RX671 Group

Voice Recognition Demonstration (AmiVoice Micro)

Introduction

This application note explains demo operation using Advanced Media, Inc. word voice recognition library 'AmiVoice® Micro' and Techno Mathematical Co., Ltd. noise suppressor and beamforming(optional) middleware 'Zoom Voice'.

Target Device

Renesas Starter Kit+ for RX671(RTK55671EHC00001BJ)

Related Documents

1. RX671 Group Renesas Starter Kit+ for RX671 User's Manual (R20UT4879EG0100)
2. RX671 Group Voice Recognition Sample Software (AmiVoice Micro) (R11AN0545EJ0100)
3. Renesas Flash Programmer V3.08Flash writing software user's manual (R20UT4813EJ0200)

AmiVoice® Micro belongs to Advanced Media, Inc.. (Shown as AmiVoice in this document.)

Zoom Voice belongs to Techno Mathematical Co., Ltd. (Shown as Zoom Voice in this document.)

Note: This demonstration is a trial version which limit the software working time to 10 minutes. For full version, please contact your sales.

Note: A design with 2cm between microphones is recommended to maximize the effect of beamforming.

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1. Outline

This demonstration is a voice recognition demo which work on Renesas Starter Kit+ for RX671 (RTK55671EHC00001BJ) using RX671 voice recognition sample software (AmiVoice). By using USB communication, Renesas Starter Kit+ for RX671 can connect to terminal software (Tera Term) and voice recognition evaluation tool.

Figure 1.1 shows demo configuration.

