FlashPro Express User Guide

Introduction

FlashPro Express is Microchip's programming software tool designed from the ground up to address secured programming assurance in production programming house environments. FlashPro Express software supports PolarFire®, PolarFire SoC, SmartFusion®2, IGLOO®2, and RTG4™ in Windows and Linux OS environments, using the FlashPro Programmer hardware.

You can install FlashPro Express two ways:

- **Integrated with Libero®**. FlashPro Express installs automatically when Libero is installed. FlashPro Express is used by Libero to perform the programming tasks for PolarFire, PolarFire SoC, SmartFusion2, IGLOO2, and RTG4, as part of the design flow.
- **Stand-alone**. FlashPro Express is also available as a stand-alone installation. This installation method is primarily used for production programming or lab programming on machines that do not require a full version of Libero.

For more information about FlashPro Express, see the Microchip website.

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1. Overview

This section provides an overview of FlashPro Express.

1.1 FlashPro Hardware Programmers

The FlashPro series of hardware programmers consists of:

- FlashPro3/X
- FlashPro4
- FlashPro5
- FlashPro6

All FlashPro series hardware programmers save board space because a single JTAG chain can be used for all JTAG devices. In-system programming using the JTAG port adds the flexibility of field upgrades or post-assembly production-line characterization. Production costs are reduced significantly as a result of elimination of expensive sockets on the board.

Note: FlashPro5 and FlashPro6 support programming though a device SPI Slave port.

For more information, visit the Microchip website.

1.2 Secure Job Programming

Job programming is the concept of using a single file to program a Microchip device or chain of Microchip devices using encrypted bitstreams.

The single job file contains all of the information necessary to setup FlashPro Express as well as the encrypted bitstream images for the devices in the job. After a job file is created, it can be passed securely to production programming houses or contract engineering facilities to load the Microchip images during manufacturing. Job projects can be exported from Libero and imported into stand-alone FlashPro Express, providing a clean delineation between design flow and production programming.

1.3 Migrating FlashPro Projects to FlashPro Express

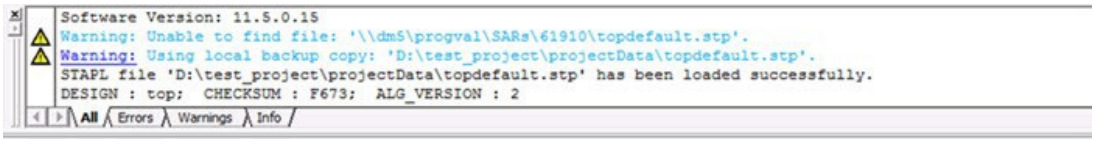
Existing FlashPro projects (`*.pro`) files are called Job Project files in FlashPro Express. These Job Projects can be opened with FlashPro Express to take advantage of Linux programming support and the simplified tool targeted for operators in a production floor environment.

Note: FlashPro projects that were created in single mode are not supported by this tool. Microchip recommends that you convert these projects to chain mode projects.

To convert the project to a chain project:

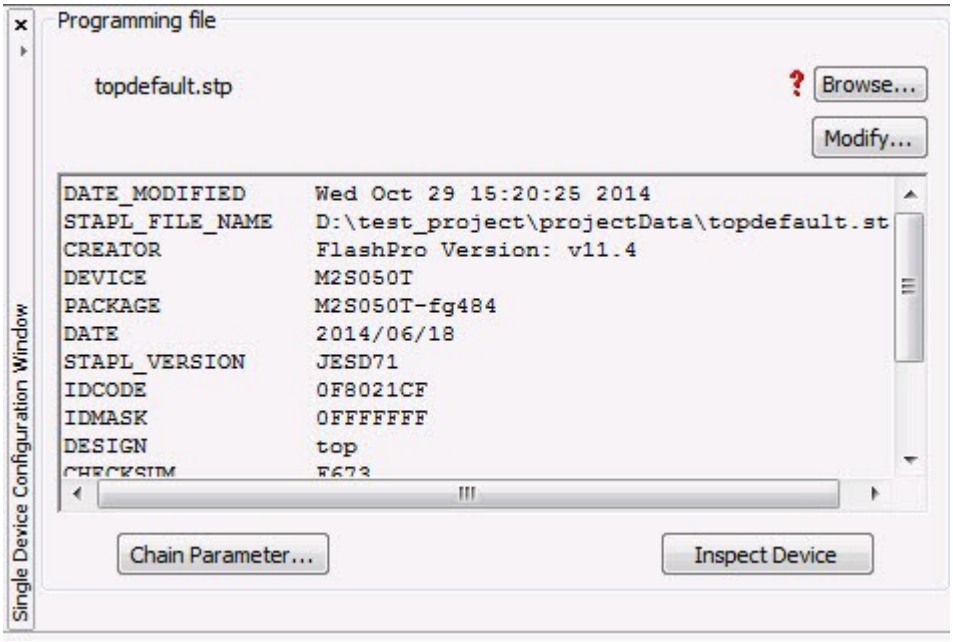
1. Open the FlashPro project (`*.pro`) in FlashPro.
2. Locate the loaded STAPL file by one of two methods:
   The log prints **STAPL file '<stapl_path>' has been loaded successfully**. **<stapl_path>** is the location of the STAPL file loaded.

   Figure 1-1. Sample Log Message



In the Single Device Configuration window, the field **STAPL_FILE_NAME** shows the location of the STAPL file loaded.

Figure 1-2. Location of STAPL File



1. Switch the project to chain mode using one of the two methods:
   - Press the chain button from the toolbar: 
   - From the **Tools** menu, select **Mode > Chain Programming**.
2. Load the STAPL file in chain mode by adding a Microchip device in the chain.
   2.1. From the **File** menu, select **Configuration > Add Microchip Devices from Files**.
   2.2. Browse to the location of the STAPL file and click **Open**.
3. To save the project, from the **File** menu, select **Save Project**.

You can now open the project using FlashPro Express.

When moving FlashPro project (`*.pro`) files to another machine, Microchip recommends that you archive the entire project folder, copy it to the new machine, extract it locally, and then load the job project within FlashPro Express. FlashPro Express opens a job project only when a programmer is connected to the machine, at least one Microchip device has programmed enabled, and all enabled Microchip devices have a bitstream file loaded.

2. Installing FlashPro Express Software and Hardware

For information about installing the FlashPro Express hardware and software, see the Microchip website.

3. Supported Device Families

The following table lists the device families and their derivatives that FlashPro Express can program directly through Libero or by exporting a FlashPro Express job.

Table 3-1. Product Families and Derivatives Directly Supported by FlashPro Express

Device Family	Description
PolarFire	Lowest power, cost optimized mid-range solution.
PolarFire SoC	Lowest power, multi-core RISC-V SoC FPGA.
SmartFusion2	Addresses fundamental requirements for advanced security, high reliability, and low power in critical industrial, military, aviation, communications, and medical applications.
IGLOO2	Low-power mixed-signal programmable solution.
RTG4	Radiation-tolerant programmable solution.

4. Getting Started

This section describes how to get started using FlashPro Express.

4.1 Starting FlashPro Express

Start FlashPro Express by running the program at **[*installation folder*] > bin > FPExpress**.

4.2 FlashPro Express Interface

The main FlashPro Express UI consists of a list of programmers and a chain table. This view displays the programmers connected to the machine, and the devices within the JTAG chain (Figure 4-1) or a single device with SPI Slave interface (Figure 4-2) specified in the job project file (PRO) file.

Figure 4-1. FlashPro Express Programmers and Chain Table (JTAG Example)

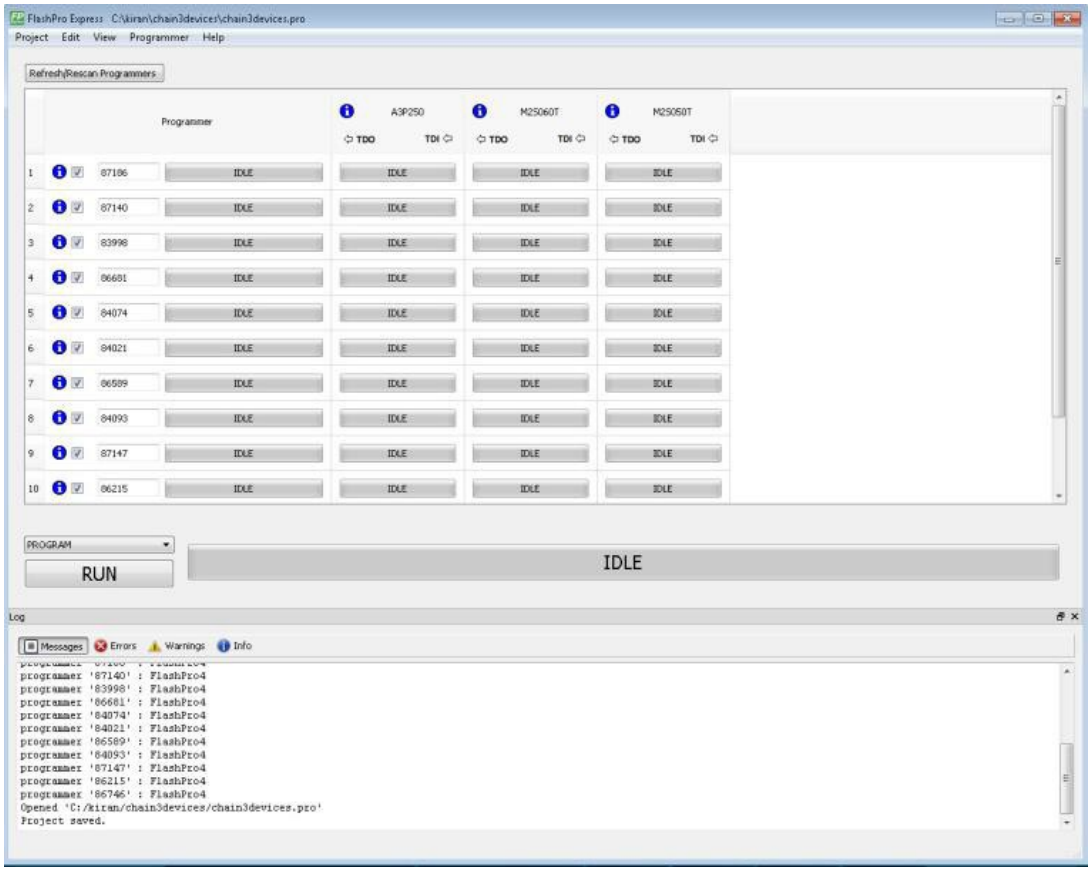
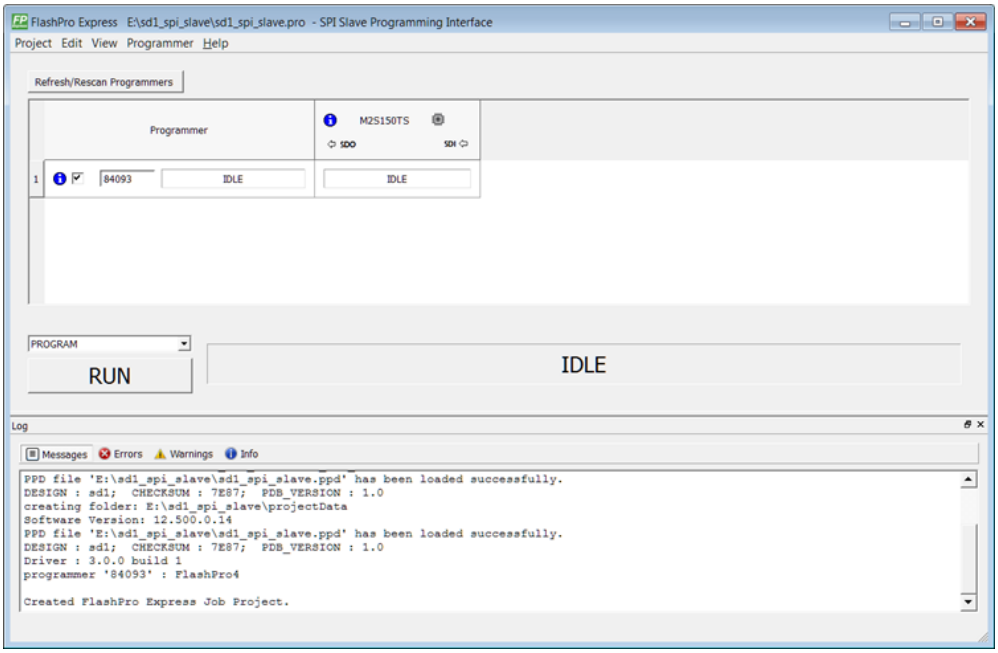


Figure 4-2. FlashPro Express Programmers and Chain Table (SPI Slave Example)



The following table describes the FlashPro actions you can perform. Devices specified as disabled in the job project (`*.pro`) file are shown disabled and their HighZ value appears in the column header.

Table 4-1. FlashPro Actions

To...	Perform This Action...
Display more information about a programmer.	Hover over the programmer Info icon.
Change a programmer name.	Click the **Name** field.
Enable or disable a programmer.	Click the check box.
Ping, Self-Test, Scan, Check Chain, or Remove it from the list.	Right-click a programmer.
View additional information about a device and programming file, if loaded.	Hover over the info icon of that device.

The following table describes the device/programmer states.

Table 4-2. Device/Programmer States

Device/Programmer State	Description
IDLE	Devices and programmers are idle and not executing any programming action.
DISABLED	Devices that are not enabled for programming.
PASSED	Last programming operation passed.
FAILED	Last programming operation failed.

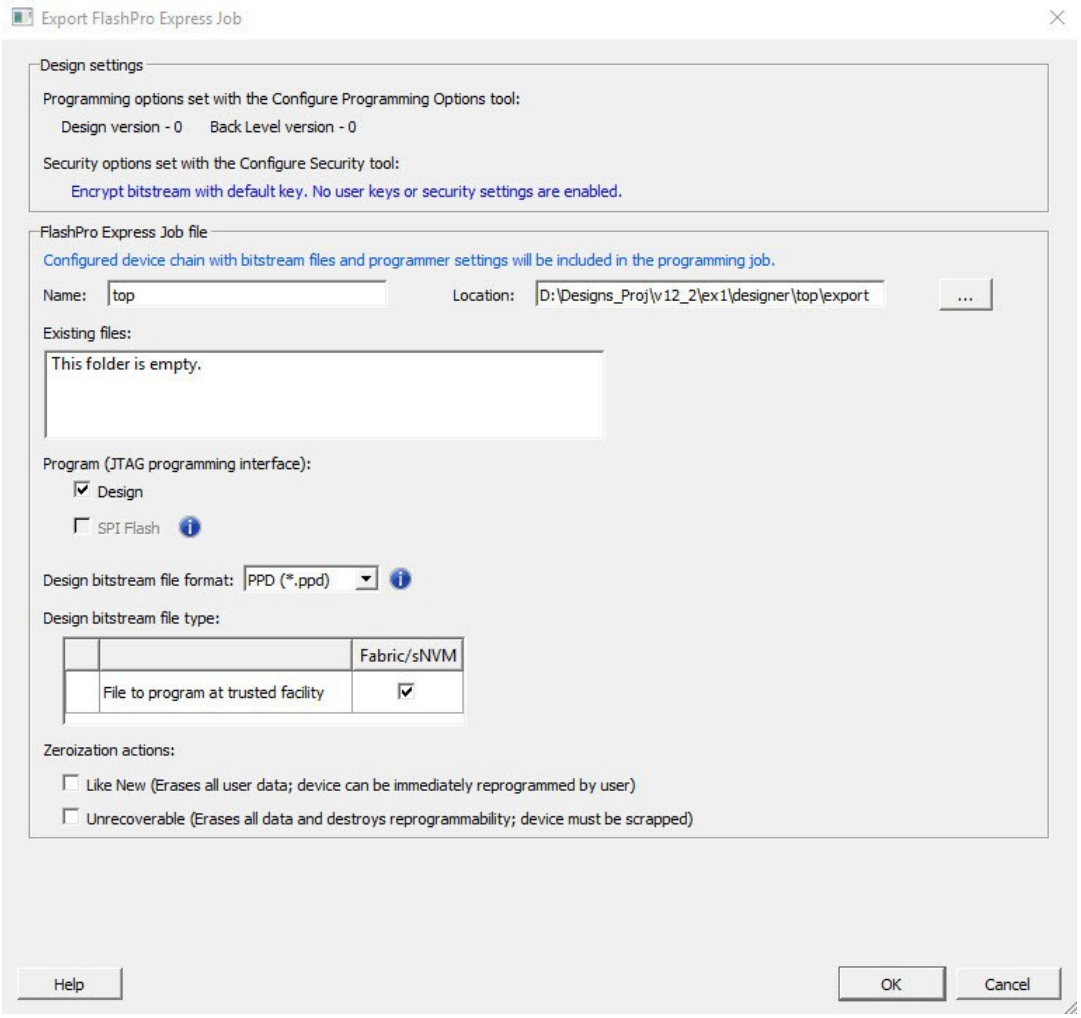
Note: SPI Slave mode is supported by FlashPro5 for SmartFusion2 and IGLOO2 devices, and by FlashPro6 for SmartFusion2, IGLOO2, and PolarFire devices. JTAG is the default interface. RTG4 devices do not support SPI Slave programming.

