



Cypress Programmer 2.0 OpenOCD

CLI User Guide

Document No.: 002-25294 Rev. **

Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709
<http://www.cypress.com>

Copyrights

© Cypress Semiconductor Corporation, 2018. This document is the property of Cypress Semiconductor Corporation and its subsidiaries, including Spansion LLC ("Cypress"). This document, including any software or firmware included or referenced in this document ("Software"), is owned by Cypress under the intellectual property laws and treaties of the United States and other countries worldwide. Cypress reserves all rights under such laws and treaties and does not, except as specifically stated in this paragraph, grant any license under its patents, copyrights, trademarks, or other intellectual property rights. If the Software is not accompanied by a license agreement and you do not otherwise have a written agreement with Cypress governing the use of the Software, then Cypress hereby grants you a personal, non-exclusive, nontransferable license (without the right to sublicense) (1) under its copyright rights in the Software (a) for Software provided in source code form, to modify and reproduce the Software solely for use with Cypress hardware products, only internally within your organization, and (b) to distribute the Software in binary code form externally to end users (either directly or indirectly through resellers and distributors), solely for use on Cypress hardware product units, and (2) under those claims of Cypress's patents that are infringed by the Software (as provided by Cypress, unmodified) to make, use, distribute, and import the Software solely for use with Cypress hardware products. Any other use, reproduction, modification, translation, or compilation of the Software is prohibited.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS DOCUMENT OR ANY SOFTWARE OR ACCOMPANYING HARDWARE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. To the extent permitted by applicable law, Cypress reserves the right to make changes to this document without further notice. Cypress does not assume any liability arising out of the application or use of any product or circuit described in this document. Any information provided in this document, including any sample design information or programming code, is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Cypress products are not designed, intended, or authorized for use as critical components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or system could cause personal injury, death, or property damage ("Unintended Uses"). A critical component is any component of a device or system whose failure to perform can be reasonably expected to cause the failure of the device or system, or to affect its safety or effectiveness. Cypress is not liable, in whole or in part, and you shall and hereby do release Cypress from any claim, damage, or other liability arising from or related to all Unintended Uses of Cypress products. You shall indemnify and hold Cypress harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of Cypress products.

Cypress, the Cypress logo, Spansion, the Spansion logo, and combinations thereof, WICED, PSoC, CapSense, EZ-USB, F-RAM, and Traveo are trademarks or registered trademarks of Cypress in the United States and other countries. For a more complete list of Cypress trademarks, visit cypress.com. Other names and brands may be claimed as property of their respective owners.

Contents



1	Introduction.....	5
	Overview.....	5
	Acronyms and Abbreviations	5
	Supported OS	6
	Supported MCU Devices	6
	Supported Hardware (Probes)	6
	Installation.....	6
	Document Convention.....	6
	Revision History	7
2	Command-Line Options.....	8
	-f (--file) <filename.cfg>	8
	-d (--debug) <n>	8
	-c (--command) <"cmd1; cmd2; ...">	8
	-l (--log_output) <logfile.txt>	8
	-s (--search) <directory>	8
3	Running TCL Commands.....	9
	Using Configuration File Only	9
	Using Command Line Only	9
	Combined – Configuration File Plus Command Line	9
4	KitProg3/MiniProg4 Driver Commands	10
	kitprog3 acquire_config <status> [target_type] [mode] [attempts]	10
	kitprog3 acquire_psoc	10
	kitprog3 power_config <status> [voltage]	10
	kitprog3 power_control <status>	11
	kitprog3 led_control <type>	11
	kitprog3 get_power	11
5	Flash Driver Commands	12
	psoc6 allow_unsafe_sflash <on off>	12
	psoc6 allow_efuse_program <on off>	12
	psoc6 reset_halt <mode>	12
	psoc6 mass_erase <bank>	12
	traveo2 ecc_error_reporting <on off>	13

6	Custom OpenOCD Commands	14
	flash rmw <address> <data>	14
	add_verify_range <target> <address> <size>	14
7	Global Variables	15
	ENABLE_ACQUIRE	15
	ENABLE_POWER_SUPPLY	15
	ENABLE_CM0, ENABLE_CM4	15
	SMIF_BANKS	15
8	Usage Examples	17
	Erase Main Flash	17
	Erase Work Flash	18
	Erase Main Flash Rows 0...10	19
	Display Memory Contents (32 words at address 0x08000000)	20
	Program Device with Verification (Intel HEX file)	21
	Modify Individual Bytes in Main Flash and Display Results.....	22
	Start GDB Server and Leave It Running	23

1 Introduction



Overview

Cypress Programmer (CYP) 2.0 is a flexible, cross-platform, integrated application to allow programming Cypress devices. It can perform Program, Erase, Verify, and Read operations on the flash of the target device. It can target an entire device, a specific region, sector, and even byte of a device.

