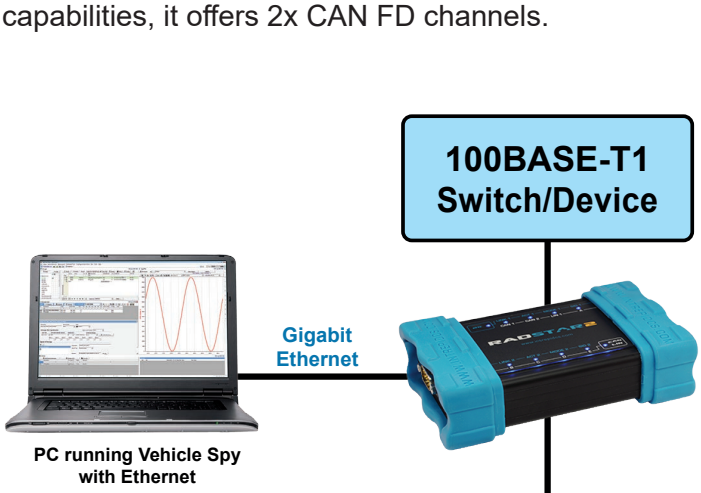
RAD-Star 2

Active Tap and Gateway for Automotive Ethernet

Intrepid's RAD-Star 2 is a multi-purpose active tap and media converter for Automotive Ethernet. Using the RAD-Star 2, you can monitor both sides of a 100BASE-T1* connection, or attach a laptop to two 100BASE-T1 ECUs or other devices. As a gateway to 10/100/1000 Ethernet, the RAD-Star 2 makes any standard Ethernet device, laptop, or data logger compatible with 100BASE-T1.

The RAD-Star 2 has two 100BASE-T1 PHYs, allowing it to tap a link between ECUs and/or switch ports. It can also act as a media converter for up to two devices. In addition to its Automotive Ethernet capabilities, it offers 2x CAN FD channels.



Using the RAD-Star 2 as an active tap

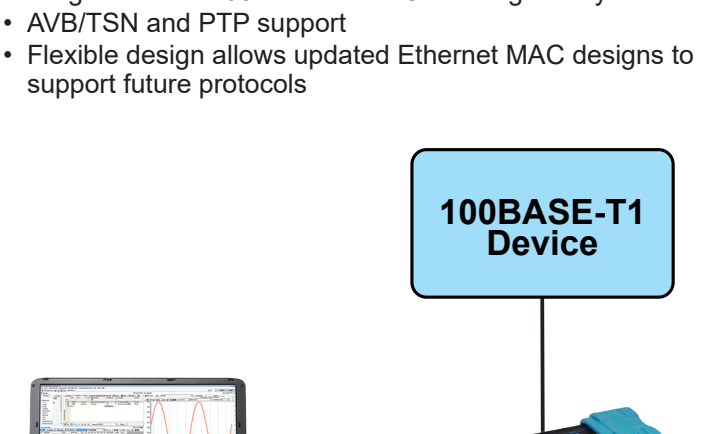
Features

- Copies full-duplex communications between connected Automotive Ethernet devices with minimal latency
- Frame encapsulation captures bad/rejected frames
- Timestamps all Ethernet and CAN FD frames with 10 ns accuracy
- Filtering and routing capabilities
- Serves as a 100BASE-T1 to 10/100/1000 Ethernet bridge with buffering capability
- Programmable 100BASE-T1 to CAN FD gateway
- AVB/TSN and PTP support
- Flexible design allows updated Ethernet MAC designs to support future protocols

Applications

The RAD-Star 2 has many features that make it the ideal tool for a variety of applications, including:

- ECU-level and system-level automated testing
- Automotive Ethernet network monitoring
- Network simulation / Restbus simulation
- Automotive Ethernet to CAN FD gateway applications
- ECU reflashing over Automotive Ethernet or CAN FD



Using the RAD-Star 2 as a media converter

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Active Tap Mode

A primary use of the RAD-Star 2 is to act as an active tap, transparently interposing itself between a pair of 100BASE-T1* Automotive Ethernet devices. This can be either an ECU-to-switch or ECU-to-ECU link. The traffic from each device on a tapped link is forwarded to its partner, ensuring seamless operation of the network. Copies of all messages are also aggregated and sent to the PC over the RAD-Star 2's Gigabit Ethernet link, where they can be analyzed using Vehicle Spy Enterprise software. Messages can be sent from the PC to connected nodes simultaneously while receiving messages from the tapped link.

