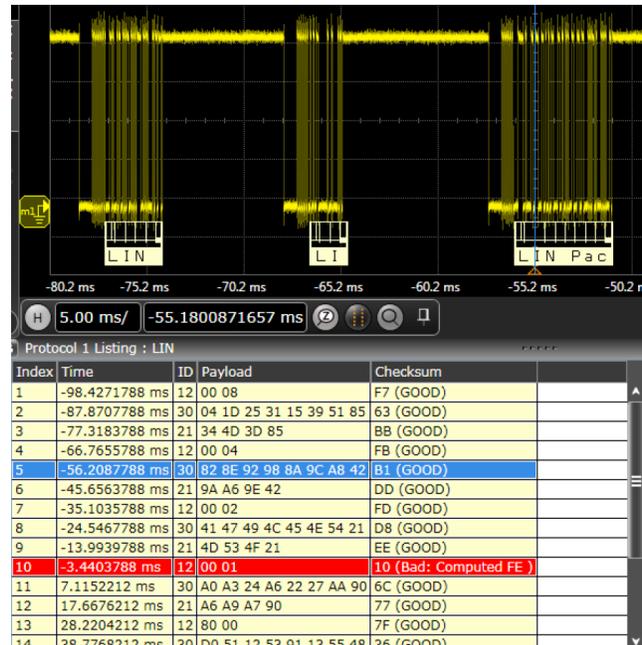


## CAN Specifications and Characteristics

CAN sources	Any analog channel (differential recommended) Any digital channel (MSO only, single ended) Any waveform memory
Signal types	Differential (L-H), CAN_L, CAN_H, Tx
Maximum data rate	Standard: 10 kbps to 5 Mbps FD: 10 kbps to 10 Mbps
Auto setup	Automatically configures trigger levels, decode thresholds, sample rate, memory depth, holdoff, and trigger
Decode options	Type: Standard or flexible data rate Standard sample point (30% to 87.5%) Setting of the standard and FD data rates
Decoded fields	All, including extended frame format Symbolic: up to first 8 bytes of CAN-FD data, uses industry standard .dbc file type, max number of messages = 256
Trigger options	All frames Data frames (standard and extended) ID, DLC, Data, res, BRS, and ESI fields Remote frames (standard and extended) ID, R0, and DLC fields Overload frames Errors: CRC, form, stuff, error frame, ACK, any Specific bits: BRS, CRC delimiter, ESI active/passive, EOF

## LIN

D9010LSSP provides a fast and easy way to debug 2-wire, 3-wire or 4-wire Serial Peripheral Interface (SPI) serial communication busses found in a wide variety of embedded designs. It provides protocol-level debug information to Keysight's Infiniium series oscilloscopes. With new, enhanced serial analysis capabilities, D9010LSSP provides not only decode, but also listing window view, software searching, and trigger on search. When serial triggering is selected, the application enables special real-time triggering hardware to ensure that the scope never misses a trigger when armed.



