GS2000 Based Module Software Development Kit Debugging

User Guide

GS2K-SDK-DB-UG-001209

Modules

GS2011M and GS2100M

GainSpan® 802.11b/g/n Ultra-Low Power Wi-Fi® Series Modules

Release 1.2.3, 12/09/2014

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About This Manual

This manual provides guidelines for evaluating the full capabilities and features of GainSpan® GS2011M and GS2100M ultra-low power 802.11 b/g/n WiFi on-board modules and debugging Serial-to-WiFi and Temperature and Light Sensor applications using IAR embedded workbench.

Refer to the following sections:

Revision History

This version of the *GainSpan GS2000 Based Module Software Development Kit Debugging User Guide* contains the following new information listed in Table 1, page 5.

Table 1 Revision History

Version	Date	Remarks
1.0	January 2014	Initial Release
1.1	March 2014	Added two additional steps for IJet/JTAG debugger (see 6.2.1.1 Debugging the Temperature and Light Sensor Application, page 59.
1.2	April 2014	Added instructions on how to build a single image binary. See 3.2 Building and Programming S2W Single Binary Image Using DOS, page 30 and 3.3 Building and Programming TLS Single Binary Image Using DOS, page 35.

Table 1 Revision History (Continued)

Version	Date	Remarks
1.2.1	August 2014	Updated screen capture to reflect Serial-to-WiFi APP_NO_FLASHFETCH. See 6.1.1.1 Debugging the Serial-to-WiFi Application, page 48.
1.2.2	September 2014	Added IAR Embedded Workbench application version number. See 2.2.2 Installing IAR Embedded Workbench, page 24.
1.2.3	December 2014	GainSpan GS2000 modules only support IAR Embedded Workbench application version 6.50.5. See 1.2 What You Will Need, page 18 and 2.2.2 Installing IAR Embedded Workbench, page 24.

Audience

This manual provides SDK users installation instructions, IAR IDE workbench application, and I-Jet hardware used for JTAG Serial-to-WiFi (S2W) and TLS application development and debugging.

Standards

The standards that are supported by the GainSpan GS module supports IEEE 802.11b/g/n.

Documentation Conventions

This manual uses the following text and syntax conventions:

- Special text fonts represent particular commands, keywords, variables, or window sessions
- Color text indicates cross-reference hyper links to supplemental information
- Command notation indicates commands, subcommands, or command elements

Table 2, page 7, describes the text conventions used in this manual for software procedures that are explained using the AT command line interface.

Table 2 Document Text Conventions

Convention Type	Description
command syntax monospaced font	This monospaced font represents command strings entered on a command line and sample source code. `AT XXXX`
Proportional font description	Gives specific details about a parameter. `<Data> DATA`
UPPERCASE Variable parameter	Indicates user input. Enter a value according to the descriptions that follow. Each uppercased token expands into one or more other token.
lowercase Keyword parameter	Indicates keywords. Enter values exactly as shown in the command description.
[ ] Square brackets	Enclose optional parameters. Choose none; or select one or more an unlimited number of times each. Do not enter brackets as part of any command. `[parm1|parm2|parm3]`
? Question mark	Used with the square brackets to limit the immediately following token to one occurrence.
<ESC> Escape sequence	Each escape sequence <ESC> starts with the ASCII character 27 (0x1B). This is equivalent to the Escape key. `<ESC>C`
<CR> Carriage return	Each command is terminated by a carriage return.
<LF> Line feed	Each command is terminated by a line feed.
<CR> <LF> Carriage return Line feed	Each response is started with a carriage return and line feed with some exceptions.

Table 2 Document Text Conventions (Continued)

Convention Type	Description
< > Angle brackets	Enclose a numeric range, endpoints inclusive. Do not enter angle brackets as part of any command. `<SSID>`
= Equal sign	Separates the variable from explanatory text. Is entered as part of the command. `PROCESSID = <CID>`
. dot (period)	Allows the repetition of the element that immediately follows it multiple times. Do not enter as part of the command. `.AA:NN can be expanded to 1:01 1:02 1:03.`
A.B.C.D IP address	IPv4-style address. `10.0.11.123`
X:X::X:X IPv6 IP address	IPv6-style address. `3ffe:506::1` Where the : : represents all 0x for those address components not explicitly given.
LINE End-to-line input token	Indicates user input of any string, including spaces. No other parameters may be entered after input for this token. `string of words`
WORD Single token	Indicates user input of any contiguous string (excluding spaces). `singlewordnospaces`

Table 3, page 9, describes the symbol conventions used in this manual for notification and important instructions.

Table 3 Symbol Conventions

Icon	Type	Description
	Note	Provides helpful suggestions needed in understanding a feature or references to material not available in the manual.
	Alert	Alerts you of potential damage to a program, device, or system or the loss of data or service.
	Caution	Cautions you about a situation that could result in minor or moderate bodily injury if not avoided.
	Warning	Warns you of a potential situation that could result in death or serious bodily injury if not avoided.
	Electro-Static Discharge (ESD)	Notifies you to take proper grounding precautions before handling a product.

Documentation

The GainSpan documentation suite listed in Table 4, page 10 includes the part number, documentation name, and a description of the document. The documents are available from the GainSpan Portal. Refer to Accessing the GainSpan Portal, page 15 for details.

Table 4 Documentation List

Part Number	Document Title	Description
GS2K-QS-001205	GainSpan GS2000 Based Module Kit Quick Start Guide	Provides an easy to follow guide on how to unpack and setup GainSpan GS2000 based module kit for the GS2011M and GS2100M modules.
GS2K-EVB-FP-UG-001206	GainSpan GS2000 Based Module Programming User Guide	Provides users steps to program the on-board Flash on the GainSpan GS2000 based modules using DOS or Graphical User Interface utility provided by GainSpan. The user guide uses the evaluation boards as a reference example board.
GS2K-SMP-EXP-UG-001207	GainSpan GS2000 Based Module Sample Examples for using Serial-to-WiFi AT Commands to Create TCP or UDP Connection User Guide	Provides an easy to follow instructions on how to setup, create, and run connection examples for UDP client/server and TCP client/server. This manual also provides instructions for provisioning the board, setting up Limited AP mode, and WiFi Protected Setup (WPS), and Web provisioning over Ad-hoc.
GS2011-S2W-APP-PRG-RG-001208	GainSpan Serial-to-WiFi Adapter Application Programmer Reference Guide	Provides a complete listing of AT serial commands, including configuration examples for initiating, maintaining, and evaluating GainSpan WiFi GS2011M series modules.
GS2100-S2W-APP-PRG-RG-001208	GainSpan Serial-to-WiFi Adapter Application Programmer Reference Guide	Provides a complete listing of AT serial commands, including configuration examples for initiating, maintaining, and evaluating GainSpan WiFi GS2100M series modules.
GS2K-SDK-DB-UG-001209	GS2000 Based Module Software Development Kit and Debugging User Guide	This manual provides SDK user installation instructions, IAR IDE workbench application, and I-Jet hardware used for JTAG Serial-to-WiFi (S2W) and TLS application development and debugging.

Table 4 Documentation List (Continued)

Part Number	Document Title	Description
GS2K-EVB-HW-UG-001210	GainSpan GS2000 Based Module Evaluation Board Hardware User Guide.	Provides instructions on how to setup and use the GS2000 based module evaluation board along with component description, jumper settings, board specifications, and pinouts.
GS2011M-DS-001211	GainSpan GS2011M Low Power WiFi Module Data Sheet	Provides information to help WiFi system designers to build systems using GainSpan GS2011M module and develop wireless applications.
GS2100M-DS-001212	GainSpan GS2100M Low Power WiFi Module Data Sheet	Provides information to help WiFi system designers to build systems using GainSpan GS2100M module and develop wireless applications.
GS2K-HTTP-EAP-UG-001213	GainSpan GS2000 Based Module Configuration Examples for using Serial-to-WiFi AT Commands to Create HTTP, HTTPS, and EAP Connection User Guide	Provides an easy to follow instructions on how to setup, create, and run connection examples for HTTP, HTTPS, and EAP.
GS2011MxxS-DS-001214	GainSpan GS2011MxxS Low Power WiFi Module Data Sheet	Provides information to help WiFi system designers to build systems using GainSpan GS2011MxxS module and develop wireless applications.
GS2K-SDK-BLDR-UG-001223	GainSpan GS2000 Based Module Software Developer Kit (SDK) Builder User Guide	Allows OEMs and system developers to configure and generate custom firmware binary images for GainSpan low power embedded GS2000 based WiFi modules. The SDK Builder supports the GainSpan GEPS software released, including the corresponding WLAN firmware.
GS2K-SDK-QS-001225	GainSpan GS2000 Based Module Software Development Kit Quick Start Guide	Provides an easy to follow guide that will walk you through easy steps to setup, evaluation, develop, and debug the full capabilities and features of the GS2011M or GS2100M embedded platform software.

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments by logging into GainSpan Support Portal. If you are using e-mail, be sure to include the following information with your comments:

- Document name
- URL or page number
- Hardware release version (if applicable)
- Software release version (if applicable)

References

The GainSpan references listed in Table 5, page 12 are available on the GainSpan Portal. Refer to Accessing the GainSpan Portal, page 15 for details.

Table 5 Other Documents and References

Title	Description
Schematics	GS2000 Based Module Evaluation Board schematics supporting: • GS2011M • GS2100M
Module Firmware and Programming Utilities	• Serial-to-WiFi (S2W) based firmware • Temperature and Light Sensor (TLS) based firmware – For use with GS2011M EVK only • Firmware Release Notes • GSFlashprogram utility for programming the modules
Smart Phone Applications	• Smart Phone applications for iOS and Android to evaluate and demonstrate the Temperature and Light Sensor (TLS) firmware. – For use with GS2011M EVK only
Software Utilities	Serial terminal program to evaluate and demonstrate Serial-to-WiFi (S2W) applications

Contacting GainSpan Technical Support

Use the information listed in Table 6, page 13, to contact the GainSpan Technical Support.

Table 6 GainSpan Technical Support Contact Information

North America	1 (408) 627-6500 - techsupport@gainspan.com
Outside North America	Europe: EUsupport@gainspan.com China: Chinasupport@gainspan.com Asia: Asiasupport@gainspan.com
Postal Address	GainSpan Corporation 3590 North First Street Suite 300 San Jose, CA 95134 U.S.A.

For more Technical Support information or assistance, perform the following steps:

1. Point your browser to http://www.gainspan.com.
2. Click **Contact**, and click **Request Support**.
3. Log in using your customer **Email** and **Password**.
4. Select the **Location**.
5. Select **Support Question** tab.
6. Select **Add New Question**.
7. Enter your technical support question, product information, and a brief description.

The following information is displayed:

- Telephone number contact information by region
- Links to customer profile, dashboard, and account information
- Links to product technical documentation
- Links to PDFs of support policies

Returning Products to GainSpan

If a problem cannot be resolved by GainSpan technical support, a Return Material Authorization (RMA) is issued. This number is used to track the returned material at the factory and to return repaired or new components to the customer as needed.

NOTE: *Do not return any components to GainSpan Corporation unless you have first obtained an RMA number. GainSpan reserves the right to refuse shipments that do not have an RMA. Refused shipments will be returned to the customer by collect freight.*

For more information about return and repair policies, see the customer support web page at: https://www.gainspan.com/secure/login.

To return a hardware component:

1. Determine the part number and serial number of the component.
2. Obtain an RMA number from Sales/Distributor Representative.
3. Provide the following information in an e-mail or during the telephone call:
   - Part number and serial number of component
   - Your name, organization name, telephone number, and fax number
   - Description of the failure
4. The support representative validates your request and issues an RMA number for return of the components.
5. Pack the component for shipment.

Guidelines for Packing Components for Shipment

To pack and ship individual components:

- When you return components, make sure they are adequately protected with packing materials and packed so that the pieces are prevented from moving around inside the carton.
- Use the original shipping materials if they are available.
- Place individual components in electrostatic bags.
- Write the RMA number on the exterior of the box to ensure proper tracking.

CAUTION! *Do not stack any of the components.*

Accessing the GainSpan Portal

To find the latest version of GainSpan documentation supporting the GainSpan product release you are interested in, you can search the GainSpan Portal website by performing the following steps:

NOTE: *You must first contact GainSpan to set up an account, and obtain a customer user name and password before you can access the GainSpan Portal.*

1. Go to the GainSpan Support Portal website.
2. Log in using your customer **Email** and **Password**.
3. Click the **Getting Started** tab to view a Quick Start tutorial on how to use various features within the GainSpan Portal.
4. Click the **Actions** tab to buy, evaluate, or download GainSpan products.
5. Click on the **Documents** tab to search, download, and print GainSpan product documentation.
6. Click the **Software** tab to search and download the latest software versions.
7. Click the **Account History** tab to view customer account history.
8. Click the **Legal Documents** tab to view GainSpan Non-Disclosure Agreement (NDA).

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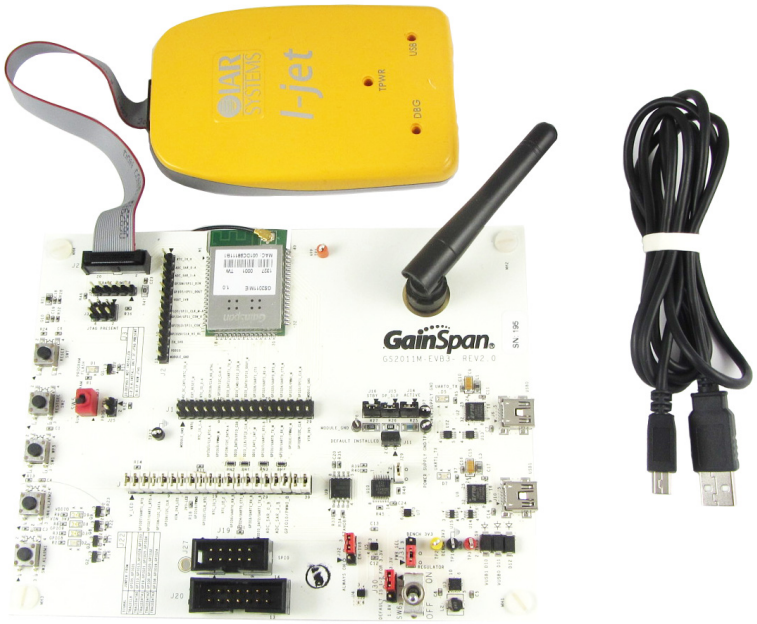
Chapter 1 Evaluation Board

This chapter provides an overview of the GainSpan® GS2000 Based Module evaluation board and what is needed to develop and debug the evaluation board.

1.1 Overview

The GS2000 based module software development and debugging application provides all the hardware and software necessary to setup, evaluate and debug the full capabilities and features of the GS2011M and GS2100M ultra-low power 802.11 b/g/n WiFi on-board modules and embedded platform software using a serial (UART) based link to a computer or external device. These modules offer a wide variety of connectivity using WiFi direct and limited AP mode over the Internet to connect a smart phone or WiFi direct connect for peer-to-peer networking without an access point, enabling easy transfer of content.



NOTE: *The instructions in this document are for both the GS2011M and GS2100M.*

1.2 What You Will Need

To start developing and debugging using GainSpan GS2000 based module evaluation board, you will need the following components:

- GainSpan GS2000 based module evaluation board (GS2011M and GS2100M)
- Serial cable (USB to Mini-USB)
- IAR i-JET JTAG debugging probe
- 20-pin JTAG ribbon cable
- Micro USB cable
- IAR Embedded Workbench for ARM version 6.50.5 with software license
- IAR Install CD (if ordered)
- From the GainSpan Portal:
  - Product documentation (see Documentation, page 10)
  - GS2011M and GS2100M board schematics
  - Software utilities to evaluate and demo Serial-to-WiFi
  - Software utilities to evaluate and demo Temperature and Light Sensor (TLS)

NOTE: *Additional GS2000 software utilities, documentation, and related product information can also be downloaded from GainSpan website: https://www.gainspan.com/secure/login.*

Chapter 2 Software Installation

This chapter introduces the tasks that are typically required to setup and install the necessary software to develop and debug applications on the GainSpan® GS2000 Based Module evaluation boards.

2.1 Installing Software Developers Kit Applications

NOTE: *GainSpan recommends you copy the contents of the SDK folder from the GainSpan Portal to a created folder on your C:/drive.*

NOTE: *Refer to the Evaluation Board Quick Start Guide for the GS2011M and GS2100M modules to setup the evaluation board and run the Serial-to-WiFi or Temperature and Light Sensor applications.*

NOTE: *Additional software versions are available on the GainSpan Support Portal website: www.gainspan.com/secure/login.*

To install the source, application binaries, and drivers, perform the following:

1. From the GainSpan Portal, open the zip file containing the SDK application.
2. Unzip the files containing the SDK application to a created folder on your C:\ drive.
3. Open the API documentation folder containing the GEPS documentation and unzip to a directory under your C:\ drive.
4. Open the **Index.html** file to view the Doxygen generated API documentation.
5. The SDK user application Serial-to-WiFi (S2W) is provided in source while the WLAN firmware is provided in binary form, and the GEPS firmware is provided in linkable object.

   The software developers kit offers a Serial-to-WiFi reference application that supports AT commands. This S2W is used with either an external HOST or Computer with a serial terminal application like Tera Term VT. Source code is provided with this application for the GS2011M and GS2100M. This is found under the “userapps” folder within the SDK.

2.2 Installing IAR IDE

There are two ways to install the IAR Embedded Workbench application.

