Tutorial - Using the USBDM

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Revisions

Version	Date	Changes
1.0	2013-02-26	First release (USBDM 4.10.4)
1.1	2013-05-08	Update (USBDM 4.10.5)
1.2	2013-06-02	Update (USBDM 4.10.5b - Released due to some issues with 4.10.5)
1.3	2013-10-13	Update (USBDM 4.10.6c for CodeWarrior 10.5)
1.4	2014-05-04	Update (USBDM 4.10.6.140 for CodeWarrior 10.6)
1.5	2014-06-01	First programming of the target microcontroller added
1.6	2014-10-19	Update (USBDM 4.10.6.200 for CodeWarrior 10.6)

Introduction

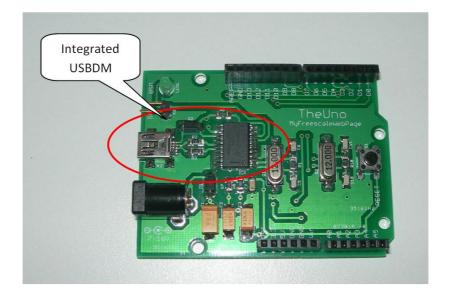
The USBDM is an open source programming cable for Freescale microcontrollers released by PGO. Several hardware versions are available depending of the targets you want to program. All source files, firmware, schematics are available on http://usbdm.sourceforge.net.

MyFreescaleWebPage proposes its own USBDM. It is based on "USBDM_SWD_JS16CWJ" schematic from PGO and is able to program HCS08, HCS12, Coldfire V1 and Kinetis SWD microcontrollers. This makes it a very good choice if you want to begin with Freescale microcontrollers!



This cheap but powerful USBDM is provided with BDM, SWD and USB cables. You can get it on the following page: <u>http://myfreescalewebpage.free.fr/toolbox/usbdm/shop.htm</u>.

TheUno and BigBrother evaluation boards are based on the USBDM with an additional serial port used to communicate with the target.



The following USBDM (found on eBay) is able to program RS08, HCS08, HCS12, CFV1, CFV2, CFV3, CFV4, Kinetis and DSC microcontrollers and is able to supply the target with 3.3 or 5V voltage.



This other USBDM (also found on eBay from BlackBoxStudio seller at <u>http://www.ebay.fr/itm/Freescale-Debugger-Programmer-for-HCS08-HCS12-Coldfire-V1-/110958979630?</u>) is compatible with HCS08, HCS12 and CFV1 microcontrollers.



This tutorial explains how to use the USBDM: installation, update, programming the target with standalone software and Freescale CodeWarrior.

If you want to use your USBDM with CodeWarrior, you must first installed CodeWarrior and then the USBDM. A tutorial is available on my website at <u>http://myfreescalewebpage.free.fr</u> in you need help.

1 Download the USBDM installation files

Today the last USBDM release is V4.10.6.200. The installation files are available on Sourceforge on the following page: <u>http://sourceforge.net/projects/usbdm/files/Version%204.10.6/Software</u>.

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The drivers are available on the following page: http://sourceforge.net/projects/usbdm/files/Version%204.10.6/Drivers.

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Download the USBDM Installer and the right USBDM Drivers according to your computer.

2 Installation of the USBDM

Please note that it is recommend to remove your previous USBDM installation before installing the last version. See "Appendix - Uninstalling the USBDM" for more details.

To install the USBDM, execute the installer.

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Storm ► Télécha	argements	- ↓	Rechercher dans : Te	éléchargements	Q
Organiser 🔻 Inclure dans la bi	bliothèque 🔻 🛛 Partager avec 💌 🛛	Nouveau dossier		•	0
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2 élément(s)					

A wizard is displayed. Click "Next".



Accept the License Agreement and click "Next".

