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Quickly Resolve the Reception Processing Time Problem  
in CAN Communications in GHS MULTI

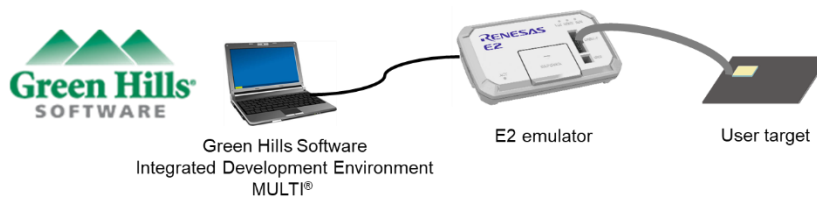
## CAN Communication Time Measurement Solution in the E2 Emulator

### Outline

Renesas recommends to use the CAN communication time measurement solution which uses the E2 emulator to improve problems with the speed performance of CAN communication applications.

This solution is implemented by the combination of the E2 emulator and the MULTI® integrated development environment (GHS MULTI) from Green Hills Software or CS+ integrated development environment from Renesas.

The following figure shows a connection example when using GHS MULTI.



Renesas also recommends developers who use GHS MULTI to use this solution. For details on GHS MULTI, refer to the web page of Green Hills Software,LLC.

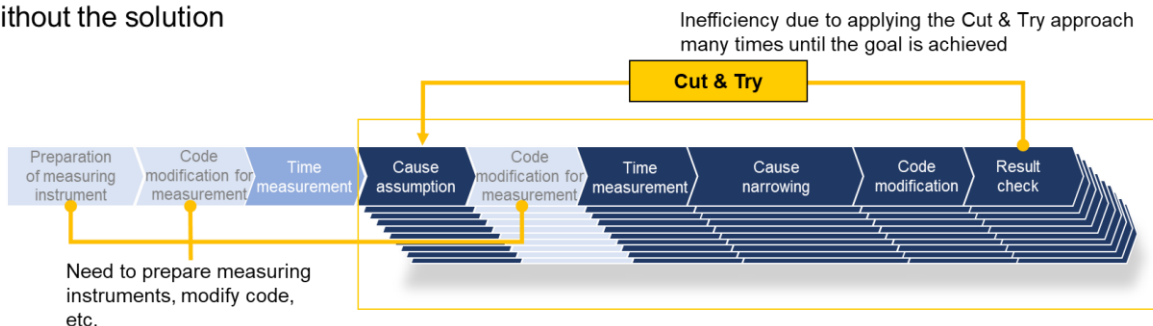
<https://www.ghs.com/>

### 1. Solution Overview

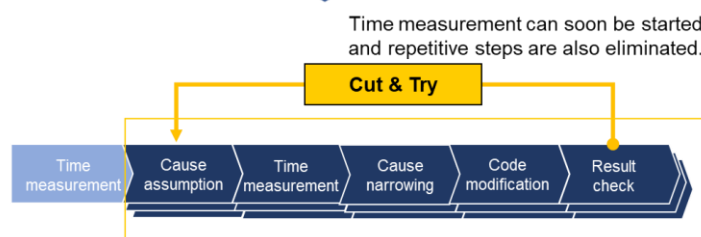
This solution significantly reduces the time required for identifying the cause when a problem occurs in CAN communication.

Before measuring the reception processing time, conventional CAN communication debugging required preparation of measuring instruments and adding a measuring code program. In addition, if there is a problem with the measurement results, modification of measurement code and remeasurement should be repeated many times to identify the cause. This solution does not require measuring instruments or measurement code for more efficient analysis, allowing you to determine communication time immediately and pinpoint problems and their causes.

