

ScopeRider

RTH-K10 - SENT (Single Edge Nibble Transmission)

Serial Trigger and Decode



**ROHDE & SCHWARZ**

# SENT (Single Edge Nibble Transmission) Protocol Overview

- **Point-to-point protocol between sensors and engine control unit (ECU)**
  - Specified by Society of Automotive Electronics, reference J2716
  - Attempts to modernize and standardize automotive sensor communication
  - First adopter sensors: throttle position, pressure, mass airflow, ...
  - Low-cost, SENT is output-only, sensor requires no receiver, only transmitter
- **Consists of two logical channels**
  - Fast-channel: Primary data channel (the actual sensor value)
  - Slow-channel
    - To transmit additional information like temperature, production codes etc
    - Two bits within fast-channel message contain slow-channel
    - Many fast messages needed to transfer one slow-channel-message

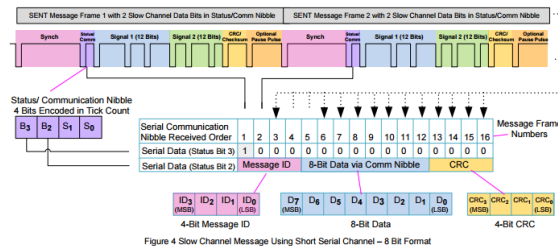


Figure 4 Slow Channel Message Using Short Serial Channel – 8 Bit Format

■ **Scope Rider is the only handheld scope with SENT T&D!**

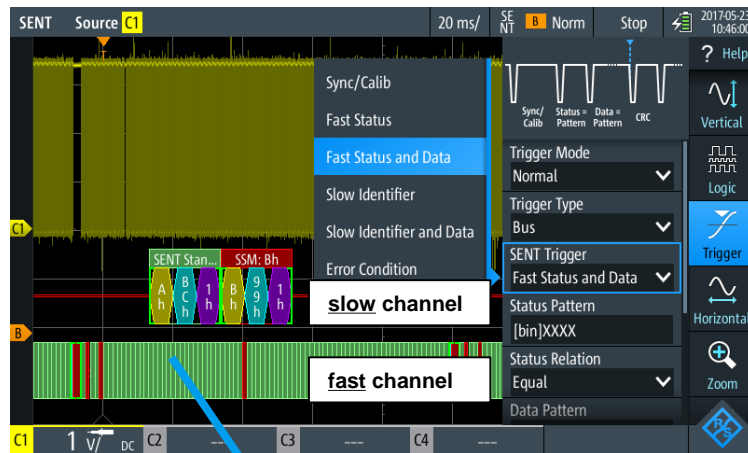
Additional technical info available at:  
<https://www.idt.com/document/whp/tutorial-digital-sent-interface-zssc416xzssc417x>

# RTH-K10 SENT Serial Protocol Trigger and Decode At a Glance

## ■ Key Benefits

- Fast, hardware based, trigger and decode function for fast and slow channel status, data or error
- Symbolic labels and symbolic decode
- Support of different CRC checksum calculations (TLE 4998X, SAE J2716, legacy, v2010 and v2016)
- Dedicated decode memory for serial protocol data not sacrificing std acquisition memory
- Operates on analog or digital (MSO) channels
- Capture long protocol sequences when used with RTH-K15 history mode
- Protocol table view of decoded messages

