



BC5161 Fuse Programming Tool Application Guidelines

D/N: AN0574EN

Introduction

The BC5161, designed and produced by Holtek, is an integrated programmable encoder 2.4GHz wireless transmitting device. The device is suitable for use in various 2.4GHz wireless remote controller applications. The transmitting frequency range lies within the 2402 MHz to 2480MHz unlicensed ISM frequency band.

The BC5161 includes an integrated high power amplifier, a digital GFSK modulation and a packet encoder. The device's RF characteristics comply with the International FCC/ETSI requirements. The BC5161 has up to 8 key functions with its 16-pin QFN package, 4.2 billion (2³²) encoder addresses, a maximum of +8dBm transmission power and up to 500Kbps transmission rate. The device provides an auto wake-up function for transmission and auto hopping frequency function. Additionally, the device matching circuit makes it easy to add new devices.

For additional convenience and ease of use, the BC5161 has a unique integrated OTP (One Time Programmable) Fuse Memory. When used together with the Holtek supplied software, users can set the RF transmitting power, frequency band, address and other parameters.

This guide introduces the fuse programming tool and provides some examples to assist users in its usage.

Functional Description

The BC5161 is a high frequency signal transmitter which uses non-integer phase-locked multiplication technology. The device includes an integrated non-integer frequency multiplier, frequency modulator and an output amplifier. The structure is shown in the following figure.



Figure 1. BC5161 Internal Block Diagram



The Fuse Data Memory shown in the block diagram is a special function included within the BC5161, which when used together with the programming software provided by Holtek, allows the easy configuration of the BC5161 parameters. These parameters include RF transmitting power, frequency band, address, keys and so on. Note that the programmed bits are non-recoverable.

Hardware Connection

Programmer: e-Link or e-WriterPro.

http://www.holtek.com/e-link



Figure 2

http://www.holtek.com/e-writerpro



Figure 3

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e-Socket programming socket: ESKT8SOP-RF2.4G / ESKT16QFN-RF2.4G.

http://www.holtek.com/e-socket





Figure 4. Connection Method



Figure 5

Software Download

To locate the software search using the keyword "BC5161" on the Home page of the Holtek official website and click on the "Software & Tools" option in the product page.

Users can also refer to the following link directly:

https://www.holtek.com/web/guest/tool-results/-/display/tool/419

Then click on the "RF Chip Parameters Setting Tool" to download the software.



Software Installation

on this to start the installation.



After the download and file decompress process has completed, an installation file will appear, click

Figure 6

Select the installation path. This can be setup manually or the default path can be used.

Setup - RF chip parameters setting tool	
Select Destination Location Where should RF chip parameters setting tool be installed?	
Setup will install RF chip parameters setting tool into the followin	g folder.
To continue, click Next. If you would like to select a different folder, click	Browse.
Files (Holtek MCJ Development Tools (RF chip parameters setting too)	Browse
At least 18.2 MB of free disk space is required.	
< Back Next >	Cancel



Select the installation directory. This can be setup manually or the default file name can be used.

Setup - RF chip parameters setting tool	
Select Start Menu Folder Where should Setup place the program's shortcuts?	
Setup will create the program's shortcuts in the following Start !	Menu folder.
To continue, click Next. If you would like to select a different folder, click	Browse.
Holtek MCU Development Tools\RF chip parameters setting tool	Browse
< Back Next >	Cancel



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Setup a shortcut on the desktop.

med?	
ineu:	C
	istalling RF chip
< Back	ext > Cancel
	e Setup to perform while in < <u>B</u> ack

Figure 9

Click the "Install" button to start the installation.



Figure 10

During installation the following screen will appear.

🔂 Setup - RF chip parameters setting tool	
Installing Please wait while Setup installs RF chip parameters setting tool on your computer.	
Extracting files C:\\Holtek MCU Development Tools\RF chip parameters setting tool\BI	N\eLinkIap.dll
	Cancel

Figure 11





Click "Finish". Check the option shown in the following picture to execute the software.

