

# HI-WAVE

## NORAL BDM Target Interface

## **Freescale Semiconductor, Inc.**

| Product Manual      | Manual Date |
|---------------------|-------------|
| HI-WAVE - NORAL BDM | 11/99       |

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# HC12 NORAL BDM Target Interface

## Overview

- The *Introduction* section introduces the Noral-BDM Target Interface concept.
- The *Interfacing Your System and Noral-BDM* section gives a small overview on communication between your host, the Flex BDM interface and supported hardware.
- The *Loading the Noral-BDM Target Component* section explain how to set the Noral-BDM target interface within HI-WAVE.
- The *Noral-BDM Target Component Menu Entries* section describes the different entries of the Noral-BDM menu.
- The *On-Chip Hardware Breakpoint* section explains how to use the *Hardware Breakpoint Configuration* dialog to set hardware breakpoints and watchpoints.
- The *HOTPLUG Connection* section explains you how to proceed to hotplug a stand alone running hardware.
- The *Noral-BDM Target Component Commands* section lists all Command Line commands bound to Noral-BDM Target Interface.
- The *Noral-BDM Target Environment Variables* section lists all **PROJECT.INI** and **DEFAULT.ENV** environment variables bound to the Noral-BDM Target Interface.

# Introduction

Another advanced feature of HI-WAVE for the embedded system development world is the ability to load different Framework targets. The Noral-BDM Background Debug Interface is introduced in this document.

The Noral-BDM is an interface developed by Noral and used by HI-WAVE to communicate with an external system also called *target system*.

With this interface, you can download an executable program from the HI-WAVE environment to an external target system based on a Motorola MCU which will execute it. You will also have the feedback of the real target system behaviour to HI-WAVE.

HI-WAVE will fully supervise and monitor the MCU of the target system i.e. control the CPU execution. You can read and write in internal/external memory (even when the CPU is running), single-step/run/stop the CPU, set breakpoints in the code.

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*Note: **Unconcerned Components** As the code is executed by an external MCU, memory statistics are not available with the Noral-BDM target component. Therefore, Profiling, Coverage analysing and I/O simulation will not work with the Noral-BDM.*

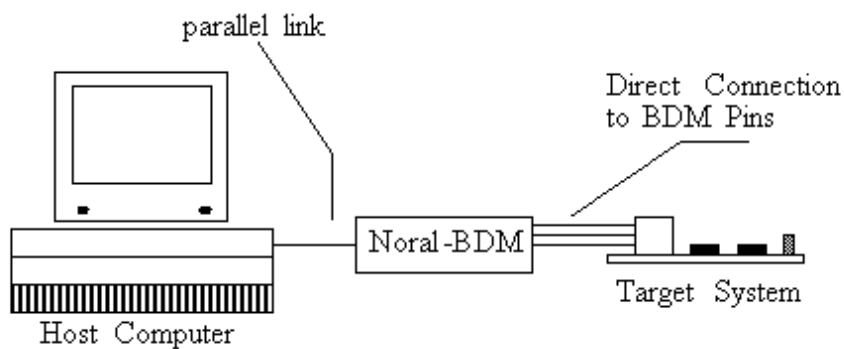
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# Interfacing Your System and Noral-BDM

*Note: Noral-BDM Structure, Configuration, Connection to the Host, Connection to the Target, Working Modes are described in Flex Tools User Manual from Noral.*

The Noral-BDM interface is designed around a parallel communication link. It is supported by any available communication device of your system (PC or SUN). The communication protocol between the Noral-BDM and your system is fully handled by the BDM Target driver automatically loaded with the Noral-BDM Target Component. However you can adapt your target system to the Noral-BDM interface.

The Noral-BDM - target system communication is serial. The parallel communication port will be used to communicate between your computer and the Noral-BDM device box.

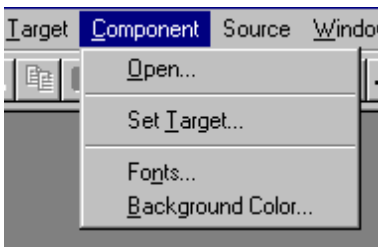


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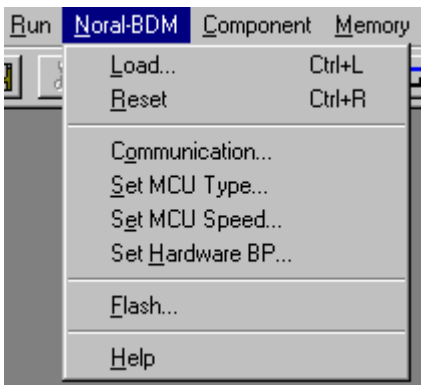
# Loading the Noral-BDM Target Component

Usually the target is set in the **PROJECT.INI** file, where **Target=Noralbdm**. If no target is set in the **PROJECT.INI** file or if a different target is set, you can load the BDM driver selecting in the main menu *Component / Set Target...* as shown below and choose *Noralbdm* in the list of proposed targets.

The Noral-BDM target **.DLL** file is not included in the HI-WAVE base installation.



After a successful target loading, the *Target* menu item is replaced by *Noral-BDM*.



The startup command file **STARTUP.CMD** is executed by *HI-WAVE* straight after the Noral-BDM Target Interface has been loaded. This file must be located in the current project directory and might contain any *HI-WAVE* or *Noral-BDM Target* command to setup the hardware target before loading an application.

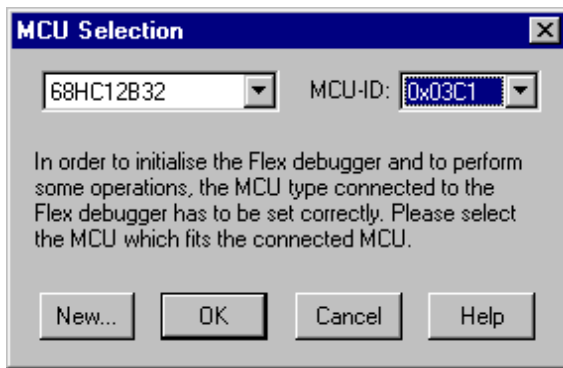
## Configuration of the MCU Name

In order to initialize the Noral-BDM and to perform some operations, the MCU type connected to the Noral-BDM must be set correctly.

If no MCU-Id was specified (Please see section *Noral-BDM Default Environment*) or the MCU name does not correspond with the expected name, an error-message pops up and the following dialog appears:

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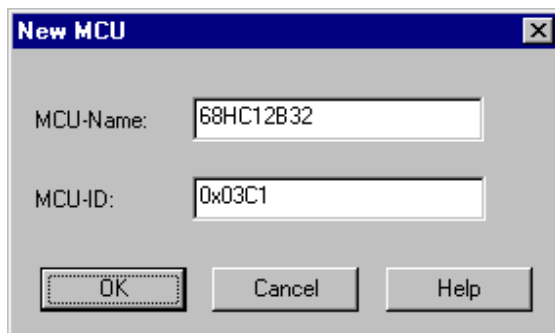




Make sure that the MCU name corresponds exact with the name expected from the Noral-BDM interface, otherwise connection to the Noral-BDM is impossible. MCU names which are accepted from Noral are:

68HC12B32, 68HC12A4, 68HC12D60, 68HC12DG128, 68HC12DA128

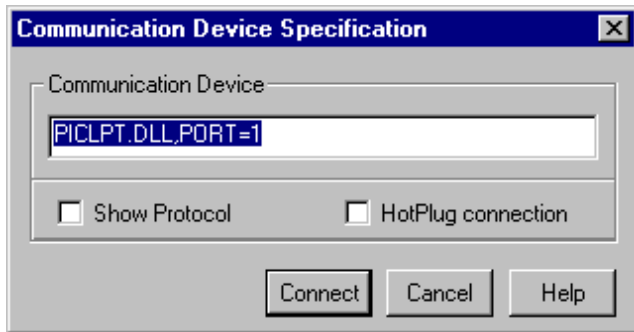
If the expected MCU name is not contained in the MCU-list, press the *New...* button, to open the following dialog:



Through this dialog, the MCU name can be adapted in such a way that the Noral-BDM interface can recognize the used MCU type correctly. If the specified MCU Id does not exist, a new entry is done in the **Mdsemcu.ini** file.

