

# CMSIS-DAP for XStream Adapters

XStream-Iso & XStreamPro-Iso CMSIS-DAP 2.0 Debugger

# User Guide

PM050A01 rev 0.0 7.March.2021

## Elprotronic Inc.

35 Austin Rumble Court King City Ontario, L7B0B2 CANADA

Web site:	www.elprotronic.com
E-mail:	info@elprotronic.com
Fax:	905-539-0474
Voice:	905-539-0424

Copyright © Elprotronic Inc. All rights reserved.

Disclaimer:

No part of this document may be reproduced without the prior written consent of Elprotronic Inc. The information in this document is subject to change without notice and does not represent a commitment on any part of Elprotronic Inc. While the information contained herein is assumed to be accurate, Elprotronic Inc. assumes no responsibility for any errors or omissions.

In no event shall Elprotronic Inc., its employees or authors of this document be liable for special, direct, indirect, or consequential damage, losses, costs, charges, claims, demands, claims for lost profits, fees, or expenses of any nature or kind.

The software described in this document is furnished under a license and may only be used or copied in accordance with the terms of such a license.

**Disclaimer of warranties:** You agree that Elprotronic Inc. has made no express warranties to You regarding the software, hardware, firmware and related documentation. The software, hardware, firmware and related documentation being provided to You "AS IS" without warranty or support of any kind. Elprotronic Inc. disclaims all warranties with regard to the software, express or implied, including, without limitation, any implied warranties of fitness for a particular purpose, merchantability, merchantable quality or non-infringement of third-party rights.

**Limit of liability:** In no event will Elprotronic Inc. be liable to you for any loss of use, interruption of business, or any direct, indirect, special incidental or consequential damages of any kind (including lost profits) regardless of the form of action whether in contract, tort (including negligence), strict product liability or otherwise, even if Elprotronic Inc. has been advised of the possibility of such damages.

## END USER LICENSE AGREEMENT

PLEASE READ THIS DOCUMENT CAREFULLY BEFORE USING THE SOFTWARE AND THE ASSOCIATED HARDWARE. ELPROTRONIC INC. AND/OR ITS SUBSIDIARIES ("ELPROTRONIC") IS WILLING TO LICENSE THE SOFTWARE TO YOU AS AN INDIVIDUAL, THE COMPANY, OR LEGAL ENTITY THAT WILL BE USING THE SOFTWARE (REFER- ENCED BELOW AS "YOU" OR "YOUR") ONLY ON THE CONDITION THAT YOU AGREE TO ALL TERMS OF THIS LICENSE AGREEMENT. THIS IS A LEGAL AND ENFORCA- BLE CONTRACT BETWEEN YOU AND ELPROTRONIC. BY OPENING THIS PACKAGE, BREAKING THE SEAL, CLICKING I AGREE BUTTON OR OTHERWISE INDICATING AS-SENT ELECTRONICALLY, OR LOADING THE SOFTWARE YOU AGREE TO THE TERMS AND CONDITIONS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THESE TERMS AND CONDITIONS, CLICK ON THE I DO NOT AGREE BUTTON OR OTHERWISE INDI- CATE REFUSAL, MAKE NO FURTHER USE OF THE FULL PRODUCT AND RETURN IT WITH THE PROOF OF PURCHASE TO THE DEALER FROM WHOM IT WAS ACQUIRED WITHIN THIRTY (30) DAYS OF PURCHASE AND YOUR MONEY WILL BE REFUNDED.

### 1. License.

The software, firmware and related documentation (collectively the "Product") is the property of Elprotronic or its licensors and is protected by copyright law. While Elprotronic continues to own the Product, You will have certain rights to use the Product after Your acceptance of this license. This license governs any releases, revisions, or enhancements to the Product that Elprotronic may furnish to You. Your rights and obligations with respect to the use of this Product are as follows:

#### YOU MAY:

- A. use this Product on many computers;
- B. make one copy of the software for archival purposes, or copy the software onto the hard disk of Your computer and retain the original for archival purposes;
- C. use the software on a network

#### YOU MAY NOT:

- A. sublicense, reverse engineer, decompile, disassemble, modify, translate, make any attempt to discover the Source Code of the Product; or create derivative works from the Product;
- B. redistribute, in whole or in part, any part of the software component of this Product;
- C. use this software with a programming adapter (hardware) that is not a product of Elprotronic Inc.