4.3 Creating a Job Project from a FlashPro Express Job

When you are ready to hand off your design for production, create a job project.

1. In Libero, run **Export FlashPro Express Job** to create a container that will be used to transfer programming configuration information, including programming files, to the production programming tool FlashPro Express.

Figure 4-3. Export FlashPro Express Job



2. In FlashPro Express, from the **Project** menu, choose **New Job Project**.
3. When prompted, specify the Programming Job file location that you just exported from Libero and the location to store the FlashPro Express job project. The job project name uses the programming job name and cannot be changed. Click **OK** to create and open a new job project for production programming.

Figure 4-4. New Job Project from FlashPro Express Job Dialog Box

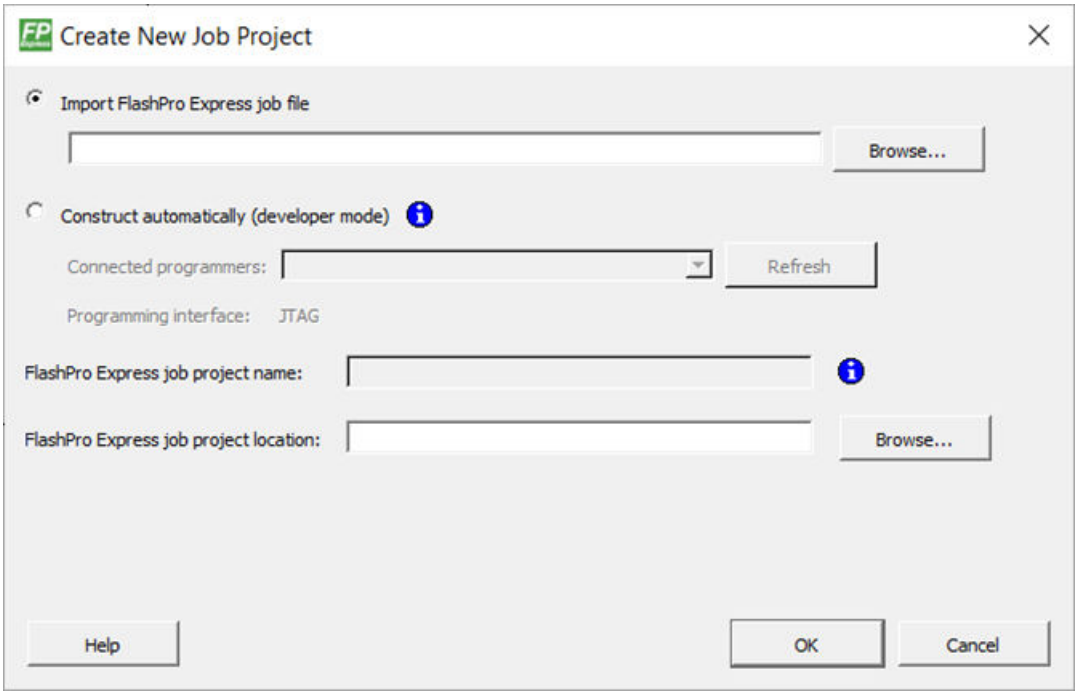
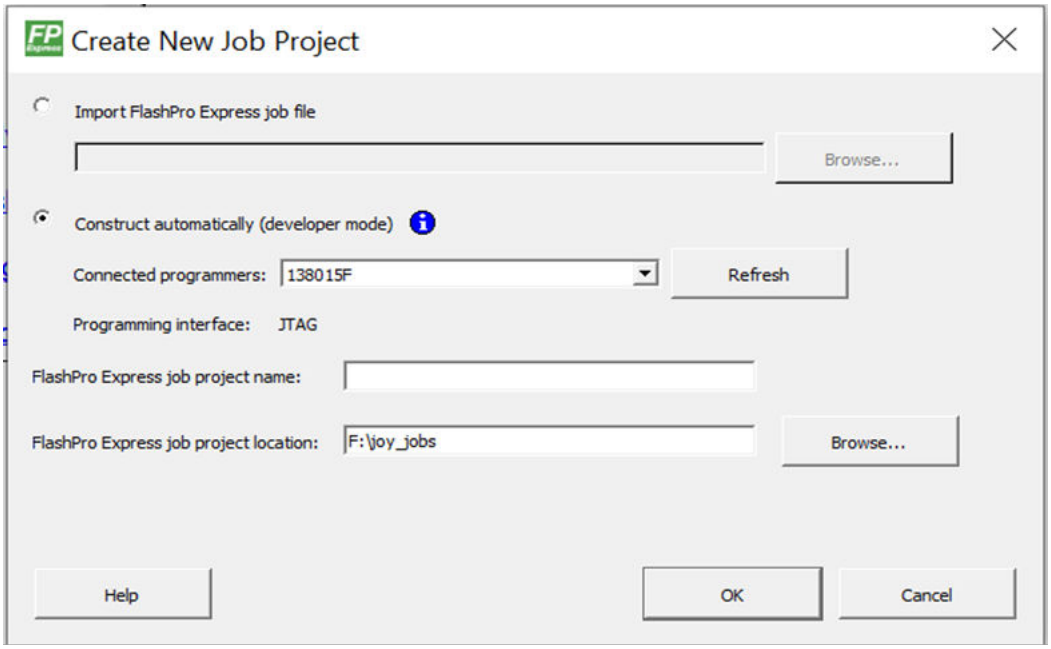


Figure 4-5. New Project from FlashPro Express Job Dialog Box in Developer Mode



In Developer mode, a new job project can also be created using **Construct automatically** option. This option can be used to construct chain by scanning the physical chain connected to the selected programmer. This feature is available only in JTAG mode. If multiple programmers are connected to the machine, select the desired programmer by clicking on the pull down menu for connected programmers field.

4.4 Opening a Job Project

To start with FlashPro Express, load a job project (`*.pro`) file.

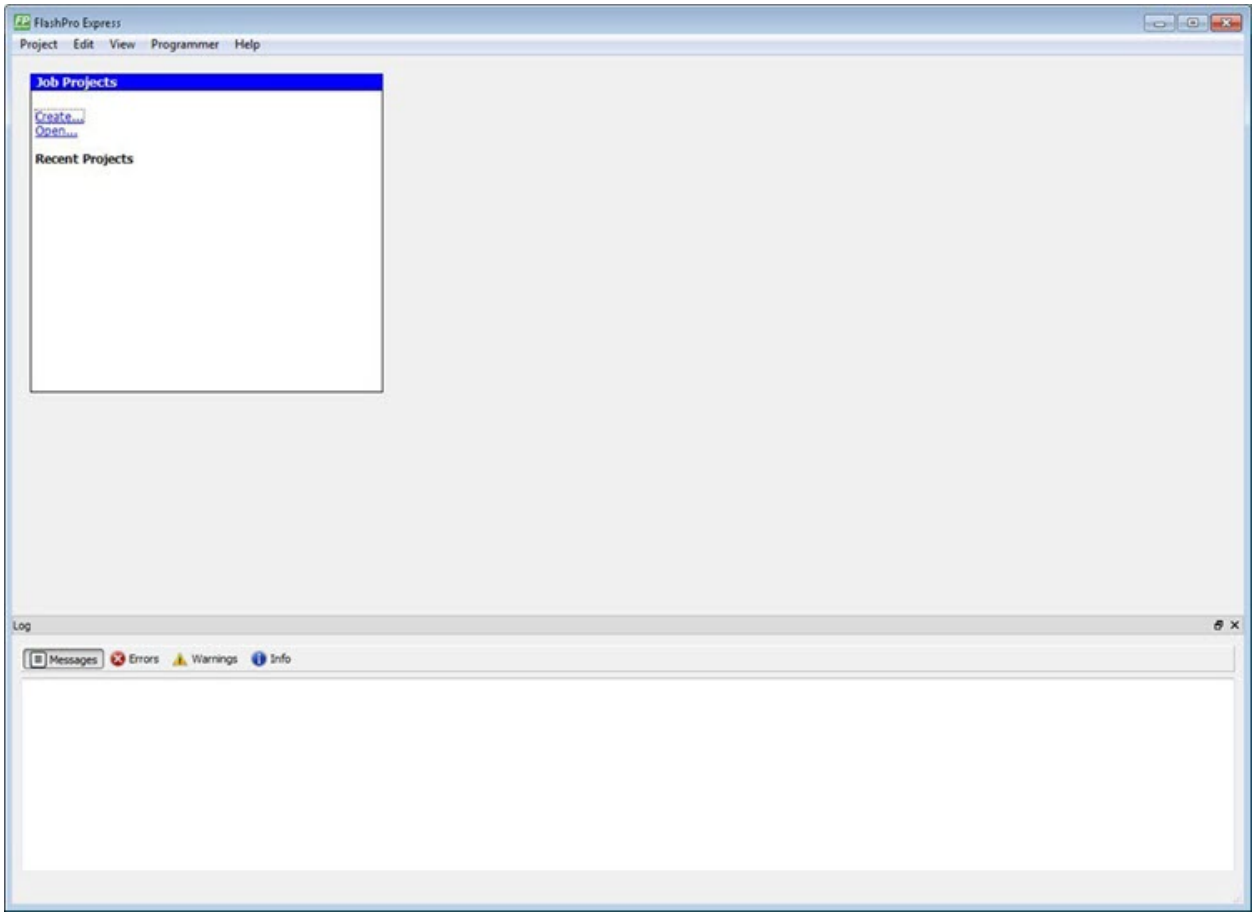
A job project opens if:

- At least one programmer is connected.
- At least one Microchip device is enabled for programming (Required for Operator Mode).
- Any enabled Microchip device for programming has a bitstream file loaded.

To open a job project:

1. From the **Project** menu, choose **Open Job Project**. The Open Project dialog box appears.
2. Find your project file or type in your project file name in the **File name** field.
3. Click **Open**.

Figure 4-6. FlashPro Express Launch Screen



4.5 Saving a Job Project

To save a job project, either:

- Click the **Save** button on the toolbar, or
- From the **Project** menu choose **Save Job Project**.

4.6 Programming Tutorials

The following programming tutorials describe real-world examples of using FlashPro.

4.6.1 Parallel Programming with FlashPro5/4/3/3X

Parallel programming allows you to program multiple Microchip devices in parallel with multiple programmers. In parallel programming, all targeted devices are programmed with the same programming file (STAPL). The targeted device or chain configuration that is connected to each programmer must be identical.

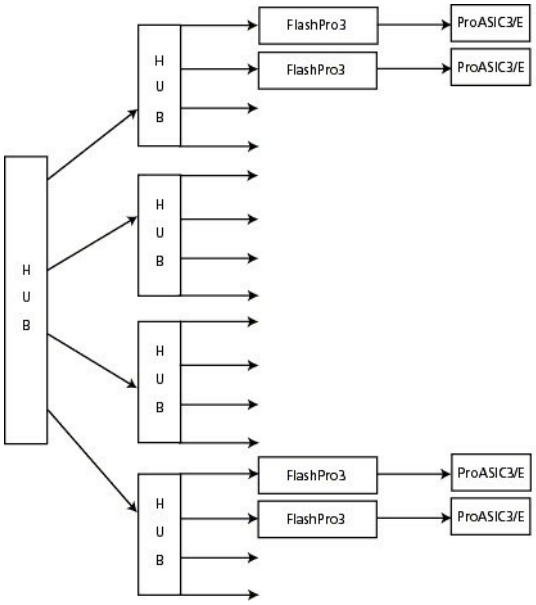
The FlashPro Express software together with the FlashPro5/4/3/3X programmers supports parallel programming via a USB port. You can connect up to sixteen FlashPro5/4/3/3X's to a PC via a USB v1.1 or a USB v2.0 port.

FlashPro5/4/3/3X requires a self-powered hub.

Connecting FlashPro5/4/3/3X (a USB v2.0 enabled programmer) to USB v1.1 port increases device programming time due to a slow data transfer rate on the USB v1.1 port in comparison to a USB v2.0 port.

The following figure shows how to connect a FlashPro5/4/3/3X programmer for parallel programming.

Figure 4-7. Connecting a FlashPro5/4/3/3X Programmer



An independent thread processes the STAPL file during parallel programming. In a Microchip test environment, parallel programming is approximately five times faster than programming 16 devices sequentially.

Note: Microchip has tested Belkin PCI-USB cards and hubs, and found that parallel programming works best when using the vendor's latest driver installed along with matching hubs.

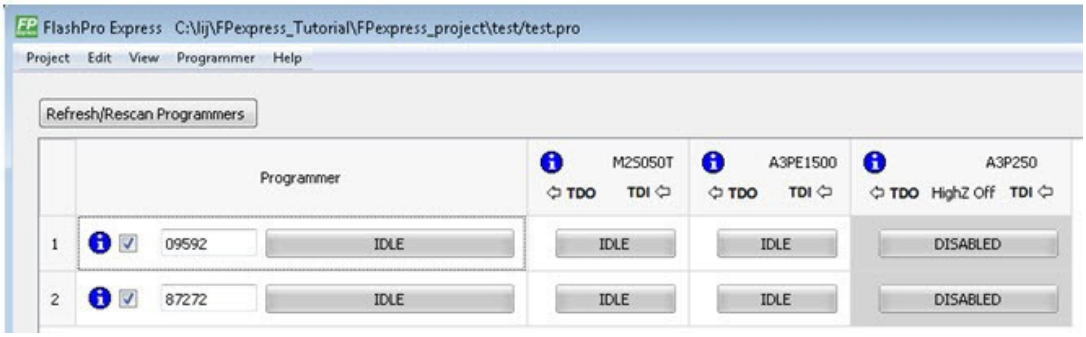
4.6.2 Chain Programming Tutorial

This tutorial describes how to use FlashPro Express to program a multi-device, multi-programmer chain. This tutorial uses the production programming flow that exports a programming job from Libero SoC, which includes chain configuration, programmer settings, and bitstream files for programming, and creates a job project from a programming job.

The following figure shows the chain used in this tutorial. M2S050T is device 1 and A3P250 is device 3.

- Device 1 is the first device to be programmed in the chain.
- Device 2 is the last device to be programmed in the chain.
- Device 3 is disabled and will not be programmed.

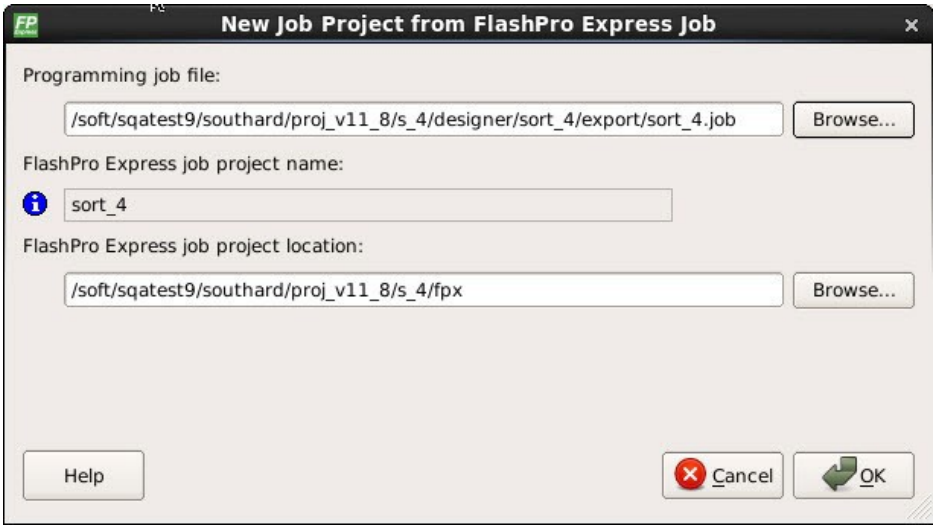
Figure 4-8. Chain Programming Devices



To program a chain:

1. From the **Project** menu, choose **New Job Project from FlashPro Express Job**.
2. Click **Browse** to load a Programming Job File, and specify your **FlashPro Express job project location**. Click **OK** to continue, as shown in the following figure.

   Figure 4-9. New Job Project from FlashPro Express Job



   FlashPro Express displays your Job Project and programmers, as shown in the following figure. The Device/ Programmer states are:

   – IDLE: Devices/programmers are idle and not executing any programming action.
   – DISABLED: Devices that are not enabled for programming.
   – PASSED: Last programming operation passed.
   – FAILED: Last programming operation failed.