## Communication Device

In case the MCU name was correct specified an no connection can be established, an error-message pops up and the following dialog appears:



Through this dialog, the used communications DLL file (from NORAL) can be specified. For the standard DLL it is **PICLPT.DLL** which is also used as default DLL. By using an alternative DLL it is possible to support remote network interfaces whereby the Noral-BDM unit is connected to a remote PC which is in turn connected via TCP/IP to the PC running the HI-WAVE.

The LPT port number which the Noral-BDM is connected to must be configured. The default port used is LPT1. E.g the standard DLL is used and the BDM unit is connected to LPT1:

PICLPT.DLL,Port=1

For NT installation, the default communication DLL is: PICLPTNT.DLL

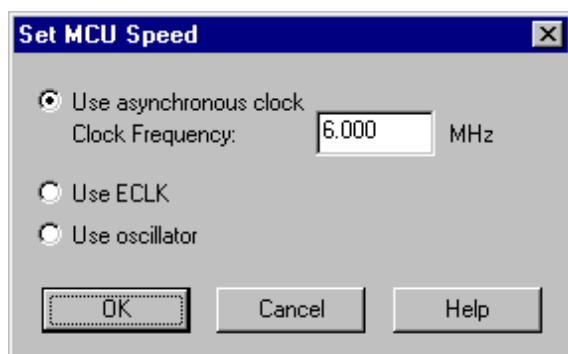
## Show Protocol

If the *Show Protocol* box is checked, the communication functions delivered from Noral Micrologics which are called from the Noral-BDM target component are reported in the Command Line window. The default state is unchecked.

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*Note: This feature is used by support personnel from HIWARE.*

## Clock Configuration



For communication between the Noral-BDM unit and the target system, the clock

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type of the BDM unit must be set correctly. This is the clock the BDM unit uses to synchronize with the target BDM. There are different modes possible:

**Asynchronous clock:** In this mode, the Noral-BDM unit uses its own internal clock thus running asynchronously with the target. The optional ECLK signal is not needed. The internal clock must be configured with the BDM baudrate of the target.

**ECKL:** The Noral-BDM unit uses the ECKL signal of the target, which allows changes of the BDM clock on the target. In this mode the flying lead *ECKL* of the Noral-BDM unit must be connected to the ECKL of the target.

**Oscillator:** The Noral-BDM unit uses the target oscillator. The target oscillator must be double the ECLK frequency. The flying lead *ECKL* of the Noral-BDM unit must be connected to the oscillator clock of the target.

The BDM clock (for asynchronous mode) and the BDM clock mode can be set through the environment variables *MCUCLOCKSPEED* and *MCUCLOCKTYPE* and through menu command *Noral-BDM | Set MCU speed...*

(Please see section *Noral-BDM Default Environment and Noral-BDM Target Component Menu Entries*). The asynchronous clock is set as default mode and the default BDM baud rate is set to 6 MHz.

The flying leads *MODA* and *MODB* are needed to control the processor's start-up mode. This prevents that the MCU begin normal execution until it is brought under control by entering BDM mode.

## Flash Programming

The HI-WAVE Noral-BDM interface has a build-in FLASH Programming interface to program onchip FLASH EEPROM modules, that you can open when choosing the *Flash...* entry in the *Noral-BDM* menu. This FLASH Programming utility must be licensed to work without size limitation. Please see the *HI-WAVE Flash Programming* manual to know more about the usage of this interface.

*Note: It is necessary to switch the Flash Programming voltage **on** with the **SETVPP** command before loading an application in Flash.*

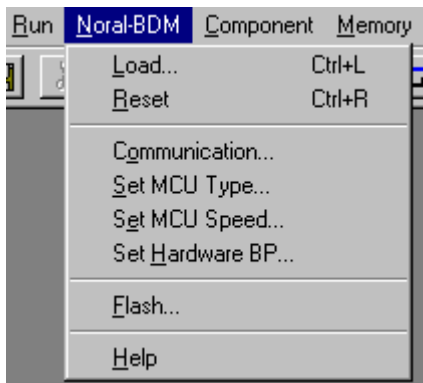
## The HI-WAVE Status Bar for the Noral-BDM



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When the Noral-BDM Target Component has been loaded, specific information are given in the HI-WAVE status bar. From the left to the right are displayed the BDM clock speed in case the asynchronous clock is used, the voltage of the target, the target CPU and the Noral-BDM status.

# Noral-BDM Target Component Menu Entries



## Loading an application

Choose *Noral-BDM* | *Load...* to load the application to debug, i.e. a **.ABS** file.

## Reset

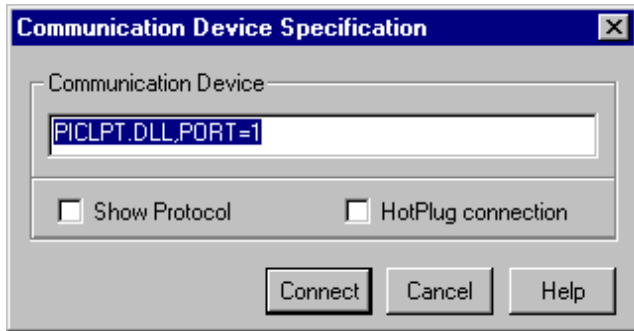
The Command *Noral-BDM* | *Reset* executes the reset command file **RESET.CMD** file and resets the target system processor.

## Communication Specification

Select entry *Noral-BDM* | *Connect...* to display the dialog box shown below.

If the connection to Noral-BDM unit is ok, the menu entry *Connect...* changes to *Communication...* and only the *Show Protocol* box can be modified.

**Communication Device** Through this box, the used communications DLL file and the communication port can be specified. For the standard DLL it is **PICLPT.DLL** and for the LPT1 port of the host computer it is **PORT=1**.



**Show Protocol** If the *Show Protocol* box is checked, the communication functions delivered from Noral Micrologics which are called from the Noral-BDM target component are reported in the Command Line window.

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*Note: This feature is used by support personnel from HIWARE.*

For more details please see section *Communication Device* of chapter *Loading the Noral-BDM target component*.

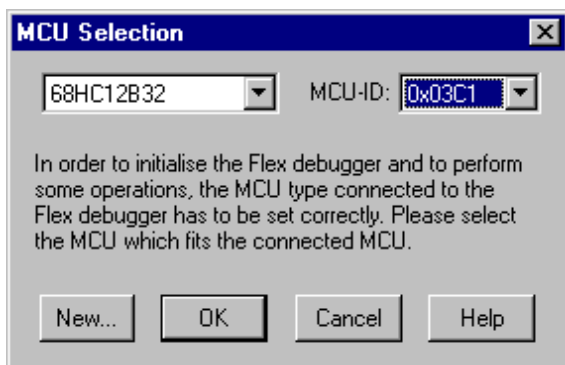
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*Note: The communication device and the baud rate saved through this dialog override environment variables **SHOWPROT** and **COMDEV** of the **DEFAULT.ENV** file.*

**HotPlug connection** If the HotPlug connection is checked, the debugger enters the HotPlug connection procedure described at section *HOTPLUG Connection*. This checkbox can be checked only checked at **Noralbdm** target component loading.

## MCU Selection

Choose *Noral-BDM | Set MCU Type...* to open this dialog.

