Freescale Semiconductor
User's Guide

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User's Guide for Applications and Templates for Xtrinsic Intelligent Sensing Framework 1.1

on the FXLC95000 Intelligent Motion-Sensing Platform

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1 Overview of Xtrinsic ISF Applications and Templates

To demonstrate selected functionality of ISF and to enable rapid development of sensor applications using ISF, example embedded applications are provided. These applications include source code which highlight proper usage of the API. They can be downloaded and run using any of the available FXLC95000 Development Board Hardware (includes KITFXLC95000EVM, FXLC95000MAG, or KITFXLC95000-10AXIS). (Refer to the Software and Tools tab of the FXLC95000 Xtrinsic Intelligent Motion-Sensing Platform web page for details.)

The following applications are available with the automated installer. In the MicroSoft Windows Start menu, go to **All Programs –> Freescale –> Xtrinsic ISF v1.1 –> Example Applications Folder**. Alternatively, go to the Downloads tab of the Xtrinsic ISF website:

- **ISF1P195K ACCELMAG PROJ**- CodeWarrior Project with source using the FXLC95000CL accelerometer and the MAG3110 magnetometer.
- **ISF1P195K GETACCELDATA PROJ** - CodeWarrior Project with source that demonstrates a simple accelerometer application.
- **ISF1P195K DSA SNSR ADAPTER TMPL** - Digital Sensor Abstraction (DSA) Template that can be used as a starting point for writing Sensor Adapters.

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- **ISF1P195K ECOMPASS PROJ** - CodeWarrior Project with source code using the FXLC95000CL accelerometer and the MAG3110 magnetometer to provide eCompass functionality.
- **ISF1P195K FXAS21000 PROJ** - Code Warrior Project with source using the FXAS21000 gyroscope from the FXLC95000.
- **ISF195K FXOS8700 ACCELMAG PROJ** - CodeWarrior Project with source using the accelerometer and magnetometer of the FSL FXOS8700 from the FXLC95000.
- **ISF1P195K MMA865X ACCEL PROJ** - CodeWarrior Project with source using the FSL MMA865X (accelerometer) from the FXLC95000.
- **ISF1P195K VIRTUAL GYRO PROJ** - CodeWarrior Project with source using the FXLC95000 and the FSL MAG3110 (magnetometer) to produce a virtual gyroscope.

NOTE

Ready to run ("out of the box") versions with pre-built binaries of some of these applications are also provided with ISF. These binaries can be found from the MicroSoft Windows Start menu, **All Programs –> Freescale –> Xtrinsic ISF v1.1 –> Prebuilt Applications Folder**. If necessary, they also appear under **Application Specific-Reference Applications** on the Downloads tab of the Xtrinsic ISF website.

FSL_MQX_3.7_FXLC95K and the ISF 1.1 core library are automatically installed by using the automated installer located on the Overview page of the Xtrinsic ISF website. Refer to the ISF 1.1 Installation Instructions document available on the Documentation tab of the Xtrinsic ISF website for the proper installation procedure for ISF. In order to compile or modify these applications, it is also necessary to install CodeWarrior 10.4 or newer. The Xtrinsic ISF website Overview page also has a link for that download if required.

NOTE

The term Application board is used in this document to refer to the board supplied with the KITFXLC95000EVM, FXLC95000MAG, or KITFXLC95000-10AXIS. Most of the supplied Freescale applications include a file named Readme.txt which provides details about the application.

2 Importing an Application project into CodeWarrior

NOTE

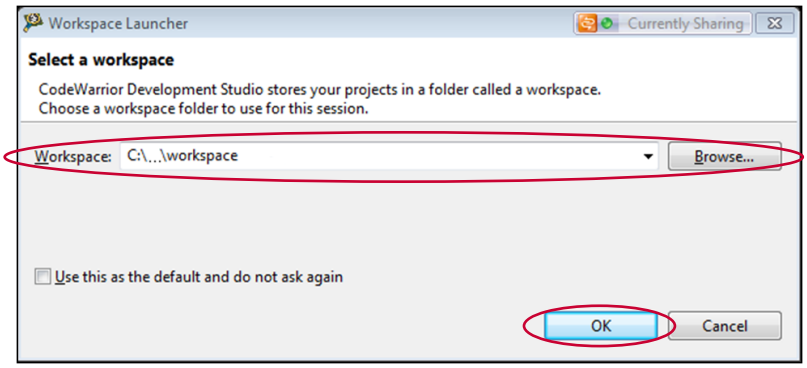
ProjectName is the generic name used throughout this document to represent one of the specific FXLC95000 Application projects provided with the ISF 1.1 release. Substitute the name of a specific project (for example, ISF1P195K GETACCELDATA PROJ) when following the instructions provided.

