

# A P P N O T E S <sup>SM</sup>

## Using a MAJIC<sup>®</sup> Probe with Intel<sup>®</sup> SDT

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### Introduction

This application note describes how to install and use the MAJIC<sup>®</sup> plug-in for the XDB debugger, part of the *Intel<sup>®</sup> C++ Software Development Tool Suite 2.0 for Intel XScale<sup>®</sup> Microarchitecture* and *Intel<sup>®</sup> C++ Software Development Tool Suite 1.2 for Palm OS, Symbian OS, Nucleus OS, and OS independent systems (iSDT)*. It also supplements the iSDT documentation with information specific to using the iSDT debugger (XDB) with the MAJIC<sup>®</sup> series of intelligent debug probes. See the *Using A MAJIC<sup>®</sup> Probe with Intel XScale<sup>®</sup> Microarchitecture* for additional information on MAJIC support for the Intel XScale<sup>®</sup> microarchitecture.

### Additional Documentation

Additional documentation for the EDT software package and MAJIC probes is installed as part of the EDT software package. On a Windows PC, use the EDT Launchpad in the Windows system tray to open the EDT Documentation Index. On a Linux PC, open `./manuals/edtX_doc_index.html` in your EDT software installation.

All iSDT documentation can be found in the `./doc` directory of the SDT installation, and can be accessed via shortcuts in the Windows **Start** menu under **Programs > Intel(R) C++ Software Development Tool Suite 1.2 > Manuals**. The following EDT and iSDT documents will prove particularly useful through the course of this application note:

<i>MAJIC Probe User's Manual</i>	Complete information on configuration and operation of the MAJIC probe, and the MON command language.
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*Using A MAJIC<sup>®</sup> Probe With Intel XScale<sup>®</sup> Microarchitecture*

Covers configuration and operational details of the MAJIC probe that are specific to targets based on Intel XScale technology.

*Intel<sup>®</sup> XDB Debugger Reference Manual*

Documents the common user interface and command language shared by all versions of the XDB debugger.

*Intel<sup>®</sup> XDB JTAG Debugger User's Manual*

Supplements the reference manual with a tutorial and information specific to using XDB with a parallel port JTAG probe.

*Intel<sup>®</sup> XFlash User's Manual*

Documents the **xflash** command line utility used to support automated flash programming in a production environment.

In the Intel<sup>®</sup> documentation, the term “JTAG” is not used in a generic sense. “JTAG” refers to a specific non-MAJIC JTAG probe and “XDB JTAG” refers to the XDB debugger configured to load the plug-in that interfaces to that probe. We use the term “XDB-MAJIC” to refer to the XDB debugger configured to load the EDT plug-in that interfaces to the MAJIC probe.

**Getting Support**

For additional assistance configuring the MAJIC probe use with the Intel Software Development Tools, please visit <http://www.mentor.com/supportnet/>.

## Installation

Installation and configuration consists of the following steps:

1. Install the iSDT package. Insert the version 1.2 or 2.0 iSDT CD into your CD-ROM drive. Your Web browser should start up automatically, displaying the CD home page. If the browser installer does not launch after a few seconds, then click **Start > Run...** and browse to find your CD drive. Then, run *index.htm*. Click the **Install Tool Suite** link to launch the iSDT installation program, and follow the prompts to complete the installation.

**NOTE:** The installer will ask for a license file, which you must get from the Intel Registration Center before you can complete the installation. Please refer to the *Registration Instructions* that were provided with your iSDT package for the software serial number, and instructions for requesting the license file.

2. If you have the Metrowerks CodeWarrior IDE already installed on your PC, and you wish to use it with the iSDT compiler and tools, you can then click the **Install Intel C++ Software Development Tool Suite Plug-in For Metrowerks\* CodeWarrior\*** link to integrate the iSDT Tool Suite with CodeWarrior.
3. Install the EDT package. Insert the EDT CD into your CD-ROM drive. If the installer does not launch after a few seconds, then, click **Start > Run...** and browse to find your CD drive, then, run *setup.exe*. Follow the instructions provided by the installer.
4. Integrate the MAJIC target plug-in with the XDB debugger in the iSDT package. This step adds a target named **MAJIC XScale COM1** that can be selected from the **XDB Settings** dialog. It is configured by default to connect to the MAJIC probe using the COM1 serial port, with PXA250 as the CPU type and standard initialization files for the DBPXA250 target board. It also adds shortcuts to the **iSDT Examples and Configurations** program groups to invoke XDB-MAJIC for the evaluation boards and example projects that iSDT supports out-of-the-box, with corresponding CPU type and board initialization files.