#### Without the solution



#### With the solution

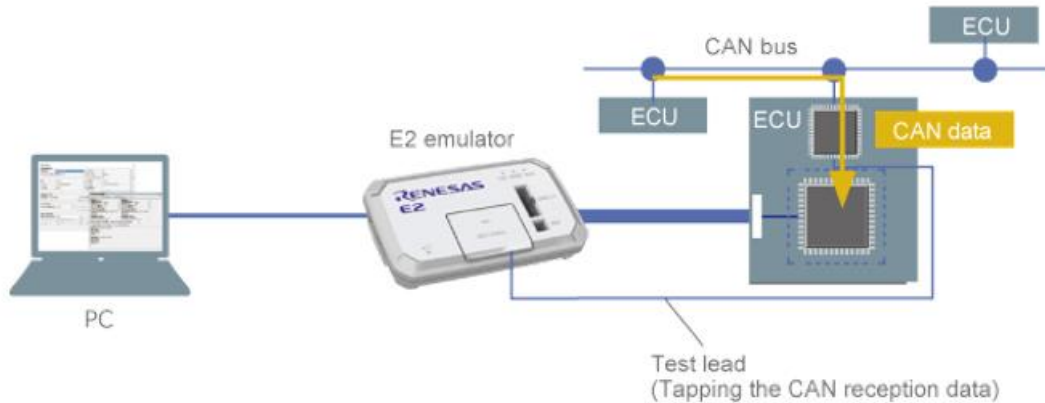


2. Features

This solution has three keywords "Easy measurement", "No missing data", and "Quick identification" for more efficient analysis regarding CAN communication reception processing time in a system in which RH850 is installed.

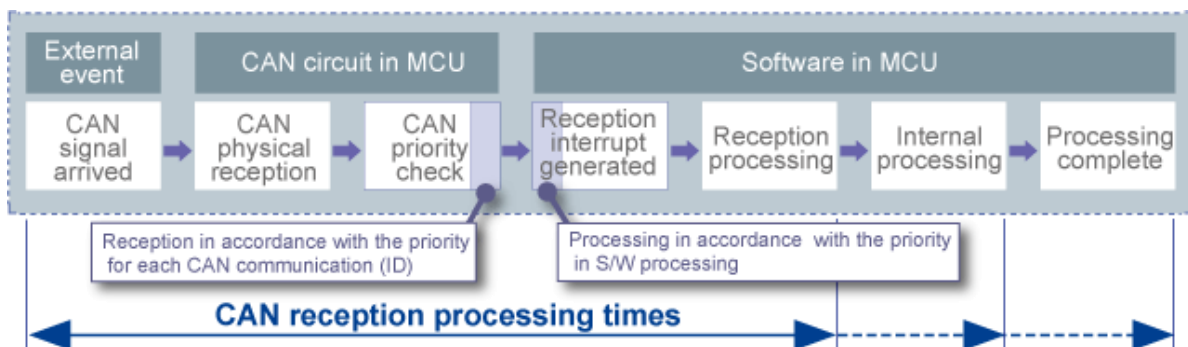
- Easy measurement: Reception processing time can be measured easily with the E2 emulator only.

The reception processing time in CAN communication can be measured just by connecting the RX signal of the RH850 family MCU to the E2 emulator by a test lead (included with the E2 emulator). An expensive CAN analyzer is not required.



- No missing data: The program stops if the reception processing time exceeds a design value.

You can set "CAN frame detection/software trace detection" as the "start/end condition of the reception processing time measurement. If the CAN communication reception processing time specified by the user exceeds a design value, the E2 emulator can stop the program and obtain information (minimum time, maximum time, average time, and number of measurements) about the CAN communication time during the measurement interval.



- Quick identification: Trace data can be verified from the measurement end point and the problem location can be identified.

CAN frames and trace data can be obtained as a chronological CAN communication log. The obtained record can be output as a CSV file.

[TIME]	[TYPE]	[Contents]
0h 00m 00s 250ms 430us 266ns	CAN	ID=0x009 DLC=0x08 DATA=0x0100000000000000 Ack=0
0h 00m 00s 250ms 540us 355ns	SWTrace	DBCP PC=0xeb8
0h 00m 00s 250ms 680us 475ns	CAN	ID=0x009 DLC=0x08 DATA=0x0200000000000000 Ack=0
0h 00m 00s 250ms 924us 950ns	SWTrace	DBTAG TAG=0x20

The elapsed time (in ns units) points to the [TIME] column.

CAN frame or trace data points to the [Contents] column.

Time measurement results can be saved in CSV format.

End point of measuring the CAN bus reception processing times points to the last row of the table.

You can quickly locate a problem in the program by finding the measurement end point of the reception processing measurement time from the CAN communication log and checking trace data from the measurement end point.

### 3. E2 Emulator

#### 3.1 Product Overview

The E2 emulator is an advanced on-chip debugging emulator and flash programmer designed for the purpose of improving development efficiency.

The maximum download speed is twice that of the E1 emulator. The E2 emulator shares the same pin-out convention as E1, and can therefore be connected to a user system designed for the E1 emulator.

For details about the E2 emulator, refer to the URL below.

<https://www.renesas.com/e2>

#### 3.2 Purchasing the Product

For ordering of the E2 emulator products, contact your local Renesas Electronics marketing office or distributor with the following information. For product pricing, make inquiries in the same manner.

Product name	E2 emulator
Orderable part number	RTE0T00020KCE00000R

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Oct.16.19	-	First edition issued

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