

RYZ014 Modules

Data Over UART with PPP

Feature Description

This document describes how to establish a standard PPP connection on the modem interface to perform traffic tests between a RYZ014-based module and a host.

When the PPP connection is up, the module will transmit the IP packet flow from the application to the network. In this mode, the PPP server is running on the module and a PPP client should run on the application side. Linux/Unix and Windows operating systems natively include a PPP protocol stack. For operating systems that do not embed an existing application to set up a PPP connection (such as Android OS), customers will have to develop their own application software to support PPP according to the standard RFC 1661: Point-to-Point Protocol.

In all the examples below, the kit must be connected to a network as a prerequisite. As the PPP connection will be established through UART, the baudrate of the UART must be the one expected by the application.

Note: Please note that in the following examples, the UART baudrate was set to 921600. Please refer to the EVK user manual to get the default baudrate of the UART to be used for PPP connection.



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1. PPP Overview

1.1 PPP Procedure

The following sequence of commands establish and terminate the PPP connection:

AT command	Response	Comment
AT+CFUN=1		
	ОК	
	+CEREG:1,"0002","01A2 2002",7	Wait for the CEREG URC showing that the modem is connected to the network
Establish the external network acc	ess (PDP context)	
AT+CGDATA="PPP",1		Where 1 is the context ID for the external network access. It can be retrieved with the AT+CGDCONT? command. It is 1 for most operators except for Verizon where it is 3.
	CONNECT	If needed, a specific APN for this CID can be set with AT+CGDCONT command.
Instead of using the AT+CGDATA	command, it is possible to use the	following command :
ATD*99***1#		1 is the CID
	CONNECT	
over the UART will be considered	ta mode and will not answer to AT of as data. Incoming URCs will not be nake the RING0 line toggle. The M0	sent to the MCU either.
	pe sequence to read the incoming	•
[+++]		The +++ command must be sent with a delay not smaller than 1 second before and after the command
	ОК	
ΑΤΟ		After checking the incoming URC, the MCU can resume the PPP session
	CONNECT	
	ne MCU should first suspend the F en terminate the session with the re	
[+++]		The +++ command must be sent with a delay not smaller than 1 second before and after the command
A = 1.1	OK	
	ОК	The delay to get the OK response can be up to 20 seconds
The PPP session is then terminate	ed	

1.2 **PPP and Low Power**

When the module enters sleep or deep sleep mode while a PPP connection is open, the PPP connection will be available again when the modem wakes up. No need for the MCU to reestablish the PPP connection.

2. Using a Linux Host

This section illustrates the use of the pppd client. Other PPP clients such as gnome-ppp, kppp, or wvdial, among others can also be used.

Please note that to be able to reach the maximum UL throughput of 1.1Mbps in 3GPP Release 14, it is necessary to change the UART0 baudrate to 1843200 as follows:

```
AT+CFUN=5
AT+SQNHWCFG="uart0","enable","rtscts","1843200" AT^RESET
```

2.1 Use Case

2.1.1 Preparation

In this example, the Linux host runs Ubuntu 14.04 and the following versions of the tools:

- chat v1.22
- pppd v2.4.5

2.1.2 Configure pppd

The main configuration file is /etc/ppp/options.

Please refer to man pppd for all details.

Replace the /etc/ppp/options file with the contents below for the test:

```
/dev/ttyACM0
921600
nodetach
noauth l
ocal
noipdefault
defaultroute
usepeerdns
crtscts lock
debug
dump
-chap connect "/usr/sbin/chat -t6 -f
/etc/chatscripts/connect"
```

In this file, configure:

- The TTY device, which is one of the AT ports of the modem
- The baud rate, which is 921600 in this example but can be 115200 or any other supported baudrate configured on the module
 - The default baud rate of the AT UART terminal can be checked by connecting a UART terminal utility such as Tera Term and running AT+IPR?. Make sure to disconnect the UART AT terminal before you attempt to use the COM port for PPP connection
- HW flow control enable with the crtscts option
- The scripts for connect and disconnect
- Other options depending on usage

2.1.3 Connect Script

In the options of the configuration file above, the script /etc/chatscripts/connect contains the commands sent to the modem to initialize the connection.

Below is an example of this script.

Replace the /etc/chatscripts/connect file with the one below for the test.



```
#ABORT "NO CARRIER"
TIMEOUT 30
ABORT ERROR
"" AT
OK AT+CGDATA="PPP",1
CONNECT ""
```

Note: AT+CGDATA="PPP", <cid> where <cid> represents the cid of the PDP context as defined by AT+CGDCONT. Use value 3 for Verizon Wireless testing and 1 for the other networks. The user can check which cid is connected to the network with AT+CGDCONT?.

See also man chat for additional information.

2.1.4 Disconnect Script

In the options of the configuration file above, the script /etc/chatscripts/disconnect contains the commands sent to the modem to terminate the PPP connection.

Replace the /etc/chatscripts/disconnect file with the one below for the test.

```
"" "\d\d\d+++\c"
```

Note: The sequence +++ is used to suspend the PPP session.

2.1.5 Terminate pppd Connection

To terminate the pppd connection, just press **<Ctrl-C>** or kill the pppd process from another terminal as shown below:

sudo killall -TERM pppd

2.2 Connecting to PPP

Note: Please disconnect the Linux station from the network before the test, to be sure to get the correct default route. Also make sure that AT UART is not in use and disconnected.

