

USBDM Debugger interface for Freescale RS08,HCS08,HCS12,Coldfire and ARM-Kinetis Devices.

Introduction

USBDM is a debugger hardware interface for a range of Freescale microcontrollers.

It is designed to work with Freescale's Codewarrior software under Windows and Linux. More recently basic support for Coldfire and Kinetis with the Codesourcery Tool chain or ARM Ltd GNU Tools for ARM has been added. A set of stand-alone programmers are also provided.

The attached files provide a port of a combined TBDML/OSBDM/TBLCF code to various processors.

The primary motivation for doing this was to produce a single BDM that could be used with the following processors:

- RS08
- HCS08,
- HC12,
- Coldfire V1-4 microcontrollers
- MC56F800xx Digital Signal Controllers (very limited range of devices).
- Kinetis ARM-cortex

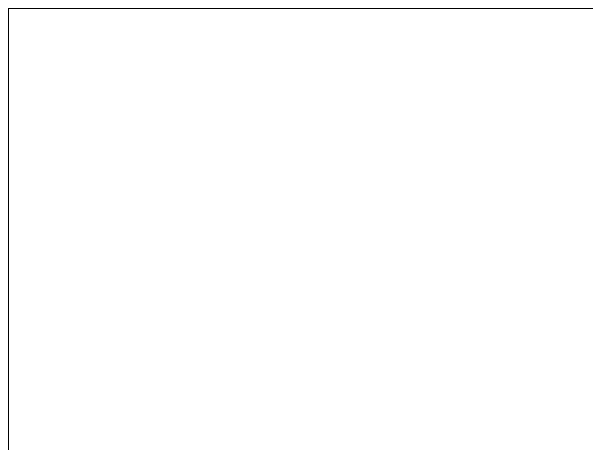
Other features have also been added compared to the original TBDML/OSBDM designs.

This site contains links to Version 4 of the following:

- A set of software drivers for MS windows and Linux that work with various version of the Freescale Codewarrior IDE, including the latest Eclipse version.
- Standard-alone programmers.
- A description of, and design files for, several versions of suitable BDM hardware
- How to adapt Freescale FRDM-xxx boards for use as programmers
- The firmware required for the above BDM hardware.

Quick Links

- [Release versions of the software for the various BDMs are available on Sourceforge.](#)
- [Various stand-alone programmers are provided to support the USBDM hardware.](#)
- [Source code is available on GitHub](#)
- [Post queries on OSBDM and TBDML Discussion Board](#)



JS16 based versions (Current designs)

The following two designs & variations use the **MC9S08JS16CWJ** (20 pin SOIC).

This chip is USB2 Full speed and supports initial **programming over USB without needing a BDM**.

Minimal design - Supports HCS12, HCS08 and Coldfire V1 Minimal design - Supports HCS12, HCS08, Coldfire V1 and Kinetis (via SWD)

- These are two alternative designs using a MC9S08JS16CWJ (20 pin SOIC).
- It is easier to construct than the JMxx version
- It may be programmed over the USB connection and **doesn't require a BDM** for initial programming.
- It replaces the Minimal JB16 designs and is recommended (by me) for newbies!
- A PCB design is supplied but is should be possible to roll-your-own on a prototyping board.

- An alternative, larger design is provided that supports Serial over USB (CDC interface) and Kinetis via SWD.

Minimal design - Supports Coldfire V2,3,4, Kinetis(via JTAG) and DSC (M56F80xx only)

- This is a minimal design using a MC9S08JS16CWJ (20 pin SOIC).
- It is easier to construct than the JMxx version
- It may be programmed over the USB connection and **doesn't require a BDM** for initial programming.
- It is approximately equivalent to the earlier JB16 based TBLCF design in functionality.
- A PCB design is supplied but it should be possible to roll-your-own on a prototyping board.
- An alternative, larger design is provided that supports Serial over USB (CDC interface).

JMxx based versions (Current designs)

The following designs use the **MC9S08JM60CLD** (44 pin LQFP).

This chip is USB2 Full speed and requires a **HCS08 BDM for programming the device**.