1. Launch **CodeWarrior 10.4 or newer**.

NOTE

If the **Select a workspace** window does not appear when **CodeWarrior** starts, open the **Select a workspace** window as follows: In the **Workbench** screen, from the **File** menu, select **Switch Workspace**, and then select **Other**.

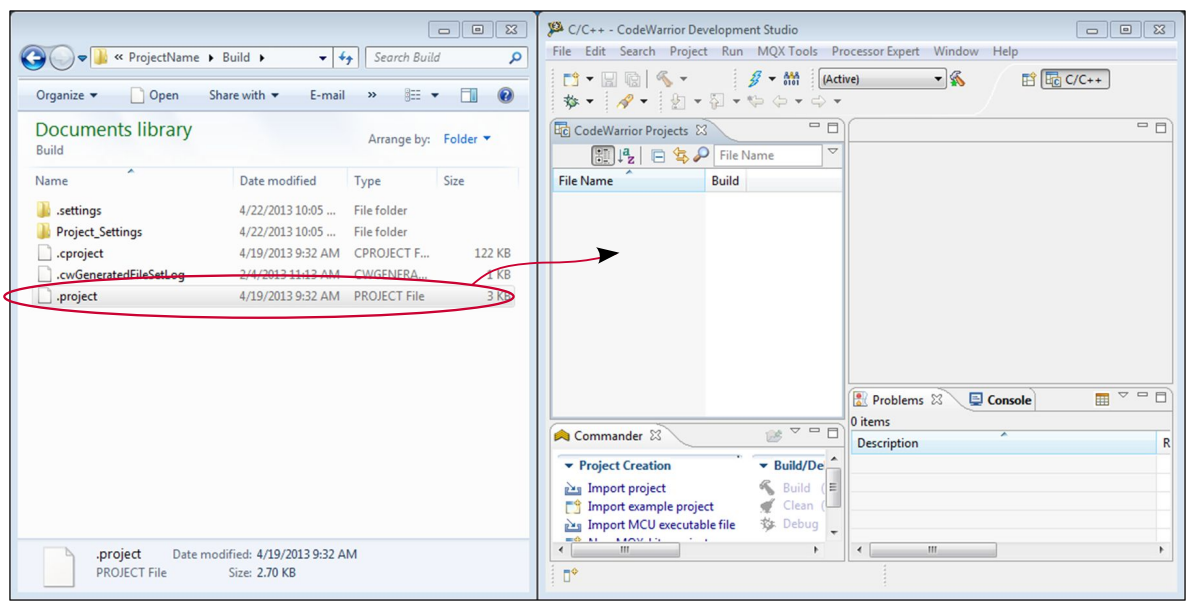
a. Create a clean workspace.
   1. In the **Select a workspace** window, click **Browse**.
   2. Create a new folder named *workspace* in a location of your choosing. This is referred to as the **workspace** folder.
   3. Select the **workspace** folder, and then click **Open**.
   4. In the **Select a workspace** window, click **OK**.



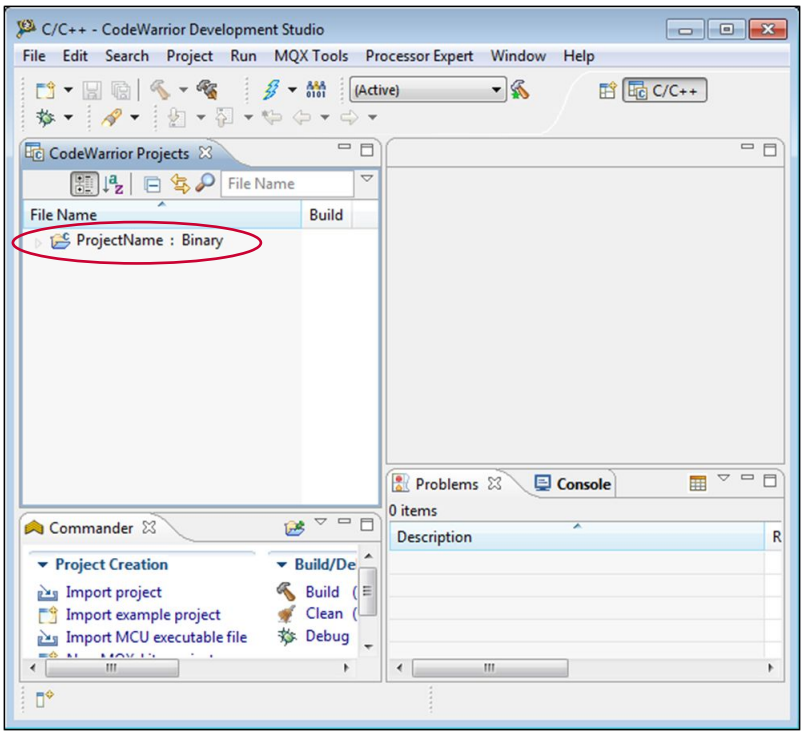
b. On the **Code Warrior Welcome Page**, select **Go to Workbench**.