When the setup is ready, run the following command to dial-up.

sudo pppd

After entering the root password, you will see the following log and the PPP connection is established.

```
ydu@ydu-X230:~/tmp/gto$ sudo pppd
[sudo] password for ydu:
pppd options in effect:
debug # (from /etc/ppp/options)
nodetach # (from /etc/ppp/options)
dump # (from /etc/ppp/options)
noauth # (from /etc/ppp/options)
-chap # (from /etc/ppp/options)
/dev/ttyUSB0 # (from /etc/ppp/options)
921600 # (from /etc/ppp/options)
lock # (from /etc/ppp/options)
connect /usr/sbin/chat -t6 -f /etc/chatscripts/connect # (from
/etc/ppp/options)
crtscts # (from /etc/ppp/options)
local # (from /etc/ppp/options)
noipdefault # (from /etc/ppp/options)
defaultroute # (from /etc/ppp/options)
usepeerdns # (from /etc/ppp/options)
Script /usr/sbin/chat -t6 -f /etc/chatscripts/connect finished (pid 7737),
status = 0x0
Serial connection established.
using channel 2
```



Using interface ppp0 Connect: ppp0 <--> /dev/ttyUSB0 sent [LCP ConfReq id=0x1 <asyncmap 0x0> <magic 0xa1249984> <pcomp> <accomp>] rcvd [LCP ConfReq id=0x1 <mru 1280> <asyncmap 0x0> <magic 0xbd59bcce> <pcomp> <accomp>] sent [LCP ConfAck id=0x1 <mru 1280> <asyncmap 0x0> <magic 0xbd59bcce> <pcomp> <accomp>] rcvd [LCP ConfAck id=0x1 <asyncmap 0x0> <magic 0xa1249984> <pcomp> <accomp>] sent [CCP ConfReq id=0x1 <deflate 15> <deflate(old#) 15> <bsd v1 15>] sent [IPCP ConfReq id=0x1 <compress VJ 0f 01> <addr 0.0.0.0> <ms-dns1 0.0.0.0> <ms-dns2 0.0.0.0>] rcvd [LCP ProtRej id=0x2 80 fd 01 01 00 0f 1a 04 78 00 18 04 78 00 15 03 2f] Protocol-Reject for 'Compression Control Protocol' (0x80fd) received rcvd [IPCP ConfReg id=0x1 <addr 192.168.50.1>] sent [IPCP ConfAck id=0x1 <addr 192.168.50.1>] rcvd [IPV6CP ConfReq id=0x1 <addr fe80::51e1:85c6:d330:d689>] Unsupported protocol 'IPv6 Control Protocol' (0x8057) received sent [LCP ProtRej id=0x2 80 57 01 01 00 0e 01 0a 51 e1 85 c6 d3 30 d6 89] rcvd [IPCP ConfRej id=0x1 <compress VJ 0f 01>] sent [IPCP ConfReq id=0x2 <addr 0.0.0.0> <ms-dns1 0.0.0.0> <ms-dns2 0.0.0.0>] rcvd [IPCP ConfNak id=0x2 <addr 192.168.6.2> <ms-dns1 172.16.66.1> <ms-dns2 172.16.66.1>] sent [IPCP ConfReq id=0x3 <addr 192.168.6.2> <ms-dns1 172.16.66.1> <ms-dns2 172.16.66.1>] rcvd [IPCP ConfAck id=0x3 <addr 192.168.6.2> <ms-dns1 172.16.66.1> <ms-dns2 172.16.66.1>] local IP address 192.168.6.2 remote IP address 192.168.50.1 primary DNS address 172.16.66.1 secondary DNS address 172.16.66.1 Script /etc/ppp/ip-up started (pid 7751) Script /etc/ppp/ip-up finished (pid 7751), status = 0x0

After the test, you can ping to network (using a different terminal) and access the internet.

2.3 Troubleshooting

The debug option can be used when launching pppd. In that case, pppd will log the contents of all control packets sent or received in a readable form. The packets are logged through syslog with facility daemon and level debug. This information can be directed to a file by setting up /etc/syslog.conf appropriately. Note that if pppd is compiled with extra debugging enabled, it will log messages using facility local2 instead of daemon.

Note that with Ubuntu machines, the /etc/syslog.conf file is replaced by /etc/rsyslog.conf instead.

3. Using a Windows Host

Please note with a Windows Host, the maximum supported baudrate is 921600, which will not allow the UE to reach the maximum UL throughput of 1.1 Mbps in 3GPP Release 14.

3.1 With sqncom2ppp Tool

This section applies to both Windows 7 and Windows 10.

3.1.1 Modem Interface Creation

A Renesas tool named sqncom2ppp can be installed to ease the Windows PPP driver configuration. Get the latest version of sqncom2ppp software from Renesas (com2ppp_setup_1.1-6.exe for example) and run this application. Click **Next/Finish** on the following windows:



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Figure 1. sqncom2ppp Setup

At this stage, sqncom2ppp is installed on your PC and can be used to configure PPP driver on Windows.

After completing the sqncom2ppp installation, perform the following steps. All these steps are required the first time PPP is used only.

- 1. Open a CMD command prompt in Windows and run it as administrator
- 2. Change directory to the default installation directory
 - C:\Program Files (x86)\Sequans Communications\com2ppp



Figure 2. com2ppp Directory

3. From this location you can run the sqncom2ppp program.

 Create the Modem interface, by typing sqncom2ppp create COMxx
 COMxx is one of the COM ports associated to the test kit.
 Please use the UART COM associated to AT Commands or to DCP



3.1.2 Modem Interface Configuration

Configure the Modem interface as follows:

- 1. Open the Windows control panel, section **Phone and Modem**
- 2. Click on Modems tab
 - The new modem can be seen in the list.
 - Double click on it
- 3. Then click on **Change Settings**



Figure 3. Select New Modem

- 4. In the Modem tab, set the baud rate of the UART port. It is typically 921600 or 115200
- 5. The baudrate of the UART can be checked with AT+IPR?