### 2. Copyright

All rights, title, and copyrights in and to the Product and any copies of the Product are owned by Elprotronic. The Product is protected by copyright laws and international treaty provisions. Therefore, you must treat the Product like any other copyrighted material.

#### 3. Limitation of liability.

In no event shall Elprotronic be liable to you for any loss of use, interruption of business, or any direct, indirect, special, incidental or consequential damages of any kind (including lost profits) regardless of the form of action whether in contract, tort (including negligence), strict product liability or otherwise, even if Elprotronic has been advised of the possibility of such damages.

#### 4. DISCLAIMER OF WARRANTIES.

You agree that Elprotronic has made no express warranties to You regarding the software, hardware, firmware and related documentation. The software, hardware, firmware and related documentation being provided to You "AS IS" without warranty or support of any kind. Elprotronic disclaims all warranties with regard to the software and hardware, express or implied, including, without limitation, any implied warranties of fitness for a particular purpose, merchantability, merchantable quality or non-infringement of third-party rights.

## **Table of Contents**

CHAPTER 1 INTRODUCTION	1
CHAPTER 2 FEATURES	2
2.1 Key Features	2
CHAPTER 3 GETTING STARTED	3
3.1 Driver Installation	3
CHAPTER 4 MAIN GRAPHICAL USER INTERFACE	4
4.1 CMSIS-DAP DEBUGGING SOFTWARE	5
4.2 CONFIGURATION SETUP IN THE XSTREAM ADAPTER	6
CHAPTER 5 DEBUGGING WITH IDE	7
5.1 Keil UVision	
5.2 IAR EW-ARM	9

## **Table of Figures**

FIGURE 4.1: MAIN DIALOG SCREEN. THIS LABEL SHOWS A XSTREAMPRO-ISO ADAPTER WITH THE GANGPRO-X LICENSE. IT CAN RUN IN	
CMSIS-DAP debugger mode, or as an Elprotronic programmer. The user can switch between these two modes at	
ANY TIME	.4
FIGURE 4.2: USB DRIVER FOR ADAPTER WORKING IN THE PROGRAMMING MODE.	.5
FIGURE 4.3: USB DRIVER FOR ADAPTER WORKING IN THE CMSIS-DAP MODE	.5
FIGURE 5.1: KEIL UVISION 5 WITH SELECTED CMSIS-DAP DEBUGGER	.7
FIGURE 5.2: KEIL UVISION 5 CMSIS-DAP TARGET SETUP WITH CONNECTED XSTREAM ADAPTER	.8
FIGURE 5.3: IAR EW-ARM WITH SELECTED CMSIS-DAP DEBUGGER	.9
FIGURE 5.4: IAR EW-ARM CMSIS-DAP TARGET SETUP WITH CONNECTED XSTREAM ADAPTER	.9

# Chapter 1 Introduction

The XStream (XStream-Iso and XStreamPro-Iso) adapters support the CMSIS-DAP 2.0 debugging protocol. The "debugging software" is designed for IDEs that target ARM MCUs and support the CMSIS-DAP 2.0 protocol from ARM.

The debugging software package comes with a Windows<sup>™</sup> USB driver that can register XStream adapters as CMSIS-DAP debuggers or standard Elprotronic Flash/Gang Programmers. The software is available for download online at http://www.elprotronic.com (supported from Windows 7 to Windows 10).

The debugging software enables communication with the IDE at USB full-speed performance with communication up to 12 Mb/s (1.5 MB/s). On the adapter side, the XStream adapter can communicate with the target device via JTAG or SWD protocol with programmable speed ranging from 100kHz to 20 MHz. In addition, when the SWD protocol is selected, the SWO line can be used for tracing the data transferred from debugged target (if supported) via UART protocol with programmable baud rate between 10 kb/s to 12.5 Mb/s.

The remainder of this manual will explain how to use all the different features of the debugging software, and how to configure the XStream adapter to act as a CMSIS-DAP debugger or revert to default Elprotronic Flash/Gang programmer mode.

