User's Manual

G3-PLC Sample Application Start Guide for GCPX3 board

Target Device

RX Series/R9A06G037

Renesas Electronics
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1. 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 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. Unused pins should be handled as described under Handling of Unused Pins in the manual.
2. Processing at Power-on
   The state of the product is undefined at the moment 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 moment 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 moment 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 moment when power is supplied until the power reaches the level at which resetting has been specified.
3. Prohibition of Access to Reserved Addresses
   Access to reserved addresses is prohibited.
   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.
4. Clock Signals
   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has 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. Moreover, 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.
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Contents

1. Introduction

1.1 Overview

This document is a start guide, which is described how to setup and operate the G3-PLC sample application.

The target of this document is the builded sample application (.mot format) included in release package of G3-PLC firmware for CPX3. Refer to the release note of G3-PLC firmware for details.

2. Setup

This chapter is described how to setup hardware and software to operate sample application.

2.1 Hardware Setup

This sample application is implemented to run on MCU(RX631) of GCPX3 board. Therefore, it is necessary to set GCPX3 board to the setting that is connected MCU and CPX3. Figure 2-1 shows the picture of GCPX3 board and Table 2-1 shows the minimum setting of GCPX3 board for running this sample application. Refer to the application note of GCPX3 evaluation kit J70D* for the details.

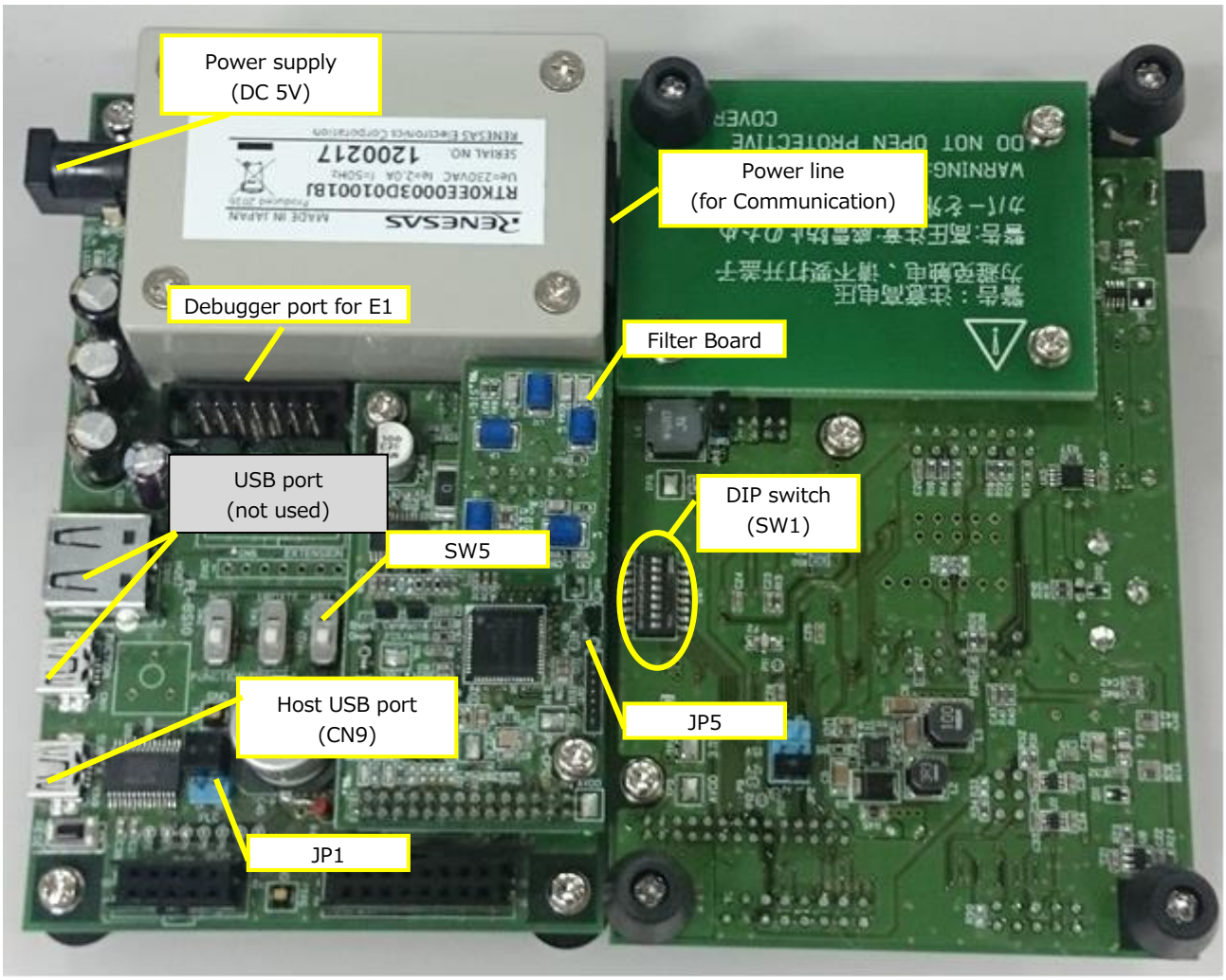

Figure 2-1 GCPX3 board

Table 2-1 Minimum setting of GCPX3 board

Parts	Setting
JP1	RX(1-3,2-4) side
JP5	open
SW1	Refer to 2.1.1
SW5	USE RX side

2.1.1 Configuration of DIP switch (SW1)

This sample application can change operation mode and band plan setting by using the DIP switch.Table 2-2 and Figure 2-2 shows this spec.

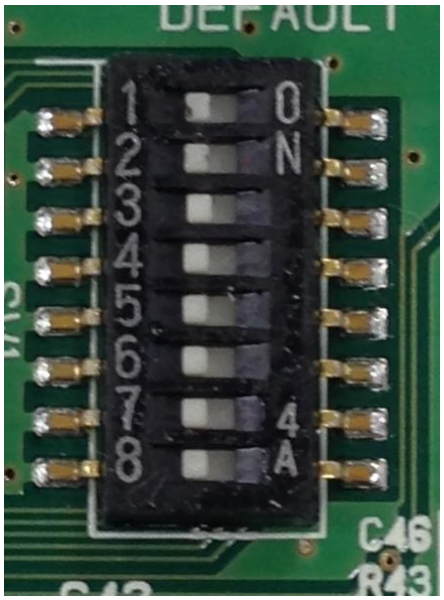

Figure 2-2 DIP switch (SW1)

Table 2-2 Configuration of DIP switch

No	OFF	ON	Description
1	Normal mode	Auto boot mode	It is selected the operation mode. Normal mode is the mode which user can operate by inputting the commands from menu. When this mode is selected, the console menu is displayed after power on the device and the sample application is booted. Refer to chapter 3 for the details of menu. Auto boot mode is the mode which running the initial setting and operation start automatically without user's operation. When this time, some parameters of initial setting is selected by No.2 and No.8 of DIP switch. After running, user can use the command menu as is the case with normal mode.
2	Disable certification mode	Enable certification on	It is enabled or disabled the certification mode. This setting is valid when auto boot mode is selected. If the certification mode is enabled, this sample application starts to run with the feasible setting for G3-PLC device certification.
3			
4			
5			
6	BandPlan_1		It is selected the band plan at setup. No.6:OFF, No.7:OFF : CENELEC-A No.6:ON, No.7:OFF : ARIB No.6:OFF No.7:ON : FCC No.6:ON, No.7:ON : CENELEC-B
7	BandPlan_0		
8	Peer	Coordinator	It is selected the device type. This setting is valid when auto boot mode is selected.

