



Gowin FPGA Sixteen JTAG Interfaces Offline Programmer

User Guide

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Contents

Contents	i
List of Figures	ii
List of Tables.....	iii
1 About This Guide	1
1.1 Purpose	1
1.2 Supported Products	1
1.3 Related Documents	1
1.4 Terminology and Abbreviation	2
1.5 Support and Feedback	2
2 FPGA Sixteen JTAG Interfaces Offline Programmer Instructions	3
2.1 Overview	3
2.2 Offline Programmer Instructions	3
2.2.1 Software Download and Driver Installation	3
2.2.2 Configuration Interface	4
2.2.3 Configure to Programmer	5
2.2.4 Password	6
2.2.5 Program Sixteen FPGA devices Simultaneously	10
2.3 Programmer Interface Connection Diagram and vcc1/2 Description	11
2.3.1 Programmer Interface Connection Diagram	11
2.3.2 Vcc1/2 Power Supply Driver Strength	11
2.4 Instructions of FPGA Offline Programmer Firmware Update	12
2.5 Notes	13
2.6 Main features are as follows:	13
2.7 Specification and Parameter	14
2.8 Error code and Troubleshooting	14

List of Figures

Figure 2-1 Driver Installed Information	4
Figure 2-2 Software Configuration Interface	4
Figure 2-3 Software Configuration Interface	6
Figure 2-4 Password Change Interface	7
Figure 2-5 Password Change Completion Interface	8
Figure 2-6 Password Configuration Interface	9
Figure 2-7 Programmer Exterior	10
Figure 2-8 Programmer Interface Connection Diagram.....	11
Figure 2-9 Firmware Update	12
Figure 2-10 Interface Parameters	14

List of Tables

Table 1-1 Abbreviations and Terminology	2
Table 2-1 vcc1/2 Power Supply Driving Capability	11
Table 2-2 Firmware and Matched Programmer Type	13
Table 2-3 Programming Time.....	13
Table 2-4 vcc1/2 Power Supply Driving Capability Reference	14
Table 2-5 Error Code Corresponding to the Fault Information.....	15

1 About This Guide

1.1 Purpose

This guide includes two parts:

1. How to use FPGA offline programmer;
2. The function, specification and parameter of programmer.

1.2 Supported Products

This manual is suitable for sixteen JTAG interfaces offline programmer OP901-16 type.

The programmer in the guide applies to the following products:

GW1N-1, GW1N-2, GW1N-4, GW1NR-4, GW1N-9, GW1NR-9, GW1NZ and GW1N-1S.

1.3 Related Documents

The latest user guides are available on our Website. Please refer to the related documents at www.gowinsemi.com:

1. [UG107](#), GW1N-1 Pinout
2. [UG105](#), GW1N-2&2B&4&4B Pinout
3. [UG114](#), GW1N-6&9 Pinout
4. [DS117](#), GW1NR series FPGA Products Data Sheet
5. [UG116](#), GW1NR-4&4B Pinout
6. [UG801](#), GW1NR-9 Pinout
7. [DS841](#), GW1NZ series FPGA Products Data Sheet
8. [UG842](#), GW1NZ-1 Pinout

1.4 Terminology and Abbreviation

The terminology and abbreviations used in this manual are as shown in below Table 1-1.

Table 1-1 Abbreviations and Terminology

Terminology and Abbreviation	Meaning
DFU	Device Firmware Upgrade
FPGA	Field Programmable Gate Array
JTAG	Joint Test Action Group
ID	Identification

1.5 Support and Feedback

Gowin Semiconductor provides customers with comprehensive technical support. If you have any questions, comments, or suggestions, please feel free to contact us directly by the following ways.

Website: www.gowinsemi.com

E-mail: support@gowinsemi.com

+Tel: +86 755 8262 0391

2 FPGA Sixteen JTAG Interfaces Offline Programmer Instructions

2.1 Overview

Offline programmer is a device that offline programs GW1N(R) chips. It has the features of data confidentiality, portability, multi-path programming, etc. It is suitable for rapidly large-volume production at the factory and is convenient for maintenance personnel to carry out. The offline programmer can simultaneously program sixteen FPGA devices, which greatly increases the mass production rate.

The offline programmer encrypts and saves the data using an AES-128 advanced encryption algorithm, and the key is saved after several times of encrypting. AES is a set of internationally recognized, commonly used and secure encryption standards that ensure securely delivering data.

2.2 Offline Programmer Instructions

The offline programmer can be configured and managed using the offline programmer software, such as data stream file management, upper programmer count management, and writer firmware update. The software supports Windows 7 and above operating systems. After configuration, the offline programmer can be used to connect to the FPGA to program.