- Purchased a software license and register via e-mail
- Purchased an Installation CD with license number to active

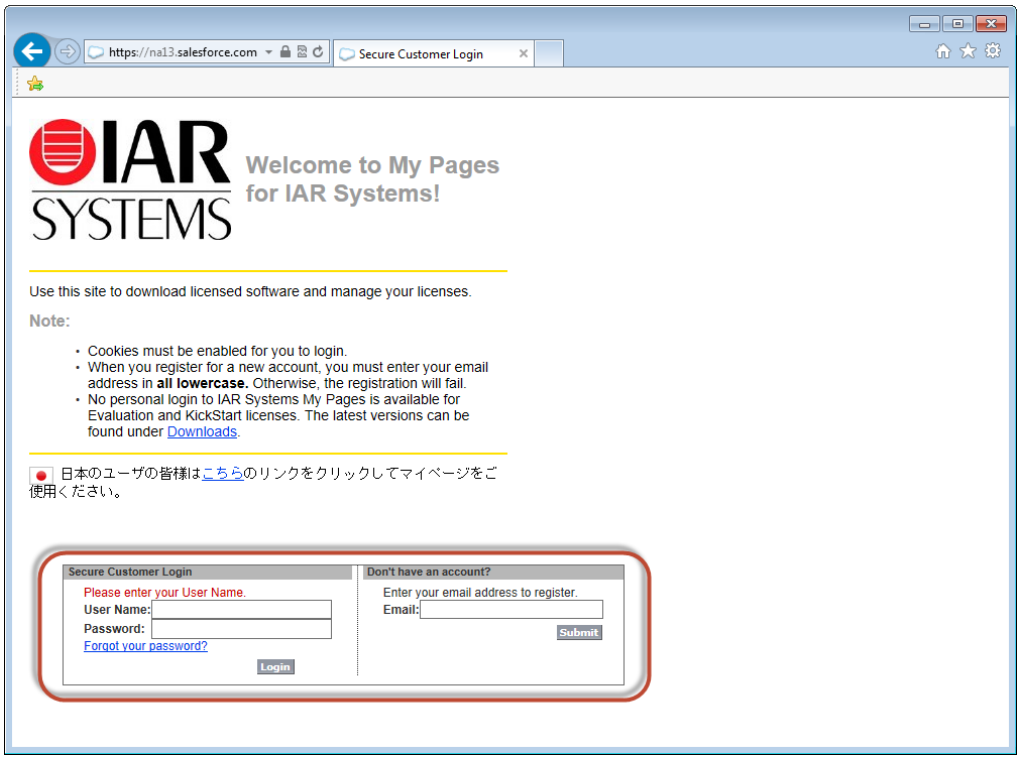
2.2.1 Register Software License

If you have purchased a software license, you will be receiving an email to register the software license.

To register the software license, perform the following:

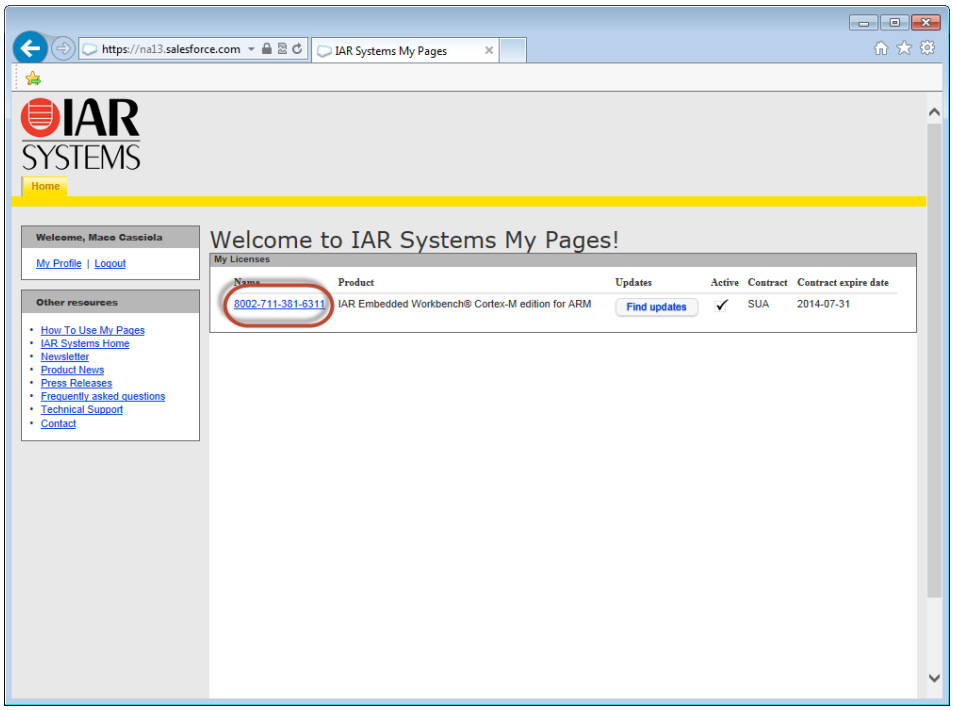
1. Go to link www.iar.com/mypages.
2. Enter your login name and password (sent to your registered email account), and register the license number that is provided (see Figure 1, page 20).

Figure 1 Login to the IAR System



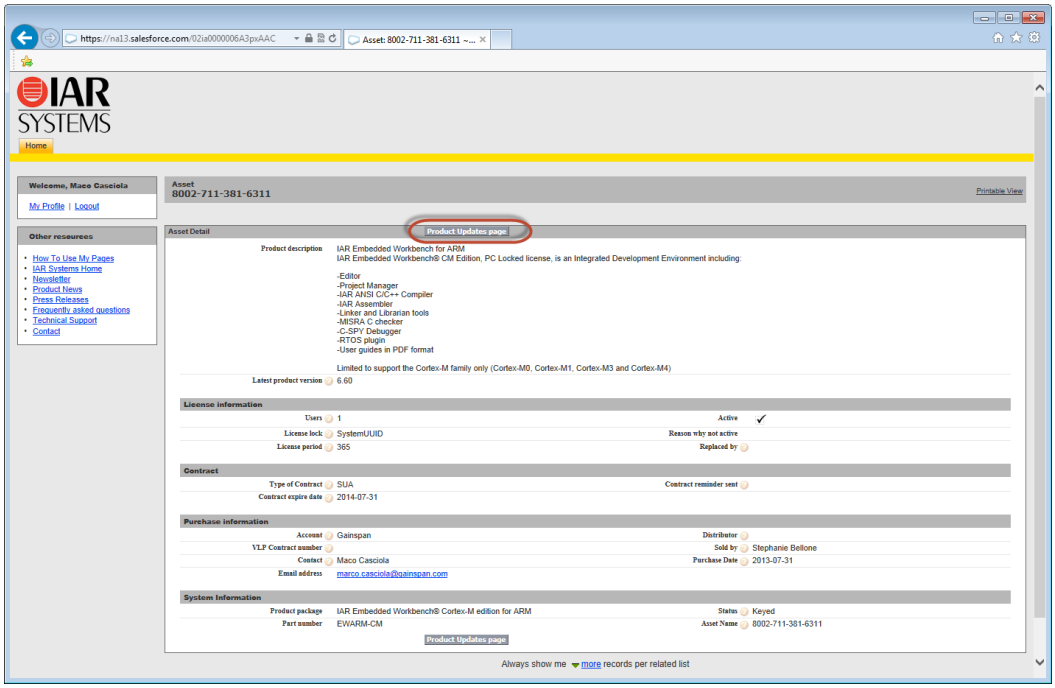
3. Once complete the IAR page will display showing your license page with the expiration date (see Figure 2, page 21).

Figure 2 Register Software License



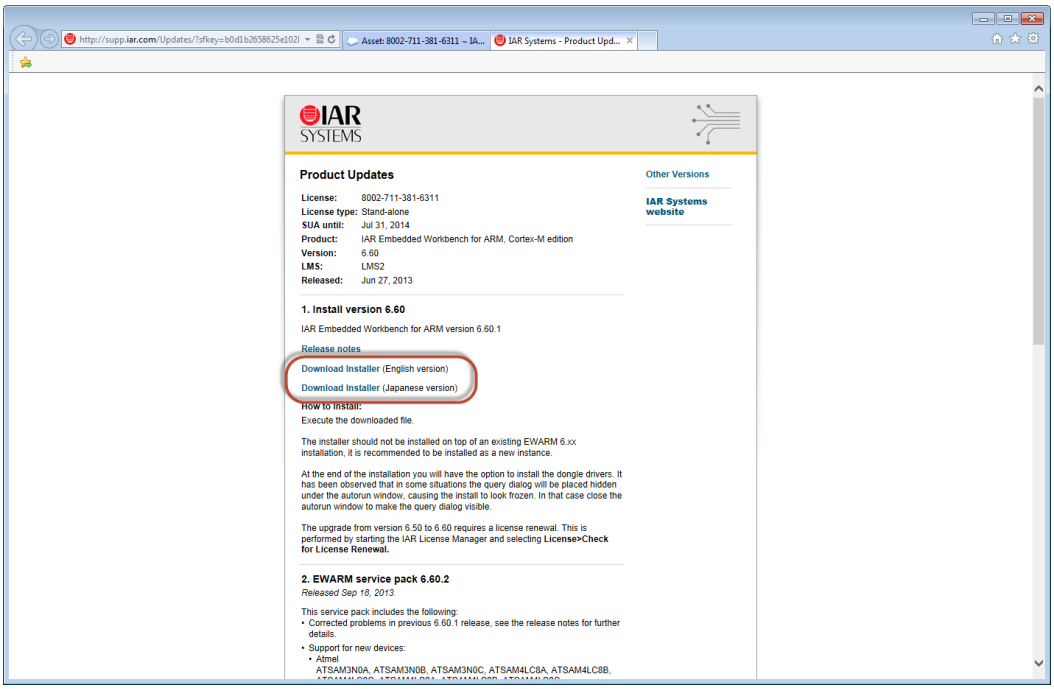
4. Click on the **license number**, and the **Asset Detail** page will display (see Figure 3, page 22).

Figure 3 IAR Asset Detail License Installation



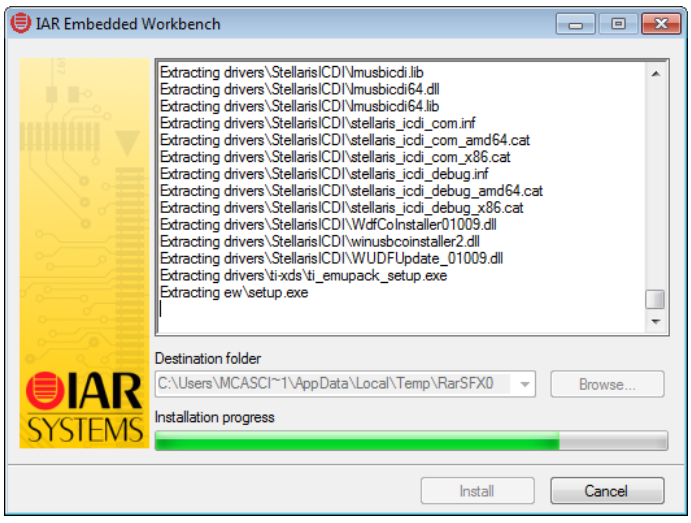
5. Click on the **Product Update page** and the latest installer will appear (see Figure 4, page 23).

Figure 4 Product Updates Download Installer



This will take several minutes to download the IAR Embedded Workbench software to your computer (see Figure 5, page 23).

Figure 5 IAR Embedded Workbench Software Being Download



6. Follow the on screen instructions to complete downloading the IAR Embedded Workbench software.

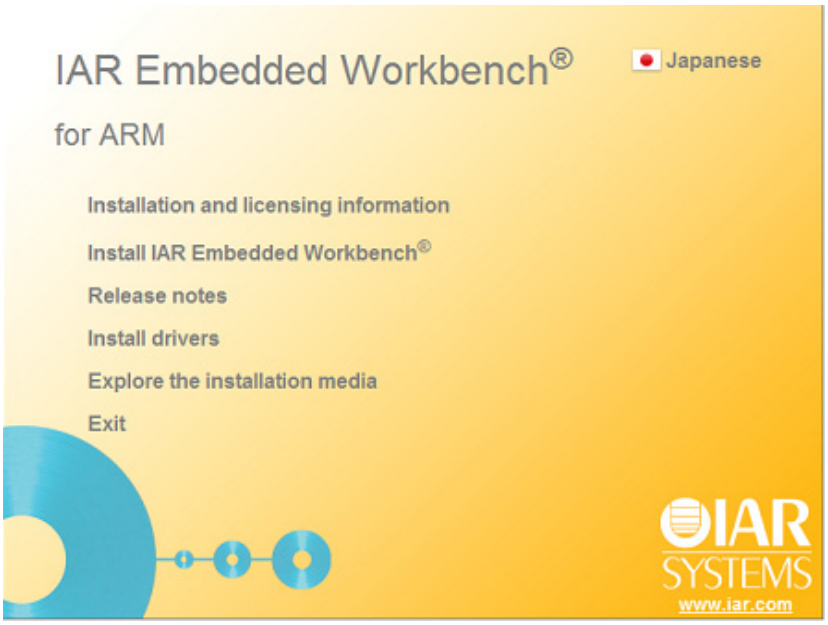
2.2.2 Installing IAR Embedded Workbench

The instructions below are to install the IAR Embedded Workbench for ARM 6.50.5. If you already have IAR workbench, you can skip these installation steps.

NOTE: *The IAR Embedded Workbench software application version may vary depending on updates, patches, and new releases.*

1. Select Install IAR Embedded Workbench and follow the on screen instructions (see Figure 6, page 24).

Figure 6 Installing IAR Embedded Workbench



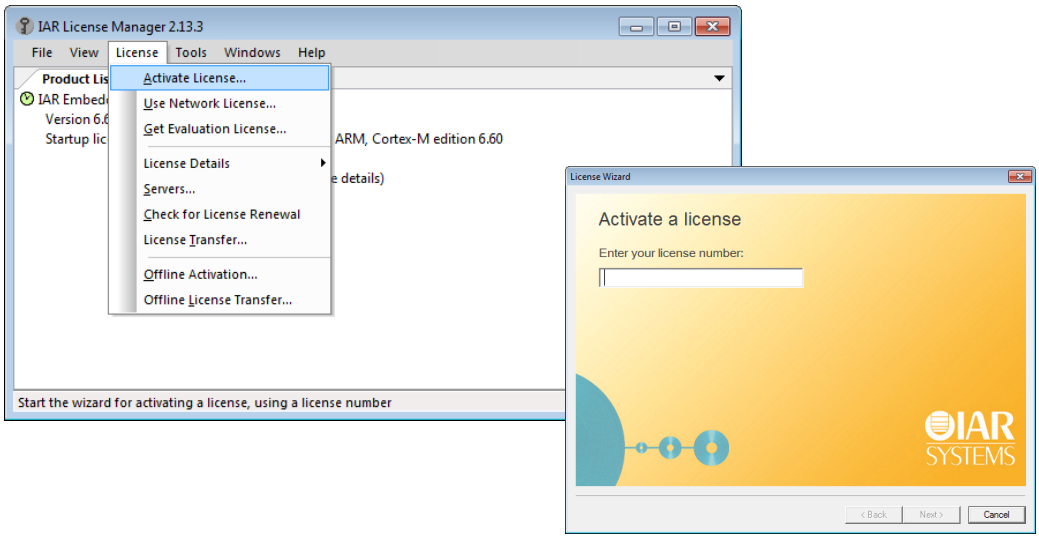
2. Enter the license number that is provided in your e-mail, CD package, or from the IAR website www.iar.com. This will activate the license (see Figure 7, page 25).

NOTE: *If you have already installed an evaluation version of this product, you don't have to reinstall it, you just need to activate your new license.*

Launch the IAR License Manager from the Start menu and select **License > Activate License** to start the license activation.

NOTE: *If any items are missing or damaged, please contact your GainSpan sales representative or local distributor.*

Figure 7 Enter License Number to Activate IAR



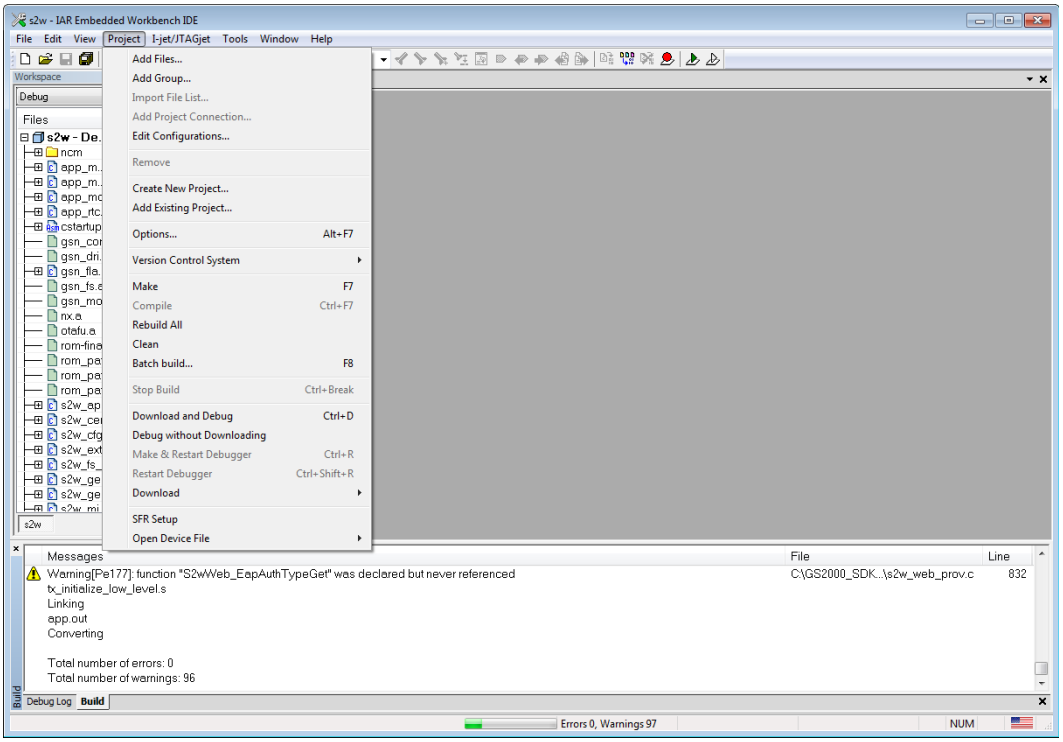
NOTE: *The software license is valid for one year.*

2.2.3 Verify IAR Embedded Workbench IDE Application is Working

To verify that IAR IDE software application is working, try compiling sample Serial-to-WiFi code, perform the following:

1. Open a project file. For example, the **s2w** located in **\SDK\userapps\s2w\build**.
2. Compile the code by selecting **Project > Rebuild All** (see Figure 8, page 26).

Figure 8 Rebuild Serial-to-WiFi Application



3. If compilation is successful you will see the **Total Number of errors: 0** message displayed.
4. Once complete this will generate the executable file: **/debug/Exe/app.bin**.
5. You can setup and use the I-Jet debugging tool to start debugging Serial-to-WiFi and Temperature and Light Sensor applications, (see Chapter 5 Setting Up the I-Jet Hardware, page 41 and Chapter 6 Debugging Applications, page 47).

