RTCU Emulator - User's manual

Version 1.02

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RTCU Emulator

1 RTCU Emulator

Welcome to the RTCU Emulator!

The RTCU Emulator allow a program to be tested in detail on a PC with a high confidence that it will behave exactly the same way in a physical RTCU device.

As each RTCU variant is emulated and almost all hardware features are available there is very few cases where a physical device is required in the complete development phase of an application.

The RTCU Emulator is based on the same source code as the actual firmware, so even possible bugs in the firmware will also be present in the RTCU Emulator.

The RTCU Emulator can be used stand-alone or it can be started directly from within the RTCU IDE.



The Emulator starts up with the main window, the Control Panel.

From the Control Panel, the rest of the <u>windows</u> can be opened, e.g. the <u>GSM</u> and <u>IO</u> windows, as shown above.

1.1 Limitations

The RTCU Emulator offers a very precise and comprehensive emulation of the physical RTCU devices, but still there are some limitations implied:

- The timing of the individual operation may vary compared to the physical device.
- The buzzer does not support different frequencies.
- Generic 1-wire is not supported.
- RFBC packets must be manually created, using the sender and receiver fields as raw data.
- The batConsumption functions are not supported.
- gsmModemMode is not supported and will return 2.
- gsmNetworkTime is not supported.
- gsmHeadset is not supported and will return FALSE when called.
- gsmHandsfree is not supported and will return 5, on devices normally supporting this.
- Bluetooth is not supported.
- Adding options are not supported, the devices are already fully upgraded.
- xVoice is not supported.
- The GPRS monitor can be configured but does not perform recovery on the connection.
- Direct cable connection to the RTCU IDE can only be established using the alternative service port.
- Device fault-mode is not supported. A fault will show a message with the corresponding fault and the emulator will stop.

Some of the above limitations are scheduled to be eliminated in future releases.

1.2 Command line arguments

The emulator cam be started from the command line like this:

RTCUEmulator.exe [options] <Project file>

<Project file> is the path to the project or the application files(.prj, .rpc or .vsx) to open from the start.

The available options are as follows:

-p <port< th=""><th>The TCP/IP port to start listening on for commands. Used by the IDE to load the</th></port<>	The TCP/IP port to start listening on for commands. Used by the IDE to load the
number>	current project.
-d <serial number></serial 	The serial number of the device to load.
-m	Start minimized

1.3 Control Panel

The control panel is the main window of the emulator. It controls which project to run, which device to run it on and controls which other windows to show.

On the initial start and when no device is loaded, it looks like this:



To load a device, click on the <u>Devices...</u> menu item.

When a device is loaded, the control panel looks like this:

RTCU Emulator



<u>Menu items</u>

Used to configure the emulator.

Device information

The device information panel shows the type, serial number and type of the emulated device, as well as the possible name of a loaded application.

Supported modules

This lists the available <u>modules</u>, <u>sorted by area</u>. Clicking the button will show the window for the module. When a button is disabled, no window is needed for this module.

When the gear symbol is available, it can be clicked to bring up the configuration dialog for the module. Some modules have multiple implementations such as the serial ports. By right clicking on the button, a menu pops up to select what implementation to use.

Configuration and selection of implementations can only be done while the emulator is stopped.

LEDs and DIP switches

All the LEDs and DIP switches of the physical devices are available.

Execution buttons

The reset button resets the device, as on a physical device. The halt button halts the execution in the device.

Emulation buttons

The Load & Run button loads the selected project(shown in tooltip) into the device and starts the emulation.

The Start button is used to start the emulation, without loading the project. The Stop button is used to stop the emulation.

Only available on Windows 7 and newer:



Hovering over the icon on the task bar shows information about the device in the Emulator.

1.3.1 Menu Items

The menu items are used to configure the emulator.

💽 MX2 tu	rbo 🖳		x
<u>P</u> roject	<u>D</u> evices	<u>W</u> indow	

Project

ſ	Proj	ect	Devices	Window	
		Оре	en	Ctrl+O	
		Loa	d & Run	F5	
		Sto	p execution	Ctrl+X	
		Exit		Alt+F4	

- o Open
- Opens an application.
- $_{\odot}$ Load & Run \$Loads the application into the device and starts it.
- $_{\odot}$ Stop execution \qquad Stops the emulation of the device. The same as pressing the Stop button.
- ∘ Exit

Exits the emulator.

Devices...

Shows the <u>Devices</u> dialog

Window

	Project	Devices	Window
	Device		Reset layout
•	MX2 turbo	Device 1	

Reset Layout

Places all the windows next to the control panel.

1.3.2 Devices

This dialog is used to manage the devices.

Devices					
SX1 pro	244999123	Device 1			
CX1 warp (Fully upgraded)	252999123	Device 1			
MX2i pro+	283999123	Device 1			
MX2 turbo	292999123	Device 1			
AX9 turbo	296999123	Device 1			
New Load	E	idit	Clone	Delete	Close

The list shows the available devices with type, serial number and name. The active device is marked with italic. The dialog has the following buttons:

New

Create a new device:

New Dev	vice		X	
Family	MX2		•	
Туре	MX2 t	urbo	·	
Serial n	umber	292999123	MX2 turbo. NX32 Architecture device.	
Name		Device 1		
			OK Cancel	

The first 3 digits of the serial-number specifies the device type in question and are similar to the corresponding physical device. The middle 3 digits "999" indicates that this is an emulator, it will never occur on a physical device.

Finally, the last 3 digits of the serial number can be changed to allow for multiple devices of the same type.

The name field allows for assigning a descriptive name to the device, to make it easier to recognize.

Load

Closes the active device and loads the selected device. Can also be done by double-clicking on a device.

Edit

The edit dialog allows for changing the serial number and name of the selected device.