The CYP 2.0 command-line interface (CLI) is based on the Open On-Chip Debugger (OpenOCD) project. OpenOCD is a powerful tool whose interface interacts with the target device via the JTAG/SWD debug ports. It allows programming internal and external flash memories of a wide range of target devices, CFI-compatible flashes, and some CPLD/FPGA devices.

OpenOCD was originally developed by Dominic Rath at the University of Applied Sciences in Augsburg. The OpenOCD source code is now available through the GNU General Public License (GPL).

This document covers the Cypress-specific CLI extensions of OpenOCD. For more details about OpenOCD, refer to the official documentation available at <http://openocd.org/documentation/>.

Acronyms and Abbreviations

- CYP – Cypress Programmer.
- CLI – A Command-line interface.
- MPN – There is a marketing part number associated with each specific device. This number is used to order a device or find information about a device from Cypress. Exp. CY8C616FMI-BL603, CY8C616FMI-BL673.
- SWD – A Serial Wire Debug interface.
- JTAG – Joint Test Action Group. Specifies the use of a dedicated debug port implementing a serial communication interface for low-overhead access without requiring direct external access to the system address and data buses.
- PSoC – The Programmable System-on-Chip is a family of microcontroller integrated circuits by Cypress. These chips include a CPU core and mixed-signal arrays of configurable integrated analog and digital peripherals.
- MCU – Microcontroller Unit.
- UDD – Universal Device Database.
- FLD – Flash Loader Database.
- AP – The Access Port register of ARM Cortex CPU. Used for programming and debugging, along with the corresponding SWD address bit selections.
- DP – The Debug Port register of ARM Cortex CPU. Used for programming and debugging, along with the corresponding SWD address bit selections.
- Region – Logical areas within the target device the programmer operates on.

Supported OS

- Windows 7 SP1 (x86 / x64)
- Windows 8.1 (x86 / x64)
- Windows 10 (x86 / x64)
- Linux
- MacOS X

Supported MCU Devices

- PSoC 6
- Traveo-II
- STM32xxx

Supported Hardware (Probes)

- SEGGER J-Link
- Cypress KitProg3
- Cypress MiniProg4

Installation

The CYP 2.0 OpenOCD CLI software is installed as part of the ModusToolbox software installation. Refer to the [ModusToolbox Installation Guide](#) for more details.

Note There is also a Cypress Programmer 2.0 GUI, which is installed separately from ModusToolbox. Refer to the *Cypress Programmer 2.0 GUI User Guide* for more details.

Document Convention

This guide uses the following conventions:

Convention	Usage
Courier New	Displays file locations and source code: C:\ ...cd\icc\, user entered text
<i>Italics</i>	Displays file names and reference documentation: <i>sourcefile.hex</i>
[bracketed, bold]	Displays keyboard commands in procedures: [Enter] or [Ctrl] [C]
File > New Project	Represents menu paths: File > New Project > Clone
Bold	Displays commands, menu paths and selections, and icon names in procedures: Click the Debugger icon, and then click Next .
Text in gray boxes	Displays cautions or functionality unique to the software or the device.

Revision History

Document Title: Cypress Programmer 2.0 OpenOCD CLI User Guide		
Document Number: 002-xxxxx		
Revision	Date	Description of Change
**	9/27/18	New document.

2 Command-Line Options



Although OpenOCD is a command-line tool, it only has few command-line options. The most important of these include:

-f (--file) <filename.cfg>

Specifies the configuration file to use. Multiple configuration files can be specified from the command line. They are interpreted in the order they are specified in the command line.

-d (--debug) <n>

Specifies the debug level. Debug level is 2 by default.

-c (--command) <"cmd1; cmd2; ...">

Execute the TCL commands cmd1, cmd2... Multiple TCL commands can be executed by either specifying the multiple -c options or passing several commands to the single -c options. In the latter case, separate the commands with a semicolon.

-l (--log_output) <logfile.txt>

Redirect the log output to the file <logfile.txt>.

-s (--search) <directory>

Specifies the directory to search for configuration files. Multiple -s options can be specified. Configuration files and scripts are searched for in the following paths. The first found file with a matching file name is used.