Phone and Modem	
General Modem Diagnostics Advanced Driver Details Port: COM10 Speaker volume	
Low High	
19200 38400 57600 115200 230400 460800 921600	
OK Cancel	

Figure 4. Select Baudrate

At this stage, a reboot of the computer is required, in order for those new settings to take effect.

3.1.3 Running a Data Session over PPP

In the current example, AT commands are mapped on COM10. The assumption is that the user has already performed all the steps described in previous sections to create the Modem interface and map it on COM10.



Start the terminal process and connect it to COM10.

Then connect the modem to the network with:

AT+CFUN=1

Wait for the Kit to connect to the network

AT+CGDATA="PPP",<mark>1</mark>

This will create the PPP connection AT+CGDATA="PPP", <cid> where <cid> is set to 1 by default. To run tests over Verizon Wireless network, cid should be set to 3. The user can check which cid is connected to the network with AT+CGDCONT?.

If everything went well, you should get a CONNECT answer. Otherwise, the command will return NO CARRIER, meaning that something went wrong and it needs to be fixed before moving further. Double check that the modem is correctly attached to the network to make sure that the baudrate matches the one of the module's UART and reset the module.

Once CONNECT is received in response to AT+CGDATA, then disconnect the serial terminal from COM10.

After this step, run the following command from the CMD terminal to establish the PPP connection.

sqncom2ppp.exe connect COM10

The above command will set up a dial-up connection if not already existing and open it.

If the following error is seen, please check that the COM port configuration is correct, and no other process is using the same COM port. Please also make sure that the PC configuration is correct (refer to section 3.1.2).

Typically, in the example, the COM port used for PPP is the same as the one for the AT command terminal. Omitting to disconnect the terminal will prevent the PPP process from succeeding.

	Dialing	
	Error 777: The connection attempt failed because the modem (or other connecting device) on the remote computer is out of order.	
	ff you continue to receive error messages, you can enable logging for analysis.	
•	Enable logging For logging options, see <u>diagnostics</u>	
	Logging options can also be accessed by clicking the Remote Access Preferences menu item under the Advanced menu of the Network Connection Folder.	
	<u>R</u> edial <u>C</u> lose	

Figure 5. Connection Error

If this step succeeds, the PPP connection will appear among other existing connections, through an <code>ipconfig</code> command and is ready for use.

If you want to stop the PPP connection, you should run the following command from the CMD terminal:

sqncom2ppp.exe disconnect COM10

As long as this PPP interface is not removed, it will be available every time the test kit is connected on this PC. The interface can be deleted using the following command from the CMD terminal:

sqncom2ppp.exe remove COM10



3.2 Without sqncom2ppp Tool (Windows 10 Host)

If you don't have access to the sqncom2ppp tool, you can configure Windows PPP driver manually as follows. This section applies to a Windows 10 host. Please refer to section 3.3 if you are using a Windows 7 host.

3.2.1 Modem Interface Creation

1. Open the device manager, click on Modems then Action -> Add legacy hardware.



Figure 6. Add Legacy Hardware



2. Click on Next.



Figure 7. Add Hardware

3. Select Install the hardware manually

Bevice Manager File Action View Help	
A huda-PC	
Add Hardware	
The wizard can help you install other hardware	
The wizard can search for other hardware and automatically install it for you. Or, if you	
know exactly which hardware model you want to install, you can select it from a list.	
What do you want the wizard to do?	
Search for and install the hardware automatically (Recommended)	
 Install the hardware that I manually select from a list (Advanced) 	
< Back Next > Cancel	

Figure 8. Install Hardware Manually



4. In the list, select Modem.

Add Hardware From the list below.	elect the type of hardware you a	re installing	
If you do not see Common hardw	he hardware category you want, cli	ick Show All Devices.	
The second secon	ces res Extender inology driver rial adapters oters oters		

Figure 9. Select Modem



5. Check Don't detect my modem.

← → 〒 2 ▶ ▲ huda-PC)
Add Hardware Wizard Install New Mode Do you want W		
	 Windows will now try to detect your modem. Before continuing, you should: 1. If the modem is attached to your computer, make sure it is turned on. 2. Quit any programs that may be using the modem. Click Next when you are ready to continue. Image: Don't detect my modem; I will select it from a list. 	
	< Back Next > Cancel	

Figure 10. Don't Detect Modem



6. In the list, select **Communications cable between two computers**.

Add Hardware Wizard		
Install New Modem		
an installation disk, clic		
Manufacturer (Standard Modem Types)	Models	
This driver is digitally signed	d. Have Disk	

Figure 11. Communications Cable between Two Computers

7. Select the UART COM associated with AT Commands or to the DCP on which PPP connection will take place. Please refer to your Test Kit User Manual. Here, the COM port is COM40.

You have selected the following modem:	
Communications cable between two computers	
On which ports do you want to install it?	
All ports Selected ports	
COM3 COM40	
COM41 COM42	

Figure 12. Select Port



8. Click on Finish.

File Action View H		
م huda-PC		
Add Hardware Wizard	a la	
Install New Mode Modem installat		
	Your modem has been set up successfully. If you want to change these settings, double-click the Phone and Modem Options icon in Control Panel, click the Modems tab, select this modem, and then click Properties.	
	< Back Finish Cancel	

Figure 13. Finish Modem Setup

9. Now in the device manager, under the **Modem** section, you can see the **Communications cable between two computers**.



Figure 14. Modem Available



If you have several dial up connections, please delete the old one, or you won't see the new modem device.