EI	nd-User License Agreement Please read the following license agreement carefully	9
	GNU GENERAL PUBLIC LICENSE	^
ŀ	Version 2, June 1991	
	Copyright (C) 1989, 1991 Free Software Foundation, Inc. 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA	
	Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.	
_	▼ I accept the terms in the License Agreement	
	Print Back Next Ca	ncel

It is possible to custom the installation. I have only verified that the installer detected my CodeWarrior installation (Eclipse Special Edition V10.6) has shown on the following screenshot. Click "Next" to perform the USBDM installation.

	y you want features to in the tree below to cha		features will be installed.
	CodeWarrior Coddfir Coldfir DSC56	800E V	The complete package.
		10.4	This feature requires 7KB on your hard drive. It has 11 of 17 subfeatures selected. The subfeatures require 458MB on your hard drive.
Location:	C:\Program Files (x	86) \pgo \USBE	OM 4.10.6.200\ Browse

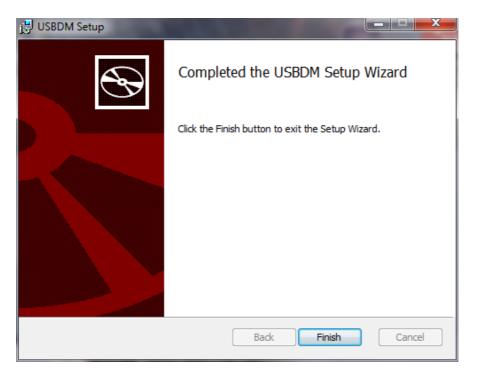
Click "Install".



The setup takes several minutes to complete.

USBDM Setup	-	
Installing USBDM		
Please wait while the Setup Wizard installs	s USBDM.	
Status:		
	Back Ne	ext Cancel

The installation ends. Click "Finish" to close the wizard.



It's now time to install the USBDM Drivers. Execute the right USBDM Drivers installer according to your configuration (Windows XP or not, x86 or x64 operating system).

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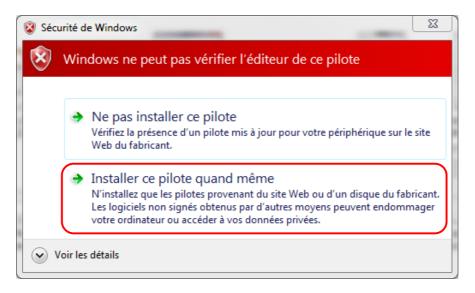
A wizard is displayed. Accept the License Agreement and click "Install".



The wizard install the USBDM Drivers.

🛃 USBDM Drivers Setup	
Installing USBDM Drivers	Ð
Please wait while the Setup Wizard installs USBDM Drivers.	
Status:	
Back	Next Cancel

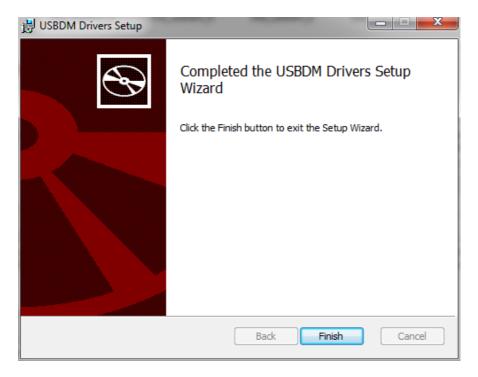
Window can't verify the publisher of the driver software. Validate the installation.



The installation takes only some few seconds. The wizard says that it is now possible to connect the USBDM. Click "OK".

USBDM Drivers S Installing USB		
Please	OM Drivers Setup	×
Status:	Connectez votre périphérique à cet ordinateur lorsque cette installation sera terminée.	ue
	ОК	
	Back Next	Cancel

Click "Finish" to close the wizard.



The installation is finished. USBDM shortcuts are available in the start menu.

3 Flashing the USBDM firmware

The microcontroller of the USBDM must be programmed with the right USBDM firmware. The table below present several USBDM versions and their features.