Figure 12

Software Function

After the programming software has been executed, there are four main function options listed at the top of the window:

All Transmitters Receivers Transcrivers evice Function Working Voltage Modulation RF Band Symbol Rate C2102 Tx 2.2~3.6V OOK/FSK 290~335,415~490,830~960MHz 0.5~50 kbps C2161 Tx 2.0~3.6V OOK/FSK 290~355,415~490,830~960MHz 2~125 kbps	All Transmitters Receivers Transcrivers evice Function Working Voltage Modulation RF Band Symbol Rate C2102 Tx 2.2~3.6V OOK/FSK 290~335,415~490,830~960MHz 0.5~50 kbps C2161 Tx 2.0~3.8V OOK/FSK 290~355,415~490,830~960MHz 2~125 kbps	Device Function Working Voltage Modulation RF Band Symbol Rate BC2102 Tx 2.2-3.6V OOK/FSK 290~335,415~490,830~960MHz 0.5~50 kbps BC2161 Tx 2.0-3.6V OOK/FSK 290~335,415~490,830~960MHz 2-125 kbps								
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wrice Function Working Voltage Modulation RF Band Symbol Rate C2102 Tx 2,2~3.6V OOK/FSK 290~335,415~490,830~960MHz 0.5~50 kbps C2161 Tx 2,0~3.8V OOK/GFSK 290~335,415~490,830~960MHz 2~125 kbps	wrice Function Working Voltage Modulation RF Band Symbol Rate C2102 Tx 2,2~3.6V OOK/FSK 290~335,415~490,830~960MHz 0.5~50 kbps C2161 Tx 2,0~3.8V OOK/GFSK 290~335,415~490,830~960MHz 2~125 kbps	Device Function Working Voltage Modulation RF Band Symbol Rate BC2102 Tx 2.2~3.6V OOK/FSK 290~335,415~490,830~960MHz 0.5~50 kbps SC2161 Tx 2.0~3.6V OOK/GFSK 290~335,115~490,830~960MHz 2~125 kbps								
C2102 Tx 2.2~3.6V OCK/FSK 290~335/415~490,830~960MHz 0.5~50 kbps C2161 Tx 2.0~3.6V OCK/GFSK 290~335,415~490,830~960MHz 2~125 kbps	C2102 Tx 2.2~3.6V OCK/FSK 290~335/415~490,830~960MHz 0.5~50 kbps C2161 Tx 2.0~3.6V OCK/GFSK 290~335,415~490,830~960MHz 2~125 kbps	3C2102 Tx 2.2~3.6V OOK/FSK 290~335/415~490,830~960MHz 0.5~50 kbps 3C2161 Tx 2.0~3.6V OOK/GFSK 290~335/415~490,830~960MHz 2~125 kbps		All	Transmitters	C R	eceivers 🔲 Transceivers			
C2161 Tx 2.0~3.6V OOK/GFSK 290~335,415~490,830~960MHz 2~125 kbps	C2161 Tx 2.0~3.6V OOK/GFSK 290~335,415~490,830~960MHz 2~125 kbps	3C2161 Tx 2.0~3.6V OOK/GFSK 290~335,415~490,830~960MHz 2~125 kbps	Device	Function	Working Voltage	Modulation	RF Band	Symbol Rate		
			3C2102	Tx	2.2~3.6V	OOK/FSK	290~335,415~490,830~960MHz	0.5~50 kbps		
C5161 Tx 2.0~3.6V GFSK 2402~2480MHz 125~500 kbps	C5161 Tx 2.0~3.6V GFSK 2402~2480MHz 125~500 kbps	3C5161 Tx 2.0~3.6V GFSK 2402~2480MHz 125~500 kbps								
			BC5161	Tx	2.0~3.6V	GFSK	2402~2480MHz	125~500 kbps		
elected Device	elected Device	selected Device	Selected	d Device						
		Selected Device								

- Figure 13
- 1. Device Selection
- 2. Configuration List
- 3. Chip Parameters Setting
- 4. Chip Programming



The four main function pages are described below.

Device Selection

Select the corresponding IC.

Configuration List

The Chip Parameter Setting files with different RF parameter values and settings are listed here.

Chip Parameters Setting

The BC5161 supports the following RF parameter settings - refer to the corresponding datasheet for more detailed information:

- Crystal C-load
- LED_SWD
- Data Rate
- Package Type
- TX Power
- CRC_EN
- etc.

Chip Programming

In this page the following functions are provided:

- Load File \rightarrow Loads the parameter files in which the RF parameters have been preset.
- Download \rightarrow Used in combination with the e-WriterPro.
- Read \rightarrow Reads out the current Fuse setting values.
- Blank Check \rightarrow Check if the IC has been programmed or not.
- Program \rightarrow Click to start programming.
- Verity \rightarrow Confirms if the programmed values are correct.
- Smart Programming \rightarrow Used in combination with the e-WriterPro.