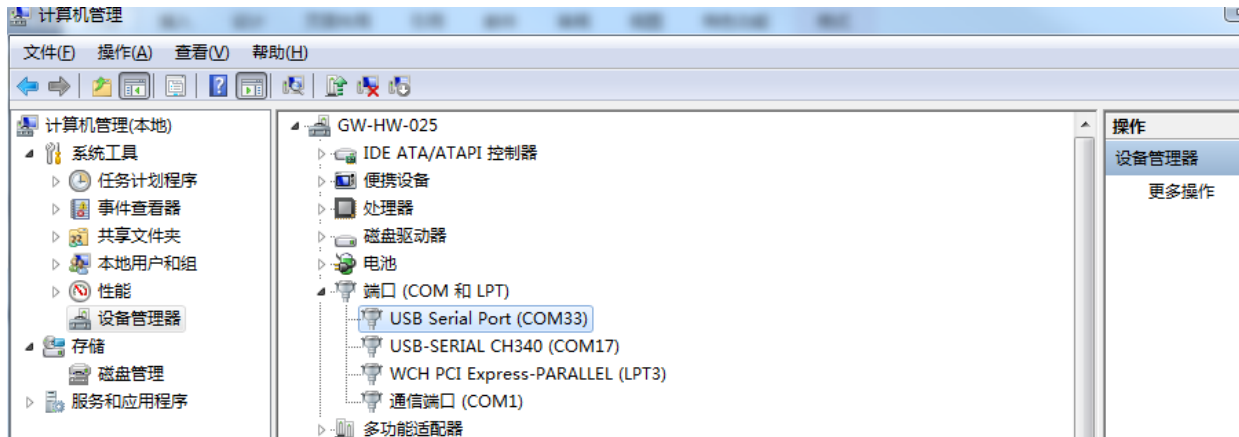
2.2.1 Software Download and Driver Installation

The software and driver package can be downloaded at Gowin website: https://www.gowinsemi.com/en/support/devkits_detail/7/; Or contact the local office or technical support center. Install the driver and the path is driver/ gowin_usb_driver.exe. After installation, use USB cable to connect the programmer and computer, and USB Serial Port (COMxx) appears on the port, that is, the driver is installed successfully.

Note!

If the user has used Gowin USB programming download cable before, it does not need to install the driver