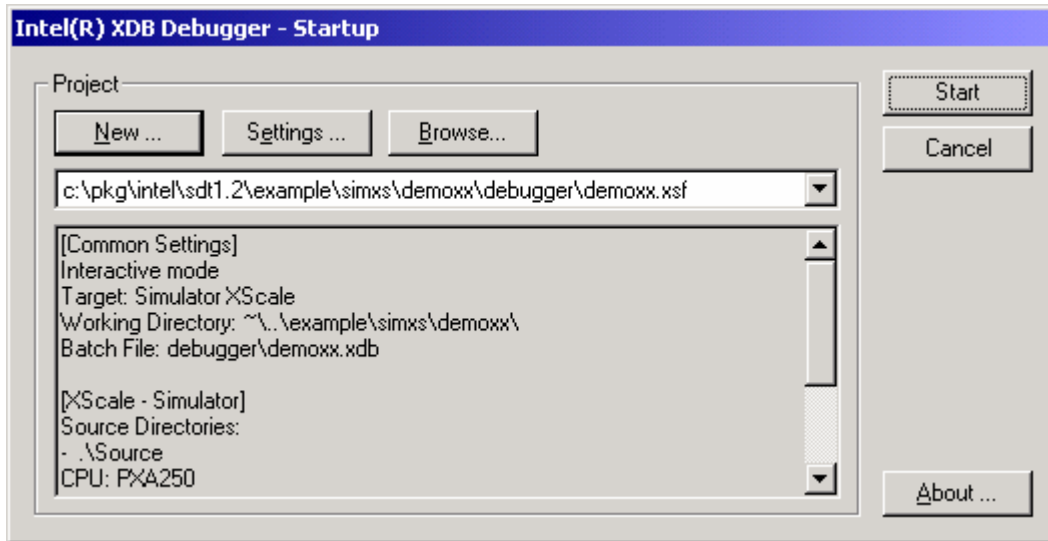
If iSDT was installed before EDT, the EDT installer should detect the installed iSDT package and install the plug-in for you. However, if you installed EDT first you can manually run the plug-in installer after both EDT and iSDT have been installed. Click **Start > Run...** and browse to find the *.udi* subdirectory in the directory where you installed the EDT package, and run *isdt\_install.exe*.

5. Configure default settings for XDB-MAJIC. This step updates the default MAJIC configurations created in step 3 to reflect your own target system and your MAJIC probe's hostname or IP address for the preferred Ethernet connection. It adds a target named **MAJIC XScale Connection** that can be selected from the **XDB Settings** dialog and configured to connect to the MAJIC probe using the connection method, processor type, and initialization file that you specify. These defaults provide the initial settings values whenever you create a new XDB project using the **MAJIC XScale Connection** target.