- the current directory
- any search dir specified on the command line using the -s option
- any search dir specified using the **add_script_search_dir** command
- \$HOME/.openocd (not on Windows)
- a directory in the OPENOCD_SCRIPTS environment variable (if set)
- the site wide-script library \$pkgdatadir/site
- the OpenOCD-supplied script library \$pkgdatadir/scripts.

3 Running TCL Commands



The Tool Command Language (TCL) commands can be passed to OpenOCD in several ways:

Using Configuration File Only

All configuration is stored in a single *sample.cfg* configuration file. For example, the following configuration file describes the PSoC 6 device connected using the KitProg3 debug probe. This file initializes the target device, programs flash with “*firmware.hex*” file, verifies programmed data, and finally shuts down OpenOCD.

```
source [find interface/kitprog3.cfg]
transport select swd
source [find target/psoc6.cfg]
program firmware.hex verify exit
```

The command line appears as follows:

```
openocd -s scripts -f path/to/sample.cfg
```

Using Command Line Only

All commands from the configuration file can be specified in the command line directly using the `-c` option.

```
openocd -s ../scripts -c "source [find interface/kitprog3.cfg]; transport select
swd; source [find target/psoc6.cfg]; program firmware.hex verify exit"
```

Combined – Configuration File Plus Command Line

A significant part of the configuration file specifies the debug adapter, transport type, target chip, SWD frequency, reset type, etc. This part of the file reflects the hardware configuration and thus stays unchanged between sessions. In some cases, it can be more convenient to use a combined method of passing the TCL commands:

Example *sample.cfg* file contents:

```
source [find interface/cmsis-dap.cfg]
transport select swd
source [find target/psoc6.cfg]
```

The OpenOCD command line:

```
openocd -s ../scripts -f path/to/sample.cfg -c "program firmware.hex verify exit"
```

4 KitProg3/MiniProg4 Driver Commands



The KitProg3/MiniProg4 (KP3/MP4) probe implements the CMSIS-DAP protocol defined by Arm with some extensions. Consequently, the KP3/MP4 driver in OpenOCD is a wrapper around the native CMSIS-DAP driver that extends its functionality with the KP3-specific extensions.

A full list of the CMSIS-DAP-specific configuration commands can be found in the OpenOCD official documentation.

Besides the standard CMSIS-DAP options, the KP3 driver exposes several custom TCL configuration commands. All commands in this section must be prefixed with the name of the driver – “kitprog3”.

kitprog3 acquire_config <status> [target_type] [mode] [attempts]

The command controls device acquisition parameters and optionally enables acquisition during the early initialization phase. Can be called at any time.

Parameters:

- **status** – A mandatory parameter, enables or disables the acquisition procedure during the initialization phase. The possible values: On, Off.
- **target_type** – Specifies the target device type. This parameter is mandatory only if status=on. The possible values:
 - 0 – PSoC4
 - 1 – PSoC5
 - 2 – PSoC6
 - 3 – Traveo-II
- **mode** – Specifies Acquisition mode. This parameter is mandatory only if status=on. The possible values: 0 – Reset, 1 – Power Cycle.
- **attempts** – The number of attempts to acquire the target device. This parameter is mandatory only if status=on.

kitprog3 acquire_psoc

The command performs device acquisition. Can be called only after the initialization phase. The acquisition procedure must be configured using acquire_config prior to calling this command.

kitprog3 power_config <status> [voltage]

The command controls the KP3 internal power supply parameters and optionally enables power during the early initialization phase. Can be called at any time.

Parameters:

- **status** – A mandatory parameter, enables or disables power supply during the initialization phase. The possible values: On, Off.
- **voltage** – The power supply voltage in millivolts. This parameter is mandatory only if status=on.

kitprog3 power_control <status>

The command turns on or off the KP3 internal power supply. Can be called only after the initialization phase. The voltage must be configured using power_config prior to calling this command.

Parameters:

- **status** – A mandatory parameter, enables or disables power supply.

kitprog3 led_control <type>

The command controls the KP3 LEDs. Can be called only after the initialization phase.

Parameters:

- **type** – A mandatory parameter, specifies the type of the LED indication. The possible values:
 - 0 – READY
 - 1 – PROGRAMMING
 - 2 – SUCCESS
 - 3 – ERROR.

kitprog3 get_power

The command reports the target voltage in millivolts. Can be called only after the initialization phase.