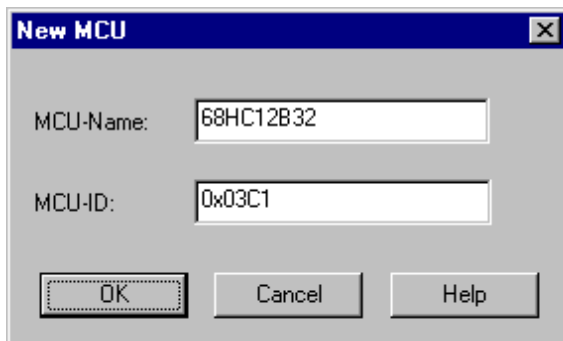


This dialog allows you to select the MCU currently used. There are two drop list

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Combo controls. They show the currently selected MCU name and MCU-ID.

The information will be taken from the file **MDSEMCU.INI**. If a specific MCU is not found in this file or the MCU name corresponds not exact with the name expected from the Noral-BDM interface, use the *New* button to open the dialog shown below:



Through this dialog the MCU name and the MCU-Id can be changed.

For details please see section *Configuration of the MCU Name*.

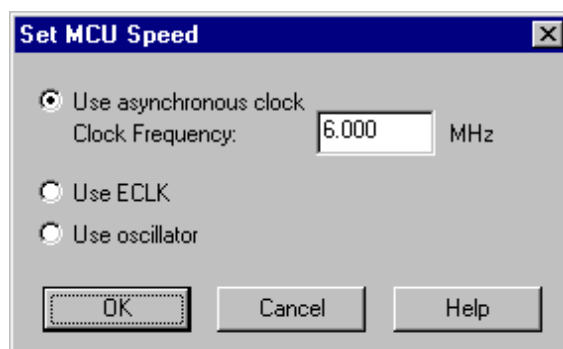
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*Note: The MCU-Id saved through this dialog overrides the environment variable **MCUID** of the **DEFAULT.ENV** file.*

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## MCU Clock Frequency

Choose *Noral-BDM | Set MCU Speed...* to open this dialog. Sets the Noral-BDM unit clock type. This is the clock the BDM unit uses to synchronize with the target BDM.



For communication between the Noral-BDM unit and the target system, the BDM clock must be set correctly. There are different modes possible:

**Asynchronous clock:** In this mode, the Noral-BDM unit uses its own internal

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clock thus running asynchronously with the target. The optional ECLK signal is not needed. The internal clock must be configured with the BDM baudrate of the target.

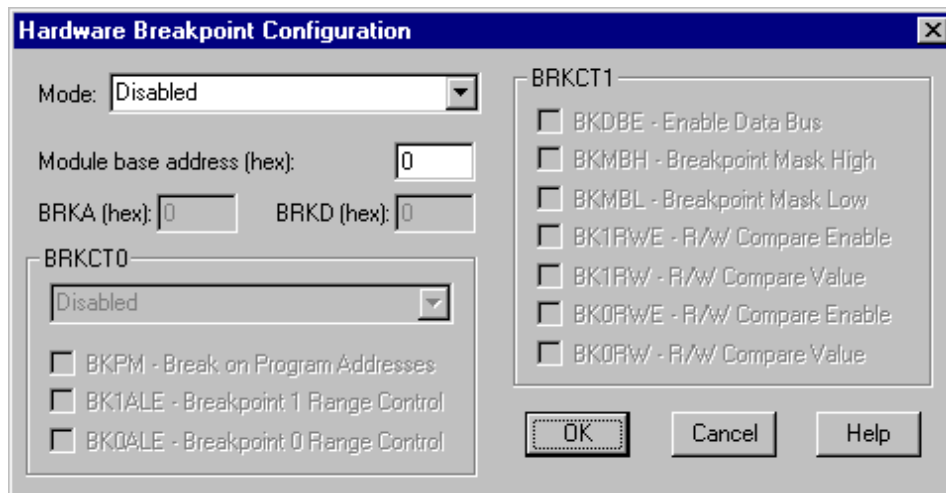
**ECKL:** The Noral-BDM unit uses the ECKL signal of the target, which allows changes of the BDM clock on the target. In this mode the flying lead *ECKL* of the Noral-BDM unit must be connected to the ECKL of the target.

**Oscillator:** The Noral-BDM unit uses the target oscillator. The target oscillator must be double the ECLK frequency. The flying lead *ECKL* of the Noral-BDM unit must be connected to the oscillator clock of the target.

*Note: The BDM Clock and the BDM Clock Mode saved through this dialog overrides the environment variable MCUCLOCKSPED and MCUCLOCK-  
TYPE of the **DEFAULT.ENV** file.*

## Hardware Breakpoint Configuration

Choose *Noral-BDM | Set Hardware BP...* to open this dialog.



This dialog allows to set up the hardware breakpoint module of the used HC12 derivative.

For details about *Hardware Breakpoint Configuration* dialog please see section *On-chip Hardware Breakpoint*.

*Note: This feature is available only if the HC12 derivative connected to the debugger through the Noral-BDM has an hardware breakpoint module. Check your MCU documentation.*

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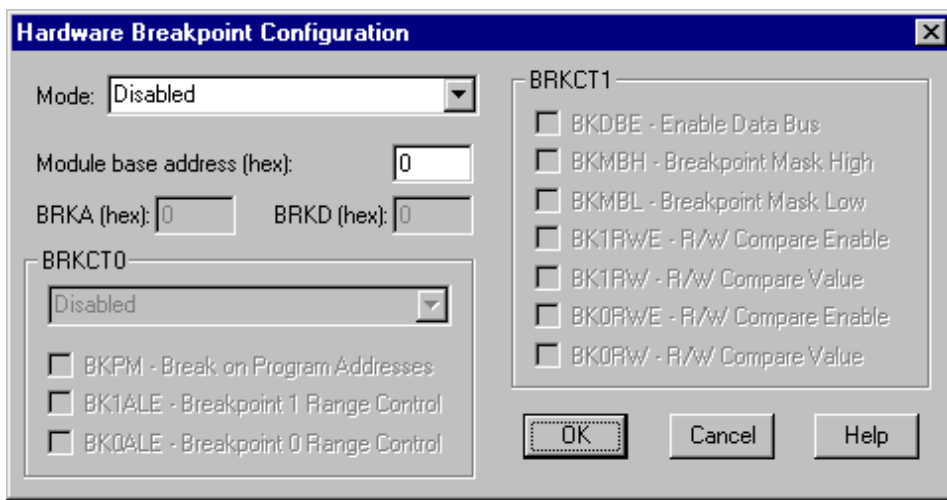


# On-Chip Hardware Breakpoint

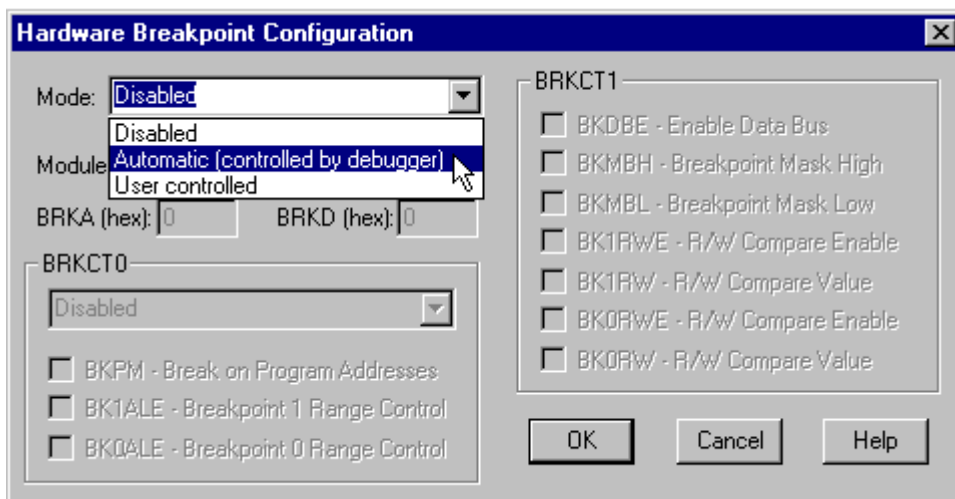
On some HC12 derivatives, an on-chip hardware breakpoint module can be used to set breakpoints and watchpoint. To invoke this module, it is necessary to set up the debugger to use this on-chip hardware breakpoint module.