Clone

Creates a new device, using the configuration of the selected device. Provide the name and serial number of the new device.

Delete

Delete the selected device.

Close

Closes the dialog.

1.4 Modules

The different modules have their own windows for managing the emulated hardware. The modules are sorted by area for a better overview.

• <u>Core</u>

- o Debug Messages
- o <u>IO</u>
- o <u>Memory</u>
- o Power Management
- <u>Data</u>
 - o Data Logger
 - o File System
 - o Persistent Data
- <u>Communication</u>
 - o <u>1-Wire</u>
 - o <u>CAN</u>
 - o Display
 - o <u>GSM</u>
 - o Network
 - <u>RF</u>
 - o Serial Ports
- <u>Sensors</u>
 - o Accelerometer/Vibration
 - o <u>GPS</u>
 - o Intrusion
 - o Real Time Clock
 - o Temperature

1.4.1 Core

The Core area contains the functionality that is common for all RTCU devices, which does not belong in other areas.

Modules:

- Debug Messages
- <u>|0</u>
- <u>Memory</u>
- Power Management

1.4.1.1 Debug Messages

The Debug Messages window is used to show the debug output from the application.



Clear List

Clears the output.

Save to file ...

Saves all the lines to a file.

Copy to clipboard

Copies all the lines to the clipboard.

Use Ctrl+C to copy the selected lines to the clipboard.

1.4.1.2 IO

The IO window allows for controlling the inputs and viewing the outputs of the device and any configured IO extensions.

296999123 - IO					
Devices	Inputs	Outputs	Analog Input (16 bit reso	olution)	
Onboard EX002	➡ Sensor_A	ight Out_light	0	0	AI 1
EX001	➡ Sensor_B	🔶 Out_alarm	0	0	AI 2
	➡ Sensor_c	I Output 3	0	0	AI 3
	➡ Sensor_D	Dutput 4	0	0	AI 4
	🔶 Input 5	reput 5 🔶	0	0	AI 5
	🔶 Input 6	Dutput 6	0	0	AI 6
	🄶 Input 7	I Output 7	0	0	AI 7
	🔶 Input 8	Dutput 8	0	0	AI 8
	🄶 Input 9	Dutput 9	Analog Output (16 bit re	solution)	
	🄶 Input 10	Dutput 10		0	AO 1
	🄶 Input 11	Dutput 11		0	AO 2
	🄶 Input 12	Dutput 12		0	AO 3
	🄶 Input 13	Dutput 13		0	AO 4
	🔶 Input 14	Dutput 14		0	AO 5
	🔶 Input 15	Dutput 15		0	AO 6
	🔶 Input 16	Dutput 16		0	AO 7
				0	AO 8

The list on the left is used to select between the onboard IO and any configured IO extensions. If a project(.prj file) has been loaded, the configured names from it will be used as names for the IOs, otherwise the default names will be used.

The red arrows shows the status of the digital inputs. Click on an input to change the state of it.

The green arrows shows the status of the digital outputs.

The value of the analog inputs can be changed on the slider or by entering a number directly. The analog outputs are shown as a bar, as well as numerically.

For the onboard IOs, additional information is available:

Inputs	Outoute				
	Outputs	Analog Input (10 bit res	olution)		
🔶 digl[1]	🔶 digO[1]	-0	95	<u>▲</u>	AI 1
🔶 digl[2]	🛶 digO[2]		464	•	AI 2
🔶 digl[3]	🔶 digO[3]	-0	285	* *	AI 3
🔶 digl[4]	🛶 digO[4]		760	* *	AI 4
🔶 dig/[8]	Irred Output 5	Analog Output (10 bit re	esolution)		
🔶 Input 6	I Output 6		0		AO 1
🔶 Input 7	I Output 7		0		AO 2
🔶 Input 8	I Output 8		0		AO 3
🔶 Input 9	I Output 9		0		AO 4
🔶 Input 10	I Output 10	SO			
🔶 Input 11	🔶 Output 11	S0 Interface			
🔶 Input 12	IP Output 12	DC Out			
Switches	User LEDs	DC-Out			
🚺 digl[5]	digO[5]	UC-Out 2			
digl[6]	odigO[6]				
🚺 digl[7]	digO[7]				
	odigO[8]				
	 → digl[2] → digl[3] → digl[4] → digl[4] → digl[8] → Input 6 → Input 7 → Input 7 → Input 8 → Input 9 → Input 10 → Input 11 → Input 12 Switches ① digl[5] ① digl[6] ① digl[7] 	→ digl[2] → digO[2] → digl[3] → digO[3] → digl[4] → digO[4] → digl[8] → Output 5 → lnput 6 → Output 6 → lnput 7 → Output 7 → lnput 8 → Output 9 → lnput 10 → Output 10 → lnput 11 → Output 12 Switches User LEDs □ digl[5] ○ digO[6] □ digl[6] ○ digO[7] ○ digO[7] ● digO[8]	→ dig[1] → dig0[2] → dig1[3] → dig0[3] → dig1[4] → dig0[4] → dig1[8] → Output 5 → lnput 6 → Output 7 → lnput 7 → Output 7 → lnput 8 → Output 8 → lnput 9 → Output 10 → lnput 10 → Output 10 → lnput 11 → Output 12 Switches User LEDs □ dig1[5] ○ dig0[5] □ dig1[6] ○ dig0[7] ○ dig0[8]	→ digl[1] → digO[2] ↓ digO[2] → digl[3] → digO[3] ↓ 285 → digI[4] → digO[4] ↓ 760 → digI[8] → Output 5 Analog Output (10 bit resolution) → Input 6 → Output 7 ↓ 0 → Input 7 → Output 8 ↓ 0 → Input 8 → Output 9 ↓ 0 → Input 10 → Output 10 ↓ 0 → Input 11 → Output 10 ↓ 0 → Input 12 → Output 10 ↓ 0 → Input 12 → Output 10 ↓ 0 → Input 12 → Output 12 ↓ 0 ↓ Input 13 ↓ 0 ↓ 0 <	→ digl[1] → dig0[2] → dig0[2] → dig1[3] → dig0[3] → dig0[4] → dig1[4] → dig0[4] → dig0[4] → dig1[4] → dig0[4] → 760 → dig1[8] → Output 5 Analog Output (10 bit resolution) → hput 6 → Output 6 0 → hput 7 → Output 7 0 → hput 8 → Output 9 0 → hput 10 → Output 10 S0 → hput 11 → Output 12 DC Out Switches User LEDs 0 dig0[5] □ dig1[5] □ dig0[6] □ dig0[7] □ dig1[7] □ dig0[7] □ dig0[8]

