



# CSB4/K531/K632

# Firmware upgrade procedure

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# 1. INTRODUCTION

### **1.1. Abstract**

**SpringCard CSB4, K531 and K632** products are based on the same hardware platform : a contactless interface (ISO/IEC 14443 only for CSB4 and K531, both ISO/IEC 14443 and 15693 for K632) and a microcontroller.

This document explains how to upgrade the firmware of the microcontroller with the flash upgrade software provided by the manufacturer of the microcontroller.

### **1.2. COVERED PRODUCTS**

At the date of writing, this document refers to the following list of products :

- CSB4-U and CSB4-S<sup>1</sup>,
- K531, K531-TTL, K531-232<sup>2</sup>,
- K632, K632-TTL, K632-232,
- RDR-K632-TTL, RDR-K632-232,.

Please read the datasheet of every product for specifications and the detailed list of features.

### **1.3.** AUDIENCE

This manual is designed for use by technical support or after-sale teams. It assumes that the reader has expert knowledge of electronics.

### **1.4. SUPPORT AND UPDATES**

Interesting related materials (product datasheets, application notes, sample software, HOWTOs and FAQs...) are available at SpringCard's web site :

#### www.springcard.com

Updated versions of this document and others will be posted on this web site as soon as they are made available.

For technical support enquiries, please refer to SpringCard support web page at www.springcard.com/support .

<sup>&</sup>lt;sup>1</sup> CSB4.3 (based on K531-2R or K531-4R core) only. Earlier CSB4, CSB4.1 and CSB4.2 (based on K531 or K531-R core) are not supported anymore.

<sup>&</sup>lt;sup>2</sup> K531-2R or K531-4R only. K531 and K531-R are not supported anymore.

# 2. CHOOSING THE COMMUNICATION INTERFACE TO FLASH YOUR PRODUCT

## 2.1. CSB4-U OR CSB4-S

CSB4-U and CSB4-S have an internal switch to control whether the microcontroller is in flash upgrade mode or in operation mode.

You must open the device to access this switch.



Disconnect your CSB4-U from the computer before opening the cover or moving the switch.

Remove power supply (unplug the jack) from your CSB4-S before opening the cover or moving the switch.

#### 2.1.1. Opening the device

Use a **PH1** screwdriver to remove the four screws under the product. Remove the cover to access the PCB.

#### 2.1.2. Switching the microcontroller to flash upgrade mode



Move the switch to the ON position.

#### 2.1.3. Switching the microcontroller back to operation mode

Move the switch to the OFF position (near digit "1")



#### 2.1.4. Closing the device

Be careful that the 2 screws going to the top (near the LEDs) are a bit longer than the 2 screws going to the bottom. Putting the long screws in the bottom holes will damage the product.

Do not over screw.

## 2.2. K531-TTL, K632-TTL AND RDR-K632-TTL

K531-TTL is a K531 mounted on an antenna featuring a serial interface at TTL level.

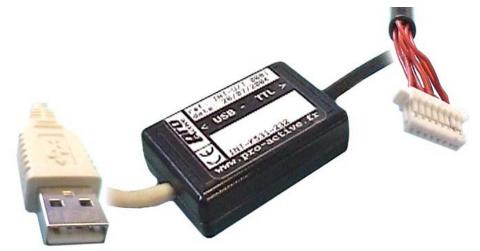
K632-TTL and RDR-K632-TTL are a K632 mounted on an antenna featuring a serial interface at TTL level.

Please refer to the product datasheet, section *pinout* to see how the product must be connected for either operation or flash upgrade mode.



Do not apply a voltage above 5V on any pin of the connector. Especially an RS-232 interface (with signals at -12/+12V) may destroy the K531-TTL, K632-TTL or RDR-K632-TTL.

**SpringCard** also offers a **serial TTL to USB interface** that is the easiest way to connect your TTL product to your computer. This interface includes a switch to put the device in flash upgrade mode, and a reset press-button to allow immediate mode change without unplugging the device.



USB interface for SpringCard TTL products (order code : INT-USB-TTL)



## 2.3. K531-232, K632-232 AND RDR-K632-232

K531-232 is a K531 mounted on an antenna featuring a serial interface at RS-232 level.

K632-232 and RDR-K632-232 are a K632 mounted on an antenna featuring a serial interface at RS-232 level.

Please refer to the product datasheet, section *pinout* to see how the product must be connected for either operation or flash upgrade mode.



The INT-USB-TTL interface will not work with RS-232 products.

### 2.4. K531 AND K632 MODULES

To be written.

# 3. GETTING STARTED WITH RENESAS FDT

The microcontroller **SpringCard CSB4 and K531** are based on is Renesas R5F21256 (R8C/25 with 32kB of code memory).