2. Locate the project of interest in the ISF installation directory: *C:\Program Files\Freescale\ISF_R1p1\Example Applications*. Copy the project folder into the CodeWarrior workspace folder (this will leave the installation folder unchanged.) Once in the workspace directory, locate the .project file within the Build directory. Alternatively, obtain the *ProjectName.zip* file which is listed under Applications Specific-Apps from the Downloads tab of the ISF website.

3. In **Windows Explorer**, locate the *.project* file in the **ProjectName/Build** folder. Drag the *.project* file (not the *.cproject* file) onto the **CodeWarrior Projects** workspace.

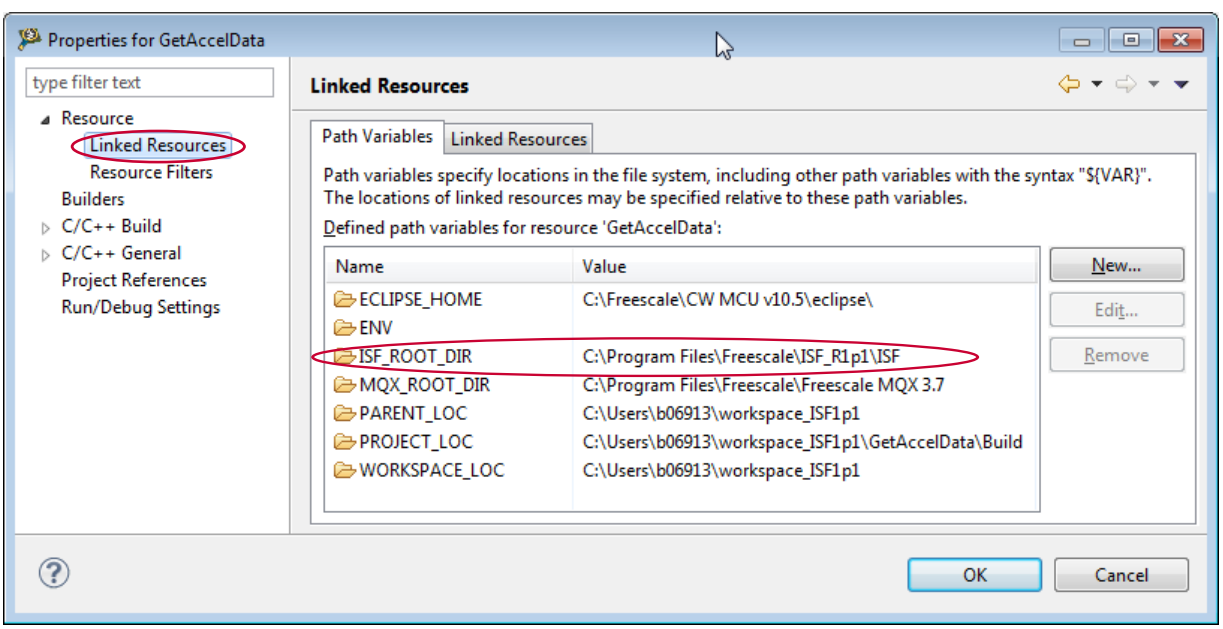


Upon completion, the project (ProjectName) should be in the **CodeWarrior Projects** workspace.



4. It is good practice to verify that the ISF libraries are properly loaded.
   a. In **CodeWarrior**, right-click on the *ProjectName* project, and then select **Properties**.
   b. Expand **Resource**, and then select **Linked Resources**.
   c. On the **Path Variables** tab, verify that **ISF_ROOT_DIR** has a value of

      C:\Progam Files\Freescale\ISF_R1p1\ISF, and then click **OK**.



Tip

In **CodeWarrior**, in the **CodeWarrior Projects** workspace, expanding the **ProjectName** directory, and then expanding the **Source** directory reveals ProjectName_main.c, the User Application that is compiled with the ISF library. Double-

clicking ProjectName_main.c brings it up in the upper right corner for viewing.
Advanced users may modify the code at their own risk if they so choose.