The switches show the state of the user switches. Click them to toggle the switch. The switches can also be controlled from the <u>control panel</u> along with any extra system switches. The User LEDs show the status of the individual user LEDs. The LEDs are also available on the <u>control panel</u> along with the system LEDs.

The status of the S0 interface and of the DC-Out external power supplies are shown on supporting devices.

1.4.1.3 Memory

The "Memory" window is a way of changing or viewing the contents of each memory location.

2969991	23 - Memory		
337 - 38	52 4081 - 409	6 1024 - 103	39 +
1024	354	1032	0
1025	54354	1033	0
1026	0	1034	0
1027	1001	1035	0
1028	1	1036	0
1029	0	1037	0
1030	1	1038	0
1031	1	1039	0
First ind	lex: 1024 🚔		

Each page shows 16 memory locations. To change the shown location, change the First index to the wanted starting location.

To add additional pages, click the "+" symbol, or right-click on a tab and click Add tab. To remove a page, click on the tab with the middle mouse button, or right-click it and select Close tab.

To change the value at a location, change the value and leave the field or press enter. While the number is being edited, it will be red. When it has been changed in the device, the text turns black again. If a memory location is used as a VAR_OUTPUT item, it is not possible to change the value as the program is overwriting the contents of the memory location with every scan.

1.4.1.4 Power Management

The Power Management window provides access to the power management functions of the device.

296999123 - Power Manag	jement
Wait event	
Supply	Wake sources
External DC	Ignition Power Apply
Voltage 12,0 🚔	Digital Input 1 GSM
V External AC	Digital Input 2 Intrusion detection
Battery	Digital Input 3 Serial port 0
Battery backup	Digital Input 4 Serial port 1
Charger enabled	Power Fail
Charging	
100 %	O Time
	Wake-up 17 sec

The label at the top shows the current power state.

Supply

Allows for connecting and removing the external power supplies and adjusting the voltage on the DC supply.

AC is only available on devices with AC.

Battery

If Battery backup is selected(restart required), the device will use the battery to continue running if no external power supply is available.

Charger enabled shows if the charger is enabled in the device and Charging shows if the battery is currently being charged.

The battery level can be seen and adjusted on the slider.

Wake sources

A list of all the available wake sources on the device. When in a power save mode, the active wake sources are highlighted.

Time

The timeout wake source, with the option to manually wake the device before the interval has elapsed, especially useful if using a long timeout.

For pmWaitEvent it shows the time until it wakes, for pmPowerDown and zpPowerDown it shows the time it will wake at.

1.4.2 Data

The Data area contains the functionality that is used to access data in the RTCU device.

Modules:

- <u>Datalogger</u>
- File System
- Persistent Data

1.4.2.1 Datalogger

The Datalogger window is used for manipulating the contents of the Datalogger storage in the device.

LJEJJJJIEJ	Datalogge					
Date	Time	Tag	V1	V2		
26-aug-2015	23:08:45	2	11	21		
26-aug-2015	23:08:45	123	10	20		
Current num	her of moord	a 🖸 Ma	viou o umb	er of records	10 (
	Del ol lecolo	15 Z Ma	Xinum nume	er or records	l IU	Fetch Data
- Fetch range	,					Clear Log
From	26. august	2015	■ 11:03	3:51 🍦		
То	26. august	2015		3:51 🔶		Destroy Log
Tag	0				[Save as

The "Fetch range" section allows filtering the records fetched.

- "From/To" limits the records to a range determined by a "Start" and "Stop" time.
- "Tag" limits the records to a particular Tag.

The "Clear Log" button empties the Datalogger.

The "Destroy Log" button will completely clear the Datalogger memory, as if the logDestroy function was called.

The "Save as file" button saves the data in a .CSV file for easy viewing in various spreadsheet programs etc.

1.4.2.2 File System

The file system windows is used to manage the file system.

292999123 - File System						
A: SD Card 🔹	••				SD Card	
					None	
	Name	Size	Time	-		
	F_LAST	34,054 MB	05-08-2015 10:16:15		sd_1	
	AUTO_SIM.CFG	563 B	03-01-1980 13:57:09		im a F	
	AUTO_SIM.PRJ	982 B	03-01-1980 13:57:09		C Imgo	
	AUTO_SIM.VSX	2,614 kB	03-01-1980 13:57:09	=	No card	
	AUTO_TES.VPI	0 B	03-01-1980 13:57:09			
	AUTO_TES.VPL	0 B	03-01-1980 13:57:09			
	AUTO_TES.VPX	0 B	03-01-1980 13:57:09			
	GPRS_INF.CFG	0 B	03-01-1980 13:57:09			
	GPRS_INF.LST	0 B	03-01-1980 13:57:09			
	GPRS_INF.PRJ	0 B	03-01-1980 13:57:09			
	GPRS_INF.RPC	0 B	03-01-1980 13:57:09	_		
	CODC INC.VOI	0.0	02.01.1000.12.57.10	*	l	
	Refresh	Recursive				

Media selection

The drop down list allows for selecting the media to show.

