



TimeFlash 2 Programmer User's Guide

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a “DS” number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is “DSXXXXXXA”, where “XXXXXX” is the document number and “A” is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the TimeFlash 2 Kit. Items discussed in this chapter include:

- [Document Layout](#)
- [Conventions Used in this Guide](#)
- [The Microchip Website](#)
- [Customer Support](#)
- [Document Revision History](#)

DOCUMENT LAYOUT

This document describes how to use the TimeFlash 2 Kit to program a MEMS oscillator device. The manual layout is as follows:

- **Chapter 1. “TimeFlash 2 Kit”** – Provides important information about the TimeFlash 2 Kit.
- **Chapter 2. “Software”** – Provides information on installing the TimeFlash 2 Kit.
- **Chapter 3. “TimeFlash 2 Features”** – Provides information about using the TimeFlash 2 GUI.
- **Appendix A. “Messages”** – Provides information about the three types of messages provided by the TimeFlash 2 interface.

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CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	<i>MPLAB® IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	<u><i>File>Save</i></u>
Bold characters	A dialog button	Click OK
	A tab	Click the Power tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	#define START
	Filenames	autoexec.bat
	File paths	c:\mcc18\h
	Keywords	_asm, _endasm, static
	Command-line options	-Opa+, -Opa-
	Bit values	0, 1
	Constants	0xFF, 'A'
Italic Courier New	A variable argument	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets []	Optional arguments	mcc18 [options] <i>file</i> [options]
Curly brackets and pipe character: { }	Choice of mutually exclusive arguments; an OR selection	errorlevel {0 1}
Ellipses...	Replaces repeated text	var_name [, var_name...]
	Represents code supplied by user	void main (void) { ... }

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- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, on-line discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: <http://support.microchip.com>.

DOCUMENT REVISION HISTORY

Revision A (June 2017)

- Converted Micrel version of the TimeFlash 2 Kit guide to Microchip user guide DS50002646A.

Revision B (August 2017)

- Updated image used in Figure 1-1.

Revision C (January 2018)

- Added [Chapter 3. "TimeFlash 2 Features"](#).

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Chapter 1. TimeFlash 2 Kit

1.1 INTRODUCTION

This is the operation manual for the Microchip TimeFlash 2 product.

1.2 KIT CONTENTS

The Microchip TimeFlash 2 kit consists of the following items:

- TimeFlash 2 Programmer
- USB Cable
- Anti-Static Tweezers
- Socket Daughter Cards



FIGURE 1-1: TimeFlash 2 Kit.

1.3 FUNCTIONS

The Microchip TimeFlash 2 programmer provides the following functions:

- Identify a Device
- Program the Microchip Family of MEMS Oscillators Either Through the GUI Options or by Importing a Configuration File
- Measure the Frequency of a Programmed Part
- Measure the Supply Current of a Programmed Part
- Log the Data History for Each Program and Measurement

Socket Daughter Cards (SDCs) are required for programming oscillators with the Microchip TimeFlash 2 programmer. The SDCs accommodate each of the six standard form factors (plus two additional SDCs for 14-pin and 20-pin devices) by simply providing a PCB extension to the programmer. For added convenience, the socket size is designated at the top of each card.

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Chapter 2. Software

2.1 PERSONAL COMPUTER REQUIREMENTS

The installation of the TimeFlash 2 software on a personal computer requires at least the following resources:

- **Operating System:** Windows 7, Windows 8.1, Windows 10.
- **Memory:** A minimum of 512 MB of available RAM.
- **Hard Disk Storage:** 16 MB of HDD storage space must be available for permanent use by TimeFlash 2.
- **CPU Speed:** 1 GHz CPU is recommended.
- **I/O Ports:** A single USB 2.0 port is required along with Internet access.
- **Screen Resolution:** A minimum screen resolution of 1024 x 768 is recommended.

2.2 SOFTWARE INSTALLATION PROCEDURE

There are two ways to download the TimeFlash 2 GUI:

1. Use the Microchip website and download the GUI's `setup.exe` file from the Software tab at <http://www.microchip.com/promo/timeflash>. This installation method ensures that the latest GUI revision is installed.
2. The TimeFlash 2 GUI installation file is also stored on the programmer's internal flash memory. Connect the TimeFlash 2 programmer to the computer via the USB cable, then locate the flash drive via the computer's file explorer (see [Figure 2-1](#)).

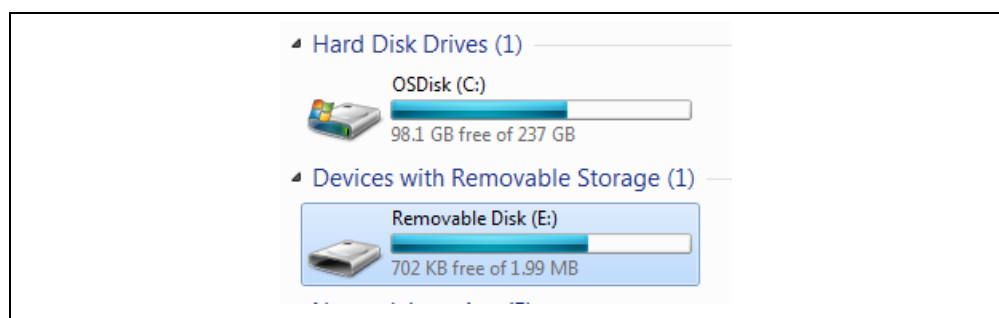


FIGURE 2-1: TimeFlash 2 Internal Flash Memory Access.

Regardless of how `setup.exe` is accessed, double click on it to begin installation. The screenshots found in [Figure 2-2](#) through [Figure 2-5](#) will appear in sequence. Just follow the steps as indicated by each figure.

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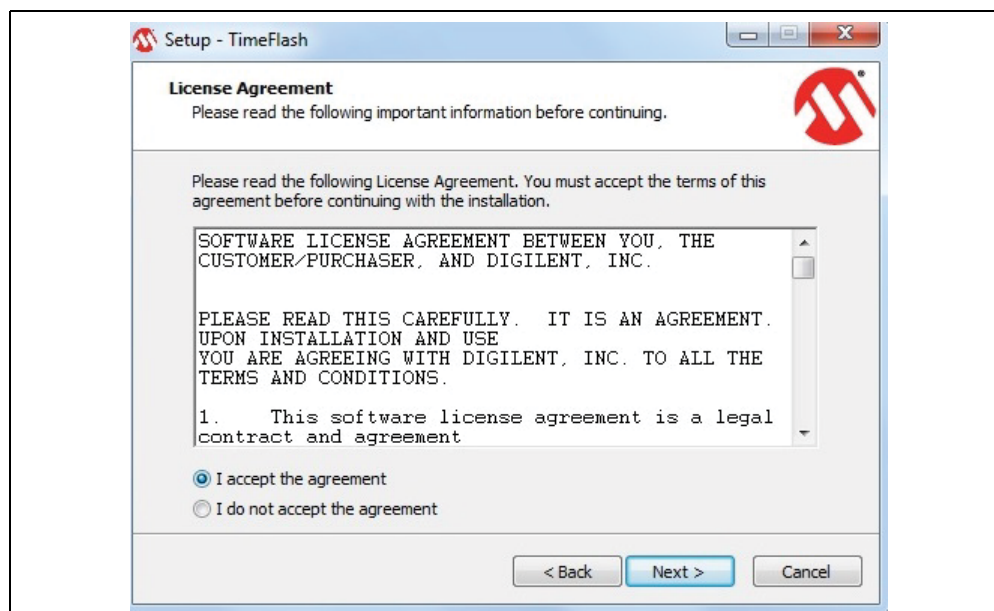


FIGURE 2-2: License Agreement. Accept the Agreement and Click **Next**.