2.2 Software setup

This sample application can be operated by inputting the commands from menu using a serial terminal tool. The terminal tool should be set as shown Table 2-3.

Table 2-3 Terminal tool settings

Item	Setting
Baud rate	115200 bps
Data length	8 bit
Parity	none
Stop	1 bit
Flow control	none
New line receives	LF

3. Operation

This sample application is displayed the start menu on serial terminal tool after booting. (when the operation mode is selected normal mode by DIP switch)

Then this sample application starts to operate by using the initial parameter stored in the data flash on MCU. ***"In the first boot after the application is installed, it is necessary to initialize the data flash. Therefore, user should execute the initial process by selecting the data flash menu from start menu."***

3.1 Start Menu

This is the menu displayed after booting in normal mode.

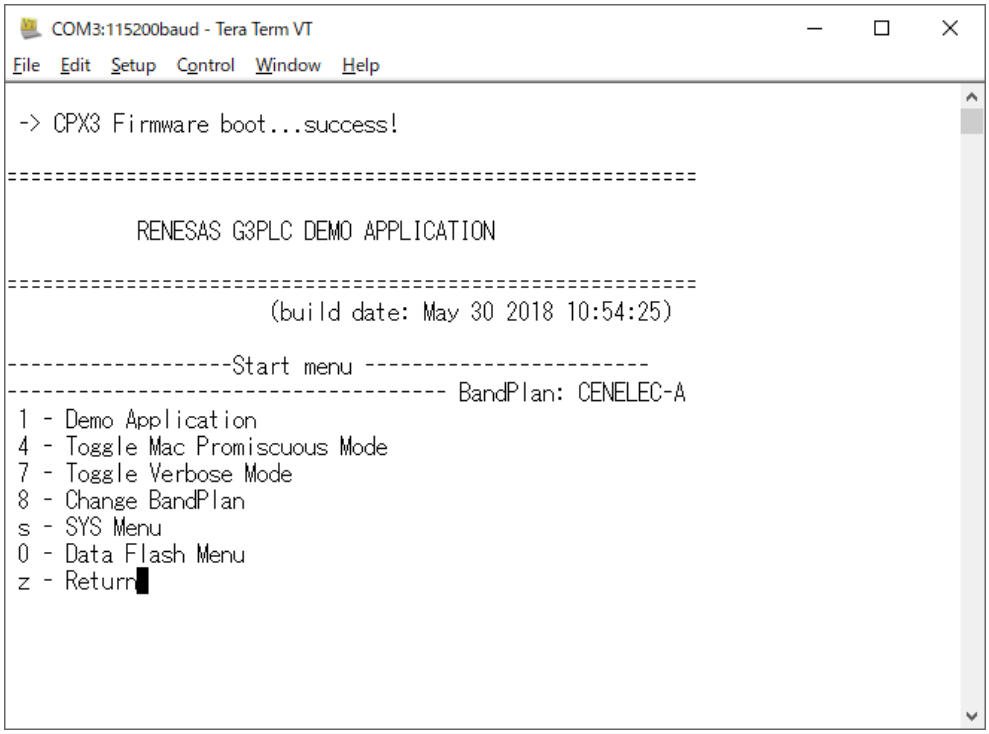

Figure 3-1 Start Menu

Table 3-1 Start Menu command list

Command	Command name	Description	Destination
1	Demo Application	Start the sample application after the device type is selected.	3.2
4	Toggle Mac Promiscuous Mode	Switch on/off of Mac Promiscuous mode. If turned on, macPromiscuousMode is activated over ch1 on dual stack.	-
7	Toggle Verbose Mode	Toggle verbose mode. If turned on, information messages are displayed.	-
8	Change BandPlan	Proceed to the menu for changing band plan.	3.3
s	SYS Menu	Proceed to the menu for operating system command.	3.4
0	Data Flash Menu	Proceed to the menu for operating data flash.	3.5
z	Return	-	-

Refer to G3 serial command specification (R9A06G037_G3_Serial_Command_Spec.docx) for Mac Promiscuous mode.

3.2 Select device type

This is the menu for selecting the device type to start the sample application.

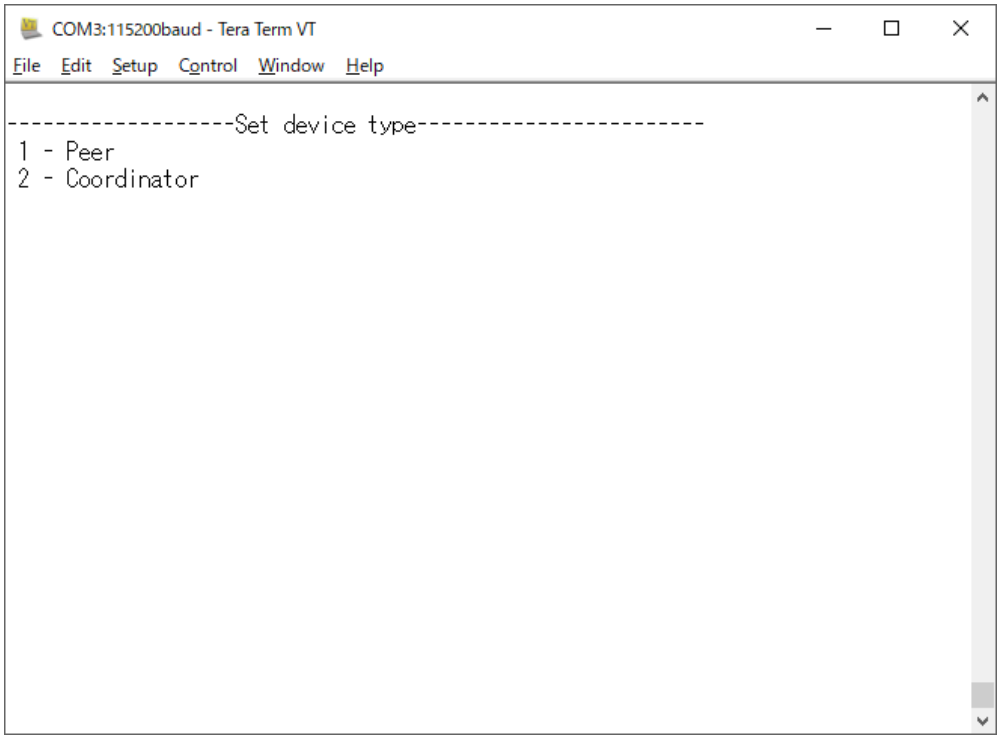

Figure 3-2 Select device type

Table 3-2 Device type settings

Command	Command name	Description	Destination
1	Peer	Set the device type to Peer. The sample application repeats Join sequence until it completes to join the PAN. After it completes Join sequence, the Peer main menu is displayed.	3.6
2	Coordinator	Set the device type to Coordinator. The sample application starts PAN. After it completes to start PAN, the Coordinator main menu is displayed.	3.7

3.3 Change BandPlan Menu

This is the menu for changing the BandPlan.