## ■ Application: Automotive sensor communication



Zoom



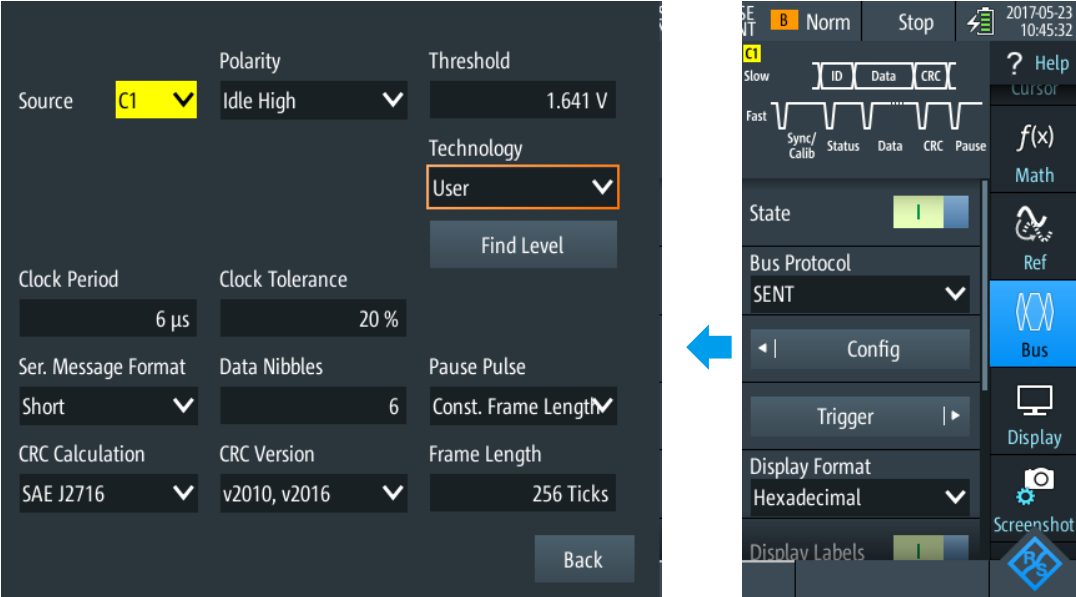
# RTH-K10 SENT Serial Protocol Trigger and Decode Easy and Flexible Protocol Configuration

**Source, Polarity and predefined or user defined thresholds** →

**Clocking parameters** →

**Short and enhanced message format** →

**CRC calculation based on SAE J2716, TLE4998X and legacy, v2010 and v2016** →



The image displays the configuration interface for the RTH-K10 SENT serial protocol. The main configuration panel is divided into several sections:

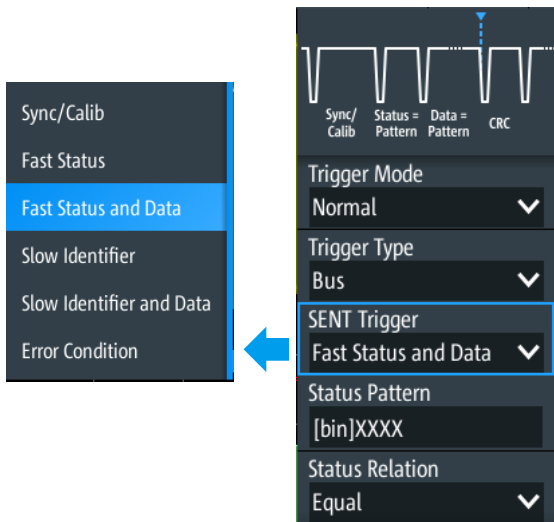
- Source, Polarity and predefined or user defined thresholds:** Source is set to C1, Polarity is Idle High, and Threshold is 1.641 V.
- Clocking parameters:** Clock Period is 6 μs and Clock Tolerance is 20%.
- Short and enhanced message format:** Ser. Message Format is Short, Data Nibbles is 6, and Pause Pulse is Const. Frame Length.
- CRC calculation based on SAE J2716, TLE4998X and legacy, v2010 and v2016:** CRC Calculation is SAE J2716, CRC Version is v2010, v2016, and Frame Length is 256 Ticks.

The secondary panel on the right shows a waveform and a menu with options like State, Bus Protocol (SENT), Config, Trigger, Display Format (Hexadecimal), and Display Labels.