This can be done using the *Hardware Breakpoint Configuration* dialog.

Select *Noral-BDM | Set Hardware BP...* menu entry. The *Hardware Breakpoint Configuration* dialog is displayed.



The *Mode* combo box allows to select between three different modes: *Disabled*, *Automatic (controlled by debugger)* and *User Controlled*.



## Disabled mode

This is the default mode for *HI-WAVE*. When the hardware breakpoint module is disabled, it is not possible to set breakpoint in Flash or in EEPROM. It is also not

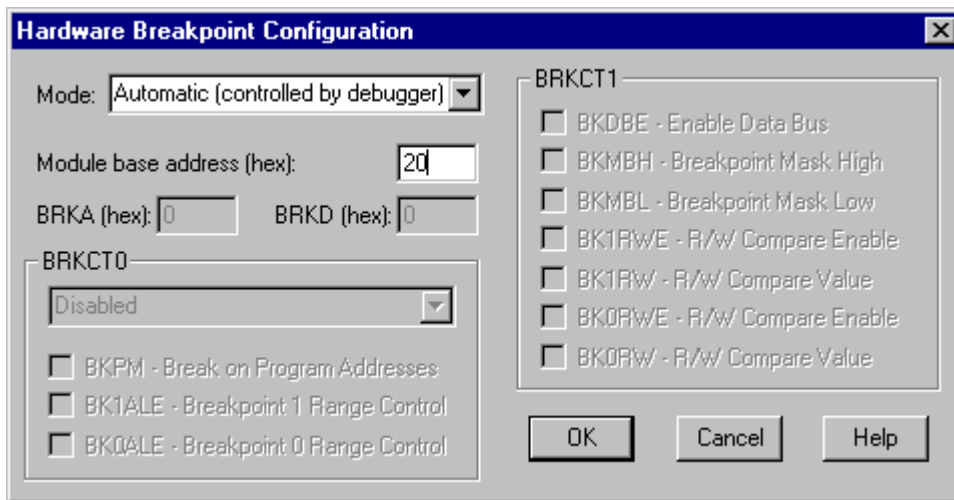
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possible to set any watchpoint, even if the application is loaded in RAM.

*Note: Some actions like “stepping over” or “stepping out” use one internal breakpoint and therefore can not be used when debugging in non volatile memory if the hardware breakpoint module is disabled.*

## Automatic (controlled by debugger) mode

If the *Automatic (controlled by debugger)* mode is selected, you have the possibility to set up to two breakpoints in *Non Volatile Memory* (or one watchpoint).



In order to set the debugger correctly, the address of the hardware breakpoint module must be set in the *Module base address* edit box.

The Module base address is typically **0x20** for the *M68HC912B32*, *M68HC912D60* and *M68HC912DG128*.

For other derivatives, please refers to Motorola’s documentation.

When those settings are done, any breakpoint which is set in *Non Volatile Memory* is considered by the debugger as an *Hardware Breakpoint*.

If your application is loaded in RAM, breakpoints are software breakpoints. In this case the *Hardware Breakpoint* module gives you the possibility to debug with breakpoints and watchpoint (only one watchpoint is available).

*Note: In Automatic mode, the HC12 hardware breakpoint module allows only two breakpoints (or one watchpoint) at the same time. If you are debugging your code in FLASH, you can not set more than two breakpoints or one watchpoint.*

*Note: Some actions like “stepping over” or “stepping out” use one internal breakpoint and therefore reduce your amount of hardware breakpoint to one.*

*Note: The M68HC812A4 does not have any Hardware Breakpoint module.*

*Note: The M68HC912DG128 hardware breakpoint module is not always able to handle correctly breakpoints on banked code, as address matching is only done on 2 bytes, regardless the PPAGE.*

## User Controlled mode

This mode allows you to fully set up the breakpoint module according to Motorola's documentation.

The following registers can be modified:

1. **BRKCT0**: Breakpoint Control Register 0
2. **BRKCT1**: Breakpoint Control Register 1
3. **BRKA**: Breakpoint Address Register
4. **BRKD**: Breakpoint Data Register

For more information about those registers, please refers to your MCU reference manual section *Breakpoints* of the *Background Debug Mode (Development Support* part of the manual).

*Note: When a hardware breakpoint or watchpoint is set in User controlled mode, the message displayed in the status bar when the breakpoint or watchpoint is reached is **ILLEGAL\_BP**.*

*Note: If the control point set is a breakpoint, it is needed to perform a single step before running again the target otherwise the target will endlessly break on the same address bus access.*

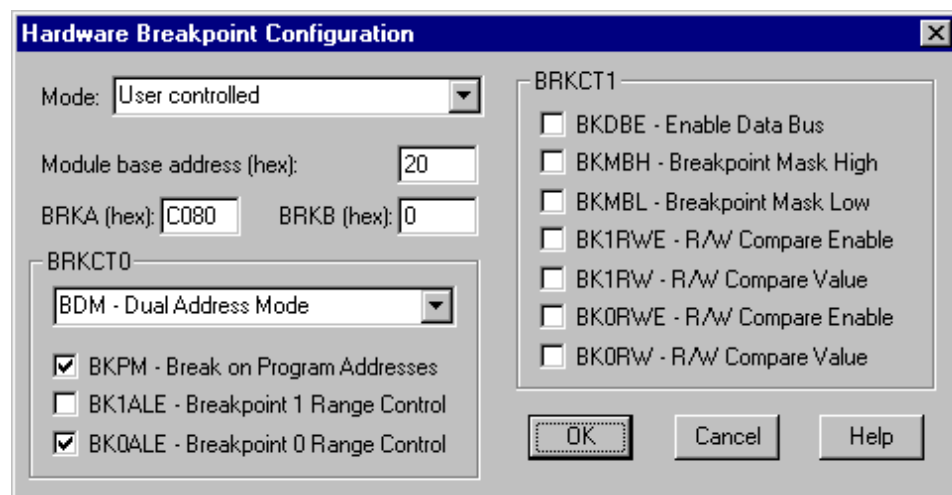
## Setting hardware breakpoints in user controlled mode (BDM - Dual Address Mode)

### Setting one hardware breakpoint in user controlled mode (BDM - Dual Address Mode)

To set an hardware breakpoint in user controlled mode, perform the following steps:

1. Open the *Hardware Breakpoint Configuration* dialog.
2. Select the *User Controlled* mode in the *Mode* list box.
3. Specify the address of the breakpoint module in *Module base address* edit box.
4. Set the address of the breakpoint in the *BRKA* register.
5. In the *BRKCT0* group, select the *BDM - Dual address Mode* for the breakpoint module.
6. The *BKPM* bit must be set so that the breakpoint module breaks if the match is on an instruction that will be executed.
7. The *BK0ALE* bit is set so that the full 16-bit value in *BRKA* is used to compare the address bus.

