CMOSTEK Offline Writer Operation Guide

Overview

CMOSTEK Offline Writer (hereinafter referred to as Writer) is a production tool which helps program configuration parameters into the NextGenRF™ series chisp in an efficient way.

This document discusses the function, operation flow and usage considerations of the Writer.

The product models covered in this document are shown in the table below.

Table 1. Product Models Covered in This Document

Chip Type	Chip Model	
Transmitter chip	CMT211xA	CMT2150L
	CMT215xA	CMT2157L
	CMT215xB	
Receiver chip	CMT221xA	CMT2217LB
	CMT225xA	CMT2217B
	CMT221xB	CMT2218B
	CMT221xLA	CMT2210LH
	CMT2210LB	CMT2217LH
SOC	CMT218xA	CMT2180AP

Notes:

1. From Writer V3.1 on, it supports 2 more chip models, CMT2157L and CMT2217LH.

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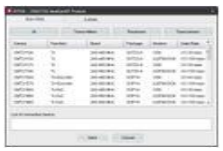
1 Offline Writer Toolkit Components

The offline Writer toolkit consists of the below hardware and software components.

Table 2. Offline Writer Toolkit Hardware and Software Components

Category	Image	Component	Function and Specification
Hardware		Offline Writer hardware	Program CMOSTEK chips offline in an efficient way.
		DC power adapter	The specification is: Input: AC 100 ~ 240 V 50/60 Hz 0.6 A. Output: DC 9 V 1 A.
		USB cable	USB male type A ->USB male type B connector, 1.5 m, connecting the Writer to PC to import chip configuration into CMOSTEK chips.
		Programming connecting cable	1 IDC 10P cable, connecting the Writer to chip programming fixture (chip pin).
Software		CMOSTEK RFPDK	The software runs on PC, can generate chip configuration file *.exp.
		CMOSTEK WriterConfig	The software runs on PC, which supports importing chip configuration file .exp to the Writer.

2 Hardware Introduction

2.1 Offline Writer Hardware Operation Panel

2.1.1 Writer Operation Panel Front View

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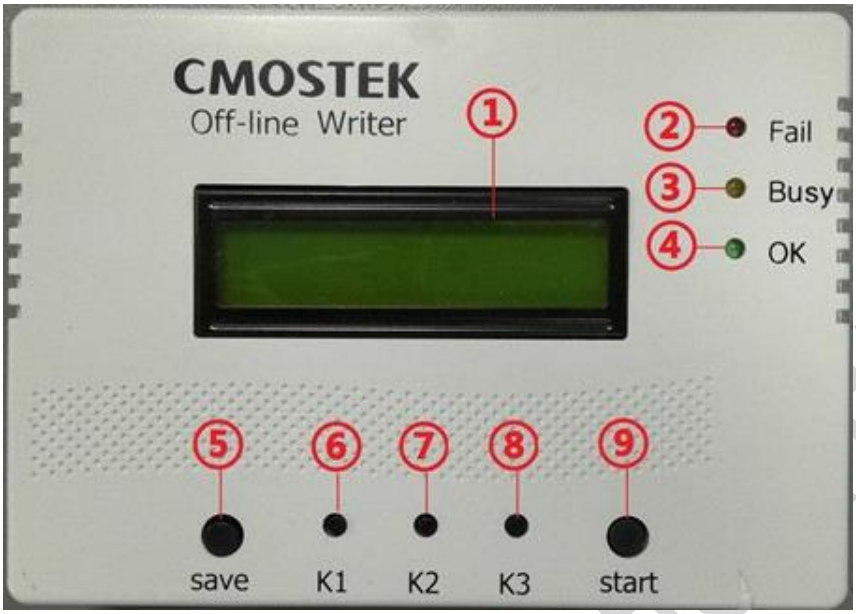

Figure 1. Front View of Offline Writer Hardware Operation Panel

Table 3. Components on Offline Writer Hardware Operation Panel

No.	Name	Function
1	Fail (red light)	The red light being on indicates programming failure.
2	Busy (yellow light)	The yellow light being on indicates the system is busy. It covers the below 2 cases. 1. In programming mode, it indicates a target chip model is identified and being programmed. 2. In USB mode, it indicates there's information exchanging through the connection between USB and PC.
3	OK (green light)	The green light being on indicates the system is OK. The light turns on upon successful programming, and keeps on after the chip is removed.
4	LCD display	Display configuration and programming related information.
5	Save button	The programming count value is saved in Flash when this button is pressed.
6 - 8	K1 – K3 button	Reserved buttons for future extension.
9	start button	It starts programming when this button is pressed.

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2.1.2 Writer Operation Panel Back View

Figure 2. Writer Operation Panel Back View

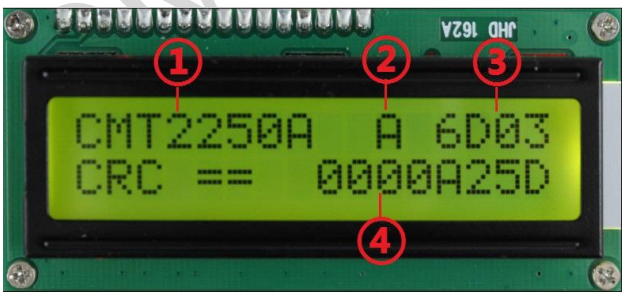
Table 4. Interfaces on Writer Operation Panel Back View

No.	Interface Name	Function
1	Programming Interface *Burn*	Connecting to a target chip to be programmed.
2	Control interface *Comm*	Connecting to an automatic programming machine, which is a third-party automatic production device connecting to this Writer to fulfill batch programming.
3	USB interface	Connecting to PC to import configuration data to the Writer.
4	Power interface *9 V/1 A*	Writer power supply, connecting to 9 V/1 A DC power adapter.