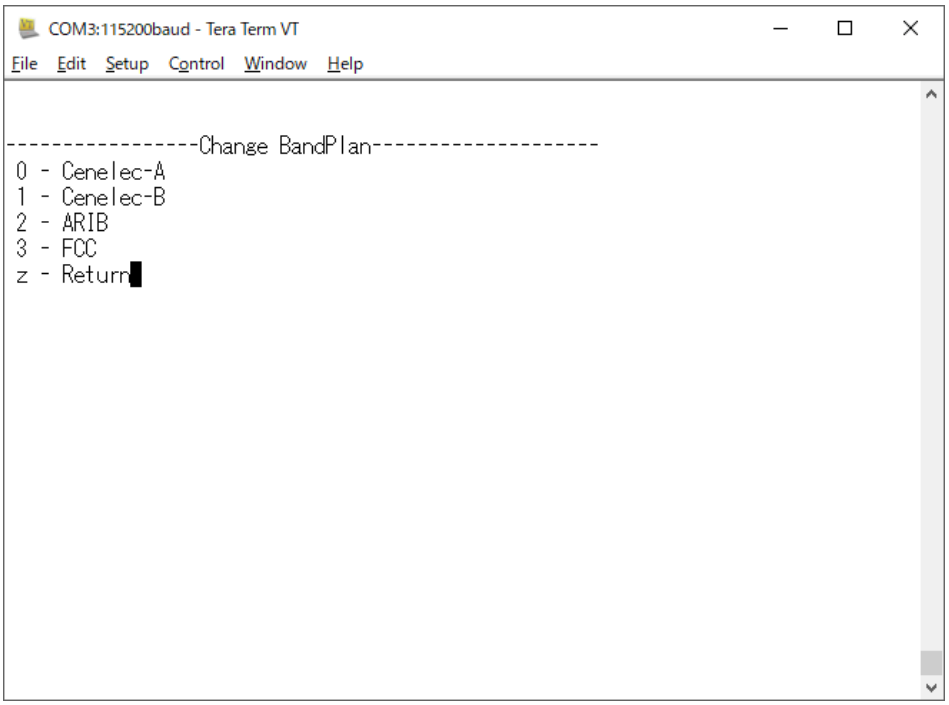

Figure 3-3 BandPlan Menu

Table 3-3 BandPlan Menu command list

Command	Command name	Description	Destination
0	Cenelec-A	Set BandPlan to CENELEC-A.	-
1	Cenelec-B	Set BandPlan to CENELEC-B.	-
2	ARIB	Set BandPlan to ARIB.	-
3	FCC	Set BandPlan to FCC.	-
z	Return	Back to the previous menu.	-

After setting BandPlan, sample application will back to the previous menu.

3.4 System Menu

This is the menu for executing the system block commands.

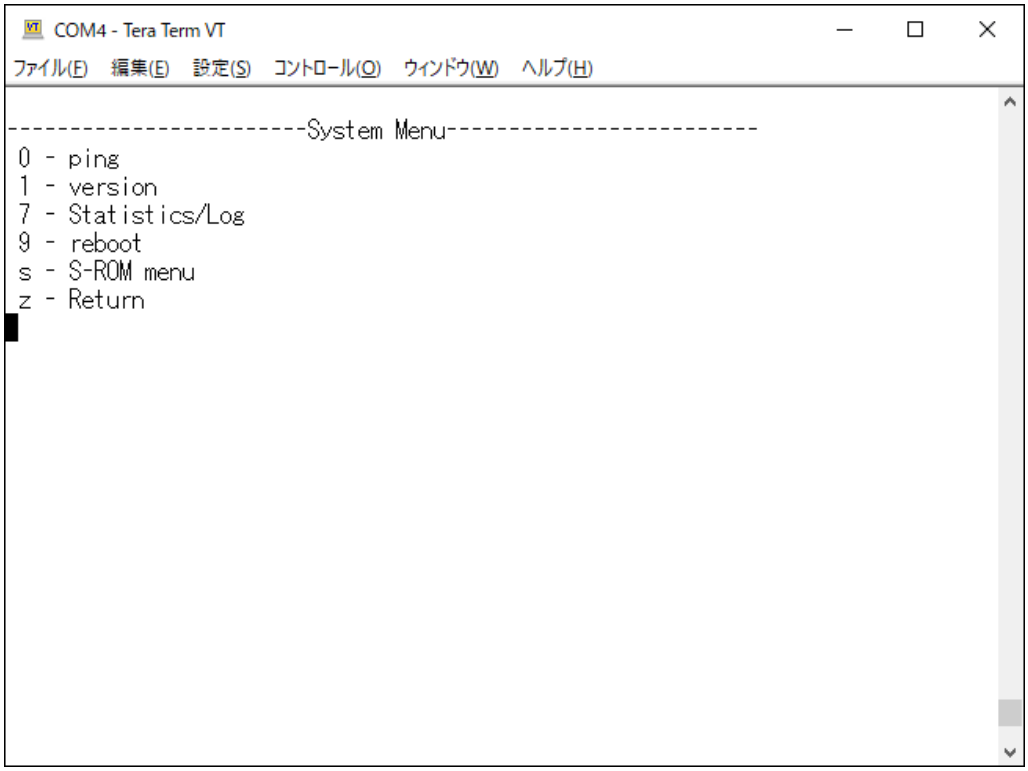

Figure 3-4 System Menu

Table 3-4 System Menu command list

Command	Command name	Description	Destination
0	ping	Sends a PING command to CPX3. If CPX 3 is in normal state, success is returned.	-
1	version	Get the version information of system block.	-
7	Statistics/Log	Proceed to menu for Statistics/Log of System block	3.4.1
9	reboot	Reboot.	-
s	S-ROM menu	Proceed to S-ROM menu.	3.4.2
z	Return	Back to the previous menu.	-

3.4.1 Statistics/Log of System block Menu

This is the menu for displaying Statistics and Logs of system block.