NOTE: *You can also download a sample project file for Temperature and Light Sensor (TLS) verification located in* ***SDK\adk\tls\build****. Follow the same procedures above.*

Chapter 3 Building Applications

This chapter provides instructions on how to build Serial-to-WiFi and Temperature and Light Sensor applications.

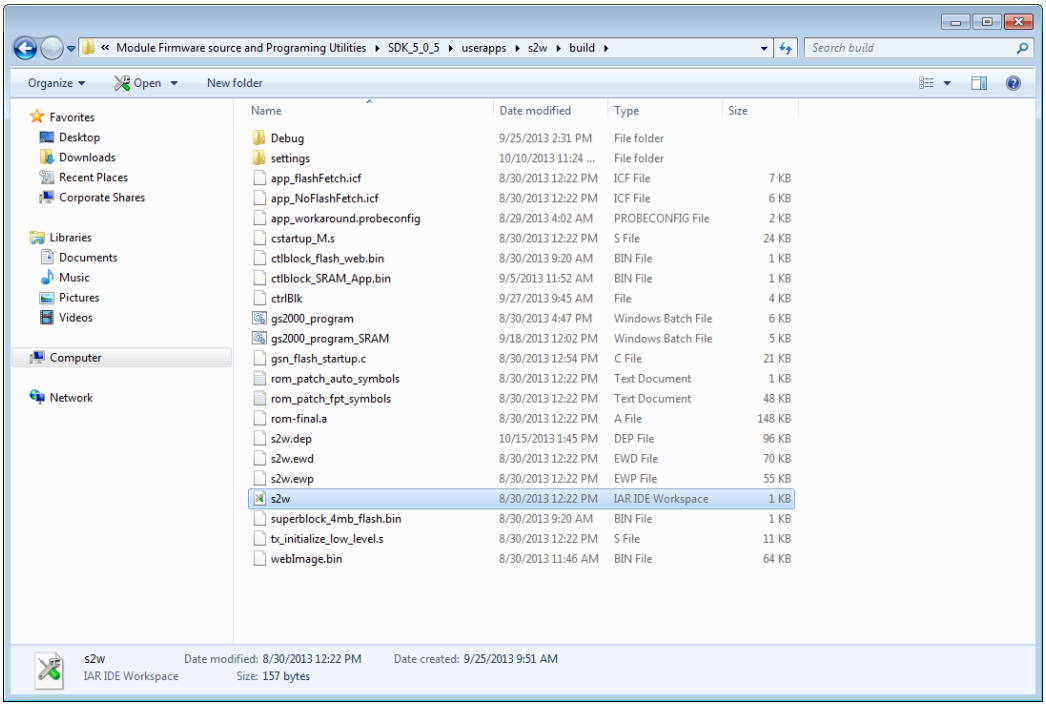
3.1 Building and Verifying Serial-to-WiFi Applications

NOTE: *Ensure that you have installed the IAR IDE 6.50.5 and also have a valid IAR license prior to proceeding with the instructions.*

To build and verify a Serial-to-WiFi application, perform the following:

1. Open a project file. For example, the **s2w** located in **\SDK\userapps\s2w\build** (see Figure 9, page 27).

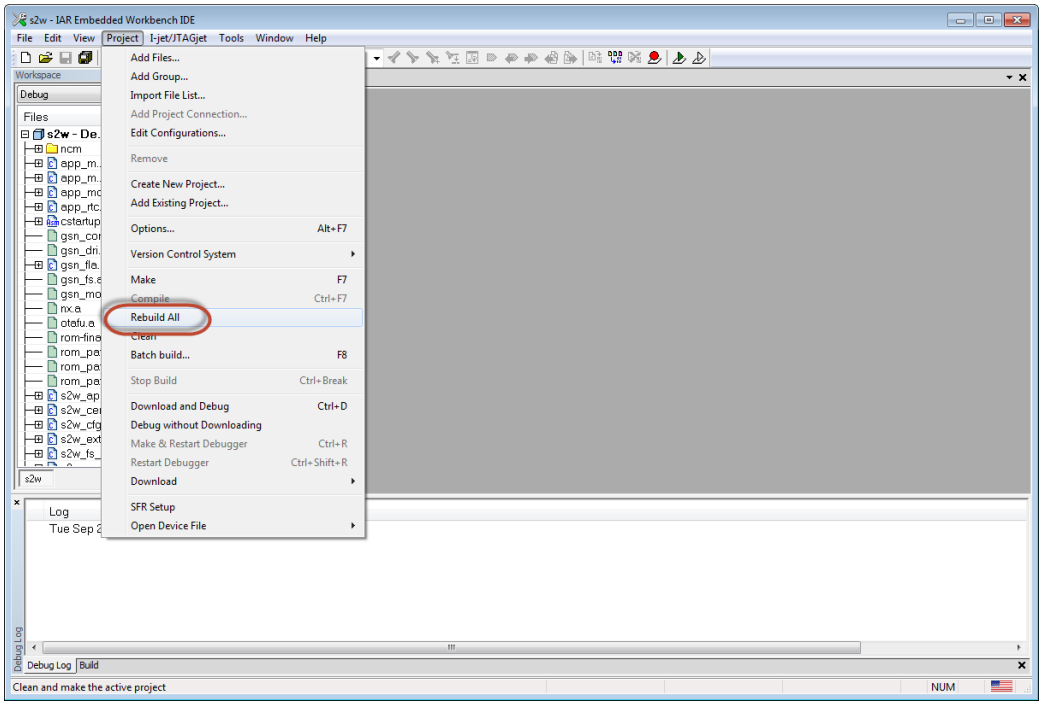
Figure 9 Serial-to-WiFi (S2W) IAR IDE Workspace File to Rebuild



2. Double-click on the **s2w** file to open the s2w-IAR Embedded Workbench IDE application.

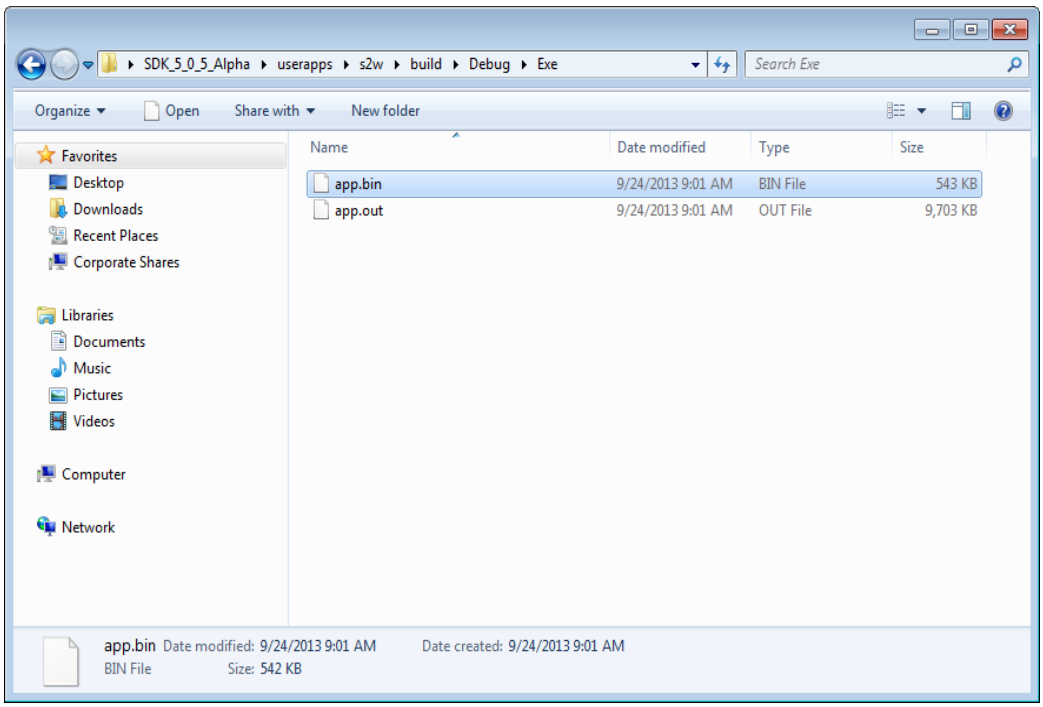
3. Navigate to the **Project** menu and select **Rebuild All** to build the Serial-to-WiFi project. The Serial-to-WiFi building configuration will start (see Figure 10, page 28).

Figure 10 Rebuild the Serial-to-WiFi Project



4. When the build is completed with no errors, **app.bin** will be generated. This will display within the **\SDK\userapps\s2w\build\Debug\Exe** folder (see Figure 11, page 29).

Figure 11 Application Binary Created



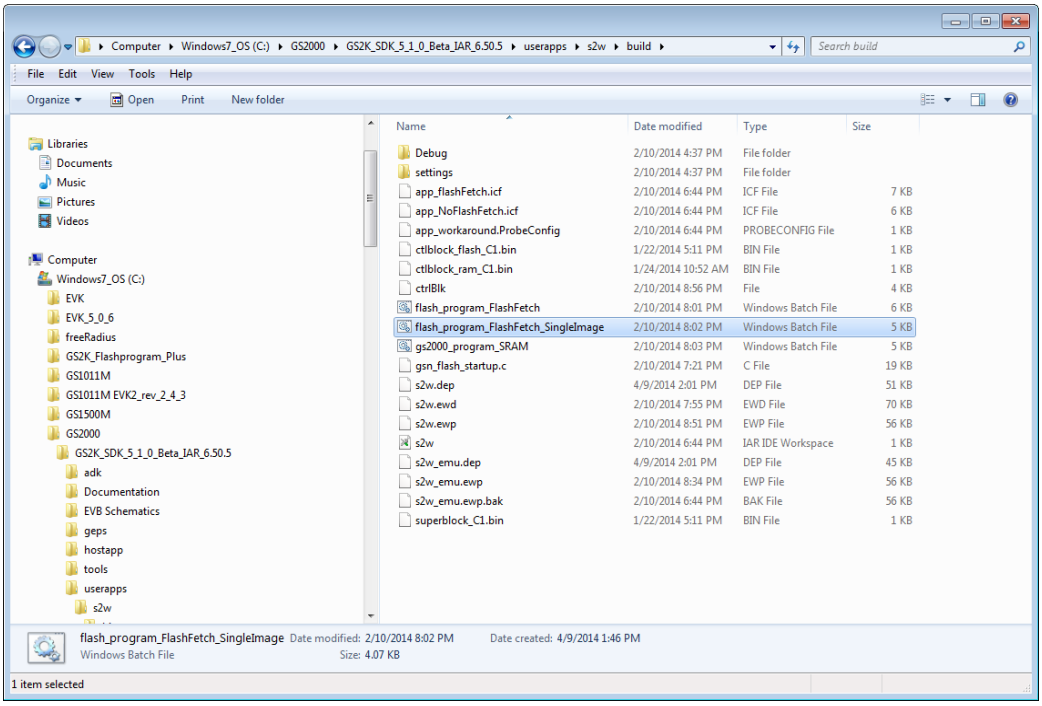
5. Next, build a single binary image for Serial-to-WiFi or TLS applications. Refer to 3.2 Building and Programming S2W Single Binary Image Using DOS, page 30.

3.2 Building and Programming S2W Single Binary Image Using DOS

To build a single binary image using DOS, perform the following:

1. Open the directory and folder where the Serial-to-WiFi (S2W) single image file is located (e.g., **C:\SDK\userapps\s2w\build**) (see Figure 12, page 30). In this example, the Serial-to-WiFi binary image will be built.

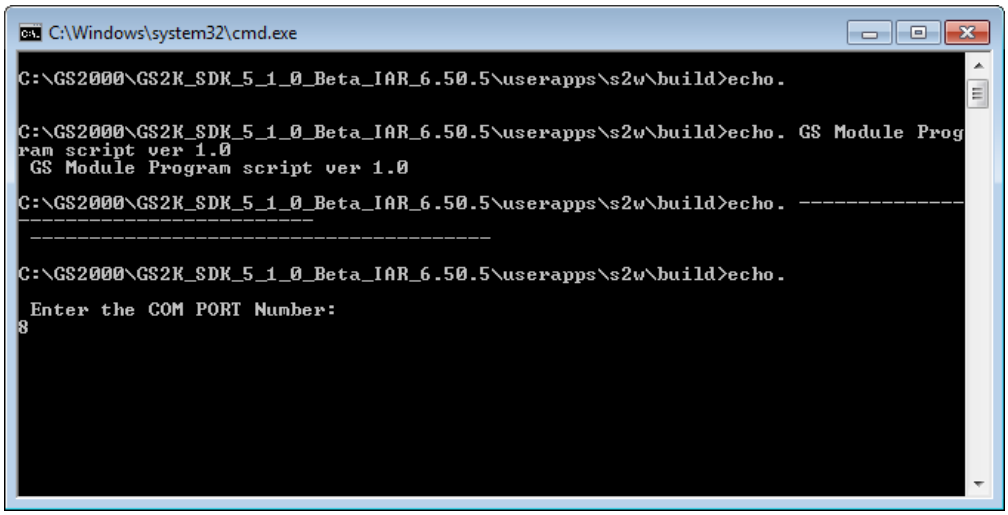
Figure 12 Selecting Flash Program Single Image File



2. Double-click on the **flash_program_FlashFetch_SingleImage** batch file. Enter the **COM** port number assigned to the module (see Figure 13, page 31). Press the **Enter** key.

NOTE: *Ensure that you use the correct COM port and no other application is using the same COM port that you have assigned to the evaluation board. Close any application that may be using the same COM port before proceeding.*

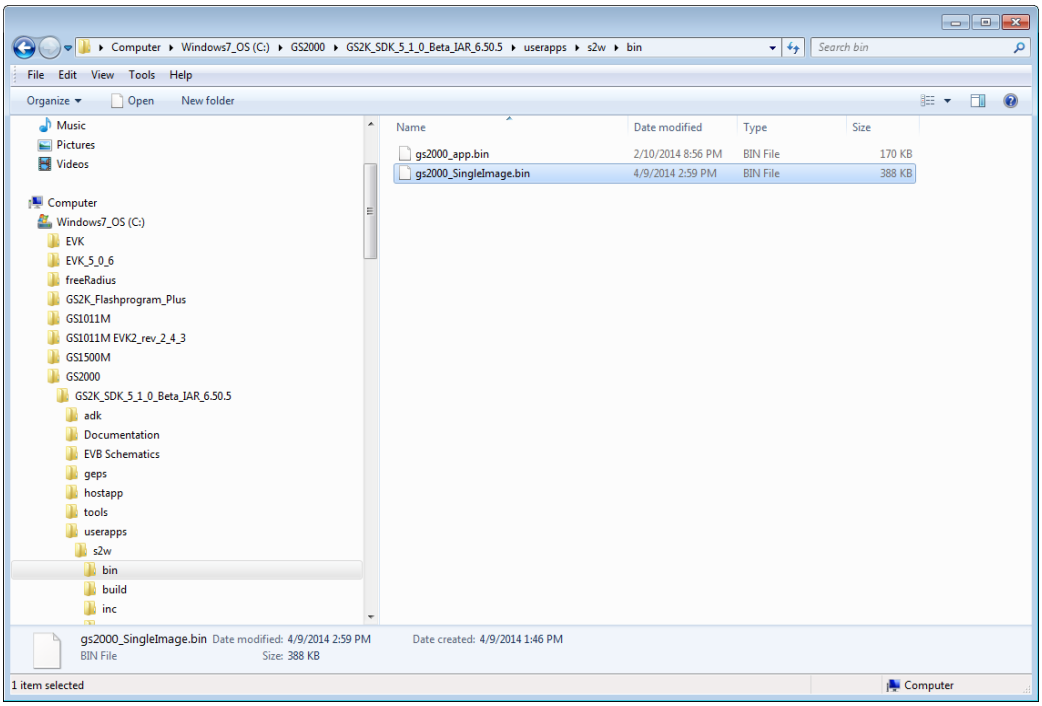
Figure 13 Enter the COM Port Number



3. A single binary image will be created under the **bin** folder (see Figure 14, page 32).

NOTE: *A single image binary will be created under the bin folder. If a **bin** folder doesn't reside under the C:\drive SDK directory, you can create **bin** folder.*

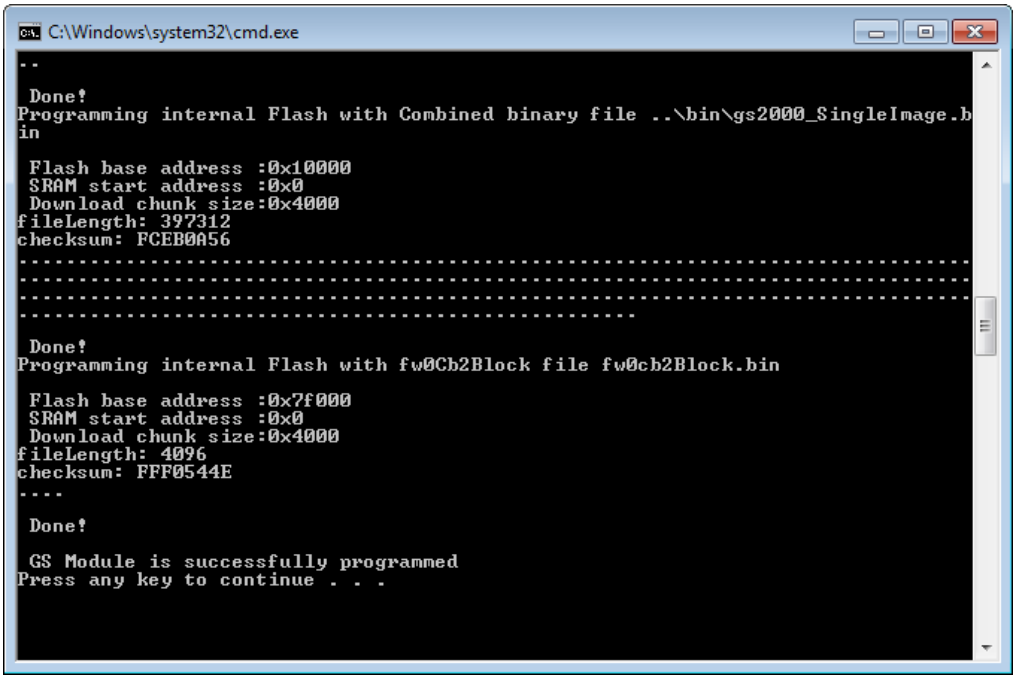
Figure 14 Single Image Binary File Created



4. Ensure that the PROGRAM/RUN switch is in the **PROGRAM** mode. Perform a power cycle. Press any key to continue to start programming the flash with the selected firmware and binaries. This will take several minutes.