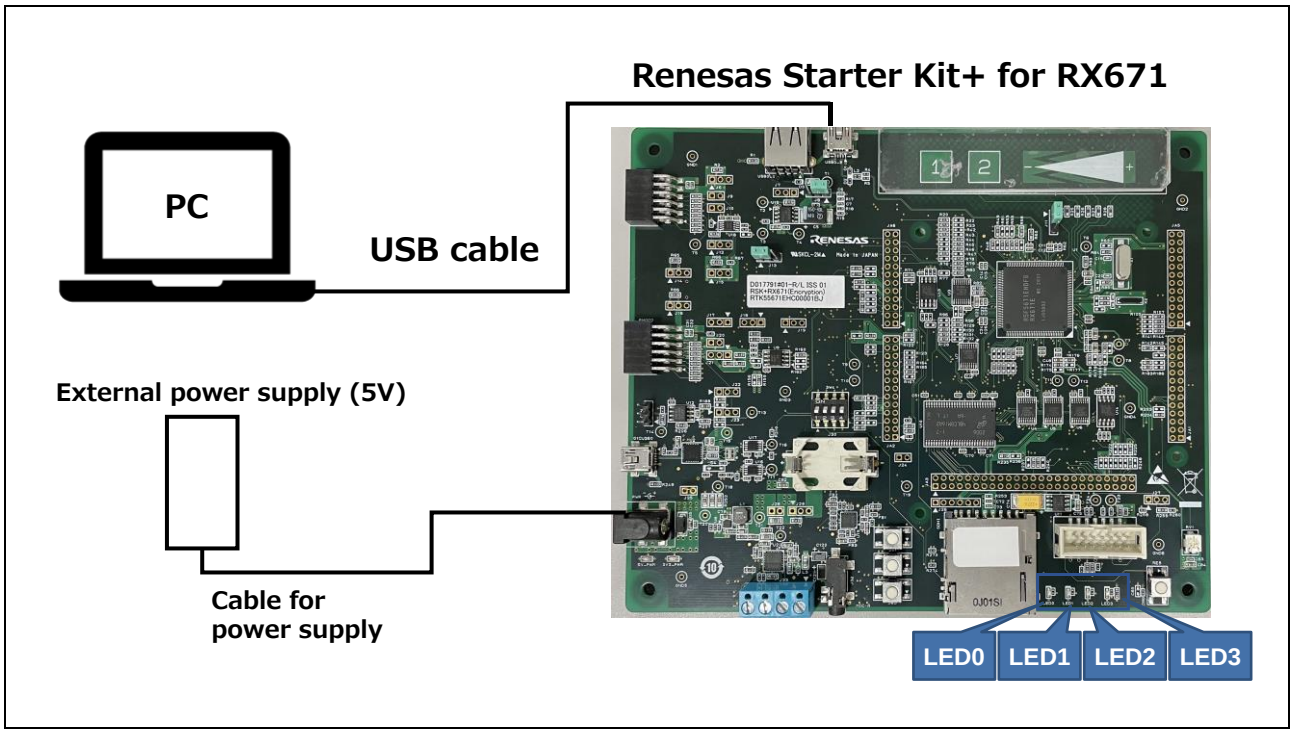


Figure 1.1 Demo configuration

2. Demo operation

Demo operation procedure is explained as below.

2.1 Jumper settings

Check the following jumper settings before turning on the power.

Table 2.1 Jumper settings

Jumper	Setting
J8	1-2 shorted (Function Mode)
J11	2-3 shorted (SSI RXD)
J13	1-2 shorted (USB0-VBUS)

2.2 Writing

This section describes the procedure for writing the voice recognition sample software (RTK55671EHC00001BJ_A_EN.mot) to the Renesas Starter Kit+ for RX671 using the Renesas Flash Programmer (RFP).

2.2.1 Install RFP

Download RFP from below URL.

Renesas Flash Programmer V3.08.03 is used for this app note.

URL: https://www.renesas.com/jp/en/software-tool/renesas-flash-programmer-programming-gui