5 Flash Driver Commands



This chapter contains flash driver commands for PSoC 6 and Traveo II.

psoc6 allow_unsafe_sflash <on|off>

The command enables or disables Writes to SFlash regions other than USER, NAR, TOC2, and KEY. The command can be called at any time. Writes to these regions are possible only on the VIRGIN silicon, so the command is mostly intended for internal use. It is useful for Flash Boot developers and validation teams. Note that erasure (performed by programming with zeros) is performed only for the USER, NAR, TOC2, and KEY regions; it is skipped for other SFlash regions regardless of this command.

psoc6 allow_efuse_program <on|off>

The command allows or disallows Writes to the EFuse region. Can be called any time. Writes to EFuse region are skipped by default. EFuse programming must be allowed for Life Cycle transitions to work.

psoc6 reset_halt <mode>

The command simulates a broken Vector Catch on PSoC6 devices. The command retrieves the address of the Vector Table from the VECTOR_TABLE_BASE registers, detects the location of the application entry points, sets a hardware breakpoint at that location and performs a reset of the target. The type of the reset can be specified by the optional <mode> parameter.

Parameters:

- **mode** – The type of the reset to be performed. The possible values are `sysresetreq` and `vectreset`. This parameter is optional. If it is not specified, `SYSRESETREQ` is used for the CM0 core and `VECTRESET` is used for other cores in the system.

psoc6 mass_erase <bank>

The command performs mass erase of the given flash bank.

Parameters:

- **bank** – The index of the flash bank. The possible values can be shown by running the **flash banks** command.

traveo2 ecc_error_reporting <on|off>

Enables or Disables the ECC error reporting during Flash Read operations (applicable for Traveo-II only).

OpenOCD supports the detection and reporting of ECC errors during the Flash Read operation. In the current implementation, the CYP reads word-by-word a requested amount of data and checks for the ECC status after each Read. This ensures all ECC errors for all memory locations are properly detected. If an ECC error occurs, the CYP retrieves the address of the faulty location from the hardware. All ECC errors along with their locations are reported to the user by means of warning messages. This process will be performed until all requested data has been read.

6 Custom OpenOCD Commands



This section documents the custom TCL commands implemented in OpenOCD to extend its functionality.

flash rmw <address> <data>

The command is intended to modify flash individual bytes. The command can be used when some data must be programmed to an arbitrary flash address preserving all data that belongs to the same flash sector.

Parameters:

- address – The start address for the programming.
- data – The hexadecimal string with data to be programmed. The format of the string is shown in the following example:

```
flash rmw 0x10001234 DEADBEEFBAADCODE
```

add_verify_range <target> <address> <size>

The command allows specifying memory regions to be compared during verify operation. By default, when no regions are defined, all the regions present in the firmware image file are compared with corresponding target memory. This breaks the verification process for some non-memory-mapped regions such as EFuses. When the target has at least one verify region specified, only data that belongs to that verify region is verified.

Parameters:

- target – The target device to assign verify regions.
- target – The start address of the region.
- size – The size of the region, in bytes.

7 Global Variables



Global variables listed below control the behavior of target configuration file (psoc6.cfg, traveo2.cfg, etc.). They should be set in the command line prior to any configuration file, such as kitprog3.cfg or psoc6.cfg

ENABLE_ACQUIRE

Enables or disables acquisition of the target device in Test Mode.

Possible values:

- 1 – Acquisition enabled (default with KitProg3/MiniProg4)
- 0 – Acquisition disabled (default for other debug adapters)

ENABLE_POWER_SUPPLY

Controls internal power supply of KitProg3/MiniProg4 adapters. If this command is specified, kitprog3 driver will enable power supply thus powering on the target during initialization.

Possible values:

- 0 – Power supply disabled
- Any other value defines target voltage in millivolts

ENABLE_CM0, ENABLE_CM4

Allow to specify CPU cores which will be visible to OpenOCD. OpenOCD will not touch disabled cores in any way.

Possible values:

- 1 – Corresponding core is enabled
- 0 – Core is disabled

SMIF_BANKS

Defines QSPI Memory banks. This variable is a two-dimensional associative TCL array of the following format:

```
set SMIF_BANKS {
  1 {addr <XIPAddr1> size <BankSz1> psize <ProgramSz1> esize <EraseSz1>}
  2 {addr <XIPAddr2> size <BankSz2> psize <ProgramSz2> esize <EraseSz2>}
  ...
  N {addr <XIPAddrN> size <BankSzN> psize <ProgramSzN> esize <EraseSzN>}
}
```

Where:

- XIPAddrN – XIP mapping address
- BankSzN – total size of this flash bank, in bytes
- ProgramSzN – minimal programming granularity (program block size), in bytes
- EraseSzN – minimal erase granularity (erase block size), in bytes.