Description	Based On	Supported Devices & Features	Firmware
USBDM_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1	USBDM_JS16CWJ_V4
USBDM_SER_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1 - Serial Port	USBDM_SER_JS16CWJ_V4
USBDM_SWD_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1, Kinetis	USBDM_SWD_JS16CWJ_V4
USBDM_SWD_SER_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1, Kinetis - Target	USBDM_SWD_SER_JS16CWJ_V4
		Power, Serial Port	
USBDM_CF_JS16CWJ	HCS08JS16	CFV2, CFV3, CFV4, Kinetis, DSC	USBDM_CF_JS16CWJ_V4
USBDM_CF_SER_JS16CWJ	HCS08JS16	HCS08, HCS12, CFV1, CFV2, CFV3,	USBDM_CF_SER_JS16CWJ_V4
		CFV4, Kinetis, DSC - Serial Port	
USBDM_CF_JMxxCLD_V3	HCS08JM60	RS08, HCS08, HCS12, CFV1, CFV2,	USBDM_CF_JMxxCLD_V4
		CFV3, CFV4, Kinetis, DSC - Target	
		Power, Serial Port	

The USBDM schematics and firmware are available in the "BDM Flash Images" directory of the USBDM installation (a shortcut is available in the start menu following the installation of the USBDM).

The USBDM based on the HCS08JM60 microcontroller must be flashed using an external tool (another USBDM for example). The USBDM based on the HCS08JS16 microcontroller can be flashed using the internal USB bootloader present in this device.

3.1 Flashing the USBDM firmware with an external tool

This will depend of the programmer used. You can refer to §5 "Programming microcontrollers" if you are using another USBDM.

3.2 Flashing the USBDM firmware with the internal bootloader of the HCS08JS16 microcontroller

The internal bootloader of the HCS08JS16 microcontroller is very convenient and can be used to flash the USBDM firmware. The internal bootloader is a specific peripheral and is always available.

First short the BLMS pin of the HCS08JS16 microcontroller to the ground. As shown below, on TheUno it is done by shorting X3 with a simple jumper. Adapt this step to your own USBDM. Please note that this is not necessary if the USBDM is blank (never programmed before), because it is starting by default with the internal bootloader in this case.



Now connect the USBDM to your computer. A new peripheral called "JS16" is detected and automatically installed.

Start "JS16 First Level Bootloader" utility.

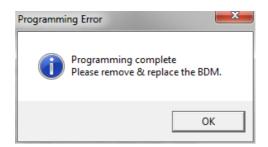
JS16 First Stage Bootloader	-	×
Tie the BLMS pin on the JS1 (if it is not blank) and plug i Choose the firmware match and then press the Program	it in. ing your hardware	2
BDM Firmware choice		
C HCS08/HCS12/CFV1		
HCS08/HCS12/CFV1 + 3	Serial	
C CFVx/DSC/ARM-JTAG		
C CFVx/DSC/ARM-JTAG	- Serial	
C HCS08/HCS12/CFV1/AF	RM-SWD	
C HCS08/HCS12/CFV1/A	RM-SWD + Serial	
HCS08/HCS12/CFV1 BDM w USB serial function.	ith	
	Program	Cancel

Select the right firmware according to your USBDM.

Description	Firmware	BDM Firmware choice
USBDM_JS16CWJ	USBDM_JS16CWJ_V4	HCS08/HCS12/CFV1
USBDM_SER_JS16CWJ	USBDM_SER_JS16CWJ_V4	HCS08/HCS12/CFV1 + Serial
USBDM_SWD_JS16CWJ	USBDM_SWD_JS16CWJ_V4	HCS08/HCS12/CFV1/ARM-SWD
USBDM_SWD_SER_JS16CWJ	USBDM_SWD_SER_JS16CWJ_V4	HCS08/HCS12/CFV1/ARM-SWD + Serial
USBDM_CF_JS16CWJ	USBDM_CF_JS16CWJ_V4	CFVx/DSC/ARM_JTAG
USBDM_CF_SER_JS16CWJ	USBDM_CF_SER_JS16CWJ_V4	CFVx/DSC/ARM_JTAG + Serial

Click "Program" to flash the USBDM.

Wait some few seconds. The following message is finally displayed to indicate that the USBDM has been correctly flashed.



Click "OK" and disconnect the USBDM. It is now possible to use the USBDM.

4 Updating the USBDM firmware

Connect the USBDM to your computer and start "USBDM Firmware Updater" utility.

USBDM Firmware Updater
File to Load
Load Source File 🗌 Auto select BDM firmware
No file loaded
Serial Number
USBDM-JS16-SER-0001
Read from Device 🗌 🗖 Auto sequence
File Information
Status: Idle
Program Flash Verify Flash Exit

You can check "Auto select BDM firmware" to automatically chose the right USBDM firmware. Note that the Serial Number of the USBDM will be set to its default value in this case.