Folder tree

The folder tree shows the folders available on the selected media. Selecting a folder will show its contents in the file list. Right-clicking on a folder allows for creating and deleting folders, and for formatting the media.

File list

The file list shows the files in the current folder, that matches the active filter.

Right-clicking a file shows a menu allowing for importing, exporting, renaming and removing the selected file.

Double-clicking on a file opens a dialog to show the contents of the file.

File filter

The file filter allows for filtering files by name. Only files containing the given text are shown. Use *.* or * to show all files.

Refresh

Click the refresh button to refresh the current folder. If Recursive is checked, any sub folders will also be refreshed.

SD Card

The SD Card area is used to manage the SD Card images, used for drive A.

To change the active SD card, simply click the radio button next to the wanted image, or select None to no have any SD Card mounted.

Clicking the "..." button to the right of the name of an SD Card image, shows a dialog to control this slot. The currently selected image can not be modified while the device is running.

Modify SD Card Image

Modify	y SD Card Image
Size:	256 MB - Write Protected
	OK Close

Pressing the "..." button will show a dialog to select the name of the SD Card image. Both new files and existing files can be used.

If a new file is used, the size and the write protection must be chosen, and OK pressed to begin the creation of the image.

This make take some time, depending on the size of the image.

Modify SD Card Image						
Size: 256 MB	Write Protected					
CU Emulator\devic	ces\256MB_SD_Card.vhd					
Creating disk image						
	OK Close					

For existing images, only the write protection can be chosen.

Modify SD Card Image						
Size:	256 MB 👻 🕅 Write Protected					
CU E	mulator\devices\256MB_SD_Card.vhd					
	OK Close					

SD Card images

Th SD card images are fixed VHD (Virtual Hard Disk) files. The VHD files can be mounted as disk drives in Windows using the Disk Management tool in Windows.

The exact steps may change depending on the Windows version.

- For Windows 7 the following steps work:
- 1. Open the Start menu.
- 2. Right-click on Computer and click Manage.
- 3. Expand Storage and Select Disk Management.

- 4. Click on the Action menu and select Attach VHD.
- 5. Find the wanted SD Card image and click OK.
- 6. The image is now mounted and will appear as a new disk drive.

To detach the image, right-click on the disk entry for the image in Disk Management and select Detach VHD.

1.4.2.3 Persistent Data

Using the Persistent Data window, it is possible to manipulate the persistent FLASH, FRAM and external FLASH memory storage of the device.

2	96999123 -	- Persistent Data
Γ	Standard FL	ASH FRAM Extended FLASH
L	Num	Contents
L	1	[Len= 4::33 44 55 66]
L	2	[This is a string in persistent memory]
L	3	[This is another string in presistent memory]
L		
L		
Ŀ		
L		
L		
L		
L		
	-	
		Erase All
L		Erase Al

Right clicking on the list shows the following menu:



Modify

Modifies the selected entry

Delete

Deletes the selected entry

Create Text Entry

Shows the Create New Persistent String dialog:

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Create Binary Entry

Shows the New Binary entry dialog:

C	reate	New	Bina	y Da	ta					
Г										
L	00	33	44	55	66	00	00	00	00	3DUf 🔺
L	08	00	00	00	00	00	00	00	00	
L	10	00	00	00	00	00	00	00	00	
L	18	00	00	00	00	00	00	00	00	· · · · · · · · · =
1	20	00	00	00	00	00	00	00	00	
L	28	00	00	00	00	00	00	00	00	
L	30	00	00	00	00	00	00	00	00	
L	38	00	00	00	00	00	00	00	00	
L	40	00	00	00	00	00	00	00	00	
L	48	00	00	00	00	00	00	00	00	
L	50	00	00	00	00	00	00	00	00	
L	58	00	00	00	00	00	00	00	00	
L	60	00	00	00	00	00	00	00	00	· · · · · · · · ·
	<u></u>			~~					00	
۱ı	.ength	to sav	ve		4			* *		
	ndex n	umbe	r(11	92)	1			* *		
									Save	Cancel

1.4.3 Communication

The Communication area contains functionality that is used to communicate with peripheral things.

Modules:

- <u>1-Wire</u> (only available on supported devices)
- <u>CAN</u> (only available on supported devices)
- <u>Display</u> (only available on supported devices)
- <u>GSM</u>
- <u>Network</u>
- <u>RF</u> (only available on supported devices)

• Serial Ports

1.4.3.1 1-Wire

The 1-wire window manages the basic 1-wire sensors; iButton and temperature sensors.



iButton

The "Contact with Reader" check box controls if the the iButton is connected to the device. The ID box controls the 1-Wire ID for the iButton.

The 1-Wire LED is shown next to the reader, when available.

Note: Reading and writing data to the iButton is not supported.

Temperature

8 temperature sensors are available with different IDs, which can be seen as tool tips. Check the check box next to the sensor to connect it to the device.

Note that the temperature is rounded to fit internal data types, and may not show the exact same value in the GUI and in the application.

1.4.3.2 CAN

The CAN window is used to simulate a CAN network.

292999123 - (CAN							
Incoming mes	sages	h	Outgo	ing messages				
ID	Data		Ena	ID	Name	Occurrence	Data	New
0x000018FF	01-02-03-04-05-06			0x000012D4	CAN-01	Once	12-34-56-78	Delete
0x0004A521	01-02-03-04-05-06-07-08			0x175	CAN-02	750 ms	01-23-45-67-89	Delete
0x00000071	01-02-03-04			0x17FF5664		2500 ms	01-23-45-67-89	Send
0x12345678	01			0x01234567	CAN-04	30 s	DE-45	Import
Mon	itor mode							Export
	Clear		•		111		+	

Simulating the CAN network can be broken down into two tasks - that is receiving CAN messages from the emulated device and transmitting CAN messages to the device.