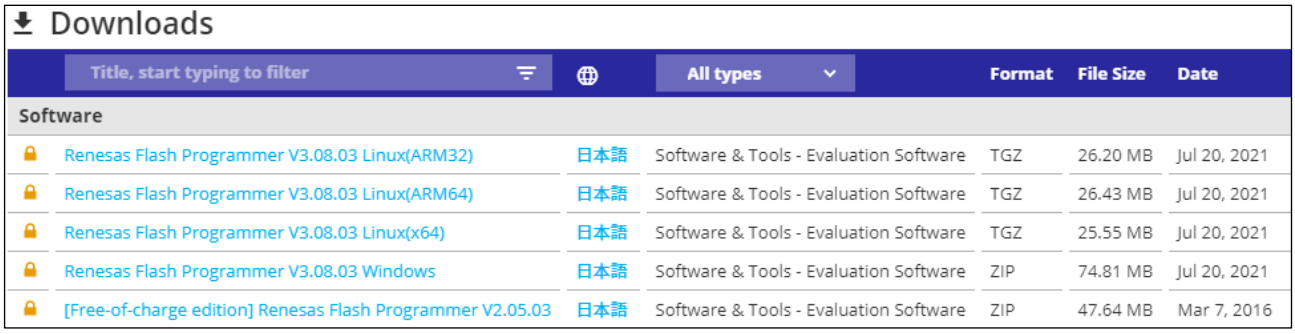


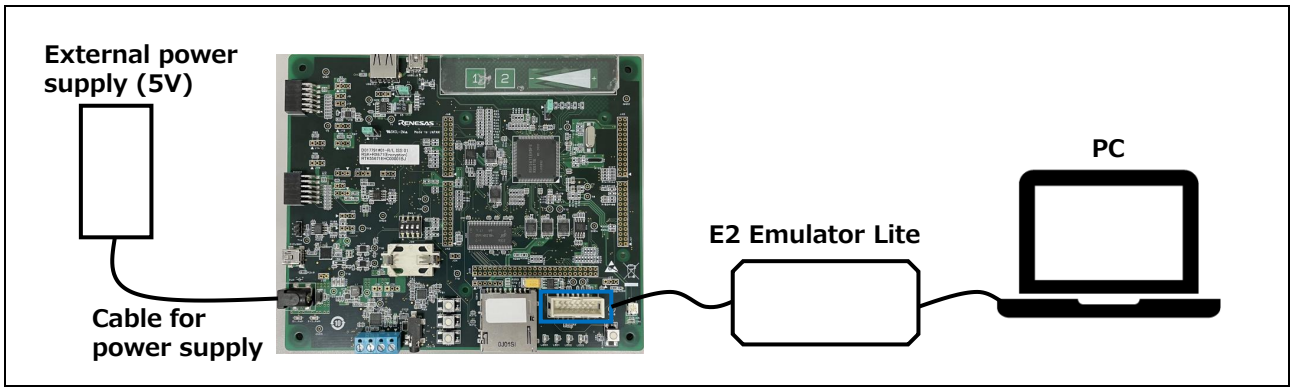
Figure 2.1 Downloads

2.2.2 FW writing procedure by RFP

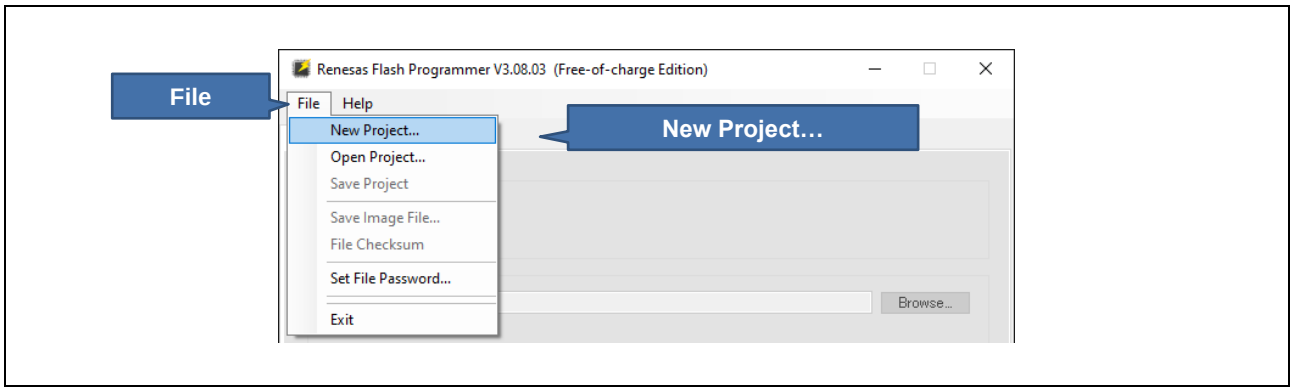
This section describes FW writing procedure using RFP.

See related document 3. Renesas Flash Programmer V3.08 Flash writing software user's manual (R20UT4813JJ0200) for the detail of RFP.

1. Connect Renesas Starter Kit+ for RX671 to PC as below.



2. Start RFP on PC
3. Select 'New project' from 'File' tub in tool bar.



4. Set the project and communication method referring to below and click 'Connect'.

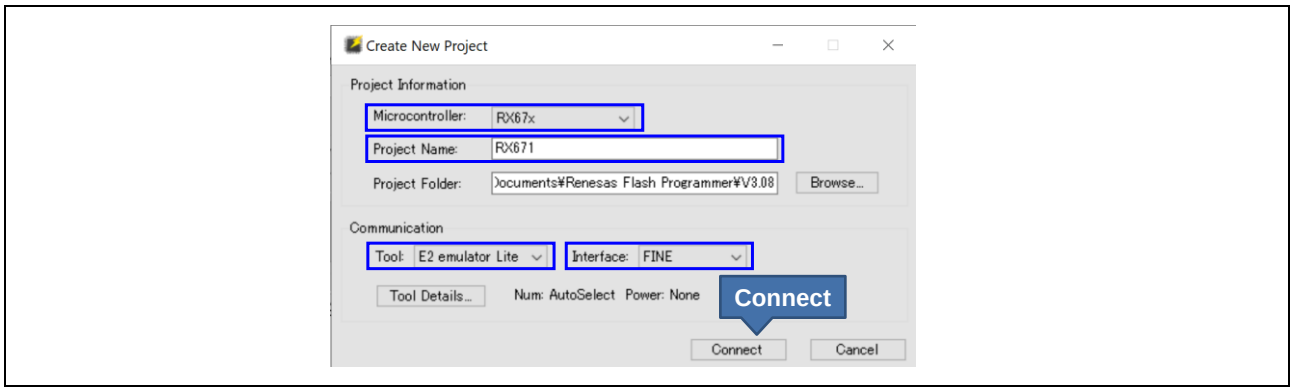
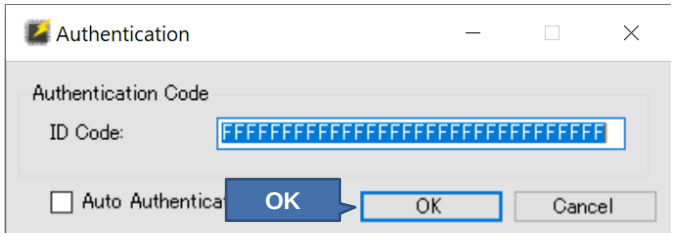