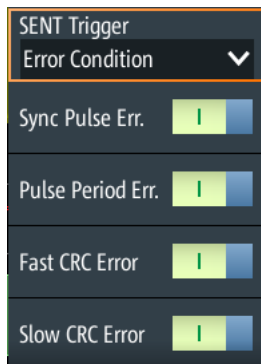
# RTH-K10 SENT Serial Protocol Trigger and Decode

## Powerful Protocol Trigger

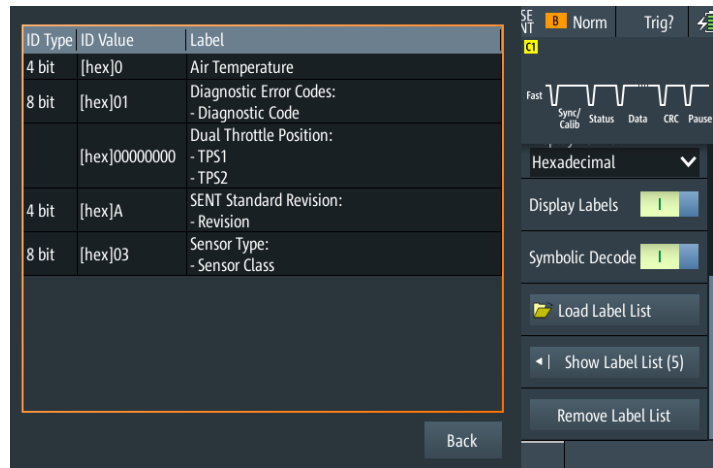
Trigger on Sync/Calib, Fast Status and Data  
Slow Identifier and Data as well as Error Condition



### Flexible Error Condition Trigger Capabilities



Symbolic labels and symbolic decode



# RTH-K10 SENT Serial Protocol Trigger and Decode Protocol Table View

## Slow- and Fast-Channel Protocol Table View

The screenshot displays two overlapping protocol table views. The top view shows 'Fast Frame' data with columns for #, Start, Status [bin], Values 4 bit [hex], and CRC [hex]. The bottom view shows 'Slow Frame' data with columns for #, Start, ID Label, and Value 8 bit [h]. Both views have context menus open, with 'Table View' and 'Slow channel' options circled in red.

#	Start	Status [bin]	Values 4 bit [hex]	CRC [hex]
1	-20.1 ms	9		
2	-19.7 ms	0100	E 8 E 4 C 9	
3	-18.4 ms	0100	E D 4 1 F 9	
4	-17.1 ms	1000	F 2 4 A 8 9	
5	-15.8 ms	0000	F 7 B 1 F 9	
6	-14.5 ms	0100	F D 4 0 5 A	

#	Start	ID Label	Value 8 bit [h]
1	+13.4 ms	SENT Standard Revision	BC
2	+33.9 ms		99
3	+121.7 ms	SENT Standard Revision	BC
4	+142.2 ms		99

## Detail-View shows additional information like clock period, sync duration and frame durations

The detail view provides a comprehensive breakdown of a single frame. It includes parameters like Frame Index (36 / 77), Start Time (+90.360 ms), State (Ok), Type (Transmission Sequence), Clock Period (5.0027 μs), Sync Duration (280.152 μs), Pause Duration (245.132 μs), Frame Duration (1280.696 μs), Status (0100), and CRC (F). A bit stream visualization at the bottom shows the sequence: S (3367), TPS1 (2), CRC (Dh), Pause (65 Ticks), Sync (280.152 μs), Stat (4h), TPS1 (3654), TPS2 (56), and CRC (Fh).

Frame Index	36 / 77
Start Time	+90.360 ms
State	Ok
Type	Transmission Sequence
Clock Period	5.0027 μs (Variation: -16.62 %)
Sync Duration	280.152 μs
Pause Duration	245.132 μs (49 Ticks)
Frame Duration	1280.696 μs (256 Ticks, Variation: +0.00 %)
Status [bin]	0100
CRC [hex]	F
Offset	0 E 4 6 8 3 1