3 Compiling, Building and Running an Application project in CodeWarrior

Compile the **ProjectName** (listed in Overview of Xtrinsic ISF Applications and Templates) project. In **CodeWarrior**, right-click the project directory and select **Clean Project**, then right-click the **project** directory, and then select **Build Project**.

Verify that no compilation problems are indicated in the bottom right status reporting area of the **CodeWarrior** interface.

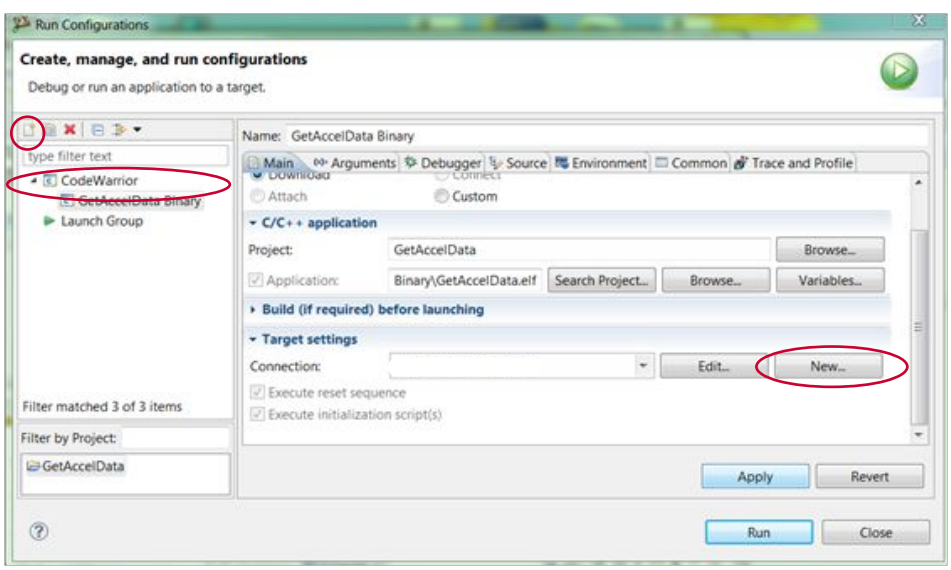
The preferred way of running the application is via downloading the S19 file using the Intelligent Sensor Mailbox Tool as described in the User's Guide for Reference Applications for Intelligent Sensing Framework 1.1. However, in order to debug the application using the CodeWarrior debugger, it is necessary to know how to load firmware within CodeWarrior. This procedure is described below.

1. Connect the Application board. Plug in the Application board via USB, then connect the P&E Multilink via USB, and then connect the P&E Multilink to the Application board.

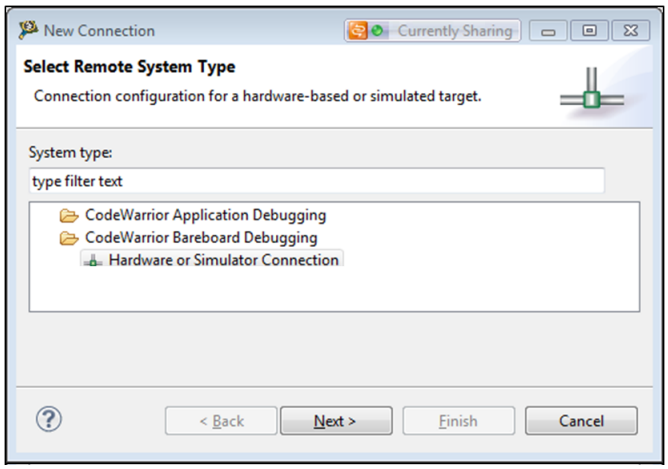
   Ensure that both lights on the P&E Multilink are lit, as well as the single light on the Application board. If the light on the Application board is not lit, use the mini-switch on the board to turn it on.

2. In **CodeWarrior**, right-click the project (ProjectName), then select **Run As**, and then select **Run Configurations**.

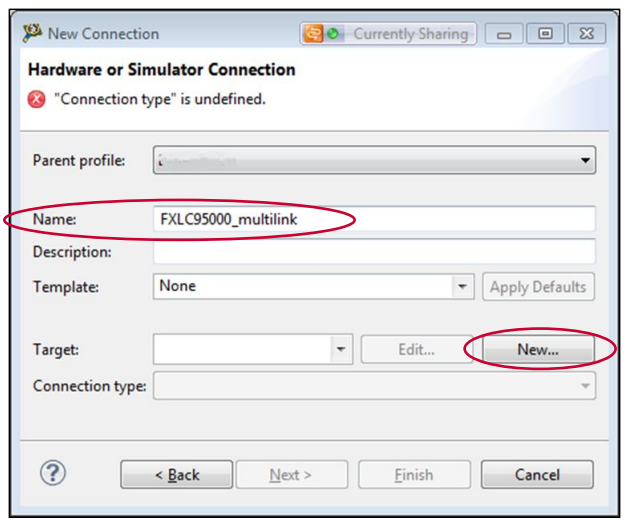
3. In the **Create, manage, and run configurations** window, select **CodeWarrior Download**, and then click the **New launch configuration** icon. This displays a **ProjectName Binary** window, which is pre-populated with some project-related information. Select **New**, located to the right of the **Connection** field.