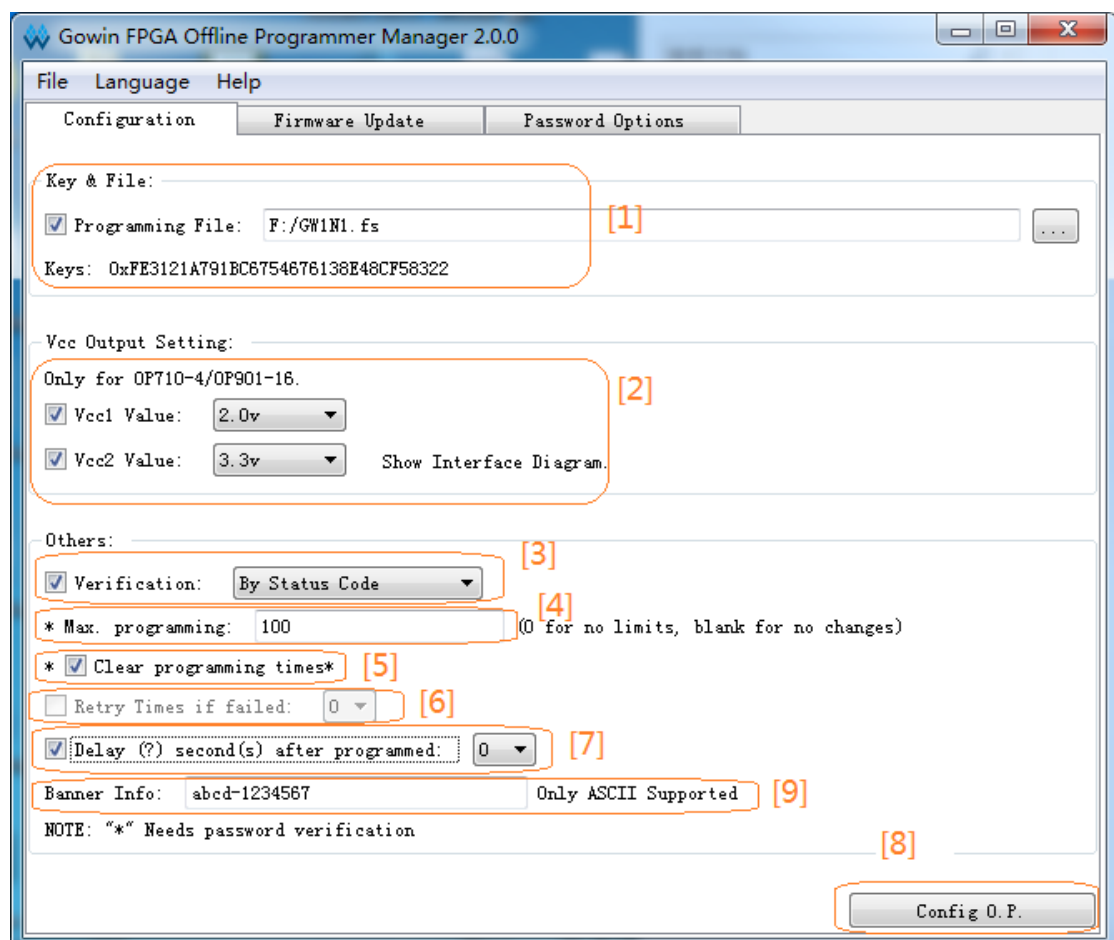
Figure 2-1 Driver Installed Information



2.2.2 Configuration Interface

OPmanager.exe is the associated software in the "bin" directory. Open OPmanager.exe, and the configuration options are as follows:

Figure 2-2 Software Configuration Interface



1. Programming File: The selected one is GW1N1.fs. Open the management tool and generate the key randomly, encrypt the data stream files and store them in the programmer.
2. Vcc1 voltage is set as 1.2v; Vcc2 is set as 3.3v. The supported voltages are: 1.0v, 1.2v, 1.5v, 1.8v, 2.0v, 2.5v, 3.3v.
3. Verification: Options are status code, read-back, or no verification.

Note!

- Status code: Determine whether the programming is successful or not according to the status code read from the FPGA after finishing programming data stream files;
 - Read-back: Determine whether the programming is successful or not according to the consistency of writing and reading after finishing programming data stream files;
 - No verification, that is, only prompts the completion of programming.
4. The max. programming times: If it sets 100, "programming times : Error" will pop up on the LCD of the offline programmer if the programming times are greater than 100. This is valid only if the password is configured correctly.
 5. Clear programming times: Clear programming times, which is valid with password configuration.
 6. Retry times if failed: Retry x times automatically if failed, and error will be reported if x times failed

Note!

Settings are not supported for the time being

7. Delay after programmed: Delay x seconds after programmed, indicating the result of programming.
8. Configure to programmer: Configure the checked information items to programmer.
9. Customized information: Any entering customized character will be displayed on the programmer screen after configuration.