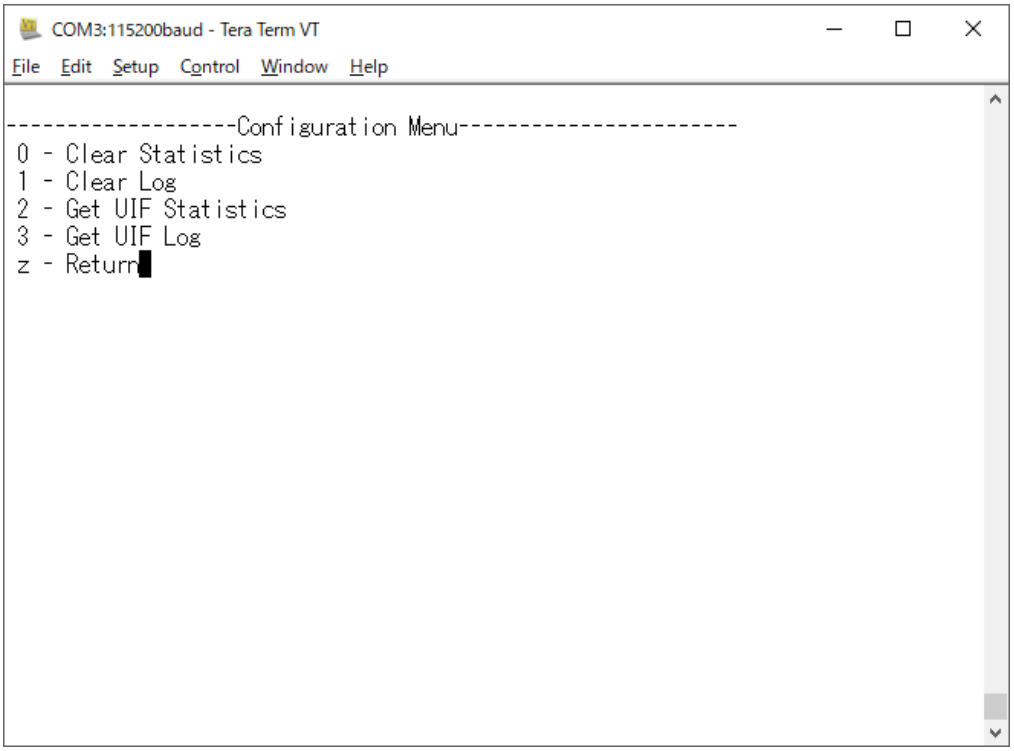

Figure 3-5 Statistics/Log of System block Menu

Table 3-5 Statistics/Log of System block Menu command list

Command	Command name	Description	Destination
0	Clear Statistics	Clear all statistics of system block.	-
1	Clear Log	Clear the log of system block.	-
2	Get UIF Statistics	Displays the statistics of UART-IF.	-
3	Get UIF Log	Displays the log of UART-IF.	-
z	Return	Back to previous menu.	-

Refer to System serial command specification (R9A06G037_System_Serial_Command_Spec.docx) for more information.

3.4.2 S-ROM Menu

This is the menu for reading and writing information to the Serial-Flash memory connected to CPX3.

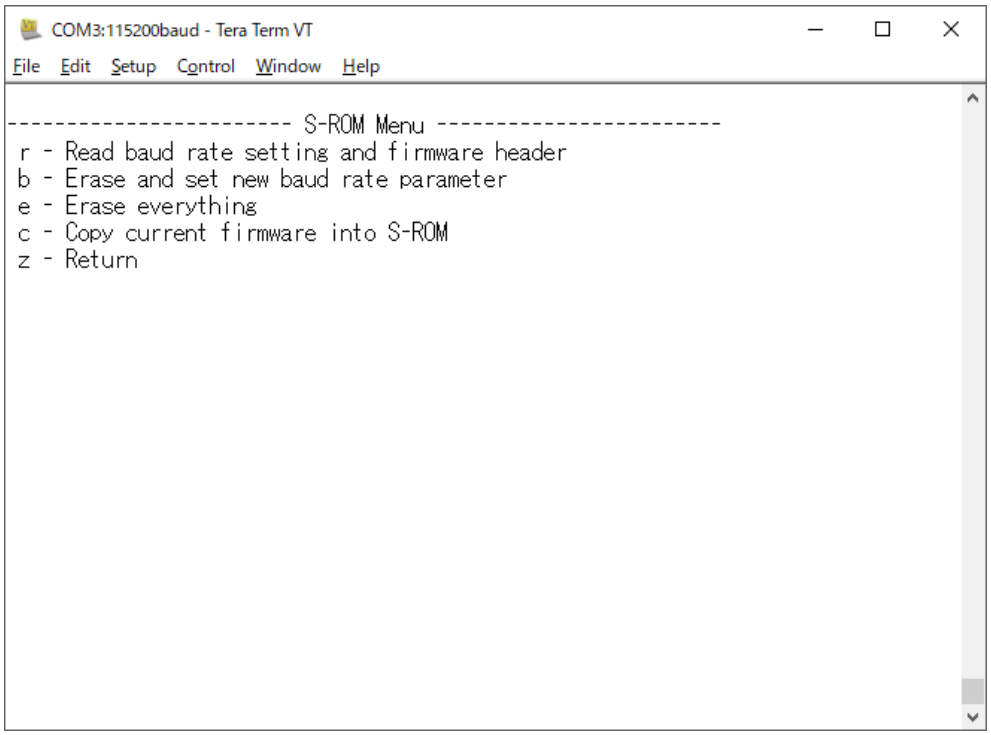

Figure 3-6 S-ROM Menu

Table 3-6 S-ROM Menu command list

Command	Command name	Description	Destination
r	Read baud rate setting and firmware header	Reads baud rate setting and FW header stored in Serial-Flash memory. And they display on terminal.	-
b	Erase and set new baud rate parameter	Erases baud rate setting stored in Serial-Flash memory. And it writes new parameters.	-
e	Erase everything	Erases whole S-ROM area.	-
c	Copy current firmware into S-ROM	Writes FW to S-ROM.	-
z	Return	Back to the previous menu.	-

Refer to Boot operation manual (R9A06G037_Boot_Operation_Manual.docx) for Serial-Flash information.

3.5 Data flash Menu

This is the menu for getting and editing information on data flash.

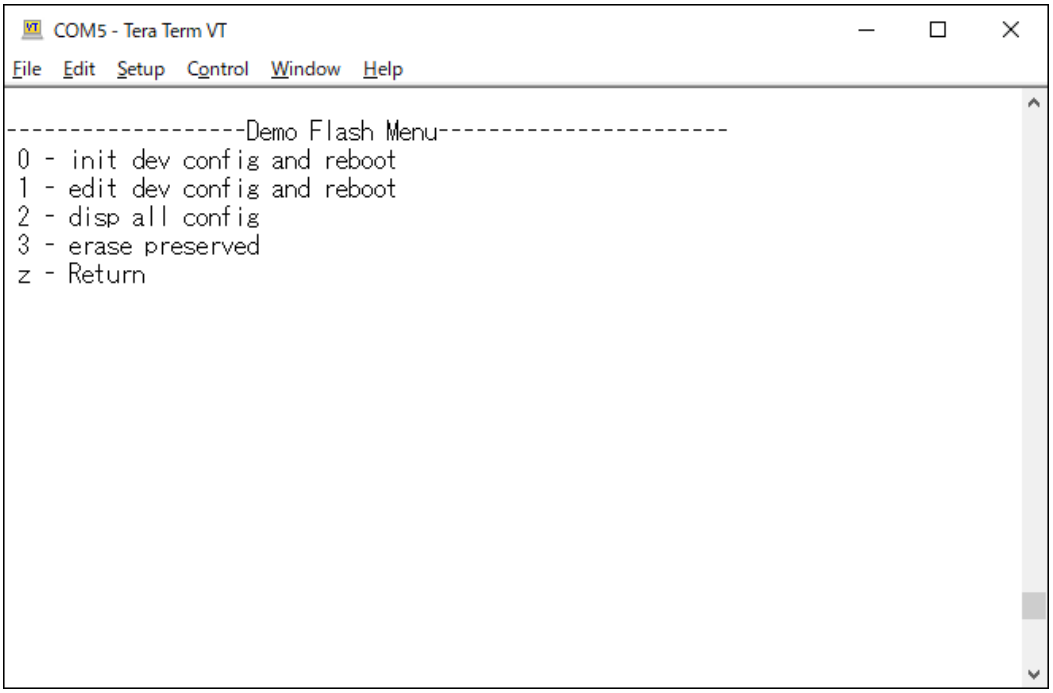

Figure 3-7 Data flash Menu

Table 3-7 Data flashMenu command list

Command	Command name	Description	Destination
0	init dev config and reboot	Initializes data flash to default value in Table 3-8. CPX3 will be rebooted after the initialize.	-
1	edit dev config and reboot	Initializes data flash with unique EUI64 address. The user can set the lesser 16bit address of EUI64. The address will be mapped to 0xFF0102FFFE00***0000*** to 0xFF0102FFFE00***FFFF***. And sets PanID automatically by 16bit address which is set.	-
2	disp all config	Shows current config parameter stored on data flash.	-
3	erase preserved	Erase preserved information like frame counter and loading sequence number.	-
z	Return	Back to the previous menu.	-

