RAD-Comet 2

10BASE-T1S Development Interface with 100/1000BASE-T1, 10/100/1000BASE-T, CAN FD and LIN

The RAD-Comet 2 is a versatile device for developing and testing 10BASE-T1S communication in automotive systems. It can be configured and used to simulate a node on a 10BASE-T1S network as well as capture and analyze 10BASE-T1S traffic simultaneously with other vehicle networks. All Ethernet and CAN traffic are timestamped precisely for logging or analysis in Vehicle Spy software.

When configured as a media converter, the RAD-Comet 2 can bridge between any of its 3 Ethernet physical layers. This is useful for connecting a PC to an Automotive Ethernet device for observing network activity in Wireshark or Vehicle Spy. It is also useful for integrating a 10BASE-T1S device or network into a 100/1000BASE-T1 network..

Primary Use Cases

- Network Monitoring and Diagnostics

- Media Converter for 10BASE-T1S and 100/1000BASE-T1

- Gateway applications between Ethernet and CAN FD

- ECU Simulation and Testing

Features

- Time Synchronization
    - gPTP Time Synchronization using 100/1000BASE-T1 or100/1000BASE-T
    - Intrepid Time Sync (ITS) with other Intrepid products

- OPEN Alliance TC10 Sleep and Wakeup (100/1000BASE-T1)

- MACsec Encryption Support (100/1000BASE-T1)

- Device Power Connections

- DB9 connector for reliable in-vehicle use

- Convenient barrel jack for bench use

- Status LEDs
    - Network status and activity
    - T1 and T1S SQI indication
    - T1S PLCA Status

- PC Connectivity
    - Data connection via USB 3 or Gigabit Ethernet (1000BASE-T)
    - Compatibility with Vehicle Spy and Wireshark
    - Open-Source Intrepid API for direct network access in Windows or Linux applications.

Network Interfaces

- 2x 10BASE-T1S (LAN8671)

- 1x 100/1000BASE-T1 (88Q2221M)

- 1x 10/100/1000BASE-T

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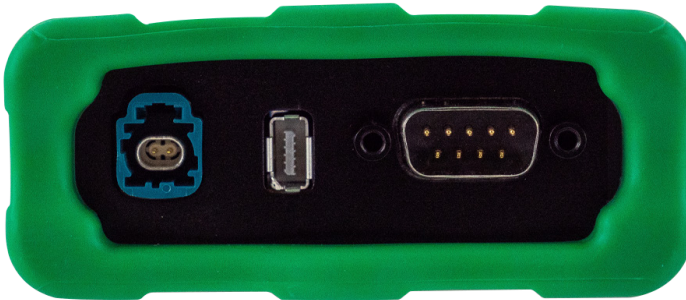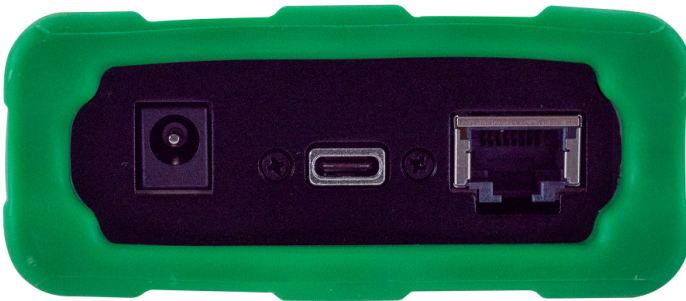
- 2x ISO CAN FD channels with selectable on-board termination
- 1x LIN