Figure 4-10. FlashPro Express with Loaded Job Project (JTAG Example)

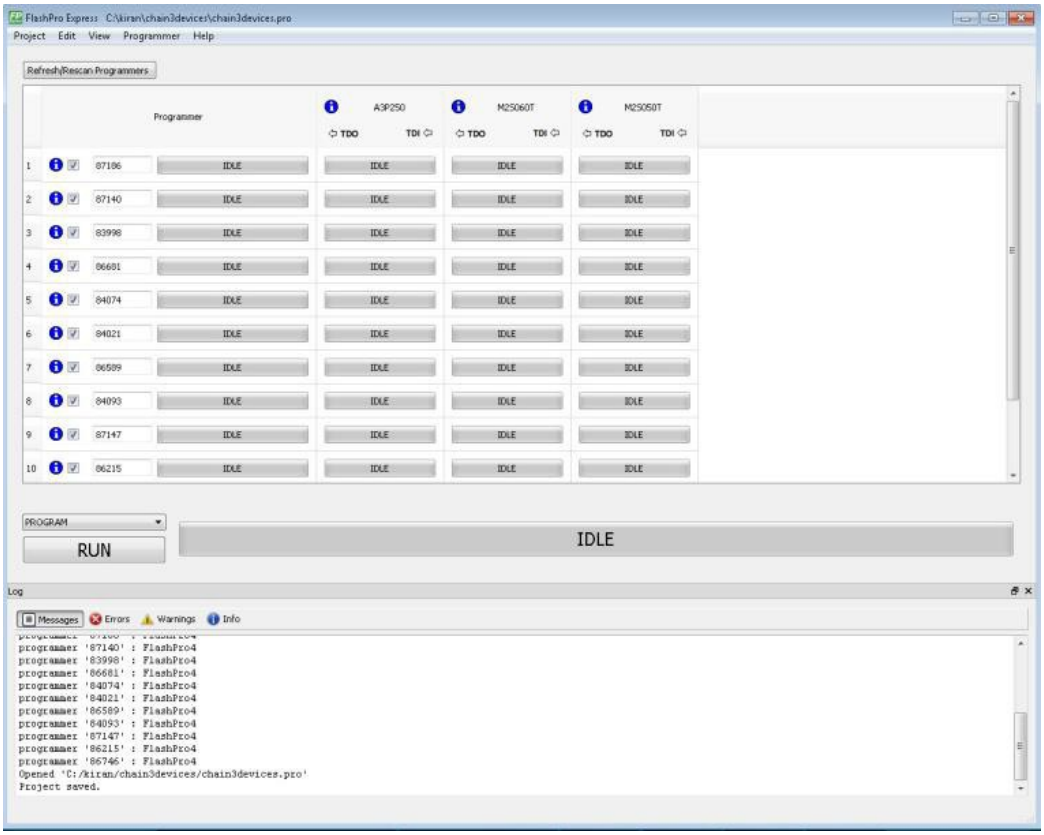
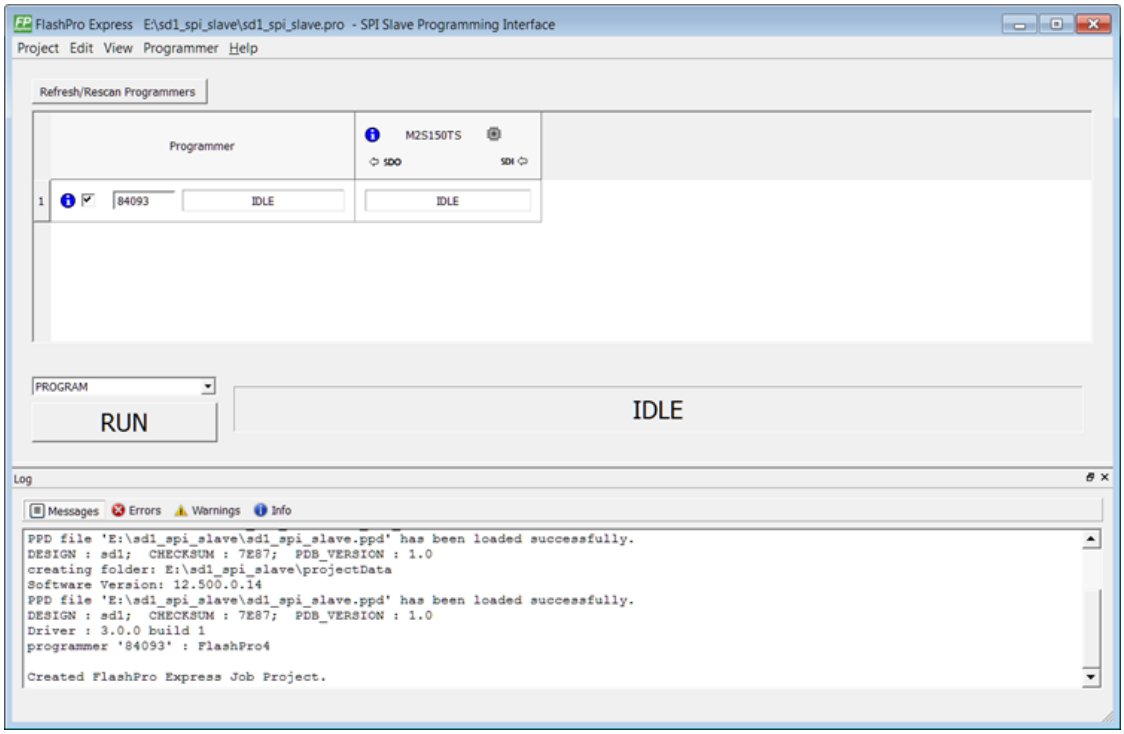


Figure 4-11. FlashPro Express with Loaded Job Project (SPI Slave Example – SmartFusion2/IGLOO2 Only)

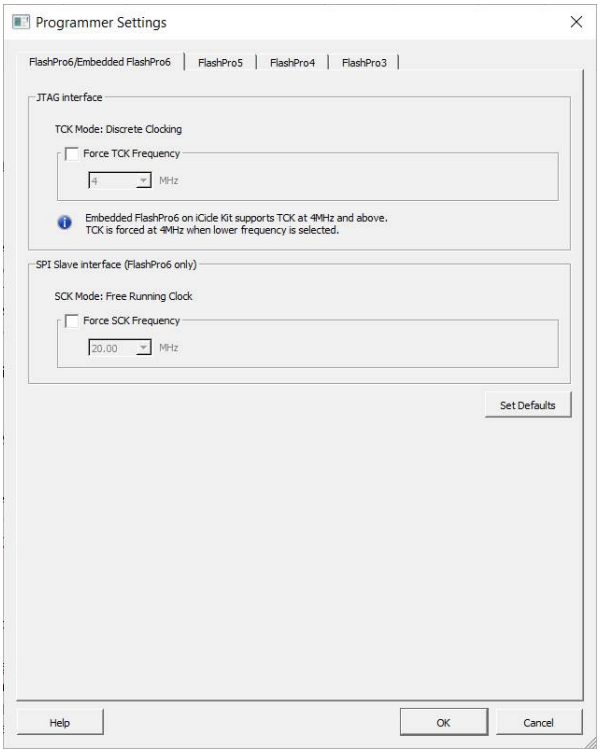


3. If your programmer is not listed, click the **Refresh/Rescan** button. To view device info, hover your mouse over the **Info** icon. If a device is Disabled for programming, the HighZ status appears in the GUI.
4. Set the Programming Action in the drop-down menu to **PROGRAM**, as shown in the following figure.

Figure 4-12. Programming Action Set to PROGRAM

5. Click **RUN**. Detailed individual programmer and device status information appears in the Programmer List. Your programmer status (PASSED or FAILED) appears in the Programmer Status Bar, as shown in the following figure.
   - Hover over the Programmer Status Bar to display information on the programmers.
   - Hover over the FAILED status to list all programmers that failed programming.
   - Hover over the PASSED status to list all the programmers that programmed successfully.

Figure 4-13. Chain Programming Complete

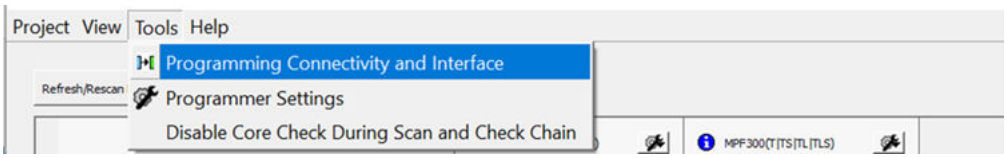


6. View the **Log** for Messages, Errors, Warnings and Info generated during programming.

5. Programming Connectivity and Interface

The Programming Connectivity and Interface option can be selected from **Tools > Programming Connectivity and Interface**.

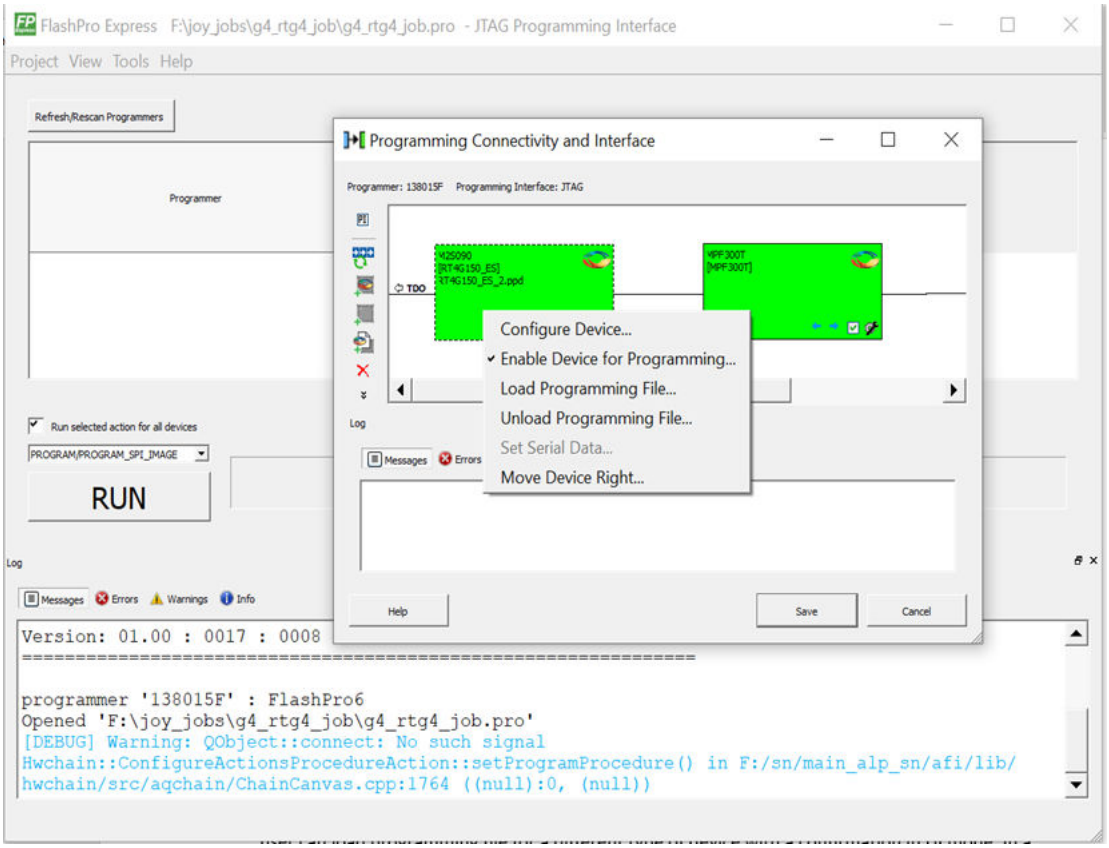
Figure 5-1. Programming Connectivity and Interface Option in Tools Menu



By default, the tool selects the first enabled programmer and opens the Programming Connectivity and Interface dialog box with an existing JTAG chain or SPI Slave device. If there is no programmer enabled, an error message is shown. The user can disable all programmers, except the one which is used by the FlashPro Express tool.

The selected programmer and current programming interface are shown in the dialog box for the user reference. The main window's programmer table is cleared as soon as the chain dialog box is opened and will be populated with saved changes or restored to previous state if changes are canceled when the dialog box is closed.

Figure 5-2. Programming Connectivity and Interface Dialog Box with Configure Chain Options



For JTAG Interface, the same configure chain options are available as in Libero SoC tool.

For SPI Slave interface, the following options are available:

- **Set Programming Interface**: Selects JTAG or SPI Slave mode.
- **Add Microsemi Device**: Adds a Microsemi device to the chain.
- **Delete device**: Deletes selected devices in the grid.

- **Zoom In**: Zoom into the grid.
- **Zoom Out**: Zoom out of the grid.

The devices used in FlashPro Express tool have the following context menu options:

- **Configure Device**: Configure device is same as the one in Libero SoC tool. Configure device option allows to configure device by loading programming file (but not a SPI Flash file) or to set device family and die.
- **Enable/Disable Device for Programming**: Enables or disables device for programming.
- **Load Programming File**: Loads the programming file.
- **Unload Programming File**: This option is enabled if programming file loaded.
- **Load SPI Flash File**: Loads a SPI Flash file. This option is always enabled. It is available for PolarFire and PolarFire SoC devices.
- **Unload SPI Flash File**: This option is enabled if SPI Flash file is loaded. It is available for PolarFire and PolarFire SoC devices.
- **Set Serial Data**: This option is disabled; serialization is not supported.
- **Move Device**: to left/right

There is no option to configure/select programming action or SPI Flash action. This option is only available in the main table because it depends on the developer mode option to run one programming action for all devices or run an action selected for each device.

From Libero SoC v12.6 onwards, you can change a device type by loading the programming file for a different device type. This is consistent with Libero flow.

In the chain dialog box and in the main table, the user can load the programming file for a different device type with a GUI confirmation. The chain tool also allows the user to re-configure the device by selecting a different family and a die. In this case, no confirmation is required.

In the batch mode, a programming file is loaded with a warning.

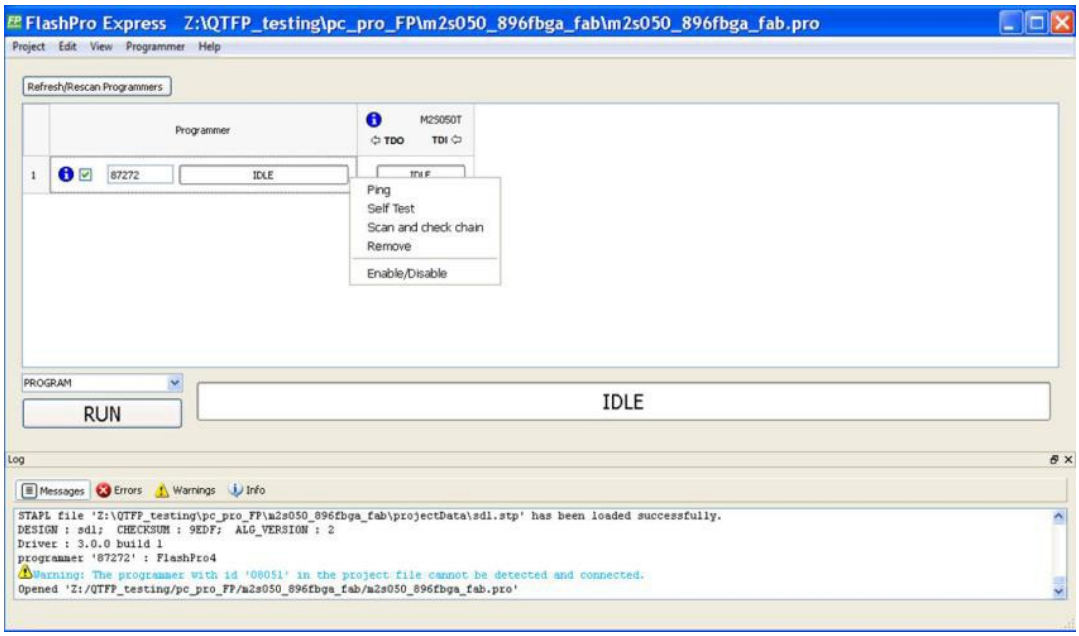
6. Programmer Settings and Operations

This section describes the FlashPro Express settings and operation.

6.1 Introduction

The FlashPro Express software allows you to connect multiple programmers to your computer. With each programmer you select, you can perform a ping, conduct a self-test, scan and check the chain, and remove, enable, or disable the JTAG chain, as shown in the following figure.