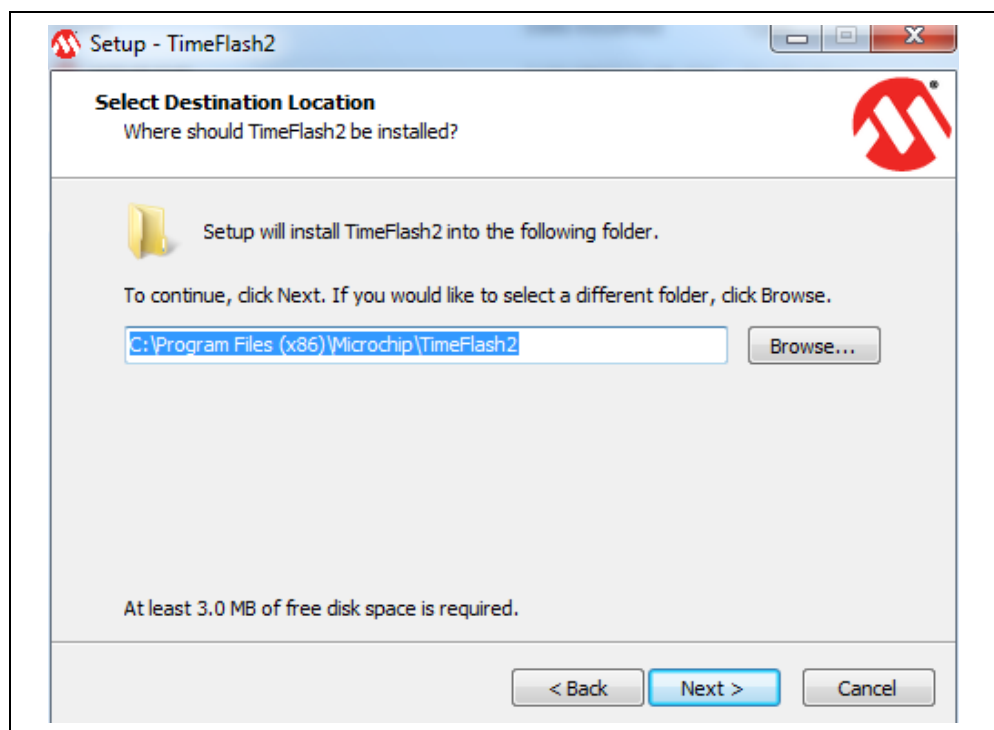


FIGURE 2-3: Select the Destination Folder, then Click **Next**.

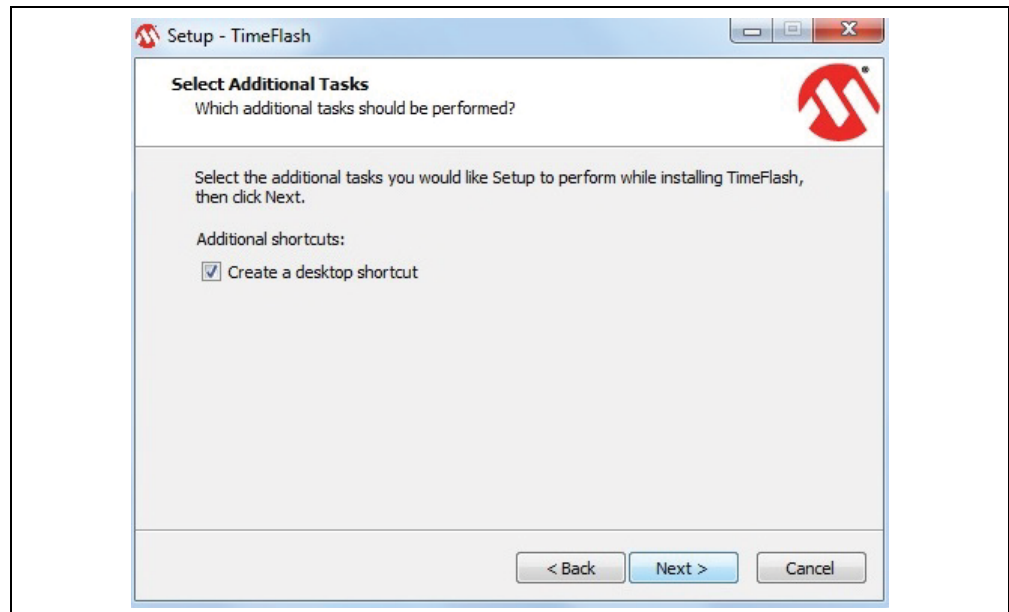


FIGURE 2-4: *Create Desktop Shortcut, if Desired, and Click **Next**.*

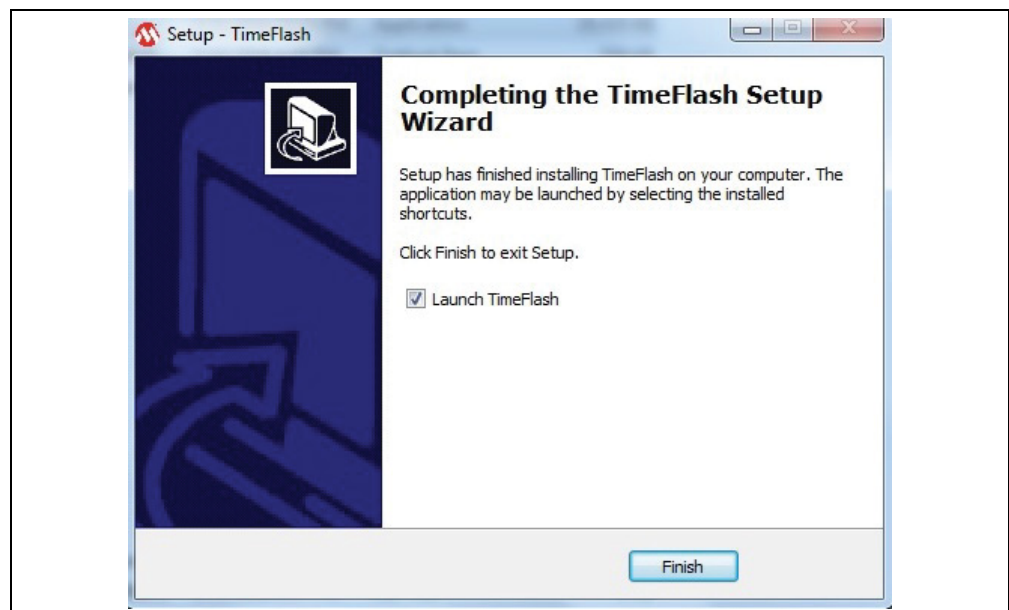


FIGURE 2-5: *Installation Complete.*

Once the installation has completed, click **Finish** and the TimeFlash 2 GUI will launch.