5. A message will display indicating flash programming is complete (see Figure 15, page 33). Press any key to close the DOS programming screen. Turn the ON/OFF switch on the evaluation board to the **OFF** position.

Figure 15 Programming Flash with Binary Files

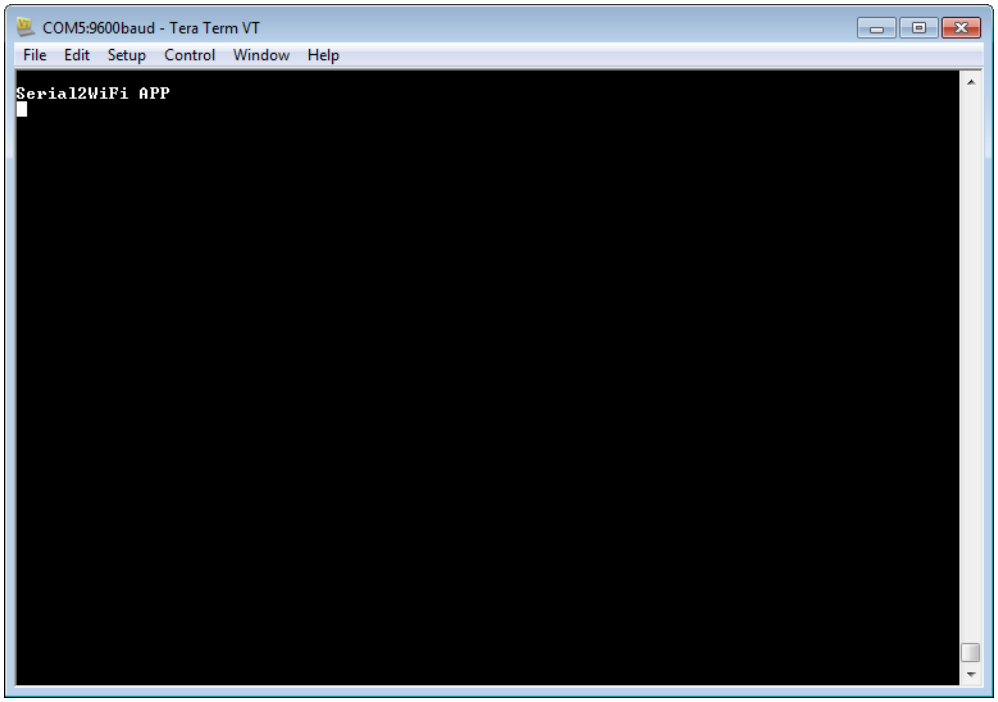


6. Turn the PROGRAM/RUN switch on the evaluation board to the **RUN** position. This will allow you to verify that the module is programmed and ready to run the Serial-to-WiFi (S2W) application.

7. Open the Tera Term VT application from your desktop and select the serial port (COM port) that was assigned to the evaluation board.

8. Turn the ON/OFF switch on the evaluation board to the **ON** position. The Tera Term VT window will display the **Serial2WiFi APP** ready prompt (see Figure 16, page 34). You are now ready to start the Serial-to-WiFi application and enter AT commands.

Figure 16 Serial-to-WiFi Application Ready Prompt



For further instructions on programming the GS2000 based module evaluation boards for Serial-to-WiFi (S2W) applications, refer to the *GS2000 Based Module Programming User Guide*.

For further instructions using Serial-to-WiFi AT commands, and create and run connection examples for UDP client/server and TCP client/server, refer to the *GS2000 Based Module Sample Examples User Guide*.

3.3 Building and Programming TLS Single Binary Image Using DOS

Open the directory and folder where the Temperature and Light Sensor (TLS) single image file is located (e.g., **C:\SDK\adk\tls\build**). Follow the same instructions as building a single image for the Serial-to-WiFi application. Refer to 3.2 Building and Programming S2W Single Binary Image Using DOS, page 30.

For further instructions on programming the GS2000 based module evaluation boards for Temperature and Light Sensor (TLS) applications, refer to the *GS2000 Based Module Programming User Guide*.

For further instructions and tutorial of how to setup and demonstrate wireless sensors that take temperature and light measurements and transmits them to a mobile device (iOS or Android), refer to the *GainSpan Temperature and Light Sensor (TLS) Application Note*.

3.4 Programming Single Binary Image Using GUI

Once the single image binaries has been created using the steps outline in 3.2 Building and Programming S2W Single Binary Image Using DOS, page 30, you can now program the flash using the GUI application. Refer to the *GainSpan GS2000 Based Module Programming User Guide*.

3.5 Building and Verifying TLS Applications

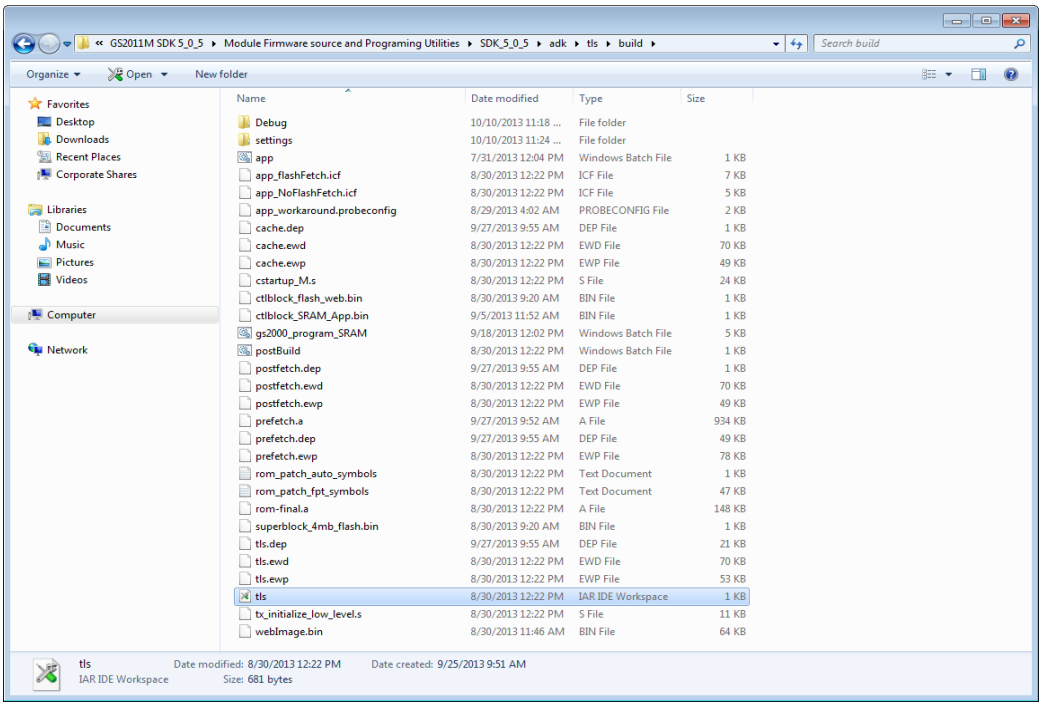
NOTE: *Ensure that you have installed the IAR IDE 6.50.5 and also have a valid IAR license prior to proceeding with the instructions.*

NOTE: *The SDK includes the Temperature and Light Sensor (TLS) application in source under the ADK directory. The TLS application is only supported for the GS2011M.*

To build and verify a Temperature and Light Sensor (TLS) application, perform the following:

1. Open a project file. For example, the **tls** located in **\SDK\adk\tls\build** (see Figure 17, page 36).

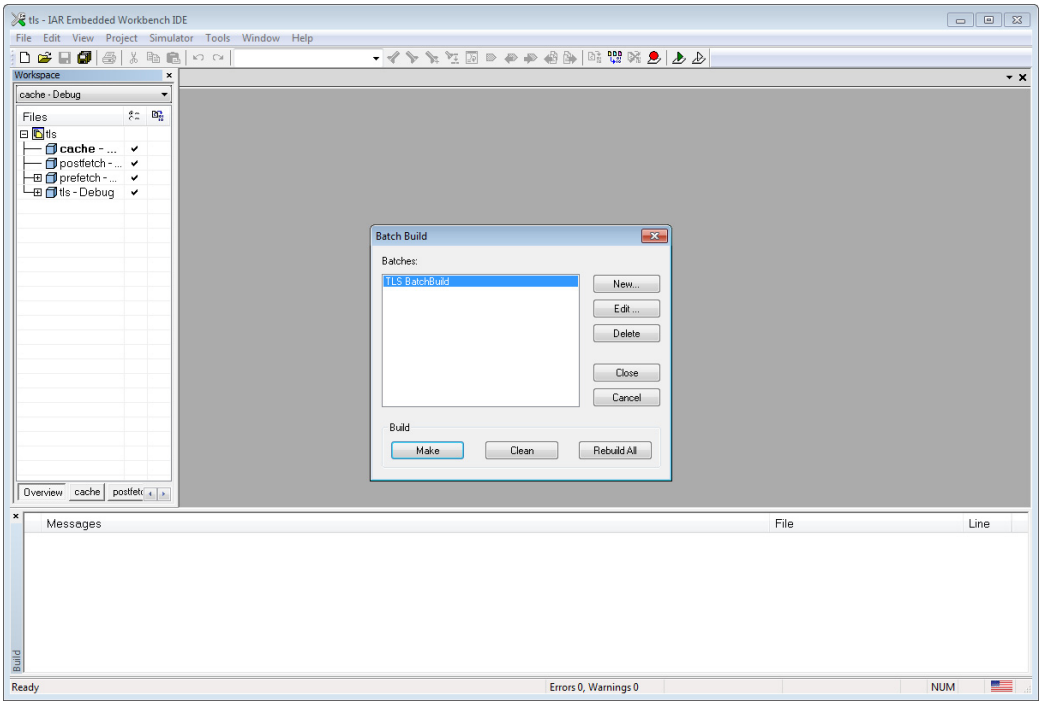
Figure 17 Temperature and Light Sensor (TLS) IAR IDE Workspace File to Rebuild



2. Double-click on the **tls** file to open the tls-IAR Embedded Workbench IDE application.
3. Navigate to the **Project** menu and select **Batch Build** to build the TLS project. The **TLS Batch Build** window will open.

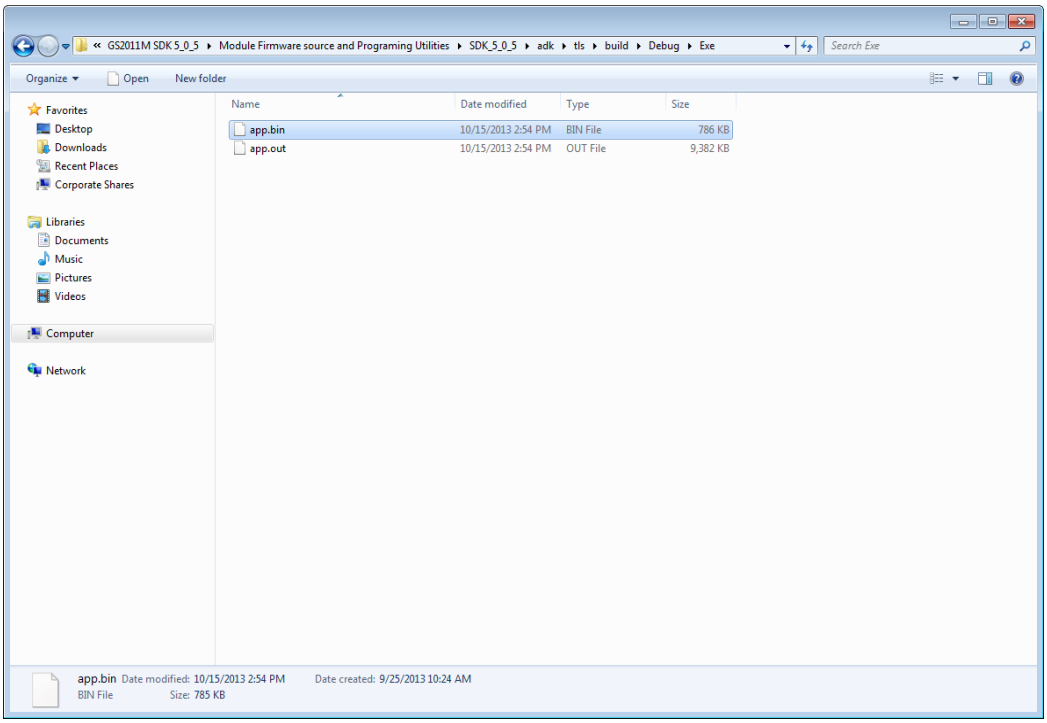
4. Click **Rebuild All** to build the TLS project. The TLS building configuration will start (see Figure 18, page 37).

Figure 18 Rebuild The Temperature and Light Sensor Project



5. When the build is completed with no errors, **app.bin** will be generated. This will display within the **\SDK\userapps\s2w\build\Debug\Exe** folder (see Figure 19, page 38).

Figure 19 Application Binary Created



6. You can now setup the IAR I-Jet debugging probe to debug Temperature and Light Sensor applications (see Chapter 5 Setting Up the I-Jet Hardware, page 41).

7. You can now program the evaluation board (see Chapter 4 Programming the Evaluation Board, page 39).

For further instructions on how to build binaries for Temperature and Light Sensor (TLS) application, refer to 3.3 Building and Programming TLS Single Binary Image Using DOS, page 35.

Refer to the *GainSpan Temperature and Light Sensor (TLS) Application Note* for running TLS demo using iOS and Android devices.

Chapter 4 Programming the Evaluation Board

For instructions on how to program the module Flash using DOS or GUI, refer to the *GainSpan GS2000 Based Module Programming User Guide*.

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Chapter 5 Setting Up the I-Jet Hardware

This chapter provides instructions on how to setup the IAR I-Jet debugging probe to the GainSpan® GS2011M and GS2100M evaluation boards to quickly debug sample Serial-to-WiFi and Temperature and Light Sensor applications.

5.1 Overview

I-Jet integrates seamlessly into IAR Embedded Workbench and is fully plug-and-play compatible. The I-Jet provides a fast in-circuit debugging platform which connects to the JTAG connector on the evaluation board to the HOST computer via the USB port.

To start debugging applications, you will need the following components:

- IAR i-JET JTAG debugging probe
- 20-pin JTAG ribbon cable
- Micro USB Cable
- PC or laptop
- Installed IAR Embedded Workbench application software (refer to Installing IAR IDE, page 20).

5.2 I-Jet Probe Setup

To connect the I-Jet probe, perform the following:

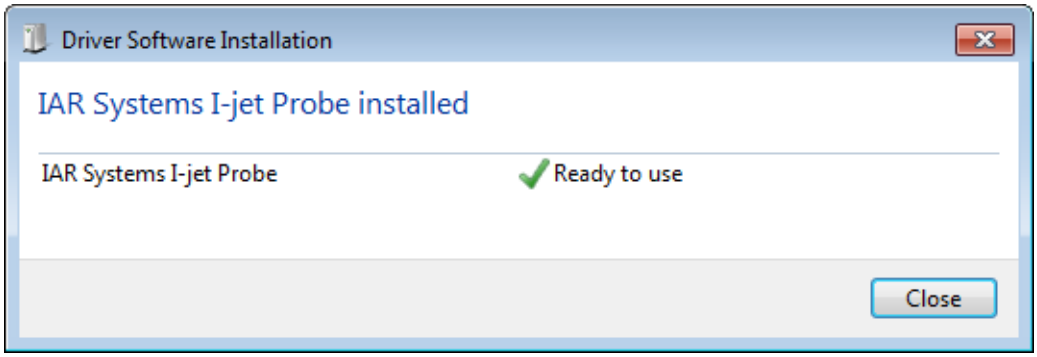
1. Plug the micro-USB cable to a USB port on a computer (see Figure 20, page 42).

NOTE: *No power supply is required, I-Jet is powered entirely by the USB port.*

Figure 20 Connecting I-Jet to a Computer or Laptop

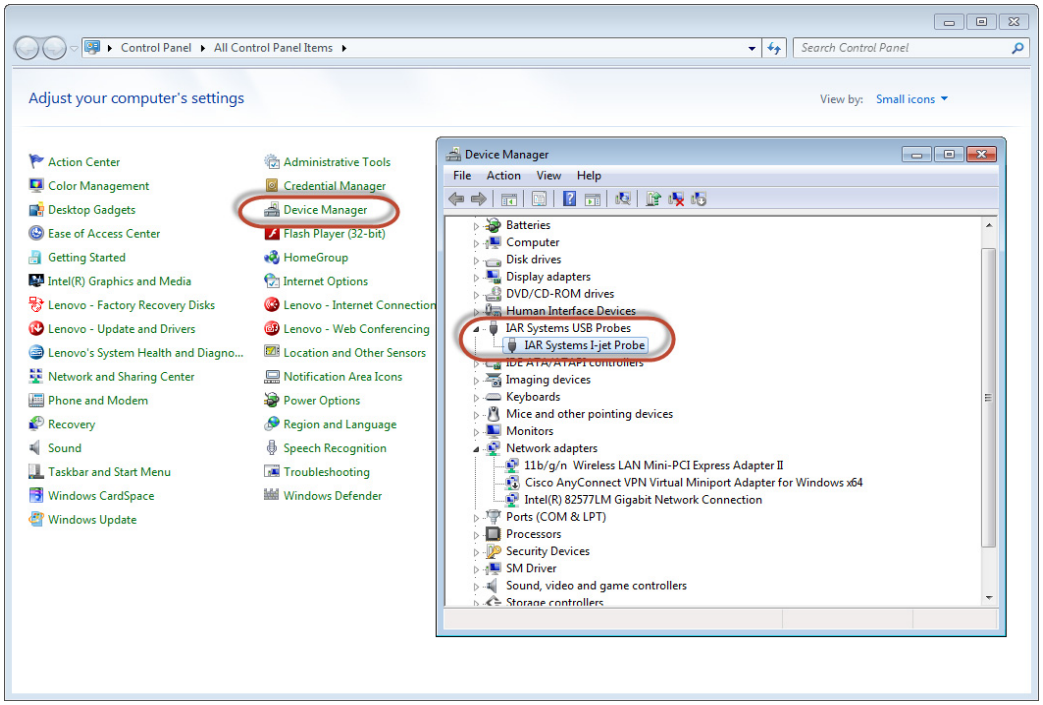
I-Jet does not require any special driver software for installation. All drivers for I-Jet are part of the installation of IAR Embedded Workbench. Windows automatically will search and install the relevant drivers for I-Jet (see Figure 21, page 42).