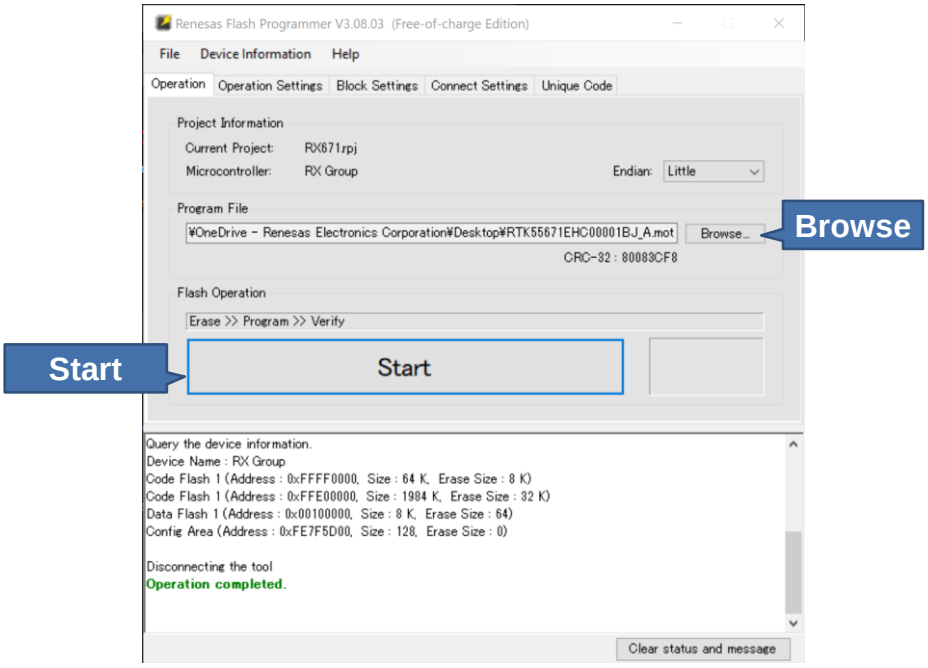
Table 2.1 Setting for project information and communication

Item	Setting
Micro controller	RX67x
Project name	(any project name)
Tool	E2 emulator Lite
Interface	FINE

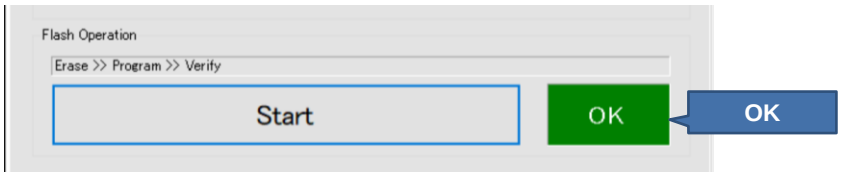
5. When required authentication code, select ‘OK’.



6. When connection is completed ‘Operation completed’ appears on status message.
7. Select applicable mot file from ‘Browse’ and click ‘Start’ to start writing.



8. Again, authentication code confirmation required. Select ‘OK’.
9. When writing is completed, the message ‘OK’ will be displayed.