## Chapter 2 Features

XStream-Iso and XStreamPro-Iso adapters can be configured as CMSIS-DAP debuggers supporting the CMSIS-DAP 2.0 protocol for ARM MCUs. Any IDE that supports the CMSIS-DAP 2.0 protocol can then use the XStream adapter in this mode for debugging.

### 2.1 Key Features

The key features of the CMSIS-DAP setup for XStream adapters:

- Supports the CMSIS-DAP 2.0 communication protocol via USB interface.
- Debugging via JTAG or SWD interface.
- Programmable JTAG/SWD communication speed from 100 kHz to 20 MHz.
- Supports tracing via SWO pin when SWD interface is used.
- Trace via UART with programmable baud rate from 10 kb/s up to 12.5 Mb/s
- Trace buffer size 32 kB
- Target device can be powered from external power supply or from XStream adapter.
- Programmable power supply from adapter 1.65V to 4.0V for XStream-Iso adapter and in the range 1.2V to 4.0 V for XStreamPro-Iso adapter. Max current up to 200 mA.
- Galvanic isolation between PC and target device
- Easy to use Windows<sup>™</sup> based software for configuration setup.
- The XS-CMSIS-DAP product is a dedicated low-cost debugging adapter that does not run any other Elprotronic programming software.
- XStream-Iso and XstreamPro-Iso adapters that already have the FlashPro-ARM, GangPro-ARM, FlashPro-X and GangPro-X license, can also run the XS-CMSIS-DAP software after they download the latest ARM software package update.

Hardware details are provided in the below documents:

https://content.elprotronic.ca/docs/Elprotronic-Programmers.pdf

https://content.elprotronic.ca/docs/Elprotronic-Connection%20to%20Programmers.pdf

## Chapter 3 Getting Started

The XS-CMSIS-DAP product package contains:

- 1. One XStream-Iso adapter
- 2. Runs software available for download from <u>www.elprotronic.com</u> download page.
- 3. One 6 feet long USB-A to USB-B cable
- 4. FPA to ARM 14-pin to 20-pin and 10 pin adapter (PE036X02) and ribbon cables

The CMSIS-DAP debugging software run under Windows 7 to 10. Follow instruction below to install the software

- 1. Download XS-CMSIS-DAP-Setup.zip, unzip it and run setup.exe.
- 2. The setup wizard appears automatically after clicking setup.exe. Begin the installation process.
- 3. Once the installation program starts, on-screen instructions will guide you through the remainder of the installation. You must accept the license agreement before using this software.

### **3.1 Driver Installation**

The installation program will place the USB driver files in Windows directories "Windows\inf" and "Windows\system32\drivers". When the CMSIS-DAP debugging software is installed then by default the drivers are preinstalled automatically. If for any reason the device cannot be seen under Device Manager when the adapter is plugged-in to USB port, then install the drivers manually. Drivers are located in the directory

C:\Program Files (x86)\Elprotronic\Drivers XStream\WIN64

## Chapter 4 Main Graphical User Interface

The main dialog (see Figure 4.1) contains an adapter's label and setup options.

Inc. (version 1.01, x86)			
	l	Iprotronic Inc.	
FPA Serial Number	:	20190240	
FPA Model	:	XS-Pro-ISO-1.2	
Description	:	GangPro-X	
FPA Access	:	(Any) GangPro-X Universal	
Boot SW PN	:	BS048X01-1.15	
Common Firmware	:	CS048X01-1.63 XStreamPro-Iso	
CMSIS-DAP ver	:	XStreamPro M-1.01 CMSIS-DAP 2.0	
Software Release Da	te :	26-February-2021	
Adapter Option Selection     MCU Vcc from Adapter       O Programmer     Auto     Power from Adapter Enable       CMSIS DAP Debugger (2.0)     Vcc Settle time (50-300ms)     50			
CMSIS DAP 2.0 Firmware version         Inside adapter       :       1.01 PSA=0x159CC864 (OK)         Available       :       1.01			
Software License for Free SW upgrad 13-JUN	e expire da		
Verification OK.			
Reload		Save Exit	

*Figure 4.1:* Main Dialog Screen. This label shows a XStreamPro-Iso adapter with the GangPro-X license. It can run in CMSIS-DAP debugger mode, or as an Elprotronic programmer. The user can switch between these two modes at any time.