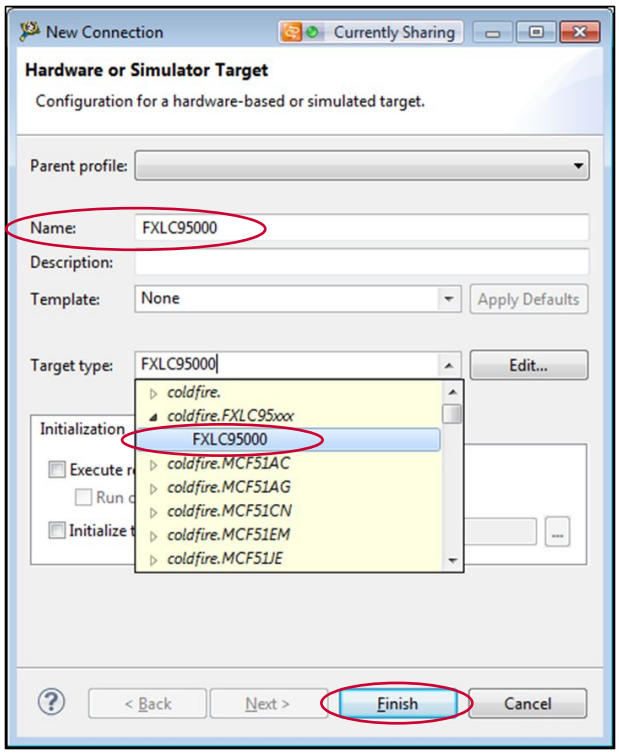
4. Upon selecting **New**, a **Select Remote System Type** window appears. In the **Select Remote System Type** window, expand **CodeWarrior Bareboard Debugging**, then select **Hardware or Simulator Connection**, and then click **Next**.



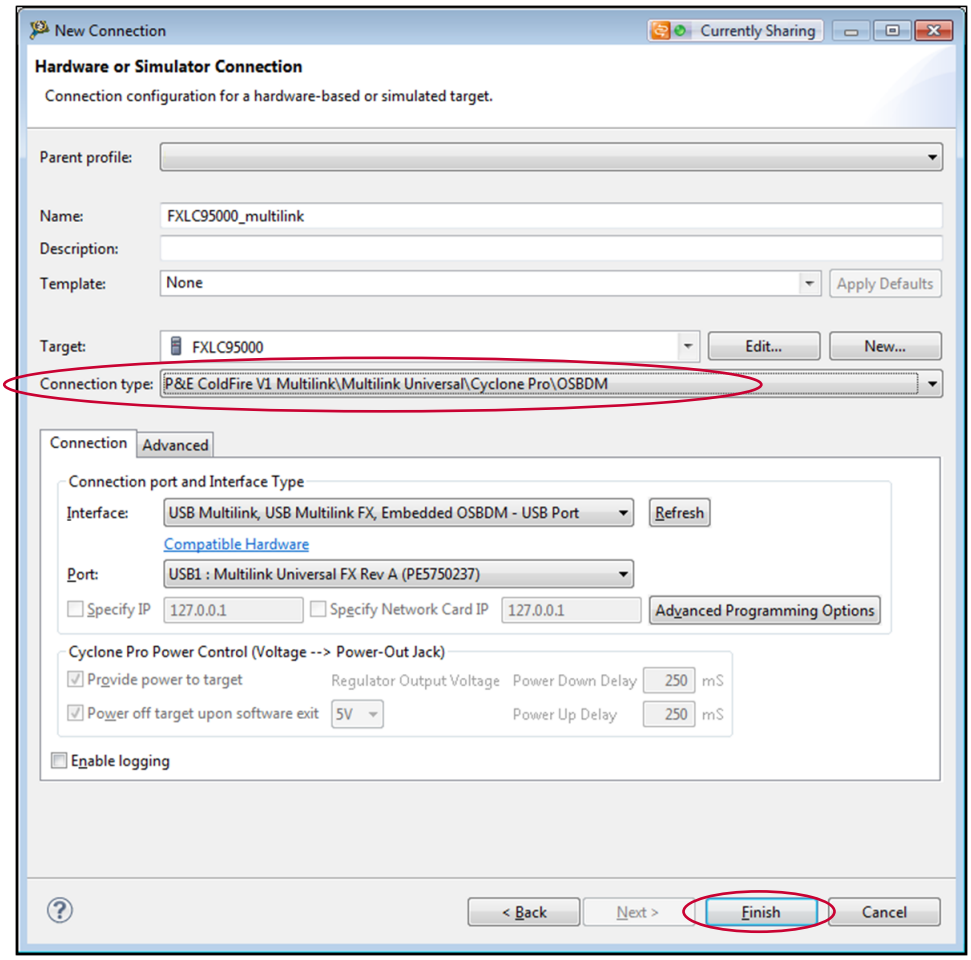
5. In the **Hardware or Simulator Connection** window, enter **FXLC95000_multilink** into the **Name** field, and then click **New**, located to the right of the **Target** field.