Figure 21 I-Jet Probe Driver Software Installation



2. Under the Windows Control Panel, check the Device Manager to verify that the IAR Systems I-Jet Probe device drivers have been installed (see Figure 22, page 43).

Figure 22 IAR Systems I-Jet Probe Driver Software Installation Complete



5.2.1 Limitations

The GS2011M and GS2100M is designed with dual CPUs and various power management modes. With these capabilities, there are some limitations when using the I-Jet for debugging. With I-Jet attached and breakpoint enabled, this may cause one of the CPUs to be halted. If this occurs, the inter CPU message buffer may overflow causing the I-Jet to go out of sync.

The following are limitation when using the I-Jet for debugging:

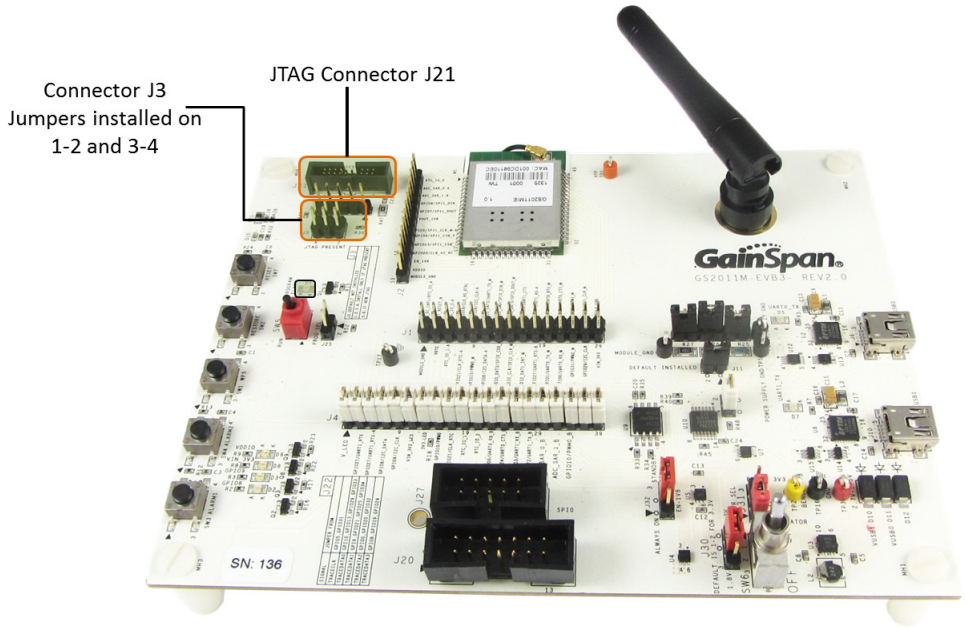
- JTAG supports only one hardware breakpoint at a time
- Programming the GS2011M device through JTAG is not supported.
- JTAG supports single-stepping through the code with the following limitations:
  - Mailbox resources between the two CPUs are limited, so when APP CPU is halted, WLAN CPU may trigger reset when the mailbox is full and WLAN cannot find the mailbox handles to exchange the messages.

5.2.2 Debug Connections for the GS2011M

To setup the GS2011M evaluation board for debugging, perform the following:

1. Turn the ON/OFF power switch (SW6) to the **OFF** position.
2. Plug the micro-USB cable into the I-Jet probe, and plug the other end of the micro-USB cable into a USB port on a computer (see I-Jet Probe Setup, page 42).
3. Plug the 20-pin JTAG ribbon cable into the JTAG connector on the I-Jet probe, and plug the other end of the ribbon cable into the JTAG connector (J21) on the GS2011M evaluation board (see Figure 23, page 44).

Figure 23 Connecting I-Jet Probe to JTAG Connector on GS2011M



NOTE: *Make sure jumpers on connector J3 are installed on pins 1-2 and 3-4.*

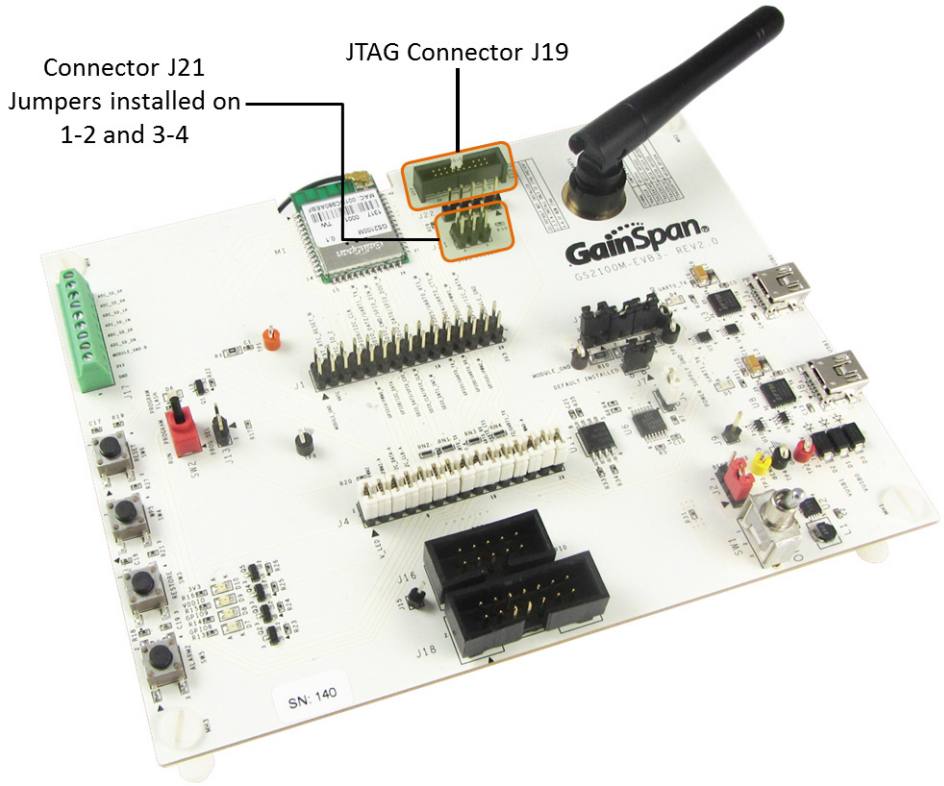
4. Power on the GS2011M evaluation board. The USB and Debug LEDs will be lit GREEN on the I-Jet probe. The GS2011M evaluation board is now ready for debugging.
5. You can now start debugging Serial-to-WiFi and the Temperature and Light Sensor applications (see Chapter 6 Debugging Applications, page 47).

5.2.3 Debug Connections for the GS2100M

To setup the GS2100M evaluation board for debugging, perform the following:

1. Turn the ON/OFF power switch (SW1) to the **OFF** position.
2. Plug the micro-USB cable into the I-Jet probe, and plug the other end of the micro-USB cable into a USB port on a computer (see I-Jet Probe Setup, page 42).
3. Plug the 20-pin JTAG ribbon cable into the JTAG connector on the I-Jet probe, and plug the other end of the ribbon cable into the JTAG connector (J19) on the GS2100M evaluation board (see Figure 24, page 45).

Figure 24 Connecting I-Jet Probe to JTAG Connector on GS2100M



NOTE: *Make sure jumpers on connector J21 are installed on pins 1-2 and 3-4.*

4. Power on the GS2100M evaluation board. The USB and Debug LEDs will be lit GREEN on the I-Jet probe. The GS2100M evaluation board is now ready for debugging.
5. You can now start debugging Serial-to-WiFi and Temperature and Light Sensor applications (see Chapter 6 Debugging Applications, page 47).

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Chapter 6 Debugging Applications

This chapter provides instructions on how to debug Serial-to-WiFi and Temperature and Light Sensor applications using the GainSpan® GS2011M and GS2100M evaluation boards.

6.1 Debugging Serial-to-WiFi Application

The GS2011M and GS2100M evaluation board supports Serial-to-WiFi application code debugging. The instructions below will allow you to program the WLAN binary into the Flash using the GS program tool while the APP binary will be directly downloaded into the RAM. This will make it easier to debug the APP code.

***NOTE:** If JTAG is present, install jumpers 1-2 and 3-4 on Jumper Connector J3 for the GS2011M, and install jumpers 1-2 and 3-4 on Jumper Connector J21.*

6.1.1 Programming the Files into Flash

To program the following files listed below into Flash, double-click on the GS2000 SRAM program file**.**

Once complete the following will take effect:

- The **superblock_4mb_flash.bin** file will be programmed onto location **0x00** on the Flash.
- When debugging only the APP code, the WLAN code will be programmed into the Flash at location:
  - `0x800000`
- The control block is already programmed and is located at:
  - `SDK_5_x_x\userapps\s2w\build\ctlblock_SRAM_App.bin at location 0x1000 and at 0xFF000`
- The superblock is already programmed and is located at:
  - `SDK_5_x_x\userapps\s2w\build\superblock_4mb|flash.bin at location 0x00`

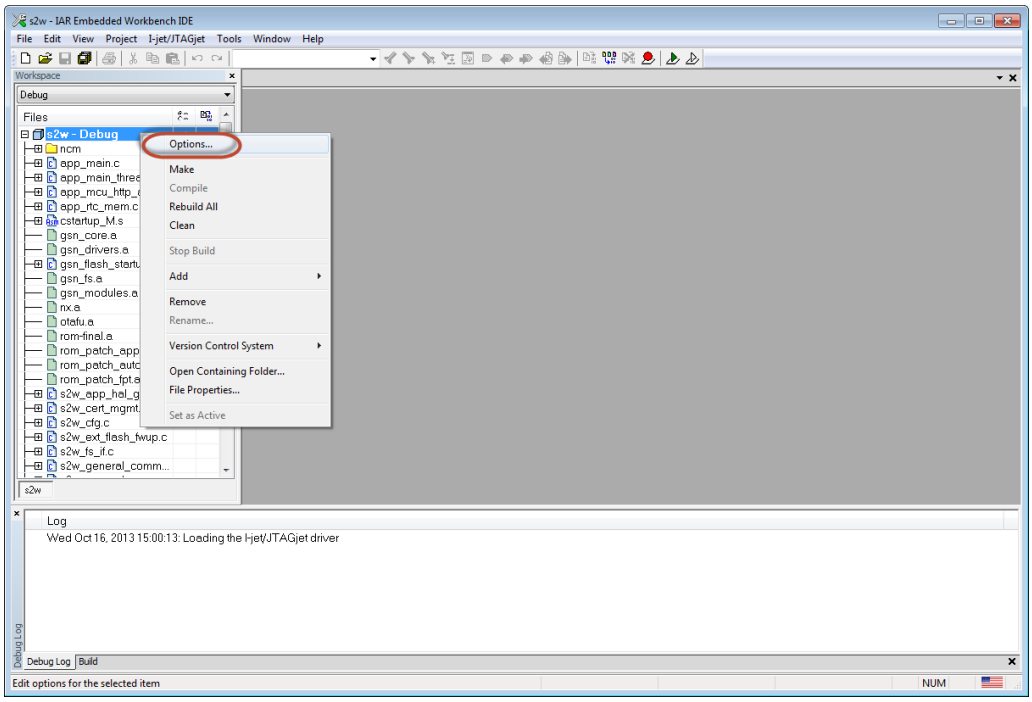
***NOTE:** The SDK program folder may be different from above. This will depend on where you installed the GainSpan firmware and binaries.*

6.1.1.1 Debugging the Serial-to-WiFi Application

To start debugging the Serial-to-WiFi application on the GS2011M and GS2100M, perform the following:

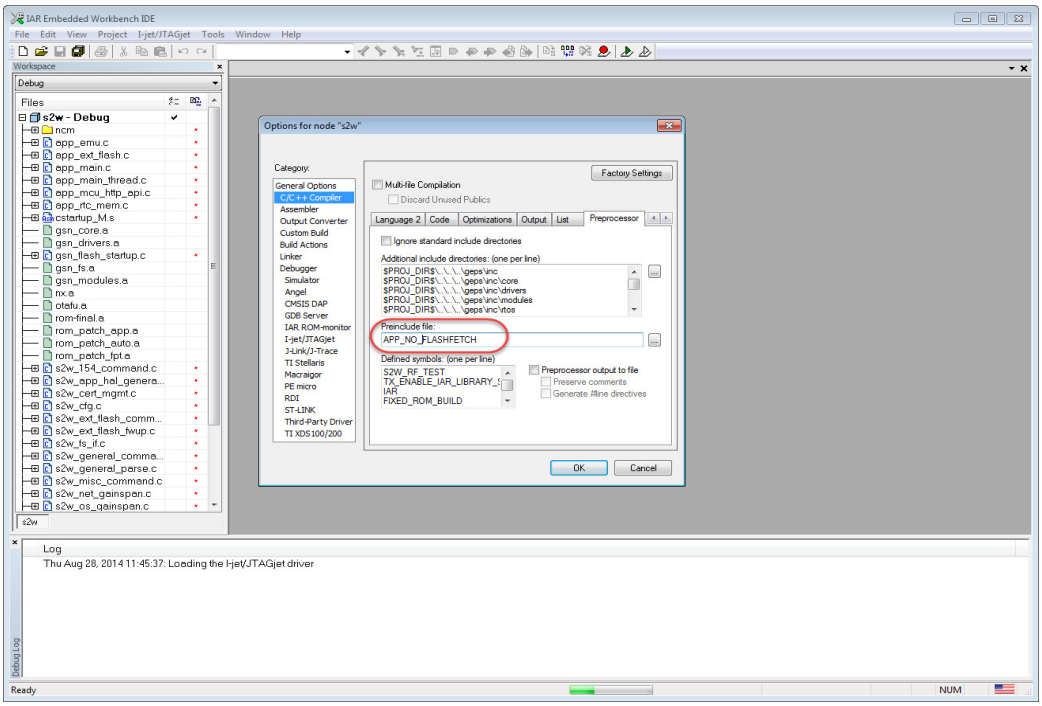
1. Start the IAR Embedded Workbench IDE application.
2. Open the **userapps\sdk\build** folder under the GS2000 SDK directory.
3. Double-click on the **S2W IAR IDE Workspace** file.
4. The **S2W Debug** file will open.
5. Select the **Project File** (e.g. s2w-Debug) and right-click.
6. Select **Options** (see Figure 25, page 48). The **Options** for node 's2w' window will display (see Figure 26, page 49).

Figure 25 Serial-to-WiFi Debug Options for S2W



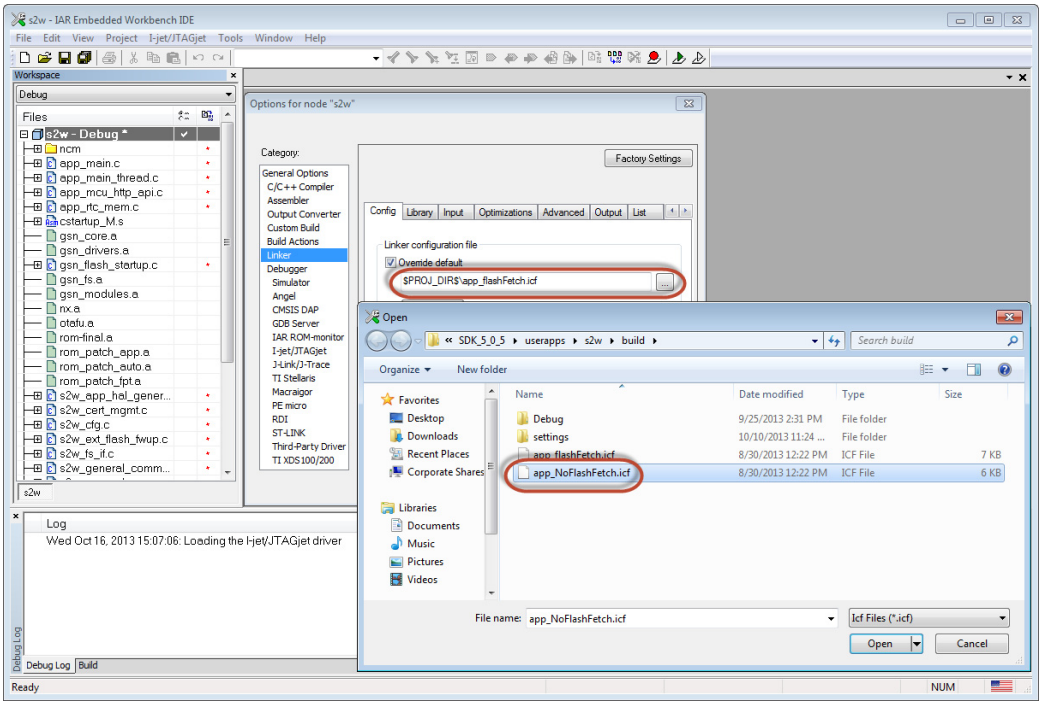
7. Select **C/C++ Compiler** category and in the **Preprocessor** tab under **Define symbols**, type in **APP_NO_FLASHFETCH** and click **OK** (see Figure 26, page 49). This define symbols file may already be defined.