Media Converter Mode

The RAD-Star 2 can be configured as a media converter, letting a PC transmit data to and receive data from two Automotive Ethernet ECUs. This allows you to simulate nodes, perform direct diagnostics, or flash ECUs. In addition, the "pure" media converter mode disables encapsulation and allows connections between media of differing bit rates, buffering as needed.

RAD-Star 2 / Gateway Testing

The RAD-Star 2 has the ability to monitor traffic between two ECUs (hosts) or between an ECU and a 100BASE-T1 switch, plus two CAN FD networks, with 10 ns time accuracy. This makes it ideal for ECU testing applications, as well as port-to-port and Ethernet-to-CAN FD latency testing.

Vehicle Spy Enterprise Software

The RAD-Star 2 works best with Intrepid's powerful Vehicle Spy Enterprise software. Vehicle Spy lets you view traffic on your tapped or media-converted Automotive Ethernet networks, even bad or unrecognized frames, synced with CAN FD frames. You can transmit messages from the PC to ECUs, perform latency testing, do ECU conformance testing, and much more.

General Specifications

- Interface to PC via 1000BASE-T (NIC) or USB 2.0 (240 Mb/s)
- Low power consumption
- Power supply: 4.5-40V operation via barrel jack; use included power supply or vehicle power
- Ten scriptable, multi-color LEDs indicate link status and modes of operation
- Two scriptable, tactile switches for manual mode selection
- Temperature range: -40°C to +85°C
- One-year limited warranty
- Field-upgradeable flash firmware
- Standalone mode, including scripting, receive messages, transmit messages, expressions, I/O and transport layers
- Dimensions: 5.41" × 3.43" × 1.43" (13.7 × 8.72 × 3.62 cm)
- Weight: 0.65 lb (295 g)

Timing Specifications

- FPGA-measured 64-bit timestamping with 10 ns accuracy on all CAN FD and Ethernet networks
- Simultaneous operation on all CAN FD/Ethernet networks
- Queuing of data to support back-to-back message transmission with buffering support > 1 GB

Network Specifications - Automotive Ethernet

- 2x 100BASE-T1* PHYs (BCM89810)
- Automatic master/slave configuration
- Link up/down status monitoring
- Signal integrity monitoring
- Ethernet error reporting through specially designed MAC.
- Latency: 780 ns PHY Rx, 240 ns PHY Tx and 300 ns internal (total 1320 ns)
- Precision Time Protocol (PTP) support
- TSN support
- Frame Preemption (IEEE 802.1Qbu) / Express Traffic (IEEE 802.3br) support
- Additional protocols supported with software updates
- 100BASE-T1 ports can be configured to be in media converter, tap, or "pure" media converter mode (unencapsulated media converter)
- Implements Intrepid's specially designed MAC layer that permits support for future industry protocols and changes with a simple firmware update.

Network Specifications - CAN / CAN FD

- 2x CAN / CAN FD channels: two dedicated ISO11898 Dual Wire CAN physical layers (MCP2561FD)
- Software-switchable between ISO CAN FD and non-ISO (Bosch) CAN FD versions
- Up to 1 Mb/s software-selectable baud rate for arbitration phase
- Up to 8 Mb/s software-selectable baud rate for data phase
- Listen-only mode support
- CAN FD implemented using the Bosch MCAN CAN controller IP
- Software-selectable termination resistors for CAN channels

Ordering Information

Part Number	Description
RAD-GALAXY	RAD-Galaxy Device with Vehicle Spy

Specifications subject to change; please contact Intrepid for the latest information. All trademarks are the property of their respective owners.

** Compatible with BroadR-Reach devices.*

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