2.3 Power supply

The power supply for this demonstration is supplied via center positive supply connector using a 2.0mm barrel power jack (PWR). Moreover, the main power supply connected to PWR should supply a minimum of 10W to ensure full functionality.

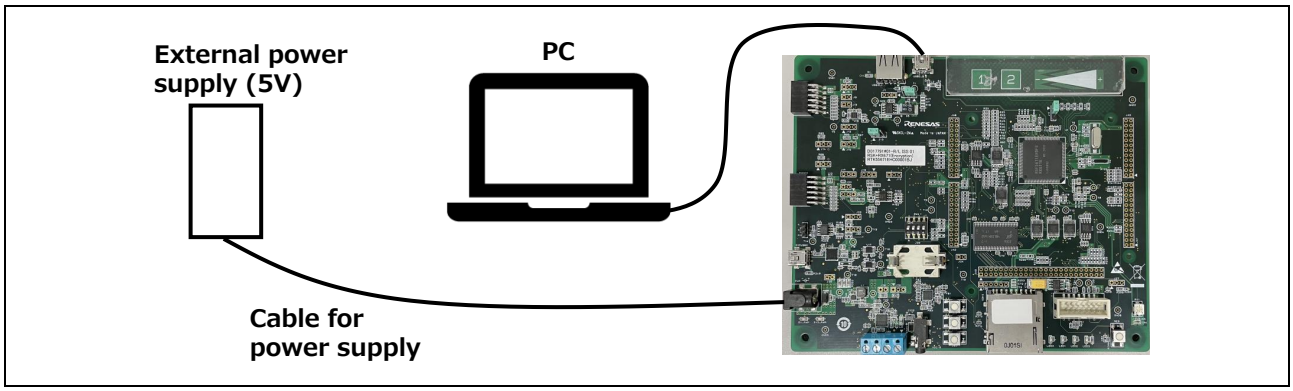
Power can also be supplied from the USB miniB connector by shorting jumper J25 on the CPU board.

For more information about power supply, please refer to RX671 Group Renesas Starter Kit+ for RX671 User's Manual (R20UT4879EG0100).

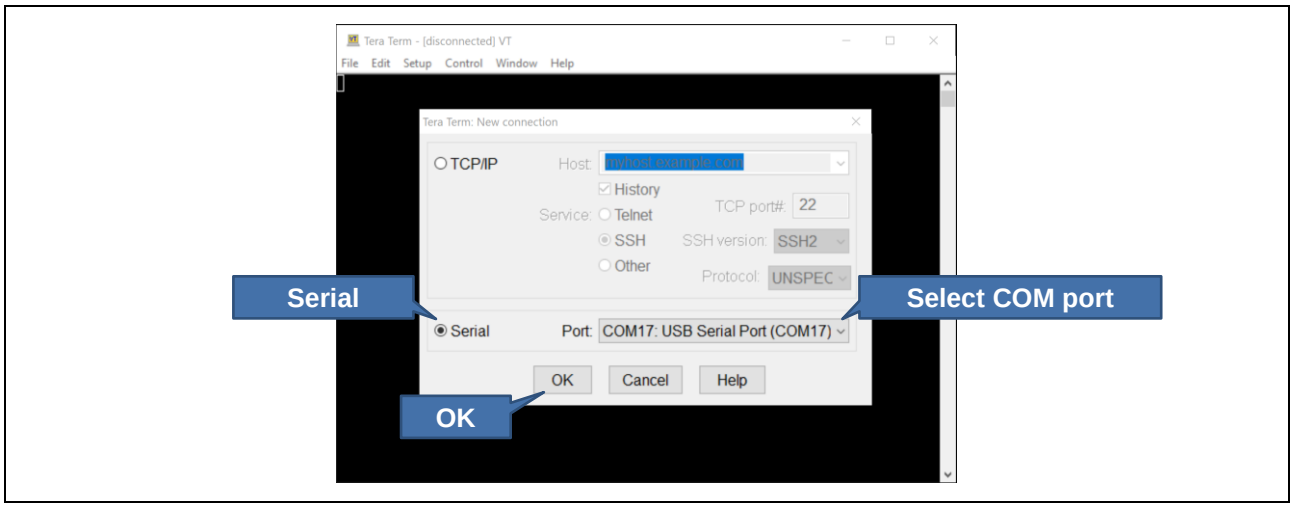
2.4 Terminal software setting

In this demo, the recognition result can be displayed and the parameters can be set with the terminal software (Tera Term) by connecting to a personal computer using a USB. The procedure for connecting to the terminal software is explained below.