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Chapter 3. TimeFlash 2 Features

3.1 LAUNCHING THE GUI

After installing the TimeFlash control software, execute the following steps to launch the application.

Navigate to the installation location of the program `Timeflash2.exe` and then double click on the icon. For convenience, a shortcut of this icon in the Start Menu will ease continued use of the software. Initially, the TimeFlash 2 application will display a logo with a transparent background (see [Figure 3-1](#)) as a Windows screen while the application launches.



FIGURE 3-1: TimeFlash 2 Logo Screen.

When the software has loaded, the following screen will appear.

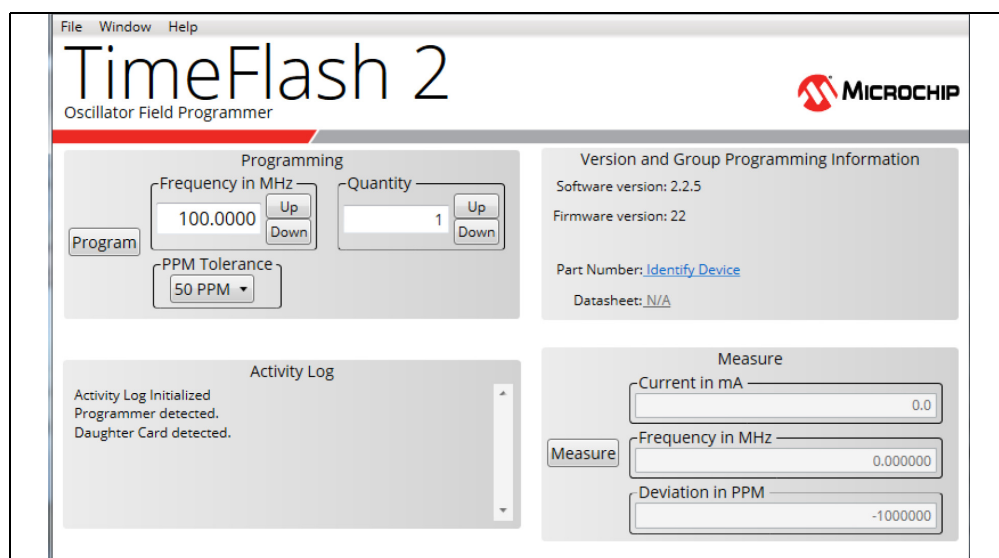


FIGURE 3-2: TimeFlash 2 GUI.

The Version Information pane displays the following information (see [Figure 3-3](#)):

Software Version **[G]** is the version of TimeFlash software that is running on the computer. The most up-to-date version is available at www.microchip.com/timeflash.

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Firmware Version **[F]** is the version of the control software that is currently running in the TimeFlash 2 programming module. If the module is not attached, then this field will be blank.

The Part Number **[E]** is the field that indicates the part number and package size of the blank component currently inserted in the Socket Daughter Card. This field, when clicked, will identify the device.

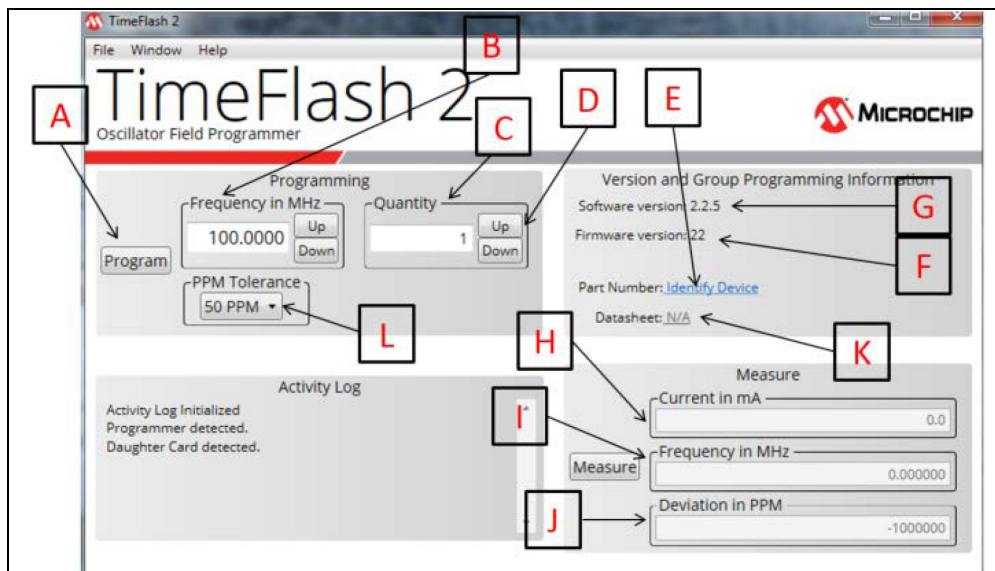


FIGURE 3-3: TimeFlash 2 GUI Features.

The items indicated in this figure will be referred to in the format of **[*]** throughout this document to reference their locations on this screen. For example, **[E]** refers to the **Part Number** item in the **Version Information** pane of this screen

3.2 IDENTIFYING A DEVICE

To identify a device, simply click on the Part Number field (see **[E]** in Figure 3-3). Note that the field is disabled until a Socket Daughter Card is attached to the programmer.

3.3 PROGRAMMING A DEVICE

1. Plug the USB cable into any available USB port on the computer
2. Plug the TimeFlash 2 programming module into the micro USB end of the USB cable.
3. Plug the desired Socket Daughter Card into the TimeFlash 2 programming module. The correct orientation results in the socket of the Socket Daughter Card and LEDs of the programming module being on the same side of the assembled unit. If the Socket Daughter Card is inadvertently connected to the programming module either 180 degrees rotated or offset from the correct alignment, no harm will be done to the unit. Under this condition, **[E]** on the screen will not display a part number.

Note: Do not unplug components, the Socket Daughter Card, or the USB cable during programming.

4. Launch the TimeFlash 2 software on the computer and note that the Software Version, Firmware Version, and Part Number are displayed. Ensure that the part number is correct for the part you are about to program.
5. Using the supplied anti-static tweezers, place the component into the socket on the Socket Daughter Card.

Note: There is a pin 1 designator printed in the corner of the socket card to assist in correctly aligning the component in the socket. If the component is inserted backwards, this condition will be detected and abort programming. The blank oscillator will not be damaged. Successive attempts to program a component that is inserted backwards can lead to degraded performance of the component, so use care when inserting the component into the unit's socket.

6. Select the Frequency in MHz field **[B]** in the Programming pane of the GUI.
7. Enter the desired frequency or click the **Up** and **Down** buttons to make a selection.
8. Check the Quantity **[C]** field to ensure that it displays “1”. Operation for quantities greater than one will be discussed in **Section 3.6 “Programming Multiple Devices”**.
9. Click the **Program** button **[A]** in this pane.
10. Wait for the finished message `Burn Completed` to appear in the Activity Log pane.

3.4 MEASURING THE FREQUENCY OF A PROGRAMMED DEVICE

1. Read the actual measured Frequency in MHz **[I]** and Deviation in PPM offset **[J]** from the appropriate fields in the Measure pane.
2. Read the Current in mA **[H]** value in the Measure pane.