Table 3-8 Data flash default value

parameter	value	Coordinator display *1	Peer display *2
BandPlan	CENELEC-A	v	v
tonemask[9]	0xFFFFFFFFFFFFFFFFFF *3	v	v
Route Type	A Route	v	v
Device Type	*4	v	v
Eui64	0xFF0102FFFE000101	v	v
PSK	0x00112233445566778899AABBCCDDEEFF	v	v
coordShort	0x0000	v	v
GMK0	0xAF4D6DCCF14DE7C1C4235E6FEF6C151F	v	-
GMK1	0x123456789ABCDEF0FFEEDDCCBBAA9988	v	-
panId	0x1001	v	-
activeKeyIndex	0x00	v	-

*1 Displays only when device type is selected Coordinator.
*2 Displays only when device type is selected Peer.
*3 Because upper limit of tonemask is different for BandPlan, value displayed is different too.
*4 Setting is different depending on DIP switch setting and device type.

3.6 Peer Main Menu

This is a menu for operating devices activated as Peer.

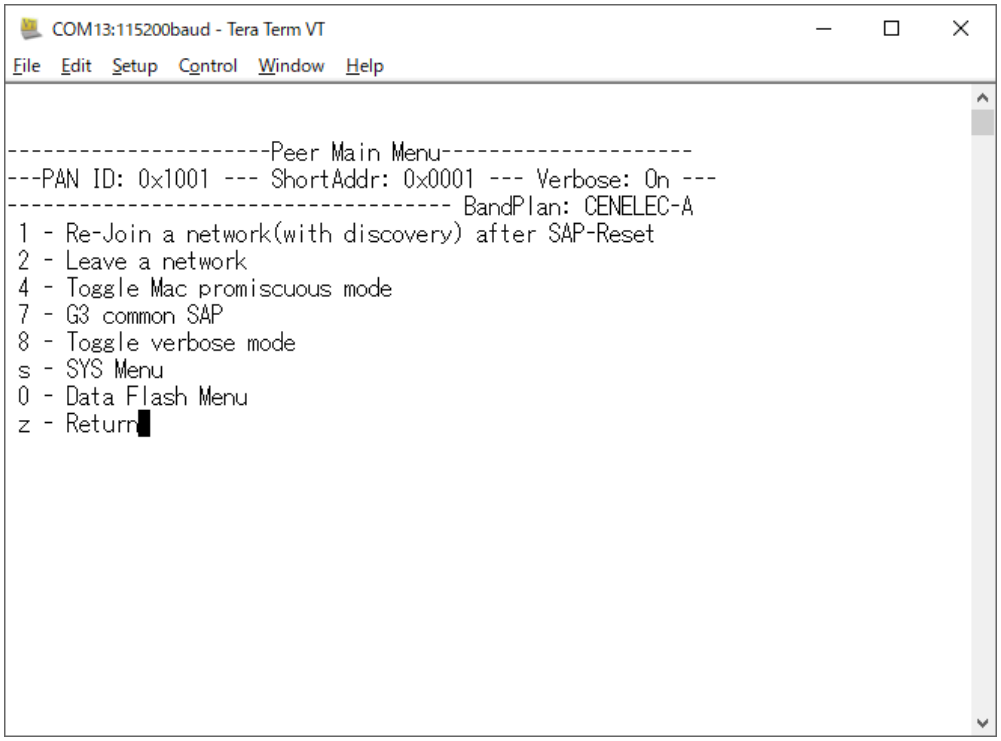

Figure 3-8 Peer Main Menu

Table 3-9 Peer Main Menu command list

Command	Command name	Description	Destination
1	Re-Join a network (with discovery) after SAP-Reset	Starts the joining procedure after resets the device, which first scans for networks invoking the network discovery primitive. The discovery procedure is repeated multiple times if no active node could be found.	-
2	Leave a network	Starts the leave procedure by sending an LBP kick frame to the coordinator using ADPM-NETOWORK-LEAVE.request. After the transmission the device resets itself.	-
4	Toggle Mac promiscuous mode	Switch on/off of Mac Promiscuous mode. If turned on, macPromiscuousMode is activated over ch1 on dual stack.	-
7	G3 common SAP	Proceed to the G3 common SAP menu.	3.8
8	Toggle verbose mode	Toggles verbose mode. If turned off, no information messages are displayed.	-
s	SYS Menu	Proceed to the system menu.	3.4
0	Data Flash Menu	Proceed to the data flash menu.	3.5
z	Return	Back to the previous menu.	-

3.7 Coordinator Main Menu

This is a menu for operating devices activated as Coordinator.

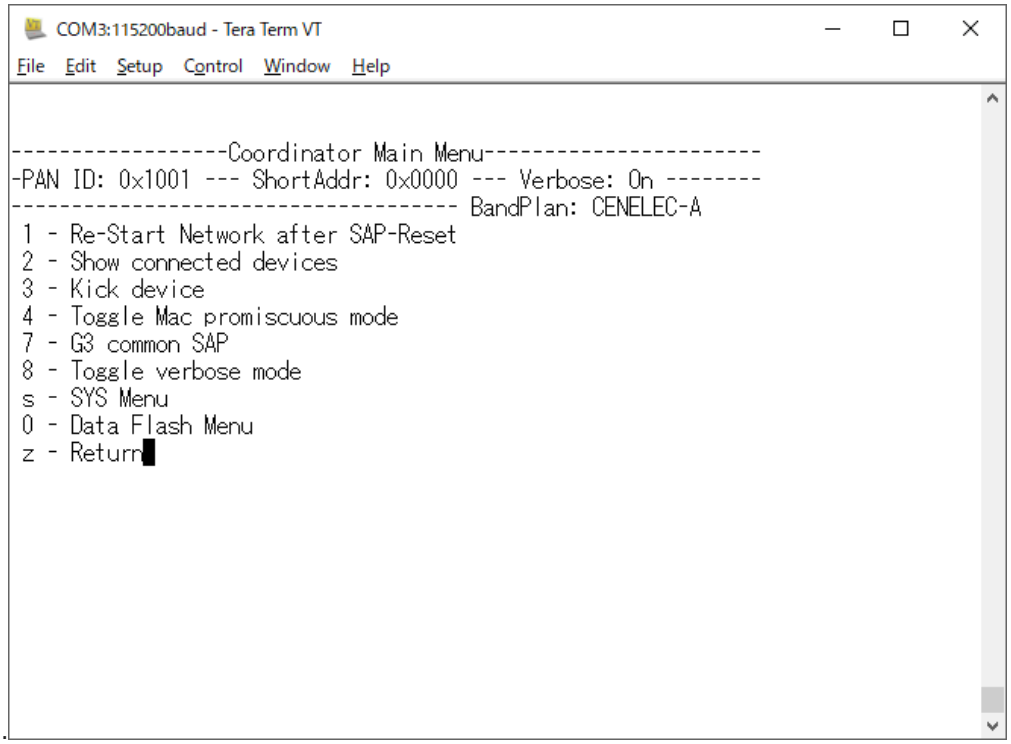

Figure 3-9 Coordinator Main Menu

Table 3-10 Coordinator Main Menu command list

Command	Command name	Description	Destination
1	Re-Start Network after SAP-Reset	After reset the device, sets a PAN coordinator and starts network.	-
2	Show connected devices	Shows a list of devices that are currently joined to the PAN.	-
3	Kick device	Removes a device from the PAN.	-
4	Toggle Mac promiscuous mode	Switch on/off of Mac Promiscuous mode. If turned on, macPromiscuousMode is activated over ch1 on dual stack.	-
7	G3 common SAP	Proceed to the G3 common SAP menu.	3.8
8	Toggle verbose mode	Toggles verbose mode. If turned off, no information messages are displayed.	-
s	SYS Menu	Proceed to the system menu.	3.4
0	Data Flash Menu	Proceed to the data flash menu.	3.5
z	Return	Back to the previous menu.	-