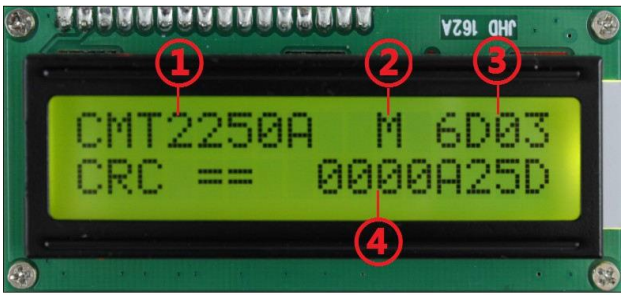
2.2 LCD Display Information

2.2.1 Offline Writer Power-on Display Information

The information is being displayed for 5 minutes after chip power-on as shown in the below figure. The information description is listed in the below table.



A Programming Mode



M Programming Mode

Figure 3. LCD Display Information During Power-on Initialization

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Table 5. Power-on Initialization LCD Display Information Description

No.	LCD Display	Description
1	CMT2250A	Display the chip model of the chip to be programmed. It should be consistent with the chip model in the imported .exp file.
2	'A' and 'M'	It represents the 2 programming modes of the Writer. The 2 programming modes are selected through the option *Auto Machine Mode* on the WriterConfig GUI. 1. ☑ (ticked) represents the Writer is in A programming mode. In this mode, the programming operation is performed each time the button *start* is pressed or a start signal is sent from the connected automatic programming machine. In this mode, the LCD displays character 'A'. 2. □ (un-ticked) represents the Writer is in M programming mode. In this mode, the programming operation is performed automatically once a chip is connected to the Writer. In this mode, the LCD displays character 'M'.
3	6D03	It represents the CRC checksum of the configuration .exp file. It should be consistent with the checksum value in the .exp file, namely the checksum value contained in the 4 characters right to '=' in *FILE CRC* =****. Upon each power-up, users should check whether the 2 checksum values are the same to avoid programming a wrong .exp file. Please refer to Section 8 for details of FILE CRC value calculation method.
4	CRC==0000A25D	It represents the CRC checksum of the configuration data. This value must be the same as the value in *CRC=0xHHHH* (Hex format),which is shown at the end of the information displayed when WrtierConfig downloads the configuration data completely. If they are not the same, *CFG CRC ERR1 ...* will be displayed and re-downloading configuration file is required in this case.

2.2.2 Programming Information Display

The programming information is displayed as shown in the below figure.

Figure 4. Programming Information Display

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Table 6. Description of Displayed Programming Information

No.	LCD Display Information	Description
1	CMT2250A	It represents the chip model of the target chip to be programmed.
2	*A* and *M*	The same as above table.
3	6D03	The same as above table.
4	0	It represents the number of chips that are successfully programmed consecutively, which is a decimal integer value. It automatically increases by 1 per each successful programming with a maximum value of 9,999,999. It recounts from 0 when reaching the maximum value. It is cleared to 0 when WriterConfig re-downloads configuration data to the Writer.
5	00001234	It represents the ID value to be programmed to the chip. It's a value with hex format. Notes: When the currently connected chip is the last one that is just programmed or it has exactly the same chip parameters as the last programmed one, this chip will not be programmed again, and the LCD will display the ID inside the chip. Once the chip is disconnected, it resumes to display the next ID to be programmed.

2.3 Indication Light and Beeper Status Information

The offline Writer status can be reflected through the indicator lights and buzzer. Please refer to Table 3 for the indicator light status details. Buzzer status is detailed in the below table.

Table 7. Buzzer Status Description

Indicating Sound	Writer Status	Description
Beep once	Writer is ready to work or programming is performed successfully.	1. After Writer power-on, beeping once represents the Writer is ready for chip configuring via USB or chip programming. 2. During chip programming, beeping once represents programming is performed successfully. The green light turns on at the same time in this case.
Beep twice	Programming fails.	When programming finishes, if it beeps twice, this indicates the programming fails. The red light turns on at the same time in this case.

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Indicating Sound	Writer Status	Description
Beep 3 times	Mismatch with the identified chip model	It indicates the chip can be identified, however the configuration parameters are unmatched with the identified chip model. It beeps 3 times in this case.
Beep 3 times in each second and keep on beeping	Configuration data validation error occurs in the Writer.	When configuration data validation error occurs in the Writer, it beeps 3 times in each cycle and and keeps on beeping. Users need to re-download configuration data in this case.

2.4 Programming Interface and Connection

The programming interface is detailed below.