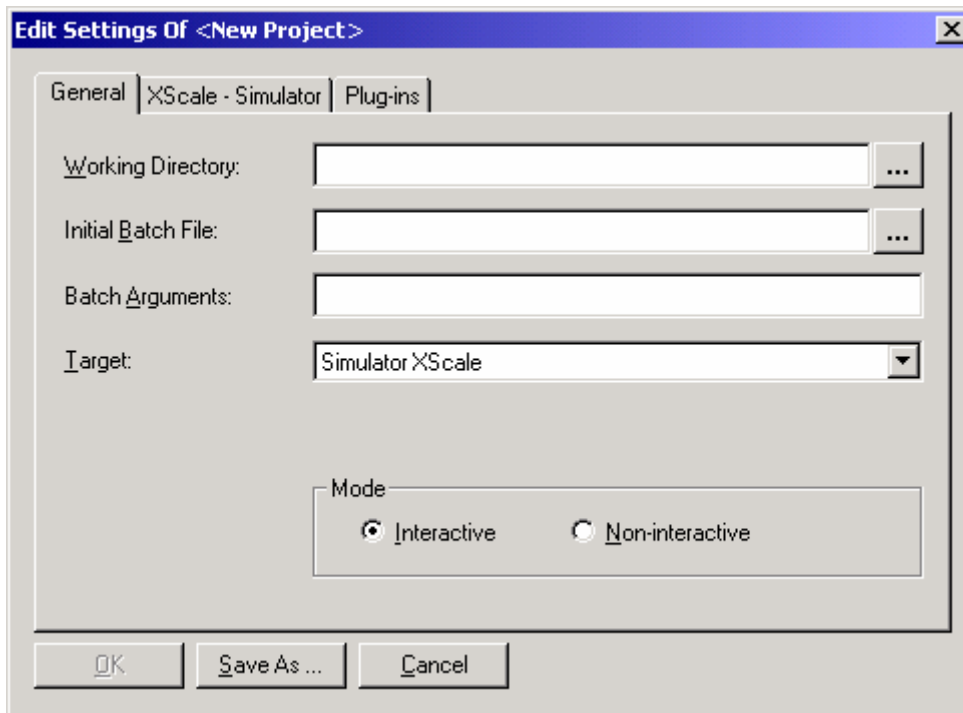
Please refer to the *MAJIC Probe User's Manual* for instructions on configuring a MAJIC probe for your target system, especially Chapter 3 - *Debug Environment*. The first section describes using the MAJIC Setup wizard. In the **Choose Operation** step, you should select **XDB for MAJIC** in the **Choose your debugger:** drop-down list. After you click **Go**, select **Setup default XDB MAJIC connection settings** in the next dialog, then continue along as described in the *MAJIC Probe User's Manual*. In the **Perform Setup** form, the available actions are **Setup Default XDB MAJIC Settings** and **Setup XFlash Utility's MAJIC Settings**. Both should be enabled. The first action creates or updates the **MAJIC XScale Connection** target and updates the various **Example and Configurations XDB** project settings. The second updates the settings for the MAJIC probe target for the Xflash command line utility (in iSDT 1.2, there is a separate version of the XFlash utility in the *xflash\_majic* directory).

## Using XDB with a MAJIC Probe

For the most part, using XDB with a MAJIC probe is the same as using XDB with any other type of target. When you launch XDB, you get a startup dialog where you can select an existing XDBSettings file. Click **Settings** to modify the settings loaded from the file, or click **New...** to create a new settings file.