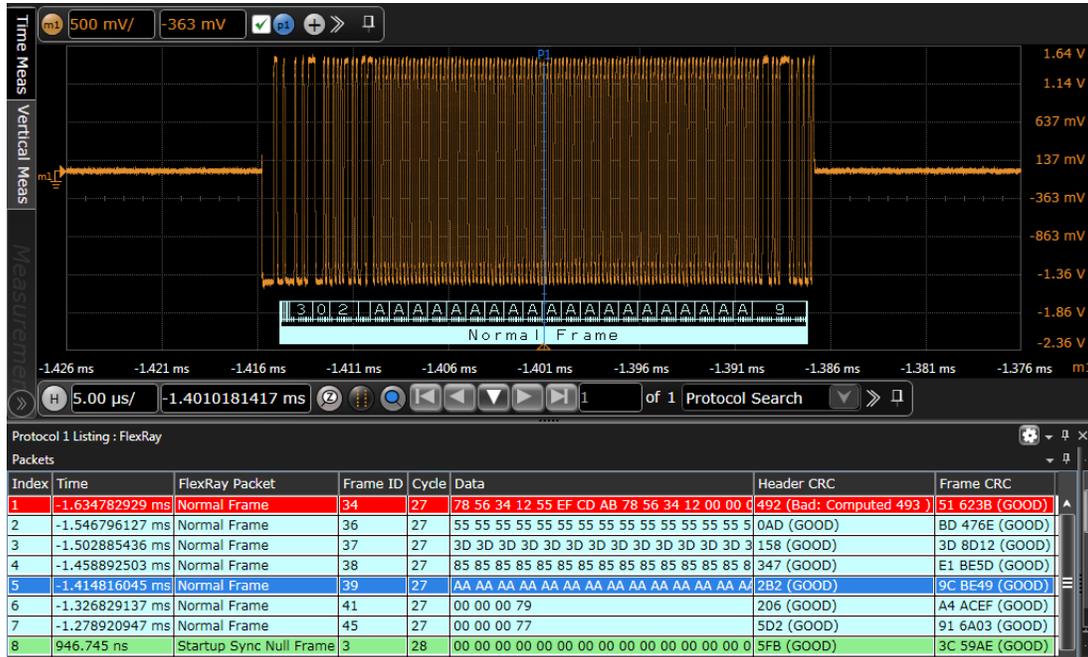
### LIN Specifications and Characteristics

LIN version support	1.3, 2.0, 2.1
LIN sources	Any analog channel Any digital channel (MSO models) Any waveform memory
Maximum data rate	2.4 kbps to 625 kbps
Auto setup	Automatically configures trigger levels, decode thresholds, sample rate, memory depth, holdoff, and trigger
Decode options	Baud rate Sample point (60% to 87.5%)
Decoded fields	All (based on version support)
Trigger options	Packets: ID, parity, and payload Wakeup Errors: parity, checksum, sync, frame length, header length, wakeup

## FlexRay

FlexRay is designed to be faster and more reliable than CAN and LIN, but it is also more expensive. FlexRay supports high data rates, up to 10 Mbps, explicitly supports both star and "party line" bus topologies, and can have two independent data channels for fault-tolerance.

When developing and/or troubleshooting the FlexRay bus, examination of hardware signals can be very important. Like all other low speed protocols on Infiniium, you will be able to set specific triggers, decodes, save and export data, run search queries, and view data in the lister. There is also an auto setup available.

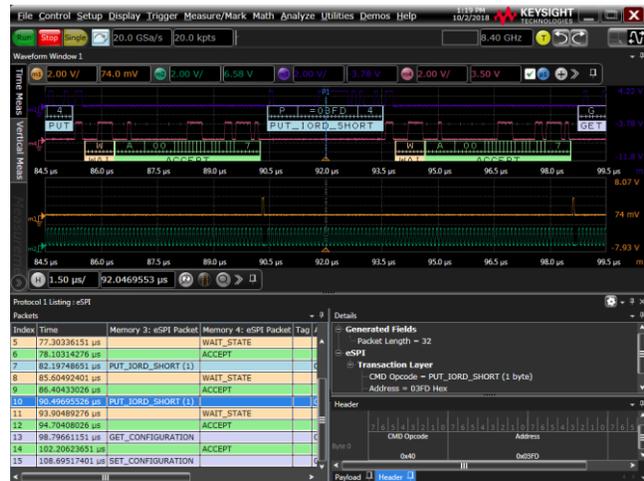


### FlexRay Specifications and Characteristics

FlexRay sources (all lines)	Any analog channel (only when speed is $\leq 50$ MHz) Any digital channel (MSO only, required for speeds $> 50$ MHz) Any waveform memory (only when speed is $\leq 50$ MHz)
Maximum rate (clock or data)	2.5 Mbps to 10 Mbps
Auto setup	Automatically configures trigger levels, decode thresholds, sample rate, memory depth, holdoff, and trigger
Decode options	Channel: A or B Baud rate Cycle time: 0 s to 100 ms
Trigger options [1]	Cycle TSS or Any TSS Frames: startup, sync, normal, null, NOT null, any Frame fields: reserved, PPI, null, Frame ID, startup frame indicator, sync frame indicator, payload length, header CRC, cycle, data Errors: bad header CRC, bad frame CRC, unknown packet, any

# SENT

Short for Single Edge Nibble Transmission, SENT is a one-way, point-to-point scheme for transmitting signal values from a sensor to a controller. It is intended to allow for transmission of high resolution data with a low system cost. It requires three wires: data, power, and ground. Data is transmitted in units of 4 bits (1 nibble) for which the interval between two falling edges (single edge) of the modulated signal with a constant amplitude voltage is evaluated.