Figure 5. Programming Interface

Table 8. Programming Interface Description

Pin #	Pin Name	Function Description	Connected Chip Pin			
			CMT211x	CMT221xA/B/LH	CMT218xA	CMT215xL
			CMT215x	CMT225xA	CMT2180AP	CMT215xB
1	CSB	Chip selection signal	-	CSB	-	-
2	GND	Power supply ground	GND	GND	GND	GND
3	VDD_M	MCU power supply	-	-	MCU VDD	-
4	VDD_RF	RF chip power supply	VDD	VDD	VDD	VDD
5	SCL	RF serial port clock signal	SCL	SCL	SCL	SCL
6	MCK	MCU clock signal	-	-	MCU CLK	LED
7	SDA	RF serial port data signal	SDA	SDA	SDA	SDA
8	MDAT	MCU data signal	-	-	MCU DATA	-
9	DOUT	Reserved pin (undefined)	-	-	-	-
10	VPP	Regulating voltage output	-	-	VPP	-

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Notes:

1. As the programming interface signal speed is high, it should use FFC cable or Dupont line with the same length to connect the Writer and the chip to ensure the correct signal timing.

3 Offline Programming Operation Flow

3.1 General Operation Flow

The general offline programming operation flow is as follows.

1. Open the RFPDK software on PC, export the chip configuration file *.exp, then close the RFPDK software.
2. Plug the programming connecting cable into the *Burn* interface to connect the Writer with the chip module or connect the Writer control interface with the automatic programming machine (refer to Section 4 Automatic Machine Connection for details). Then plug in power supply.
3. Connect the Writer with PC through the USB cable. Load the configuration file .exp on WriterConfig GUI and download it to the Writer (refer to Section 3.2 Configuration Downloading Using WriterConfig for details).
4. Perform programming according to Writer operating mode.
   a) In A mode, perform programming by pressing *start* button manually or sending *start* signal from the automatic programming machine.
   b) In M mode, once the chip is connected, the Writer will identify the chip and perform programming automatically with no need to press *start* button.

3.2 Configuration Downloading Using WriterConfig

Open WriterConfig GUI, the version information is shown as the label 7 and label 8 in the below figure. Label 7 shows WriterConfig software version. For instance, in the below figure, the software version is V1.3.0. Label 8 shows both the Writer hardware and firmware version information. For instance, in the below figure, hardware version is V3 and firmware version is 130.App.

WriterConfig supports 2 configuration downloading methods corresponding to whether the chip is a SOC type.

3.2.1 Transmitter and Receiver Chip Configuration Downloading

For transmitter and receiver type chips, users can follow step 1 to step 6 in sequence to download configuration data through WriterConfig.

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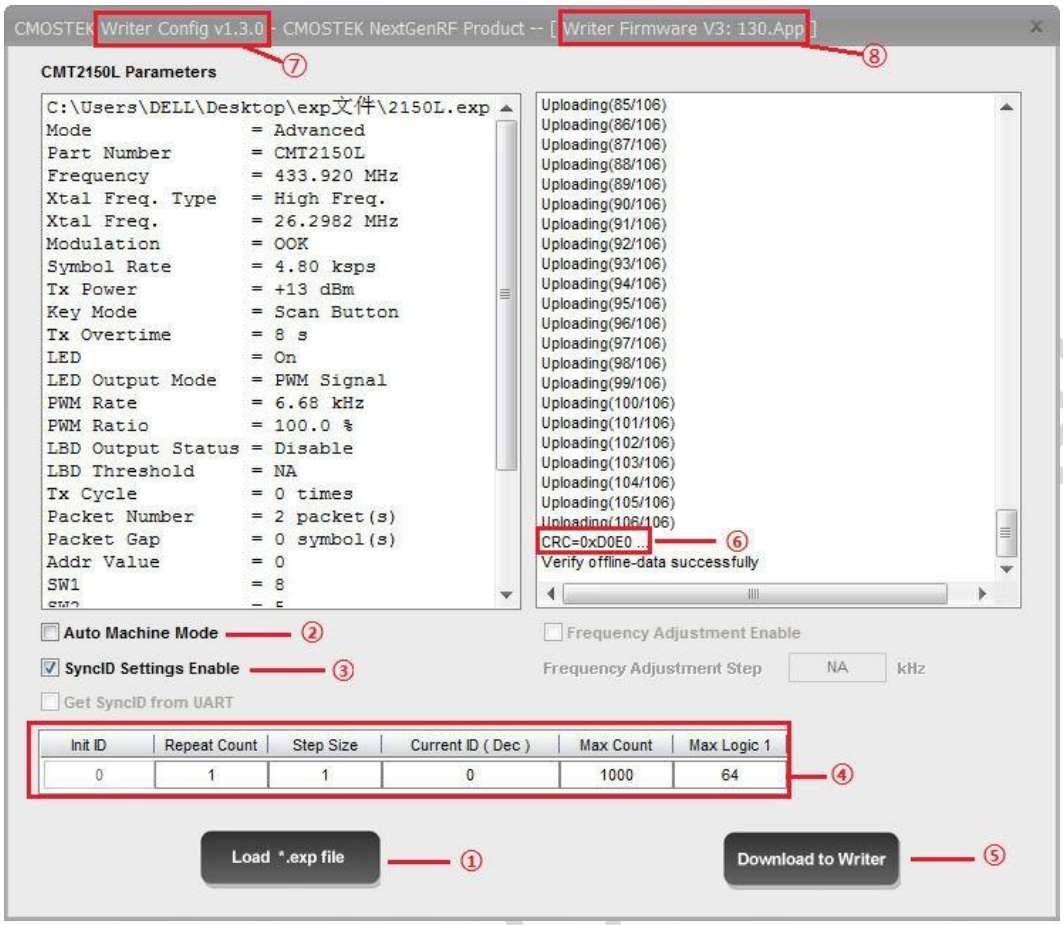