Figure 26 Add App No Flash Fetch to "C" Compiler for S2W



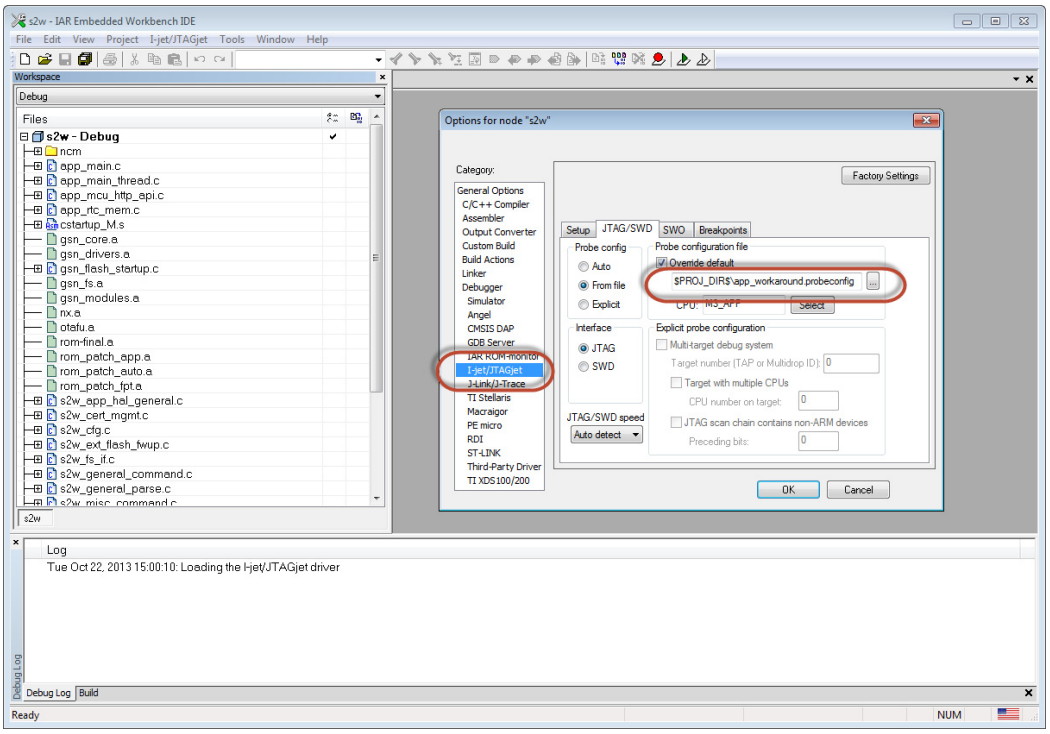
8. Select the configuration file **app_NoFlashFetch.icf** under Linker Configuration file and click **OK** (see Figure 27, page 50).

Figure 27 Selecting Configuration Flash Fetch File for S2W



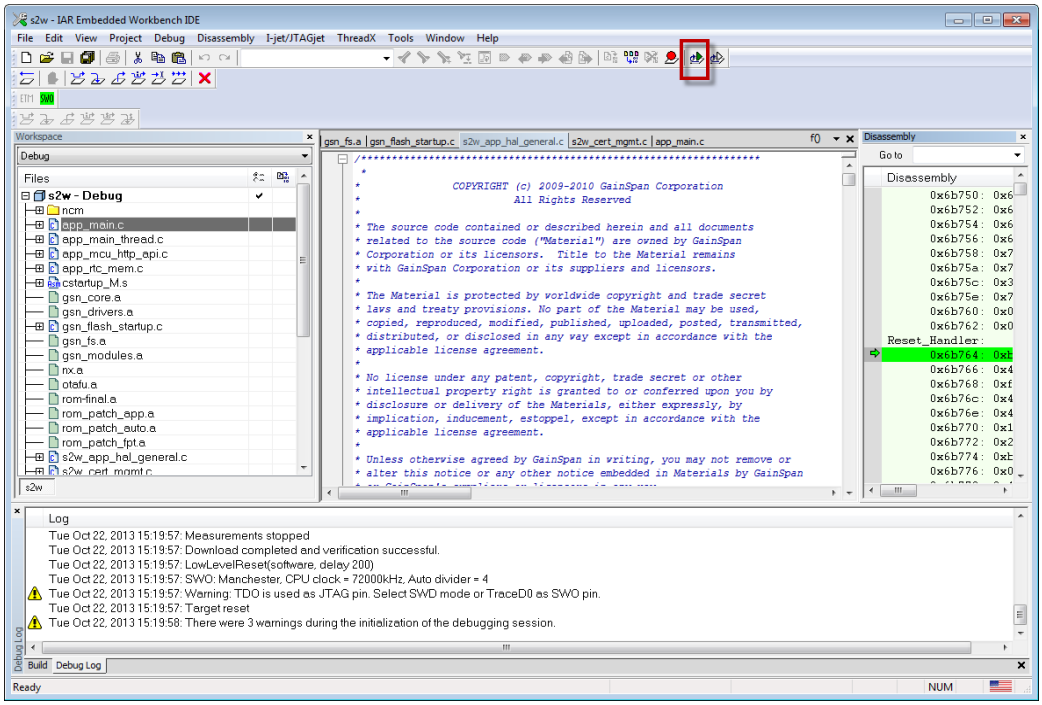
9. Select **I-jet/JTAG** category. Select the **JTAG/SWD** tab. Click the **Browse (...)** button to search for the **app_workaround.probeconfig** file. Click the **Open** button. The project directory application workaround probe configuration file is displayed. Click **OK** (see Figure 28, page 51).

Figure 28 JTAG Application Workaround File for S2W



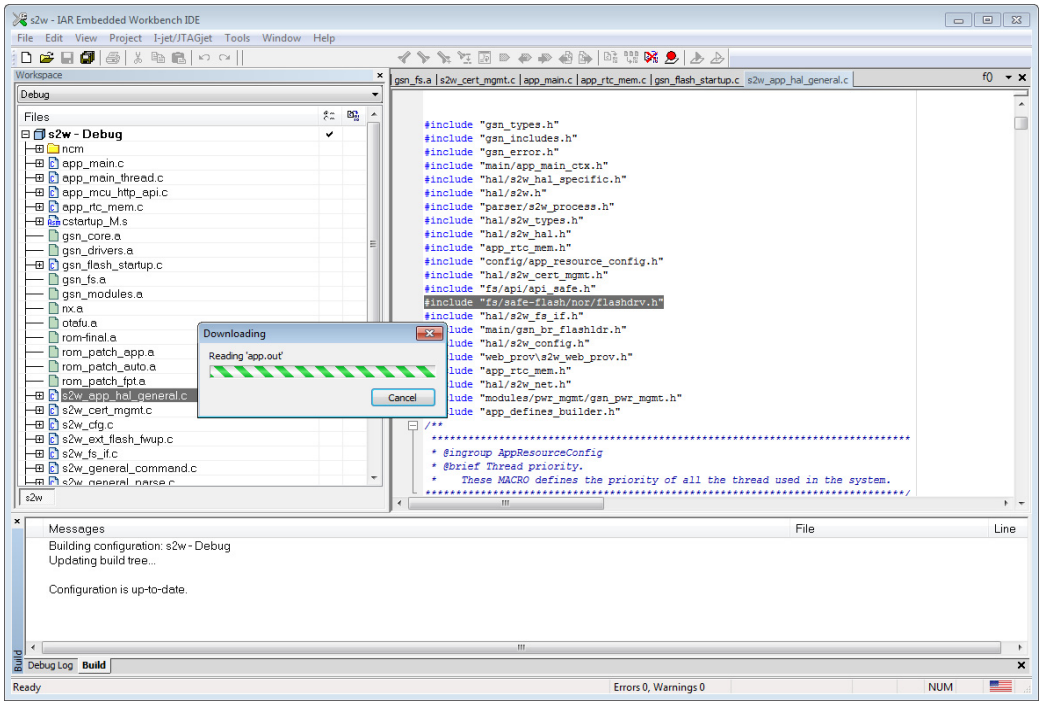
10. Select **Download and Debug** option (see Figure 29, page 52). This will save the open files, recompile if necessary, and load the generated binaries directly into SRAM.

Figure 29 Select Download and Debug for S2W



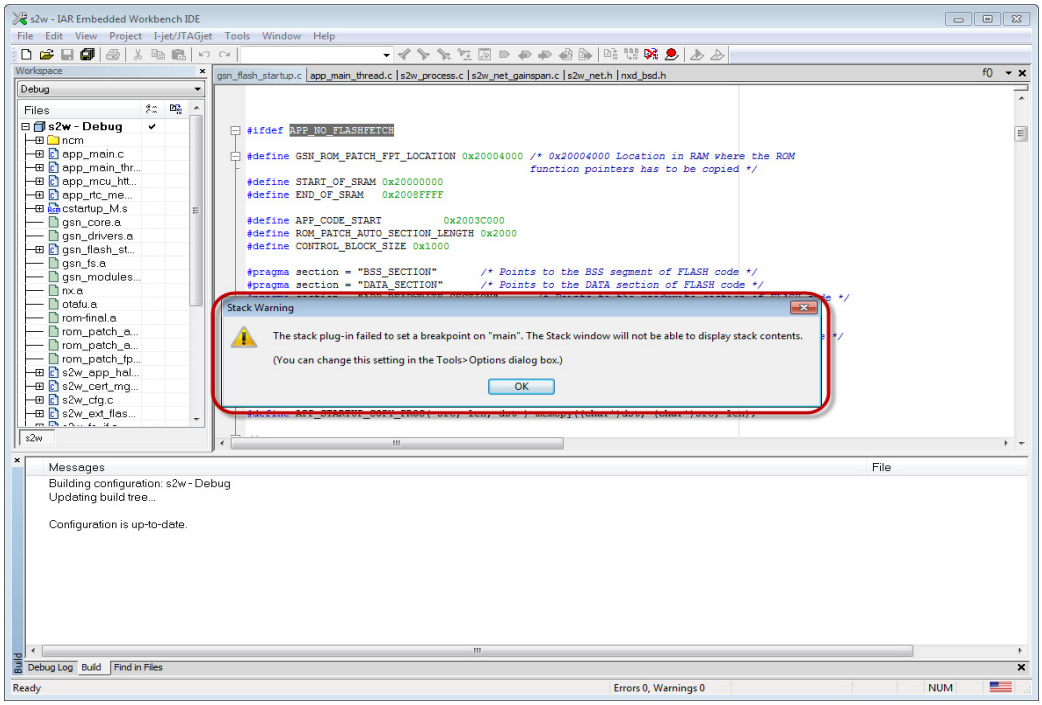
11. When compiling is complete, the code is downloaded to SRAM (see Figure 30, page 53).

Figure 30 Code is Downloaded to SRAM for S2W



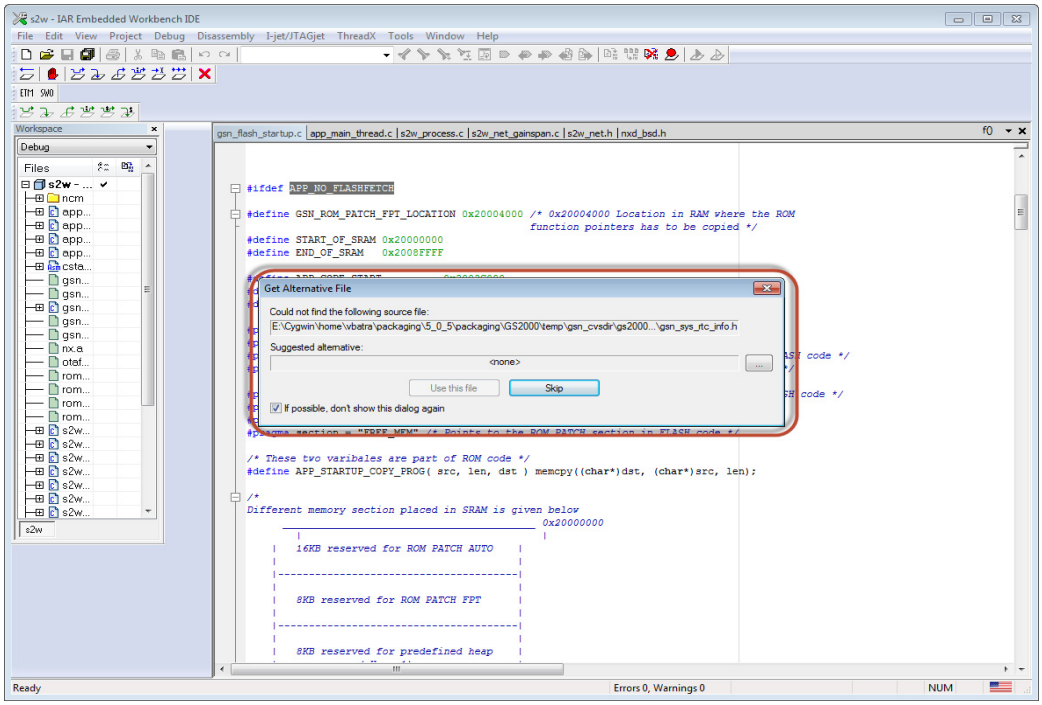
12. A Stack Warning message will display (see Figure 31, page 54). Click **OK** to continue.

Figure 31 Stack Warning Message for S2W



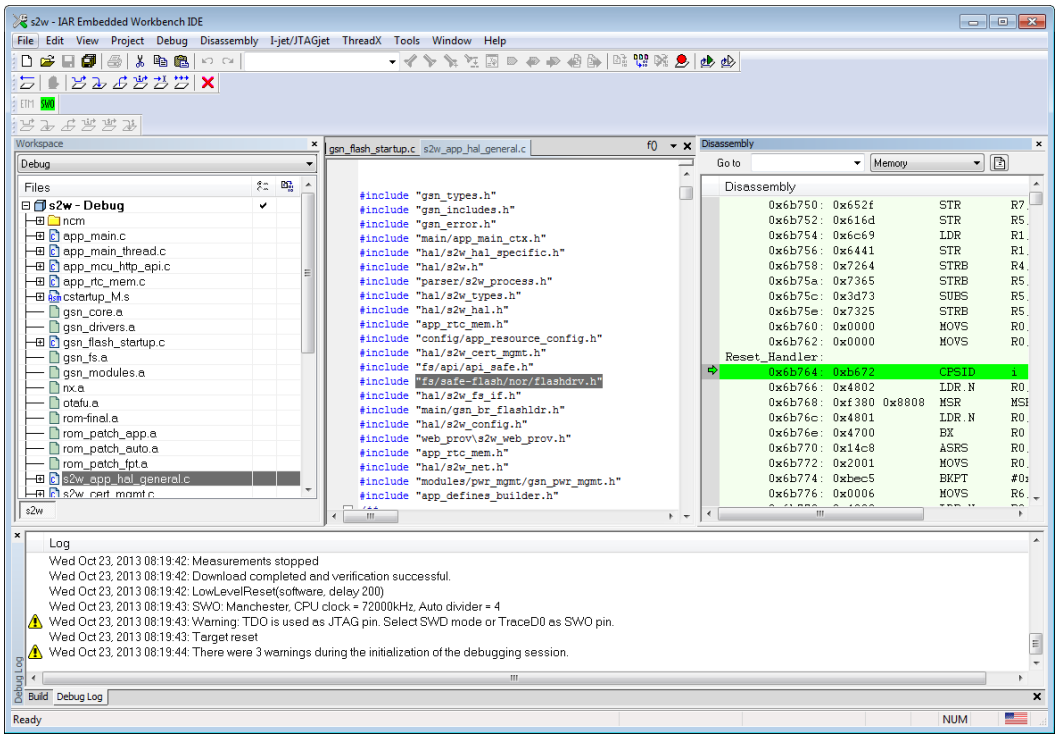
13. The **Get Alternative File** message will display. Click **Skip** to continue (see Figure 32).

Figure 32 Skip Alternative File Message for S2W



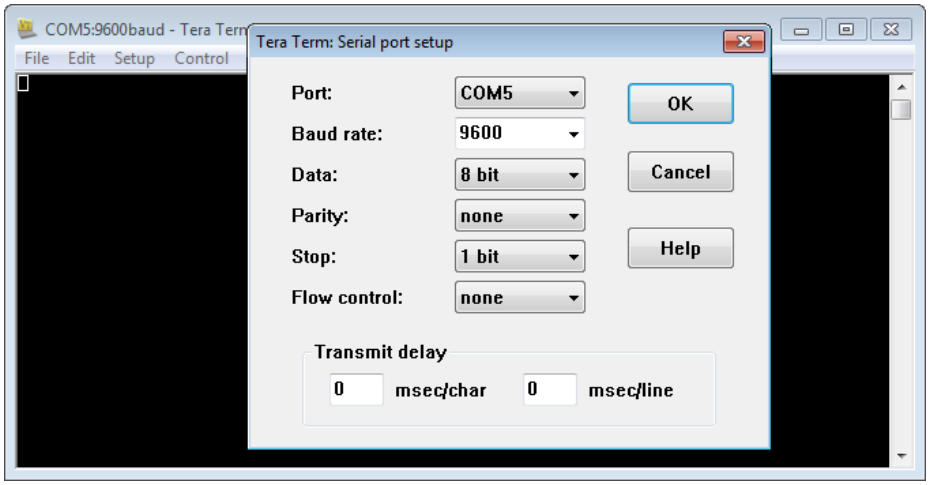
14. Once the code has been successfully downloaded to RAM, a debug interface with the computer pointing at RESET handler will be highlighted (see Figure 33, page 56).

Figure 33 Debug Interface Pointing to RESET Handler for S2W



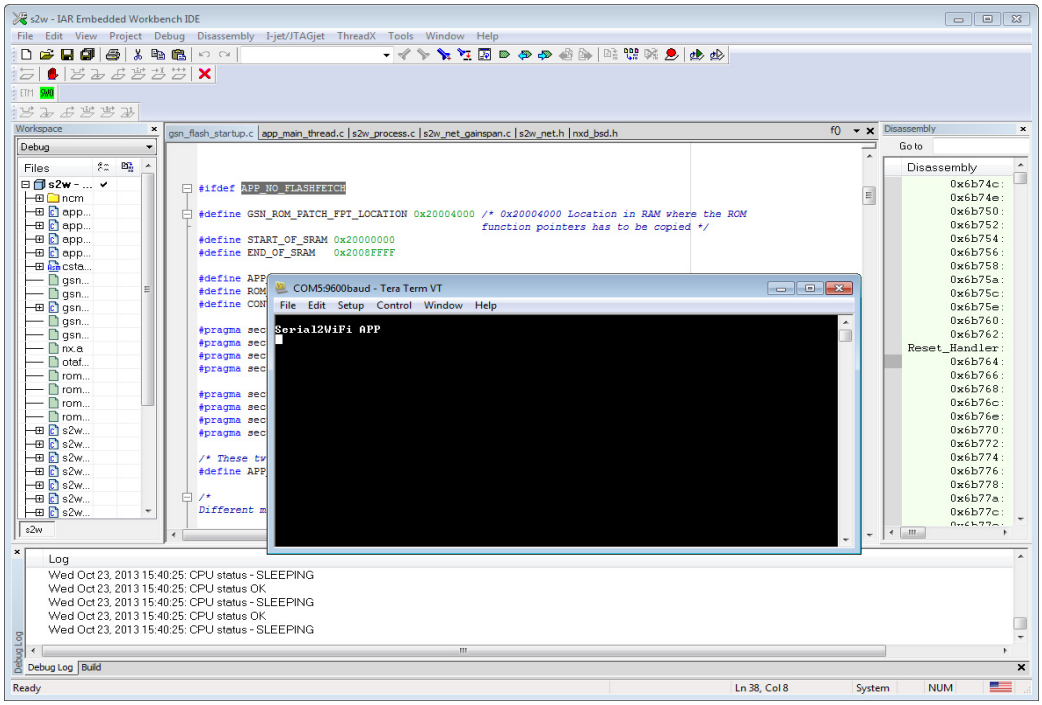
15. Start the Tera Term VT application and set the serial COM port settings baud rate to **9600** (see Figure 34, page 56) and click **OK**.