In the following bitmap, one hardware breakpoint is set at address **0xC080**:



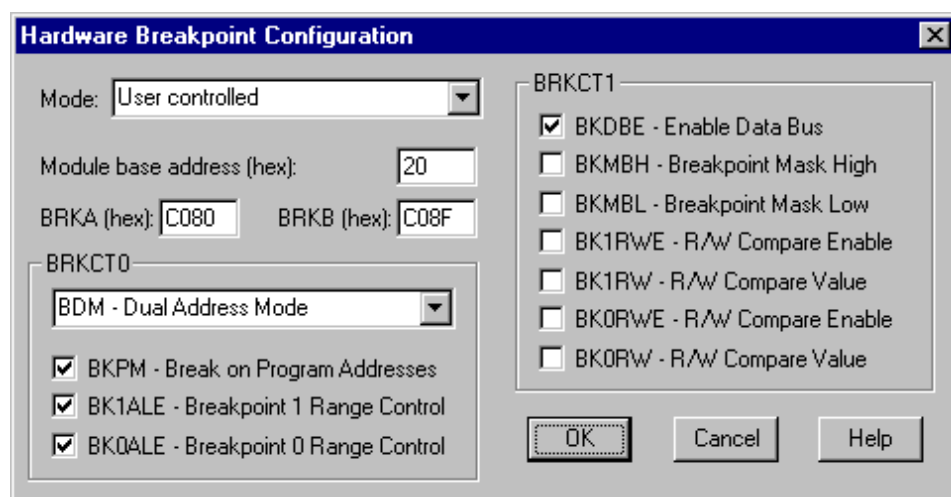
8. Click *Ok* to close the *Hardware Breakpoint Configuration* dialog.
9. Run the target. If the breakpoint can be reached, the debugger is stopped and *ILLEGAL\_BP* is displayed in the status bar.
10. To run the target again, it is needed to first perform an assembly or single step otherwise the same breakpoint is reached again and again.

## Setting one second hardware breakpoint in user controlled mode (BDM - Dual Address Mode)

To set one second hardware breakpoint in *User Controlled* mode, perform the following steps:

1. Set the address of the second breakpoint in the *BRKD* register.
2. In *BRKCT0*, the *BK1ALE* bit is set so that the full 16-bit value in *BRKD* is used to compare the address bus.
3. In *BRKCT1*, the *BKDBE* bit is set to enable the comparison of *BRKD* with the address bus.

In the following bitmap, two hardware breakpoint are set at address **0xC080** and **0xC08F**:



4. Click *Ok* to close the *Hardware Breakpoint Configuration* dialog.
5. Run the target. If the breakpoints can be reached, the debugger is stopped and *ILLEGAL\_BP* is displayed in the status bar. Do not forget to perform a single step before running the target otherwise the target will stop again on the same breakpoint.

## Setting watchpoints in user controlled mode (BDM - Dual Address Mode)

### Setting one watchpoint in user controlled mode (BDM - Dual Address Mode)

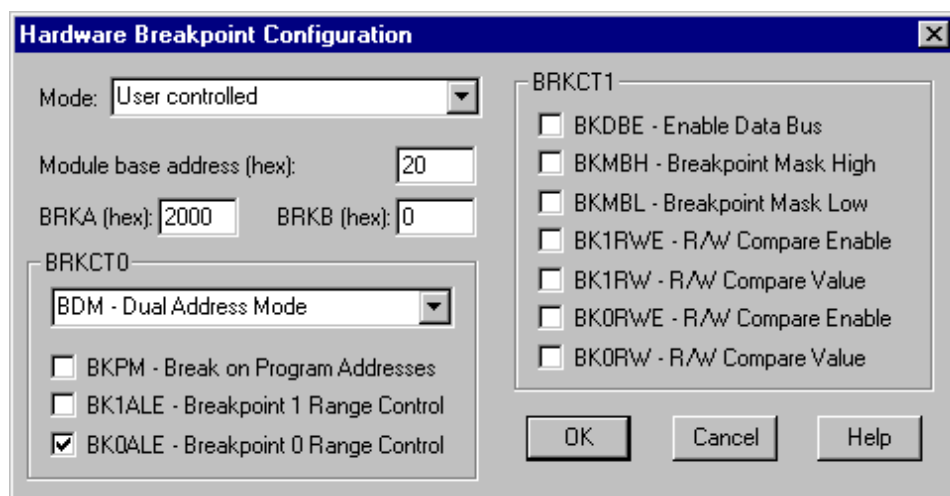
To set a watchpoint in *User Controlled* mode, perform the following steps:

1. Open the *Hardware Breakpoint Configuration* dialog.

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2. Select the *User Controlled* mode in the *Mode* list box.
3. Specify the address of the breakpoint module in *Module base address* edit box.
4. Set the address of the watchpoint in the *BRKA* register.
5. In the *BRKCT0* group, select the *BDM - Dual address Mode* for the breakpoint module.
6. The *BK0ALE* bit is set so that the full 16-bit value in *BRKA* is used to compare the address bus.

In the following bitmap, one read/write access watchpoint is set at address **0x2000** (the access size for this watchpoints is 1 byte):



7. Click *Ok* to close the *Hardware Breakpoint Configuration* dialog.
8. Run the target. If the watchpoint can be reached, the debugger is stopped and *ILLEGAL\_BP* is displayed in the status bar.

*Note: A two bytes access size watchpoint can be set up by using two contiguous one byte access size watchpoint.*

### Setting one second watchpoint in user controlled mode (BDM - Dual Address Mode)

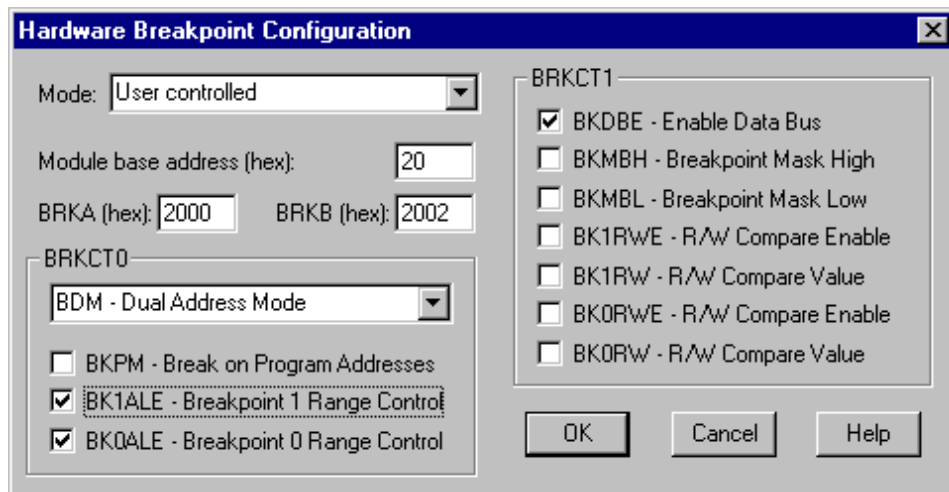
To set a second watchpoint in *User Controlled* mode, perform the following steps:

1. Set the address of the second watchpoint in the *BRKD* register.
2. In *BRKCT0*, the *BK1ALE* bit is set so that the full 16-bit value in *BRKD* is used to compare the address bus.
3. In *BRKCT1*, the *BKDBE* bit is set to enable the comparison of *BRKD* with the address bus.

In the following bitmap, two read/write access watchpoints are set at address

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0x2000 and 0x2002 (the access size for those watchpoints is 1 byte):



4. Click *Ok* to close the *Hardware Breakpoint Configuration* dialog.
5. Run the target. If the watchpoints can be reached, the debugger is stopped and *ILLEGAL\_BP* is displayed in the status bar.

*Note: A two bytes access size watchpoint can be set up by using two contiguous one byte access size watchpoint.*

### Controlling the kind of access of the two watchpoints in user controlled mode (BDM - Dual Address Mode)

The breakpoint module can be set up so that a break occurs on a read, a write or a read/write data access.