3.2.2 Modem Interface Configuration

1. In the device manager, right click on the modem interface and select Properties.



Figure 15. Modem Properties

 In the tab Modem list of baudrates for Maximum Port Speed, you will see that the maximum value is 115200. Check that the port corresponds the one you chose. The baudrate to be set is the one of the UART that will be used for the PPP connection. You can refer to your Test Kit User Manual or use AT+IPR? to get it.

▶ ♠ ☶ 🖸 🖬 💻		
Audio inputs and out Batteries Biometric devices	mmunications cable between two computers Properties × eneral Modem Diagnostics Advanced Driver Details Events Port: COM40 Speaker volume Low High Maximum Port Speed 115200 Dial Control Wait for dial tone before dialing	^

Figure 16. Maximum Port Speed

If you need to set 921600 baudrate, you must modify the base register as follows:



- Close the Properties window and start regedit as administrator.
- Go into: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Class\{4D36E96D-E325-11CE-BFC1-08002BE10318}\0003
 Note that the file isn't necessarily named 0003
- Check that the AttachedTo field value matches the UART COM port used when creating the modem (here COM40).

	3 6	d36e965	-e325-11c	-bfc1-0	002be1	0318)	-				~	Name	Туре	Data
	5 6	d36e966	-e325-11c	bfc1-00	002be1	(0318)						ab) (Default)	REG SZ	(value not set)
	> . (d35e967	-e325-11c	e-bfc1-00	002be1	0318]						(ab) AttachedTo	REG SZ	COM40
			-e325-11c									all ConfigDialog	REG_SZ	modemui.dll
	S		-e325-11c									10 DCB	REG BINARY	1c 00 00 00 00 4b 00 00 15 20 00 00 00 00 0a 00 0a 0.
			-e325-11c									10 Default	REG BINARY	C1 00 00 D0 00 00 00 00 00 00 00 00 00 00
			-e325-11c								100	20 DeviceType	REG BINARY	00
			-e325-11c									ab DriverDate	REG_SZ	3-9-2000
	~	0000	-0523-110	e-bici-u	0020e1	(0516)						700 DriverDateData	REG BINARY	00 40 84 69 5a 89 bf 01
	13	0001										ab DriverDesc	REG SZ	Communications cable between two computers
	1.3	0002									100	ab DriverVersion	REG_SZ	10.0.17134.1
	1	0003										ab) EnumPropPages32	REG_SZ	modemui.dll, ModemPropPagesProvider
	31	0004										A FriendlyName	REG_SZ	Communications cable between two computers
	- ST	0005										22 ID	REG_BINARY	10 94 32 06
	40	Proper	ties									a) InfPath	REG_SZ	mdmhayes inf
Edit Binary V						*****			 	 ×		and Inf Section	REG_SZ	M2700
EOIT DINARY W	aue									^		el LoggingPath	REG_SZ	C:\WINDOWS\ModemLogs\ModemLog_Commu
Value name:										_		Manufacturer	REG_SZ	(Standard Modern Types)
					-	_	_					MatchingDeviceId	REG_SZ	pnpc031
Properties							_					Model	REG_SZ	Communications cable between two computers
										\		200 PermanentGuid	REG_BINARY	83 08 1f 2c 4a 4e c7 42 b0 fa c2 31 4f 4a f6 a0
Value data:	1.00		~			10	-	00						65 06 11 2C 48 48 C/ 42 DUTA C2 51 41 48 10 80
Value data:	00	00 00					00 00	66 66				10 PortSubClass	REG_BINARY	02
Value data: 0000 0008 0010	00 00	00 00	99 99	90 0 90 3	10 E	88 I 88 I	99 99	66 66	 			Properties	REG_BINARY REG_BINARY	C2 C0 CC 60 D0 C0 CC 60 D0 C0 C0 60 D0 CC 60 D0 C0 C0 D0 D0 C0.
0010 0013	60	00	99 99	90 0 90 3	10 E	88 I 88 I	88	66	 			Properties ProviderName	REG_BINARY REG_BINARY REG_SZ	112 00 00 00 00 00 00 00 00 00 00 00 00 00
Value data: 0000 0008 0010	00 00	00 00	99 99	90 0 90 3	10 E	88 I 88 I	99 99	66 66	 			Properties	REG_BINARY REG_BINARY	C2 C0 CC 60 D0 C0 CC 60 D0 C0 C0 60 D0 CC 60 D0 C0 C0 D0 D0 C0.

Figure 17. AttachedTo Field

- Right-click on Properties and select Modify Binary Data...
- Find the first occurrence of 00 C2 01 00 and change it into 00 10 0E 00.