8 Usage Examples



All the examples in this chapter assume you have a PSoC 6 target device connected to the PC via the KitProg3 or MiniProg4 debug probe. The current working directory is the default install directory (for example, c:\Program Files (x86)\Cypress\Cypress OpenOCD\ on Windows).

For convenience, the *board.cfg* config file has been created in the same directory as OpenOCD executable. File contains default configuration suitable for the majority of the PSoC 6 kits. The file contains the following configuration:

```
source [ find interface/kitprog3.cfg ]
transport select swd
source [ find target/psoc6.cfg ]
init
reset init
```

Erase Main Flash

```
>bin\openocd.exe -s ../scripts -f board.cfg -c "psoc6 mass_erase 0; exit"
```

A possible output of OpenOCD:

```
Open On-Chip Debugger 0.10.0+dev-1.0.0.181 (2018-09-24-10:46)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
adapter speed: 1500 kHz
Warn : Transport "swd" was already selected
adapter speed: 1000 kHz
** Auto-acquire enabled, use "set ENABLE_ACQUIRE 0" to disable
cortex_m reset_config sysresetreq
cortex_m reset_config vectreset
Info : CMSIS-DAP: SWD Supported
Info : CMSIS-DAP: FW Version = 2.0.0
Info : CMSIS-DAP: Interface Initialised (SWD)
Info : SWCLK/TCK = 1 SWDIO/TMS = 1 TDI = 0 TDO = 0 nTRST = 0 nRESET = 1
Info : CMSIS-DAP: Interface ready
Info : VTarget = 3.292 V
Info : kitprog3: acquiring PSoC device...
Info : clock speed 1000 kHz
Info : SWD DPIDR 0x6ba02477
Info : psoc6.cpu.cm0: hardware has 4 breakpoints, 2 watchpoints
Info : psoc6.cpu.cm4: hardware has 6 breakpoints, 4 watchpoints
Info : Listening on port 3333 for gdb connections
Info : Listening on port 3334 for gdb connections
```

```
Warn : Only resetting the Cortex-M core, use a reset-init event handler to reset
any peripherals or configure hardware srst support.
Info : kitprog3: acquiring PSoC device...
target halted due to debug-request, current mode: Thread
xPSR: 0x21000000 pc: 0x00001f2c msp: 0x08047790
** Device acquired successfully
** SFlash SiliconID: 0xE2062200
** Flash Boot version: 0x021D8001
** psoc6.cpu.cm4: Ran after reset and before halt...
target halted due to debug-request, current mode: Thread
xPSR: 0x61000000 pc: 0x1600400c msp: 00000000
[100%] [#####] [ Erasing ]
```

Erase Work Flash

```
>bin\openocd.exe -s ../scripts -f board.cfg -c "psoc6 mass_erase 1; exit"
```

A possible output of OpenOCD:

```
Open On-Chip Debugger 0.10.0+dev-1.0.0.181 (2018-09-24-10:46)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
adapter speed: 1500 kHz
Warn : Transport "swd" was already selected
adapter speed: 1000 kHz
** Auto-acquire enabled, use "set ENABLE_ACQUIRE 0" to disable
cortex_m reset_config sysresetreq
cortex_m reset_config vectreset
Info : CMSIS-DAP: SWD Supported
Info : CMSIS-DAP: FW Version = 2.0.0
Info : CMSIS-DAP: Interface Initialised (SWD)
Info : SWCLK/TCK = 1 SWDIO/TMS = 1 TDI = 0 TDO = 0 nTRST = 0 nRESET = 1
Info : CMSIS-DAP: Interface ready
Info : VTarget = 3.297 V
Info : kitprog3: acquiring PSoC device...
Info : clock speed 1000 kHz
Info : SWD DPIDR 0x6ba02477
Info : psoc6.cpu.cm0: hardware has 4 breakpoints, 2 watchpoints
Info : psoc6.cpu.cm4: hardware has 6 breakpoints, 4 watchpoints
Info : Listening on port 3333 for gdb connections
Info : Listening on port 3334 for gdb connections
Warn : Only resetting the Cortex-M core, use a reset-init event handler to reset
any peripherals or configure hardware srst support.
Info : kitprog3: acquiring PSoC device...
target halted due to debug-request, current mode: Thread
xPSR: 0x21000000 pc: 0x00001f2c msp: 0x08047790
** Device acquired successfully
** SFlash SiliconID: 0xE2062200
** Flash Boot version: 0x021D8001
** psoc6.cpu.cm4: Ran after reset and before halt...
target halted due to debug-request, current mode: Thread
xPSR: 0x61000000 pc: 0x1600400c msp: 00000000
```

```
[100%] [#####] [ Erasing      ]
```