Incoming messages

The "Incoming messages" list shows the CAN messages received from the device.

The messages are listed in the order they are received - with the oldest at the top and the newest at the bottom.

When the simulated CAN network is in "Monitor" mode, the received messages are listed with a light grey background, no acknowledge is sent for the messages, and the canSendMessage function will fail with a timeout.

Columns

• ID

This column contains the identifier of the received message. The identifier is displayed as a hexadecimal number.

Data

This column contains the data bytes of the received message. The bytes are displayed as hexadecimal numbers.

Monitor

This check box is used to select Monitor mode for the CAN network.

Monitor mode is a way for the simulated CAN network to listen and receive messages without interacting with the device.

This is the same as Monitor mode in the VPL application.

Clear

This button will remove all the received messages from the list.

Outgoing messages

The "Outgoing messages" group is used to manage the CAN messages that are available for being transmitted to the device.

An existing CAN message can be edited by double-clicking on it.

Columns:

Name

This column contains the name of the message. Naming the messages is not required but can make it easier to recognize what it represents.

- Occurrence This column contains the frequency with which the message will be sent to the device once it has been enabled.
- ID

This column contains the identifier of the message. The identifier is displayed as a hexadecimal number.

• Data This column contains the data bytes of the message. The bytes are displayed as hexadecimal numbers.

New

This button will create a new message. The CAN message dialog (see below) is used to configure the new message.

Delete

This button will remove the selected message.

Send / Enable / Disable

This button will show a different title dependent on the occurrence of the selected message. When the selected message has an occurrence of one, the button will show "Send", and the message will be sent to the device when pressed.

When the selected message is disabled (black text), the button will show "Enable", and the message will be enabled when pressed. An enabled message will be sent to the device repeatedly with the configured interval.

When the selected message is enabled (green text), the button will show "Disable", and the message will be disabled when pressed. A disabled message will no longer be sent to the device.

Import

This button will import a previously exported collection of messages and add it to the list.

Export

This button will export the messages from the group as a collection of messages. The CAN message collection is stored in a human readable XML file.

Modify CAN message

The modify CAN message dialog is used to create and modify CAN messages.

CAN mes	sage	2								×
○ Text	۲	Hex								
	00	01	02	03	04	05	06	07		
0000	DE	45	00	00	00	00	00	00	ÞE	
Length:	2		*							
ID		V X	TD	0x0	1234	567		_		
								•		
Name		CAN	-04							
Occurren	ce	30				*	sec.			
								OK		
								UK		ancer

ID

This is the message identifier. If XTD is selected, it is an extended identifier.

Name

The name of the message. It is not required, but can be helpful to keep track of the messages.

Occurrence

The occurrence determines if the message must be manually sent or if it automatically is sent at the specified interval, e.g. setting the occurrence to 120 seconds will send the message every two minutes.

1.4.3.3 Display

The display provides the LCD and buttons as found on the DX4 devices.



LCD display power

This option sets the behaviour of the LCD displays when the device starts (either by reset or if external power is applied).

The device must be restarted for this setting to be applied.

1.4.3.4 GSM

The GSM window provides access to the SMS features, the SIM card and some of the GSM parameters. On supported devices, the Voice features are also available.

292999123 - GSM			
O Power O Off hook 0 outgoing messages	pending Clear pending	\square	Phone Network SIM Card
Outgoing SMS			Hangup or reject
Ena Name Occurrence Data	New		Hangap of reject
Test message Once Hello, world	! Delete		
	Send		Hang Up Make Call
	Import		Caller ID: 10203040
	Export	>	1 2 3
	✓ Send		4 5 6
Incoming SMS			
SMS 15:18:23 -> [4712]:MAX DIST=50 has been set SMS 15:18:23 -> [4712]:Not watching home position SMS 15:18:23 -> [4712]:New homeposition Lat=54.4	6.4800 Lon=9.38.0		* 0 #
	Clear list		

The left panel provides access to sending and receiving SMS messages.

Outgoing messages

To send a simple SMS message, simply enter it into the text field in the middle and click the Send button to the right of the field.

To save messages for later or to create binary messages, use the New button to create a new message, and then send it by selecting it and clicking the Send button to the right of the list. To modify an existing message, double-click on the message.

When a message is sent, it goes onto a pending queue, waiting for the device to receive it. When more than 50 messages are pending, the automatic sending of messages are disabled until the number of pending messages drops again.

New

To create a new message, click the "New" button.

Delete

The delete button deletes the selected message.

Send

The send button sends the selected message to the device.

Enable/Disable

Enables or disables the automatic sending of the selected message.

Export

RTCU Emulator

The export button can be used to save the messages for use later on a different device. The messages are stored in a human readable XML file.

Import

The import button can be used to add previously saved messages to the list.

Clear pending

The Clear pending button is used to clear the pending messages, e.g. if they are no longer relevant.

Modify messages dialog

The following dialog is used to create and modify messages.

Message
● Text ─ Hex
Text message
Length: 12
Name
OK Cancel

Here the message can be entered, either as text or as binary and a name for the message can be set. If the message is binary, it will be sent a a PDU, otherwise it is sent as an SMS.

The occurrence determines if the message must be manually sent or if it automatically is sent at the specified interval, e.g. setting the occurrence to 120 seconds will send the message every two minutes.

Incoming messages

Incoming messages are shown in the list at the bottom. Binary messages can be double-clicked to open them in a hex viewer.