omputer	HKEY LOC	AL MACH	NE\SYS	EM\Curre	ntCont	rolSet\0	ontrol	\Class\{	4d36e96	d-e325-11ce-bfc1-08002be	03183,000	13		
		{4d36e9	65-c325	11ce-bfc1	08002	be10318	}				4	Name	Туре	Data
	Edit Binary	/alue									×	(Default)	REG SZ	(value not set)
	1.000										2222	ab AttachedTo	REG SZ	COM40
	Value name:										100	ConfigDialog	REG_SZ	modemui.dll
	Properties											20 DCB	REG_BINARY	1 c 00 00 00 00 4b 00 00 15 20 00 00 00 00 0a 00 0a 0.
	Value data:											16 Default	REG_BINARY	01 00 00 00 00 00 00 00 00 00 00 00 00 0
	0000	00	00			00	00	00	00			BeviceType	REG_BINARY	00
	6668	00	00			00	00	00	00			DriverDate	REG_SZ	3-9-2000
	0010 0018	00 00	00			30 00	00 C2	00 01	00 00	· · · · · · · · · · ·		Ster Driver Date Data	REG_BINARY	00 40 84 69 5a 89 bf 01
	0020	00	20		~	00		01	00			ab DriverDesc	REG_SZ	Communications cable between two computers
	S COM ST											ab DriverVersion	REG_SZ	10.0.17134.1
												EnumPropPages32	REG_SZ	modemui.dll,ModemPropPagesProvider
												ab FriendlyName	REG_SZ	Communications cable between two computers
												暖)ID	REG_BINARY	10 94 32 06
												(ab) InfPath	REG_SZ	mdmhayes.inf
	1										-	ab)InfSection	REG_SZ	M2700
										OK Cano	el	LoggingPath	REG_SZ	C:\WINDOWS\ModemLogs\ModemLog_Commu.
	1113	14425-0	71	11ce-hfc1	12003	ba10219	1					Manufacturer	REG_SZ	(Standard Modern Types)
				11ce-bfc1								MatchingDeviceId	REG_SZ	pnpc031
	1			11ce-bfc1			÷					ab Model	REG_SZ	Communications cable between two computers
	1 5			11ce-bfc1								36 PermanentGuid	REG_BINARY	83 08 1f 2c 4a 4e c7 42 b0 fa c2 31 4f 4a fō a0
	1 3			11ce-bfc1								Re PortSubClass	REG_BINARY	02
	s	{4d35e9	77-e325	11ce-bfc1	-08002H	be10318	3					Reporties	REG_BINARY	00 00 00 00 00 00 00 00 00 00 00 00 00
	5	{4d36e9	78-e325	11ce-bfc1	08002	be10318	1					and ProviderName	REG_SZ	Microsoft
	>			11ce-bfc1								ab ResponsesKeyName	REG_SZ	Communications cable between two computers::
	>			11ce-bfc1								80 UINumber	REG_DWORD	0x00000001 (1)
	2			11ce-bfc1										
	2			11ce-bfc1										
	3			11ce-bfc1										
	3			480-2466-		100 2223								
	1 3			415e-a6cc 11d1-bf5										
	1 3			4057-a056										
1 1				-11d1-bf5										

Figure 18. Modify Data



- Close regedit, return in the device manager and re-open the **Properties** window of **Communications** cable between two computers
- Select **921600** as maximum baudrate

🏟 📅 🗐 🚺 🖬 🛒	Communications cable between two computers Properties	×
✓	Consul Modern Discounting Advanced Drive Datata Consta	
> 📢 Audio inputs and outpu	General Modem Diagnostics Advanced Driver Details Events	
> S Batteries	Port: COM40	
Biometric devices Bluetooth	C I I.	
> (i) Bluetooth	Speaker volume	
> Computer	Low High	
> ControlVault Device		
> Disk drives		
> Display adapters	Maximum Port Speed	
> Firmware	Maximum For Speed	
> 🙀 Human Interface Device	921600 ~	
> Keyboards		
> Memory technology de		
> () Mice and other pointing	Dial Control	
🗸 📕 Modems	Dial Control	
Communications ca	Wait for dial tone before dialing	
Communications ca		
> 🤜 Monitors		
✓		
🚽 Intel(R) Dual Band W		
Intel(R) Ethernet Cor		
😨 Npcap Loopback Ac	OK Cance	ł
🐙 Realtek USB GbE Far		

Figure 19. Set 921600 as Maximum Baudrate



3.2.3 Creating a Dial-Up Connection1. Open the Network and Sharing Center

- 🔿 🕤 🋧 🔽 > Control Pa	anel > Network and Internet > Network	and Sharing Center 🗸 🗸 🖑	Search Control Panel	3	
Control Panel Home	nel Home View your basic network information and set up connections				
Change adapter settings	View your active networks				
Change advanced sharing settings	Network Public network	Access type: Internet Connections: U Ethernet 2			
	Change your networking settings —				
	Set up a new connection or Set up a broadband, dial-up,	network . or VPN connection; or set up a router or access point.			
	Troubleshoot problems Diagnose and repair network	problems, or get troubleshooting information.			
See also					
Infrared					
Internet Options					

Figure 20. Network and Sharing Center

2. Click on Connect to a workplace

Choose a connection option		
Connect to the Internet Set up a broadband or dial-up connection to the Internet.		
Set up a new network Set up a new router or access point.		
Manually connect to a wireless network Connect to a hidden network or create a new wireless profile.		
Connect to a hidden network or create a new wireless profile.		
Connect to a workplace Set up a dial-up or VPN connection to your workplace.		
<u></u>		- 5%

Figure 21. Connect to a Workplace



3. Select Dial directly

<i></i>	Tonnect to a Workplace	
	How do you want to connect?	
	→ Use my Internet connection (VPN) Connect using a virtual private network (VPN) connection through the Internet.	
	🔊 — 🎱 — 🕪	
	→ Dial directly Connect directly to a phone number without going through the Internet.	
	🔊 — 🍺	
	Can	

Figure 22. Select Dial Directly

4. Select the modem you created (here: **Communication cable between two computers**)

← 📠 Connect to a	- 14/				
← 🔤 Connect to a	a workplace				
Which mode	em do you want to	use?			
Som Kode					
1				Can	

Figure 23. Select Modem



5. Set a dummy number in **Telephone number** and click on **Don't connect now**. Then click on **Next**

Type the telephone	number to connect to						
Your network administra	tor can give you this information.						
Telephone number:	1234	Dialing Rules					
Destination name:	Dial-up Connection						
This option allow	 Use a smart card Allow other people to use this connection This option allows anyone with access to this computer to use this connection. Don't connect now; just set it up so I can connect later 						

Figure 24. Set Dummy Telephone Number

6. Click on Create

Type your use	r name and password		
User name:			
Password:			
	Show characters		
Domain (optional)			

Figure 25. Create Dial Up Connection



7. Return on the **Network and Sharing Center** and click on **Change adapter settings**. You will see your dial up connection created. You can rename it as you wish.