The microcontroller **SpringCard CSB4 and K531** are based on is Renesas R5F21258 (R8C/25 with 64kB of code memory).

This microcontroller is upgradeable on the field, through its serial interface, thanks to Renesas Flash Development Toolkit (FDT) version 4 or newer.

FDT is a Windows program, that runs on 2000/XP/Vista.

### 3.1. DOWNLOAD AND INSTALL FDT

The latest version of FDT is available free of charge at Renesas' :

- Go to www.renesas.com.
- Navigate to Development Tools → Flash and PROM Programming → Flash Development Kit.
- Choose « Download the latest version of FDT free of charge ».

You'll be prompted for your company details before accessing the download.

**Note :** Renesas' web site changes frequently, and its URLs are not « user friendly », therefore preventing us to give the actual link here. Alternatively, you may temporarily download FDT 4.00 (R00) at

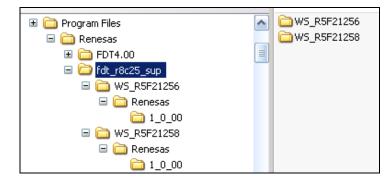
www.springcard.com/download/tmp/fdtv400r00.exe

#### **3.2.** DOWNLOAD AND INSTALL THE **R8C/25** SUPPORT FILES

Default installation of FDT only offers a limited support of both microcontrollers. We recommend to download the following support file :

#### www.springcard.com/download/tmp/fdt\_r8c25\_sup.zip

Unzip the downloaded zip file on your computer's hard drive. Remember the directory where you have unzipped the file.





## **3.3.** CREATE A WORKSPACE FOR CSB4 OR K531



CSB4 and K531 have 32kB of flash memory for code, where K632 has 64kB. Be sure to create a different FDT workspace for either family.

Launch FDT from Start Menu.

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10'0'0'				
	Vet sourt       Gener       Image: Section of the source particle definition of the source partis and the source pa	P N Cont Annual		
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Choose « create a new project workspace », and click « OK ».

New Project Workspace		? 🗙
Projects		
FDT Project Generator	Workspace Name: Project Name: Directory: C:\Program Files\Renesas\FDT4.00\Worksp	Browse
	CPU family: All Flash Devices	
	Tool chain: None	
Properties		
	OK	Annuler

Enter a name for your new project workspace (for instance, R8C25\_32), and click « OK ». If left blank, the default project name is the same value as the workspace name.

CSB4/K531/K632 - Firmware upgrade procedure

Choose Device A	nd Kernel			
The FLASH Development Toolkit supports a number of Renesas FLASH devices. Select the device you wish to use with this project from the list below.				
Filter:		_		Other
Туре	Full Name	Kernel Version	Info	~
H8S	H8S/2110BE	1 1 00		

In the « Choose Device And Kernel » box, click « Other... »

Open An Alternate	Configuration File		? 🛛
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ws_R5F21256.fcf			
Nom <u>d</u> u fichier :			<u>O</u> uvrir
Fichiers de <u>t</u> ype :	FDT Configuration Files (*.fcf)	•	Annuler

- In the « Open An Alternate Configuration File... » box, browse to the folder where you've unzipped the fdt\_r8c25\_sup.zip file, then browse into subfolder named WS\_R5F21256 until you reach the target file
- Select the target file WS\_R5F21256.fcf and click « Open »

oose Device	And Kernel			
The FLASH Development Toolkit supports a number of Renesas FLASH devices. Select the device you wish to use with this project from the list below.				
Filter:		Ĩ		Other
Туре	Full Name	Kernel Version	Info	^
R8C	R5F212BC	1 0 00	1	
R8C	R5F212C7	1 0 00		
R8C	R5F212C8	1_0_00		
R8C	R5F212CA	1_0_00		
R8C	R5F212CC	1_0_00		
R8C	R5F212D7	1_0_00		
R8C	R5F212D8	1_0_00		
R8C	R5F212DA	1_0_00		
R8C	R5F212DC	1_0_00		
R8C	WS_R5F21256	1_0_00	R8C	
HOC .	W3_H0F21208	1_0_00	HOL	~
<				>
		< <u>P</u> récédent	<u>S</u> uivant >	Annuler

Now back to the « Choose Device And Kernel » box, scroll-down and select WS\_R5F21256. Click « Next »





You may be notified that the checksum of the file is invalid. Click « Yes » to ignore this warning.



You must now select the serial communication port your device is connected to. Please read chapter 2 if you don't already know this information.