USBDM-CF - Supports HCS12, HCS08, RS08 & Coldfire V1, V2, V3 & V4, Kinetis(via JTAG) and MC56F80xx

- This is a complete fully-featured design using a MC9S08JM60CLD (44 pin LQFP).
- It has target power and various other options.
- It **REQUIRES a BDM** for initial programming.
- Later firmware updates may be done over the USB

USBDM-TWR-xxxx - Supports various Freescale Tower systems

- This supports the OSBDM-JM60 hardware as used in various Freescale Tower systems.
- Allows use of the stand-alone USBDM programmers with Tower boards.
- Significant speed improvement over OSBDM with some targets.
- Serial port support uses the standard USB CDC interface and so serial ports appear as the usual COM devices under Windows and Linux.
This means they may be used with standard serial programs such as Hyperterminal and within a Terminal window in Codewarrior Eclipse.

MK20DX128 based versions (Current designs)

The following design use the **MK20DX128** present on various Freescale FREEDOM boards (Arduino form factor).

This chip is USB2 Full speed and the chips on the Freedom boards include a pre-programmer bootloader (OpenSDA) that allows installation of USBDM without a programmer.

USBDM_OpenSDA - Supports various Freescale Freedom boards

- This supports the OpenSDA hardware as used in various [Freescale Freedom systems](#).
- Allows use of the stand-alone USBDM programmers with FRDM boards.
- The Freedom board may be used to Open source tool chains such as Codesourcery or ARM Ltd GNU tools.
- The Freedom board may be used as a programmer for external devices (with the addition of a cable and header).
- Serial port support uses the standard USB CDC interface and so serial ports appear as the usual COM devices under Windows and Linux.
This means they may be used with standard serial programs such as Hyperterminal and within a Terminal window in Codewarrior Eclipse or Eclipse Juno (with suitable plugin).

JB16 based versions - These design are obsolete

Please note that these designs are obsolete.

The **JB16** chip used in these designs have a ROM firmware flaw which makes it impossible to reprogram the chip firmware. When the chip is in bootloader mode it fails to enumerate properly under Windows 7 or 8 and later updates of WIN-XP. Because of this it is not possible to update the firmware which make it impractical to support them.

The USBDM software *may* still work to some extent but I cannot make any guarantees.

These versions were mainly produced to be compatible with the previous hardware versions of TBDML or OSBDM which were based on the MC908JB16. This is a USB low speed device. The provided firmware versions allow (some) of these devices to be updated to a combined TBDML/OSBDM. It also allows these to be used with the new Eclipse-based Codewarrior which does not support the original osbdm or tbdml.

There are several hardware designs supplied :

- Complete USBDM - Supports **HCS12, HCS08, RS08 & Coldfire V1**
 - This is a complete fully-featured design using MC68HC908JB16DW (28 pin SOIC)
- Minimal TBDML 20pin SOIC - Supports **HCS12, HCS08, Coldfire V1**
 - This is a very minimal design using MC68HC908JB16DW (28 pin SOIC)
- Minimal TBDML 28pin SOIC - Supports **HCS12, HCS08, Coldfire V1**
 - This is a very minimal design using MC908JB16JDWE (20 pin SOIC)

BDM firmware versions are also supplied to support several existing hardware designs by other people:

- WTBDM08/12
 - A commercial design available from Witztronics.
- OSBDM
 - A previous design posted on Freescale OSBDM board
- HCS08-OSBDM+E
 - A previous design posted on Freescale OSBDM board

Device Characteristics and links to documentation

The table below shows the support provided by each version and provides links to further information.

Description	Current Design	Device Support					Features	
		RS08	HCS08, HCS12, CFV1	Kinetis	CFV2, CFV3, CFV4*	DSC*	Target Power	Serial Port
USBDM_JB16 (Unsupported)	No		X					
USBDM_CF_JMxxCLD	No	X	X	JTAG	X	X	X	
USBDM_SER_JS16CWJ	No		X					X
USBDM_CF_SER_JS16CWJ	No		X	JTAG	X	X		
USBDM_JMxxCLC	No	X	X				X	
USBDM_JMxxCLD	No	X	X				X	
USBDM_JS16CWJ	No		X					
USBDM_SWD_JS16CWJ	Yes		X	SWD				
USBDM_SWD_SER_JS16CWJ	Yes		X	SWD			X	X
USBDM_CF_JS16CWJ	Yes			JTAG	X	X		
USBDM_CF_JMxxCLD_V3 Also supports Tower systems.	Yes	X	X	JTAG	X	X	X	X
USBDM_OpenSDA Custom OpenSDA (FRDM-KL25Z).	Yes			SWD				X