Note: The Deviation in PPM **[J]** uses the frequency value displayed in the Programming pane as a 0 ppm reference point and the user selectable value in **[L]** as a maximum threshold.

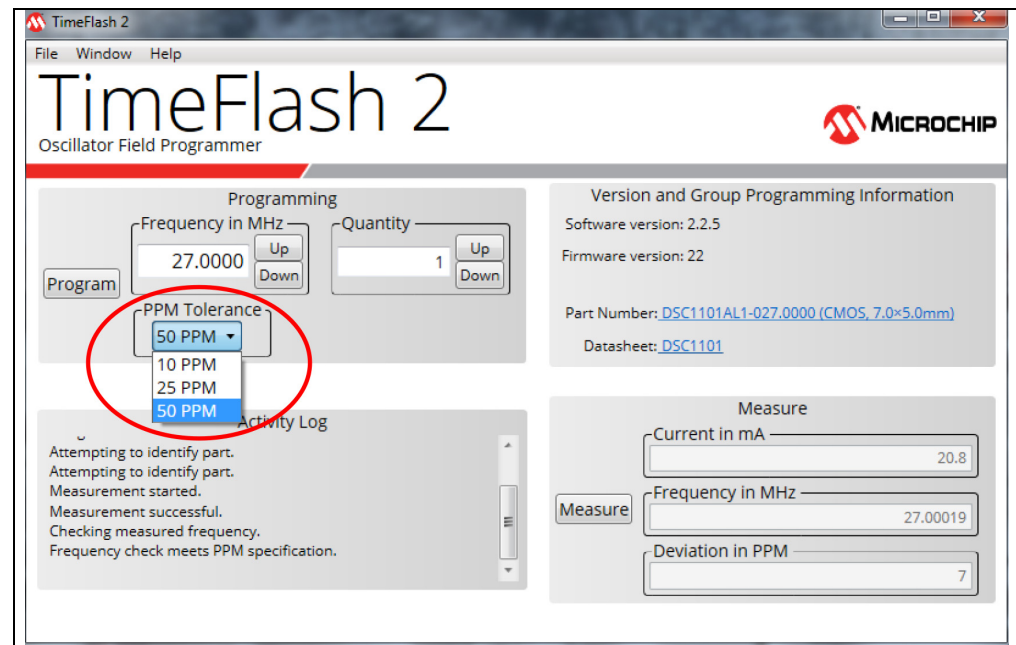


FIGURE 3-4: User-Selectable PPM Maximum Value.

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3.5 LINKING TO THE DEVICE DATA SHEET

Once the device has been programmed, its final part number will display in field **[E]** and the link to the data sheet on the Microchip website will appear in field **[K]** as illustrated in Figure 3-5.

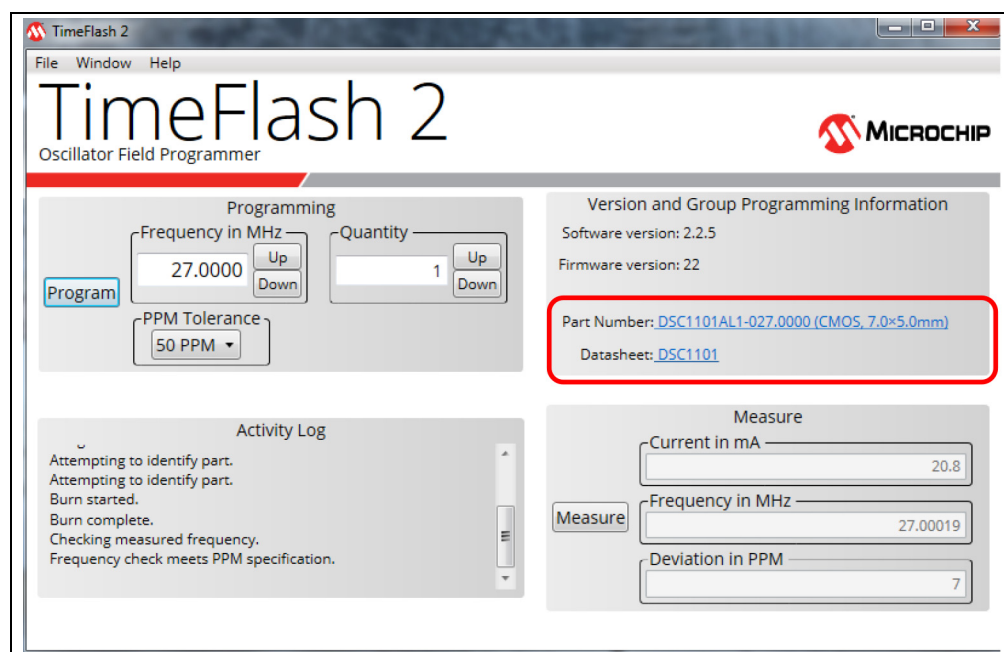


FIGURE 3-5: Programmed Device Part Number and Link to Data Sheet.

3.6 PROGRAMMING MULTIPLE DEVICES

1. To program multiple devices to the same frequency, the Quantity field **[C]** can be set to a number greater than 1 by entering the desired value or pressing the **Up** and **Down** buttons **[D]**. The user may select a quantity from 1 to 999. When the **Program** button **[A]** is pressed, the TimeFlash 2 will program the part that is in the Daughter Card Socket. When the part is successfully programmed, the counter will be decremented and the system will measure and display the frequency in the Frequency in MHz field **[I]** of the Measure pane.
2. Using the supplied anti-static tweezers, place the next component into the socket on the Socket Daughter Card.
3. Click the **Program** button **[A]** and observe that the counter has decremented.
4. Continue repeating steps 2 and 3 until all devices are programmed.

If the device does not program, an error message will appear in the Activity Log and the counter will not be decremented.

5. A pass/fail counter is available on the top-right side of the Version and Group Programming Information pane to indicate the total number of parts and the total number of successful programmings (pass) and unsuccessful programmings (fail).

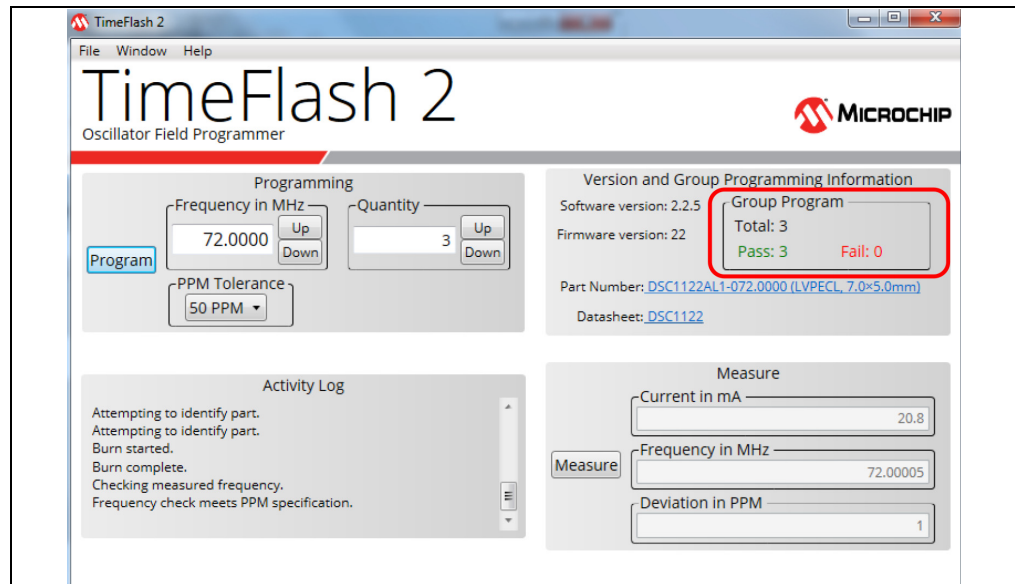


FIGURE 3-6: Pass/Fail Counters for Group Programming.