Instead, you can load the right firmware yourself by clicking "Load Source File" button and browsing to the USBDM firmware. It is then possible to set the Serial Number yourself or to click "Read from device" to reuse the existing Serial Number. This is very useful if you have several USBDM because you will be able to use them at the same time on your computer by giving them different Serial Number values.

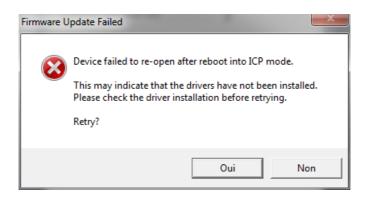
USBDM Firmware Updater File to Load 1 Load Source File Auto select BDM firm USBDM_SER_JS16CWJ_V4.sx Serial Number	Choose a firmware file	ages 🕨 JS16	- 4 Recherch	er dans : JS16	× م
		-			
USBDM-JS16-1108-001 1	Organiser Nouveau dossier	1		= - 1	0
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Read from Device Auto	Bureau USBDM_CF_JS16CWJ_V4	06/08/2013 00:06	USBDM HCS08 Pr	39 Ko	
Read from Device Auto	Emplacements ré USBDM_CF_SER_JS16CWJ_V4	06/08/2013 00:29	USBDM HCS08 Pr	39 Ko	
	Téléchargements	06/08/2013 00:18	USBDM HCS08 Pr	39 Ko	
File Information 3	Bibliothèques	06/08/2013 00:19 06/08/2013 00:19	USBDM HCS08 Pr USBDM HCS08 Pr	39 Ko 39 Ko	
	Documents	06/08/2013 00:31	USBDM HCS08 Pr	39 Ko	
Serial # =		00/00/2013 00.31	0300/0110300 P1	55 K0	
USBDM-JS16-SER-0001	J Musique				
	🛃 Vidéos				
Hardware Version =					
USBDM-SER -(JS16CWJ-V2)	🤣 Groupe résidentiel				
	_				
Software Version = 4.10	1 Ordinateur				
	Lisque local (C:) JOELGUITTET (U: -				
	JOELGOITTET (0: -				
	Nom du fichier : USBDM_SER_JS16CWJ_V4			*.sx,*.s1?)	-
			Ouvrir	- Annul	er
					i
Status: Idle					
Program Flash Verify Flash	Exit				

Click on "Program Flash" button. The following window is displayed.



Click "OK" to validate. The USBDM reboots.

On my computer this is sometimes failing and the following message is displayed.



Click "No" to cancel the operation and try again by pressing "Program Flash" button.

The firmware of the USBDM is updated and verified.

	Accessing BDM	
	Programming BDM Firmware	
	Elapsed time: 0:00:05	
		X
irmwar	re Update Completed	23
	The update of the Firmware has completed successfully. Presss OK to continue.	
	ОК	

It is now possible to use the USBDM.

5 Programming microcontrollers

5.1 Using standalone programmer

Some applications are provided by PGO to program microcontrollers with the USBDM. The following example is done using TheUno, on which the target microcontroller is a HCS08DZ60 device.

Connect the USBDM and start "HCS08 Programmer". The following window is displayed. The USBDM has been detected. Click "Detect" if not.

Flash Programmer	X
Interface Target Advanced	
Select BDM	
USBDM-JS16-1108-001	Detect
USBDM HC308, HC312, Coldfire-V1 BDM	
Target Vdd Control	
© Off C 3.3V C 5V	
Cycle target Vdd on reset	
Cycle target Vdd on connection problem	5
Leave target powered on exit	
Connection control	
Automatically re-connect	
Use RESET signal	
BDM Firmware Ver 4.10.5	DLL Ver 4.10.6.10
	Close

Go to the "Target" tab.

Click on "Detect Chip" to check the target microcontroller.