🗧 🔶 👻 🛧 🎦 > Control Panel > Netwo	ork and Internet > Network Connection	s võ	Search Network Connections 🔎
Organize Start this connection Rena	ame this connection Delete this conn	nection Change settings of this connection	III 🔹 🗖 🚺
Name	Status	Device Name	Connectivity
Dial-up Connection	Disconnected	Communications cable between two computers	
📮 Ethernet	Network cable unplugged	Intel(R) Ethernet Connection (4) I219-LM	
Ethernet 2	Network	Realtek USB GbE Family Controller	Internet access
Npcap Loopback Adapter	Disabled	Npcap Loopback Adapter	
🚚 sequans_vpn	Network cable unplugged	TAP-Windows Adapter V9	
affl Wi-Fi	Not connected	Intel(R) Dual Band Wireless-AC 8265	

Figure 26. Check Dial Up Connection

- 8. Right-click on Properties and then in General/Connect using
 - Click the write link, here Communication cable between two computers (COM40) if you created more than one dial-up connection.
 - Click Configure... and select 921600 in Maximum speed (bps) and then Ok. Disable all the hardware features.

← → × ↑ 😰 > Control Panel > Network and	Dial-up Connec	ction Properties		×	ڻ ~	Search Ne	etwork Conne	ctions	Q
Organize 👻 Start this connection Rename thi	General Options	Security Networking	Sharing		is connection				?
Name	Connect using:						Connectivit	У	
Jial-up Connection		ations cable between	two computers (CON	12	een two computers				
💭 Ethernet	Communic	ations cable between	two computers #2 (((4) 1219-LM				
Ethernet 2	<		>	\$	troller		Internet acc	ess	
Provide Adapter			_	Mod	dem Configuration)
sequans_vpn	the same numbers	Configure							
ផ្លាញ់ Wi-Fi	Dial only first av	vailable device			Communications cab	le between tw	o computers (C	OM40)	
	Phone number			-					
	Area code:	Phone number:		Max	timum speed (bps):	921600			~
	~	1234	Alternates	Mod	dem protocol				
	Country/region	code:		H	ardware features				
				[Enable hardware flow co	ontrol			
	Use dialing r	niles	Dialing Rules	[Enable modem error con	trol			
			Letoning Theres] [Enable modem compres	sion			
	Privacy statement			1					
					Enable modem speaker				
		-	2220 1 1	-		-	011	-	
			OK Car	1C			OK	Cano	el

Figure 27. Configure Connection



9. In the **Options** tab, tick only **Display progress while connecting** and set **Idle time before hanging up** to **20 minutes**. Then click **OK**.

🗧 🚽 👻 🛧 😰 > Control Panel > Network and	Dial-up Connection Properties	×	ڻ ~	Search Network Connections 🛛 🔎
Organize 👻 Start this connection Rename th	General Options Security Networking Sharing		s connection	III 🔻 🔟 🤇
Name Dial-up Connection Dial-up Connection Future t Future t Npcap Loopback Adapter sequans_vpn future Wi-Fi	 ✓ Display progress while connecting Prompt for name and password, certificate, etc. Include Windows logon domain Prompt for phone number Idle time before hanging up: 20 minutes 	~	een two computers (4) I219-LM roller KC 8265	Connectivity Internet access
	ОК	Cancel		

Figure 28. Create Dialup Connection

Note: At this stage, a reboot of the computer is required for those new settings to take effect.

3.2.4 Running a Data Session over PPP

In the current example, AT commands are mapped on COM40. The assumption is that the user already performed all the steps described in previous sections to create the modem interface and map it on COM40.

Start the terminal process and connect it to COM40.

Then connect the modem to the network with:

AT+CFUN=1 Wait for the Kit to connect to the network

 $AT+CGDATA="PPP", \frac{1}{2}$ This will create the PPP connection

AT+CGDATA="PPP", <cid> where<cid> represents the cid of the PDP context as defined by AT+CGDCONT. Use value 3 for Verizon Wireless testing and 1 for the other networks. The user can check which cid is connected to the network with AT+CGDCONT?.

If everything went well, you should get a CONNECT answer. Otherwise, the command will return NO CARRIER, meaning that something went wrong and it needs to be fixed before moving further. Double check that the modem is correctly attached to the network.

Once CONNECT is received in response to AT+CGDATA, then disconnect the serial terminal from COM40.

Establish PPP connection as follows.



1. Right click on the **Dial-up Connection** (or whatever the name you gave) in the **Sharing Center** and select **Connect**.



Figure 29. Connect

2. Click on Dial-up Connection in the Windows 10 Internet Access popup (here in airplane mode)

토	Network Connected
C::	Dial-up Connection
(G	Wi-Fi Turned off
	work & Internet settings ge settings, such as making a connection metered.
<i>II.</i> Wi-Fi	ာ္ကာ (ျာ) Mobile Airplane mode
\$	へ 🖻 💱 🔕 👒 🕁 d× 5:12 PM 2/26/2019 🔁

Figure 30. Internet Access



3. Windows 10 interface will show up. Click Connect

Settings		– 🗆 ×
命 Home	Dial-up	
Find a setting	➢ Dial-up	
Network & Internet	Dial-up Connection	
⊕ Status		
🕼 Wi-Fi	Connect Advanced options	Remove
臣 Ethernet	Set up a new connection	
ଳ Dial-up	Related settings	
% VPN	Change adapter options	
$r_{\mathcal{V}}^{n}$ Airplane mode	Network and Sharing Center Windows Firewall	
(⁽ I)) Mobile hotspot	windows rinewall	
🕒 Data usage	Have a question?	
Proxy	Get help	
	Make Windows better	

Figure 31. Windows10 Dial Up Interface

A dialog window opens, quickly passes the connection steps until it shows Connected for a few seconds, then it closes itself.