General Specifications

- Ix Industrial connector
- Automotive Voltage Range Operation (5.5V-40V)
- Temperature Range: -40°C to +85°C
- Low Power Consumption
- Automatic or static master/slave PHY configuration (T/T1 networks)
- LED indicators for Link Status and Network Activity
- Standalone mode including scripting, receive messages, transmit messages, expressions, and Gateways
- Battery-backed real time clock (RTC)
- 10 ns message time stamping precision
- Field-upgradeable flash firmware
- Compact design: 5.35" x 3.46" x 1.46" (13.6 x 8.8 x 3.7cm)
- Rugged aluminum enclosure with rubber bumpers for durability
- Light weight: less than 1 lb. (.45 kg)
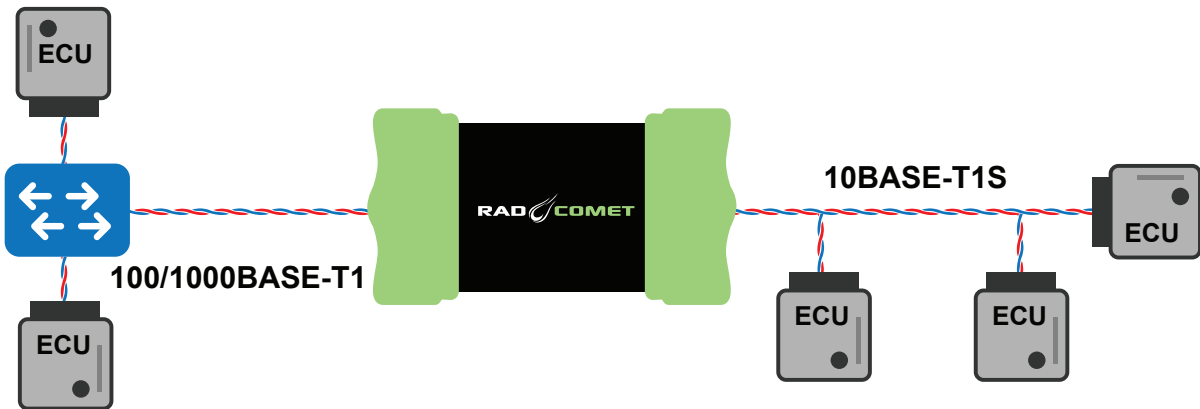- 1 Year Limited Warranty
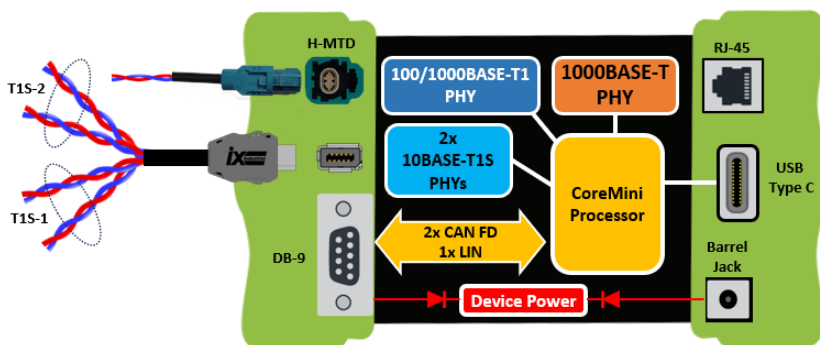
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Operational Overview and Use Cases

The RAD-Comet 2 can be used as a media converter between 10BASE-T1S and either of the other Ethernet physical layers available on the device. It can also serve as a media converter for 100/1000BASE-T1
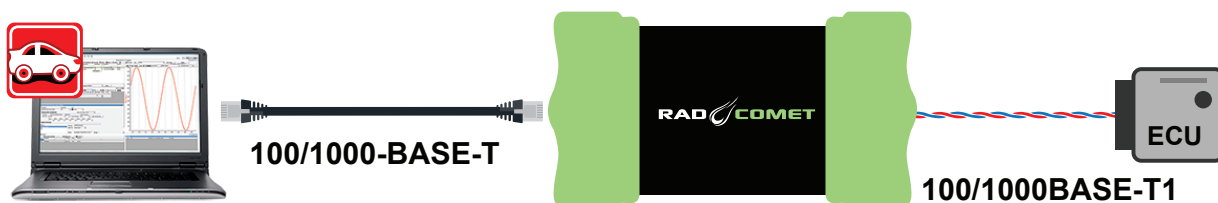
10BASE-T1S ⟷ 10/100/1000BASE-T

10BASE-T1S ⟷ 100BASE-T1

100/1000BASE-T ⟷ 100/100BASE-T1 Media Conversion

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Stand-Alone Gateway

Elaborate gateways can be implemented between any of the networks available on the RAD-Comet 2.

CAN/Ethernet Gateway

Payloads can be extracted from frames arriving on one network, placed into a different PDU structure with a different header and sent to another network.