3.8 G3 common SAP Menu

This is menu for G3 common SAP which allows common service for G3 block between Coordinator and Peer, such as send data frame, access information base entry.

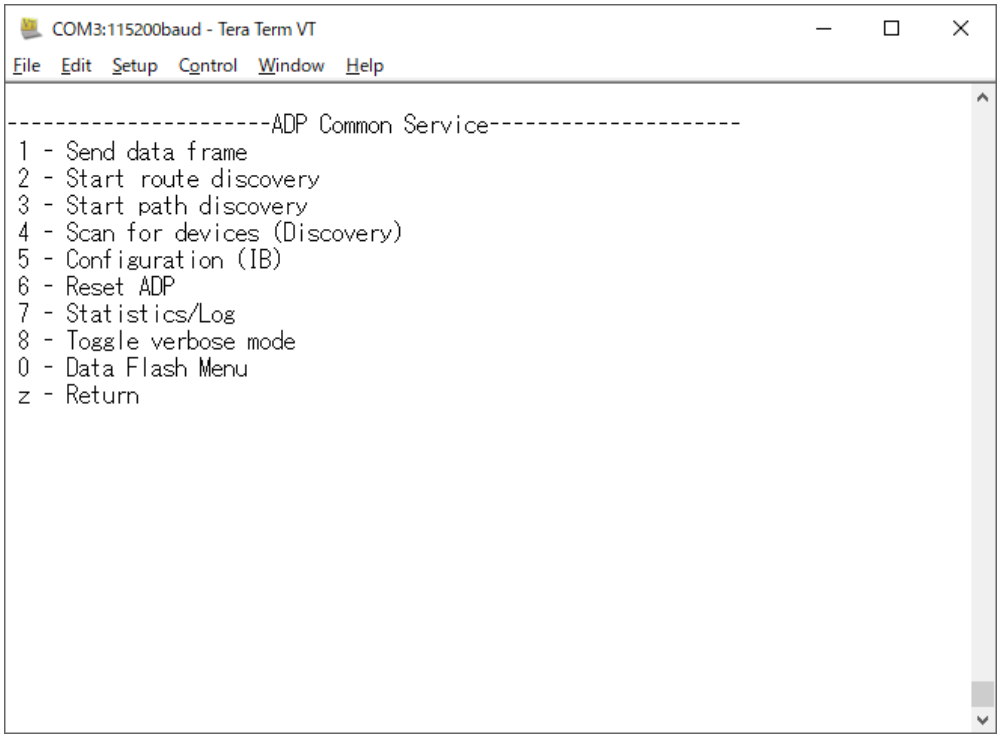

Figure 3-10 G3 common SAP Menu

Table 3-11 G3 common SAP Menu command list

Command	Command name	Description	Destination
1	Send data frame	Proceed to the sending data menu.	3.8.1
2	Start route discovery	Proceed to the route discovery menu.	3.8.2
3	Start path discovery	Proceed to the path discovery menu.	3.8.3
4	Scan for devices (Discovery)	Starts the discovery procedure to detect neighboring nodes.	-
5	Configuration (IB)	Proceed to the Configuration menu.	3.8.4
6	Reset ADP	The reset adaptation layer menu. Note that after this menu, the device has left the network.	-
7	Statistics/Log	Proceed to the Statistics/Log of G3 block Menu.	0
8	Toggle verbose mode	Toggles verbose mode. If turned off, no information messages are displayed.	-
0	Data Flash Menu	Proceed to the data flash menu.	3.5
z	Return	Back to the previous menu.	-

3.8.1 Send data frame

This is the menu for sending a data frame to a specified node in the network. The user has to provide the short address, the payload length, has to decide if automatic route discovery shall be allowed or not and frame type. Furthermore, the sample application allows to send the same frame multiple times and sets priority. If ICMP is specified for the frame type, the receiver returns the same data as a response.

➢

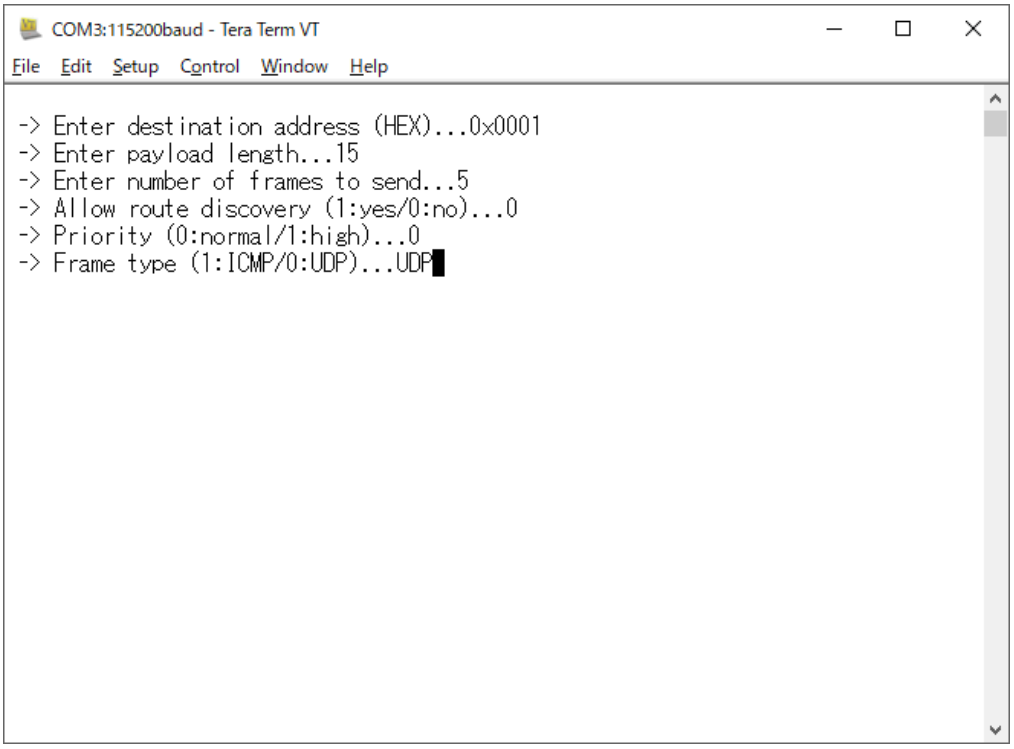

Figure 3-11 Input parameters of send data

Table 3-12 Setting parameters of send data

Input	Description	Format
destination address	Destination Short Address	4 digits of hexadecimal number which starts from “0x” ex)0x0001
payload length	Payload length	(1-1232)
number of frames	How many times to send data frame	(1-65535)
route discovery	Automatic Route Discovery shall be allowed or not.	1:yes / 0:no
Priority	Priority	0:normal / 1:high
Frame type	Send data frame type	1:ICMP / 0:UDP

The following data is stocked in the payload of transmission frame.
ICMP: 0xFF Fixed.
UDP: The first 1 byte is 0x00. It increases in 1 for 1 byte from the next.