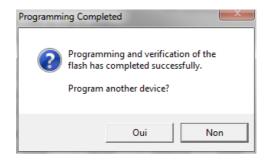
Flash Programmer	
Interface Target Advanced	
Load Hex Files No File Loaded	ntal Load 🦳 Auto Reload
Device Selection	
DZ-MC9S08DZ60	Detect Chip
Filter by chip ID (100E)	
Clock type and parameters	
Clock Module	Trim Frequency
S08MCGV1 -	0.00 kHz
Clock Module Address	NVTRIM Address
48 (hex)	FFAE (hex)
Security • Image C Secure	C Unsecure C Smart
Device Operations Erase Options	
EraseAll 💌 🗖 Enable S	Sounds Trim Value: - 0x??.?
Program Flash Verify Fl	lash Load and Go
	Close

Choose the right microcontroller in the device selection list ("DZ-MC9S08DZ60" in this example).

Click on "Load Hex Files" to select the application you want to program. Finally click on "Program Flash".

Load Hex	Files 🔽 Increm	ental Load	Auto Reload
TEST_THE	UNO.abs.s19		
Device Sele	ction		
DZ-MC950	8DZ60	•	Detect Chip
Filter by	chip ID (100E)		
Clock type	and parameters —		
Clock Modu	le	Trim Frequ	lency
S08MCGV1		0.00	kHz
Clock Modu	le Address	NVTRIM A	ddress
48	(hex)	FFAE	(hex)
Security			
Image	C Secure	O Unsecu	re C Smart
Device Ope	rations		
Erase Opti	ons		
EraseAll	👻 🗆 Enable	e Sounds Tri	m Value: - 0x??.?
-	Flash Verify	Flash	Load and Go

The device is programmed and a message is displayed to indicate that the operation completed.



Click "No" and close the HCS08 Programmer utility.

5.2 Using Freescale CodeWarrior

It is possible to use the USBDM with Freescale CodeWarrior to load and debug applications.

Simply choose the USBDM in the connection list during the creation of the project, as shown on the following screenshot (Freescale CodeWarrior V10.6).

🥦 New Bareboard Project	x
Connections	
Choose the connection to use for this project	
Connection to be used:	
P&E USB MultiLink Universal [FX] / USB MultiLink	
P&E Cyclone	
P&E TraceLink	
Open Source JTAG	
OpenSDA	
Segger I-Link / J-Trace / SWO (SWD based)	
Connect to USBDM Open Source BDM.	
	-
(?) < Back Next > Finish Cancel	

Then, it is possible to load and debug applications with the USBDM as done if you were using any other tool.

5.3 Target microcontroller "secured" - Programming failed

The target microcontroller may be "secured" the first time you attempt to perform the programming or if you have secured it. This means that the content of the Flash memory is protected and the USBDM fails to program the microcontroller in this case.

To unsecure the device, first power off your target, make a short circuit on BKGD signal with the ground and power on the target again. Finally remove the short circuit and load your program. This should now succeed (the microcontroller is no more secured).

Conclusion

The USBDM is a powerful device. It is regularly updated to support new microcontrollers. You are now ready to build your own USBDM and use it to load and debug applications on many Freescale devices.

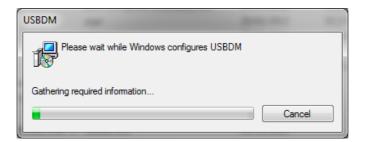
Appendix - Uninstalling the USBDM

Uninstalling the USBDM is done very simply using the Control Panel.

Select USBDM and click "Uninstall" button.