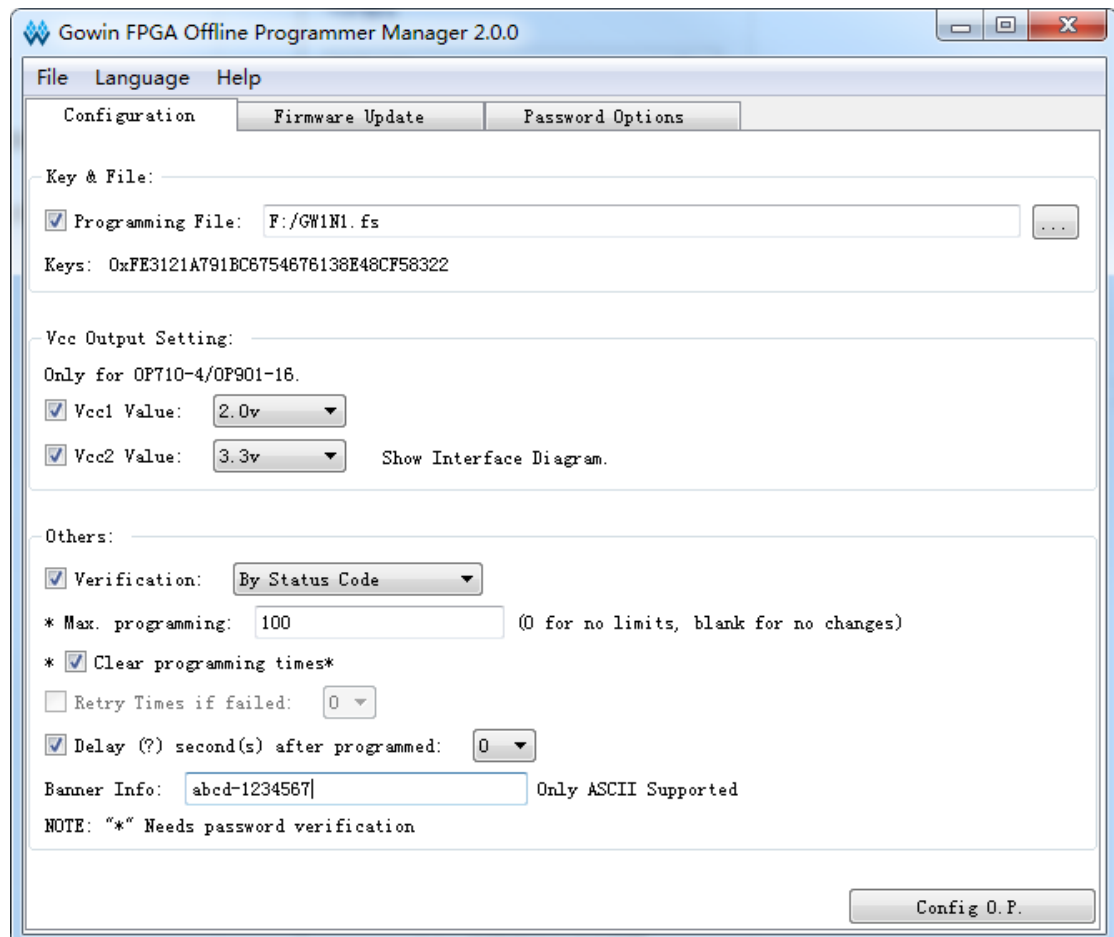
2.2.3 Configure to Programmer

The associated software is required to configure the programmer. Open the OPManager.exe software to configure it, as shown in Figure 2-3. The configuration steps are as follows:

1. Select data stream file (Only supports FS format at present).
2. The voltage of vcc1 is 2.0v and vcc2 is 3.3v.
3. Verification selection: Select according to the status code.
4. Set the max. programming times or leave it blank.
5. Click the "Configure to Programmer" button.
6. Reboot the programmer after configuration.

Note!

For the item with *, it needs correct password check to configure to the programmer. If the password is not correct, it will show that the password check fails, but the configuration of other items to the programmer will not be affected

Figure 2-3 Software Configuration Interface

2.2.4 Password

Configure the max. programming times and clear programming times, it needs to enter the password of the current offline programmer and update it to the local before configuring to the programmer. If the password is incorrect, there is no permission to configure the max. programming times and clear programming times. For the first time to use, steps are as follows:

1. When the new offline programmer is first used, the default factory password is 00000000.
2. Enter the original password 00000000, then enter the new password 12345678, confirm the password 12345678.

Note!

The new password can be set to any 8 digits

3. Click Change to change the password of the offline programmer.
4. Click Update Local Password to obtain permission: It can set the max. programming times and clear the programming times.

A password has been set for the programmer. The steps are as follows:

1. Enter the password of the programmer, such as: 11111111, click Update Local Password.
2. Configure the max. programming times and clear programming times.
3. If the password is incorrect, the max. programming times and clearing programming times can not be configured. And other configuration items are not affected.