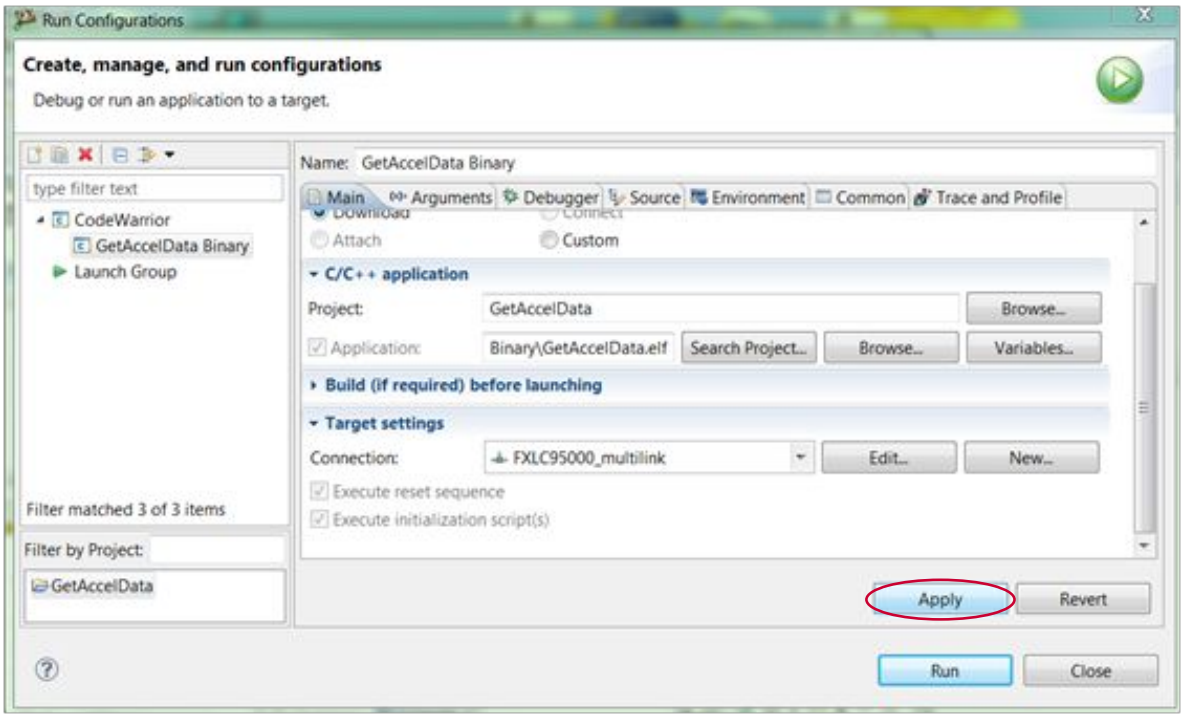
6. In the **Hardware or Simulator Target** window, enter **FXLC95000** into the **Name** field. In the **Target type** menu, expand **coldfire.FXLC95xxx**, then select **FXLC95000**, and then click **Finish**.



7. In the **Hardware or Simulator Connection** window, from the choices available in the **Connection type** menu, select the **P&E ColdFire multilink** (exact wording may be different), and then click **Finish**.



8. In the **Create, manage, and run configurations** window, click **Apply**. The connection type is now saved. Do not close this window.



9. Reset the Application board. Turn the mini-switch on the Application board off, and then unplug the USB cable from the Application board. Reconnect the USB cable, and then turn the mini-switch on the Application board to the on position.