The debug console of test kit shows that PPP connection is established and shows the local and remote IP addresses.

3.2.5 Troubleshooting

If you encounter any issue while setting up the PPP connection, please check the following:

- Check in the device manager that the COM port used for PPP is the right one. It should correspond either to the AT port of the test kit or to the debug port.
- Check that the Hardware features are all disabled in the PPP connection properties
 - Make sure that you reboot your laptop after configuring the dial-up connection.
 - Make sure that the COM port used for PPP is not already opened somewhere else
 - Check that the UE is attached and has a valid IP address.
 - Check that the AT+CGDATA command was set using the right cid by checking the PDN attached to the network with AT+CGDCONT?

3.3 Without sqncom2ppp Tool (Windows 7 Host)

This section describes how to set up a PPP connection using a Windows 7 host if you don't have access to the sqncom2ppp tool. Computer used for testing should have no firewall and user should have administrator rights.

3.3.1 Modem Interface Creation

First associate a dial-up interface with the modem



1. Open the "Phone and Modem" settings panel



Figure 32. Open Phone and Modem Control Panel

If you see a pop-up window like the following, this is because you need to set some "area zone" the first time you install a dialup modem connection. Just enter **0000** for example and then click **OK**.

the following information about y What country/region are you in r		inceus
United States	•	
What area code (or city code) ar		
If you dial a number to access ar	n outside line, what is it?	
The phone system at this locatio	n uses:	
Tone dialing	ng	
	OK Car	ncel

Figure 33. Location Information



2. Choose the **Modems** tab in the next window.

Locations:	n from which you are dialing.	
Location	Area Code	
	tion 00	
	New Edit Dele	ete

Figure 34. Modem Tab

3. Click on the **Add** button to add a new modem interface. In the new window that pops up, enable the option **Don't detect my modem. I will select it from a list**.

Do you want Win	n dows to detect your modem?
	Windows will now try to detect your modem. Before continuing, you should:
	 If the modem is attached to your computer, make sure it is turned on.
	Quit any programs that may be using the modem.
	Click Next when you are ready to continue.
	☑ Don't detect my modem; I will select it from a list.

Figure 35. Don't Detect Modem



4. Wait while you see **Retrieving a list of all devices** and a few seconds later a list of modern models appear. Select the **Standard 56000 bps Modern**.

Install New Modem	
Select the manufactu an installation disk, cl	rer and model of your modem. If your modem is not listed, or if you have ick Have Disk.
Manufacturer	Models
(Standard Modem Types)	Standard 28800 bps Modem Standard 33600 bps Modem Standard 56000 bps Modem

Figure 36. Select Standard 56000 bps Modem



RYZ014 Modules

5. In the next window that appears, you need to associate a COM port with the Modem. Please use the UART COM associated with AT Commands or to DCP (refer to your test kit user manual). If you don't see the COM port to be used in the list, make sure that it is not being used by another application.

Phone and Modern Dialing Rules Moderns	Advanced
Add Hardware Wiz	
	You have selected the following modem: Standard 56000 bps Modem On which ports do you want to install it? C All ports Selected ports COM8
	< Back Next > Cancel

Figure 37. Associate COM Port with Modem

6. Click on **Next** to finish the installation of the modem device.

allation is finished!
Your modem has been set up successfully.
If you want to change these settings, double-click the Phone and Modem Options icon in Control Panel, click the Modems tab, select this modem, and then click Properties.

Figure 38. Finish Installation



7. A new modem device associated to the COM port has been created

Dialing Rules Modems Advanced The following modems are instal	ed:	
Modem	Attached To	
E Standard 56000 bps Modem	COM8	
@ Add	Remove Properties	

Figure 39. Modem Installed

3.3.2 Modem Interface Configuration

- 1. Configure the Modem interface as follows
 - Open the Windows control panel **Phone and Modem** section
 - Click on the **Modems** tab
 - The new modem can be seen in the list.
 - Double-click on it
 - Then click on Change Settings

	Communications cable between two computers Properties
	General Modem Diagnostics Advanced Driver Details Image: Communications cable between two computers Communications cable between two computers Device type: Modems Manufacturer: (Standard Modem Types) Location: Unknown
A Phone and Modem	Device status
Dialing Rules Modems Advanced Image: State of the following modems are installed; Image: State of the following modems are installed; Modem Attached To Communications cable between two comp. COM10	This device is working property.
MAd Remove Propeties	Change settings

Figure 40. Change Modem Settings



- In the **Modem** tab, set the baud rate of the UART port
- The baudrate of the UART can be checked with AT+IPR?

Phone and Modem	
Communications cable between two computers Properties	
General Modem Diagnostics Advanced Driver Details	
Port: COM10	
Speaker volume	
Maximum Port Speed	
921600 - 300 - 1200 - 2400 - Dial Cont 4800 5600 - 132400 - 38400 - 57600 - 115200 - 230400 - 460800 - 921600 -	
OK Cancel	

Figure 41. Set Baudrate

Note: At this stage, a reboot of the computer is required, in order for those new settings to take effect.