Figure 34 Start Tera Term and Set Serial COM Port Baud Rate for S2W



16. Click on the **Go/Start** button to see the **Serial2WiFi APP** banner on the Tera Term VT screen (see Figure 35, page 57).

Figure 35 Serial2WiFi APP Displayed in Tera Term Window



NOTE: *The GainSpan GS2011M or GS2100M evaluation board may have to be power cycled if the Serial2WiFi APP message doesn't appear within the Tera Term VT window.*

17. For additional features of the IAR Embedded Workbench IDE application, refer to 6.3 Additional Debugging Options, page 70.

6.2 Debugging Temperature and Light Sensor Application

NOTE: *Low power TLS cannot be debugged using I-Jet JTAG because both WLAN and Application CPUs will be turned off.*

The GS2011M and GS2100M evaluation board supports Temperature and Light Sensor (TLS) application code debugging.

Refer to 5.2 I-Jet Probe Setup, page 42 to set the JTAG jumpers for the GS2011M and GS2100M.

6.2.1 Programming the Files into Flash

To program the files into Flash open the SDK folder where the TLS firmware and utilities reside. Double click on the GS2000 SRAM file.

Once complete the following will take effect:

- The superblock_4mb_flash.bin file will be programmed onto location 0x00 on the Flash.
- When debugging only the APP code, the WLAN code will be programmed into the Flash at location:
  - `0x800000`
- The control block is already programmed and is located at:
  - `SDK_5_x_x\userapps\tls\build\ctlblock_SRAM_app.bin at location 0x1000 and at 0xFF000`
- The superblock is already programmed and is located at:
  - `SDK_5_x_x\userapps\tls\build\superblock_4mb_flash.bin at location 0x00`

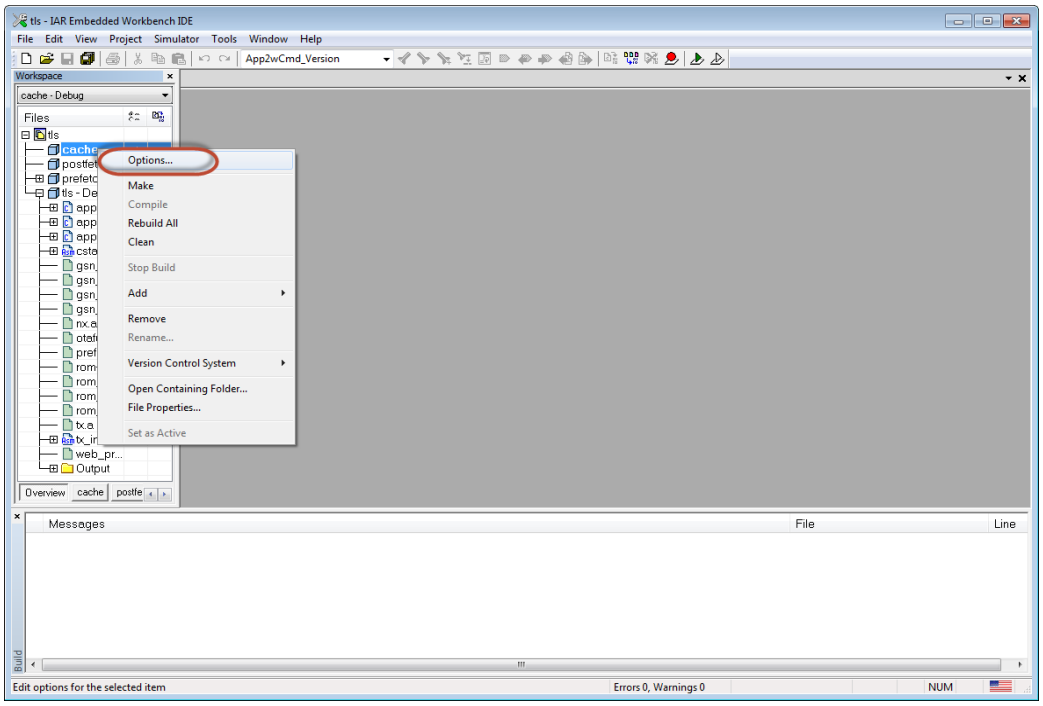
NOTE: *The SDK program folder may be different from above. This will depend on where you installed the GainSpan firmware and binaries.*

6.2.1.1 Debugging the Temperature and Light Sensor Application

To start debugging the Temperature and Light Sensor (TLS) application on the GS2011M and GS2100M, perform the following:

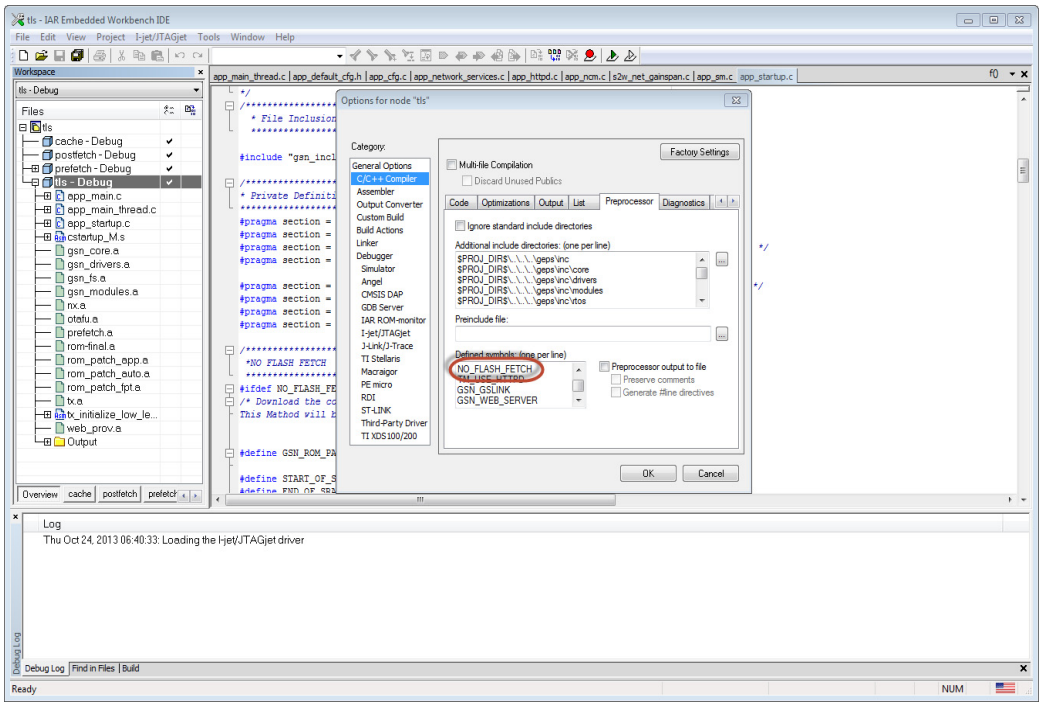
1. Start the IAR Embedded Workbench IDE application.
2. Open the SDK project file for TLS**.**
3. Right click on the **Project File** and click on **Options** (see Figure 36, page 59).

Figure 36 Temperature and Light Sensor Debug Options



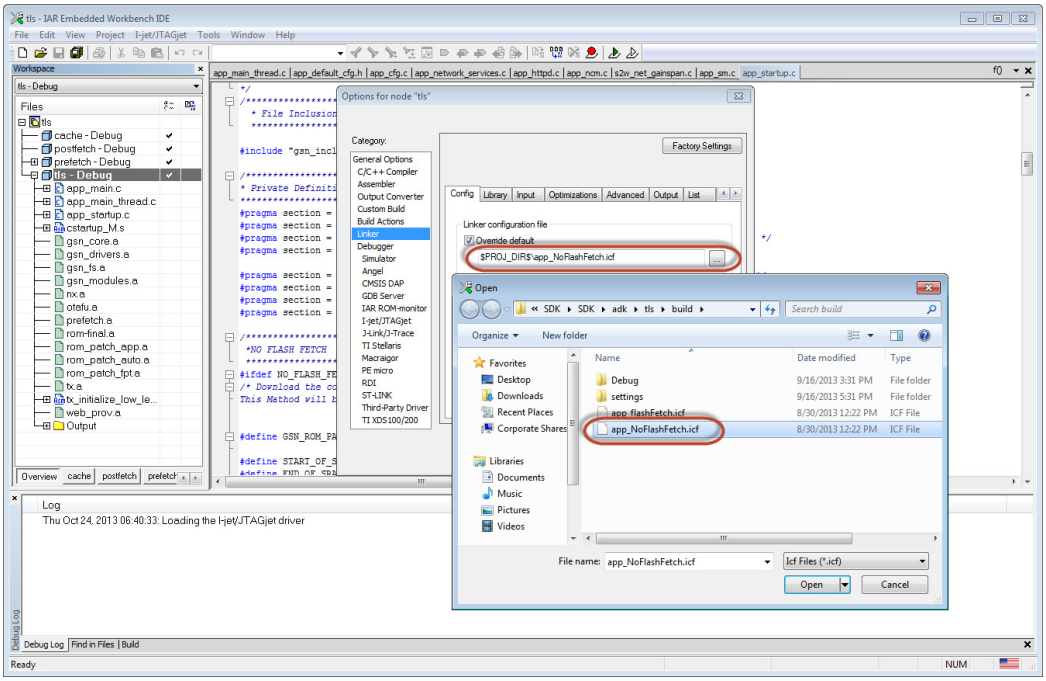
4. Select C/C++ Compiler category and in the **Preprocessor** tab under **Define symbols**, type in **NO_FLASH_FETCH** and click **OK** (see Figure 37, page 60).

Figure 37 No Flash Fetch to "C" Compiler for TLS



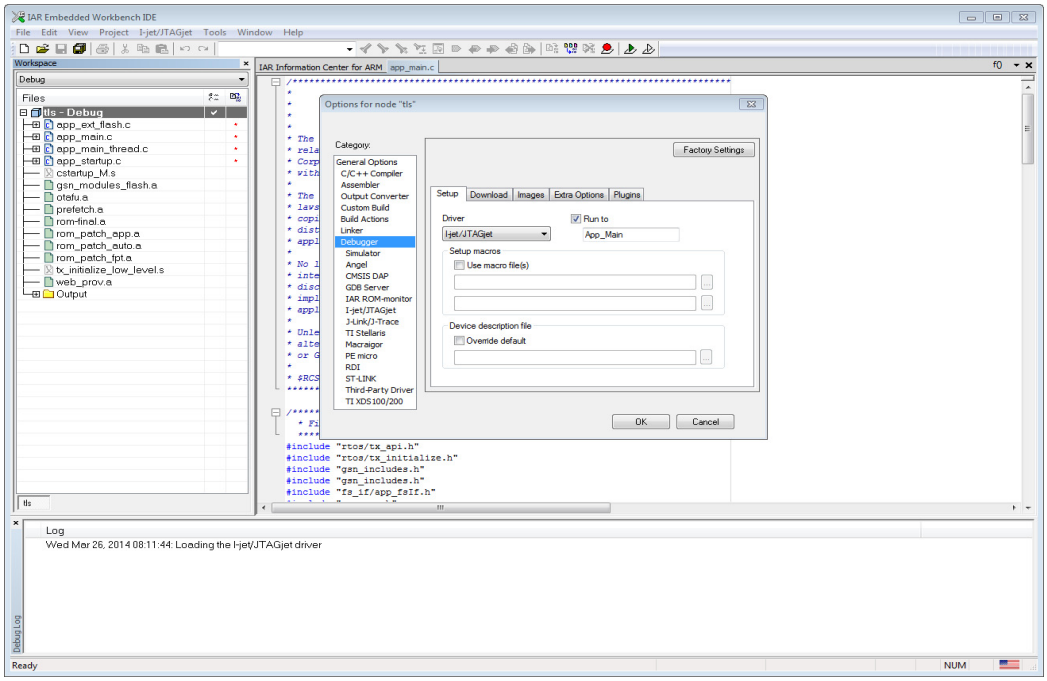
5. Select the configuration file **app_NoFlashFetch.icf** under Linker Configuration file (see Figure 38, page 61).

Figure 38 Selecting Configuration Flash Fetch File for TLS



6. Select Debugger under Options for TLS. Select the Setup tab and set debugger driver to I-Jet/JTAGjet and click **OK**. (see Figure 39, page 62).

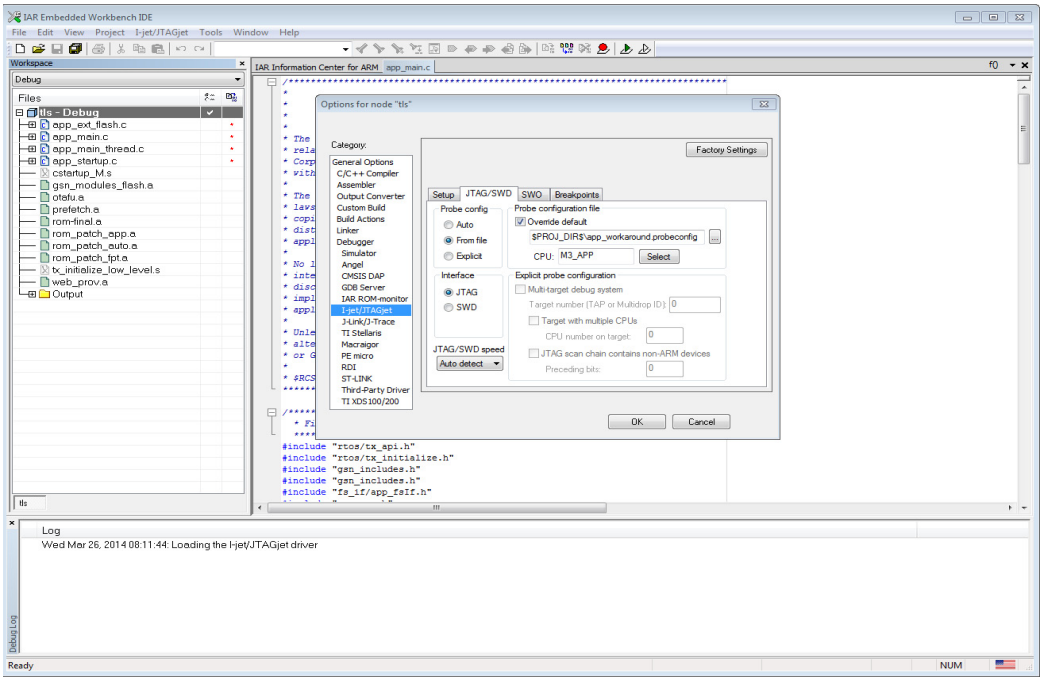
Figure 39 Set Debugger Driver to I-JET/JTAGjet



NOTE: *You can also set the run to App_Main to have a breakpoint automatically set at the start of your application.*

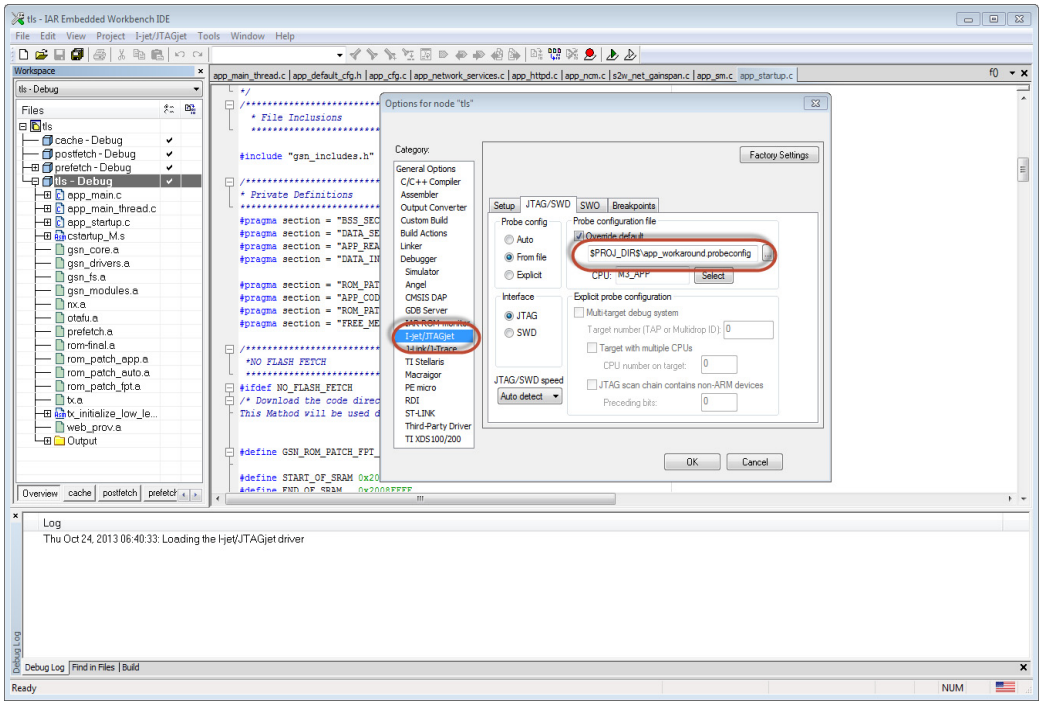
7. Select I-jet/JTAGjet under Options for TLS. Select the JTAG/SWD tab and set probe configuration file to **app_workaround.probeconfig** (see Figure 40, page 63).