Tab panel

The button between the left panel and the tab panel on the right can be used to hide the right tab panel.

Phone tab

The phone tab is only available on device with voice support.

It is used to create and answer voice calls and for sending DTMF tones.

Phone Ne	etwork SIM	Card
Hangup o	or reject	
Hang U	р	Make Call
10203040	Caller ID:	
1	2	3
4	5	6
7	8	9
•	0	#

The status field at the top shows the current status of the connection. The name of the buttons change depending on the status of the connection.

Hang Up

Ends an ongoing call. **Make Call** Initiates a call to the device **Reject** Rejects an incoming call from the device. **Answer** Accepts an incoming call from the device.

Caller ID

Sets the phone number used as sender on outgoing messages and as caller ID when initiating a call.

Key pad

Keys to press to send the corresponding DTMF tones.

Network tab

The network tab is used to set the network parameters.

Phone Network SIM Card
Status
Disconnected
Connected
Searching
Access denied
Antenna
Signal level -67 🚔
External antenna selected
Base station
LAC 14D5 🚔
Cell ID 100A 🚔
Current provider
23802 (Home)

Status

This is the status of the connection of the device to the GSM network.

- Disconnected
 - $\circ\,$ The device is not connected to the GSM network.
- Connected
 - $\,\circ\,$ The device is connected to the GSM network.
- Searching
 - \circ The device is searching for a provider.
- Access denied
 - $\circ\,$ The device cannot connect to the GSM network.

Signal level

This number will be presented to the RTCU when calling gsmSignalLevel.

For devices that can switch between internal and external antenna, the selected antenna is shown.

LAC

This number will be presented to the RTCU when calling gsmGetLAC.

Cell ID

This number will be presented to the RTCU when calling gsmGetCelIID.

Current provider

This sets the GSM PLMN (Public Land Mobile Network Number) of the provider the device is currently connected to.

SIM Card tab

The SIM Card tab is used to control the SIM card. For devices with dual SIM card readers, both SIM cards are available.

Phone	Network	SIM Card									
V Ext	emal SIM o	ard present									
ICCID	ICCID										
123456789012345											
🔽 Inte	emal SIM c	ard present									
ICCID											
12345	678901234	6									
Active	SIM card r	eader: Extern	al								

SIM card present

This determines whether the SIM card is present in the RTCU device. **ICCID** This sets the ICCID, the "serial number" of the SIM card.

On devices with multiple SIM Cards, the active SIM card reader is shown.

1.4.3.5 Network

This dialog allows one to set all relevant parameters for making a connection to RTCU Gateway using TCP/IP.

Please consult the technical documentation for the RTCU Gateway.

On supported devices, it is also used to control the ethernet connection.

RTCU Emulator

296999123 - Network										
Ethemet										
Cable connected	1 I									
Gateway										
Enable Gateway: 🔽										
IP: g	w.rtcu.dk									
Port: 5	Port: 5001									
Kew										
Noy.										
Advanced settings										
Max connect attempt	ts: 3 🌲									
Max send attempts:	5									
Response timeout:	45									
hosponse tineout.	40 💌									
Keep alive frequency	/: 300 🚖									
Encryption key:										
01 23 45 67 8	39 AB CD EF									
01 23 45 67 8	S9 AB CD EF									
Fetch	Apply									

By using the "Fetch" button, it is possible to read the current configuration of the device, and the "Apply" button will store the current configuration in the device.

Cable connected

On devices with built in ethernet, this is used to control if a network cable is plugged in and connected to the network.

Enable Gateway

Determines if the gateway should be enabled.

IP

The IP address or symbolic name of the RTCU Gateway.

Port

The port number that is to be used for communicating with the RTCU Gateway (this is set in the RTCU Gateway).

Key

The key value that is to be used when communicating with the RTCU Gateway (this is set in the RTCU Gateway).

Advanced parameters

Maximum connect attempts

This is the maximum number of connection attempts to the RTCU Gateway before the reconnecting the

mobile network to the GSM network.

Maximum send attempts

This is the maximum number of send request attempts before the send fails.

Response timeout

This is the time spent waiting for a response, and it is specified in seconds.

Keep alive frequency

Frequency for sending self-transactions through the RTCU Gateway (number of seconds between self-transactions).

The purpose of the self-transaction is to ensure a healthy two-way communication channel through the RTCU Gateway.

For applications that are only sending data from the device to the server, this frequency can safely be increased.

Setting the value to zero will disable the self-transactions completely.

Encryption key

The 128 bit long key used for encryption of data sent to and received from the RTCU Gateway.

1.4.3.6 RF

The RF window is used to send and receive RF packages.

296999123 - RF												
 Incoming patient 	ackages			Outgo	Outgoing packages							
Sender	Receiver	Data 🖌	-	Ena	Name	Receiver	Sender	Occurrence	Da	New		
246	118	92-BD-41-			Button 1	118	246	Once	92-1	Delete		
247	119	93-BC-40-			Button 2	244	116	Once	10-:	Delete		
244	116	90-BF-43-/ =	8		Button 2	209	9	Once	A5-	Send		
245	117	91-BE-42-			Button 1	185	49	Once	4D- (Import		
234	114	86-B1-55-(
235	115	87-B0-54-							U	Export		
232	112	84-B3-57-1	-									
•	III	4										
		Clear		•					•			

Outgoing packages

The outgoing messages panel contains a list of packages that can be sent, and buttons to manage them.

To modify an existing packet, double-click on the package.

New

To create a new package, click the "New" button.

Delete

The delete button deletes the selected package.

Send

The send button sends the selected package to the device.

Enable/Disable

Enables or disables the automatic sending of the selected package.

Export

The export button can be used to save the packages for use later on a different device. The packages are stored in a human readable XML file.