Usage Considerations

When connecting to the BC5161, if the following window pops up, this indicates that Holtek now has a new software version available. Users can choose whether to update the software or not.

Warning	×
New FW vers Current Versio New Version:	
	Cancel

Figure 14

If not required, click on "Cancel".

If the new version is required, click the "Help" button on the upper right of the screen, then select "Update Firmware" to initiate the update.

				-	>
					Help
	Symbol Rate	 			
Hz	Symbol Rate 0.5~50 kbps		 		
Hz Hz			 		

Figure 1	5
----------	---

Update Firmware	\times
Press "Start" key to upd	ate F/W
Start	Quit

Figure 16

Update F	irmware			\times
		Erasing		
	Start		Quit	

Figure 17



Update Firr	nware		×
	Downle	bading	
	Start	Quit	

Figure 18

Update Firmware	×
Update F/W suc	cess!
Start	Quit

Figure 19

After the update has finished, click "Quick" to exit.

Example 1

Purpose: RF parameter file preparation.

Tool: Software only.

Step1: Click the shortcut on the PC desktop after which the following window will pop up.

vice Sele	ction Con	figuration List Chip	Parameters Set	tting Chip Programming		Н
	All	Transmitters	C Re	eceivers 🔲 Transceivers		
Device	Function	Working Voltage	Modulation	RF Band	Symbol Rate	
BC2102	Tx	2.2~3.6V	OOK/FSK	290~335,415~490,830~960MHz	0.5~50 kbps	
BC2161	Tx	2.0~3.6V	OOK/GFSK	290~335,415~490,830~960MHz	2~125 kbps	
BC5161	Tx	2.0~3.6V	GFSK	2402~2480MHz	125~500 kbps	
	Device					

Figure 20

Step2: Double-click on BC5161 after which the UI will switch to the "Configuration List" page.

2	Configuration	n List - RF	chip param	neters setting	tool					-	- 🗆 X	
De	vice Selection	n Config	guration List	Chip Paran	neters Setting	Chip Programm	iing				Help	
C	Configuration	File List										
	File Name New File	C-load	XO_SEL	LED_SWD	DataRate	Package Type	Tx Power	PKT_ADDRE0	PKT_ADDRB1	PKT_ADDR82	PKT_ADDRB3	
L 14	< Selected File										>	

Figure 21

Step3: Double-click the "New File", the software UI will automatically switch to the "Chip Parameters Setting" page.

evice Selection Configu	ration List	Chip Parameters	Setting	Chip Programmir	ng				Help
Parameter Settings									
Crystal C-load	XO_SEL		LED_S	WD	DataRate		Package Type		
32 ~	32	✓ MHz	Tx	\sim	125	✓ Kbps	8SOP-EP 🗸 🗸		
Tx Power	PKT_ADD	ORB0	PKT_A	DDRB1	PKT_ADDRB2		PKT_ADDRB3		
8(high powe \sim	0	Н	0	Н	0	Н	Н		
PKT_ADDRB4	PAIRBO		PAIRB		PAIRB2		PAIRB3		
Н	0	Н	0	Н	0	Н	0 Н		
PAIRB4	I2C		CRC_S		PCF_EN		DEVICE_ID		
0 H	Key mo	de 🗸	Disab	ole ~	Enable	\sim	Disable \vee		
ADDR_LEN	ENCRYP	к	Divice	-	DiviceID_1		DiviceID_2		
3 ~ Bytes	0		0	Н	0	Н	0 H		
WOT	WOT_Tir		Resen	-	НОР	_	HOP_Type		
Disable \checkmark		10ms	0	\sim	Disable	\sim	\sim		
HOPFreq_Num	APRD		ARD		HOP_Freq1		HOP_Freq2		
1 ~	380	∨ us	380	✓ us	2402	MHz	2402 MHz		
HOP_Freq3	HOP_Fre		LVD_E		LVD_Vol	_	CRC 37400	Export asm file	,
2402 MHz	2402	MHz	Disab	ole V	2.2V	\sim	37400	Print	
PKT_ADDR	PAIR		Divice						
0 H	0	н	0	н				Save	

Figure 22

Step4: After completing all the settings, click the "Save As" button in the bottom right of the screen to save the settings as a file with a custom name or click the "Save" button to store the settings as a file with the default name.



Example 2

Purpose: Check if the BC5161 has been programmed which means checking if the IC is empty. After this read the IC programmed data.

Tool: e-Link + e-Socket or e-Link + user's own PCB.

Step1: Click the shortcut on the PC desktop to execute the software.