### 4.1 CMSIS-DAP debugging software

The XStream adapters (XStream-Iso and XStreamPro-Iso) have the capability to operate as an Elprotronic programmer or as a CMSIS-DAP Debugger. The working mode is selected in the Adapter Option Selector. Each of these two working modes uses different USB communication protocols and different USB drivers, therefore only one mode can be used at one time. Elprotronic programming software like the FlashPro-ARM or GangPro-ARM will not detect the adapter if it is in CMSIS-DAP mode. Conversely, debugging IDEs will not see the adapter if it is in Elprotronic programmer mode. Therefore, make sure to select your desired mode of operation before proceeding to production programming or debugging. When the programming mode is selected then the following USB driver can be seen under Device Manager (see Figure 4.2)

🚔 Device Manager	X
<u>File Action View H</u> elp	
Monitors	*
🕨 🔮 Network adapters	
Ports (COM & LPT)	
Processors	
Sound, video and game controllers	
⊳ ₁₽ System devices	
🔈 🏺 Universal Serial Bus controllers	=
🖌 🏺 Universal Serial Bus devices	
🗸 🚽 XStream (Elprotronic)	-

*Figure 4.2:* USB Driver for adapter working in the programming mode.

When the CMSIS-DAP mode is selected then the following USB driver can be seen under Device Manager (see Figure 4.3)

🚔 Device Manager	٢
<u>File Action View H</u> elp	
Monitors	*
🕨 🕎 Network adapters	
Ports (COM & LPT)	
Processors	
Sound, video and game controllers	
🖂 📲 System devices	
🔈 🏺 Universal Serial Bus controllers	E
🍐 🏺 Universal Serial Bus devices	
CMSIS-DAP XStream (Elprotronic)	-



### 4.2 Configuration setup in the XStream Adapter

Connect XStream adapter to PC and run the CMSIS-DAP configuration software. You should see the adapter's label and selected configuration as seen in Figure 4.1. First check if the CMSIS-DAP firmware version inside the adapter is the same as the available firmware version in the configuration software. If firmware is not the same or the check sum/PSA is not OK, then press the **Update FW** button and the firmware inside the XStream adapter will be updated.

The next option that should be set in the CMSIS-DAP configuration is the power option for the XStream adapter. The CMSIS-DAP 2.0 protocol does not explicitly control power supply, but the XStream adapter has the option to supply the target. That is why the user must choose between external power supply or configure the XStream adapter's output voltage and check the "Power from Adapter Enable" box. The XStream-Iso adapter can supply Vcc from 1.7V to 4.0V, or if the XStreamPro-Iso adapter is used from 1.2V to 4.0. Additionally, the Vcc Settle time should be set to specify the time from when the power-up of the target is initiated to when the other circuits on the target board are stable. The Settle time can be specified in the range from 50 to 300 ms. By, default that time is set to 50 ms. When finished, press the "Save" button to store the configuration inside the XStream adapter.

# Chapter 5 Debugging with IDE

When the XStream adapter is set for CMSIS-DAP debugging mode then adapter is ready to be used with IDE software that supports the CMSIS-DAP 2.0 USB protocol. Below is the setup description for two IDEs that support the CMSIS-DAP 2.0 USB protocol – the Keil uVision and the IAR EW-ARM IDE.

### 5.1 Keil uVision

Run the Keil IDE software uVision 5 or higher and select the **Option for Target** (see Figure 5.1). Then in Tab **Debug** select the option **CMSIS-DAP Debugger**. Press button **Settings** then the following screen should be displayed (see Figure 5.2). On the CMSIS-DAP – JTAG/SWD Adapter should be displayed **XStream-Iso CMSIS-DAP**. Select desired communication protocol, JTAG or SWD and desired communication speed. If target device is connected then in the SW Device Group should be displayed valid IDCODE and Device Name. Now, the XStream adapter is ready for debugging via CMSIS-DAP protocol. Select and set the Trace option if applicable.