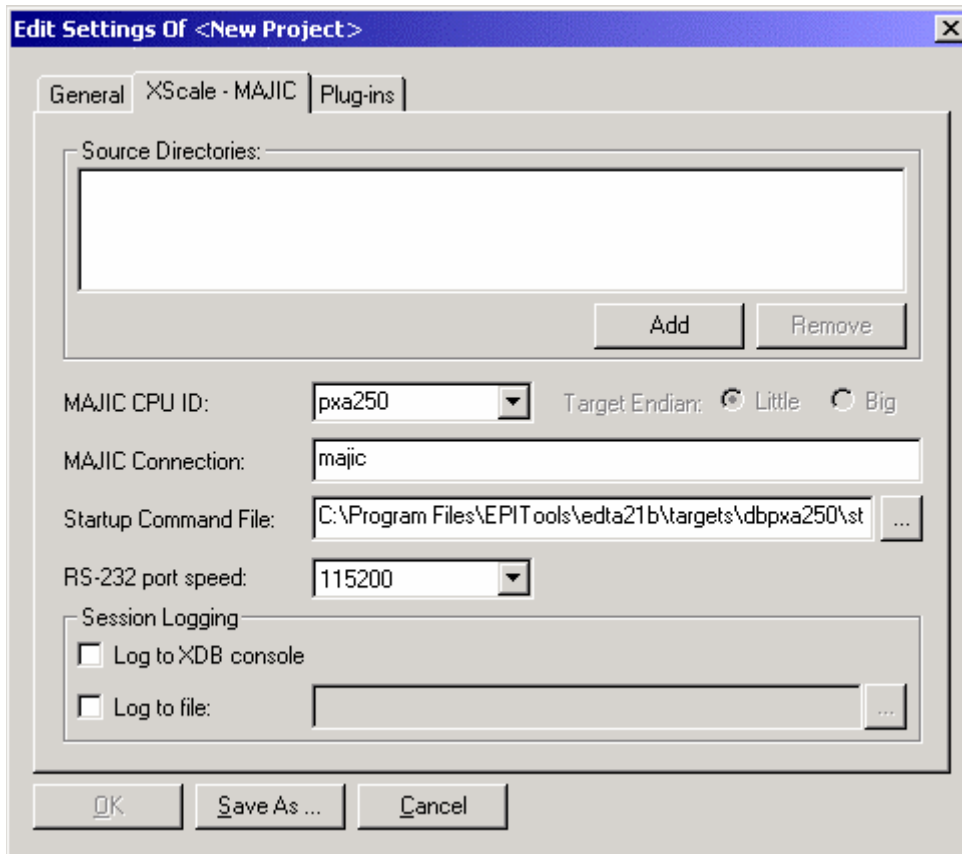


When you click **Settings** or **New**, the **XDB Edit Settings** dialog box appears.



The **Target:** drop-down list allows you to select any supported target type, and the middle tab will change to reflect the selected type. When you select **MAJIC XScale COM1** or **MAJIC XScale Connection**, the middle tab changes to XScale – MAJIC.

If you click the **XScale – MAJIC** tab, the following dialog box is displayed. This dialog box lets you edit the XDB settings that are specific to the MAJIC probe.



### Source Directories

Enter the path names of directories to be searched for the source files for you project, if needed. This field is actually common to all XDB target types and is described in section 2.2.2.2 of the *Intel XDB Debugger Reference Manual*.

The rest of the fields are MAJIC probe-specific and are described in the following sections.

### MAJIC CPU ID

Select the correct EPI CPU identifier from the drop-down list. Not all Intel XScale cores supported by MAJIC probes are included in the list. Only those fully supported by XDB will appear.

### Target Endian

Only little-endian targets are supported by XDB at this time.

### MAJIC Connection

Enter **com1** or **com2** to specify a serial port to use for communication with the MAJIC probe. When using Ethernet, enter the hostname or IP address assigned to the MAJIC probe. It is not necessary to append “:e” to the hostname or IP address for Ethernet connections.

### **Startup Command File**

Enter the path name of the start-up command file to initialize the MAJIC probe and target board. This is the same command file you would use with Mentor Graphic's MONICE and EDBICE debuggers, and it is processed by the MAJIC plug-in when XDB first connects. This is documented in Chapter 3 of the *MAJIC Probe User's Manual*. Don't confuse this with the XDB start-up command file you can specify in the **General** tab, as described in section 2.2.2.1 of the *Intel XDB Debugger Reference Manual*.

### **RS-232 port speed**

This drop-down list controls the baud rate if you are using a serial connection. If you are not using the serial port to communicate with the MAJIC probe, it doesn't matter what value is selected. The default value is 9600 baud.

### **Session Logging**

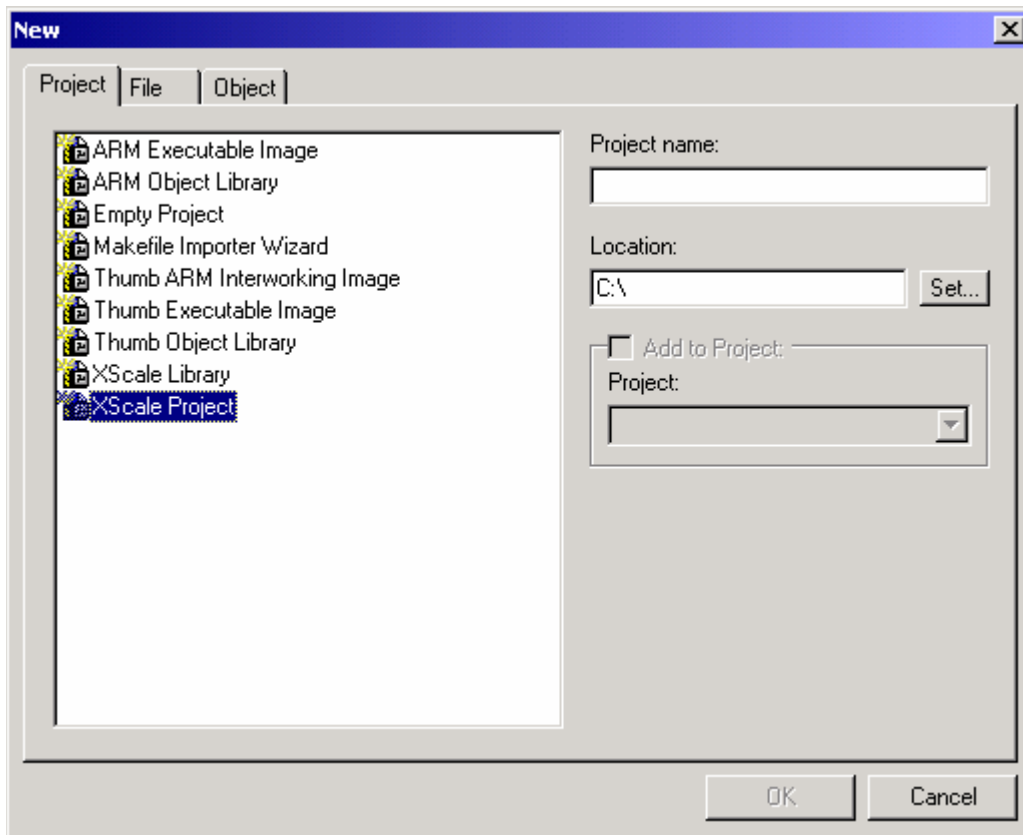
These options can be used to generate a detailed log of the API calls that XDB is making to the MAJIC<sup>®</sup> plug-in. If you are having a problem using XDB with your MAJIC probe, the technical support department may direct you to enable session logging to a file to help in diagnosing the problem. Otherwise, these options should normally be disabled.

