

Evaluating the physical layer in the Controller Area Network (CAN) bus widely used for automotive applications is essential to analyzing communication failures that may occur, in particular, for such reasons as noise resulting from surge voltages or level fluctuations resulting from post-wiring overloads. The CAN BUS SIGNAL ANALYZER captures and analyzes the waveforms of bus signals that proved difficult with conventional protocol analyzers alone.

## CAN Bus Waveform Observation and Analysis

### Supported CAN Bus Specifications

- Bit rate: 33.3, 83.3, 125, 250 and 500 Kbps, and 1 Mbps  
(High-speed CAN and Low-speed CAN)
- Message format: Standard (11-bit ID)/Extended (29-bit ID)
- Input method: Input CAN\_H and CAN\_L signals using a differential probe.

### CAN Bus Trigger Functions

- Start-of-Frame (SOF) Field trigger
- Identifier (ID) Field trigger:  
For this trigger, you can select either the standard or extended message format. A maximum of four IDs can be specified to activate the trigger on their logical OR condition.
- RTR Field trigger: The trigger is activated by a Remote frame.
- Data Field trigger  
You can set data of 1 to 8 bytes.  
The trigger is activated by any data larger (>) or smaller (<) than the specified byte size.
- Error Frame trigger  
The trigger is activated when an active error flag is set.

You can set trigger conditions with a combination (logical AND) of these five types of triggers. You can also set a sample point as a percentage to define which part of a bit the analyzer should sample.

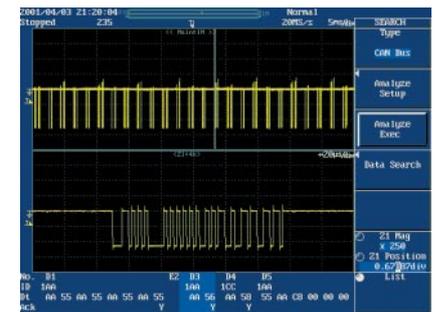
### CAN Bus Analysis Functions

These functions analyze waveform data existing on the CAN bus and acquired into long-record-length memory with a maximum of 16 megawords (MW) in a time-series manner. The functions then list the results of analyzing the ID and Data field codes and examining the presence/absence of ACK field codes, along with the waveform data.

A frame waveform corresponding to the one selected by the cursor on the list automatically appears in the Zoom window. This feature enables you to observe the bus signal while concurrently viewing the analysis results. Thus, you can easily verify how noise or level fluctuations affect the communication data and carry out debugging work very efficiently. In the Detailed View mode, you can view the type of frame, the time interval from the point of triggering to the start of the frame, and CRC data, along with error information. You can set two threshold levels, Upper and Lower, in order to judge the state of each bit. This feature lets you analyze Indefinite States.



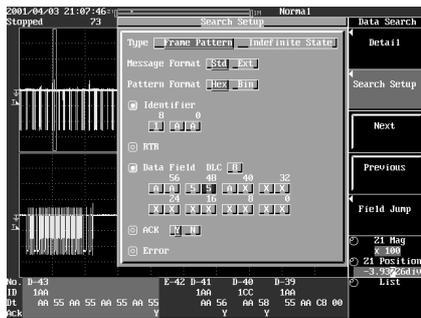
Example of Setting Trigger Conditions



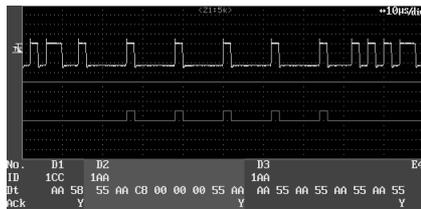
Listing and Waveform Display of Analysis Results

No.	Time (ms)	ID	Data	CRC	ACK	Info.
E	-4	-3.284	1AA	AA		ACTIVE
D	-3	-3.226	1AA	AA	26CB	Y
D	-2	-2.802	1CC	AA	0FE9	Y
D	-1	-1.634	1AA	55	AA	
E	0	0.004	542	AA		Format
E	1	0.480	1AA	AA		ACTIVE
D	2	1.085	1AA	AA	26CB	Y
D	3	2.339	1CC	AA	0FE9	Y
D	4	3.815	1AA	55	AA	
				CB		
				00		
				00		
				00		
				55		
				AA	1B85	Y

Display of Detailed Analysis Results



Example of Setting Data Search Function



Example of Stuff Bit Display

## ■ Data Search and Field Jump Functions

The data search function makes a high-speed search of all the frames you acquired for a frame containing the specified ID Field, Data Field, and ACK Field codes. This function can also search for error frames. A magnified view of the frame found is shown in the Zoom window. This function can also search for a frame containing an Indefinite State.