Communications Port		X
Workspace Workspace Workspace Display Display Device Imager Device Imager Comms.mot Device Imager Device Imager Jarget files Device Imager Jarget files Devi	The FLASH Development Toolkit supports connection through the standard PC Serial port and the USB port. Use this page to select your desired communications port. All settings may be changed after the project is created. Select port: Select port: Select an Interface type to connect to the target device with. Normally this will be "Direct Connection" or simply left blank. Select Interface: Direct Connection	
	< <u>P</u> récédent <u>S</u> uivant > Annule	r

Choose the right port, and click « Next ».

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Connection Type	
Workspace 40 DA FF 55 Workspace 40 DA FF 55 Workspace 100 DA FF 55 Workspace 100 DA FF 55 Control 100 Device Image Control 100 Device Image Contro	The FLASH Development Toolkit can connect to your device in a number of different ways. All the options on this page may be changed after the Project has been created.          Select Connection:
	< <u>P</u> récédent <u>S</u> uivant > Annuler

- Uncheck the « Use default » checkbox, and choose 38400 bps in the list. Click « Next »
- In the following pages, click « Next » (leaving all options to their default value), until « Finished »



## **3.4.** CREATE A WORKSPACE FOR K632



CSB4 and K531 have 32kB of flash memory for code, where K632 has 64kB. Be sure to create a different FDT workspace for either family.

Launch FDT from Start Menu.

Fisch (averlage and ) subst		A 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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	Options OK	
	Canada a new project work games Canad	
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This is an unsupported freemer versio	**	
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iastr		line of a second second
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Choose « create a new project workspace », and click « OK ».

New Project Workspace	?	X
Projects		
FDT Project Generator	Workspace Name: Project Name: Directory: C:\Program Files\Renesas\FDT4.00\Worksp Browse CPU family: All Flash Devices Tool chain: None	
	OK Annul	er

Enter a name for your new project workspace (for instance, R8C25\_64), and click « OK ». If left blank, the default project name is the same value as the workspace name.

CSB4/K531/K632 - Firmware upgrade procedure

Choose Device A	nd Kernel			
The FLASH Development Toolkit supports a number of Renesas FLASH devices. Select the device you wish to use with this project from the list below.				
Filter:		_	Other	
Туре	Full Name	Kernel Version	Info 🔥	
H8S	H8S/2110BE	1 1 00	-	

In the « Choose Device And Kernel » box, click « Other... »

Open An Alternate	e Configuration File			? 🗙
<u>R</u> egarder dans :	2_00	-	•	
₩5_R5F21258.fcf				
Nom <u>d</u> u fichier :				<u>O</u> uvrir
Fichiers de <u>t</u> ype :	FDT Configuration Files (*.fcf)		•	Annuler

- In the « Open An Alternate Configuration File... » box, browse to the folder where you've unzipped the fdt\_r8c25\_sup.zip file, then browse into subfolder named WS\_R5F21258 until you reach the target file
- Select the target file WS\_R5F21258.fcf and click « Open »

Choose Device A	and Kernel			×
The FLASH Development Toolkit supports a number of Renesas FLASH devices. Select the device you wish to use with this project from the list below.				
Filter:				Other
Туре	Full Name	Kernel Version	Info	~
R9C R8C R8C R8C R8C R8C R8C R8C	R5F212C7 R5F212C8 R5F212CA R5F212CC R5F212D7 R5F212D7 R5F212D8 R5F212DA	1_0_00 1_0_00 1_0_00 1_0_00 1_0_00 1_0_00 1_0_00 1_0_00	CilProo	ram Files\Renesas'
R8C	R5F212DC	1_0_00		ann nos pronosas.
R8C B8C	WS_R5F21256 WS_R5F21256	1_0_00	R8C B8C	
R8C	WS_R5F21258	1_0_00	R8C	
		< <u>P</u> récédent	<u>S</u> uivant >	Annuler

Now back to the « Choose Device And Kernel » box, scroll-down and select WS\_R5F21258. Click « Next »



FLASH D	evelopment Toolkit 🛛 🛛 🛛		
	The checksum for this configuration file is not valid.		
	Do you wish to continue?		
	Qui <u>N</u> on		

You may be notified that the checksum of the file is invalid. Click « Yes » to ignore this warning.



You must now select the serial communication port your device is connected to. Please read chapter 2 if you don't already know this information.

Communications Port		X
Workspace and Spires and APT Spires and APT Spires and Spires and Spires and Spires and APT Spir	The FLASH Development Toolkit supports connection through the standard PC Serial port and the USB port. Use this page to select your desired communications port. All settings may be changed after the project is created. Select port:	
	< <u>P</u> récédent <u>S</u> uivant > Annule	r

Choose the right port, and click « Next ».