Figure 6-1. FlashPro Express Right-Click Menu

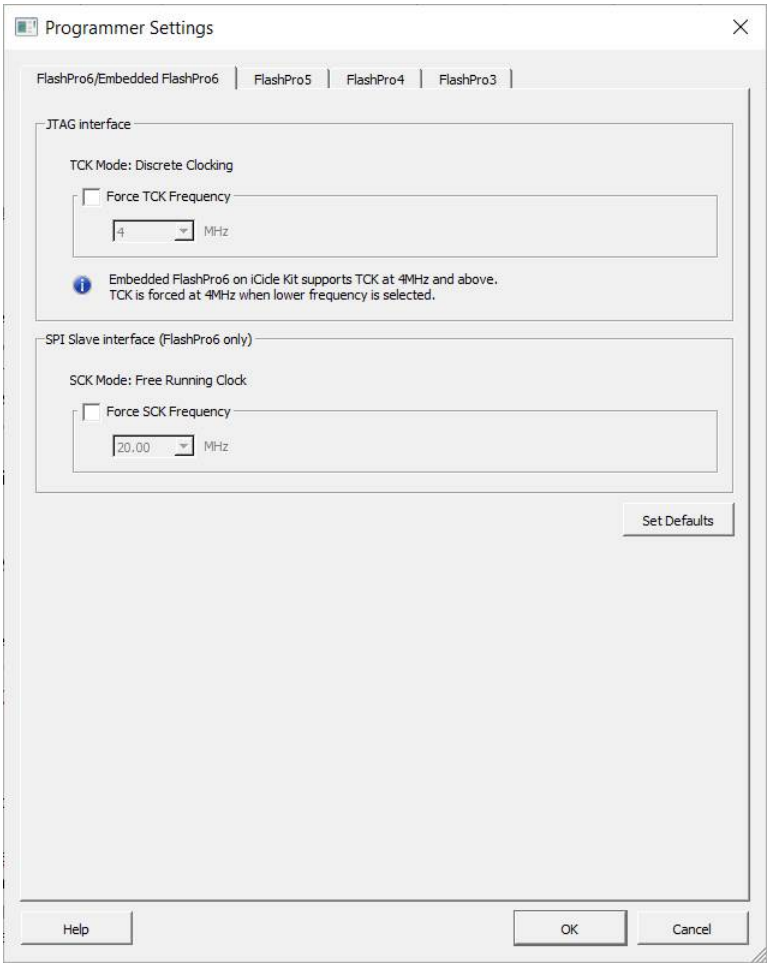


6.2 Programmer Settings

To view the Programmer Settings dialog box, in the Libero SoC Design Flow window, expand **Configure Hardware**, double-click **Configure Programmer**, or right-click **Configure Programmer** and choose **Programmer Settings**.

For the JTAG interface, you can set specific voltage and force TCK frequency values for your programmer in this dialog box. For the SPI Slave interface, you can set specific voltage and force SCK frequency values for your programmer. SPI Slave mode is supported by FlashPro5 for SmartFusion2 and IGLOO2 devices, and by FlashPro6 for SmartFusion2, IGLOO2, and PolarFire devices. SPI Slave mode is not supported for RTG4 devices. JTAG is the default interface.

Figure 6-2. Programmer Settings



The Programmer Settings dialog box includes options for FlashPro6/5/4/3/3X. Limitation of the TCK frequency for the selected programmer are:

- FlashPro6: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 MHz
- FlashPro5: 1, 2, 3, 4, 5, 6, 10, 15, 30 MHz
- FlashPro4: 1, 2, 3, 4, 5, 6 MHz
- FlashPro3/3X: 1, 2, 3, 4, 6 MHz TCK frequency limits by target device (refer to the target device data sheet)

During execution, the frequency set by the FREQUENCY statement in the PDB/STAPL file overrides the TCK frequency setting you select in the Programmer Settings dialog box, unless you also select the **Force TCK Frequency** check box.

Limitation of the SCK frequency for the selected programmer are: 1.00, 2.00, 2.50, 3.33, 4.00, 5.00, 6.67, 8.00, 10.00, 13.33, and 20.00 MHz

6.2.1 FlashPro5/4/3/3X Programmer Settings

For FlashPro5/4/3/3X, if you choose the Force TCK Frequency, select the appropriate MHz frequency. For FlashPro4/3X settings, you can switch the TCK mode between a Free running clock and a Discrete clocking. Use discrete clocking when there is a JTAG non-compliant device in a chain with Microchip devices. After you make your selections(s), click **OK**.

6.2.1.1 Default Settings

- The **Force TCK Frequency** option is unchecked to instruct the FlashPro5/4/3/3X to use the TCK frequency specified by the Frequency statement in the PDB/STAPL file(s).

- The FlashPro5/4/3/3X default TCK mode setting is **Free running clock**.

6.2.2 TCK Setting for Force TCK Frequency

If **Force TCK Frequency** is checked in the **Programmer Setting**, the selected TCK value is set for the programmer and the Frequency statement in the PDB/STAPL file is ignored.

6.2.3 Default TCK Frequency

If the IPD/STAPL file or Chain does not exist, the default TCK frequency is set to 4 MHz.

If more than one Microchip flash device is targeted in the chain, the FlashPro Express software passes through all of the files and searches for the "freq" keyword and the "MAX_FREQ" **Note** field. The FlashPro Express software uses the lesser value of all the TCK frequency settings and the "MAX_FREQ" **Note** field values.

6.3 Ping Programmers

Right-click a programmer and choose Ping.

Note: To ping new programmers quickly, click the **Refresh/Rescan for Programmers** button.

6.4 Performing a Self-Test

Before performing a self-test, connect the programmer to the self-test board that came with your programmer. Then right-click the programmer you want to self-test and choose **Self Test**.

Note: Self-test is not supported with FlashPro5/4 programmers. These programmers are tested rigorously at the factory during production.

6.5 Scanning and Checking a Chain

The scan chain operation scans and analyzes the JTAG chain connected to programmers you selected and checks that a scanned chain matches the chain configured in FlashPro Express.

To scan a chain, right-click the programmer you want to scan and choose **Scan and check chain**.

6.6 Enabling and Disabling Programmers

After loading a job project, you can enable, disable, or remove a programmer, as well as ping, self-test, run scan, and check chain on any of the connected programmers. These actions are available in the right-click menu for each programmer in the programmer column.

Check the check box next to a programmer in the **Programmer** column to enable the programmer or uncheck the check box to disable the programmer.

6.7 Renaming a Programmer

Enter a new programmer name in the Programmer window to rename the programmer. By default, the programmer name is the same as the programmer ID.

6.8 Removing a Programmer

To remove a programmer, right-click the programmer and choose **Remove**.

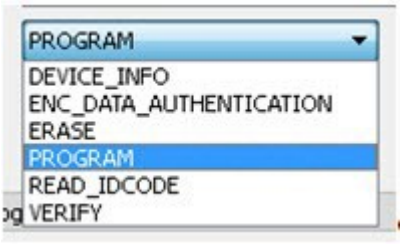
6.9 Selecting and Running an Action

FlashPro Express supports the following programming actions:

- DEVICE_INFO
- ENC_DATA_AUTHENTICATION. This action is visible when every device in the chain contains encrypted bitstream files. Selecting this action checks each bitstream file for authentication.
- ERASE
- PROGRAM
- READ_IDCODE
- VERIFY

To select a programming action, select an action from the **Programming Action** drop-down menu in FlashPro Express, as shown in the following figure.

Figure 6-3. FlashPro Express Programming Actions



To run the selected programming action, click the **RUN** button below the **Programming Action** drop-down menu.

7. Chain Programming

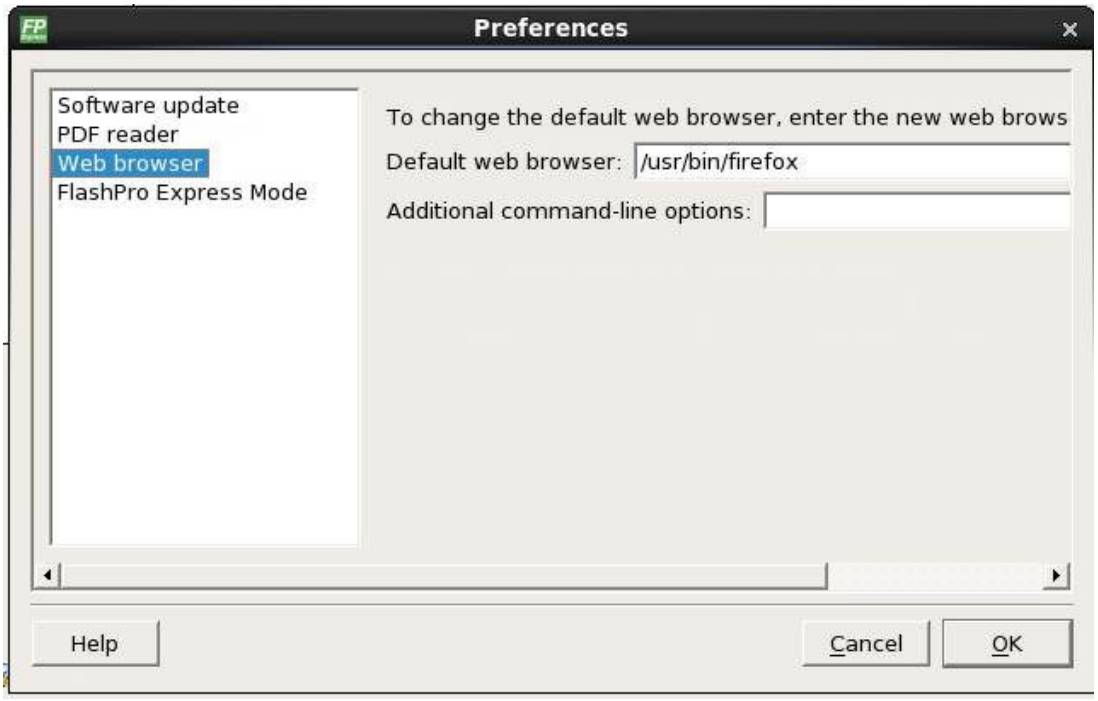
This section describes how to perform chain programming.

7.1 Chain Order

Chain Programming allows you to program several devices at one time. The order of devices in the chain imported from Job Project must match the physical chain to be programmed.

The TDO for the first device connects to the programmer, and the last device's TDI connects to the programmer. The devices in the chain go in order from a device's TDI into the next device's TDO, as shown in the following figure.

Figure 7-1. Chain Order



7.2 Multiple Device Chain Programming

The FlashPro Express software allows direct chain programming without generating a chain STAPL file. Each device is programmed in sequential order, starting from device 1 to device *N* (see the following example).

```
TDI > Device N > Device N-1 >… > Device 2 > Device 1 > TDO
```

7.2.1 Device Programming Compatibility

PolarFire, SmartFusion2, IGLOO2, and RTG4 devices can be programmed in the same chain.

7.2.2 Programmer Support

FlashPro5/4/3/3X supports PolarFire, SmartFusion2, IGLOO2, and RTG4 devices. The Vpump on FlashPro5/4/3/3X is designed to support the programming of only one device. Make sure that Vpump, Vcc, and Vjtag are provided on board for chain programming. Connect the Vpump to the header as the Flashpro Express software will attempt to check for all external supplies, including Vpump, to ensure successful programming. There is no limitation to the chain length; however, ensure that the JTAG signal integrity and the timing are preserved.

8. FlashPro Express Modes

Starting with Libero SoC v12.5, FlashPro Express supports two modes:

- Operator mode
- Developer mode

Operator mode is a current flow that provides production programming. It is the default mode and allows you to run selected actions for individual and all devices.

Developer mode allows you to:

- Update jobs before running programming.
- Enable or disable chain devices.
- Load design and SPI Flash Programming files and select different programming actions for each chain device and SPI-Flash.
- Run selected actions for individual and all devices.

You select Operator or Developer mode using the Preference dialog box (**Project > Preferences**). The preference is saved per user per machine on Windows and per user on Linux. The mode preference remains the same until you change it.

Figure 8-1. FlashPro Express Mode Preference Dialog (Windows)

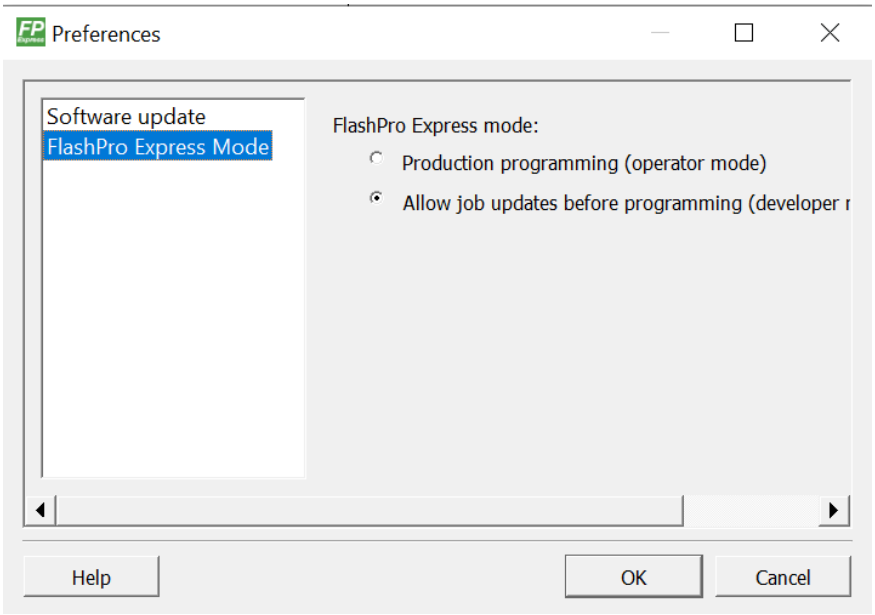
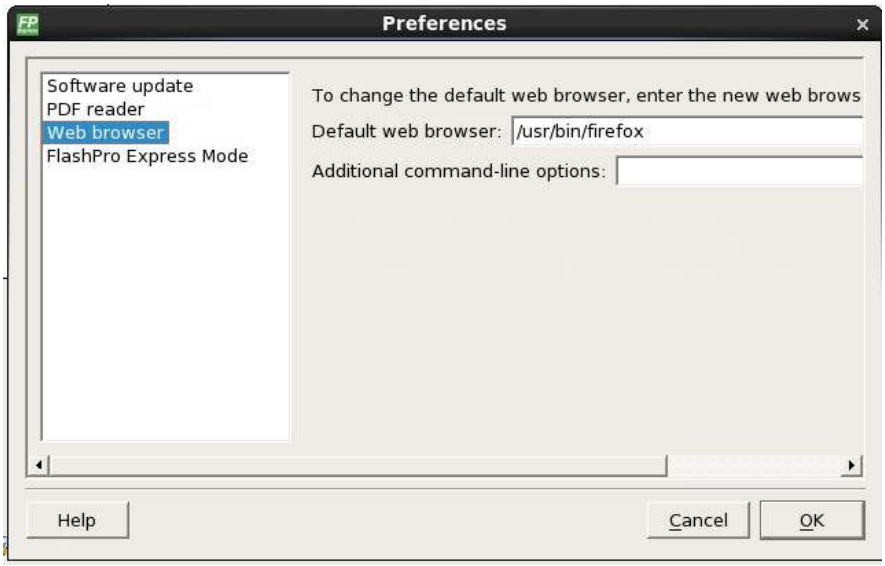


Figure 8-2. FlashPro Express Mode Preference Dialog (Linux)



The FlashPro Express mode can be switched before opening a job. If a job is opened, you are prompted to confirm closing of the job to save the mode preference after clicking the **OK** button.

After a job is opened in Developer mode, each device displays:

- An info ( ) icon with device specific data.
- Design icon ( ). The per-device selected action appears next to the icon if the **Run selected action for all devices** option is unselected.
- SPI Flash icon ( ) if SPI Flash programming is available for the device. The per-device selected SPI Flash action appears next to the icon if the **Run selected action for all devices** option is unselected.
- Configure button ( ) providing a menu of configuration options based on the device. The configure button is enabled when no programming action is running.