Erase Main Flash Rows 0...10

```
>bin\openocd.exe -s ../scripts -f board.cfg -c "flash erase_sector 0 0 10; exit"
```

A possible output of OpenOCD:

```
Open On-Chip Debugger 0.10.0+dev-1.0.0.181 (2018-09-24-10:46)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
adapter speed: 1500 kHz
Warn : Transport "swd" was already selected
adapter speed: 1000 kHz
** Auto-acquire enabled, use "set ENABLE_ACQUIRE 0" to disable
cortex_m reset_config sysresetreq
cortex_m reset_config vectreset
Info : CMSIS-DAP: SWD Supported
Info : CMSIS-DAP: FW Version = 2.0.0
Info : CMSIS-DAP: Interface Initialised (SWD)
Info : SWCLK/TCK = 1 SWDIO/TMS = 1 TDI = 0 TDO = 0 nTRST = 0 nRESET = 1
Info : CMSIS-DAP: Interface ready
Info : VTarget = 3.297 V
Info : kitprog3: acquiring PSoC device...
Info : clock speed 1000 kHz
Info : SWD DPIDR 0x6ba02477
Info : psoc6.cpu.cm0: hardware has 4 breakpoints, 2 watchpoints
Info : psoc6.cpu.cm4: hardware has 6 breakpoints, 4 watchpoints
Info : Listening on port 3333 for gdb connections
Info : Listening on port 3334 for gdb connections
Warn : Only resetting the Cortex-M core, use a reset-init event handler to reset
any peripherals or configure hardware srst support.
Info : kitprog3: acquiring PSoC device...
target halted due to debug-request, current mode: Thread
xPSR: 0x21000000 pc: 0x00001f2c msp: 0x08047790
** Device acquired successfully
** SFlash SiliconID: 0xE2062200
** Flash Boot version: 0x021D8001
** psoc6.cpu.cm4: Ran after reset and before halt...
target halted due to debug-request, current mode: Thread
xPSR: 0x61000000 pc: 0x1600400c msp: 00000000
[100%] [#####] [ Erasing      ]
erased sectors 0 through 10 on flash bank 0 in 0.174531s
```

Display Memory Contents (32 words at address 0x08000000)

```
>bin\openocd.exe -s ../scripts -f board.cfg -c "mdw 0x08000000 32; exit"
```

A possible output of OpenOCD:

```
Open On-Chip Debugger 0.10.0+dev-1.0.0.181 (2018-09-24-10:46)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
adapter speed: 1500 kHz
Warn : Transport "swd" was already selected
adapter speed: 1000 kHz
** Auto-acquire enabled, use "set ENABLE_ACQUIRE 0" to disable
cortex_m reset_config sysresetreq
cortex_m reset_config vectreset
Info : CMSIS-DAP: SWD Supported
Info : CMSIS-DAP: FW Version = 2.0.0
Info : CMSIS-DAP: Interface Initialised (SWD)
Info : SWCLK/TCK = 1 SWDIO/TMS = 1 TDI = 0 TDO = 0 nTRST = 0 nRESET = 1
Info : CMSIS-DAP: Interface ready
Info : VTarget = 3.297 V
Info : kitprog3: acquiring PSoC device...
Info : clock speed 1000 kHz
Info : SWD DPIDR 0x6ba02477
Info : psoc6.cpu.cm0: hardware has 4 breakpoints, 2 watchpoints
Info : psoc6.cpu.cm4: hardware has 6 breakpoints, 4 watchpoints
Info : Listening on port 3333 for gdb connections
Info : Listening on port 3334 for gdb connections
Warn : Only resetting the Cortex-M core, use a reset-init event handler to reset
any peripherals or configure hardware srst support.
Info : kitprog3: acquiring PSoC device...
target halted due to debug-request, current mode: Thread
xPSR: 0x21000000 pc: 0x00001f2c msp: 0x08047790
** Device acquired successfully
** SFlash SiliconID: 0xE2062200
** Flash Boot version: 0x021D8001
** psoc6.cpu.cm4: Ran after reset and before halt...
target halted due to debug-request, current mode: Thread
xPSR: 0x61000000 pc: 0x1600400c msp: 00000000
0x08000000: fee7fee7 0c00ec67 18c94d83 a74c2428 e2b12b65 3a700842 899247ef c9360ab2
0x08000020: 1418a661 b61ae5bd f228a811 11fa46c1 15a6ce0e 6b170d80 13f586f0 4493a476
0x08000040: 119b597b a548e4e2 c0903b6c bea3fede 41b59b19 69ee5c5f 2b6b440d 3719620a
0x08000060: c20051b1 8db4d1ad cd49c0f0 5ecd00aa 9edeeba2 be5fdda4 19ea06a6 f7e52c03
```