For each watchpoint, two bytes are defined in the **BRKCT1** register to set up the kind of access:

- **BK0RWE** and **BK0RW** are use to set up the kind of access on the address specified in the **BRKA** register.
- **BK1RWE** and **BK1RW** are use to set up the kind of access on the address specified in the **BRKB** register.

The following table shows how to define the values in those registers to select the correct access kind:

|              | <b>BKxRWE</b> | <b>BKxRW</b> |
|--------------|---------------|--------------|
| READ / WRITE | 0             | 0            |
| WRITE        | 1             | 0            |
| READ         | 1             | 1            |

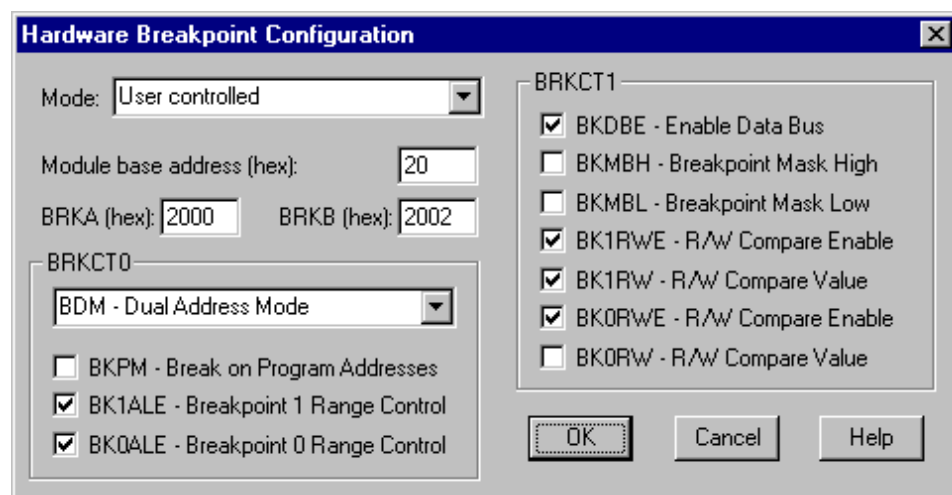
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The following example show how to set up the *READ/WRITE* (default) watchpoints set in the previous section to be *READ* or *WRITE* watchpoints.

1. The *BKxRWE* bit of *BRKCT1* register must be set for both watchpoints so that the access kind is checked.
2. Leave the *BKORW* bits reset in *BRKCT1*. The hardware breakpoint modules will break on a *WRITE* access for the address in *BRKA*.
3. Set the *BK1RW* bits in *BRKCT1*. The hardware breakpoint modules will break on a *READ* access for the address in *BRKD*.

In the following bitmap, a write access watchpoint is set at address **0x2000** and a read access watchpoint is set at address **0x2002** (the access size for those watchpoint is 1 byte):



4. Click *Ok* to close the *Hardware Breakpoint Configuration* dialog.
5. Run the target. If the watchpoints can be reached, the debugger is stopped and *ILLEGAL\_BP* is displayed in the status bar. The debugger stops on read access at the address in *BRKA* and on write access at the address in *BRKD*.

*Note: If a two bytes access size watchpoint has been set up by using two contiguous one byte access size watchpoint, the settings for the access kind should be the same for the registers *BRKA* and *BRKD*.*

## Setting one conditional watchpoint in user controlled mode (BDM - Full Breakpoint Mode)

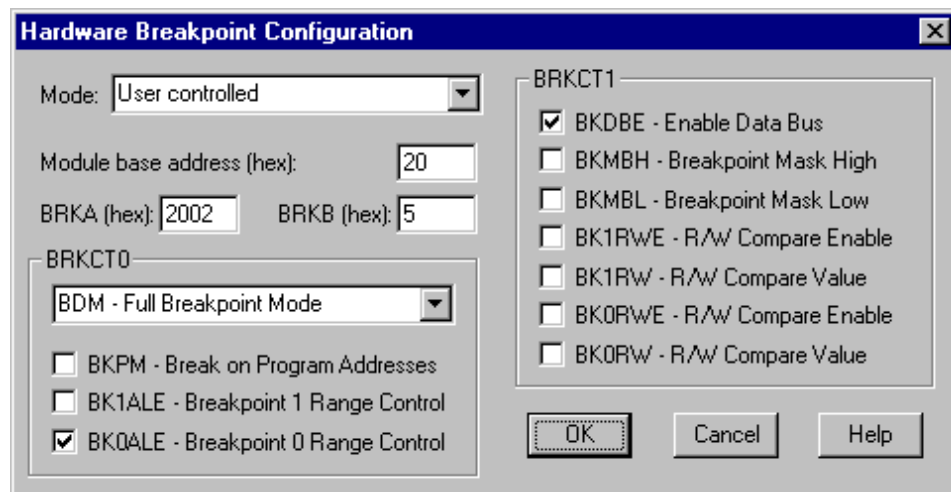
To set a conditional watchpoint in *User Controlled* mode, perform the following steps:

**For More Information: [www.freescale.com](http://www.freescale.com)**



1. Open the *Hardware Breakpoint Configuration* dialog.
2. Select the *User Controlled* mode in the *Mode* list box.
3. Specify the address of the breakpoint module in *Module base address* edit box.
4. Set the address of the watchpoint in the *BRKA* register.
5. Set the value to match on break in the *BRKD* register. This value is an hexadecimal value.
6. In the *BRKCT0* group, select the *BDM - Full Breakpoint Mode* for the breakpoint module.
7. The *BK0ALE* bit is set so that the full 16-bit value in *BRKA* is used to compare the address bus.
8. In the *BRKCT1* group, the *BKDBE* bit is set to enable the *BRKD* register.

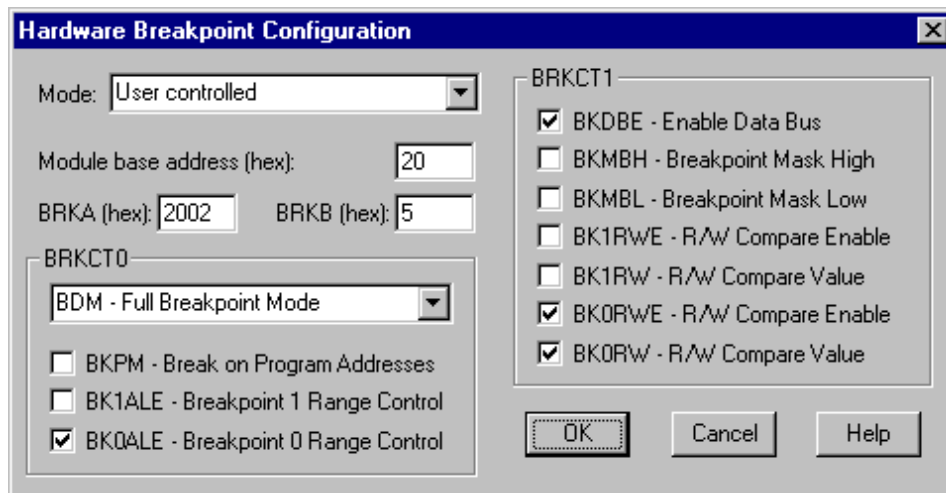
In the following bitmap, a conditional read/write access watchpoint is set at address **0x2002**, the debugger will stop when the 16-bit value at address **0x2002** is equal to **0x0005**:



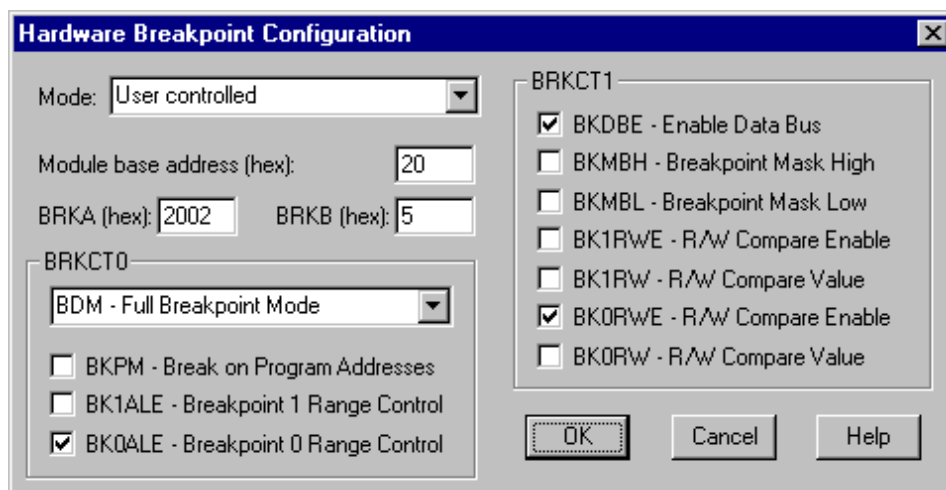
The access kind can also be specified using the *BK0RWE* and *BK0RW* bit of the *BRKCT1* group:

|              | <b>BK0RWE</b> | <b>BK0RW</b> |
|--------------|---------------|--------------|
| READ / WRITE | 0             | 0            |
| WRITE        | 1             | 0            |
| READ         | 1             | 1            |

In the following bitmap, a conditional write access watchpoint is set at address **0x2002**, the debugger will stop when the 16-bit value at address **0x2002** is equal to **0x0005** and is read:



In the following bitmap, a conditional write access watchpoint is set at address **0x2002**, the debugger will stop when **0x0005** is written at address **0x2002** (16-bit value):

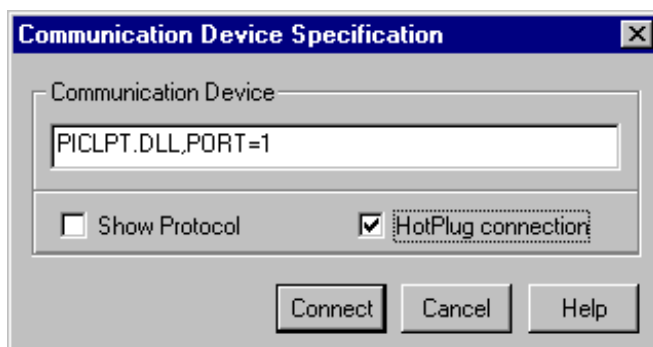


# HOTPLUG Connection

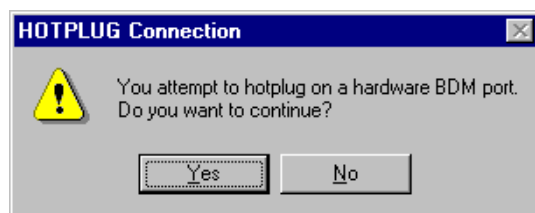
The Flex BDM interface HOTPLUG feature gives you the possibility to connect to a stand alone running hardware equipped with a BDM connector and therefore to trace the current running code.

## Who to "Hotplug" with the Noral-BDM Target Interface?

1. **IMPORTANT:** Your **STARTUP.CMD** and **RESET.CMD** should not execute any hardware access command, like **WB** (write byte) commands. If this kind of command exists, put these commands into comments with **"//"**.
2. Power supply your Flex BDM interface. **Do NOT connect the BDM connect now!**
3. Start the HI-WAVE debugger and load the **Noralbdm** target. After a short while, the dialog below is displayed:

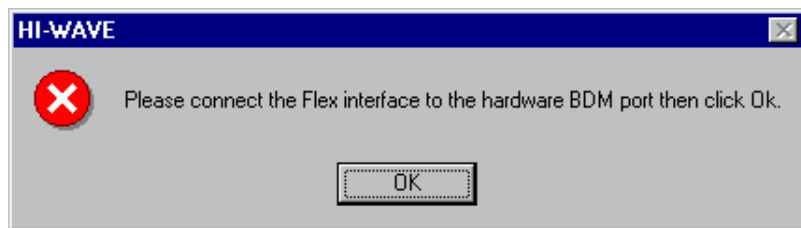


4. After checking the **HotPlug connection** checkbox, click the **Connect** button. The HOTPLUG Connection message informs you that you are about to hotplug. From this point, you can cancel the operation clicking **No** or go on clicking **Yes**.

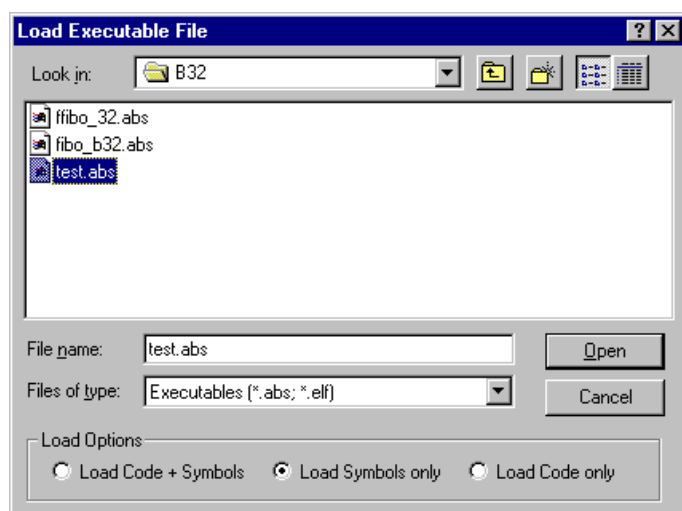


5. When clicking **Yes**, the Flex BDM interface connector is "de-activated", like if each wire was in high impedance level. The dialog below is displayed.

For More Information: [www.freescale.com](http://www.freescale.com)



6. Now you can connect the Flex BDM connector to your hardware BDM connector. Once done, click the *Ok* button.
7. The debugger turns to **Running** status automatically. To found out where is currently the running program, you need stop the debugger.
8. Then choosing *Noral-BDM / Load...* menu, you can load with "**Load Symbols only**" Load option the running program in the debugger as show below to display and trace the original Source code.



---

*Note: Do **NOT** load the program **Code** otherwise the PC will be modified. Load with "**Load Symbols only**" Load option.*

---

# Noral-BDM Target Component Commands

The following commands can be used in any command file, e.g. **STARTUP.CMD** file, or typed in the Command Line component. The startup command file **STARTUP.CMD** is executed by *HI-WAVE* straight after the Noral-BDM Target Interface has been loaded. This file must be located in the current project directory. You can use any *HI-WAVE* command in this file and take advantage of the wide set of commands introduced in the *HI-WAVE* manual to setup the target hardware before loading any application.

The *ICD-12* Target Interface specific commands are:

**BANKWINDOW**  
**PROTOCOL**  
**RESET**  
**SETVPP**

Those commands can be entered in the **STARTUP.CMD** file or in the *Command Line* component of *HI-WAVE*.

## BANKWINDOW

### Short Description

specify a banked memory area

### Syntax

**BANKWINDOW** (PPAGE | DPAGE | EPAGE) <range> <reg. address>

### Description

With the command **Bankwindow**, it is possible to set up the debugger to work in banked memory model.

To define a banked memory area, the range of memory in the page and the address of the corresponding page register must be defined. Three different page registers can be specified: **DPAGE**, **EPAGE** and **PPAGE**. These registers are displayed in the register component.

For More Information: [www.freescale.com](http://www.freescale.com)

**Example BANKWINDOW PPAGE 0x8000..0xBFFF 0xFF**

This command allows to use the banked memory model in *HI-WAVE* using the *M68HC12DG128*.