- Step2: Double-click the BC5161, the UI will switch to the "Configuration List" page, and then double-click the "New File".
- Step3: The UI will switch to the "Chip Programming" page, the values shown in the window are the BC5161 default settings.
- Step4: Users can also click on the "Read" / "Blank Check" to check if the Fuse has been programmed or not. This will be shown in the "Message" window at the bottom right area of the screen.

		2			H
vice Selection	Configuration List	Chip Parameters Setting	Chip Programming		h
					HW:e-Link for RF IC
evice of paran	neters	Data Checksum			FW:0009H
BC5161		583H		Emulated	
arameters					
ltem	Content	Value	^	Load File	
C-load	32	20H			
KO_SEL	32 MHz	OH		Download	
LED_SWD	Tx	0H		Read	
DataRate	125 Kbps	1H		Read	
Package Type	8SOP-EP	0H		Blank Check	
Tx Power	8(high power)	OH			
PKT_ADDRB0	0	0H		Program	
PKT_ADDRB1	0	OH			
PKT_ADDRB2	0	0H		Verify	
PKT_ADDRB3	This parameter	is disabled	Sm	art Programming	
PKT_ADDRB4	This parameter	is disabled	511	lant Programming	
PAIRBO	0	0H	Message		
PAIRB1	0	OH	60H 00H 00I	1720 020 200 660 05	H 4AH 00H 64H 12H A1H AFH 00H 00H 00H 00H 00
PAIRB2	0	OH	Blank Checki		n 4An 00h 04h 12h A1h AFH 00H 00H 00H 00H 00
PAIRB3	0	OH	00H 00H 00H	н оон оон оон оон оо	H 00H 00H 00H 00H 00H 00H 00H 00H 00H 0
PAIRB4	0	OH	Chip is Blank	:	
2C	Key mode	OH			
CRC_SEL	Disable	0H			
PCF_EN	Enable	1H			
DEVICE_ID	Disable	0H			
ADDR_LEN	3 Bytes	0H			
ENCRYPK	0	OH			
DiviceID_0	0	0H			
DiviceID 1	0	OH	× <		>

Figure 23

Example 3

Purpose: Programming the IC. Users can create new parameter setting values directly or use the preset parameter files.

Tool: e-Link + e-Socket or e-Link + user's own PCB.

Step1: Click the shortcut on the PC desktop to execute the software.

Step2: After confirming that the hardware has been connected then go to the "Device Selection" page and double-click on BC5161.

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- Step3: Switch to the "Configuration List" page and double-click the "New File" button. The software window will then automatically switch to the "Chip Parameters Setting" page to allow users to select their required settings.
- Step4: After selecting the required settings in the "Chip Parameter Setting" page, users can switch the software window to the "Chip Programming" page. The parameter box on the left lists all the RF parameter values setup during Step3 while the message box in the bottom right shows the Fuse values in hexadecimal format.

evice Selection	Configuration List	Chip Parameters Setting	Chip Programmin	9	Hel
					HW:e-Link for RF IC
Device of paran	neters	Data Checksum			FW:0009H
BC5161		BE6H		Emulated]
arameters					
ltem	Content	Value	^	Load File	
C-load	32	20H		Download	
XO_SEL	32 MHz	OH		Download	
ED_SWD	Tx	OH		Read	
DataRate	250 Kbps	2H		Nedu	
Package Type	16QFN	OH		Blank Check	
Tx Power	8(high power)	OH			
PKT_ADDRB0	105	69H		Program	
PKT_ADDRB1	68	44H			
PKT_ADDRB2	50	32H		Verify	
PKT_ADDRB3	85	55H		mart Programming	
PKT_ADDRB4	53	35H	3	man programming	
PAIRBO	52	34H	Message		
PAIRB1	82	52H		011 7411 0011 0011 0011	5H 4AH 00H 64H 12H A1H AFH 69H 44H 32H 55H 35
PAIRB2	51	33H	OCH OCH O	0H 74H 02H 30H 66H 9	5H 4AH 00H 04H 12H ATH AFH 09H 44H 32H 55H 33
PAIRB3	145	91H			
PAIRB4	37	25H			
12C	Key mode	OH			
CRC_SEL	2bytes	ЗH			
PCF_EN	Enable	1H			
DEVICE_ID	Enable	1H			
ADDR_LEN	5 Bytes	2H			
ENCRYPK	0	OH			
DiviceID_0	18	12H			
DiviceID 1	35	23H	v <		>



Step5: After the above steps have been executed, click the "Program" button to start programming. Before the actual programming process begins, a "Blank Check" operation will be executed to ensure correct programming. If the Blank Check operation has been successful, meaning that the IC is blank, then programming will be executed automatically. If the Blank Check has not been successful, meaning that the IC is not blank, the programming operation will not be executed and a warning message will pop up. The software will then wait for a user input to determine the next action. The figure below shows the warning message box.