	figuration Tous les Panneaux de configuration Progra	immes et fonctionnalites	▼ 49 Re	chercher dans :	Programmes et fonc
Page d'accueil du panneau de configuration	Désinstaller ou modifier un programme				
Afficher les mises à jour installées	Pour désinstaller un programme, sélectionnez-le dans	la liste et cliquez sur Désinstaller, l	Modifier ou Répa	rer.	
Activer ou désactiver des fonctionnalités Windows	Organiser 🔻 Désinstaller Molifier Réparer				:== • @
	Nom	Éditeur	Installé le	Taille	Version
	Skype [™] 6.3	Skype Technologies S.A.	01/05/2013	20,9 Mo	6.3.105
	Sourcery G++ Lite for ColdFire ELF	CodeSourcery	15/07/2011		2010.9.0.39
	SuperCopier2		19/03/2011		
	O Synergy	The Synergy Project	24/10/2011		1.4.4
	💷 u-center	u-blox	01/12/2012		
C	End UtraEdit 15:20	IDM Computer Solutions, Inc.	24/07/2011	50,0 Mo	1220 2020 2020
	USBDM	pgo	25/02/2013	92,5 Mo	4.10.4
		pgo	25/02/2015	10,0 Mo	1.0.1
	VirtualCloneDrive	Elaborate Bytes Microsoft Corporation	24/03/2011 27/03/2011	2.27.14	9.0.21022
	I Visual Studio .NET Prerequisites - English 訳Visual Studio 2005 Tools pour Office Second Edition	Microsoft Corporation	27/03/2011	2,27 1010	9.0.21022
	Visual Studio Zools for the Office system 3.0 Runtime	Microsoft Corporation	27/03/2011		
	VLC media player 1.1.9	VideoLAN	21/03/2011		1.1.9
	Windows Driver Package - Saleae LLC (WinUSB) USB		09/03/2013		11/02/2006 6.0.6000.
	Windows Live 2011	Microsoft Corporation	04/04/2012		15.4.3555.0308
	Windows Mobile 5.0 SDK R2 for Pocket PC	Microsoft Corporation	27/03/2011	129 Mo	5.00.1700.5.14343.06
	Windows Mobile 5.0 SDK R2 for Smartphone	Microsoft Corporation	27/03/2011	79,1 Mo	5.00.1700.5.14343.06
	KinISO .	WinISO Computing Inc.	15/04/2012	22,2 Mo	6.1.0.4472
	🕞 WinPcan 4.1.2	CACF Technologies	22/10/2011	<u> </u>	4.1.0.2001
	•	III			

The USBDM is uninstalled.



Finally select USBDM Drivers and click "Uninstall" button.

Page d'accueil du panneau de configuration	Désinstaller ou modifier un programme		4 FC - D/		
Afficher les mises à jour installées	Pour désinstaller un programme, sélectionnez-le dans	la liste et cliquez sur Desinstaller, l	viodifier ou Repai	rer.	
Activer ou désactiver des fonctionnalités Windows	Organiser - Désinstaller Répirer				
	Nom	Éditeur	Installé le	Taille	Version
	Skype™ 6.3	Skype Technologies S.A.	01/05/2013	20,9 Mo	6.3.105
	Sourcery G++ Lite for ColdFire ELF	CodeSourcery	15/07/2011		2010.9.0.39
	SuperCopier2		19/03/2011		
	O Synergy	The Synergy Project	24/10/2011		1.4.4
	u-center	u-blox	01/12/2012		
6	E UkraEdit 15.20	IDM Computer Solutions, Inc.	24/07/2011	50,0 Mo	15.20.10
	USBDM Drivers	pgo	25/02/2013	10,0 Mo	1.0.1
L L	CirtualCloneDrive	Elaborate Bytes	24/03/2011		
	Visual Studio .NET Prerequisites - English	Microsoft Corporation	27/03/2011	2,27 Mo	9.0.21022
	🕞 Visual Studio 2005 Tools pour Office Second Edition	Microsoft Corporation	27/03/2011		
	🔀 Visual Studio Tools for the Office system 3.0 Runtime	Microsoft Corporation	27/03/2011		
	📥 VLC media player 1.1.9	VideoLAN	21/04/2011		1.1.9
	🕿 Windows Driver Package - Saleae LLC (WinUSB) USB	Saleae LLC	09/03/2013		11/02/2006 6.0.6000
	Nindows Live 2011	Microsoft Corporation	04/04/2012		15.4.3555.0308
	Windows Mobile 5.0 SDK R2 for Pocket PC	Microsoft Corporation	27/03/2011	129 Mo	5.00.1700.5.14343.06
	Windows Mobile 5.0 SDK R2 for Smartphone	Microsoft Corporation	27/03/2011		5.00.1700.5.14343.06
	Kit WinISO	WinISO Computing Inc.	15/04/2012	22,2 Mo	6.1.0.4472
	🗑 WinPcap 4.1.2	CACE Technologies	22/10/2011		4.1.0.2001
	WinSCP 4.1.6	Martin Prikryl	02/02/2013		4.1.6

The USBDM Drivers are uninstalled.