The following list describes Developer mode features:

- Device configuration options

Figure 8-3. Device Options to Program Design

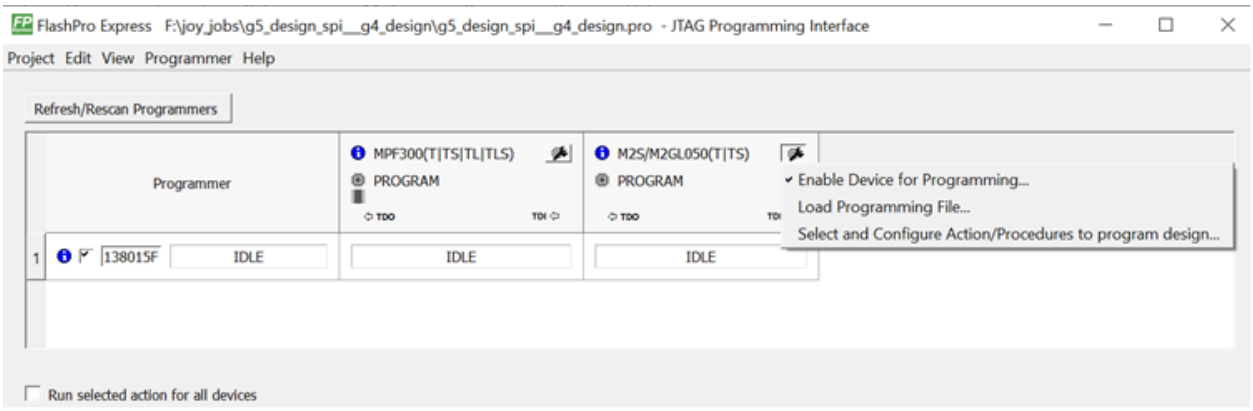
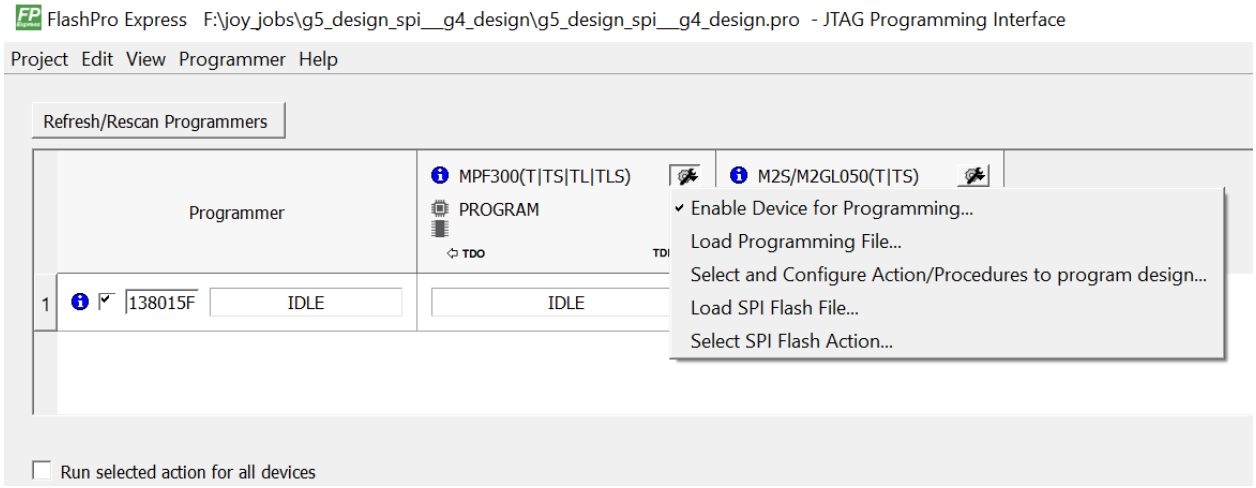
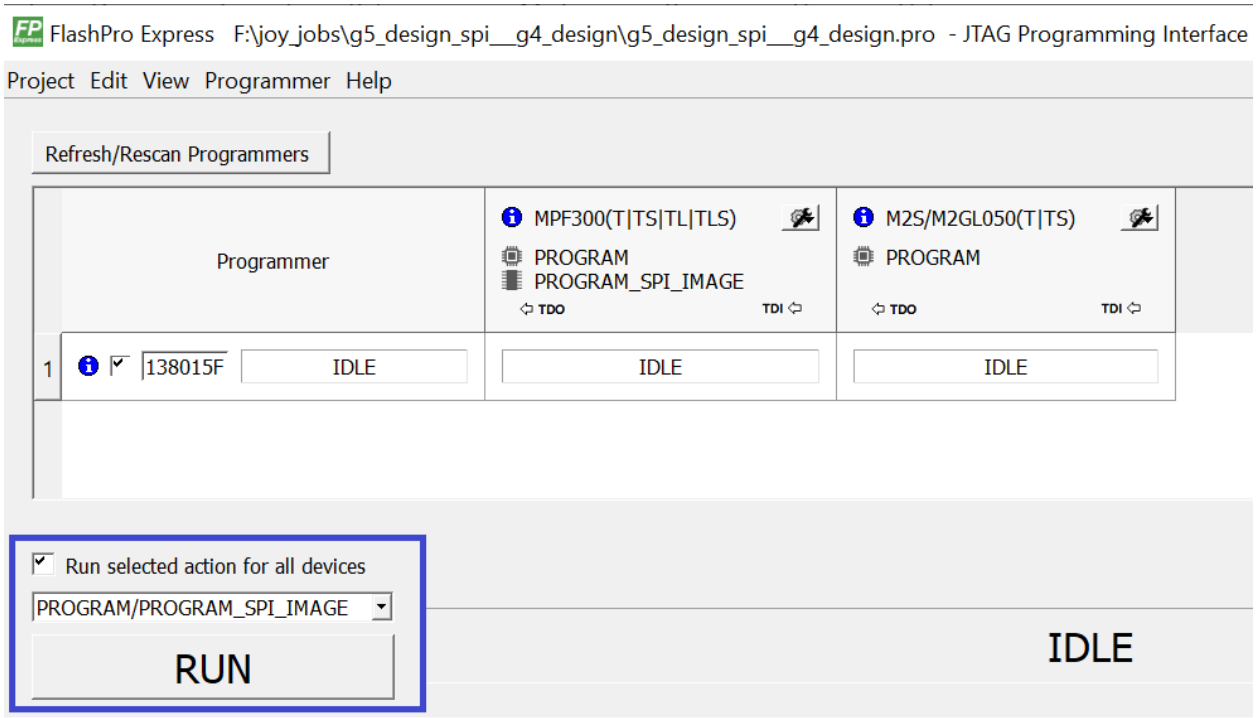


Figure 8-4. Device Options to Program Design and SPI Flash



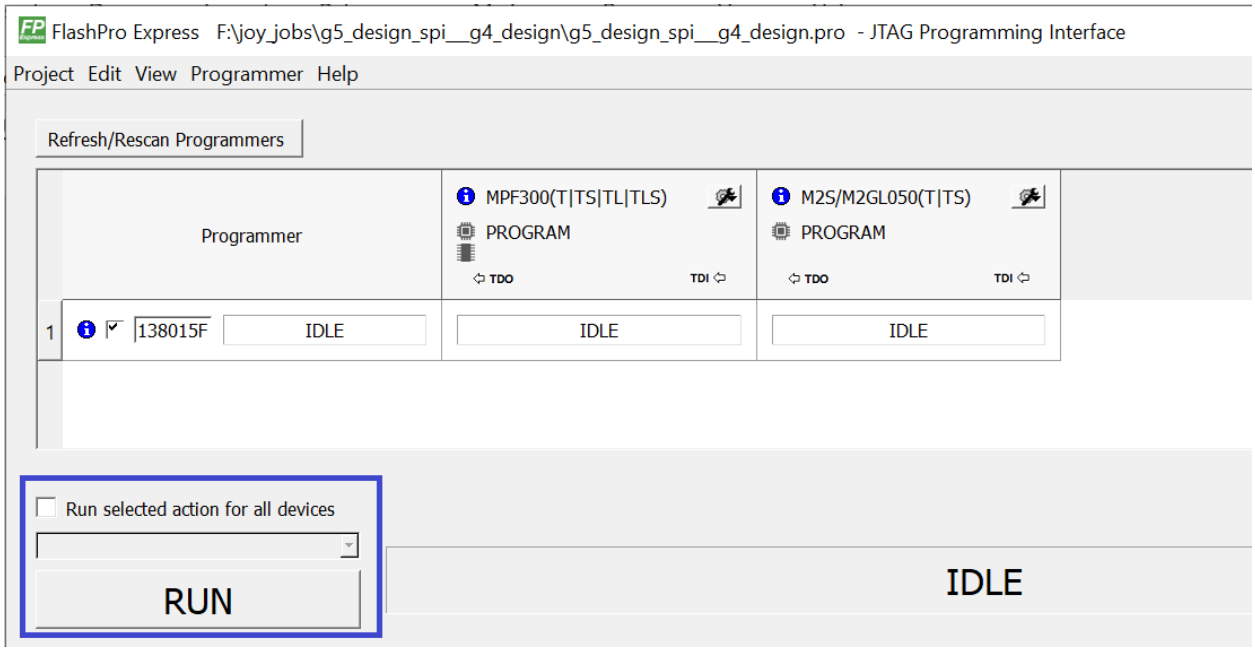
- Enable/Disable device for programming. The option allows the device to be enabled or disabled (put in “bypass”). You must load the programming file when enabling a device that is in “bypass,” with no programming file associated with the device or SPI-Flash. The device header info tooltip is updated with selected programming action if enabled or “bypass” if disabled.
  Note: The job cannot be saved if all devices are disabled or if any enabled devices do not have a loaded programming file. If all the devices are disabled, an actions combo box and a **Run** button are disabled.
- Load Programming File. The option is available for the enabled devices to load a different programming file for the target device. FlashPro Express requires all programming files to be in the local job folder. When loading a programming file from outside the job folder the file will be copied to the job folder first and then loaded for the selected device. The user must confirm copying the programming file to the job folder and overwriting the existing file.
- Select a programming action and configure actions and procedures per device. The option allows the selection of the programming action and configuration of the actions’ procedures. The option is available for an enabled device that has programming file loaded, and when the **Run selected action for all devices** option is unselected.
- Load SPI Flash file. This option allows you to load a different SPI Flash programming file.
- Select SPI Flash Action. The option allows the selection of the programming action for the SPI Flash. The option is available for the enabled device that has SPI Flash Programming File loaded, and when the **Run selected action for all devices** option is unselected.
- Program device selected actions. In Developer mode, when the **Run selected action for all devices** check box is selected, FlashPro Express runs selected action from the drop-down list below the check box for all enabled devices – similar to Operator mode.

Figure 8-5. Run One Action for All Chain Devices



When the **Run selected action for all devices** check box is unselected, the actions drop-down list is disabled. FlashPro Express runs the programming actions for the enabled device and SPI Flash, as selected uniquely for each device.

Figure 8-6. Run Device Selected Actions



9. TCL Commands

This section describes the FlashPro Express Tcl commands.

9.1 About Tcl Commands

A Tool Command Language (Tcl) file contains scripts for simple or complex tasks. You can run scripts from the Windows command line, or store and run a series of Tcl commands in a `*.tcl` batch file.

You can run Tcl commands from scripts or from a Windows or Linux command line. Tcl commands are case sensitive. However, their arguments are not.

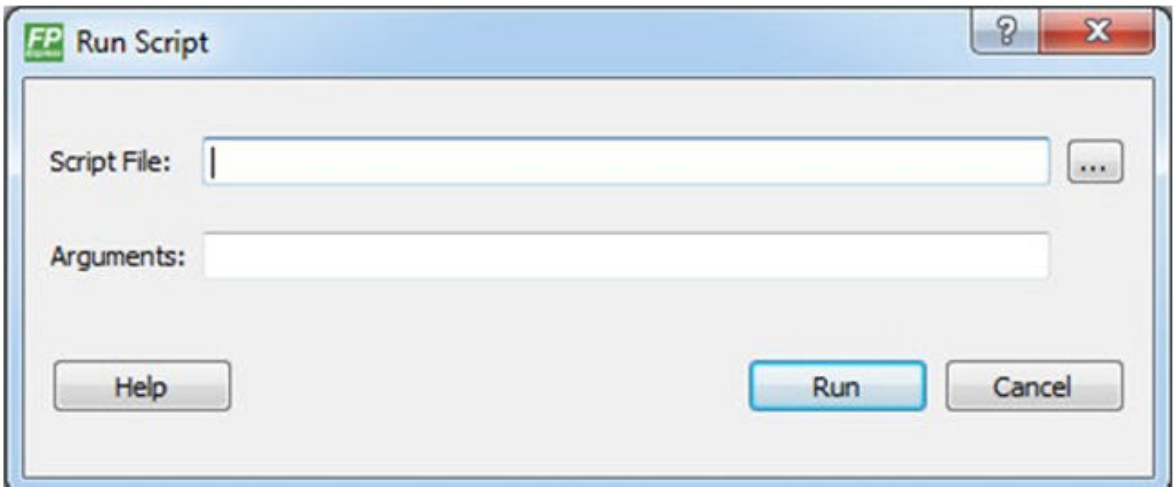
For information about all Tcl commands supported by FlashPro Express, see the Tcl Command Reference Guide (SmartFusion2, IGLOO2, RTG4) and Tcl Command Reference Guide (PolarFire).

9.2 Executing a Tcl Script File in FlashPro Express

To execute a Tcl script in FlashPro Express:

1. From the **File** menu, choose **Execute Script** to display the Run Script dialog box.

   Figure 9-1. Run Script Dialog Box

2. Click the **Browse** button to display the Open dialog box, in which you can go to the folder containing the script file to open. When you click **Open**, FlashPro Express enters the full path and script filename into the Run Script dialog box.
3. In the **Arguments** box, enter the arguments to pass to your Tcl script. Separate each argument by a space character.
4. Click **Run**.

9.3 Running Tcl Scripts from the Command Line

You can run Tcl scripts from a Windows or Linux command line.

1. At the prompt, type the path to the Microchip software followed by the word `SCRIPT`, a colon, and the name of the script file, as follows:

   ```
   <location of Microchip software>/bin/FPExpress.exe SCRIPT:<filename>
   ```

   The following example executes in batch mode the script *foo.tcl*:

   ```
   <location of Microchip software>/bin/FPExpress.exe script:foo.tcl
   ```

   The following example executes in batch mode the script foo.tcl and exports the log in the file *foo.txt*:

```
<location of Microchip software>/bin/FPExpress.exe script:foo.tcl logfile:foo.txt
```

The following example executes in batch mode the script *foo.tcl*, creates a console where the log is displayed briefly, and exports the log in the file *foo.txt*:

```
<location of Microchip software>/bin/FPExpress.exe script:foo.tcl
console_mode:brief logfile:foo.txt
```

If you leave console_mode unspecified or set it to **hide**, FlashPro Express executes without a console window. To leave the console window open, run the script with the console_mode parameter set to **show**, as in the following example:

```
<location of Microchip software>/bin/FPExpress.exe script:foo.tcl
console_mode:show logfile:foo.txt
```

2. To pass arguments to the Tcl script from the command line, use the `SCRIPT_ARGS` variable, as follows:
```
<location of Microchip software>/bin/FPExpress.exe SCRIPT:<filename>
SCRIPT_ARGS:"param1 param2 param3"
```

   Arguments passed to a Tcl script can be accessed through the Tcl variables `argc` and `argv`. The following examples show how a Tcl script accesses these arguments:

```
puts "Script name: $argv0"

puts "Number of arguments: $argc" set i 0

foreach arg $argv { puts "Arg $i : $arg" incr i

}
```

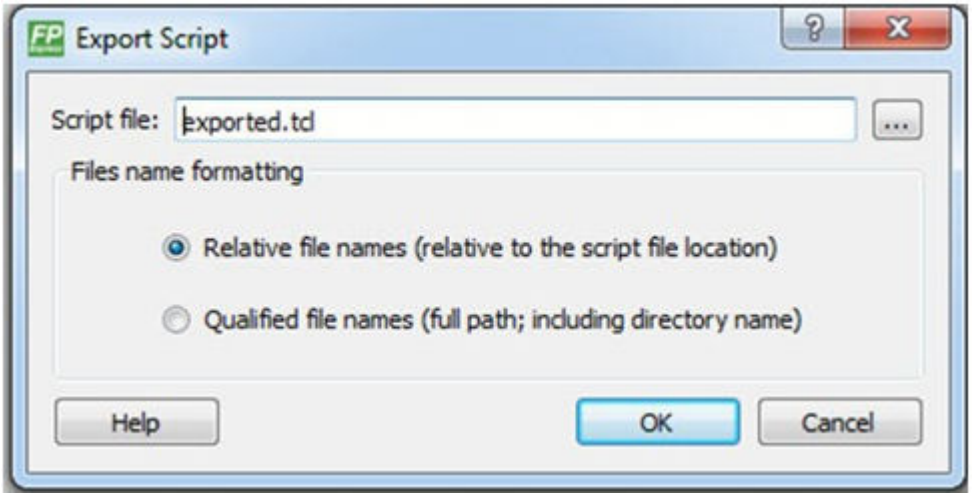
   Note: If the script name is protected with double quotes, script names can contain spaces. For example:
```
FPExpress script:"FPExpress tcl/foo 1.tcl"
```

9.4 Exporting Tcl Scripts from FlashPro Express

To export Tcl scripts from FlashPro Express:

1. From the **File** menu, choose **Export Script File**.
2. Enter the filename and click **Save**. The Export Script Options dialog appears, as shown in the following figure.

Figure 9-2. Script Export Options Dialog Box



3. Check the **Include commands from current project only** to export commands of the current project only. You can specify the filename formatting by selecting **Relative filenames** (relative to the current directory) or **Qualified filenames** (absolute path, including the directory name).
4. Click **OK**.