Figure 6. Version Information and Configuration Data Downloading On WriterConfig

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Table 9. Configuration Data Downloading Steps on WriterConfig

No.	Configuration Item	Function Description
1	Load *.exp file	Import the configuration file .exp that is generated by RFPDK into WriterConfig.
2	Auto Machine Mode	Choose one of the below 2 programming modes. 1. ☑ (ticked), represents the Writer is in A programming mode. In this mode, the programming operation is performed each time the button *start* is pressed or a *start* signal is sent from the connected automatic programming machine. In this mode, the LCD displays character 'A'. 2. □ (un-ticked), represents the Writer is in M programming mode. In this mode, the programming operation is performed automatically when a chip is connected to the Writer. In this mode, the LCD displays character 'M'.
3	SyncID Settings Enable	Select whether to enable automatic incremental ID function, this is only required for CMT2x5x series chips.
4	SyncID Settings	Automatic incremental ID function settings. Please refer to the table SyncID Settings Description for more details.
5	Download to Writer	Download configuration parameters to the Writer.
6	CRC checksum for configuration data	It is used to check the correction of the the downloaded configuration data. This value must be the same as the value in *CRC=0xHHHH* (Hex format),which is displayed on the LCD during Writer power-on initialization. If they are not the same, *CFG CRC ERR1 ...* will be displayed and re-downloading configuration file is required in this case.

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The SyncID Settings description is shown in the below table.

Table 10. SyncID Settings Description

No.	Configuration Item	Function Description
1	InitID	Configure the first SyncID to be programmed to chip.
2	Repeat Count	How many chips will be programmed successively with the same ID until it changes to the next ID.
3	Step Size	Once every chip is programmed completely, it will update the next ID based on Step Size, which can be set as a negative value.
4	Current ID	1. When the Writer programs chips continuously, the SyncID is updated based on CurrentID other than InitID. 2. When the currently connected chip is the last one that is just programmed or it has exactly the same chip parameters as the last programmed one, this chip will not be programmed again, and the ID will displayed as the ID inside the chip. 3. It should be noted that the ID here is a decimal value, however it is displayed in Hex format on Writer LCD.
5	Max Count	It is used to limit the maximum programming times of this chip configuration.
6	Max Logic 1	In the automatic incremental Sync ID case, it is used to limit the number of maximum bit 1 contained in Sync ID.

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3.2.2 SOC Type Chip Configuration Downloading

With the SOC type of chips, CMT2180xA for instance, users need to import CMT218xA .exp file at first following the steps given in above Section, then the MCU setting window will pop up on WrtierConfig GUI as shown in the below figure.

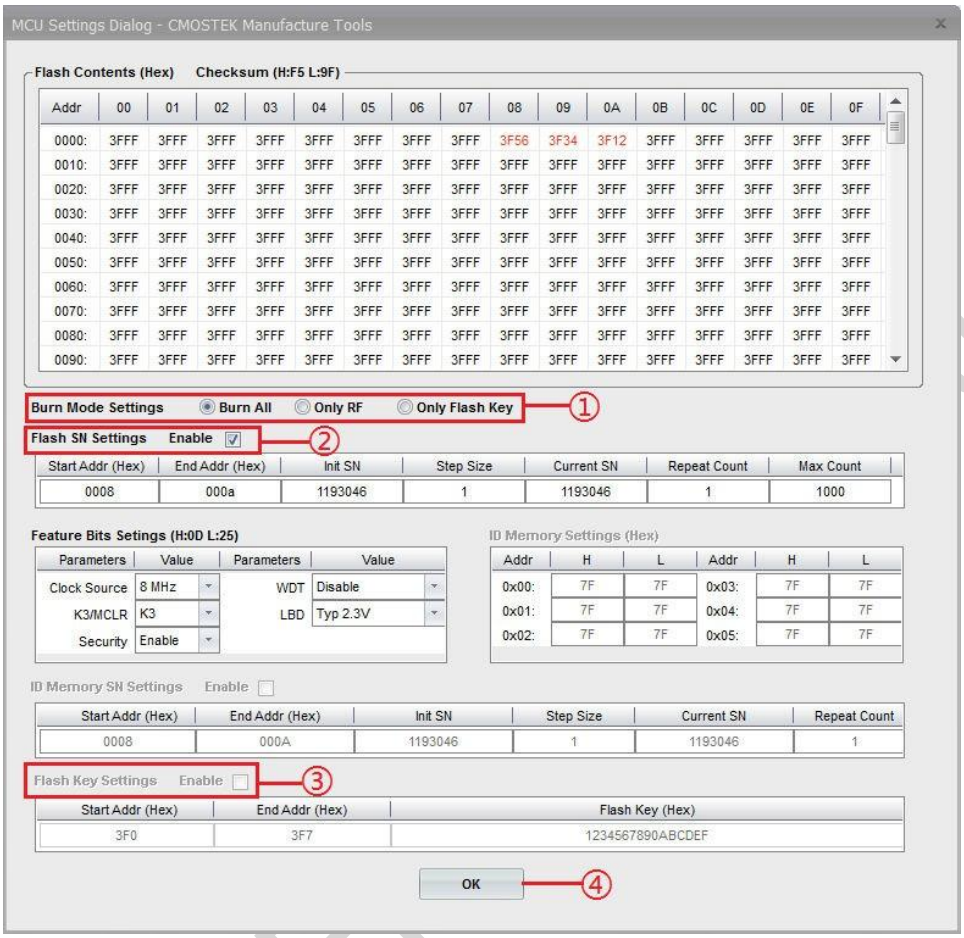

Figure 7. MCU Setting GUI for SOC Type Chip Configuration Downloading

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Table 11. WriterCongfig MCU Configuration Downloading Steps