- 2. Check modem configuration
 - Open the Windows control panel, Network and Sharing Center section
 - Click on Change adapter settings on the left
 - Select the right connection (Sequans Interface COM##) and click on Change settings of this connection from the menu above, then Configure



Figure 42. Modem Configuration



RYZ014 Modules

— Check that the speed is correct, and that HW flow control is enabled

Maximum speed (bps):	cable between two computers (COM	
Modem protocol		-
Hardware features		
Enable hardware flow Enable modem error of		
Enable modem comp	ression	
Enable modem speaker	ок	Cancel

Figure 43. Check Modem Speed and Hardware Flow Control

3.3.3 Running a Data Session over PPP

In the current example, AT commands are mapped on COM10. Assumption is made that the user already performed all the steps described in previous sections to create the modem interface and map it on COM10.

Start the terminal process and connect it to COM10.

Then connect the modem to the network with:

 $\ensuremath{\texttt{AT+CFUN=1}}\xspace$ Wait for the Kit to connect to the network

AT+CGDATA="PPP", 1 This will create the PPP connection

AT+CGDATA="PPP", <cid> where <cid> is set to 1 by default. To run tests over Verizon Wireless network, cid should be set to 3. The user can check which cid is connected to the network with AT+CGDCONT?.

If everything went well, you should get a CONNECT answer. Otherwise, the command will return NO CARRIER, meaning that something went wrong and it needs to be fixed before moving further. Double check that the modem is correctly attached to the network.

Once CONNECT is received in response to AT+CGDATA, then disconnect the serial terminal from COM10.



3.3.3.1 Creating a Dial-up Connection

1. From the Network settings panel, choose Setup a new connection or network.



Figure 44. Set Up New Connection

2. Then choose Set up a dial-up connection.



Figure 45. Set Up a Dial-Up Connection

RYZ014 Modules

3. Enter *00# as the **Dial-up phone number** and then click on **Connect**.

Type the information f	rom your Internet service provider	(ISP)
Dial-up phone number:	*00#	Dialing Rules
User name:	[Name your ISP gave you]	
Password:	[Password your ISP gave you]	
	Show characters	
	Remember this password	
Connection name:	Dial-up Connection	
🚱 🔲 Allow other people to This option allows an	use this connection yone with access to this computer to use this	connection.
I don't have an ISP	· · · · · · · · · · · · · · · · · · ·	

Figure 46. Enter Phone Number

4. Windows will immediately try to open the dial-up connection

💮 🔚 Create a Dial-up Connection			
Connecting to Dial-up Connec	tion		
· · · · · · · · · · · · · · · · · · ·		- 🎱	
	Dialing *00#		
		Sk	ip Cancel

Figure 47. Opening Dial-Up Connection



3.3.3.2 Opening Dial-up Connection

1. From the Windows Control Panel, open the Network and Sharing Center settings and choose Change adapter settings. Right-click on the icon of the Dial-up Connection and choose Connect.



Figure 48. Connect

2. In the new window that pops up, click on **Dial**. You don't need to enter anything in the user name/password fields.

Organize 🔻 Start th	Connect Dial-up Connection	tion Change settings of this connection 🛛 🔠 🔻 🗔 🔞
Name Bluetooth Network C Dial-up Connection LAN (Ethernet) LTE sequans_vpn VirtualBox Host-Only atfll Wireless Network Co ptfll Wireless Network Co	User name:	Device Name Connectivity Bluetooth Device (Personal Area Standard 56000 bps Modem Intel(R) 82579LM Gigabit Netwo GTOUsbV Device #2 No Internet access TAP-Windows Adapter V9 VirtualBox Host-Only Ethernet A Internet access Intel(R) Centrino(R) Advanced Internet access Microsoft Virtual WiFi Miniport Microsoft Virtual WiFi Miniport
	Save this user name and password for the following users: Me only Anyone who uses this computer Dial: *99# Dial Cancel Properties Help	

Figure 49. Dial



3. Once the connection is established, you can right-click on the icon for **Dial-up Connection** and choose **Status** for checking connection parameters after clicking on **Details** (IP address and so on).



Figure 50. Check Parameters

3.3.3.3 Closing Dial-up Connection

Right-click on the icon of the Dial-up Connection and choose Disconnect.

Control Panel > Network	anu Inter	net Network Connections 	▼ 🍫 Search	Network Connections	
Organize Disconnect this connection	Ren	ame this connection View sta	tus of this connection »	II • 🔟 🤅	
Name		Status	Device Name	Connectivity	
Bluetooth Network Connection 2	Connection 2 Disabled		Bluetooth Device (Personal Area		
🛄 Dial-up Connection		Dist un Connection 2	Standard 56000 bps Modem	No Internet access	
LAN (Ethernet) LTE sequans_vpn		Disconnect	Intel(R) 82579LM Gigabit Netwo		
		Status	GTOUsbV Device #2	No Internet access	
		Set as Default Connection	TAP-Windows Adapter V9		
VirtualBox Host-Only Network atfl Wireless Network Connection 3		Create Copy	VirtualBox Host-Only Ethernet A Intel(R) Centrino(R) Advanced		
		Create Copy		Internet access	
gff Wireless Network Connection 4		Create Shortcut	Microsoft Virtual WiFi Miniport		
	۲	Delete			
		Rename			

Figure 51. Disconnect



Revision History

		Descript	ion
Rev.	Date	Page	Summary
Rev.1.00	Dec.9.20	-	Initial release
Rev.1.40	Mar.23.22	-	Added PPP Overview section.
			Other minor changes.
Rev.1.41	Mar. 30.22	6	Removed extraneous text from code sample.
		17	Fixed the example filename to match Figure 17.



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 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.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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