10. Troubleshooting

This section lists the exit codes for PolarFire, RTG4, and SmartFusion2 and IGLOO2.

10.1 PolarFire Exit Codes

The following table lists the PolarFire exit codes.

Table 10-1. PolarFire Exit Codes

Error Code	Exit Message	Exit Code	Possible Cause	Possible Solution
	Passed (no error)	0	—	—
0x8002	Failed to disable programming mode Failed to set programming mode	5	Unstable voltage level. Signal integrity issues on JTAG pins.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8032	Device is busy	5	Unstable VDDIx voltage level.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications.
0x8003	Failed to enter programming mode	5	Unstable voltage level. Signal integrity issues on JTAG pins. DEVRST_N is tied to LOW.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection. Tie DEVRST_N to HIGH prior to programming the device.
0x8004	Failed to verify IDCODE	6	Incorrect programming file. Incorrect device in chain. Signal integrity issues on JTAG pins.	Choose the correct programming file and select the correct device in the chain. Measure JTAG pins and noise for reflection. If TRST is left floating then add pull-up to pin. Reduce the length of Ground connection.

.....continued

Error Code	Exit Message	Exit Code	Possible Cause	Possible Solution
0x8005 0x8006 0x8007 0x8008	Failed to verify FPGA Array Failed to verify Fabric Configuration Failed to verify Security Failed to verify sNVM	11	Device is programmed with a different design or the component is blank. Unstable voltage level. Signal integrity issues on JTAG pins.	Verify the device is programmed with the correct data/design. Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8013	External digest check via JTAG/SPI Slave is disabled.	–18	External Digest check via JTAG/SPI Slave is disabled.	Need to use a bitstream file which has a valid FlashLock/UPK1 to enable external digest check via JTAG/SPI Slave.
0x8015	FPGA Fabric digest verification: FAIL Deselect procedure 'DO_ENABLE_FABRIC' to remove this digest check.	–20	FPGA Fabric is either erased or the data has been corrupted or tampered with.	If the Fabric is erased, deselect procedure **DO_ENABLE_FABRIC** from action **VERIFY_DIGEST**.
0x8016	sNVM digest verification: FAIL Deselect procedure 'DO_ENABLE_SNVM' to remove this digest check.	–20	sNVM is either erased or the data has been corrupted or tampered with.	If the sNVM is erased, deselect procedure **DO_ENABLE_SNVM** from action **VERIFY_DIGEST**.
0x8018	User security policies segment digest verification: FAIL Deselect procedure 'DO_ENABLE_SECURITY' to remove this digest check.	–20	Security segment is either erased or the data has been corrupted or tampered with.	If the security is erased, deselect procedure **DO_ENABLE_SECURITY** from action **VERIFY_DIGEST**.
0x8019	UPK1 segment digest verification: FAIL Deselect procedure 'DO_ENABLE_SECURITY' to remove this digest check.	–20	UPK1 segment is either erased or the data has been corrupted or tampered with.	If the UPK1 is erased, deselect procedure **DO_ENABLE_SECURITY** from action **VERIFY_DIGEST**.

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Error Code	Exit Message	Exit Code	Possible Cause	Possible Solution
0x801A	UPK2 segment digest verification: FAIL Deselect procedure 'DO_ENABLE_UKS 2' to remove this digest check.	–20	UPK2 segment is either erased or the data has been corrupted or tampered with.	If the UPK2 is erased, deselect procedure **DO_ENABLE_UKS2** from action **VERIFY_DIGEST**.
0x801B	Factory row and factory key segment digest verification: FAIL	–20	Factory row and factory key segment have been erased through zeroization or the data has been corrupted or tampered with.	
0x801C	Fabric configuration segment digest verification: FAIL Deselect procedure 'DO_ENABLE_FAB RIC' to remove this digest check.	–20	Fabric configuration segment is either erased or has been corrupted or tampered with.	If the Fabric configuration is erased, deselect procedure **DO_ENABLE_FABRIC** from action **VERIFY_DIGEST**.
0x8052	UEK1 segment digest verification: FAIL Deselect procedure 'DO_ENABLE_UEK 1' to remove this digest check.	–20	UEK1 segment is either erased or the data has been corrupted or tampered with.	If the UEK1 is erased, deselect procedure **DO_ENABLE_UEK1** from action **VERIFY_DIGEST**.
0x8053	UEK2 segment digest verification: FAIL Deselect procedure 'DO_ENABLE_UEK 2' to remove this digest check.	–20	UEK2 segment is either erased or the data has been corrupted or tampered with.	If the UEK2 is erased, deselect procedure **DO_ENABLE_UEK2** from action **VERIFY_DIGEST**.
0x8054	DPK segment digest verification: FAIL Deselect procedure 'DO_ENABLE_DPK' to remove this digest check.	–20	DPK segment is either erased or the data has been corrupted or tampered with.	If the DPK is erased, deselect procedure **DO_ENABLE_DPK** from action **VERIFY_DIGEST**.
0x8057	SMK segment digest verification: FAIL	–20	SMK segment is either erased or the data has been corrupted or tampered with.	If the SMK is erased, deselect procedure **DO_ENABLE_SMK** from action **VERIFY_DIGEST**.

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Error Code	Exit Message	Exit Code	Possible Cause	Possible Solution
0x8058	User Public Key segment digest verification: FAIL	–20	User Public Key segment is either erased or the data has been corrupted or tampered with.	If the User Public Key is erased, deselect procedure **DO_ENABLE_USER_PUBLIC_KEY** from action **VERIFY_DIGEST**.
0x801D	Device security prevented operation	–21	The device is protected with user pass key 1 and the bitstream file does not contain user pass key 1. User pass key 1 in the bitstream file does not match the device.	Run DEVICE_INFO to view security features that are protected. Provide a bitstream file with a user pass key 1 that matches the user pass key 1 programmed into the device.
0x801F	Programming Error.	–22	Bitstream file has been corrupted or was incorrectly generated.	Regenerate bitstream file. Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications.
	Bitstream or data is corrupted or noisy		Unstable voltage level. Signal integrity issues on JTAG pins.	Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8021	Programming Error. Invalid/Corrupted encryption key	–23	File contains an encrypted key that does not match the device File contains user encryption key, but device has not been programmed with the user encryption key.	Provide a programming file with an encryption key that matches that on the device. First program security with master programming file, then program with user encryption 1/2 field update programming files.
0x8023	Programming Error. Back level not satisfied	–24	Design version is not higher than the back-level programmed device.	Generate a programming file with a design version higher than the back level version.
0x8001	Failure to read DSN	–24	Device is in System Controller Suspend Mode. Check board connections.	TRSTB should be driven High or disable System Controller Suspend Mode.
0x8027	Programming Error. Insufficient device capabilities	–26	Device does not support the capabilities specified in programming file.	Generate a programming file with the correct capabilities for the target device.
0x8029	Programming Error. Incorrect DEVICEID	–27	Incorrect programming file. Incorrect device in chain. Signal integrity issues on JTAG pins.	Choose the correct programming file and select the correct device in chain. Measure JTAG pins and noise or reflection. If TRST is left floating, then add pull-up to pin. Reduce the length of ground connection.

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Error Code	Exit Message	Exit Code	Possible Cause	Possible Solution
0x802B	Programming Error. Programming file is out of date, please regenerate.	–28	Programming file version is out of date.	Generate programming file with latest version of Libero SoC.
0x8030	Programming Error Invalid or inaccessible Device Certificate	–31	FAB_RESET_N is tied to ground.	FAB_RESET_N should be tied to HIGH.
0x8032 0x8034 0x8036 0x8038	Instruction timed out	–32	Unstable voltage level. Signal integrity issues on JTAG pins.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8010	Failed to unlock user pass key 1	–35	Pass key in file does not match device.	Provide a programming file with a pass key that matches pass key programmed into the device.
0x8011	Failed to unlock user pass key 2	–35	Pass key in file does not match device.	Provide a programming file with a pass key that matches pass key programmed into the device.
0x804F	Bitstream programming action is disabled	–38	Unstable voltage level. Bitstream programming action has been disabled in Security Policy Manager.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Need to use a bitstream file which has a valid FlashLock/UPK1 to enable the bitstream programming action.
0x805B	Error, security must be either programmed on a blank device or with the FPGA Fabric design	–42	Security only bitstream programming on a programmed device.	Use this bitstream on a blank device or generate a new bitstream that contains the FPGA Fabric design along with the security.

10.2 RTG4 Exit Codes

The following table lists the RTG4 exit codes.

Table 10-2. RTG4 Exit Codes

Error Code	Exit Message	Possible Cause	Possible Solution
	Passed (no error)	—	—
0x8001	Failure to read DSN	Device is in System Controller Suspend Mode. Check board connections.	TRSTB should be driven High on device power up. Disable System Controller Suspend Mode in the Programming Bitstream Settings tool within Libero and reprogram the device.
0x8002	Device is busy	Unstable VDDIx voltage level.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications.
0x8003	Failed to enter programming mode	Unstable voltage level. Signal integrity issues on JTAG pins. DEVRST_N is tied to LOW.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection. Tie DEVRST_N to HIGH prior to programming the device.
0x8004	Failed to verify IDCODE	Incorrect programming file. Incorrect device in chain. Signal integrity issues on JTAG pins.	Choose the correct programming file and select the correct device in the chain. Measure JTAG pins and noise for reflection. If TRST is left floating then add pull-up to pin. Reduce the length of Ground connection.
0x8005	Failed to verify IDCODE RT4G150_ES STAPL file is not compatible with RT4G150 production devices. You must use a STAPL file for RT4G150 device.	Programming file is for RT4G150_ES and device is RT4G150. Incorrect programming file Incorrect device in chain. Signal integrity issues on JTAG pins.	Generate a programming file for RT4G150 device. Choose the correct programming file and select the correct device in the chain. Measure JTAG pins and noise for reflection. If TRST is left floating then add pull-up to pin. Reduce the length of Ground connection.
0x8006	Failed to verify IDCODE RT4G150 STAPL file is not compatible with RT4G150_ES devices. You must use a STAPL file for RT4G150_ES device.	Programming file is for RT4G150 and device is RT4G150_ES. Incorrect programming file Incorrect device in chain. Signal integrity issues on JTAG pins.	Generate a programming file for RT4G150_ES device. Choose the correct programming file and select the correct device in the chain. Measure JTAG pins and noise for reflection. If TRST is left floating then add pull-up to pin. Reduce the length of Ground connection.

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Error Code	Exit Message	Possible Cause	Possible Solution
0x8007	Failed to verify FPGA Array	Device is programmed with a different design or the component is blank. Unstable voltage level. Signal integrity issues on JTAG pins.	Verify the device is programmed with the correct data/design. Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8008	Device is blank	Attempting to verify digest of a blank device.	Program the device prior to running the **VERIFY_DIGEST** action.
0x8009	FPGA array digest check is disabled	Digest check has been disabled by the Programming Bitstream Settings tool within Libero.	Drive TRSTB high during device power up. Enable digest check in the Programming Bitstream Settings tool within Libero and reprogram the device.
0x800A	Failed to verify digest: Instruction timed out	Unstable voltage level. Signal integrity issues on JTAG pins.	Run the **VERIFY_DIGEST** action again. Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x800B	FPGA Fabric digest verification: FAIL	Programming bitstream components do not match components programmed. FPGA Fabric is either erased or the data has been corrupted or tampered with.	Use the same programming file that was used to program the device.
0x800C	Factory row segment digest verification: FAIL	Programming bitstream components do not match components programmed. Factory row segment data has been corrupted or tampered with.	Use the same programming file that was used to program the device.

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Error Code	Exit Message	Possible Cause	Possible Solution
0x800D	Bitstream Error. Bitstream or data is corrupted or noisy.	Bitstream file has been corrupted. Bitstream was incorrectly generated. Unstable voltage level. Signal integrity issues on JTAG pins.	Regenerate bitstream file. Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x800E	Failed to query programming bitstream settings: Instruction timed out	Unstable voltage level. Signal integrity issues on JTAG pins.	Run the **DEVICE_INFO** action again. Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x800F	Bitstream Error. Incorrect DEVICEID	Incorrect programming file. Incorrect device in chain. Signal integrity issues on JTAG pins.	Choose the correct programming file and select the correct device in the chain. Measure JTAG pins and noise for reflection. If TRST is left floating then add pull-up to pin. Reduce the length of Ground connection.
0x8010	Operation has been disabled by programming bitstream settings	Operation has been disabled by the Programming Bitstream Settings tool in Libero. User disabled Fabric Erase/Write/Verify and attempted to Erase/ Program/Verify the device.	Drive TRSTB high during device power up. Enable the disabled operation in the Programming Bitstream Settings tool in Libero and reprogram the device.
0x8011	Failed to check bitstream: Instruction timed out	Unstable voltage level. Signal integrity issues on JTAG pins.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.

.....continued			
Error Code	**Exit Message**	**Possible Cause**	**Possible Solution**
0x8012, 0x8013	Failed to erase device: Instruction timed out	Unstable voltage level Signal integrity issues on JTAG pins.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8014	Failed to program device: Instruction timed out	Unstable voltage level. Signal integrity issues on JTAG pins.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8015	Error, device is not ready.	DEVRST_N may have been driven LOW during programming.	Need to ensure that DEVRST_N is driven HIGH during programming. The reliability of the device in space cannot be guaranteed if this has occurred. It is the user's responsibility to ensure that DEVRST_N is driven HIGH during programming.

10.3 SmartFusion2 and IGLOO2 Exit Codes

The following table lists the SmartFusion2 and IGLOO2 exit codes.

Table 10-3. SmartFusion2 and IGLOO2 Exit Codes

Error Code	Exit Code	Exit Message	Possible Cause	Possible Solution
	0	Passed (no error)	—	—
0x8002	5	Failure to configure device programming at 1.2/1.0 VCC voltage	Unstable voltage level. Signal integrity issues on JTAG pins.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8032	5	Device is busy	Unstable VDDIx voltage level.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications.

.....continued

Error Code	Exit Code	Exit Message	Possible Cause	Possible Solution
0x8003	5	Failed to enter programming mode	Unstable voltage level. Signal integrity issues on JTAG pins. DEVRST_N is tied to LOW.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection. Tie DEVRST_N to HIGH prior to programming the device.
0x8004	6	Failed to verify IDCODE	Incorrect programming file. Incorrect device in chain. Signal integrity issues on JTAG pins.	Choose the correct programming file and select the correct device in the chain. Measure JTAG pins and noise for reflection. If TRST is left floating then add pull-up to pin. Reduce the length of Ground connection.
0x8005 0x8006 8x804A	10	Failed to program eNVM	Unstable voltage level. Signal integrity issues on JTAG pins.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8027 0x8028	10	Authentication Error Bitstream and device mismatch	Libero device selection does not match the target device.	Generate a programming file with the correct device selection for the target device.
0x8007 0x804C	11	Failed to verify FPGA Array Failed to verify Fabric Configuration Failed to verify Security	Device is programmed with a different design or the component is blank. Unstable voltage level. Signal integrity issues on JTAG pins.	Verify the device is programmed with the correct data/design. Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.

.....continued

Error Code	Exit Code	Exit Message	Possible Cause	Possible Solution
0x8008 0x8009 0x8049	11	Failed to verify eNVM	Device is programmed with a different design. Unstable voltage level. Signal integrity issues on JTAG pins.	Verify the device is programmed with the correct data/design. Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8013	–18	Digest request from SPI/JTAG is protected by User Pass Key 1	Digest request from SPI/JTAG is protected by user pass key 1. Lock bit has been configured in the Debug Policy within Security Policy Manager (SPM).	Provide a programming file with a pass key that matches pass key programmed into the device.
0x8014	–19	Failed to verify digest	>Unstable voltage level. Signal integrity issues on JTAG pins.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8015	–20	FPGA Fabric digest verification: FAIL	Programming bitstream components do not match components programmed. FPGA Fabric is either erased or the data has been corrupted or tampered with.	Use the same programming file that was used to program the device.
0x8016	–20	eNVM_0 digest verification: FAIL	Programming bitstream components do not match components programmed. eNVM_0 data has been corrupted or tampered with.	Use the same programming file that was used to program the device.
0x8017	–20	eNVM_1 digest verification: FAIL	Programming bitstream components do not match components programmed. eNVM_1 data has been corrupted or tampered with.	Use the same programming file that was used to program the device.