No.	Name	Function Description
1	Burn Mode Settings	It has 3 programming mode options. Burn All: program both MCU Flash and RF parameters. Only RF: program RF parameters only. Only Flash Key: program Flash Key only.
2	Flash SN Settings	Configure ID related information in MCU Flash. Please refer to Table *SN Settings* for more details.
3	Flash Key Settings	Set MCU Flash Key.
4	OK	After users click *OK* button, it will close MCU Setting GUI and return to main GUI.
5	Download to Writer	On main GUI, download configuration parameters to the Writer.

4 Automatic Programming Machine Connection

The automatic programming machine sends *start* signal to initiate chip programming, then it checks the status signal *OK/busy/fail* responded by the Writer to control the further operation of the automatic machine, thus to fulfill automatic batch-mode programming. The settings and connection for A mode is as follows.

1) A mode settings

On WriterConfig GUI, tick on ☑Auto Machine Mode, then download configuration parameters to the Writer, then the Writer will program chips in A mode.

2) Automatic programming machine connection

The automatic programming machine is connected to the Writer 's control interface Comm through a cable, as shown in the below figure and table.

Figure 8. Writer Control Interface Comm

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Table 12. Programming Interface Description

Pin #	Pin Name	IO	Function Description	Connected Automatic Machine Pin
1	FAIL	O	Output failure indication, low active.	Fail
2	GND	GND	Ground	Gnd
3	BUSY	O	Indicate the Writer is busy, low active.	Busy
4	VEXT	I	External power supply input. It's the corresponding level value when UART TX outputs high level with a voltage range of 1.8 - 5 V.	-
5	OK	O	Successful indication, low active.	Ok
6	NC	-	Not connected.	-
7	START	I	The signal to trigger programming start, low level active. The low level lasting time should be more than 30 ms and less than 50 ms.	Start
8	TX	O	UART TX, output.	-
9	3.3V	O	3.3 V power supply output.	-
10	RX	I	UART RX, input.	-

5 Firmware Upgrading and Downgrading

Users can perform the Writer firmware upgrading or downgrading on WriterConfig GUI. Through firmware upgrading, the Writer firmware can be upgraded to the version matched with the latest published WriterConfig version. Through firmware downgrading, users can choose to downgrade the Writer firmware back to an appropriate workable lower version.

Before performing upgrading or downgrading, make sure the offline Writer is well connected with PC via a USB cable and the WriterConfig software GUI is opened and the main GUI shows.

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5.1 Firmware Upgrading

Upon WriterConfig startup, the Writer firmware is checked. If the current firmware version is lower than the WriterConfig version, the information as shown in the below figure will pop up to notify users of whether to upgrade Writer firmware. Users can click *OK* to perform Writer firmware upgrading or click *Cancel* to cancel the firmware upgrading as shown in the below figure.