3.8.2 Route discovery

This is menu for initiating a manual route discovery.

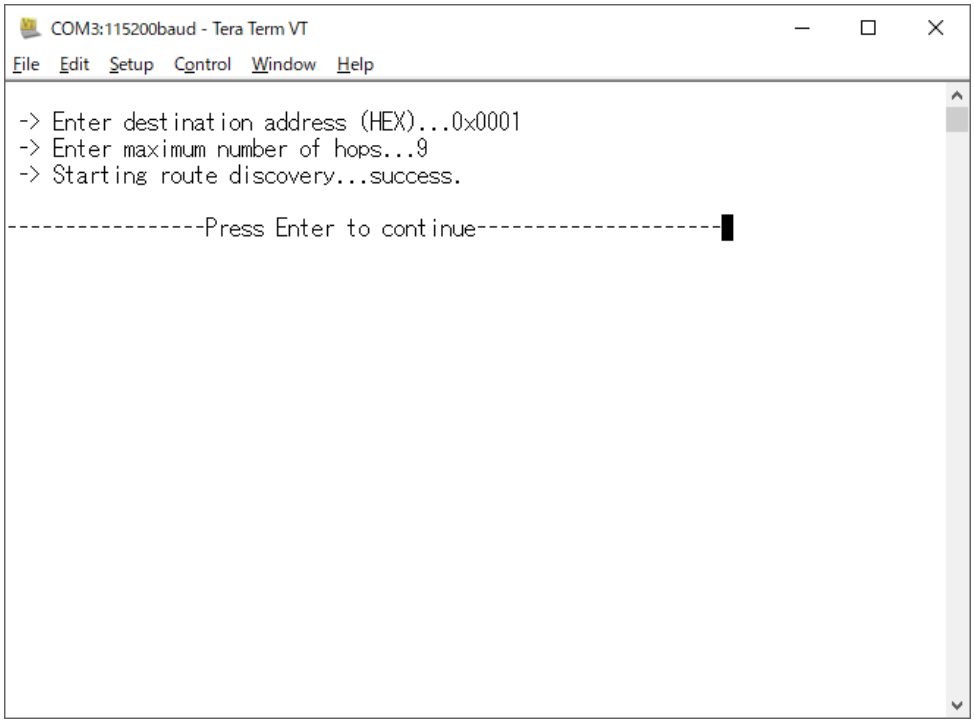

Figure 3-12 Input parameters of Route Discovery

Table 3-13 Setting parameters of Route Discovery

Input	Description	Format
destination address	Destination Short Address	4 digits of hexadecimal number which starts from “0x” ex)0x0001
maximum number of hops	Maximum Hop	(0-9)

3.8.3 Path discovery

This is menu for starting a path discovery. If successful, the list of hops is displayed.

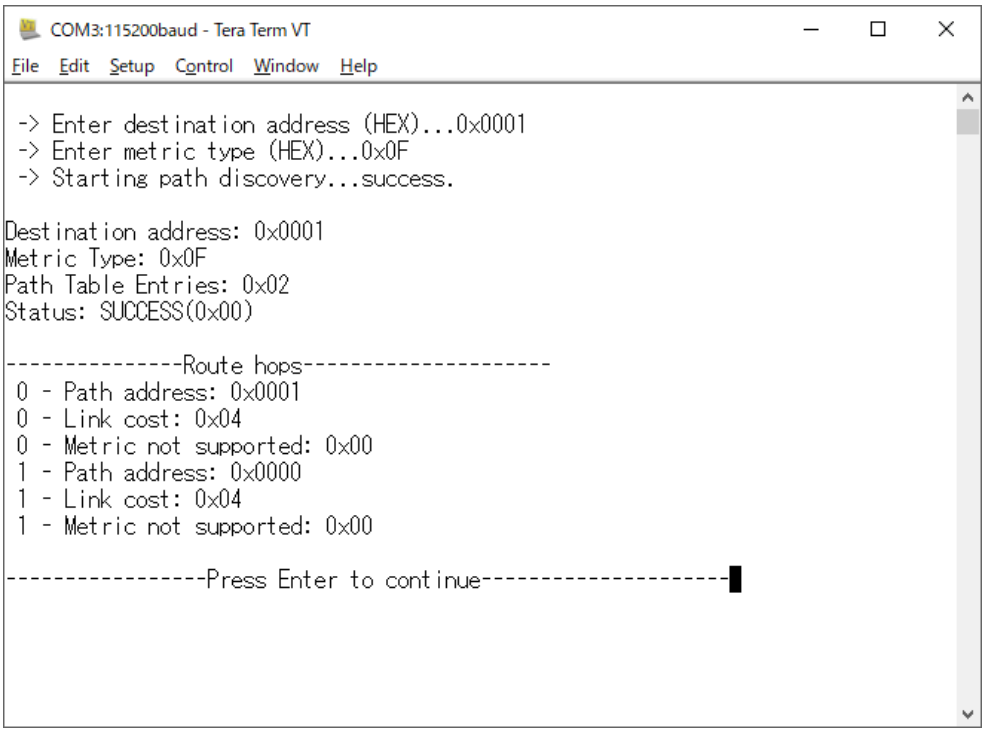

Figure 3-13 Input parameters of Path Discovery

Table 3-14 Setting parameters of Path Discovery

Input	Description	Format
destination address	Destination Short Address	4 digits of hexadecimal number which starts from “0x” ex)0x0001
metric type	metric type	(0-F) 2 digits of hexadecimal number which starts from “0x” ex)0x01 The default metric type of sample application is 0x0F.

3.8.4 Information base get/set Menu

This is menu for accessing access information base in the layer of MAC, ADP and EAP.