Even for frames comprising no less than 100 bits, the Field Jump function automatically finds the starting point of a Data or Control field and shows it in the Zoom window.

## ■ Stuff Bit Calculation Function

This function calculates and extracts the stuff bit from the frame data and represents it as a waveform.

## ■ CAN Bus Signal Measurement in Synch with Other Signals

The CAN BUS SIGNAL ANALYZER comprises the DL7200 multichannel digital oscilloscope with four analog channels and 16-bit logic input channel (optional) as its base unit. You can analyze the CAN bus in synchronization not only with its signal but also with other signals, such as a signal from a sensor or a control signal sent to a module. Using this feature along with the CAN bus trigger and analysis functions, you can efficiently evaluate and debug the overall range of your system.

## ■ Performance Data of CAN Bus Signal Analyzer with CAN Bus Signal Analysis Functions Option

### Basic Specifications

Number of input channels: Four analog channels plus 16-bit digital channel (optional)  
 CH1: CAN bus signal input (used with a differential probe)  
 Maximum sampling rate: 2 GS/s when the Interleave mode is on  
 1 GS/s when the Interleave mode is off  
 Maximum record length: 16 MW when the Interleave mode is on  
 8 MW when the Interleave mode is off  
 Frequency characteristics: 500 MHz for 50-Ω input  
 400 MHz for 1-MΩ input

### Supported CAN Bus Specifications

CAN Bus: CAN Version 2.0B  
 Bit rate: 33.3, 83.3, 125, 250 and 500 Kbps, and 1 Mbps  
 High-speed CAN = ISO11898  
 Low-speed CAN = ISO11519-2

### CAN Bus Trigger Functions

Trigger source: CH1 (used with a differential probe)  
 Trigger type: SOF trigger  
 ID Field trigger, selectable from 4 types of IDs  
 RTR trigger  
 Data Field trigger, configurable up to 8 bytes  
 Error Frame trigger  
 Combination trigger (based on a combination of these five types of triggers)

### CAN Bus Analysis Functions

Number of analyzable frames: 8000 maximum  
 Analysis results display: Listing and waveform display of analysis results  
 Auxiliary analysis functions: Data Search function  
 Field Jump function  
 Stuff bit calculation function

### DL7200 CAN Bus Signal Analyzer Models and Suffix Codes

Model	Suffix Code	Description
701430		DL7200 with 4-MW max. memory
701440		DL7200 with 16-MW max. memory
Power cable	-D	UL and CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	SAA standard
Options	/B5	Built-in printer
	/N3	Logic input for model 701430*1
	/N4	Logic input for model 701440*1
	/F7	<b>CAN Bus Signal Analysis function</b> *2
	/E2	Two additional passive probes
	/E3	Two FET probes*3
	/C9	PC card interface
/C10	Ethernet and PC card interfaces*4	

#### Notes:

- \*1 The 700985 logic probe is optional.
- \*2 The optional 701920 differential probe is required to measure CAN bus signals.
- \*3 The DL7200 main unit comes standard with a power supply output terminal block (capable of accommodating up to four probes) for use with the 701920 differential, 700939 FET and 700937 current probes.
- \*4 When the "/C10" option is selected, the DL7200 comes with a PC card interface.

### Accessories

Name	Part Number	Description
Differential probe	701920	10:1 500-MHz bandwidth
FET probe	700939	900-MHz bandwidth
Logic probe	700985	8-bit input 80-MHz toggle frequency
Current probe	700937	DC to 50 MHz

#### NOTICE

- Before operating the product, read the instruction manual thoroughly for proper and safe operation.
- If this product is for use with a system requiring safeguards that directly involve personnel safety, please contact the Yokogawa sales offices.



YOKOGAWA ELECTRIC CORPORATION

Measurement Sales Dept./Phone: 81-422-52-6614, Fax: 81-422-52-6624

YOKOGAWA CORPORATION OF AMERICA

Phone: 1-770-253-7000, Fax: 1-770-251-2088

YOKOGAWA EUROPE B.V.

Phone: 31-33-4622142, Fax: 31-33-4641659

YOKOGAWA ENGINEERING ASIA PTE. LTD

Phone: 65-2419933, Fax: 65-2412606

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