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CSB4/K531/K632 - Firmware upgrade procedure

Workspace Industrial Co Workspace Industrial Co Display Device Image	The FLASH Development Toolkit can connect to your device in a number of different ways. All the options on this page may be changed after the Project has been created.           Select Connection:
0 00 00 of Target files on a	🔽 Kernel already running
A 72 EB B1 T S: Keybeard.m 1 55 B3 S: S Comme.mot 5 Comme.comme.mot 5 Comme.comme.comme.mot 5 Comme.co	In BOOT Program mode the device erases its FLASH prior to connection. The Toolkit downloads programming kernels to the device as required.
	The Recommended Speed setting is based on the current device and clock. The user may also input their own, if this is supported by the kernel (and the interface board).
	<ul> <li>Recommended Speeds: 38400 Use</li> </ul>
8 <mark>47 EF-84 80 8<u>3 6F-98</u> IE 1</mark>	C User Specified:
	< <u>P</u> récédent <u>S</u> uivant > Annuler

- Uncheck the « Use default » checkbox, and choose 38400 bps in the list. Click « Next »
- In the following pages, click « Next » (leaving all options to their default value), until « Finished ».

### **3.5. ADD A FIRMWARE TO YOUR WORKSPACE**

In the following screenshots, we focus on the FDT workspace for CSB4 or K531 ( $R8C25\_32$ ). Of course when working with a K632 product, use the appropriate workspace ( $R8C25\_64$ ).

In the tree on the left, right click on the project.



- In the popup menu, click on « Add Files... »
- Browse to the firmware file you want to download in the product (firmware files have the « .mot » extension).

CSB4/K531/K632 - Firmware upgrade procedure

# 4. How to flash your product

### **4.1. SELECT THE RIGHT FIRMWARE FOR YOUR PRODUCT**

All the CSB4/K531 group products on the one hand, all the K632 group products on the other hand, share a large part of their hardware including their microcontroller, but of course, they behave differently, due both to their hardware specificities and to their own specifications.

Generally speaking, putting the wrong firmware in any product is possible, and <u>may</u> appear to work, but this is not the way the product is intended to operate.

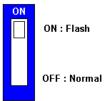
Please make sure to always put the appropriate firmware in your product.

### **4.2.** SWITCH THE MICROCONTROLLER TO FLASH UPGRADE MODE



Please read chapter 2 to learn how to put your device in flash upgrade mode.

For the products featuring one « Flash Mode » switch, move the switch to the ON position.

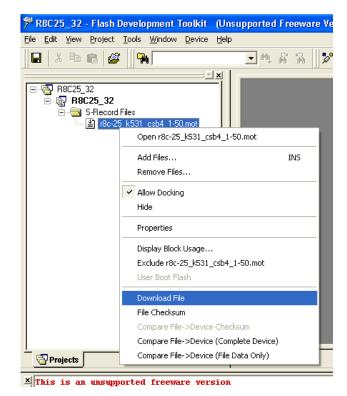


Cycle power or reset the product.

### 4.3. FLASH THE PRODUCT

Back to FDT screen, right click on the file you want to download in the device.

CSB4/K531/K632 - Firmware upgrade procedure



- In the popup menu, click « Download File »
- Wait during the flash operation (this takes 20 to 60 seconds)

```
Clock Frequency = N/A, Clock Mode = N/A, CKM = N/A, and CKP = N/A
 Connecting to device 'WS_R5F21256' on 'COM4'
 Configuration:
 'BOOT Mode' connection - using emulated interface
 Opening port 'COM4' ...
 Loading Comms DLL
 Loaded Comms DLL
 Initiating BOOT SCI sequence
 Attempting 9600
 Changing baud rate to 38400 bps
 ID code check successful
 Connection complete
 Lock Bit Disabled
 All blocks marked as unknown written status
 Erasing 2 blocks from device
 Erased block EB1 (0x00008000 - 0x0000BFFF)
 Erased block EBO (0x0000C000 - 0x0000FFFF)
 Erase complete
 Processing file :"I:\projects\springcard\springprox\firmware\_output\r8c-25_k531_csb4_1-50
 [Data Flash] - No Data Loaded
 Operation on User Flash
 Writing image to device... [0x00008000 - 0x0000FFFF]
 Data programmed at the following positions:
  0x00008000 - 0x0000FFFF
                               Length : 0x00008000
 32 K programmed in 39 seconds
 Image successfully written to device
```

Check that the output ends by « Image successfully written to the device »

#### End the procedure by clicking on « Disconnect » in the « Device » menu.

Window	Device	Help
	Connect to Device	
	Disconnect	

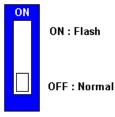
### 4.4. SWITCH THE MICROCONTROLLER BACK TO OPERATION MODE



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Please read chapter 2 to learn how to put back your device in operation mode.

For the products featuring one « Flash Mode » switch, move the switch back to the OFF position.



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