Program Device with Verification (Intel HEX file)

OpenOCD supports programming of elf, Intel HEX, Motorola SREC and binary file formats. For binary files relocation offset must be specified as an argument to 'program' command.

```
>bin\openocd.exe -s ../scripts -f board.cfg -c "program c:/BlinkyLED.hex verify
reset; exit"
```

A possible output of OpenOCD:

```
Open On-Chip Debugger 0.10.0+dev-1.0.0.181 (2018-09-24-10:46)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
adapter speed: 1500 kHz
Warn : Transport "swd" was already selected
adapter speed: 1000 kHz
** Auto-acquire enabled, use "set ENABLE_ACQUIRE 0" to disable
cortex_m reset_config sysresetreq
cortex_m reset_config vectreset
Info : CMSIS-DAP: SWD Supported
Info : CMSIS-DAP: FW Version = 2.0.0
Info : CMSIS-DAP: Interface Initialised (SWD)
Info : SWCLK/TCK = 1 SWDIO/TMS = 1 TDI = 0 TDO = 0 nTRST = 0 nRESET = 1
Info : CMSIS-DAP: Interface ready
Info : VTarget = 3.292 V
Info : kitprog3: acquiring PSoC device...
Info : clock speed 1000 kHz
Info : SWD DPIDR 0x6ba02477
Info : psoc6.cpu.cm0: hardware has 4 breakpoints, 2 watchpoints
Info : psoc6.cpu.cm4: hardware has 6 breakpoints, 4 watchpoints
Info : Listening on port 3333 for gdb connections
Info : Listening on port 3334 for gdb connections
Warn : Only resetting the Cortex-M core, use a reset-init event handler to reset
any peripherals or configure hardware srst support.
Info : kitprog3: acquiring PSoC device...
target halted due to debug-request, current mode: Thread
xPSR: 0x01000000 pc: 0x00001f2c msp: 0x080477a8
** Device acquired successfully
** SFlash SiliconID: 0xE2062200
** Flash Boot version: 0x021D8001
** psoc6.cpu.cm4: Ran after reset and before halt...
target halted due to debug-request, current mode: Thread
xPSR: 0x61000000 pc: 0x1600400c msp: 00000000
Warn : Only resetting the Cortex-M core, use a reset-init event handler to reset
any peripherals or configure hardware srst support.
Info : kitprog3: acquiring PSoC device...
target halted due to debug-request, current mode: Thread
xPSR: 0x01000000 pc: 0x00001f2c msp: 0x080477a8
** Device acquired successfully
** SFlash SiliconID: 0xE2062200
** Flash Boot version: 0x021D8001
** psoc6.cpu.cm4: Ran after reset and before halt...
target halted due to debug-request, current mode: Thread
xPSR: 0x61000000 pc: 0x1600400c msp: 00000000
```

```
** Programming Started **
auto erase enabled
Info : Flash write discontinued at 0x10002200, next section at 0x10080000
[100%] [#####] [ Erasing      ]
[100%] [#####] [ Programming  ]
[100%] [#####] [ Erasing      ]
[100%] [#####] [ Programming  ]
Warn : no flash bank found for address 0x90300000
Warn : no flash bank found for address 0x90500000
wrote 15360 bytes from file c:/BlinkyLED.hex in 0.779366s (19.246 KiB/s)
** Programming Finished **
** Verify Started **
verified 15360 bytes in 0.074616s (201.029 KiB/s)
** Verified OK **
** Resetting Target **
Warn : Only resetting the Cortex-M core, use a reset-init event handler to reset
any peripherals or configure hardware srst support.
```