📱 Options for Target 'STM32L476 Flash'			
Device   Target   Output   Listing   User   C/C++   Asm   Linker	Debug Utilities		
C Use Simulator with restrictions Settings			
Limit Speed to Real-Time	ULINK Pro Cortex Debugger		
C Load Application at Startup Initialization File:	CMSIS-DAP Debugger Initializatio Models Cortex:M Debugger ST-Link Debugger UULink Debugger EEEdit		
Restore Debug Session Settings         Image: Breakpoints       Image: Toolbox         Image: Breakpoints       Image:	Restore       Pemicro Debugger         SiLabs UDA Debugger         Image: Silabs UDA Debugger		
CPU DLL: Parameter:	Driver DLL: Parameter:		
SARMCM3.DLL -REMAP -MPU	SARMCM3.DLL -MPU		
Dialog DLL: Parameter:	Dialog DLL: Parameter:		
DCM.DLL -pCM4	TCM.DLL -pCM4		
Warn if outdated Executable is loaded       Warn if outdated Executable is loaded         Manage Component Viewer Description Files			
OK Cancel Defaults Help			

Figure 5.1: Keil uVision 5 with selected CMSIS-DAP Debugger

### CMSIS-DAP for XStream Adapters

#### USER GUIDE

CMSIS-DAP Cortex-M Target Driver Setup		Ren: [Lonar Delleg.]Littles.]	x
Debug Trace Flash Download Pack			
CMSIS-DAP - JTAG/SW Adapter	-SW Dev	Device	
XStream-Iso CMSIS-DAP		IDCODE Device Name Move	
Serial No: 20190003	SWDIO	IO Ox2BA01477 ARM CoreSight SW-DP	
Firmware Version: 2.0		Down	1
SWJ Port SW Max Clock: 10MHz		Automatic Detection ID CODE:	_
Connect & Reset Options Connect Normal ▼ Reset	SYSRES	Cache Options Download Options RESETREQ (I  I	
▼ Reset after Connect       ▼ Cache Memory       □ Download to Elash         □ Log Debug Accesses       □ Stop after Reset       □ Download to Elash			
		OK Cancel Hel	P

Figure 5.2: Keil uVision 5 CMSIS-DAP Target Setup with connected XStream Adapter

### 5.2 IAR EW-ARM

Run the IAR IDE software EW-ARM version 9.1 or up and select the *Option -> Debugger* (see Figure 5.3).

Options for node "STM32L476"	<b>———</b>
Category: General Options Static Analysis Runtime Checking C/C++ Compiler Assembler Output Converter Custon Build Build Actons Linker Debugger Simulator CADI CMSIS DAP GDB Server I-jet J-Link/J-Trace TI Stellaris N-L-Ink PE micro ST-LINK Tinid-Perty Driver TI MSP-FET	Setup       Download       Images       Multicore       Extra Options       Plugins         Driver       Images       Images       Images       Images       Images         Driver       Images       Images       Images       Images       Images         Driver       Images       Images       Images       Images       Images       Images         Driver       Images       Images
TI XDS	OK Cancel

*Figure 5.3:* IAR EW-ARM with selected CMSIS-DAP Debugger

Select the *CMSIS-DAP Debugger*. Press button OK then go to CMSIS DAP Debugger option setup (see Figure 5.4). Select Interface type JTAG or SWD. The Vcc external or internal is set by the configuration software (see Figure 4.1).

Options for node "STM32L476"		×
Category: General Options Static Analysis Runtime Checking C/G++ Compiler Assembler Output: Converter Output: Converter	Setup     Interface     Breakpoints       Probe config     Probe configuration file       @ Auto     Qverride default       @ From file     CPU;       Explicit     CPU;       Interface     Explicit probe configuration	Factory Settings
CHGIS DAP           GDB Server           I-jet           3-Link/)-Trace           TI Stelaris           Nut-link           PE micro           ST-LINK           Third-Party Driver           TI MSP-FET           TI XOS	SWD      Larget number (1AP or Multidrop U):      Target with multiple CPUs     CPU number on target      OK	Cancel

Figure 5.4: IAR EW-ARM CMSIS-DAP Target Setup with connected XStream Adapter