Figure 2-4 Password Change Interface

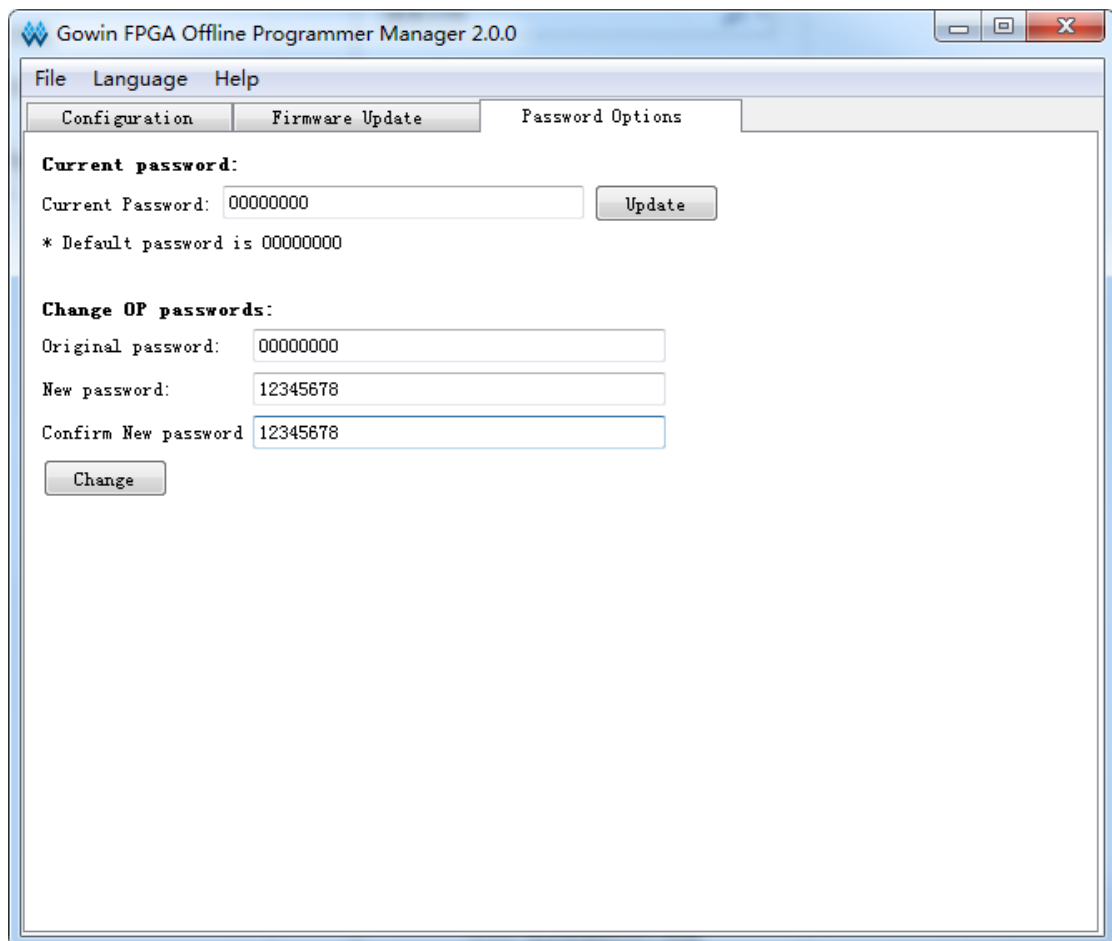


Figure 2-5 Password Change Completion Interface

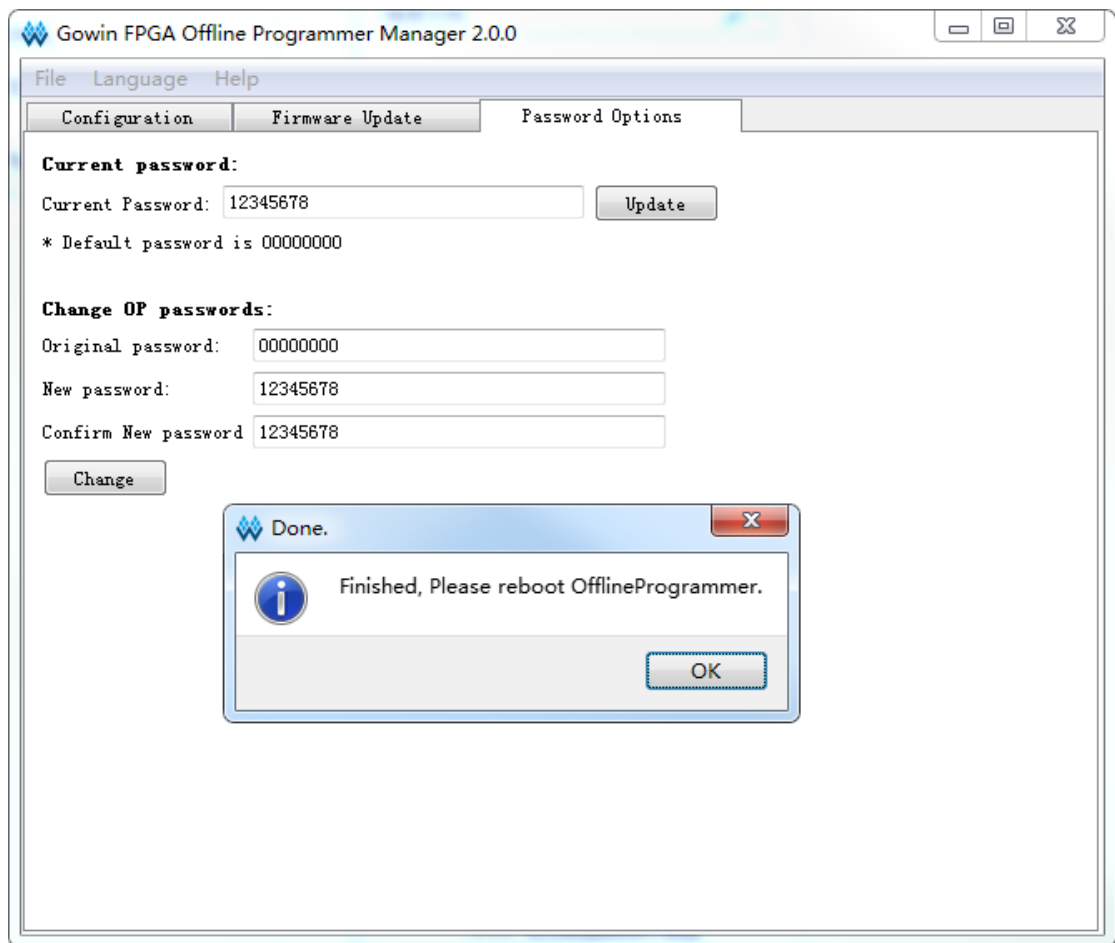
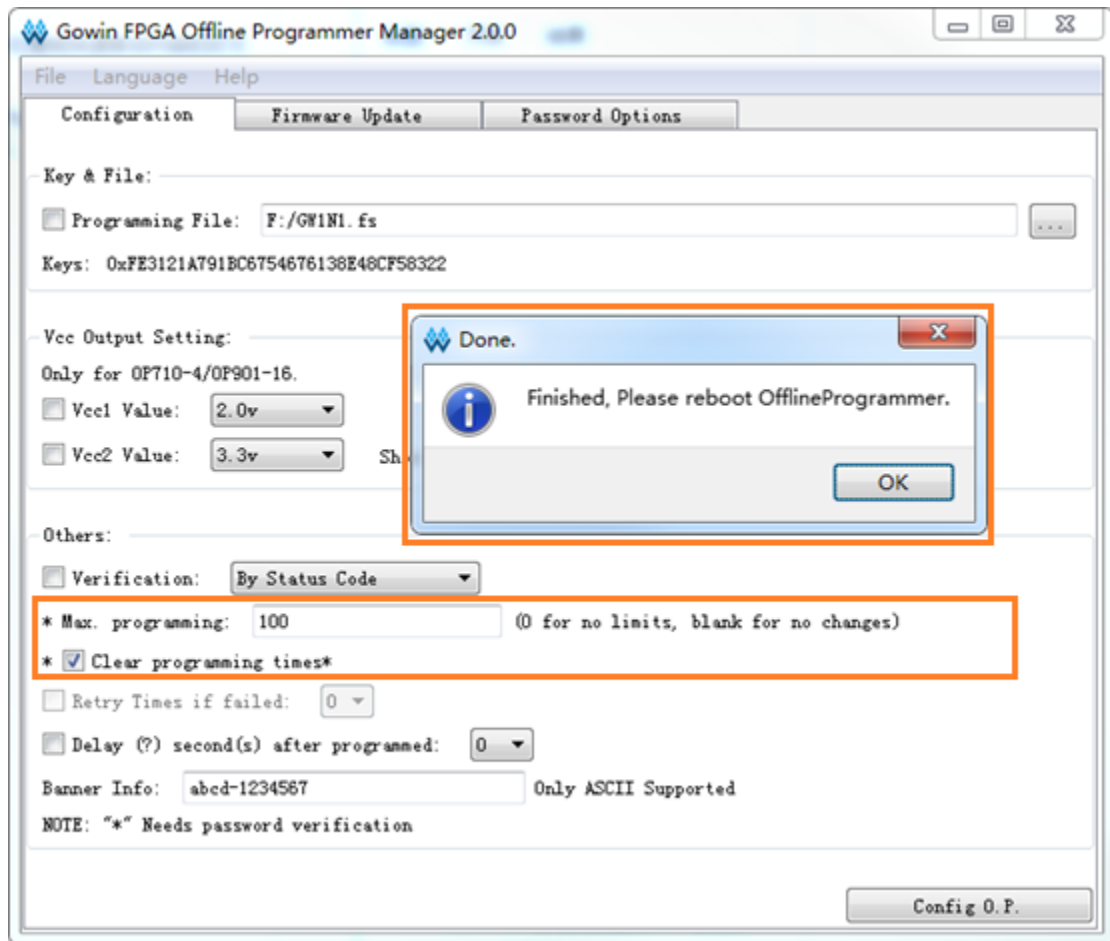


Figure 2-6 Password Configuration Interface



2.2.5 Program Sixteen FPGA devices Simultaneously

Figure 2-7 Programmer Exterior



Operation steps of programing sixteen FPGA devices simultaneously are as follows:

1. Programmer power supply

Note!

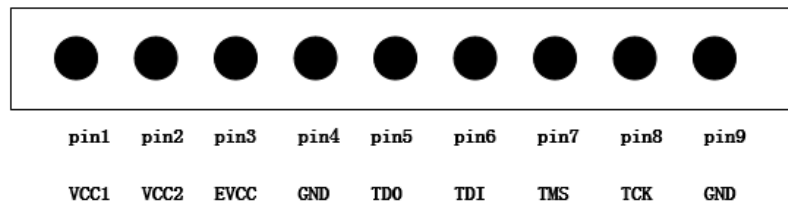
Support USB power supply or 5V power supply;

2. Connect sixteen FPGAs to the programmer;
3. Press the Program key, the screen displays detecting the device and the corresponding ID CODE is displayed after the device is detected. The buzzer will beep after the programming is done successfully.