This commands means the **PPAGE** register located at address **0xFF** must be used to build the PC address when the code is located in banked memory area, from **0x8000** to **0xBFFF**.

The **PPAGE** register (located at address **0xFF**) will be displayed in the register component.

**Example**

**BANKWINDOW PPAGE 0x8000..0xBFFF 0x35**

**BANKWINDOW DPAGE 0x7000..0x7FFF 0x34**

**BANKWINDOW EPAGE 0x0400..0x07FF 0x36**

These 3 consecutive commands set the Noral-BDM interface to use the banked memory model with an *HC12A4* derivative wired with codepage, datapage and extrapage.

# PROTOCOL

---

## Short Description

switches on/off the *Show Protocol* functionality

## Syntax

**PROTOCOL** ON|OFF

## Description

If this command is used, all the messages sent to and received from the *ICD-12* interface are reported in the *Command Line* window of *HI-WAVE*.

### Example **PROTOCOL ON**

*Note: The Show Protocol is a useful debugging feature if there is a communication problem.*

# RESET

---

## Short Description

resets of the target board

## Syntax

**RESET**

## Description

With this command it is possible to reset the target from the *Command Line* component of *HI-WAVE*.

The target board is reset and the reset vector is read in the target memory from the vector table (address **0xFFFFE**).

**Example**   **RESET**



# SETVPP

---

## Short Description

sets on/off the programming voltage of the Flex interface.

## Syntax

**Syntax:** `SETVPP ON|OFF`

## Description

This command let your set the programming voltage on to program onchip FLASH EEPROMs with the FLASH programming (NVMC) interface. When the command “SETVPP ON” is executed, the FLEX module delivers the programming voltage through its “Berg” BDM connector. When the command “SETVPP OFF” is executed, the FLEX module delivers no more the programming voltage through its “Berg” BDM connector.

**Example** `SETVPP ON`

# Noral-BDM Target Environment Variables

All environment variables used by the Noral-BDM Target Interface component are in the **PROJECT.INI** file or in the **DEFAULT.ENV** file of your current project directory, section **[NORAL FLEX BDM]**. All variables match settings from the Noral-BDM Target Interface dialogs. They usually must be set within these dialogs.

The Noral-BDM Target Interface specific environment variables are:

BPModuleAdr  
BPModuleMode  
COMDEV  
MCUClockSpeed  
MCUClockType  
MCUId  
REG\_BRKA  
REG\_BRKB  
REG\_BRKCT0  
REG\_BRKCT1  
SHOWPROT

---

*Note: Please see the HI-WAVE Flash Programming manual for NV\_PARAMETER\_FILE, NV\_SAVE\_WSP and NV\_AUTO\_ID variables description.*

---

- **BPModuleAdr**

Syntax: **BPModuleAdr=<address of the breakpoint module>**

Location: **PROJECT.INI**

Associated to: *Hardware Breakpoint Configuration* dialog

Short Description: The **BPModuleAdr** variable is used to specify the address of the hardware breakpoint module. This address is needed if the hardware breakpoint module is in *Automatic (controlled by debugger)* mode or in *User Controlled* mode.

- **BPModuleMode**

Syntax: **BPModuleMode= 0 | 1 | 2**

Location: **PROJECT.INI**

For More Information: [www.freescale.com](http://www.freescale.com)

Associated to: *Hardware Breakpoint Configuration* dialog

Short Description: The **BPModuleMode** variable is used to specify the hardware breakpoint module mode:

- **BPModuleMode=0** the hardware breakpoint module is disabled.
- **BPModuleMode=1** the hardware breakpoint module is in *Automatic (controlled by debugger)* mode. In this case, variable **BPModuleAdr** is used to specify the address of the breakpoint module.
- **BPModuleMode=2** the hardware breakpoint module is in *User Controlled* mode. In this case, the variable *BPModuleAdr* is used to specify the address of the breakpoint module, **REG\_BRKCT0**, **REG\_BRKCT1**, **REG\_BRKA** and **REG\_BRKB** are used to store the values set in registers **BRKA**, **BRKB**, **BRKCT0** and **BRKCT1** of the hardware breakpoint module.
- **COMDEV**

Syntax: **COMDEV**=<Noral parallel port communication DLL filename> ,  
**PORT**=<LPT port number>

**Example** **COMDEV**=PICLPT.DLL, **PORT**=1

Location: **PROJECT.INI**

Associated to: *Communication Device Specification* dialog

Short Description: The communication DLL file and port to be used on the host computer can be specified using the variable **COMDEV**.

- **MCUClockSpeed**

Syntax: **MCUClockSpeed**=< X-tal value(Hz)/2 >

Location: **PROJECT.INI**

Associated to: *Set MCU Speed* dialog

Short Description: The target MCU X-tal frequency / 2.

- **MCUClockType**

Syntax: **MCUCLOCKTYPE**=ASYNC | ECLK | OSC / 2

Location: **PROJECT.INI**

Associated to: *Set MCU Speed* dialog

Short Description: The BDM clock mode can be set up through this environment variable. For details please see section *Clock Configuration*. The asynchronous

For More Information: [www.freescale.com](http://www.freescale.com)

mode is set as default mode. This environment variable will be overwritten if the BDM clock mode is changed in a later debug session.

- **MCUID**

Syntax: **MCUID=<MCU-ID of the connected derivative>**

Location: **PROJECT.INI**

Associated to: *MCU Selection* dialog

Short Description: The **MCUID** variable is used to store the MCU-ID of the derivative connected to the Flex interface.

Each MCU has its own MCU-ID which is assigned by Motorola.

- **REG\_BRKA**

Syntax: **REG\_BRKA=<value in the BRKA register>**

Location: **PROJECT.INI**

Associated to: *Hardware Breakpoint Configuration* dialog

Short Description: The **REG\_BRKA** variable is used to store the value of the **BRKA** register of the breakpoint module when it is used in *User Controlled* mode.

For more details about the **BRKA** (Breakpoint Address Register) register, please check your MCU documentation from Motorola.

- **REG\_BRKB**

Syntax: **REG\_BRKB=<value in the BRKB register>**

Location: **PROJECT.INI**

Associated to: *Hardware Breakpoint Configuration* dialog

Short Description: The **REG\_BRKB** variable is used to store the value of the **BRKB** register of the breakpoint module when it is used in *User Controlled* mode.

For more details about the **BRKB** (Breakpoint Data Register) register, please check your MCU documentation from Motorola.

- **REG\_BRKCT0**

Syntax: **REG\_BRKCT0=<value in the BRKCT0 register>**

Location: **PROJECT.INI**

Associated to: *Hardware Breakpoint Configuration* dialog

For More Information: [www.freescale.com](http://www.freescale.com)

Short Description: The **REG\_BRKCT0** variable is used to store the value of the **BRKCT0** register of the breakpoint module when it is used in *User Controlled* mode.

For more details about the **BRKCT0** (Breakpoint Control Register 0) register, please check your MCU documentation from Motorola.

- **REG\_BRKCT1**

Syntax: **REG\_BRKCT1**=<value in the BRKCT1 register>

Location: **PROJECT.INI**

Associated to: *Hardware Breakpoint Configuration* dialog

Short Description: The **REG\_BRKCT1** variable is used to store the value of the **BRKCT1** register of the breakpoint module when it is used in *User Controlled* mode.

For more details about the **BRKCT1** (Breakpoint Control Register 1) register, please check your MCU documentation from Motorola.

- **SHOWPROT**

Syntax: **SHOWPROT**=1 | 0

Location: **PROJECT.INI**

Associated to: *Communication Device Specification* dialog

Short Description: If the *Show Protocol* is used, all the commands and responses sent and received are reported in the *Command Line* component of *HI-WAVE*.

If the variable is set to 1, *Show Protocol* is activated.



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