3.7 LOGGING DATA

As soon as the TimeFlash 2 GUI is launched, all the devices that have a frequency programmed or measured are logged into two files: a program log file and a measure log file (see [Figure 3-7](#) and [Figure 3-8](#)).

To open the program log file, click **Window**, then select **Program Log**. This will open a window that shows the device part number, programmed frequency, measured ppm, measured current, and status (program pass or program fail).

To open the measure log file, click **Window**, then select **Measure Log**. This will open a window that shows the device part number, nominal frequency measured, ppm measured compared to the nominal, current measured, and status (measurement pass or fail, as compared to the threshold in field **[L]**).

Both files can be saved in Microsoft Excel format.

Please note that once the GUI is closed, all information in both program and measure log files is deleted, unless it was previously saved as Excel files.

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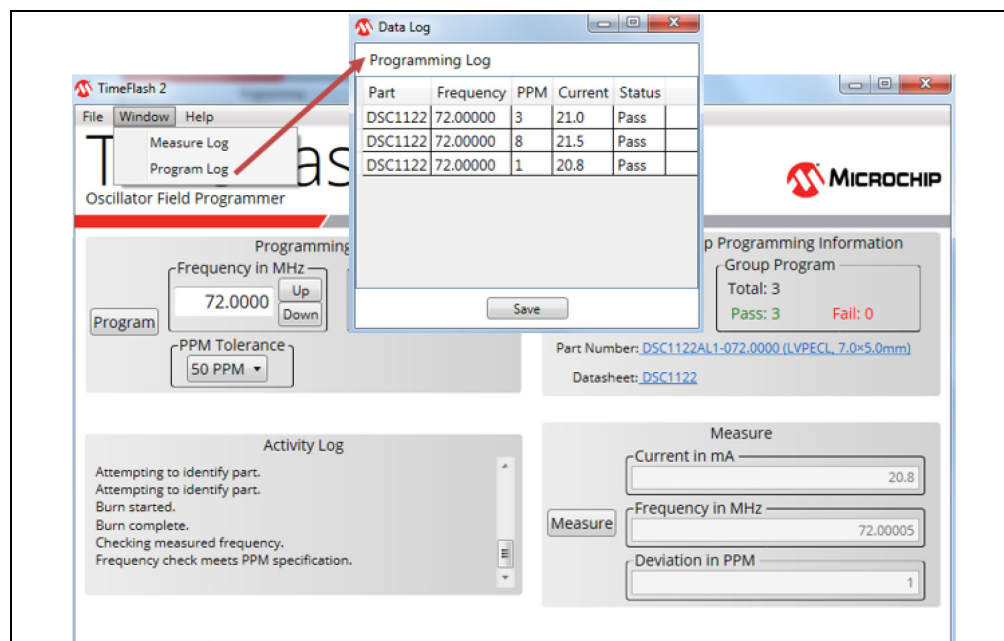


FIGURE 3-7: Program Log.

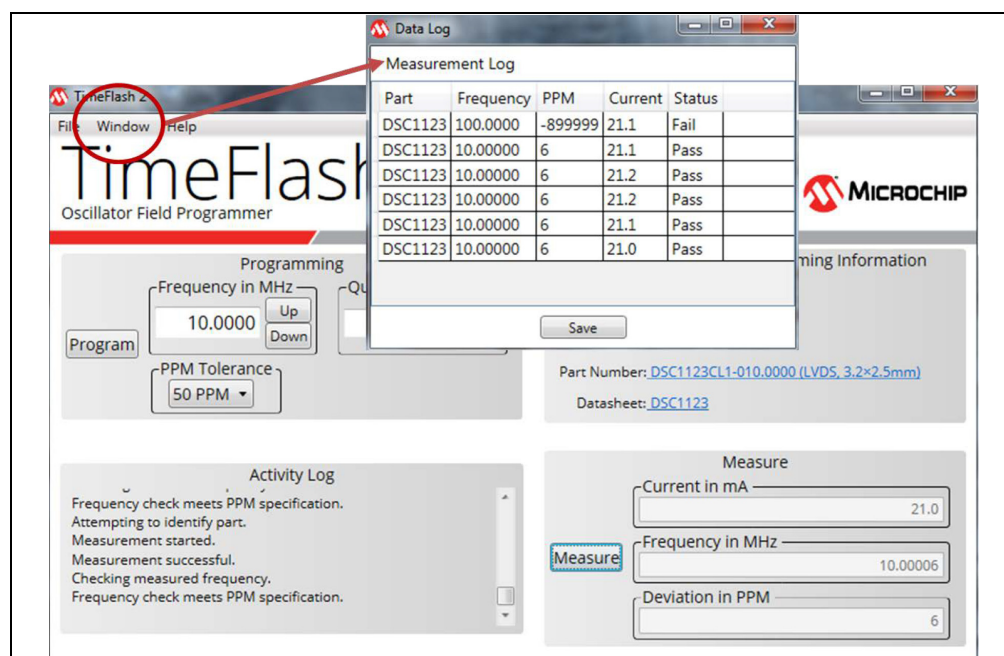


FIGURE 3-8: Measure Log.

3.8 PROGRAMMING THE OUTPUT BUFFER

The DSC1100xxx-PROG family of parts offers a programmable differential output buffer that can be programmed as either LVPECL, LVDS, or HCSL.

Once the TimeFlash 2 GUI recognizes that the device in the Socket Daughter Card is a DSC1100, it will automatically enable a pull-down menu (see Figure 3-9) where the user can select one of the three output standards.

Table 3-1 summarizes the part number options for configurable and configured parts.