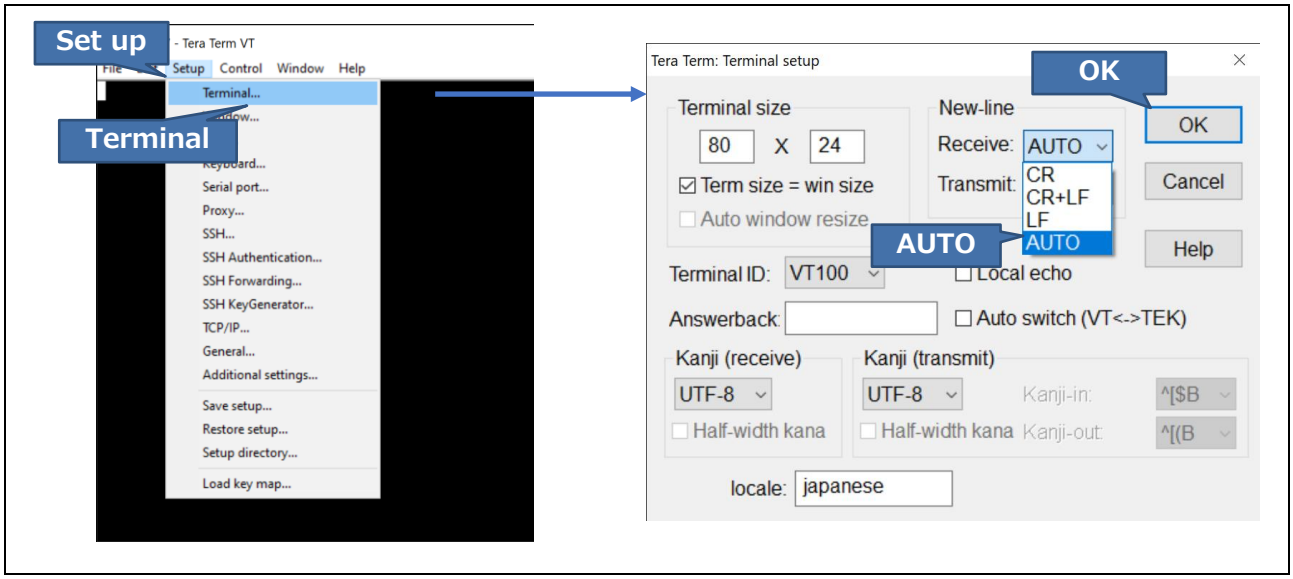
1. Supply power to the CPU board and connect it to the PC with the USB cable as shown below.



2. Start Tera Term.
3. Select ‘Serial’ and COM port which is connected to the board, then click ‘OK’.



4. Select ‘Terminal’ from setting tub and set the indent code to ‘AUTO’ for receive side, then click ‘OK’.



3. Demo procedure

Start demonstration by talking to the demo board.

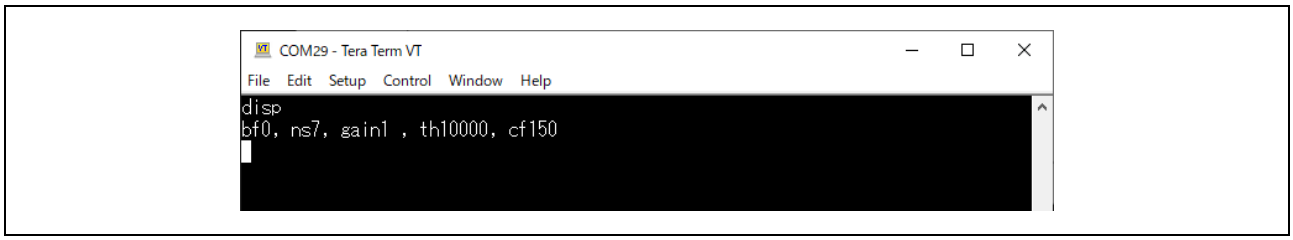
3.1 Voice Command

Refer Chapter4 for recognizable voice command and action according to the recognition result.