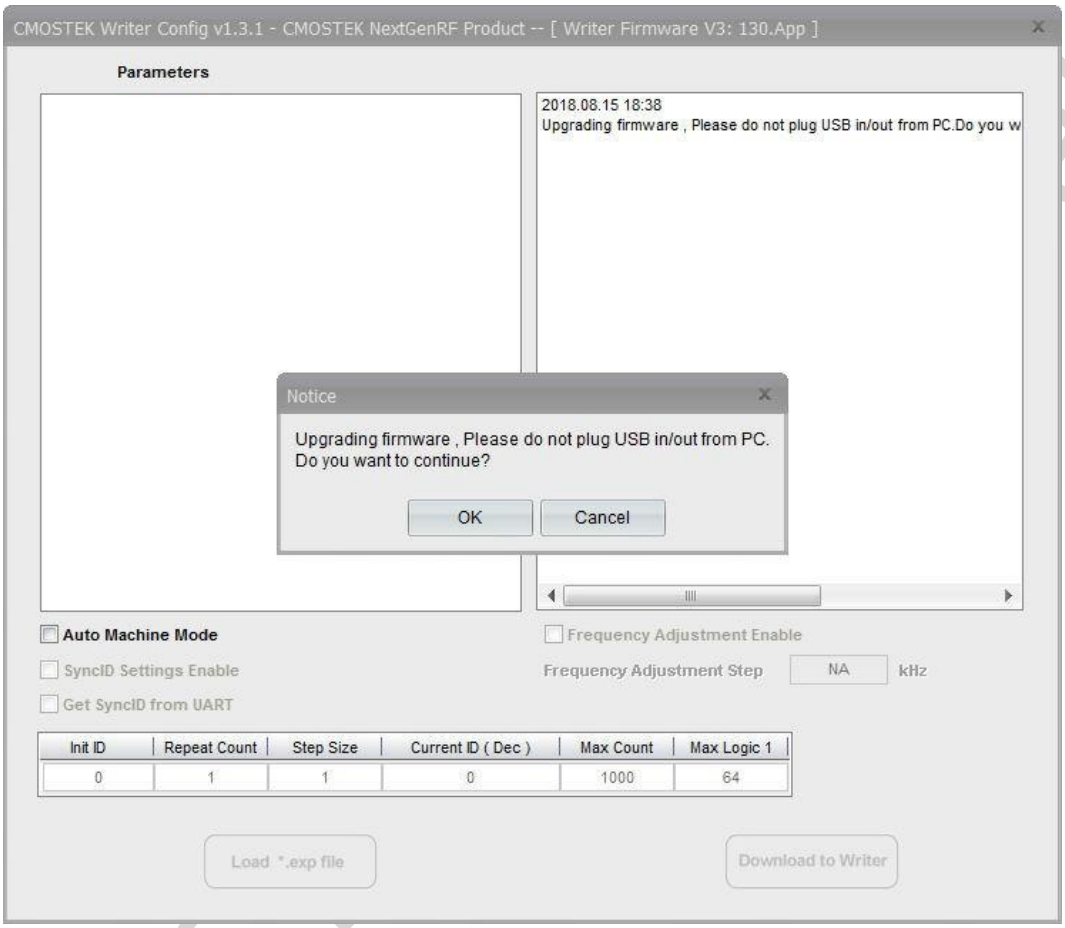

Figure 9. Upgrade Writer Firmware on WriterConfig GUI

5.2 Firmware Downgrading

Before downgrading, users need rename the target firmware file (in the WriterConfig installation folder with file name format as brn-Vx.y.z.32c) to *brn-V4.9.9.32c*. After then, restart WriterConfig software, the same information as that in firmware upgrading will pop up. Users can click *OK* to perform Writer firmware downgrading or click *Cancel* to cancel the firmware downgrading as shown in the below figure.

> Please pay attention that, due to internal design change, the target downgrading file name is updated to *brn-V**4**.9.9.32c* (originally the target downgrading file name is brn-V9.9.9.32c). For all COMSTEK offline Writer WriterConfig versions, users should change the target downgrading file name to *brn-V4.9.9.32c* to fulfill firmware downgrading.

In the firmware file name format brn-Vx.y.z.32c, x.y.z represents firmware version. For example, for brn-V1.3.0.32c, the firmware version is V1.3.0.

After downgrading, rename the file name brn-V**4**.9.9.32c back to the original file name to avoid repeated downgrading indication.

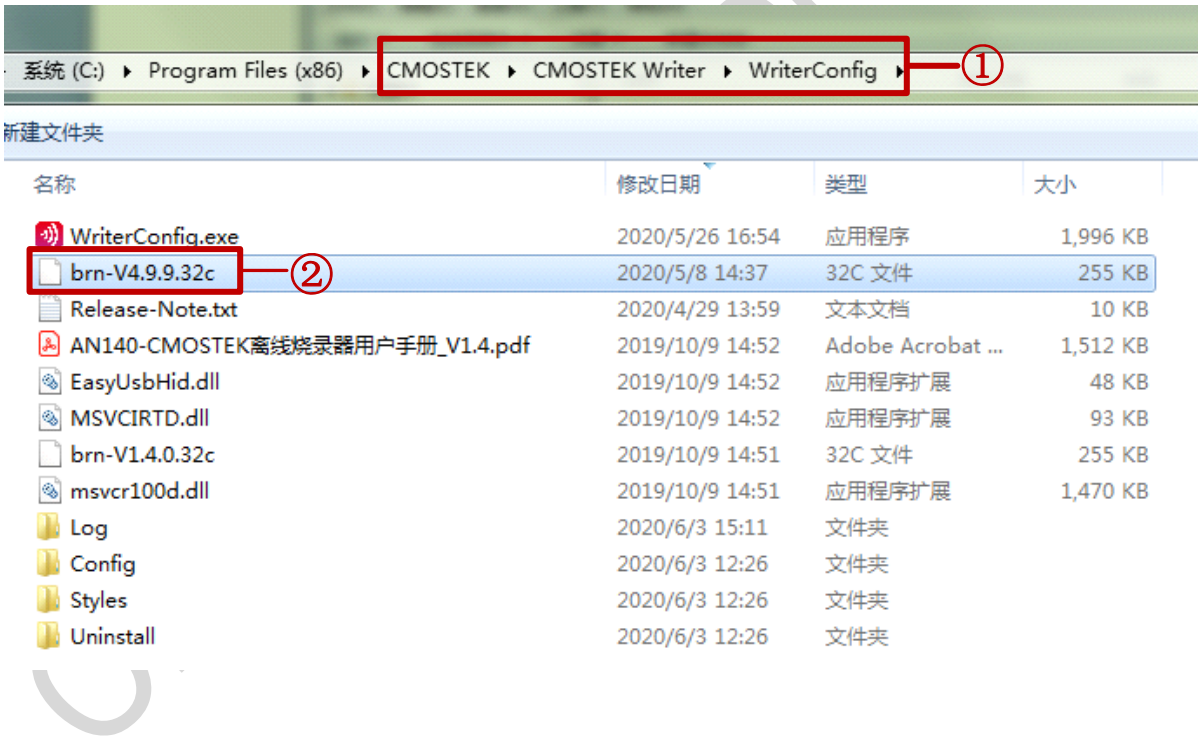

Figure 10. Downgrading Offline Writer Firmware

5.3 Handling of False Upgrading Across Different Writer Types

COMSTEK provides multiple types of offline Writers. These different types of Writers have different PC-side software name, firmware name, version number range and target downgrading file name as shown in the below table. When multiple types of Writer software entries have been installed on users' PC, users need to ensure opening the correct Writer software on PC according to offline Writer type.