Any changes you make to your settings for an existing XDB settings file are automatically saved when you click **OK**. If you are creating a new project, you need to click **Save As...** and specify a destination directory and file name for the settings file. Normally, you would save the file in the same directory as the program you are debugging.

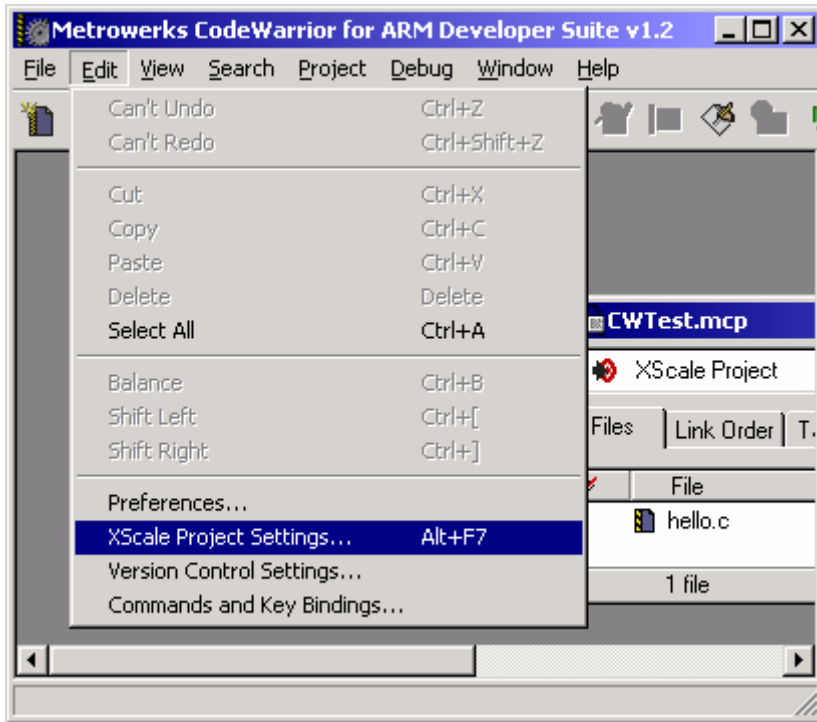
Once your settings are correct (which they will be by default if you have followed installation step 4), power on your target system and the MAJIC probe and click **Start** to open XDB and connect to your MAJIC and the target. Once in XDB, there are very few MAJIC probe-specific issues for you to acknowledge. They are described in the next section. If you are new to XDB, we recommend you read the Intel manuals and follow the tutorial in Chapter 3 of the *Intel XDB JTAG Debugger User's Manual* (iSDT 1.2).

## Using CodeWarrior® IDE with a MAJIC Probe

Installing the **Intel C++ Software Development Tool Suite Plug-in for Metrowerks CodeWarrior** plug-in adds two templates to the list you can choose from when creating a new project in the CodeWarrior® IDE – XScale Library and XScale Project.