* DSC support is very limited in Codewarrior 10 and the stand-alone programmer

* CFV2,3,4 support is limited in the stand-alone programmer

Other Links

- [Previous software version 3.2 may be found here.](#)

Notes

- Please note that these design are different from the **Freescale OSBDM-JM60** design which was proceeding independently while I was doing the above designs.

History

[History & Issues](#)

Credits

The bulk of the code is taken from the TBDML, OSBDM and TBLCF projects and I very much appreciate the effort involved in producing the original code. I hope this extension will be useful.

The hardware interface is based on TBDML, Freescale USBSPYDER08 and my own invention.

References

- Altium Designer (PCB Design) - <http://www.altium.com/products/altium-designer/>
- Axiom MC56F8006 Demo board - http://www.freescale.com/webapp/sps/site/prod_summary.jsp?code=MC56F8006DEMO
- Codesourcery - <http://www.codesourcery.com/>
- Coldfire Flasher - http://www.freescale.com/files/soft_dev_tools/software/programmers/CFFLASHER.zip
- Doxygen Documentation tool - <http://www.stack.nl/~dimitri/doxygen/index.html>
- I2C voltage level conversion - Phillips application note <http://www.standardics.nxp.com/support/documents/i2c/pdf/an97055.pdf> or http://www.nxp.com/acrobat_download/applicationnotes/AN10441_1.pdf (Phillips part of NXP now?)
- LIBUSB-WIN32 - <http://libusb-win32.sourceforge.net/>
- MAX662 Data sheet - <http://www.maxim-ic.com>
- OSBDM - <http://forums.freescale.com/freescale/board?board.id=OSBDM08>
- OSBDM hardware - <http://forums.freescale.com/freescale/board/message?board.id=OSBDM08&thread.id=212>
- Tasking GDI Spec - <http://www.tasking.com/resources/technologies/debuggers/gdikdi.shtml>
- Tcl/Tk - <http://www.tcl.tk/software/tcltk/8.5.html>
- TBDML - <http://forums.freescale.com/freescale/board?board.id=TBDML>
- TBDML hardware - <http://forums.freescale.com/freescale/board/message?board.id=TBDML&thread.id=2>
- USBSPYDER08 - USB mini board for Freescale's Low-End 8-bit Microcontrollers - <http://www.freescale.com/>
- Ultimate Packer for eXecutables (UPX) has been used to pack DLLs and EXEs - <http://upx.sourceforge.net/>
- WTBDMs08/12 (Witztronics) Hardware - <http://www.witztronics.com/>
- WxWidgets Cross Platform Library has been used for the GUI - <http://www.wxwidgets.org/>
- Xerces XML parser - <http://xerces.apache.org/xerces-c>
- Windows Installer XML (WiX) toolset <http://wix.sourceforge.net/>

Queries

Any queries please post on the Freescale [OSBDM Discussion Board](#).

Some Commercial versions of USBDM BDMs

I am aware of several companies producing commercial versions of USBDMs of various kinds:

- [Flashgenie.net](#)
- [Technological Arts](#)
- [Witztronics](#)
- [Wytec's Motorola/Freescale software development tools](#)
- [Gravador para Microcontroladores Freescale \(Gravador USBDM\)](#)
The software may be used to "upgrade" the following devices to enable the on-board BDM as a USBDM bdm.
- [Selected Freescale Tower boards \(Kinetic, Coldfire, HCS08 and HCS12\)](#)
- [Freescale FRDM boards](#)
- [Axiom MC56F8006 Demo board](#) .

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Portions of this software is based on OSBDM software
Portions of this software is based on TBDML software
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Turbo BDM Light ColdFire (TBLCF)
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