Table 13. Multiple CMOSTEK Offline Writer Types

No.	Offline Writer Name	PC-side Software Name	PC-side Software Version Range	Target Downgrading File Name	Description
1	CMOSTEK offline Writer	CMOSTEK WriterConfig	V130 - V499	brn-V4.9.9.32c	Unified CMOSTEK offline Writer
2	CMT2380F32 offline Writer	CMT2380F32 WriterConfig	V100 - V129	brn-V1.2.9.32c	Offline Writer specific for CMT2380F32
3	CMT216xA offline Writer	CMT216xA WriterConfig	V500 - V599	brn-V5.9.9.32c	Offline Writer specific for CMT216xA series chips

When multiple types of Writer software entries have been installed on users' PC, it may occur false upgrading across different Writer types. For example, a user needs to open CMT2380F32 WriteConfig, however CMT216xA WriterConfig is opened by mistake. If it happens that the CMT216xA Writer firmware version is higher than the CMT2380F32 Writer firmware version, the information will pop up indicating users to upgrade firmware. If the user clicks *OK* in this case, a false upgrading will happen, which will impact normal Writer operations.

When false upgrading across different Writer types occurs, users can follow steps in below to restore the Writer back to the original normal state before the false upgrading.

1. Power on the correct Writer hardware through USB.
2. Close the wrong PC-side Writer software.
3. Select the target downgrading file and change to downgrading file name. The details are as below.

   Select the correct software icon on PC, right click->property->open file location, then it opens the target file folder. In the file folder, among the filenames with a format of brn-Vx.y.z.32c, select the file with the largest xyz value (namely the file with the largest version number). Rename this file name to the downgrading file name (for Unified Writer, the downgrading file name is brn-V4.9.9.32c; for CMT2380F32 Writer, it is brn-V1.2.9.32c; for CMT216xA Writer, it is brn-V5.9.9.32c. Please refer to the above Table 13 for more details).
4. Reopen the correct Writer software on PC, the window will pop up to indicate upgrading. Click *OK* and wait for upgrading being done. At this time, the falsely upgraded firmware has been restored to the original normal state.
5. Rename the file name in step 3 back to its original name to avoid the upgrading indication that pops out each time when the Writer software is opened.

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6 Operation Considerations

The Writer operation considerations are listed in the below table.

Table 14. CMOSTEK Offline Writer Operation Considerations

No.	Considerations
1	During WriterConfig downloading configuration data to the Writer, RFPDK cannot be opened. Otherwise it will cause Writer exception and configuration downloading error due to both RFPDK and WriterConfig occupying the same USB channel. During the Writer being connected with PC via USB cable, do not run both WriterConfig and RFPDK at the same time to avoid exceptions.
2	During programming, the Writer should not be connected to a PC on which the RFPDK or WriterConfig software is opened, otherwise it will cause the loss of SyncID.
3	If SyncID is needed during programming, in the case of low battery or battery being uninstalled but with no battery change in time, it will fail in saving SyncID in the Writer, thus resulting in SyncID loss upon next power-on.
4	Before changing the button cell, users must press *Save* button first to save the programming count value into the Flash, thus the programming count value can be restored from Flash upon next power-on. Moreover users should press *Save* button each time finishing programming to ensure programming counting reliability.
5	For CMT2180AP, CMT2180A and CMT2189A, it must use DC 9V1A to provide power supply for programming, since using USB cable to provide power may cause programming failure due to insufficient voltage.
6	For Writer V3.0, it should use WriterConfig V1.2.8 version. For Writer 3.1, it should use WriterConfig V1.3.0 or a higher version.

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7 FAQ

The frequently asked questions and answers of CMOSTEK Writer are listed in the below table.

Table 15. Frequently Asked Questions and Answers

No.	Exceptions	Causes and Solutions
1	LCD display one of the below items: *1. Low Battery, Pls Press SAVE key.* *2. Low Battery, Pls Replace Battery.* *3. No Battery, Pls Press SAVE key.* 4. *No Battery, Pls Replace Battery.*	**Cause:** no battery in the Writer or battery low. **Solution:** after press *Save* button, change the battery under the LCD to ensure the programming count can be saved. **Caution**: if SyncID (series no.) is needed in programming, in the case of low battery or battery being uninstalled but without battery change in time, it will fail in saving SyncID in the Writer, thus resulting in SyncID loss upon next power-on.
2	LCD displays a series of black blocks with no correct characters.	**Cause:** poor contact during power-up. **Solution:** power off for a while, then power on again. If it still has problem, please contact technical supporting.
3	LCD displays *CFG CHK ERR1 ….*	**Cause:** configuration data checksum error **Solution:** download configuration file again through WriterConfig.
4	During downloading configuration data, a window pops up WriterConfig GUI displaying: *Erase offline-data fail, please check the setup, or check the Offline-Writer version and try again.*	**Cause:** WriterConfig V1.2.8 cannot download configuration data to Writer V3.1. **Solution:** use WriterConfig V1.3.0 or higher version to work with Writer V 3.1.
5	During downloading configuration data, a window pops up WriterConfig GUI displaying: *The Writer Firmware version 128.App, should use Writer Config v1.2.8.*	**Cause:** WriterConfig V1.3.0 or higher version cannot download configuration data to Writer V3.0. **Solution:** use WriterConfig V1.2.8 to work with Writer V 3.0.
6	During downloading configuration data, a window pops up WriterConfig GUI displaying: *The versions of Writer Config and Offline-Writer do not match, please update the Writer Config version.* .	**Cause:** WriterConfig software version (version format Vx.y.z) and Writer firmware version (version format abc.App) are mismatched. **Solution:** use the latest WriterConfig software version or use the WriterConfig software version matched with the current Writer firmware version.
7	WriterConfig GUI responds very slow or freezes, such as refreshing only one line per second or even slower.	**Cause:** USB communication is abnormal. **Solution:** exit WriterConfig software, re-plug USB cable and then start WriterConfig software again. If it still has problem, please restart PC.