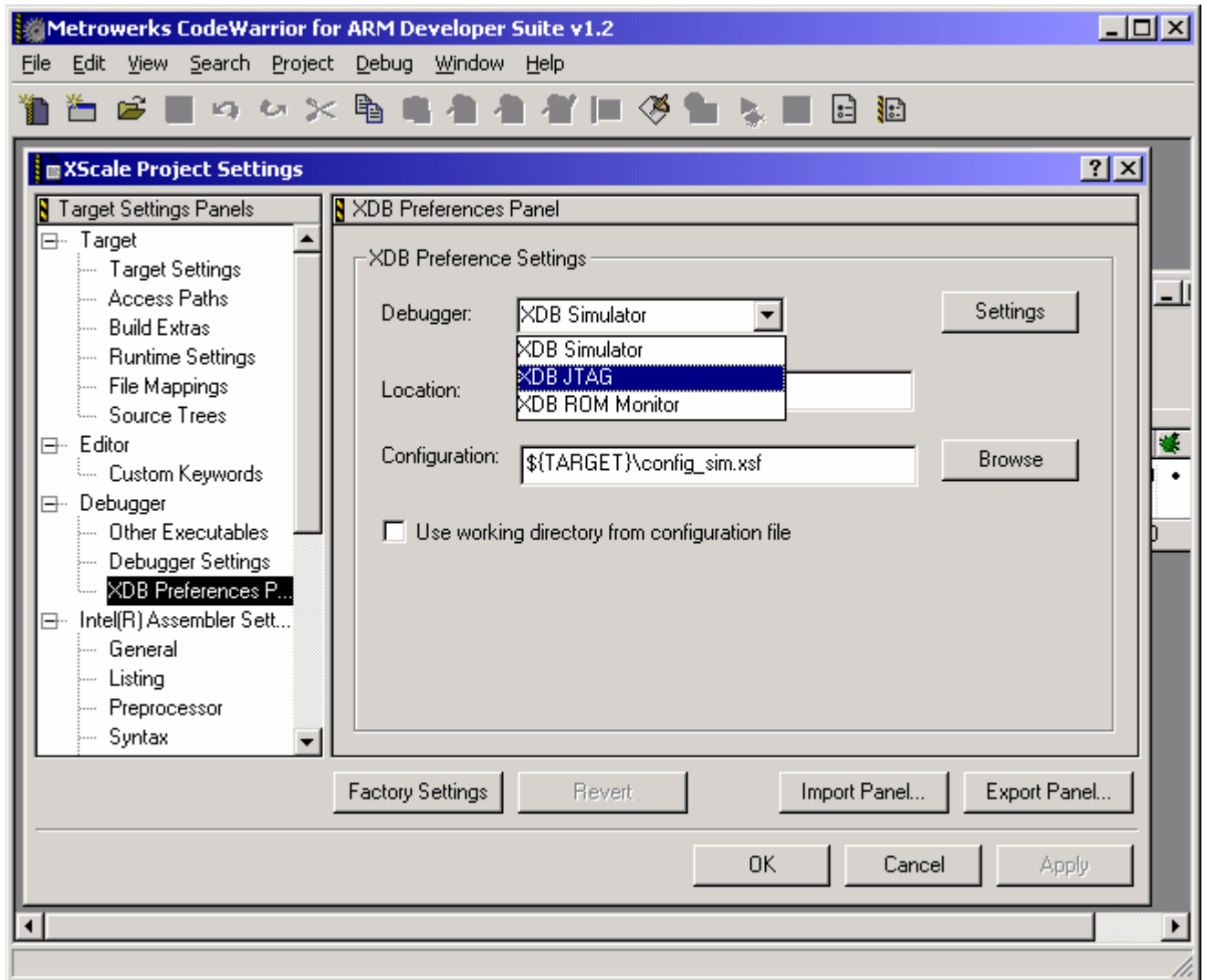


XScale Library is a template for building a library using the iSDT compiler, and XScale Project is a template for building and debugging an application program using the iSDT compiler and XDB debugger. Creating a project using either template adds an iSDT-specific entry to the **Edit** menu for editing the project settings.



The XScale Project Settings dialog box adds panels for configuring the appropriate iSDT tools to the standard CodeWarrior preference panels. The XScale Library template adds panels for the iSDT compiler, assembler, file converter and librarian. Similarly, the XScale Project template adds panels for the iSDT compiler, assembler, file converter, linker and debugger.