3.2 Display on PC

Below shows display example of Tera Term. Refer Chapter4 for detail.

- Display the settings



- Display the recognition results

  If the confidence level of a recognized word exceeds the set confidence threshold, it judges that the word is recognized and display ‘OK.’

4. Functions

The Functions of this demonstration are as below.

1. Get audio input data from microphone
2. Noise suppression, beamforming (optional) and voice recognition processing
3. Turn ON the LED1
4. Transfer operation information via USB

4.1 Recognizable voice and actions by recognition results

When power on, LED stays off and turns on LED0 when voice detected. After voice detection, action will be conducted based on below voice recognition results.

LED1 will stay until other voice detection.

Table 4.1 Recognizable voice command and actions by recognition results

ID	Voice command	Activity	
		LED1	USB
1	Ami Voice	ON	Send results
2	Turn on the electric fan	ON	Send results
3	Electric fan swing	ON	Send results
4	Turn on the air conditioner	ON	Send results
5	Raise the temperature	ON	Send results
6	Open the door	ON	Send results
7	Turn on the light	ON	Send results

Note: This demonstration is a trial version which limit the software working time to 10 minutes. After 10 minutes, LED3 will turn on and voice will not be recognized.

4.2 Voice recognition setting on the terminal software

This demo can change setting and display of both AmiVoice and Zoom Voice on terminal software (Tera Term).

Changeable conditions are as below.

- Condition1 Beamfoming reduction amount of Zoom Voice
- Condition2 Noise reduction of Zoom Voice
- Condition3 Amplification width of voice data
- Condition4 Utterance detection threshold of AmiVoice (Detect Threshold)
- Condition5 Confidence Threshold value of AmiVoice (Confidence Threshold)

4.2.1 Parameter display

To display current parameter, input ‘disp’ on Tera Term and press Enter key.

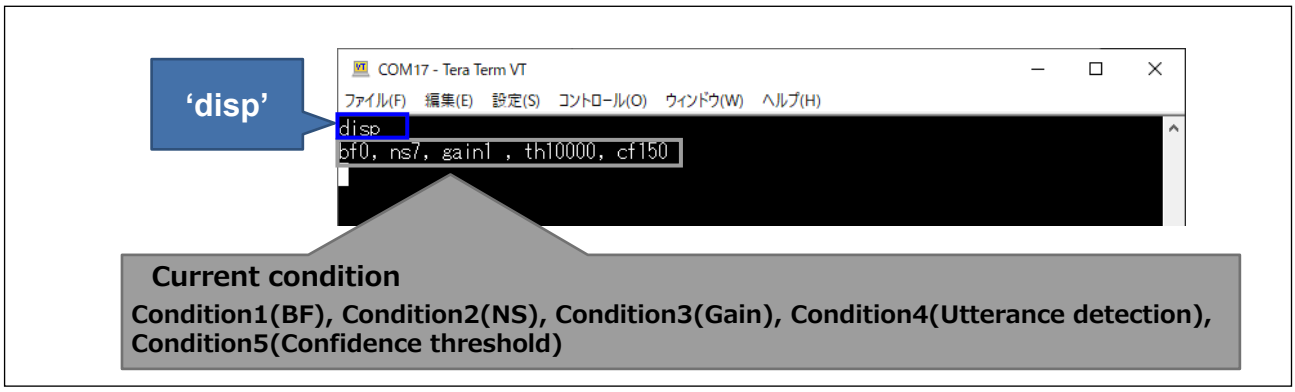


Figure 4.1 Display parameters

4.2.2 Parameter setting

To change the parameter setting, input the condition you want to change and value on Tera Term, then press Enter key.