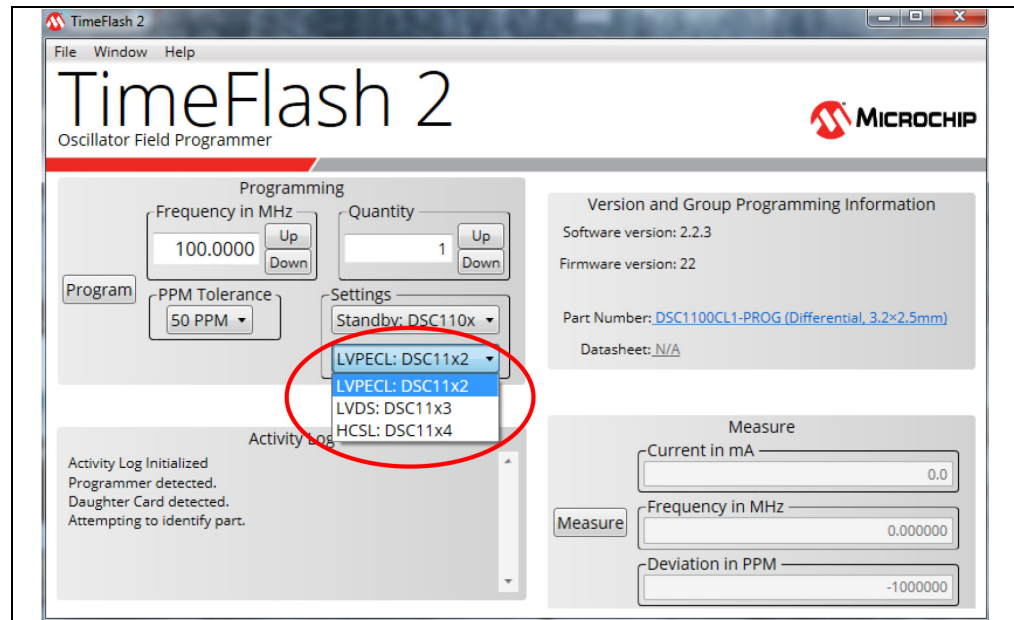


FIGURE 3-9: Output Buffer Selection.

TABLE 3-1: PART NUMBERS FOR OUTPUT BUFFER OPTIONS

Configurable Part Number	Configured Part Number	Description	
DSC1100NLx-PROG	DSC1102NLx	LVPECL	N = 7 mm x 5 mm package L = -40°C to +105°C x = 3 = 20 ppm x = 5 = 10 ppm
	DSC1103NLx	LVDS	
	DSC1104NLx	HCSL	
DSC1100BLx-PROG	DSC1102BLx	LVPECL	B = 5 mm x 3.2 mm package L = -40°C to +105°C x = 3 = 20 ppm x = 5 = 10 ppm
	DSC1103BLx	LVDS	
	DSC1104BLx	HCSL	
DSC1100CLx-PROG	DSC1102CLx	LVPECL	C = 3.2 mm x 2.5 mm package L = -40°C to +105°C x = 3 = 20 ppm x = 5 = 10 ppm
	DSC1103CLx	LVDS	
	DSC1104CLx	HCSL	
DSC1100DLx-PROG	DSC1102DLx	LVPECL	D = 2.5 mm x 2.0 mm package L = -40°C to +105°C x = 3 = 20 ppm x = 5 = 10 ppm
	DSC1103DLx	LVDS	
	DSC1104DLx	HCSL	

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3.9 PROGRAMMING THE INPUT SELECTION PIN

The DSC1101xxx-PROG family of parts offers a programmable Input Selection Pin functionality where pin 1 of the device can be programmed as either standby or output enable (OE) functionality.

Once the TimeFlash 2 GUI recognizes that the device in the Socket Daughter Card is a DSC1101, it will automatically enable a pull-down menu (see [Figure 3-10](#)) where the user can select one of the two functions to assign to pin 1.

[Table 3-2](#) summarizes the part number options for configurable and configured parts.

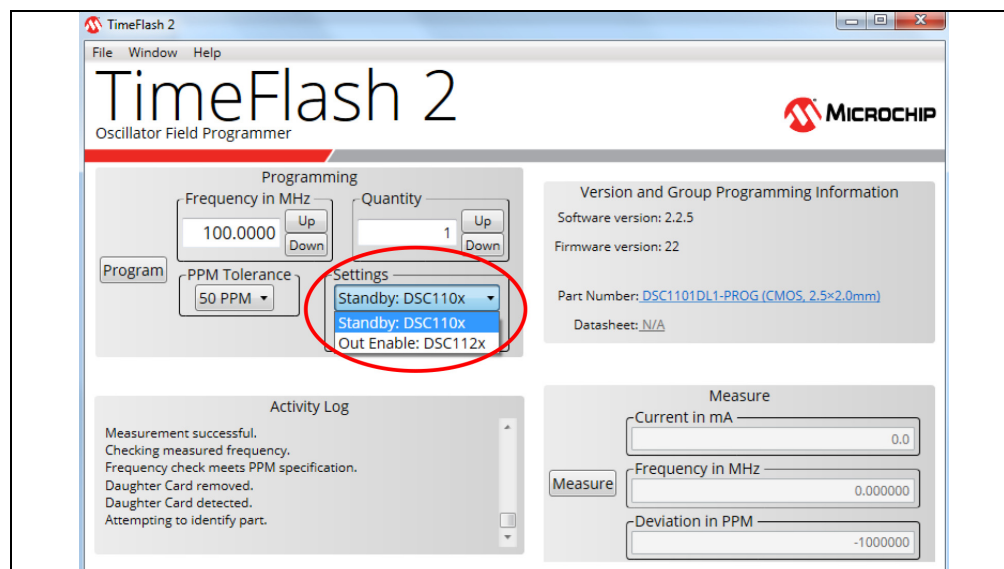


FIGURE 3-10: Control Input Pin Selection.

TABLE 3-2: PART NUMBERS FOR INPUT SELECTION PIN OPTIONS

Configurable Part Number	Configured Part Number	Description	
DSC1101NLx-PROG	DSC1101NLx	Pin 1 is standby	N = 7 mm x 5 mm package L = -40°C to +105°C x = 3 = 20 ppm x = 5 = 10 ppm
	DSC1121NLx	Pin 1 is Output Enable	
DSC1101BLx-PROG	DSC1101BLx	Pin 1 is standby	B = 5 mm x 3.2 mm package L = -40°C to +105°C x = 3 = 20 ppm x = 5 = 10 ppm
	DSC1121BLx	Pin 1 is Output Enable	
DSC1101CLx-PROG	DSC1101CLx	Pin 1 is standby	C = 3.2 mm x 2.5 mm package L = -40°C to +105°C x = 3 = 20 ppm x = 5 = 10 ppm
	DSC1121CLx	Pin 1 is Output Enable	
DSC1101DLx-PROG	DSC1101DLx	Pin 1 is standby	D = 2.5 mm x 2.0 mm package L = -40°C to +105°C x = 3 = 20 ppm x = 5 = 10 ppm
	DSC1121DLx	Pin 1 is Output Enable	

3.10 PROGRAMMING THE DRIVE STRENGTH

The DSC1101xxx-PROG family of parts offers a programmable Output Drive Strength functionality where the CMOS output buffer can be programmed for either high-drive or low-drive strength.

Once the TimeFlash2 GUI recognizes that the device in the Socket Daughter Card is a DSC1101, it will automatically enable a pull-down menu (see Figure 3-11) where the user can select one of the two output drive strengths.

Table 3-3 summarizes the part number options for configurable and configured parts.