Warning		\times
Chip is not Blank,continu	e to program?	
Yes	No	



Step6: If using a previously setup RF parameters setting file to program the IC, after the Step 2 operation has been executed, click the "Load" button. Now the software will automatically open the system default folder in which users can select and open their required file.

Step7: Check the information in the "Parameters" and "Message" boxes to determine whether the parameters are correct. If correct, the program operation can be executed.

If there are any errors or setting changes, switch to the "Chip Parameters Setting" page for re-configuration and then switch back to the "Chip Programming" page.

Example 4

Purpose: Use the e-WriterPro tool for programming.

Tool: e-WriterPro + e-Socket - inserted into the e-WriterPro Line Pin.

Step1: Click the shortcut on the PC desktop, the following prompt message will pop up, meaning that the e-WriterPro version is not applicable to this software and needs to be updated before use.

Warning	\times
The hardware FW is 'e-WriterPro', execute "Help\Update Firmware" to update the FW	
Cancel	

Figure 26

The following message informs users that Holtek has now released an updated version of the software which users can decide to update or not.

Warning	\times
New FW version has been found: Current Version:0011H New Version:0014H	
Cancel	



If not, click "Cancel".

If yes, click the "Help" button at the upper right to select "Update Firmware" to execute an update.

- Step2: Double-click "BC5161" in the "Device Selection" page. Users can now create new parameter setting values or use the pre-configured parameter files. Refer to Example 3.
- Step3: If users want to create new parameter settings, click on "Download" in the "Chip Programming" page.

The "Select IC Package" window will pop up.

The BC5161 provides e-Sockets with both 8-pin and 16-pin types. Users can select the package type, either 16-pin QFN-A or 8-pin SOP-A, according to their specific requirements.





Figure 28

Holtek also provides an option for the ICP mode. Users can select this mode for direct On Board programming.

Step4: The programming can be initiated after the download operation has completed.

Example 5

Purpose: Use e-WriterPro and use Smart Programming for offline programming.

Tool: e-WriterPro + e-Socket - inserted into the e-WriterPro Line Pin.

Implement the above steps until the process arrives at the step to execute a "Download" in the "Chip programming" page.

Step1: Click "Smart Programming" in the "Chip Programming" page after which the following window will pop up.

Smart Programming-BC5	161.efs			×
Device BC5161 Program Setting Blank Check Program Verify	>	Counter Success Fail Total	0	Reset
		Save	Config	
		Set	Writer	
		A	uto	
Operation Time sec		¢	Quit	

Figure 29

Step2: Select the "Blank Check" / "Program" / "Verify" options and add these options to the field on the right hand side. Click the "Save Config" followed by "Set Writer". The "Auto" button will then be available for use after these actions have been implemented.

Smart Programming-BC5161.efs*	×
Device BC5161 Program Setting Blank Check Program Verify > Verify <	Counter Success 0 Reset Fail 0 Total 0 Reset All Save Config Set Writer Auto
Operation Time sec	Quit

Figure 30

Step3: During programming, users can click on the "Auto" button or press the red button on the e-WriterPro directly to execute the functions selected in Step2. This example selects Blank Check, Program and Verify functions. After the execution has successfully completed, a "Success" prompt message will pop up.

Smart Programming-BC5161.efs*		×
Device BC5161 Program Setting Blank Check Program Verify> < Success	Blank Check Program	Counter Success 1 Reset Fail 0 Total 1 Reset All Save Config Set Writer Auto
Operation Time 1.656 sec		Quit

Figure 31

Step3-1: During programming, users can use the PC to execute programming or select offline programming as follows:

Connect the e-WriterPro to the Holtek Adapter and then connect the power supply. Then press the red button on the e-WriterPro directly to initiate offline programming.



Conclusion

This document has introduced how to use the Holtek BC5161 Fuse programming tools. If users have any related suggestions please contact Holtek.

Reference Files

Reference file: BC5161 Datasheet.

For more information, refer to the Holtek official website http://www.holtek.com/en.

Version and Modify Information

Date	Author	Issue
2020.10.13	何信智	V1.00

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