## SENT Specifications and Characteristics

SENT data sources	Any analog channel Any digital channel (MSO only) Any waveform memory Any math function
Clock period	1 $\mu$ s to 300 $\mu$ s
Auto setup	Automatically configures trigger levels, decode thresholds, sample rate, memory depth, holdoff, and trigger
Decode options	Tolerance: 3% to 30% Number of nibbles: 1 to 6 Clock idle state: high or low CRC format: 2008 or 2010 Pause mode: ON, OFF, or SPC
Trigger options	Fast Nibbles: S&C, Data Errors: Fast channel CRC error, tolerance violation, successive sync pulses error, pulse period error, any error

## Ordering information and related literature

### Flexible Software Licensing and KeysightCare Software Support Subscriptions

Keysight offers a variety of flexible licensing options to fit your needs and budget. Choose your license term, license type, and KeysightCare software support subscription.

#### License Terms

**Perpetual** – Perpetual licenses can be used indefinitely.

**Time-based** – Time-based licenses can be used through the term of the license only (6, 12, 24, or 36 months).

#### License Types

**Node-locked** – License can be used on one specified instrument/computer.

**Transportable** – License can be used on one instrument/computer at a time but may be transferred to another using Keysight Software Manager (internet connection required).

**USB Portable** – License can be used on one instrument/computer at a time but may be transferred to another using a certified USB dongle (available for additional purchase with Keysight part number E8900-D10).

**Floating (single site)** – Networked instruments/computers can access a license from a server one at a time. Multiple licenses can be purchased for concurrent usage.

#### KeysightCare Software Support Subscriptions

Perpetual licenses are sold with a 12 (default), 24, 36, or 60-month software support subscription. Support subscriptions can be renewed for a fee after that.

Time-based licenses include a software support subscription through the term of the license.

**KeysightCare Software Support Subscription provides peace of mind amid evolving technologies.**

- Ensure your software is always current with the latest enhancements and measurement standards.
- Gain additional insight into your problems with live access to our team of technical experts.
- Stay on schedule with fast turnaround times and priority escalations when you need support.

## Selecting your license

- Step 1.** Choose your software product (eg. D9010AUTP).
- Step 2.** Choose your license term: perpetual or time-based.
- Step 3.** Choose your license type: node-locked, transportable, USB portable, or floating.
- Step 4.** Depending on the license term, choose your support subscription duration.

## Examples

If you selected:	Your quote will look like:	
D9010AUTP node-locked perpetual license with a 12-month support subscription	<b>Part Number</b>	<b>Description</b>
	D9010AUTP	Automotive Decode and Trigger Software
	R-B5P-001-A	Node-locked perpetual license
	R-B6P-001-L	KeysightCare software support subscription, node-locked–12 months
D9010AUTP transportable time-based 6-month license	<b>Part Number</b>	<b>Description</b>
	D9010AUTP	Automotive Decode and Trigger Software
	R-B4P-001-F	6-months, node-locked KeysightCare software support subscription

To configure your product and request a quote:

<http://www.keysight.com/find/software>

Contact your Keysight representative or authorized partner for more information or to place an order:

[www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

## Related literature

Type	Description / URL
Brochure	<a href="#">Infiniium S-Series</a> (500 MHz to 8 GHz real time oscilloscope)
Brochure	<a href="#">Infiniium V-Series</a> (8 GHz to 33 GHz real time oscilloscope)
Data Sheet	<a href="#">Infiniium UXR Series</a> (13 GHz to 110 GHz real time oscilloscope)
Brochure	<a href="#">30 Things Only Infiniium Oscilloscopes Can Do</a>

Learn more at: [www.keysight.com](http://www.keysight.com)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