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8 FILE CRC Checksum Calculation Method

The FILE CRC checksum calculation method is shown in the below figure.

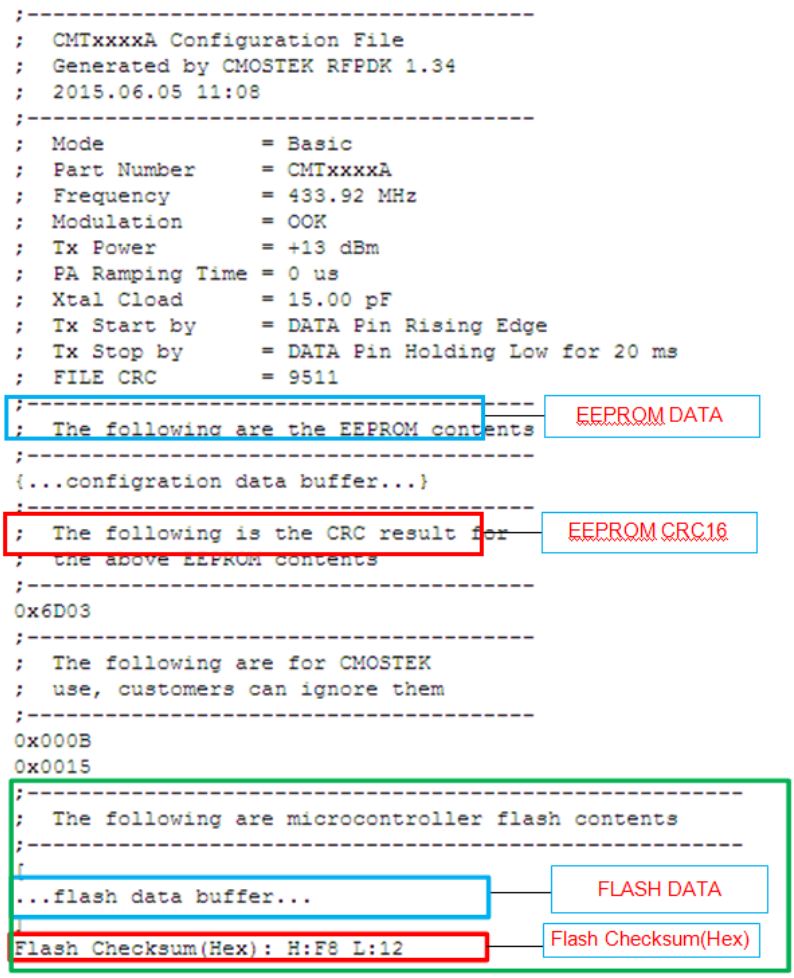

Figure 11. FILE CRC Checksum Calculation Example

FILE CRC = [EEPROM CRC16] XOR [Flash Checksum(Hex)]

Notes:

1. When the chip provides Flash, the information inside the green rectangle in above figure will be included in .exp file as shown in the above figure.

   Based on Flash Checksum(Hex): H:F8 L:12 , then,

   FILE CRC = [EEPROM CRC16] XOR [Flash Checksum(Hex)]

   = 0x6D03 XOR 0xF812

   = 0x951

2. When Flash is not provided in the chip, the information inside the green rectangle in above figure will not be included in .exp file. In this case, Flash Checksum(Hex) takes the value H:00 L:00, thus the FILE CRC result is the same as EEPROM CRC16 value.

9 Revise History

Table 16. Revise History Records

Version No.	Chapter	Description	Date
0.6	All	Initial version	2015-04-12
0.7	All	Update Offline-Writer V3 operation flow	2017-04-24
1.2	All	1. Add 2 supported chip types CMT2157L and CMT2217LH 2. Update information on new button support, interface and ID saving upon power off.	2018-9-13
1.3	6,7	Add Sections Operation Considerations and FAQ.	2018-10-26
1.4	Overview 5.2 5.3	1. Table 1, change CMT2157B to CMT215xB. 2. Change downgrading file name from xx9.9.9 to xx4.9.9. Add user notification for downloading operation change, namely it needs to change the target downloading file name to brn-V**4**.9.9.32c rather than brn-V**9**.9.9.32c. 3. Add information on the handling of false upgrading across multiple Writer types.	2020-06-03

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10 Contacts

CMOSTEK Microelectronics Co., Ltd. Shenzhen Branch
Address: 30th floor of 8th Building, C Zone, Vanke Cloud City, Xili Sub-district, Nanshan, Shenzhen, GD, P.R. China

Tel: +86-755-83231427
Post Code: 518055
Sales: sales@cmostek.com
Supports: support@cmostek.com
Website: www.cmostek.com

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