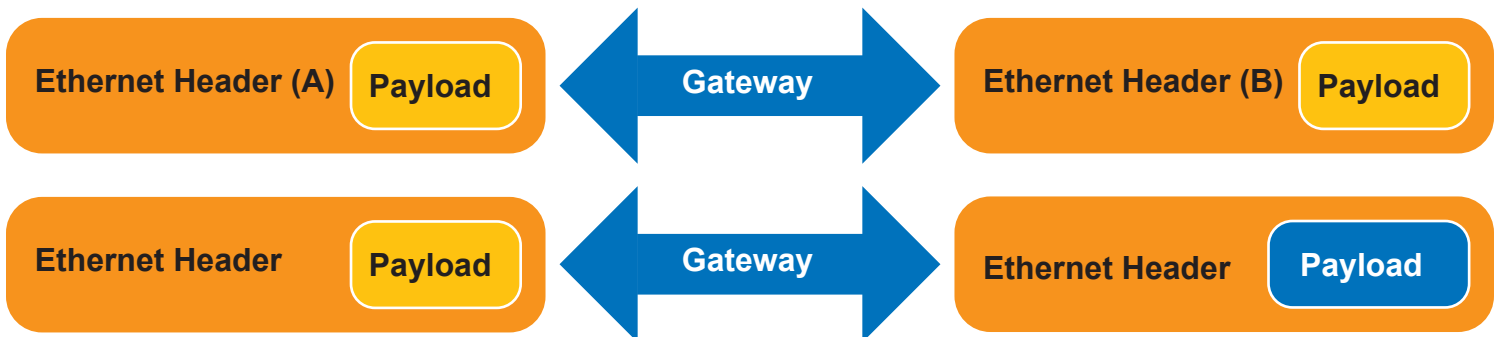| CAN (FD) Header | Payload | ← Gateway → | Ethernet Header | Payload |

Examples of this utility include (but not limited to):

- Networking devices from different architectures for a proof-of-concept
- Networking devices during the transition from one vehicle architecture to the next
- Streaming select (or all) network traffic for logging and analysis

Ethernet/Ethernet Gateway

Frames can arrive on one Ethernet network and sent out to another network directly, or after changing anything in the header or payload.

| Ethernet Header (A) | Payload | ← Gateway → | Ethernet Header (B) | Payload |

| Ethernet Header | Payload | ← Gateway → | Ethernet Header | Payload |

This functionality can be used to realize many novel functions useful in vehicle testing.

- Changing frame destination
- MAC Spoofing
- Layer 3/4 Address Translation
- Payload scaling
- Payload manipulation (Boundary testing, fault injection, penetration testing, etc.)

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Simulation and Scripting

Using Vehicle Spy you can define transmit messages on any network with custom data and send them manually or on a schedule of your choosing. You can also write intelligent scripts that implement arbitrary logic and compile them into embedded scripts which can run within the device itself. This functionality allows you to create specialized test scenarios, and to simulate ECUs and gateways.

PHY Register access

In any mode, each PHY can be accessed by the embedded processor over MDIO in order to read and write configuration registers.

Pinout

The H-MTD connector on the left is a 100/1000BASE-T1 port with the following pin assignments. Looking into the connector, the leftmost pin is Pin #1 with pin indexing increasing from left to right.

H-MTD 01 Connector Pinout

Pin	Label	Description
1	TRD+	Data transmit and receive, positive
2	TRD-	Data transmit and receive, negative

DB-9 Connector

The DB-9 connector on the right holds two CAN FD channels and can also be used to power the RAD-Comet 2. Pin assignments are listed in the table below.

Pin	Signal	Pin	Signal
1	LIN	6	GND
2	CAN 1 L	7	CAN 1 H
3	GND_Isolated for LIN	8	CAN 2 H
4	CAN 2 L	9	VBATT
5	GND		

Ordering Information

Part Number	Description
RAD-Comet 2	10BASE-T1S Development Interface with 100/1000BASE-T1, 10/100/1000BASE-T, CAN FD and LIN

INTREPID
CONTROL SYSTEMS
www.intrepidcs.com

1850 Research Drive
Troy, MI 48083 USA
Phone: +1 (586) 731-7950
Fax: +1 (586) 731-2274

automotive engineering
tool alliance
www.aeta-rice.com