10. To use Freescale supplied Applications and interact with them from a PC, a custom program named the Intelligent Sensor Mailbox Tool is provided. NOTE: The Intelligent Sensor Mailbox Tool is generic enough to be used only in the context of the Freescale-supplied Applications; it is not provided as a full-featured development/debug tool for users to interface with their custom applications on the FXLC95000.

    The mailbox tool can be found in the Windows menu **Start –> All Programs –> FXLC95000 Mailbox Tool** menu. Alternatively, obtain the Intelligent Sensor Mailbox Tool executable file, ISF1P1WIN_MAILBOX_TOOL_EXE, from the Downloads tab of the ISF website.

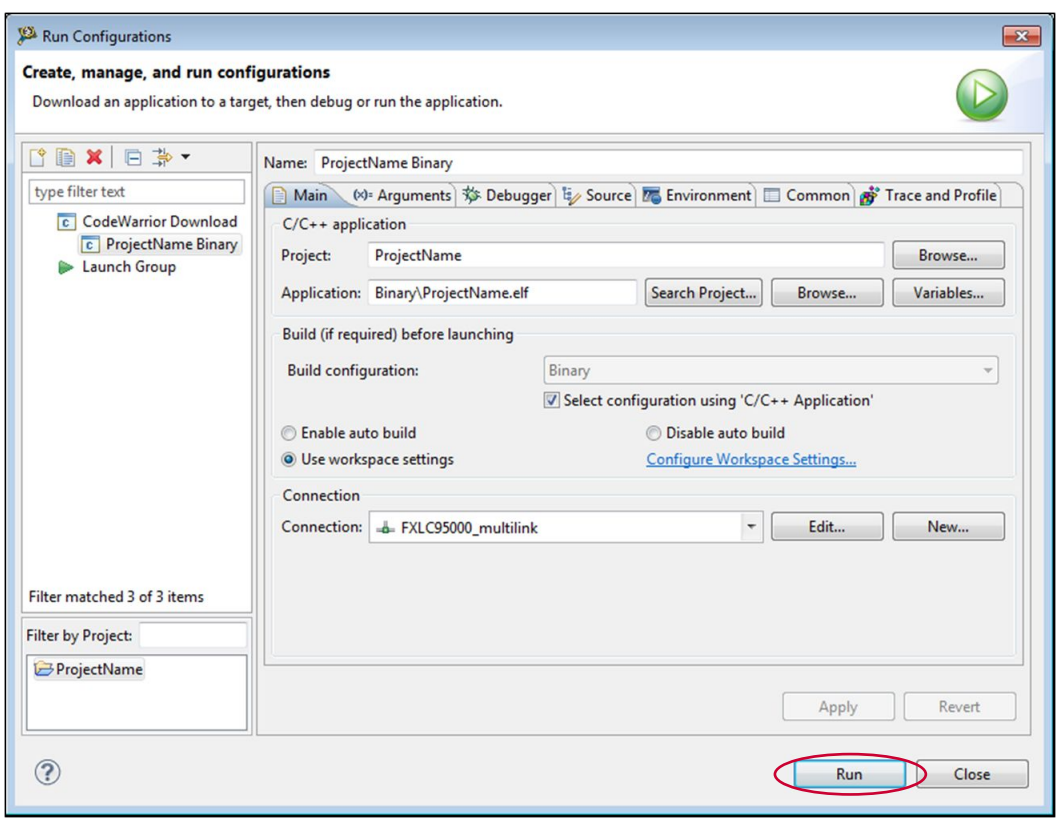
11. After locating the Intelligent Sensor Mailbox Tool executable file using Windows file explorer, launch it. When the main tool window opens, click **Open Comm** on the **Com Port** tab.

    If the communication is opened correctly, expect to see **Running ROM code** displayed in the window, and **Connected to Device** displayed in the bottom-left corner. Do not close the Intelligent Sensor Mailbox Tool.

Note

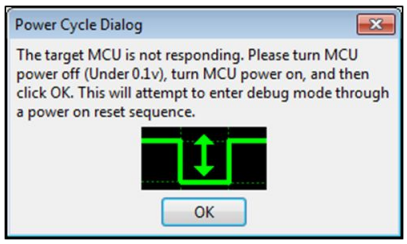
If, upon clicking Open Comm, a pop up window appears, please follow the instructions carefully.

12. In **CodeWarrior**, in the **Create, manage, and run configurations** window, click **Run**. In the lower right corner of **CodeWarrior**, launching information will appear indicating that the image is being moved onto the board. Wait for all of these notifications to disappear, indicating the process is complete.