Import

The import button can be used to add previously saved packages to the list.

Modify packages dialog

The following dialog is used to create and modify packages.

Package										×
🔘 Text	۲	Hex								
	00	01	02	03	04	05	06	07		
0000	12	34	56						. 41	/
1										
Length:	3		*]						
Name				_		1				
Occurren	се	0,00				-	sec.			
Sender		1								
Receiver		0								
		5	•				_			
								OK		Cancel

This dialog can both be used to send rf packages and for sending raw packets, e.g. to be able to send RFBC packets.

For raw messages, the receiver is used as the first byte and the sender is used as the second byte.

Here the data can be entered, either as text or as binary and a name for the package can be set.

The occurrence determines if the package must be manually sent or if it automatically is sent at the specified interval, e.g. setting the occurrence to 5 seconds will send the package every 5 seconds.

Incoming packages

The incoming packages list shows all the packages received from the device. Double-clicking a package will show the package in a separate dialog:

Show package dialog

The dialog shows the contents of the package, along with the sender and receiver.

Package								×
Sender: Receiver:		2 1	47 19					
000000000000000000000000000000000000000	93 1D	BC A6	40	AF	8 B	67	43	
Hex View	© Te	ext Vie	ew				Close	,

1.4.3.7 Serial Ports

Multiple serial port implementations are available.

- <u>Virtual Serial Port</u> A window to communicate with the serial port.
- <u>Physical Serial Port</u> Use a real serial port on the computer.
- <u>Virtual MDT</u> A virtual MDT device to emulate connecting an MDT to the device.

1.4.3.7.1 Physical Serial Ports

The physical serial ports use a real serial port on the PC to communicate through, allowing the connection of many different kinds of peripherals(special cable may be needed).

As it uses the PC serial ports, no GUI is needed, instead a configuration dialog is used to select the port to use.

1	Configuration of serial port
	Serial port on PC COM1 Refresh
	Save Cancel

Click Refresh to refresh the list of serial ports.

Connection to the IDE

It is possible to connect the emulated device to the IDE by calling <code>boardSetServicePortAlt(port:=1)</code> on the device, and then connecting the serial port used by the IDE with the serial port used by the Physical Serial Port on the emulator.

The connected serial ports can either be real serial ports that are connected using a null modem cable, or virtual serial port pairs, such as created by e.g. <u>com0com</u> (make sure that "use Ports class" and "enable buffer overrun" are enabled).

1.4.3.7.2 Virtual Serial Ports

The virtual serial ports window makes it possible to send and receive data from the serial port.

2	96999	123 - Seria	l port 0														
F	Outgo	ing				Inc	oming) data	1								
l	Ena	Name	Occurrence	Data	New	50	6F	72	74	20	30	20	69	73	Port	0 is	
U		Data	Once	0D-44-61-74-61-0A		20	6F	70	65	6E	0D	0A	44	61	oper	nDa	
		Auto data	5.0	0D-41-75-74-6E-0A	Delete	74	61	20	72	65	63	65	69	76	tare	eceiv	
l		/ dio data		00 41 /0 /4 01 0/	Send	44	61	74	61	20	72	65	63	65	Data	rece	
l					Import	69 0D	76 0A	65	64	20	6F	6E	20	30	ived	on O	
					Export												
l																	
l																	
l																	
l																	
	•		III	•													
				•	Send		Clea	ar									
	Open	(9600) 🔽	RTS 🔳 CTS	DTR DCD	DSR												

The left panel contains a list of packets that can be sent, and buttons to manage them. To modify an existing packet, double-click on the packet.

New

To create a new packet, click the "New" button.

Delete

The delete button deletes the selected packet.

Send

The send button sends the selected packet to the serial port.

Enable/Disable

Enables or disables the automatic sending of the selected packet.

Export

The export button can be used to save the packets for use later on a different device. The packets are stored in a human readable XML file.

Import

The import button can be used to add previously saved packets to the list.

Modify packets dialog

The following dialog is used to create and modify packets.

RTCU Emulator

Packet										×
○ Text	۲	Hex								
0000	00 0D	01 44	02 61	03 74	04 61	05 0A	06	07	. Data.	
Length				1						
Name	6	Data	÷			1				
Occurren	ice	0,00	I) I 🌲	sec.			
								ОК	Ca	incel

Here the data can be entered, either as text or as binary and a name for the packet can be set.

The occurrence determines if the packet must be manually sent or if it automatically is sent at the specified interval, e.g. setting the occurrence to 5 seconds will send the packet every 5 seconds.

1.4.3.7.3 Virtual MDT

The virtual MDT has all the features of the real MDT, allowing for easy testing of programs using the MDT.

Use the mouse to click on the buttons.

292999123 - M	DT on Serial port 0						
F1	Hi	ghlight	test	text	1	2	3
F2	Un	derline	test	text	4	5	6
F3	Bl:	ink 1	test	text	7	8	9
F4	Bl	ink 2	test	text	*	0	#
F5							
F6							
(I)	v	>	٨	V	Ok	2	x

1.4.4 Sensors

The Sensors area contains modules used to monitor the environment.

Modules:

- <u>Accelerometer/Vibration</u> (only available on supported devices)
- <u>GPS</u> (only available on supported devices)
- Intrusion (only available on supported devices)
- Real Time Clock
- <u>Temperature</u>

1.4.4.1 Accelerometer/Vibration

The accelerometer/vibration window provides access to the accelerometer and the vibration sensor on supported devices.

292999123 - Accelerometer/Vibration									
Acceleration									
X:	0 mg								
Y:	0 mg								
z:0	-996 mg								
Set acceleration									
Accelerometer Event									
X:	0 mg								
Y:	0 mg								
z:0	0 mg								
Send event									
Shock Event									
X: 🔽 Y: 🔲 Z: 🔽									
Send event									
Vibration									
Make vibration									

The vibration sensor is disabled while the accelerometer is open.