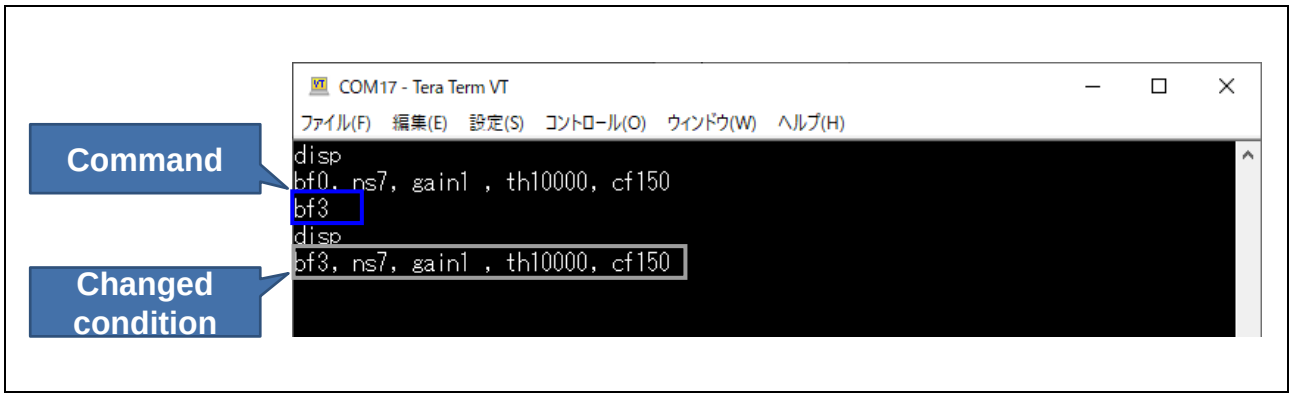


Figure 4.2 Parameter setting

4.2.3 Parameter setting command

This section describes the conditions you want to change and how to enter the changed values.

- Change Zoom Voice Beamfoming reduction amount

  Zoom Voice Beamforming amount can be changed by inputting number 0 to 7 after ‘bf’.

Table 4.2 Zoom Voice Beamfoming reduction change

Setting	Changeable condition	String input to Tera Term
1	Function OFF	bf0
2	1	bf1
3	2	bf2
4	3	bf3
5	4	bf4
6	5	bf5
7	6	bf6
8	7	bf7

- Change Zoom Voice noise reduction amount

  Zoom Voice noise reduction can be changed by inputting number 0 to 9 after ‘ns’.

Table 4.3 Zoom Voice noise reduction change

Setting	Changeable condition	String input to Tera Term
1	Function OFF	ns0
2	1	ns1
3	2	ns2
4	3	ns3
5	4	ns4
6	5	ns5
7	6	ns6
8	7	ns7
9	8	ns8
10	9	ns9

- Change amplification width of voice data

  To change amplification width of voice data, input number 0 to 9 after ‘gain’.

Table 4.4 Amplification width of voice data change

Setting	Changeable condition	String input to Tera Term
1	Function OFF	gain0
2	1	gain1
3	2	gain2
4	3	gain3
5	4	gain4
6	5	gain5
7	6	gain6
8	7	gain7
9	8	gain8
10	9	gain9

- Change utterance detection of AmiVoice (Detect Threshold)

  To change the utterance detection threshold, input value 1000 to 1500 after ‘th.’

Table 4.5 Change utterance detection of AmiVoice

Setting	Changed value	String input to Tera Term
Example	Change to 13000	th13000

- Change confidence threshold value of AmiVoice (Confidence Threshold)

  To change confidence threshold of AmiVoie, input value 0 to 255 after ‘cf.’

Table 4.6 Change confidence threshold of AmiVoice

Setting	Changed value	String input to Tera Term
example	Change to 200	cf200

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Sep.01.21	-	First release

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on

   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state

   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins

   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals

   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin

   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
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8. Differences between products

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