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Error Code	Exit Code	Exit Message	Possible Cause	Possible Solution
0x8018	–20	User security policies segment digest verification: FAIL	Programming bitstream components do not match components programmed. User security policy segment data has been corrupted or tampered with.	Use the same programming file that was used to program the device.
0x8019	–20	User key set 1 segment digest verification: FAIL	Programming bitstream components do not match components programmed. User key set 1 segment data has been corrupted or tampered with.	Use the same programming file that was used to program the device.
0x801A	–20	User key set 2 segment digest verification: FAIL	Programming bitstream components do not match components programmed. User key set 2 segment data has been corrupted or tampered with.	Use the same programming file that was used to program the device.
0x801B	–20	Factory row and factory key segment digest verification: FAIL	Programming bitstream components do not match components programmed. Factory row and factory key segment data has been corrupted or tampered with.	Use the same programming file that was used to program the device.
0x801C	–20	Fabric configuration segment digest verification: FAIL	Programming bitstream components do not match components programmed. Fabric configuration segment data has been corrupted or tampered with.	Use the same programming file that was used to program the device.
0x801D 0x801E 0x804B	–21	Device security prevented operation	The device is protected with user pass key 1 and the bitstream file does not contain user pass key 1. User pass key 1 in the bitstream file does not match the device.	Run DEVICE_INFO to view security features that are protected. Provide a bitstream file with a user pass key 1 that matches the user pass key 1 programmed into the device.

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Error Code	Exit Code	Exit Message	Possible Cause	Possible Solution
0x801F 0x8020 0x8040	–22	Authentication Error Bitstream or data is corrupted or noisy	eNVM has been locked by a master in your design. Running VERIFY action on a blank device. Bitstream file has been corrupted. Bitstream was incorrectly generated.	Release the lock on the eNVM after your master has completed its access operations. Write 0x00 to "REQACCESS" register in eNVM Control Registers (address 0x600801FC) to release the access. Program the device prior to running VERIFY action. Regenerate the bitstream file.
0x8021 0x8022	–23	Authentication Error Invalid/Corrupted encryption key	File contains an encrypted key that does not match the device. Attempting to erase a device with no security using master security file. File contains user encryption key, but device has not been programmed with the user encryption key. Device has user encryption key 1/2 enforced and you are attempting to reprogram security settings.	Provide a programming file with an encryption key that matches that on the device. Run DEVICE_INFO action to verify that the device has no security. If the device does not have security, you cannot erase it. First program security with master programming file, then program with user encryption 1/2 field update programming files. You must first ERASE security with the master security file, then you can reprogram new security settings.
0x8041	–23	Authentication Error Invalid/Corrupted encryption key	File contains an encrypted key that does not match the device. File contains user encryption key, but device has not been programmed with the user encryption key. Attempting to erase a device with no security using master security file. Device has user encryption key 1/2 enforced and you are attempting to reprogram security settings.	Provide a programming file with an encryption key that matches that on the device. Run DEVICE_INFO action to verify that the device has no security. If the device does not have security, you cannot erase it. First program security with master programming file, then program with user encryption 1/2 field update programming files. You must first ERASE security with the master security file, then you can reprogram new security settings.
0x8023 0x8024 0x8042	–24	Authentication Error Back level not satisfied	Design version is not higher than the back-level programmed device.	Generate a programming file with a design version higher than the back level version.
0x8001	–24	Failure to read DSN	Device is in System Controller Suspend Mode. Check board connections.	TRSTB should be driven High or disable "System Controller Suspend Mode".

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Error Code	Exit Code	Exit Message	Possible Cause	Possible Solution
0x8025 0x8026 0x8043	–25	Authentication Error DSN binding mismatch	DSN specified in programming file does not match the device being programmed.	Use the correct programming file with a DSN that matches the DSN of the target device being programmed.
0x8044	–26	Authentication Error Insufficient device capabilities	Device does not support the capabilities specified in programming file.	Generate a programming file with the correct capabilities for the target device.
0x8027 0x8028	–26	Authentication Error Bitstream and device mismatch	Libero device selection does not match the target device.	Generate a programming file with the correct device selection for the target device.
0x8029 0x802A 0x8045	–27	Authentication Error Incorrect DEVICEID	Incorrect programming file. Incorrect device in chain. Signal integrity issues on JTAG pins.	Choose the correct programming file and select the correct device in chain. Measure JTAG pins and noise or reflection. If TRST is left floating, then add pull-up to pin. Reduce the length of ground connection.
0x802B 0x802C	–28	Authentication Error Programming file is out of date, please regenerate	Programming file version is out of date.	Generate programming file with latest version of Libero SoC.
0x8046	–28	>Authentication Error Unsupported bitstream protocol version	Old programming file.	Generate programming file with latest version of Libero SoC.
0x802F	–30	JTAG interface is protected by UPK1	Invalid or no UPK1 is provided.	User needs to provide correct UPK1 to unlock device.
0x8030 0x8031 0x8048	–31	Authentication Error Invalid or inaccessible Device Certificate	M2S090 Rev. A or M2S150 Rev. A: Either certificate is corrupted or the user hasn't provided the application code in the eNVM or provided invalid application code. FAB_RESET_N is tied to ground.	User can program a valid application code. This can be done with SoftConsole. FAB_RESET_N should be tied to HIGH.

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Error Code	Exit Code	Exit Message	Possible Cause	Possible Solution
0x8032 0x8033 0x8034 0x8035 0x8036 0x8037 0x8038 0x8039	–32	Instruction timed out	Unstable voltage level. Signal integrity issues on JTAG pins.	Monitor related power supplies that cause the issue during programming; check for transients outside of Microchip specifications. See your device data sheet for more information on transient specifications. Monitor JTAG supply pins during programming; measure JTAG signals for noise or reflection.
0x8010	–35	Failed to unlock User Pass Key 1	Pass key in file does not match device. Plaintext pass key match is disabled. This occurs if HSM was used to program the device.	Provide a programming file with a pass key that matches pass key programmed into the device. Match pass key using HSM.
0x8011	–35	Failed to unlock User Pass Key 2	Pass key in file does not match device. Plaintext pass key match is disabled. This occurs if HSM was used to program the device.	Provide a programming file with a pass key that matches pass key programmed into the device. Match pass key using HSM.
0x8012	–35	Failed to unlock debug pass key	Pass key in file does not match device. Plaintext pass key match is disabled. This occurs if HSM was used to program the device.	Provide a programming file with a pass key that matches pass key programmed into the device. Match pass key using HSM.
0x804D	–36	<HSM related error message based on scenario>	HSM communication error. HSM call returns error.	Check whether the communication path to HSM is up. Make sure project is loaded properly and that HSM tickets have not been cleaned.
0x804E	–37	Device already has Security programmed. Please erase the device using master file before reprogramming Security Settings.	HSM flow does not support reprogramming device directly if Security has already been programmed.	Erase security and try programming the device.

11. SmartDebug

Microchip's SmartDebug tool complements design simulation by allowing verification and troubleshooting at the hardware level.

For detailed information about SmartDebug for SmartFusion2, IGLOO2, and RTG4, see the SmartDebug User Guide (SmartFusion2, IGLOO2, RTG4).

For detailed information about SmartDebug for PolarFire, see the SmartDebug User Guide (PolarFire).

12. Electrical Parameters

This section describes the FlashPro electrical parameters.

12.1 DC Characteristics for FlashPro6

Table 12-1. DC Characteristic for FlashPro6

Parameter	Test Condition	VJTAG Voltage Range	Min.	Typ.	Max.	Unit
VIH High-level input voltage	—	1.20 V to 1.95 V	VJTAG_VSPI x 0.65	—	—	V
	—	1.95 V to 2.70 V	1.6	—	—	V
	—	2.70 V to 3.60 V	2	—	—	V
VIL Low-level input voltage	—	1.20 V to 1.95 V	—	—	VJTAG_VSPIx0.35	V
	—	1.95 V to 2.70 V	—	—	0.7	V
	—	2.70 V to 3.60 V	—	—	0.8	V
VOH	IOH = –100 µA	1.2 V to 3.6 V	VJTAG_VSPI - 0.2	—	—	V
	IOH = –3 mA	1.2 V	—	—	—	V
	IOH = –6 mA	1.4 V	1.05	—	—	V
	IOH = –8 mA	1.65 V	1.2	0.95	—	V
	IOH = –9 mA	2.3 V	1.75	—	—	V
	IOH = –12 mA	3 V	2.3	—	—	V
VOL	IOH = –100 µA	1.2 V to 3.6 V	—	—	—	V
	IOH = –3 mA	1.2 V	—	0.25	—	V
	IOH = –6 mA	1.4 V	—	—	—	V
	IOH = –8 mA	1.65 V	—	—	—	V
	IOH = –9 mA	2.3 V	—	—	—	V
	IOH = –12 mA	3 V	—	—	—	V
IOH High-level output current	—	1.1 V to 1.2 V	—	—	–3	mA
	—	1.4 V to 1.6 V	—	—	–6	mA
	—	1.65 V to 1.95 V	—	—	–8	mA
	—	2.3 V to 2.7 V	—	—	–9	mA
	—	3 V to 3.6 V	—	—	–12	mA

.....continued						
Parameter	**Test Condition**	**VJTAG Voltage Range**	**Min.**	**Typ.**	**Max.**	**Unit**
	—	1.1 V to 1.2 V	—	—	3	mA
	—	1.4 V to 1.6 V	—	—	6	mA
IOL Low-level output current	—	1.65 V to 1.95 V	—	8	—	mA
	—	3 V to 3.6 V	—	12	—	mA
	—	2.3 V to 2.7 V	—	9	—	mA

12.2 DC Characteristics for FlashPro5/4/3/3X

The target board must provide the VCC, VCCI, VPUMP, and VJTAG during programming.

The VJTAG signal is driven from the target/DUT board. The VJTAG pin is sensed by the FP4 to configure the internal input and output buffers to the same I/O voltage levels. The VJTAG pin is only an input pin to the programmer.

Table 12-2. DC Characteristic for FlashPro5/4/3/3X

Description	Symbol	Min.	Max.	Unit
Input low voltage, TDO	VIL	–0.5	0.35*VJTAG	V
Input high voltage, TDO	VIH	0.65*VJTAG	3.6	V
Input current, TDO	IIL, IIH	–20	+20	mA
Input capacitance, TDO			40	pF
Output voltage, VPUMP, operating	VPP	+3.0	+3.6	V
Output current, VPUMP	IPP	—	250	mA
VJTAG = 1.5 V				
Output low voltage, TCK, TMS, TDI, 100 µA load	VOL	0.0	0.2	V
Output low voltage, TCK, TMS, TDI, 4 mA load	VOL	0.0	0.30*VJTAG	V
Output high voltage, TCK, TMS, TDI, 100 µA load	V	VJTAG–0.2	VJTAG	V
Output high voltage, TCK, TMS, TDI, 4 mA load	VOH	0.70*VJTAG	VJTAG	V
Output current, TCK, TMS, TDI	IOL, IOH	–4	+4	mA
VJTAG = 1.8 V				
Output low voltage, TCK, TMS, TDI, 100 µA load	VOL	0.0	0.2	V
Output low voltage, TCK, TMS, TDI, 6 mA load	VOL	0.0	0.3	V
Output high voltage, TCK, TMS, TDI, 100 µA load	VOH	VJTAG–0.2	VJTAG	V
Output high voltage, TCK, TMS, TDI, 6 mA load	VOH	1.25	VJTAG	V
Output current, TCK, TMS, TDI	IOL, IOH	–6	+6	mA
VJTAG = 2.5 V				

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Description	Symbol	Min.	Max.	Unit
Output low voltage, TCK, TMS, TDI, 100 µA load	VOL	0.0	0.2	V
Output low voltage, TCK, TMS, TDI, 8 mA load	VOL	0.0	0.6	V
Output high voltage, TCK, TMS, TDI, 100 µA load	VOH	VJTAG–0.2	VJTAG	V
Output high voltage, TCK, TMS, TDI, 8 mA load	VOH	1.8	VJTAG	V
Output current, TCK, TMS, TDI	IOL, IOH	–8	+8	mA
VJTAG = 3.3V				
Output low voltage, TCK, TMS, TDI, 100 µA load	VOL	0.0	0.2	V
Output low voltage, TCK, TMS, TDI, 8 mA load	VOL	0.0	0.4	V
Output high voltage, TCK, TMS, TDI, 100 µA load	VOH	VJTAG–0.2	VJTAG	V
Output high voltage, TCK, TMS, TDI, 8 mA load	VOH	2.4	VJTAG	V
Output current, TCK, TMS, TDI	IOL, IOH	–8	+8	mA

13. Electrical Specifications

This chapter describes the FlashPro electrical specifications.

13.1 FlashPro6

FlashPro6 is a JTAG-based programmer for flash based Microchip devices.

The FlashPro6 output is supplied via a connector to which a detachable 10-pin cable is fitted. The connector on the FlashPro6 unit is a 2x5, RA male Header connector that is manufactured by 3M and has a manufacturer's part number of N2510-5002-RB. This is a standard 2x5, 0.1-pitch keyed connector. Use the 10-pin right- angle header, 3M P/N N2510-5002-RB (DigiKey P/N MHE10K-ND) for FlashPro6 and use the 10-pin straight header,

The following figure shows the signals on the pins of the FlashPro6 10-pin connector.

Figure 13-1. FlashPro6 10-Pin Connector

Note: All ground pins must be connected. The rectangular shape shows connections on the programmer itself. Arrows show current flow towards or from the rectangular programmer.

The following table lists the signals.

Table 13-1. FlashPro6 Signal Description

Signal	Description
GND	Signal reference
TCK/SCK	JTAG clock; SPI clock
TDI/SDI	JTAG data input to device; SPI MOSI
TDO/SDO	JTAG data output from device; SPI MISO
TMS/SS#	JTAG mode select; SPI Chip Select
nTRST	Programmable output pin may be set to off, toggle, low, or high level
VJTAG	Reference voltage from the target board

Some designers of high-integrity military and avionic boards may arrange their boards so that TRST is tied to ground via a weak pull-down resistor. The purpose of this is to hold the JTAG state-machine in a reset state by default, so that even with TCK oscillating, some sudden ion bombardment or other electrical even will not suddenly throw the JTAG state-machine into an unknown state. If your design also uses a weak pull-down resistor on TRST on your board, enabling the "Drive TRST" flag will be required to force the JTAG state-machine out of reset to permit programming to take place. With most boards, there is no need to select this flag.

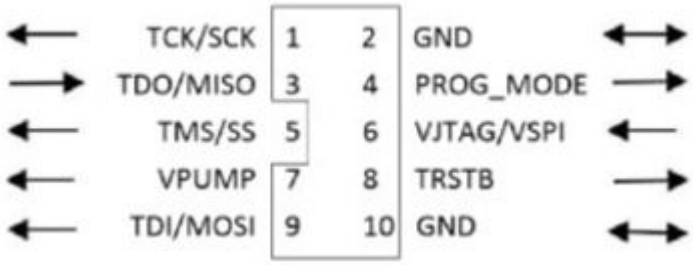
13.2 FlashPro5

FlashPro5 is a JTAG- and a SPI-based programmer for flash-based Microchip devices.

The FlashPro5 output is supplied via a connector to which a detachable 10-pin cable is fitted. The connector on the FlashPro5 unit is a 2x5, RA male Header connector that is manufactured by AMP and has a manufacturer's part number of 103310-1. This is a standard 2x5, 0.1-pitch keyed connector. Use the 10-pin right-angle header, AMP P/N 103310-1 (DigiKey P/N A26285-ND) for FlashPro4 and use the 10-pin straight header, AMP P/N 103308-1 (DigiKey P/N A26267-ND) for the straight version.

The following figure shows the signals on the pins of the FlashPro5 10-pin connector.

Figure 13-2. FlashPro5 10-Pin Connector



Note: All ground pins must be connected. The rectangular shape shows connections on the programmer itself. Arrows show current flow towards or from the rectangular programmer.

The following table lists the signals.

Table 13-2. FlashPro5 Signal Description

Signal	Description
VPUMP	3.3 V Programming voltage
GND	Signal reference
TCK/SCK	JTAG clock; SPI clock
TDI/SDI	JTAG data input to device; SPI MOSI
TDO/SDO	JTAG data output from device; SPI MISO
TMS/SS#	JTAG mode select; SPI Chip Select
nTRST	Programmable output pin may be set to off, toggle, low, or high level
VJTAG	Reference voltage from the target board
PROG_MODE	IGLOO v2 family - used for switching from VCC 1.2 V to 1.5 V during programming

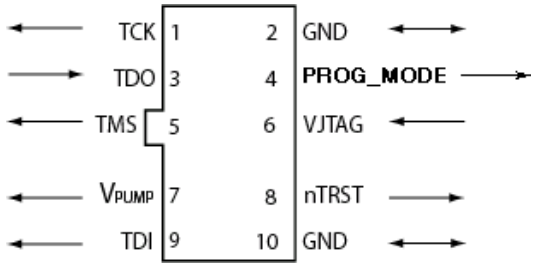
Some designers of high-integrity boards (military and avionic) may arrange their boards so that TRST is tied to ground via a weak pull-down resistor. The purpose of this is to hold the JTAG state-machine in a reset state by default, so that even with TCK oscillating, some sudden ion bombardment or other electrical even will not suddenly throw the JTAG state-machine into an unknown state. If your design also uses a weak pull-down resistor on TRST on your board, enabling the "Drive TRST" flag will be required to force the JTAG state-machine out of reset to permit programming to take place. With most boards, there is no need to select this flag.