2.3 Programmer Interface Connection Diagram and Vcc1/2 Description

2.3.1 Programmer Interface Connection Diagram

Figure 2-8 Programmer Interface Connection Diagram



Note!

- 3.3V is the voltage outputting to the FPGA device.
- The pin pitch is 2.54mm.
- The output voltage of VCC1 and VCC2 can be 1.0 v, 1.2v, 1.5v, 1.8v, 2.5v, and 3.3v.
- EVCC is the input voltage, which is the VCCIO voltage of the FPGA chip and should be consistent with the bank voltage of JTAG IO.

2.3.2 Vcc1/2 Power Supply Driver Strength

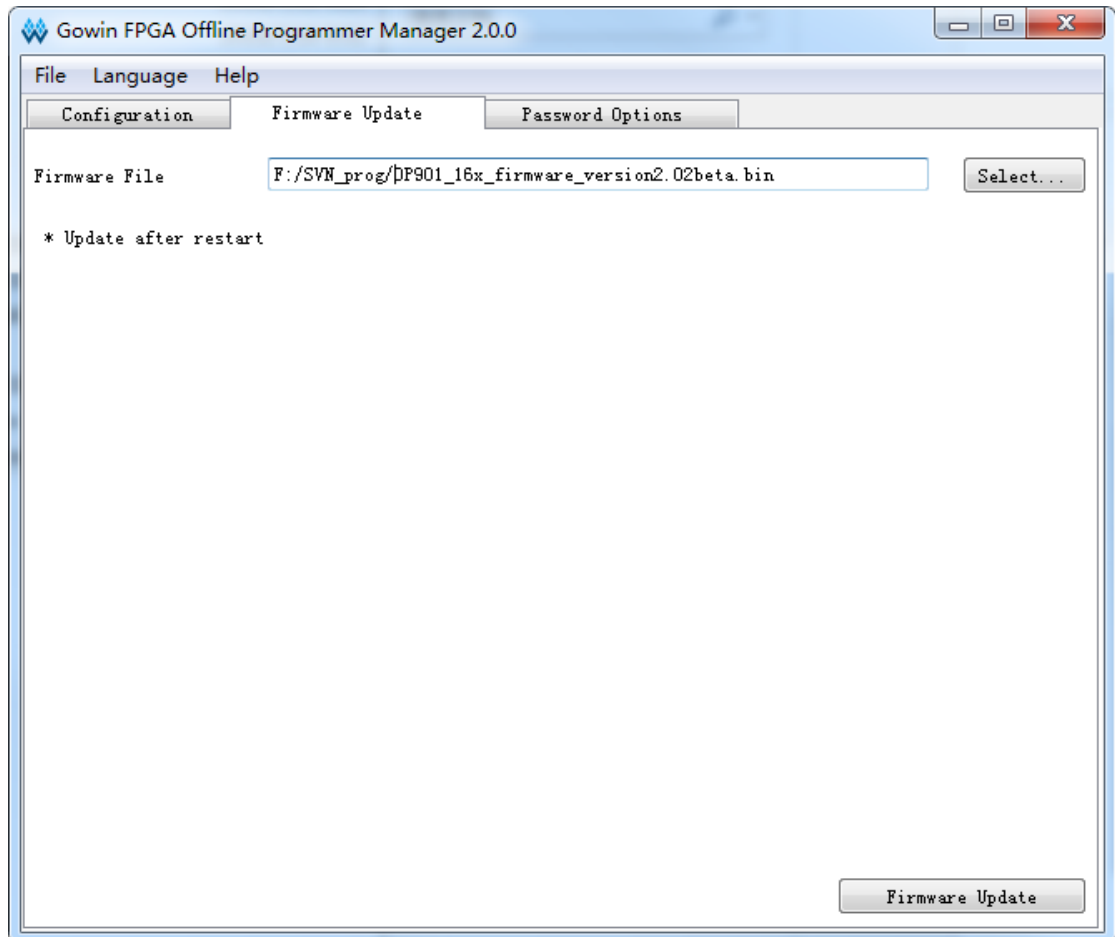
Vcc1/2 power supply driver strength is shown in Table 2-1.