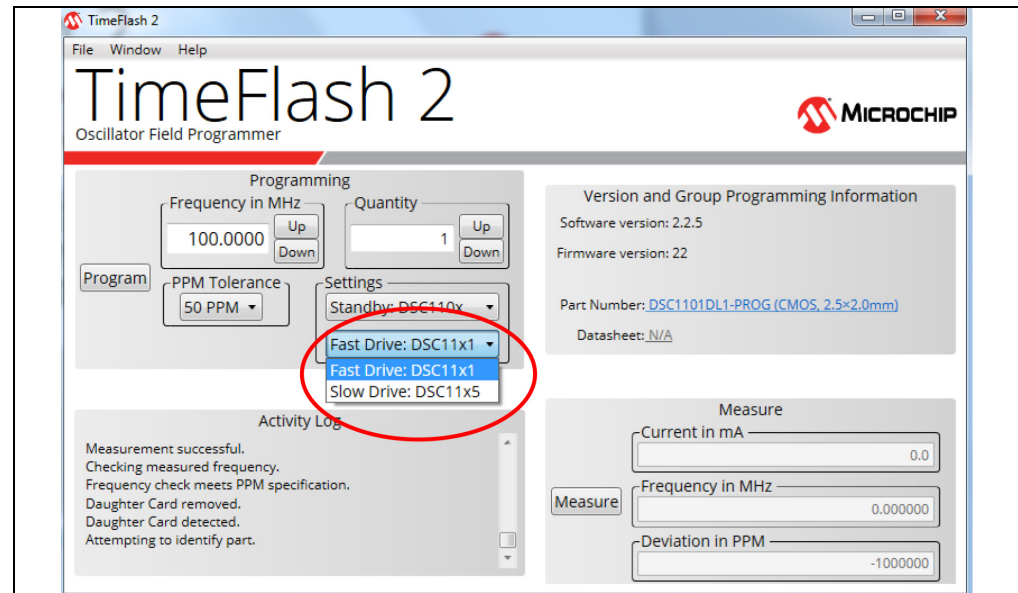


FIGURE 3-11: Drive Strength Selection.

TABLE 3-3: PART NUMBERS FOR OUTPUT DRIVE STRENGTH OPTIONS

Configurable Part Number	Configured Part Number	Description	
DSC1101NLx-PROG	DSC1101NLx	Output Drive Strength is High	N = 7 mm x 5 mm package L = -40°C to +105°C
	DSC1105NLx	Output Drive Strength is Low	x = 3 = 20 ppm x = 5 = 10 ppm
DSC1101BLx-PROG	DSC1101BLx	Output Drive Strength is High	B = 5 mm x 3.2 mm package L = -40°C to +105°C
	DSC1105BLx	Output Drive Strength is Low	x = 3 = 20 ppm x = 5 = 10 ppm
DSC1101CLx-PROG	DSC1101CLx	Output Drive Strength is High	C = 3.2 mm x 2.5 mm package L = -40°C to +105°C
	DSC1105CLx	Output Drive Strength is Low	x = 3 = 20 ppm x = 5 = 10 ppm
DSC1101DLx-PROG	DSC1101DLx	Output Drive Strength is High	D = 2.5 mm x 2.0 mm package L = -40°C to +105°C
	DSC1105DLx	Output Drive Strength is Low	x = 3 = 20 ppm x = 5 = 10 ppm

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3.11 IMPORTING A CONFIGURATION FILE

The multi-output, clock generator families of DSC2000FL2-PROG (two output) and DSC400KL2-PROG (four output) are programmed by importing a configuration file generated by ClockWorks.

1. Go to <http://clockworks.microchip.com/timing>.
2. Under **Clock Generators**, select the desired family: DSC2000 (also called DSC2xxx) or DSC400.
3. Select the desired frequency and output standard (CMOS, LVPECL, LVDS, or HCSL).
4. Select the temperature range, stability, and frequency select options. The DSC2000 family also offers a choice between I²C, SPI, and neither of those (Refer to Figure 3-12).

Crystal-less™ Configurable Clock Generator DSC2XXX (MEMS-based)

Precision is up to 6 decimal places (MHz). Frequency range is:

- 2.3MHz to 170MHz for LVCMOS output format and temp range -40°C to 85°C or -20°C to 70°C
- 2.3MHz to 460MHz for differential output formats and temp range -40°C to 85°C or -20°C to 70°C
- 3.3333MHz to 170MHz for LVCMOS output format and temp range -40°C to 105°C or -55°C to 125°C
- 3.3333MHz to 460MHz for differential output formats and temp range -40°C to 105°C

Output Frequency 1:

Output Frequency 2:

Output Format 1:

Output Format 2:

Check the frequency select box if you wish to enter second set of frequencies. (next page) ☐ Frequency select?

Temp Range:

☒ -40°C to 85°C

☐ -20°C to 70°C

☐ -40°C to 105°C

☐ -55°C to 125°C

I2C or SPI Interface:

☒ None

☐ I2C

☐ SPI

Stability:

☒ +/-50ppm

☐ +/-25ppm

☐ +/-10ppm

Power Supply: 2.5V/3.3V

FIGURE 3-12: ClockWorks Interface for DSC2000.

5. After submitting the design/sample request, click on the **Config File** icon (purple CFG) to download the device configuration file (see Figure 3-13).

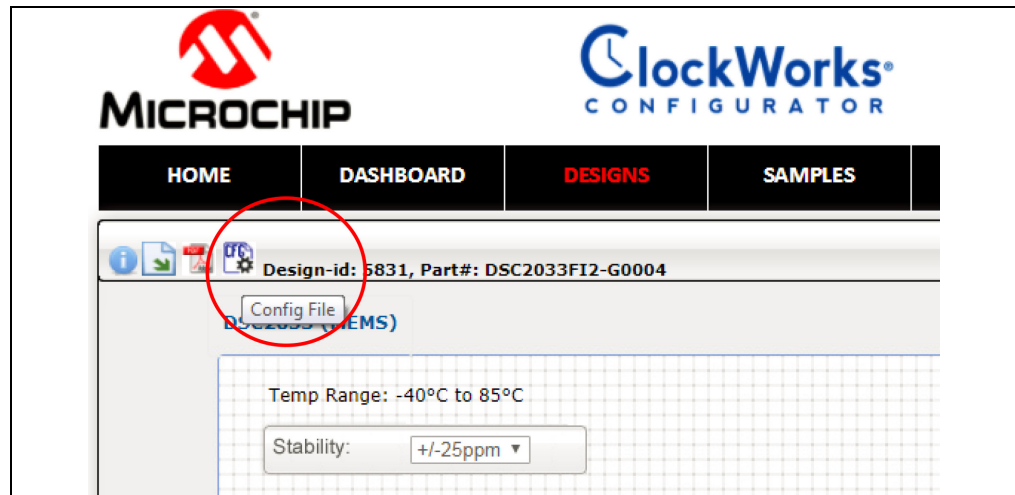


FIGURE 3-13: Locating the Config File in ClockWorks.

6. After saving the configuration file to the computer, open the TimeFlash 2 GUI. Then click **File** and select **Import** to import the configuration file (Figure 3-14).