Modify Individual Bytes in Main Flash and Display Results

```
>bin\openocd.exe -s ../scripts -f board.cfg -c "mdw 0x10000000 8; flash rmw
0x10000002 11223344; mdw 0x10000000 8; exit"
```

A possible output of OpenOCD:

```
Open On-Chip Debugger 0.10.0+dev-1.0.0.181 (2018-09-24-10:46)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
adapter speed: 1500 kHz
Warn : Transport "swd" was already selected
adapter speed: 1000 kHz
** Auto-acquire enabled, use "set ENABLE_ACQUIRE 0" to disable
cortex_m reset_config sysresetreq
cortex_m reset_config vectreset
Info : CMSIS-DAP: SWD Supported
Info : CMSIS-DAP: FW Version = 2.0.0
Info : CMSIS-DAP: Interface Initialised (SWD)
Info : SWCLK/TCK = 1 SWDIO/TMS = 1 TDI = 0 TDO = 0 nTRST = 0 nRESET = 1
Info : CMSIS-DAP: Interface ready
Info : VTarget = 3.292 V
Info : kitprog3: acquiring PSoC device...
Info : clock speed 1000 kHz
Info : SWD DPIDR 0x6ba02477
Info : psoc6.cpu.cm0: hardware has 4 breakpoints, 2 watchpoints
Info : psoc6.cpu.cm4: hardware has 6 breakpoints, 4 watchpoints
Info : Listening on port 3333 for gdb connections
Info : Listening on port 3334 for gdb connections
Warn : Only resetting the Cortex-M core, use a reset-init event handler to reset
any peripherals or configure hardware srst support.
Info : kitprog3: acquiring PSoC device...
target halted due to debug-request, current mode: Thread
xPSR: 0x01000000 pc: 0x00001f2c msp: 0x080477a8
```

```

** Device acquired successfully
** SFlash SiliconID: 0xE2062200
** Flash Boot version: 0x021D8001
** psoc6.cpu.cm4: Ran after reset and before halt...
target halted due to debug-request, current mode: Thread
xPSR: 0x61000000 pc: 0x1600400c msp: 00000000
0x10000000: 08024000 10000159 0000000d 100001bd 00000000 00000000 00000000 00000000
[100%] [#####] [ Erasing      ]
[100%] [#####] [ Programming ]
modified 4 byte(s) in 512 byte region at 0x10000000 in 0.051963s (9.622 KiB/s)
0x10000000: 22114000 10004433 0000000d 100001bd 00000000 00000000 00000000 00000000

```

Start GDB Server and Leave It Running

```
>bin\openocd.exe -s ../scripts -f board.cfg
```

A possible output of OpenOCD:

```

Open On-Chip Debugger 0.10.0+dev-1.0.0.181 (2018-09-24-10:46)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
adapter speed: 1500 kHz
Warn : Transport "swd" was already selected
adapter speed: 1000 kHz
** Auto-acquire enabled, use "set ENABLE_ACQUIRE 0" to disable
cortex_m reset_config sysresetreq
cortex_m reset_config vectreset
Info : CMSIS-DAP: SWD Supported
Info : CMSIS-DAP: FW Version = 2.0.0
Info : CMSIS-DAP: Interface Initialised (SWD)
Info : SWCLK/TCK = 1 SWDIO/TMS = 1 TDI = 0 TDO = 0 nTRST = 0 nRESET = 1
Info : CMSIS-DAP: Interface ready
Info : VTarget = 3.297 V
Info : kitprog3: acquiring PSoC device...
Info : clock speed 1000 kHz
Info : SWD DPIDR 0x6ba02477
Info : psoc6.cpu.cm0: hardware has 4 breakpoints, 2 watchpoints
Info : psoc6.cpu.cm4: hardware has 6 breakpoints, 4 watchpoints
Info : Listening on port 3333 for gdb connections
Info : Listening on port 3334 for gdb connections
Warn : Only resetting the Cortex-M core, use a reset-init event handler to reset
any peripherals or configure hardware srst support.
Info : kitprog3: acquiring PSoC device...
target halted due to debug-request, current mode: Thread
xPSR: 0x01000000 pc: 0x00001f2c msp: 0x080477a8
** Device acquired successfully
** SFlash SiliconID: 0xE2062200
** Flash Boot version: 0x021D8001
** psoc6.cpu.cm4: Ran after reset and before halt...
target halted due to debug-request, current mode: Thread
xPSR: 0x61000000 pc: 0x1600400c msp: 00000000
Info : Listening on port 6666 for tcl connections

```

Info : Listening on port 4444 for telnet connections