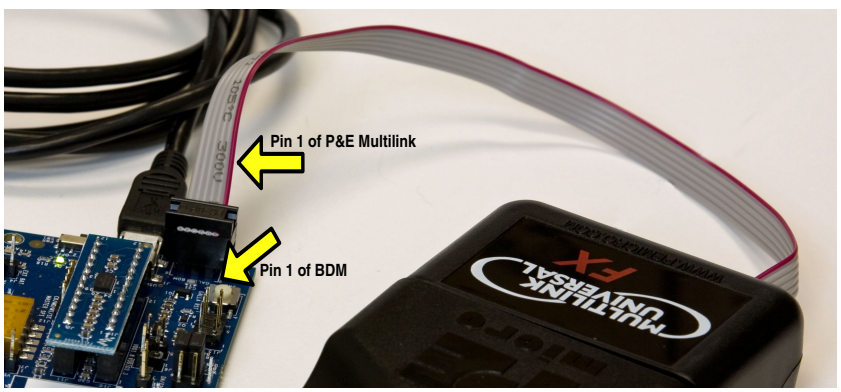
Note

If a **Power Cycle Dialog** appears, this indicates that the cable connecting the P&E Multilink and the Application board could be connected backwards.



If this is the case, complete the following:

a. Abort the Run, and then close the **Intelligent Sensor Mailbox Tool**.
b. Turn the mini-switch on the Application board off, and then unplug the USB cable from the board.
c. Verify that the Pin 1 marking on the cable from the P&E is properly connected to Pin 1 on the BDM connector on the Application board as shown below.



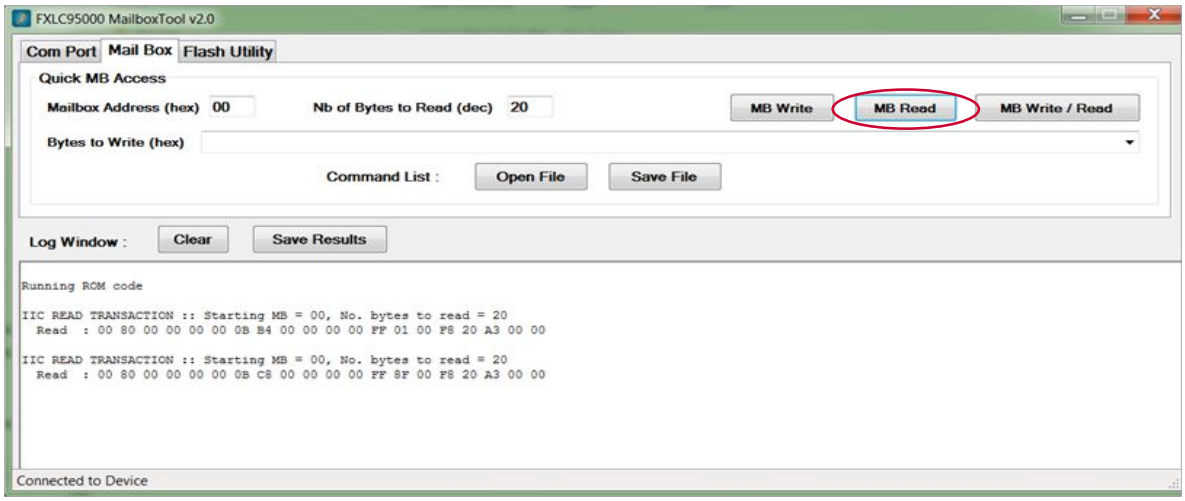
d. Reconnect the USB cable, and then turn the mini-switch on the Application board on.
e. Re-launch the **Intelligent Sensor Mailbox Tool** and click **Open Comm**.
f. In the **CodeWarrior** window, right-click the *ProjectName* project, then select **Run As**, then select **Run Configurations**, and then repeat this step.
g. If the Power Cycle Dialog continues to appear, this is an indication that the debugger tool cannot properly connect to the Application board processor and further hardware debugging is necessary.

13. The sample application is now running on the Application board. Data and commands can be sent to the application board from the Intelligent Sensor Mailbox Tool and data can be received from the application.

    To read the contents of the mailboxes, in the **Intelligent Sensor Mailbox Tool** select **MB Read** on the **Mailbox** tab.

Note

Do not expect the same values shown in the following figure. The left-most pair of hexadecimal numbers is Mailbox 0.



14. Some applications also require you to write bytes via the Intelligent Sensor Mailbox Tool in order to properly configure the device.

    To write bytes via the Intelligent Sensor Mailbox Tool, enter the command into the **Bytes to Write** field, and then click **MB Write**.

    For more information, refer to the *README.txt* file of the project and reference documents available in the Documentation tab of the Xtrinsic ISF website.

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