13.3 FlashPro4

The FlashPro4 output is supplied via a connector to which a detachable 10-pin cable is fitted. The connector on the FlashPro4 unit is a 2x5, RA male Header connector that is manufactured by AMP and has a manufacturer's part number of 103310-1. This is a standard 2x5, 0.1-pitch keyed connector. Use the 10-pin right-angle header, AMP P/N 103310-1 (DigiKey P/N A26285-ND) for FlashPro4 and use the 10-pin straight header, AMP P/N 103308-1 (DigiKey P/N A26267-ND) for the straight version.

The following figure shows the signals on the pins of the FlashPro4 10-pin connector.

Figure 13-3. FlashPro4 10-Pin Connector



Note: All ground pins must be connected. The rectangular shape shows connections on the programmer itself. Arrows show current flow towards or from the rectangular programmer.

The following table lists the signals.

Table 13-3. FlashPro4 Signal Description

Signal	Description
VPUMP	3.3 V Programming voltage
GND	Signal reference
TCK	JTAG clock
TDI	JTAG data input to device
TDO	JTAG data output from device
TMS	JTAG mode select
nTRST	Programmable output pin may be set to off, toggle, low, or high level
VJTAG	Reference voltage from the target board
PROG_MODE	IGLOO v2 family - used for switching from VCC 1.2 V to 1.5 V during programming

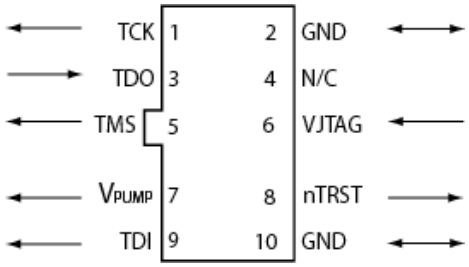
Some designers of high-integrity boards (military and avionic) may arrange their boards so that TRST is tied to ground via a weak pull-down resistor. The purpose of this is to hold the JTAG state-machine in a reset state by default, so that even with TCK oscillating, some sudden ion bombardment or other electrical event will not suddenly throw the JTAG state-machine into an unknown state. If your design also uses a weak pull-down resistor on TRST on your board, enabling the “Drive TRST” flag will be required to force the JTAG state-machine out of reset to permit programming to take place. With most boards, there is no need to select this flag.

13.4 FlashPro3

The FlashPro3 output is supplied via a connector to which a detachable 10-pin cable is fitted. The connector on the FlashPro3 unit is a 2x5, RA male Header connector that is manufactured by AMP and has a manufacturer’s part number of 103310-1. This is a standard 2x5, 0.1-pitch keyed connector. Use the 10-pin right-angle header, AMP P/N 103310-1 (DigiKey P/N A26285-ND) for FlashPro5/4/3/3X and use the 10-pin straight header, AMP P/N 103308-1 (DigiKey P/N A26267-ND) for the straight version.

The following figure shows the signals on the pins of the FlashPro3 10-pin connector.

Figure 13-4. FlashPro3 10-Pin Connector



Note: All ground pins must be connected. The rectangular shape shows connections on the programmer itself. Arrows show current flow towards or from the rectangular programmer.

The following table lists the signals.

Table 13-4. FlashPro3 Signal Description

Signal	Description
VPUMP	3.3 V Programming voltage
GND	Signal reference
TCK	JTAG clock
TDI	JTAG data input to device
TDO	JTAG data output from device
TMS	JTAG mode select
nTRST	Programmable output pin may be set to off, toggle, low, or high level
VJTAG	Reference voltage from the target board
N/C	Programmer does not connect to this pin

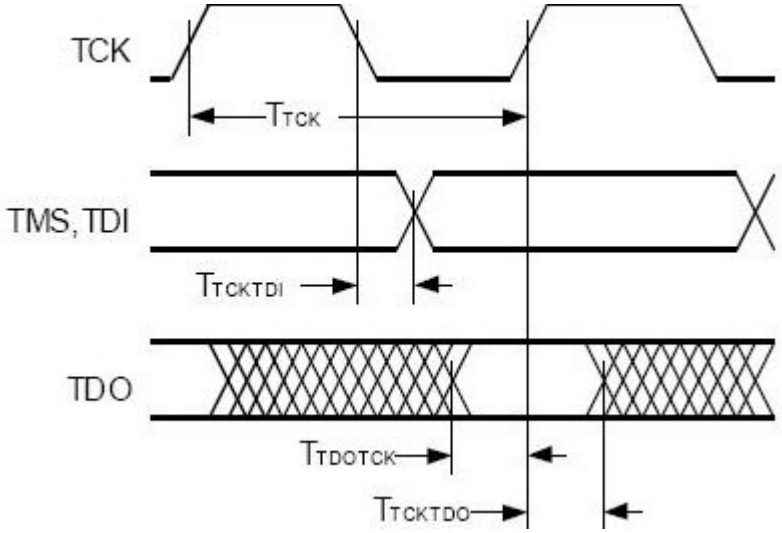
Some designers of high-integrity military and avionic boards may arrange their boards so that TRST is tied to ground via a weak pull-down resistor. The purpose of this is to hold the JTAG state-machine in a reset state by default, so that even with TCK oscillating, some sudden ion bombardment or other electrical even will not suddenly throw the JTAG state-machine into an unknown state. If your design also uses a weak pull-down resistor on TRST on your board, enabling the “Drive TRST” flag will be required to force the JTAG state-machine out of reset to permit programming to take place. With most boards, there is no need to select this flag.

13.5 JTAG Switching Characteristics

This section describes the FlashPro JTAG switching characteristics.

The following figure shows the JTAG switching characteristics.

Figure 13-5. JTAG Switching Characteristics



13.5.1 FlashPro6 Characteristics

Table 13-5. JTAG Switching Characteristics for FlashPro6

Description	Symbol	Min.	Max.	Unit
Output Delay from TCK to TDI, TMS	TTCKTDI	2	2.2	ns
TDO setup time before TCK rising, VJTAG=3.3 V	TTDOTCK	11.4	481	ns
TDO setup time before TCK rising, VJTAG=1.5 V	TTDOTCK	10.5	487	ns
TDO Hold time after TCK rising	TTCKTDO	0	—	
TCK period	TTCK	49.4	—	ns

13.5.2 FlashPro5/4/3/3X Characteristics

Table 13-6. JTAG Switching Characteristics for FlashPro5/4/3/3X

Description	Symbol	Min.	Max.	Unit
Output delay from TCK to TDI, TMS	TTCKTDI	–2	2	ns
TDO setup time before TCK rising, VJTAG=3.3	TTDOTCK	12	—	ns
TDO setup time before TCK rising, VJTAG=1.5	TTDOTCK	14.5	—	ns
TDO hold time after TCK rising	TTCKTDO	0	—	ns
TCK period	TTCK	41.7	10667	ns

14. FlashPro Express Reference

Use this chapter as a reference for the FlashPro Express user interface.

14.1 FlashPro Express Start Page

The FlashPro Express Start page is the first page that appears when the tool starts. This page provides the interface for loading a project into the tool by either navigating to the project location or clicking a recently opened project.

14.2 FlashPro Express Project Menu

The following table lists the FlashPro express project menu details.

Table 14-1. FlashPro Express Project Menu

Command	Function
New Job Project	New job project folder with programming job name will be created at the specified location.
Open Job Project	Loads a job project into the tool by reading the information in the user-specified `.pro` file.
Close Job Project	Closes the current job project.
Save Job Project	Saves the current job project.
Set Log File	Sets the location of the Log file to your specified location.
Export Log File	Exports the Log file to your specified location.
Preferences	Allows you to select FlashPro Express mode.
Execute Script	Runs your specified Tcl script.
Export Script File	Exports all commands run in this session to your specified path as a Tcl script.
Exit	Exits FlashPro Express.

14.3 FlashPro Express Edit Menu

Table 14-2. FlashPro Express Edit Menu

Command	Function
Clear Log Window	Clears the Log window.

14.4 FlashPro Express View Menu

Table 14-3. FlashPro Express View Menu

Command	Function
Log Window	Shows or hides the Log window.

14.5 FlashPro Express Tools Menu

The following table lists the FlashPro express tools menu details.

Table 14-4. FlashPro Express Tools Menu

Command	Function
Programming Connectivity and Interface	The Programming Connectivity and Interface window displays the physical chain from TDI to TDO or SPI Slave configuration.
Programmer Settings	Opens the Programmer Settings dialog box in which you can set options for supported Microchip programmers.
Disable Core Check During Scan and Check Chain	Disables core checking during scan and check chain operations.

14.6 FlashPro Express Help Menu

Table 14-5. FlashPro Express Help Menu

Command	Function
Help Topics	Opens the help.
Microchip Technical Support	Opens the Microchip technical support site.
Microchip Web Site	Opens the Microchip website in your default browser.
User Guide	Opens the FlashPro Express User Guide.
Check for Software Updates	Checks for software updates if you are connected to the Internet.
About FlashPro Express	Lists the FlashPro Express release information.

14.7 FlashPro Express Log Window and Status Bar

The following sections describe the FlashPro Express Log window and status bar.

14.7.1 FlashPro Express Log Window

The FlashPro Express Log window shows status messages for user activity.

- Click the appropriate tab (**Messages**, **Errors**, **Warning**, and **Info**) to filter messages by type.
- Use the right-click menu to copy text, clear the log, and scroll the log.
- Use the def variable LOG_WINDOW_BUFFER_SIZE to set the buffer size.
- Use the **View** menu to show or hide the Log window.

14.7.2 FlashPro Express Status Bar

The Status Bar at the bottom shows the status of the load project action.

15. Appendix A: Sample Programming and SmartDebug Times Using FlashPro5 and FlashPro6

The tables in this appendix show sample programming times using FlashPro5 and FlashPro6 programmers.

The following table shows sample PPD programming times.

Table 15-1. Sample PPD Programming Times

Devices[1]	PPD Programming Time[2] (mm:ss)		
	FlashPro5	FlashPro6	
	TCK=4 MHz	TCK=4 MHz	TCK=20 MHz[3]
	USB 2.0	USB 2.0/3.0	USB 2.0/3.0
M2S/A2GL 005	—	—	—
M2S/A2GL 010	—	—	—
M2S/A2GL 025	—	—	—
M2S/A2GL 050	2min 9sec	2min 10sec	2min 2sec
M2S/A2GL 060	—	—	—
M2S/A2GL 090	—	—	—
M2S/A2GL 150	4min 21sec	4min 19sec	3min 54sec
RTG4	2min 10sec	1min 56sec	1min 33sec
MPF100	39sec	28sec	23sec
MPF200	1min 3sec	43sec	28sec
MPF300	1min 33sec	1min 4sec	43sec
MPF500	1min 57sec	1min 34sec	1min

Notes:

- [1] FlashPro6 supports JTAG programming for all SmartFusion2, IGLOO2, RTG4 and PolarFire devices.
- [2] To benefit from the improved programming time using FlashPro6, use the PPD file format for SmartFusion2, IGLOO2 and PolarFire devices. Programming time speed up with PPD will be added in future releases.
- [3] To program the device at 20 MHz TCK, take appropriate steps to ensure signal integrity of the JTAG signals.

The following table shows sample SPI Flash programming times, all of which use PPD flow.

Table 15-2. SPI Flash Programming

(N25Q00AA13GSF40G / MT25QL01GBBB8ESF-0SIT TR)[1] 10 MByte data	PPD Programming Time				
	FlashPro5[4]		FlashPro6[2]		
	TCK = 4 MHZ	TCK = 15 MHz[3]	TCK = 4 MHZ	TCK = 15 MHz[3]	TCK = 20 MHz[3]
	USB 2.0	USB 2.0	USB 2.0/3.0	USB 2.0/3.0	USB 2.0/3.0
Program SPI Flash	8min 30sec	5min 29sec	22min 12sec	13min 9sec	12min 11sec

.....continued					
(N25Q00AA13GSF40G / MT25QL01GBBB8ESF-0SIT TR)[1] 10 MByte data	PPD Programming Time				
	FlashPro5[4]		FlashPro6[2]		
	TCK = 4 MHZ	TCK = 15 MHz[3]	TCK = 4 MHZ	TCK = 15 MHz[3]	TCK = 20 MHz[3]
	USB 2.0	USB 2.0	USB 2.0/3.0	USB 2.0/3.0	USB 2.0/3.0
Verify SPI Flash	2hrs 22min 10sec	2hrs 10min 28sec	23min 05sec	14min 17sec	13min 21sec
Read SPI Flash	2hrs 34min 20sec	2hrs 23min 45sec	22min 30sec	13min 54sec	12min 55sec
Erase SPI Flash	19sec	18sec	1min 51sec	1min 49sec	1min 48sec

Notes:

- [1] SPI Flash programming has been tested on N25Q00AA and MT25QL01G/MT25QU01G devices only. Contact technical support for other SPI-Flash device support needs.
- [2] FlashPro6 has longer programming times for SPI Flash devices, when compared to FlashPro5. However, readback and verification times are significantly shorter. Programming time for FlashPro6 will be improved in future releases.
- [3] To program the device at a high TCK frequency, take appropriate steps to ensure signal integrity of the JTAG signals.
- [4] FlashPro5 supports MT25QL01G and N25Q00AA13Gxx40G only.

16. Appendix B: Regulatory and Compliance Information

EU Declaration of Conformity:

This product complies with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

To view the Declaration of Conformity in English: http://www.microsemi.com/index.php?option=com_docman&task=doc_download&gid=131772

Non-English: http://www.microsemi.com/index.php?option=com_docman&task=doc_download&gid=131748

Markings:

CE This product complies with 2004/108/EC, Electromagnetic Compatibility (EMC) Directive

For Korea:

Type of Equipment	User's Guide
A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
Class A Equipment (Industrial Broadcasting & Communication Equipment)	This equipment is **Industrial (Class A) electromagnetic wave suitability equipment** and seller or user should take notice of it, and this equipment is to be used in the places except for home.

17. Revision History

Revision	Date	Description
B	12/2020	Added 5. Programming Connectivity and Interface section. Added Construct Automatically option to create new job project in developer mode, section 4.3 Creating a Job Project from a FlashPro Express Job. Updated the following sections for minor edits: 14.5 FlashPro Express Tools Menu, 6.2 Programmer Settings, 14.2 FlashPro Express Project Menu.
A	11/2020	Initial Revision.

18. Microchip FPGA Technical Support

Microchip FPGA Products Group backs its products with various support services, including Customer Service, Customer Technical Support Center, a website, and worldwide sales offices. This section provides information about contacting Microchip FPGA Products Group and using these support services.

18.1 Customer Service

Contact Customer Service for non-technical product support, such as product pricing, product upgrades, update information, order status, and authorization.

- From North America, call **800.262.1060**
- From the rest of the world, call **650.318.4460**
- Fax, from anywhere in the world, **650.318.8044**

18.2 Customer Technical Support

Microchip FPGA Products Group staffs its Customer Technical Support Center with highly skilled engineers who can help answer your hardware, software, and design questions about Microchip FPGA Products. The Customer Technical Support Center spends a great deal of time creating application notes, answers to common design cycle questions, documentation of known issues, and various FAQs. So, before you contact us, please visit our online resources. It is very likely we have already answered your questions.

You can communicate your technical questions through our Web portal and receive answers back by email, fax, or phone. Also, if you have design problems, you can upload your design files to receive assistance. We constantly monitor the cases created from the web portal throughout the day. When sending your request to us, please be sure to include your full name, company name, and your contact information for efficient processing of your request.

Technical support can be reached at soc.microsemi.com/Portal/Default.aspx.

For technical support on RH and RT FPGAs that are regulated by International Traffic in Arms Regulations (ITAR), log in at soc.microsemi.com/Portal/Default.aspx, go to the **My Cases** tab, and select **Yes** in the ITAR drop-down list when creating a new case. For a complete list of ITAR-regulated Microchip FPGAs, visit the ITAR web page.

You can track technical cases online by going to My Cases.

18.3 Website

You can browse a variety of technical and non-technical information on the Microchip FPGA Products Group home page, at www.microsemi.com/soc.

18.4 Outside the U.S.

Customers needing assistance outside the US time zones can either contact technical support at (https://soc.microsemi.com/Portal/Default.aspx) or contact a local sales office.

Visit About Us for sales office listings and corporate contacts.

The Microchip Website

Microchip provides online support via our website at www.microchip.com/. This website is used to make files and information easily available to customers. Some of the content available includes:

- **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, online discussion groups, Microchip design partner program member listing
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Customer Support

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- Distributor or Representative
- Local Sales Office
- Embedded Solutions Engineer (ESE)
- Technical Support

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

Technical support is available through the website at: www.microchip.com/support

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Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
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