Table 2-1 vcc1/2 Power Supply Driving Capability

	Voltage Configuration (V)	Max.output current (A)
Vcc1	1.000	0.240
Vcc2	1.000	0.240
Vcc1	1.800	0.240
Vcc2	1.800	0.240
Vcc1	2.500	0.210
Vcc2	2.500	0.210
Vcc1	3.300	0.090
Vcc2	3.300	0.090

2.4 Instructions of FPGA Offline Programmer Firmware Update

Figure 2-9 Firmware Update



The firmware update steps are shown below.

Note!

Firmware update is to update the offline programmer so that the latest features can be used

1. Connect the programmer to the PC using a USB cable.
2. Select the firmware to update, such as op901_16xversion1.x.bin,
3. Click the firmware update, wait for the prompt box to restart the device, and restart the offline programmer to complete the update.
4. The obtaining address of the latest firmware:

https://www.gowinsemi.com/en/support/devkits_detail/7/

Note!

The firmware to download should match the offline programmer

Table 2-2 Firmware and Matched Programmer Type

Firmware Name	Matched Programmer Type
OP710_4x_firmware_version1.9x.bin	OP710-4 (Blue Shell)
OP720_4x_firmware_version2.0x.bin	OP720-4 (Balck Shell)
OP901_16x_firmware_version2.0x.bin	OP901-16

2.5 Notes

1. If the firmware is updated with mismatched firmware, resulting in abnormal programmer, it needs to follow the following steps to repair:
 - a). The programmer powers off and shuts down;
 - b). Press the programming button to start, the buzzer will beep;
 - c). Select the correct firmware and re-update.
2. When multiple devices are programed simultaneously, only the same series of devices are supported. For example, all the GW1N-1 devices or all the GW1N-4 devices.
3. The data stream file is configured to the offline programmer. Select the FPGA to be programmed according to the screen prompt: "currently support: GW1N1.fs(R)-x", to avoid other damage to the FPGA.

2.6 Main features are as follows:

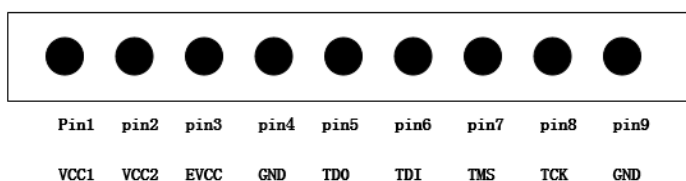
- Power Supply
 - Working voltage: DC5V±10%
 - Power: 1.75W
 - Maximum working power: 6.3w
- Memory
 - Internal memory: 8MByte
- Reference time of programming

Table 2-3 Programming Time

Chip Type Supported	Programming Time (ms)
GW1N-1	5312
GW1N-2	5312
GW1N(R)-4	5312
GW1N(R)-9	6278
GW1NZ	4600
GW1NS-2	4500

Note!

- In JTAG mode, the data can be programmed into the internal flash of the FPGA.
- Programming time is the total time of erasing the internal flash and successfully program the stream file into the FPGA internal flash. Program one FPGA and program four FPGAs requires the same time.
- Supporting devices
GW1N(R)-1, GW1N(R)-2, GW1N(R)-4, GW1N(R)-4B, GW1N(R)-6, GW1N(R)-9, GW1NZ and GW1N-1S.
- Interface Parameters

Figure 2-10 Interface Parameters

- The pin pitch is 2.54mm.
- The output voltage of VCC1 and VCC2 can be 1.0 v, 1.2 v, 1.5 v, 1.8 v, 2.5 v, 3.3 v.
- vcc1/2 power supply driver strength reference

Table 2-4 vcc1/2 Power Supply Driving Capability Reference

	Voltage Configuration (V)	The max.output current (A)
vcc1	1.000	0.240
vcc2	1.000	0.240
vcc1	1.800	0.240
vcc2	1.800	0.240
vcc1	2.500	0.210
vcc2	2.500	0.210
vcc1	3.300	0.090
vcc2	3.300	0.090

2.7 Specification and Parameter

- Working environment: 0-60 °C
- Host: 205*180*35mm
- Screen: distinguishability (320*240) size (32mm*38mm)
- Net weight: 800g.

2.8 Error code and Troubleshooting

After programming or if programming is successful, it will prompt: Programmed successfully and displayed STA :0x1f020 or STA :0x3f020. If the device is abnormal, an error code will be reported, and the the error

code corresponding to the fault information are as follows .

Table 2-5 Error Code Corresponding to the Fault Information

Error	Fault Inforamtion	Troubleshooting
E01	POR error	
E02	GoWin VLD error	
E03	Device error	Detects whether the access device
E04	No access device	Check whether the device is
E05	Data stream file failed to open	Reconfigure the data stream file to
E06	Programming failure	Re - programming, retry 3 times
E07	The programming is completed	JTAG reuse, read back information