To configure a CodeWarrior project based on the XScale Project template to use XDB-MAJIC for debugging, first select **XDB Preferences Panel** in the **Target Settings Panels** tree.



Note that the **XDB Preference Settings** panel offers only three choices in the **Debugger:** drop-down list. Unfortunately, it is not currently possible to have an XDB MAJIC choice added to this list. But you can alter the settings for any of the existing choices to use the MAJIC plug-in. When you click the **Settings** button next to the **Debugger:** drop-down list, the standard XDB Edit Settings dialog box appears. You can then select a MAJIC target type and configure the XDB-MAJIC settings as described in the [Using XDB with a MAJIC Probe](#) section of this application note. Your settings will be saved in the .xsf file specified in the **Configuration:** field of the **XDB Preferences** panel.

## Corrections to XDB Manuals

### Intel XDB Debugger Reference Manual

Since the *Intel XDB Debugger Reference Manual* (iSDT 1.2) and *The Intel XDB Debugger Online Help* (iSDT 2.0) describe the bulk of the XDB user interface which is independent of the target type used, it is almost completely applicable to XDB-MAJIC. However, there is one undocumented feature and three issues relating to the MAJIC probe that you must recognize and they are as follows:

1. XDB supports a global start-up command file in addition to the project-specific start-up command file that can be specified in the **General** dialog box under **Settings** (Initial Batch file), and the application-specific command file that can be specified in the **Load** dialog box (Initfile). If there is a file named *startup.xdb* in the *SDT\xdb* directory, XDB will execute the commands in it every time it starts up.
2. Section 2.2.2.3 (iSDT 1.2) documents the **Target Connection:** setting which is specific to the ROM-MONITOR and JTAG target types. The corresponding pages in the *XDB Debugger Help* file for iSDT 2.0 make it clear that the setting is target-specific. The corresponding MAJIC option is labeled **MAJIC Connection:** to avoid confusion.
3. The **CUSTOM** command documented in section 4.2.9 (iSDT 1.2) is applicable to a MAJIC probe. The *iSDT 2.0 XDB Debugger Help* does not document **CUSTOM** as a general command, but target-specific **CUSTOM** commands are listed in the simulator and JTAG debugger sections. The MAJIC plug-in includes a MONICE-compatible command interpreter. Nearly all the MONICE commands described in the *MAJIC Probe User's Manual* are available via XDB's **CUSTOM** command, with the only exception being execution-related commands, for example:

```
xdb> custom "h"  
xdb> custom "h d"  
xdb> custom "h dv""  
xdb> custom "l c:\\myproject\\myprogram.axf"  
xdb> custom "dv \"dv is a MON command\n\" ; di"
```

The first three examples show how to enter the MON Help command for varying levels of help. The fourth example shows how to enter the MON Load command to download your program, which will give the fastest possible download time. The last example shows how to enter a command string consisting of a *dv* command followed by a *di* command. Please note the need for backslashes to escape the backslashes in the program pathname and the quote characters that are part of the *dv* command, since the **CUSTOM** command requires the entire command line to include a quoted string. The syntax of quoted strings in XDB is the same as for the C language, so embedded quote and backslash characters need to be “escaped” by a backslash. In file pathnames, you can also use forward slashes rather than escaped backslashes.

- ISDT 1.2 only: Sections 4.2.11.7, 4.2.38.8, and 4.2.39.12 document the **DELETE**, **SET**, and **SHOW EXCEPTION** commands. **DELETE** and **SET** work as described, but **SHOW EXCEPTION** can display incorrect results.

The MAJIC probe has a configuration option named `vector_catch` that controls which exceptions cause execution to halt and which are ignored. This is typically set in the start-up command file selected by the MAJIC Setup wizard, or in the **XDB Edit Settings** dialog box. The **SET EXCEPTION** and **DELETE EXCEPTION** commands call an API function that correctly updates the MAJIC probe's `vector_catch` option, so they work as expected. However, there is no corresponding query function in the iSDT 1.2 API. **SHOW EXCEPTION** just assumes that the initial state is to ignore all exceptions and keeps track of the changes made via **SET EXCEPTION** and **DELETE EXCEPTION**. If the `vector_catch` setting in your start-up file is set to catch any vectors, or if you change `vector_catch` directly with the **CUSTOM** command, the actual `vector_catch` setting will not be reflected by XDB's **SHOW EXCEPTION** command. This issue does not apply to XDB in iSDT 2.0.