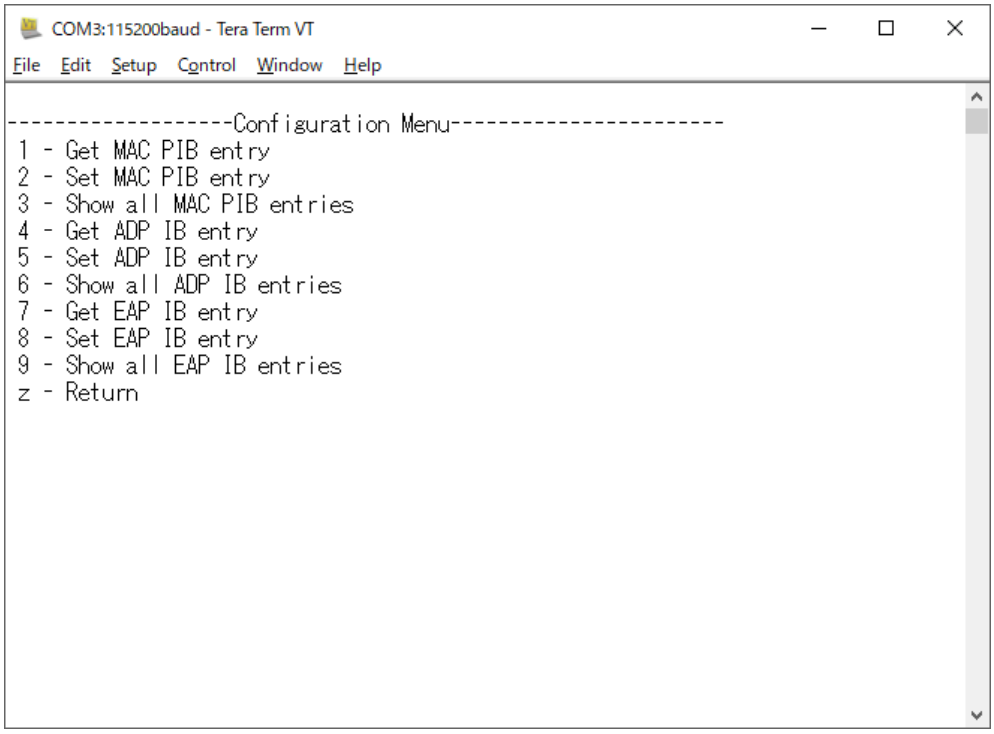

Figure 3-14 Configuration Menu

Table 3-15 Configuration Menu command list

Command	Command name	Description	Destination
1	Get MAC PIB entry	Reads an entry from the MAC layer information base. The entry is selected by providing the corresponding attribute ID, which are displayed in menu 3.	-
2	Set MAC PIB entry	Writes an entry to the MAC layer information base. The entry is selected by providing the corresponding attribute ID, which are displayed in menu 3.	-
3	Show all MAC PIB entries	Displays all entries of the MAC layer information base.	-
4	Get ADP IB entry	Reads an entry from the ADP layer information base. The entry is selected by providing the corresponding attribute ID, which are displayed in menu 6.	-
5	Set ADP IB entry	Writes an entry to the ADP layer information base. The entry is selected by providing the corresponding attribute ID, which are displayed in menu 6.	-
6	Show all ADP IB entries	Displays all entries of the ADP layer information base.	-
7	Get EAP IB entry	Reads an entry from the EAP layer information base. The entry is selected by providing the corresponding attribute ID, which are displayed in menu 9.	-
8	Set EAP IB entry	Writes an entry to the EAP layer information base. The entry is selected by providing the corresponding attribute ID, which are displayed in menu 9.	-
9	Show all EAP IB entries	Displays all entries of the MAC layer information base.	-
z	Return	Back to previous menu.	-

Refer to G3 serial command specification (R9A06G037_G3_Serial_Command_Spec.docx) for IB details.

3.8.5 Statistics/Log of G3 block Menu

This is menu for displaying statistics and Log of G3 block.

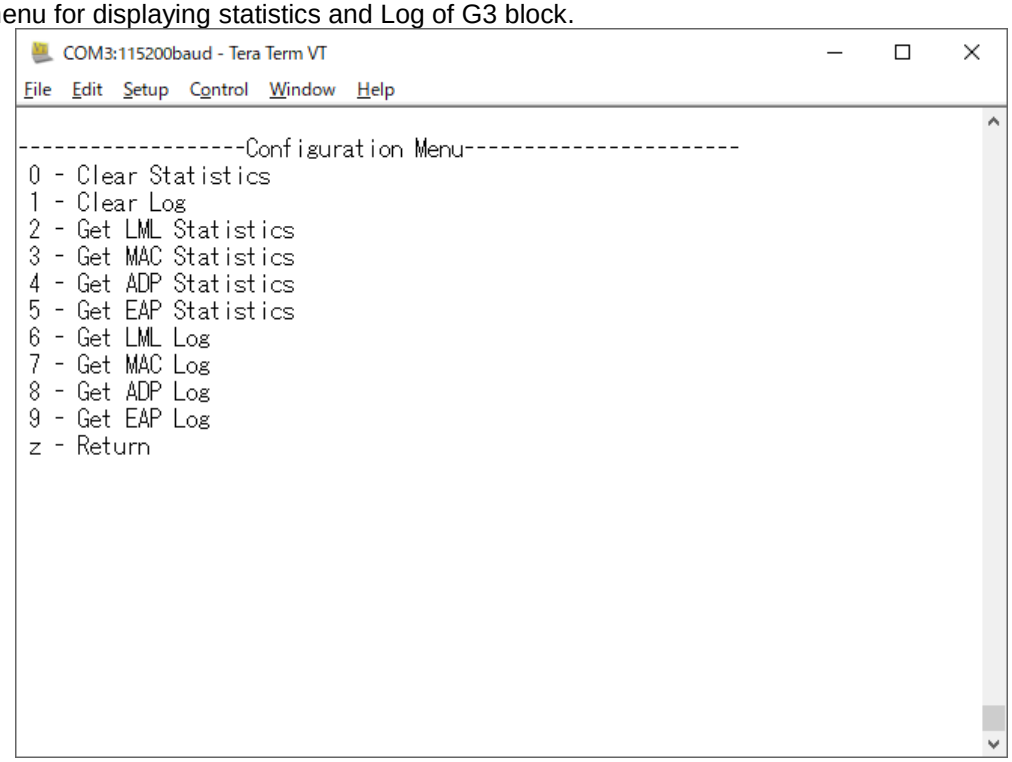

Figure 3-15 Statistics/Log of G3 block Menu

Table 3-16 Statistics/Log of G3 block Menu command list

Input	Command menu	Description	Destination
0	Clear Statistics	Clear all statistics of G3 Channel.	-
1	Clear Log	Clear the log of G3 Channel.	-
2	Get LML Statistics	Displays the statistics of the LML layer.	-
3	Get MAC Statistics	Displays the statistics of the MAC layer.	-
4	Get ADP Statistics	Displays the statistics of the ADP layer.	-
5	Get EAP Statistics	Displays the statistics of the EAP layer.	-
6	Get LML Log	Displays the log of the LML layer.	-
7	Get MAC Log	Displays the log of the MAC layer.	-
8	Get ADP Log	Displays the log of the ADP layer.	-
9	Get EAP Log	Displays the log of the EAP layer.	-
z	Return	Back to the previous menu.	-

Refer to G3 serial command specification (R9A06G037_G3_Serial_Command_Spec.docx) for more information.

Revision History

Date	Revision	Section	Substance
September 10, 2015	Rev.0.01	-	correction of erroneous description
December 1, 2015	Rev.0.02	-	Add Statistics/Lod app Add macPromiscuous mode app for Dual use
December 14, 2015	Rev.0.03	2.1.2	Modify configuration setting by Dip switch
February 16, 2016	Rev.0.04	2.1.2	Modify configuration setting by Dip switch
March 28, 2016	Rev.0.05	2.3	Add bandplan switch, modify certification mode.
September 5, 2016	Rev.1.00	-	correction of erroneous description
March 23, 2017	Rev.1.01	2.3.4	Add sys menu
May 15, 2018	Rev.1.02	2,3	Fully correct 2.3 in accordance with change of sample application
Apr 24, 2019	Rev.1.03	3.4 3.5	Modified console menu display.

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Renesas Electronics America Inc.
1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338

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