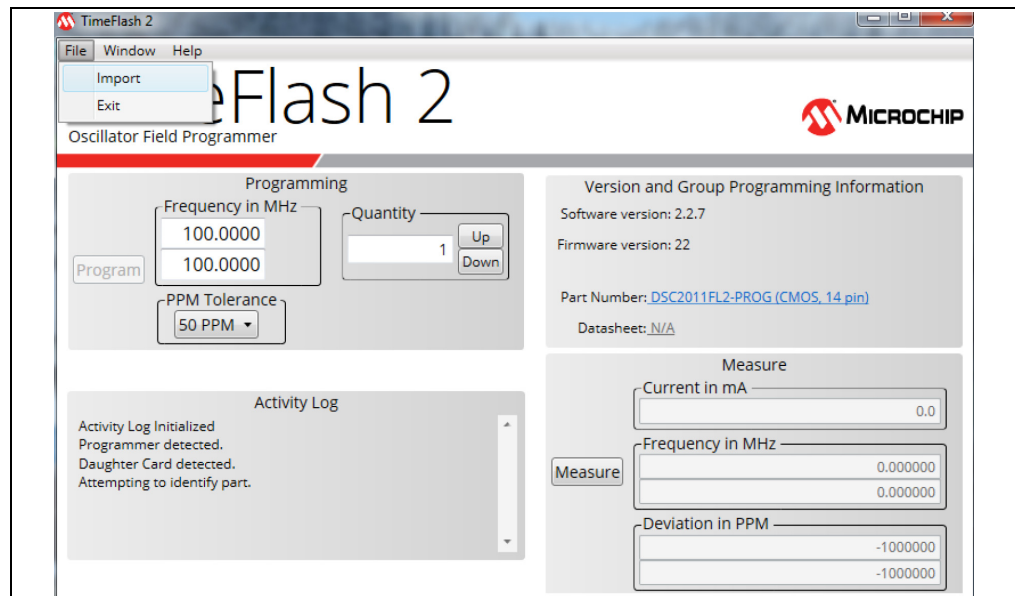


FIGURE 3-14: Importing a Configuration File.

7. TimeFlash 2 recognizes the device and the frequency for each output. Click the **Program** button to program the device (see Figure 3-15).

TimeFlash 2 Programmer User's Guide

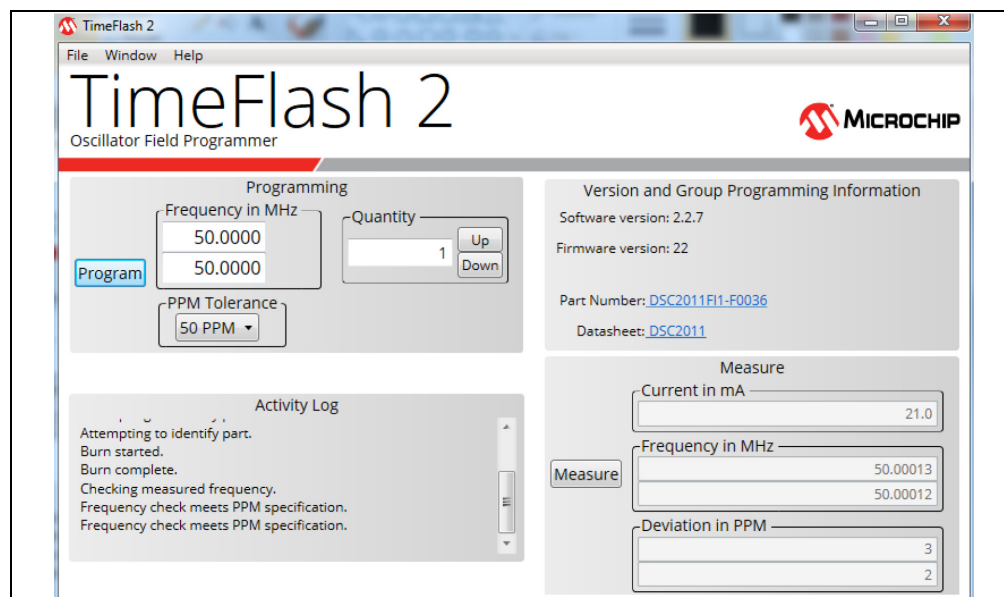


FIGURE 3-15: Example of a Device Programmed via a Configuration File.

Table 3-4 summarizes the part number options that can be programmed with a configuration file from ClockWorks.

TABLE 3-4: PART NUMBERS THAT ARE PROGRAMMED VIA CONFIG FILE

Configurable Part Number	Configured Part Number	Description
DSC2000FL2-PROG	Depends on selected output standard	Two Output, One-Time-Programmable MEMS Clock Generator, Low Jitter, -40°C to +105°C, 25 ppm, 3.2 mm x 2.5 mm package.
DSC400KL2-PROG	Depends on selected output standard	Four Output, One-Time-Programmable MEMS Clock Generator, Low Jitter, -40°C to +105°C, 25 ppm, 5.0 mm x 3.2 mm package.

Appendix A. Messages

A.1 MESSAGES

The following tables display the TimeFlash 2 application messages based on three classifications on severity: Information Only, Warning, and Error.

TABLE A-1: INFORMATION ONLY MESSAGES

Message Text	Location	Pre-Condition
Downloading installer	Activity Log	Update link pressed by user.
Installer was successfully downloaded	Activity Log	Downloading installer pointed by version.xml successful.
Burn started	Activity Log	User clicked Burn .
Burn complete	Activity Log	Programming was successful.
Measurement started	Activity Log	User clicked Measure .
Measurement successful	Activity Log	Measurement was successful.
Programmer detected	Activity Log	TimeFlash 2 was connected and initialized successfully.
Daughter Card detected	Activity Log	A supported daughter card was connected.
Daughter Card removed	Activity Log	A daughter card was removed.
Programmer removed	Activity Log	TimeFlash 2 was removed.
Please replace the part with a blank one and press OK	Pop-up Dialog	When the quantity field is > 1 and programming an oscillator was successful, this dialog gives the user a chance to insert a new part.
Attempting to identify part	Activity Log	The programmer is now trying to determine the exact part number of the oscillator in the socket.

TABLE A-2: WARNING MESSAGES

Message Text	Location	Pre-Condition
Testing programmed part failed. Try doing a measurement.	Activity Log	Communication failure with the programmer while trying to measure the frequency of the oscillator after programming and power-cycle.
This Socket Daughter Card does not support...	Activity Log	Legacy daughter cards do not support all oscillator families and all operations. Use the universal socket daughter cards or a different oscillator.

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TABLE A-2: WARNING MESSAGES (CONTINUED)

Message Text	Location	Pre-Condition
Not supported Daughter Card detected, check for application updates.	Activity Log	An unsupported daughter card was connected.

TABLE A-3: ERROR MESSAGES

Message Text	Location	Pre-Condition
Could not download the installer.	Activity Log	Downloading installer pointed by version.xml failed.
Could not locate the installer. Update failed.	Activity Log	The installer pointed by version.xml was not found or cannot be accessed.
Part inserted backwards.	Activity Log	An overcurrent condition was detected, probably because the oscillator was inserted backwards.
No programmable part present.	Activity Log	Communication failure with the oscillator while trying to calibrate the frequency.
Burn failed, still programmable, re-burn same part.	Activity Log	Communication failure with the oscillator while trying to measure the calibrated frequency.
Burn failed, still programmable, re-burn same part.	Activity Log	The deviation between the target and measured frequency is > 1000 ppm.
Burn failed, discard part.	Activity Log	OTP programming failed. Part most likely not re-usable.
Could not cycle power. Unplug the programmer and reconnect.	Activity Log	Turning power off/on failed.
Measurement failed.	Activity Log	Communication failure with the programmer while trying to measure the frequency.
No oscillator was detected in socket.	Activity Log	Communication failure with the oscillator. Most probably no oscillator in socket or not properly inserted.
Identification failed.	Activity Log	Communication failure while attempting to identify the exact part number of the oscillator in the socket.

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