Acceleration

To change the current acceleration, select the wanted acceleration on the sliders and click the Set acceleration button. This acceleration will then be used until it is changed again.

Acceleration event

To create an acceleration event, set the sliders to the size of the acceleration and click the Send event button. If the acceleration does not match the conditions for the event, no event will be created.

Shock event

To create a shock event, select the axes that the shock must happen on and click the Send event button.

Vibration

If vibration is available, a vibration can be created by clicking the Make vibration button.

1.4.4.2 GPS

The "GPS" window allows sending virtual GPS positions to the device.

292999123 - GPS	
Position GPS SBAS GLONASS	
PDOP 1,00 ♀ In view: 24 VDOP 1,00 ♀ Used: 10 HDOP 1,00 ♀ In view: 24 VDOP 1,00 ♀ Used: 10 HDOP 1,00 ♀ In view: 24 VDOP 1,00 ♀ Used: 10 HDOP 1,00 ♀ In view: 24 Position 1,00 ♀ In view: 24 Latitude 55° 51.3075'N In view: 24 Longitude 9° 51.0547'E Attitude Altitude 3,00 ♀ m Movement Speed 5,000 ♀ km/h Course 3,00 ♀ °	Mode No Fix 2D 3D 3D 3D + SBAS Antenna Present Short-circuit
O Power	Restore default

Power

The Power LED shows it the GPS receiver is powered on.

Restore default

Restores all the fields to their default values.

PDOP, VDOP and HDOP

Sets the DOP values for the fix. The DOP values describe the dilution of precision in the different directions.

In view and Used

Shows the total number of satellites in view and in use, depending on the current fix mode and the <u>satellite configuration</u>.

Latitude, Longitude and Altitude

Sets the position in space.

Speed and Course

Sets the speed and course of the position. Note that the position does not automatically update to move with the speed.

Mode

Sets the fix mode:

- No fix
- 2D fix
- 3D fix
- 3D fix + SBAS

Antenna

Allows for setting the status of the antenna.

Satellite configuration

For each kind of supported satellites, it is possible to control the status of the satellites

292999123 - GPS												
Position	Position GPS SBAS GLONASS											
	SVID:	Elev:	Az:	SNR:	In view	Tracked	Used					
Sat. 1	1 🌲	11 🌲	0 🌲	45 🌲	1	V	\checkmark					
Sat. 2	2 🌩	12 🌲	30 🌲	45 🌲	1	V						
Sat. 3	3 🌲	13 🌲	60 🌲	45 🌲	V	V						
Sat. 4	4 🌲	14 🌲	90 🌲	45 🌲	V	V						
Sat. 5	5 🌲	15 🌲	120 🌲	45 🌲	V	V	V					
Sat. 6	6 🌲	16 🌲	150 🌲	45 🌲	V	V						
Sat. 7	7 🌲	17 🌲	180 🌲	45 🌲	V	V						
Sat. 8	8 🌲	18 🌲	210 🌲	45 🌲	V	V						
Sat. 9	9 🌲	19 🌲	240 🌲	45 🌲	V	V						
Sat. 10	10 🌲	20 🌲	270 🌲	45 🌲	V	V						
Sat. 11	11 🌲	21 🌲	300 🌲	45 🌲	V	V						
Sat. 12	12 🌲	22 🌲	330 🌲	45 🌲	V	V						
Powe	r				Re	estore defau	lt					

For each satellite, a number of parameters can be changed.

SVID

The number of the satellite. The range of the numbers depends on the satellite system. This field have no effect on the position.

Elevation

The elevation angle for the satellite. This field have no effect on the position.

Azimuth

The azimuth angle for the satellite. This field have no effect on the position.

SNR

Signal-to-Noise Ratio for the satellite. This field have no effect on the position.

In view

The satellites is visible to the receiver, but not necessarily being tracked.

Tracked

The satellite is has been found by the receiver and is being tracked.

Used

The satellite is used to calculate the position.

1.4.4.3 Intrusion

Check the check box to report an intrusion.

296999123 - Intrusio...

1.4.4.4 Real Time Clock

Used to control the Real Time Clock (RTC) in the device.

296999123 - Real Time Clock	
RTC Time	
26. august 2015 09:43:14	Adjust Date and Time
Apply PC time	26. august 2015 🔍 💌
Clock speedup factor: 1	09:36:49
0	Apply

Apply PC time

This button sets the RTC to the current time in the PC.

Adjust Date And Time

This panel can be used to the the RTC to a specific time.

Clock speedup factor

Increasing the speedup factor allows for quickly reaching a future time.

Note that the real time clock is only used for date functions and does not effect the execution speed or the different delays.

1.4.4.5 Temperature

Used to control the internal temperature of the device.

296999123 - Ter	nperatu	ire	
Temperature	20	°	Apply

2 Using the RTCU Emulator from the RTCU IDE

To use the RTCU Emulator from the RTCU IDE, the Virtual RTCU Engine must be set to 'RTCU NX32 Emulator', in the Settings dialog:

Settings	X
Communication Editor Sin	nulator
Virtual RTCU Engine:	RTCU NX32 Emulator
RTCU Simulator	N
Serial connection:	NONE
MDT type used:	NMP 🗾
Ignition input:	Input 5
RTCU NX32 Emulator	
Base port:	20200 ÷
	OK Cancel

Settings dialog in RTCU IDE version 8.10

When the emulator has been started from the RTCU IDE, the current working project will be bound to the <u>'Load & Run' button</u> allowing for fast loading and easy debugging of projects during application development.