### Intel® XDB JTAG Debugger User's Manual (iSDT 1.2)

There are actually very few differences from XDB's point of view between the JTAG and MAJIC target types, so this manual is also largely applicable to XDB-MAJIC if you simply read "MAJIC" everywhere the manual says "JTAG". The specific exceptions are listed as follows.

Sections 1.2 and 1.3, a description of the parallel port adapter used for XDB-JTAG and its restrictions, are not applicable. Chapter 2, *Installation*, is also not applicable to the MAJIC probe and is superseded by this document.

You can follow the tutorial in Chapter 3 with XDB-MAJIC. Just use the **MAJIC Debugger (board\_name) Start** menu shortcut rather than **JTAG Debugger (board\_name)** or browse to `<installation-directory>\example\majicxs\demox\debugger` rather than `<installation-directory>\example\ocdxs\demox\debugger` to invoke XDB-MAJIC in section 3.1.1.

Most of Chapter 4 is also applicable to XDB-MAJIC. In section 4.1.1 (bullet 3), you should navigate to the directory `<installation-directory>\xdb\configurations\majic` rather than `<installation-directory>\xdb\configurations\ocd`. In section 4.1.2, bullet 3, the target for XDB-MAJIC Debugger is **MAJIC XScale Connection** or **MAJIC XScale COM1**. In bullets 4 and 5, the example directories would be under `example\majicxs` rather than `example\ocdxs`. Bullets 8 and 10 through 13 are not applicable. Refer to the earlier description of the **XScale – MAJIC** settings dialog box.

Sections 4.3, 5.5, and 5.6 are not applicable to XDB-MAJIC. The **SWI Options** dialog box will be present, but any values entered in it or via the **SWI "SET OPTION"** command will not be used. With MAJIC, the `top_of_memory` configuration option is used to set the stack and heap limits. This option is typically set in the start-up command file selected by the MAJIC Setup wizard, or in the **XDB Edit Settings** dialog box.

In section 4.5, *Enhanced Breakpoints*, you can not specify a specific breakpoint register for hardware breakpoints. The MAJIC probe manages the breakpoint registers automatically.

Chapter 6, *Diagnostic Messages*, is specific to the JTAG Target and is not applicable to the MAJIC probe. XDB-MAJIC displays error messages in the XDB Console window rather than relying on numeric codes.

### Intel XFlash User's Manual

#### iSDT 1.2:

The `-tgttype` option documented in the manual does not work. In fact, `xflash.exe` does not support multiple target types in any way. In order to provide a version of XFlash that works with the MAJIC probe, `isdtd_install.exe` creates a second copy of the XFlash utility in a sub-directory named `.xflash_majic`. In order for this copy to work correctly with your MAJIC probe and target board, you need to use the wizard to customize your default settings as described in the *Installation* section, step 5.

### iSDT 2.0:

The **-tgttype** option works correctly in iSDT 2.0, so the MAJIC target plug-in is integrated with the Xflash utility in sub-directory *.xflash*. To use Xflash with the MAJIC probe, specify **'-tt "MAJIC Xscale"'**.

### Other Issues

If you are new to XDB, you may be surprised to learn that XDB does not automatically set the PC to your program's entry point address when it is loaded. By default, execution will begin at the reset address regardless of where your program is loaded. The most convenient way to set the PC is to specify an "Initfile" (XDB batch file) in the **Load** dialog box, and include in it a command to set the PC to whatever label is used to identify the entry point in your build environment. For example, the samples directory contains a file named *set\_pc.xdb* which includes the following command:

```
set sysreg pc=&__main
```

When loading a sample program, click the **Initfile** check box and browse to *set\_pc.xdb*. Another approach to this issue is demonstrated in the iSDT examples. They use the initial batch file (*demoxx.xdb*), specified in the XDB settings and executed once when XDB starts up, to define toolbar buttons for Download, Reload, and Start that load the demo program and set the PC in one operation.

There is a problem with the **Output** window used to display program "semi-hosting" output. If any register windows are open while the target program is running, they will be updated every time output is added to the **Output** window. This can cause a significant slow-down in execution performance as well as other problems. If your program is using semi-hosting to display output in XDB, we strongly recommend that you open register windows only when stopped at a breakpoint.