Figure 40 I-Jet/JTAGjet Probe Configuration File



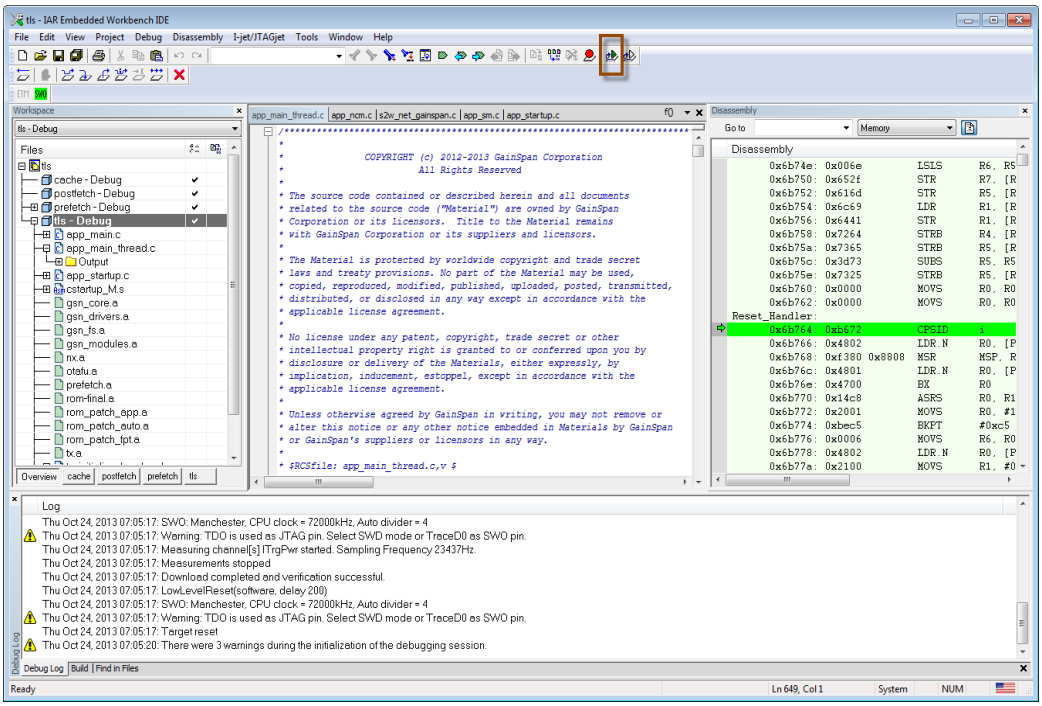
8. Select **I-jet/JTAG** category. Select the **JTAG/SWD** tab under **Probe configuration file**. Make sure the project directory application workaround probe configuration file is displayed, and click **OK** (see Figure 41, page 64).

Figure 41 JTAG Application Workaround File for TLS



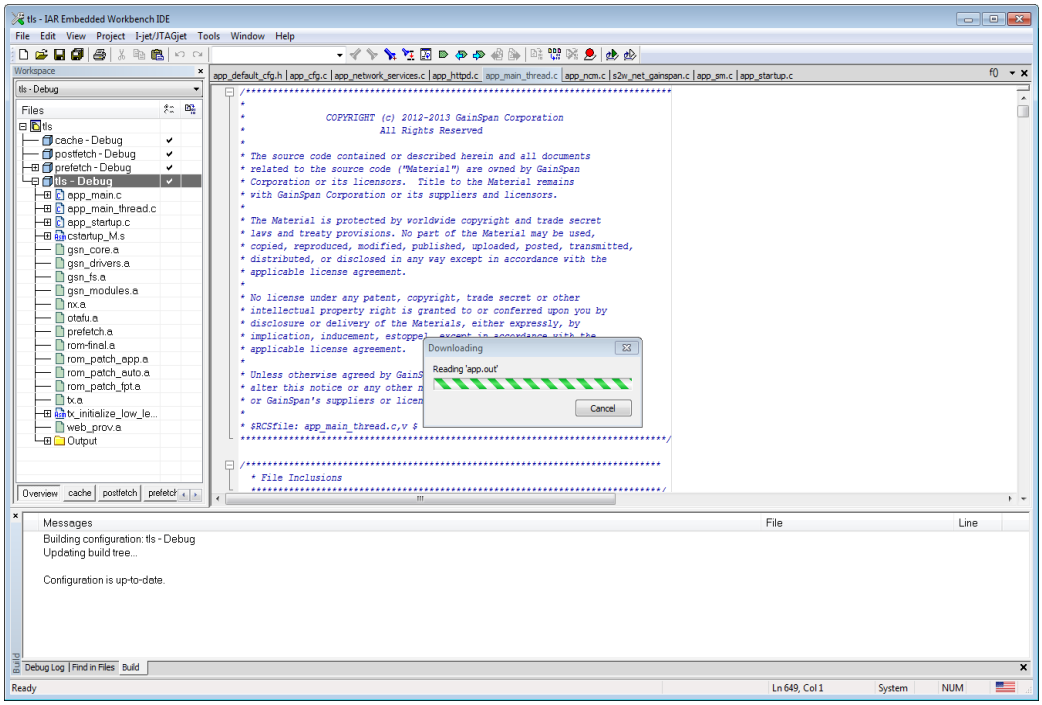
9. Select **Download and Debug** option (see Figure 42, page 65). This will save the open files, recompile if necessary, and load the generated binaries directly into SRAM.

Figure 42 Select Download and Debug for TLS



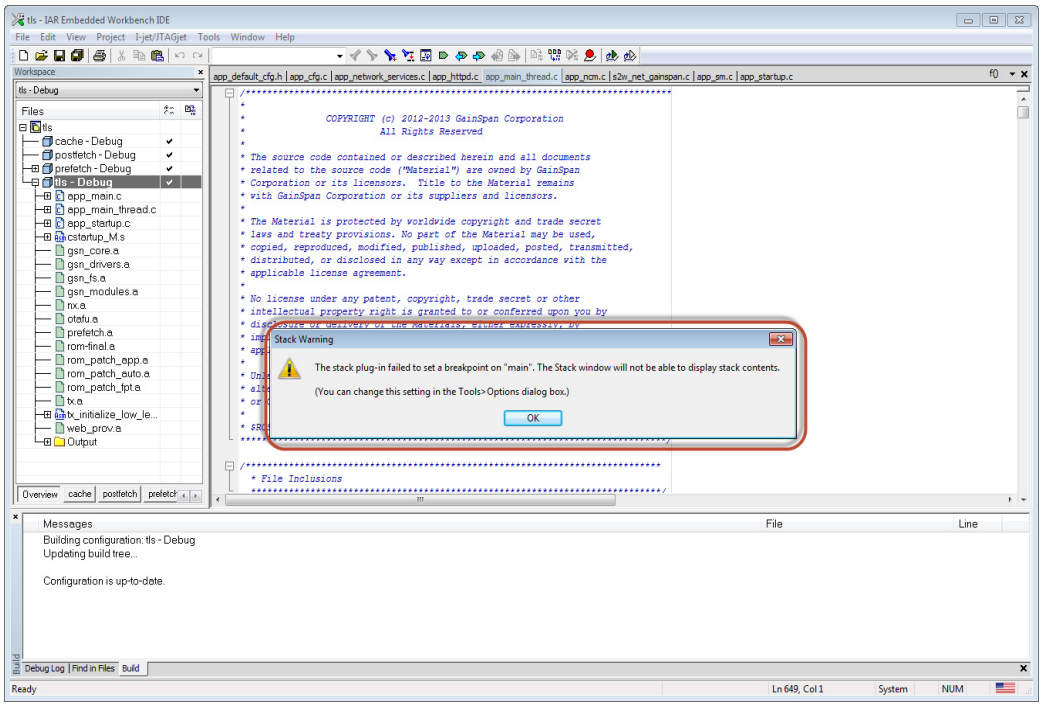
10. When compiling is complete, the code is downloaded to SRAM (see Figure 43, page 66).

Figure 43 Code is Downloaded to SRAM for TLS



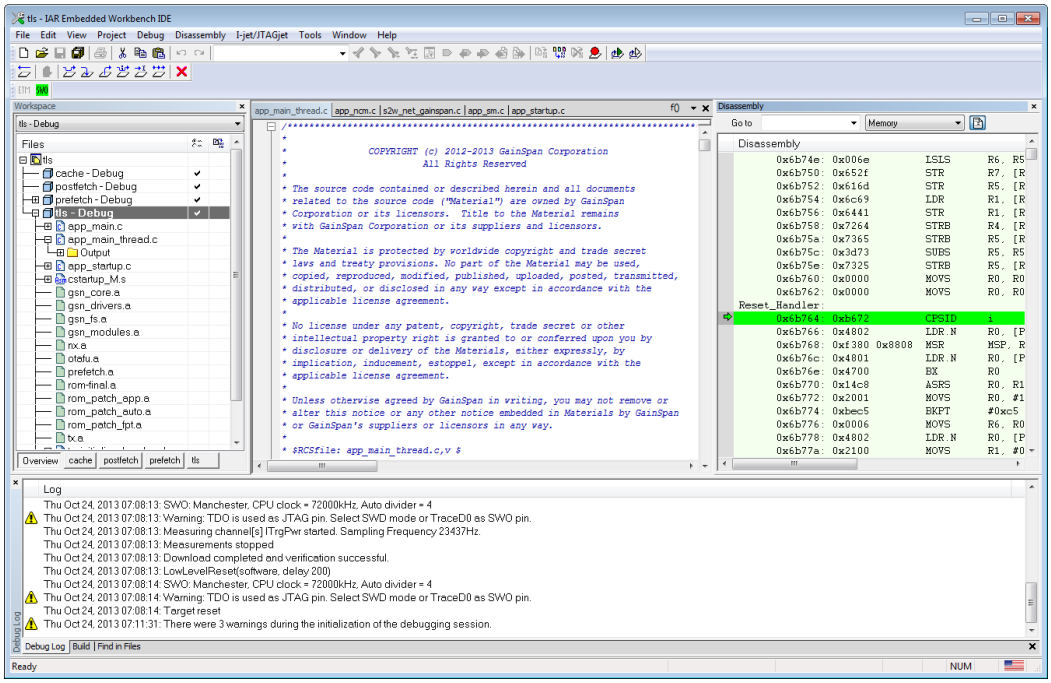
11. A Stack Warning message will display (see Figure 44, page 67). Click **OK** to continue.

Figure 44 Stack Warning Message for TLS



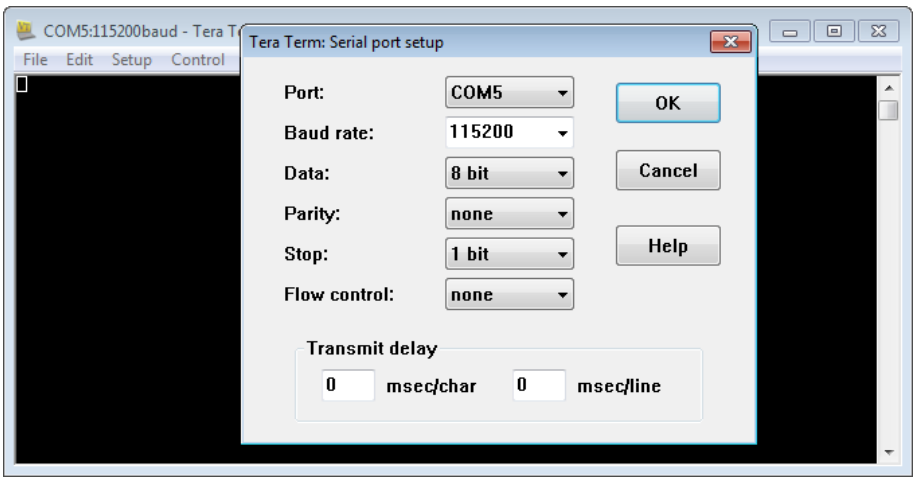
12. Once the code has been successfully downloaded to RAM, a debug interface with the computer pointing at RESET handler will be highlighted (see Figure 45, page 68).

Figure 45 Debug Interface Pointing to RESET Handler for TLS



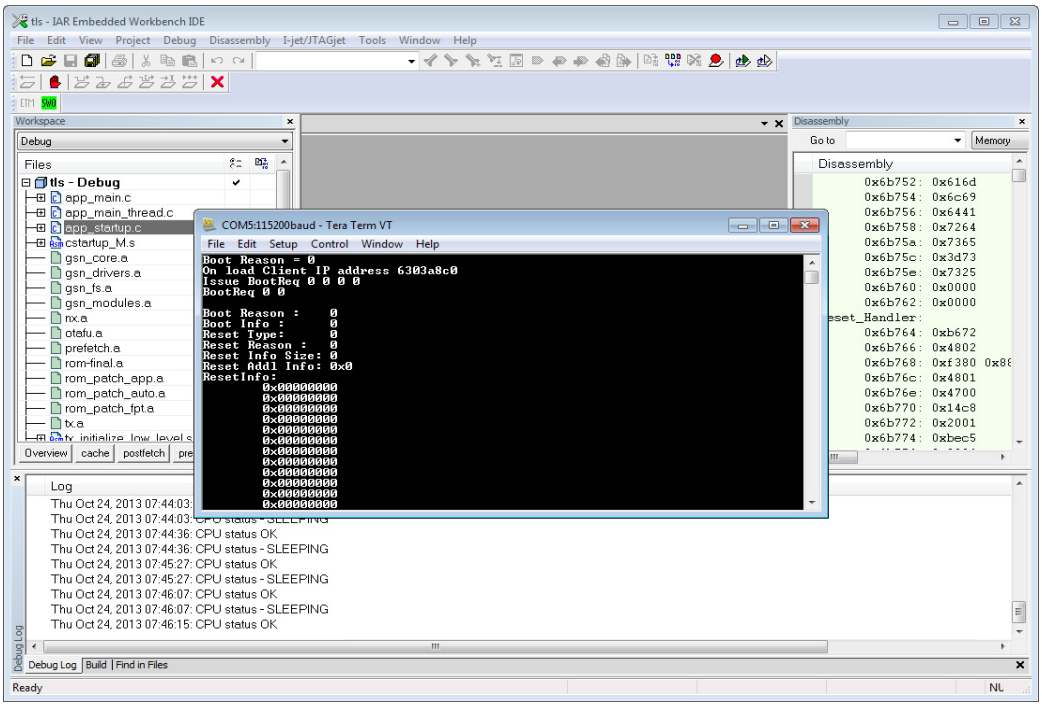
13. Start the Tera Term VT application and set the serial COM port settings baud rate to **115200** (see Figure 46, page 68) and click **OK**.

Figure 46 Start Tera Term and Set Serial COM Port Baud Rate for TLS



14. Click on the **Go/Start** button to see the **TLS** debug information displayed in the Tera Term VT screen (see Figure 47, page 69).

Figure 47 TLS Information Displayed in Tera Term Window



NOTE: *The GainSpan GS2011M or GS2100M evaluation board may have to be power cycled if the Temperature and Light Sensor information doesn't appear within the Tera Term VT window.*

15. For additional features of the IAR Embedded Workbench IDE application, refer to 6.3 Additional Debugging Options, page 70.

6.3 Additional Debugging Options

There are several different types of debugging options available through the IAR Embedded Workbench IDE application for Serial-to-WiFi (S2W) and Temperature and Light Sensor (TLS). The additional debugging options below describe the S2W. The Temperature and Light Sensor (TLS) screens are identical.

These debugging options are:

- Placing breakpoints into code
- Viewing registers
- Displaying Variables
- Memory location
- Call Stack, etc.

Figure 48, page 70 shows the IAR Embedded Workbench IDE additional options for debugging. These can be access through a simple point and click. Table 7, page 71 describes these additional debugging options.

Figure 48 Additional Debugging Options

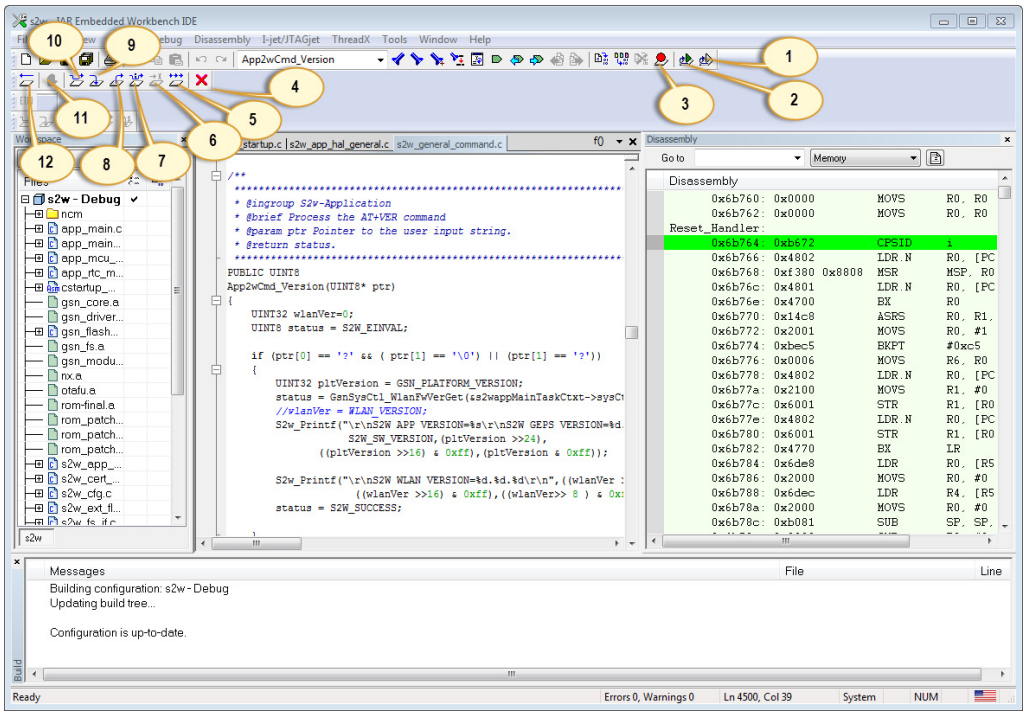


Table 7 Additional Debugging Options Selection

Button No.	Description
1	Restart Debugger
2	Make & Restart Debugger
3	Toggle Breakpoint
4	Stop Debugging
5	Go (Start)
6	Run to Cursor
7	Next Statement
8	Step Out
9	Step Into
10	Step Over
11	Break
12	Reset

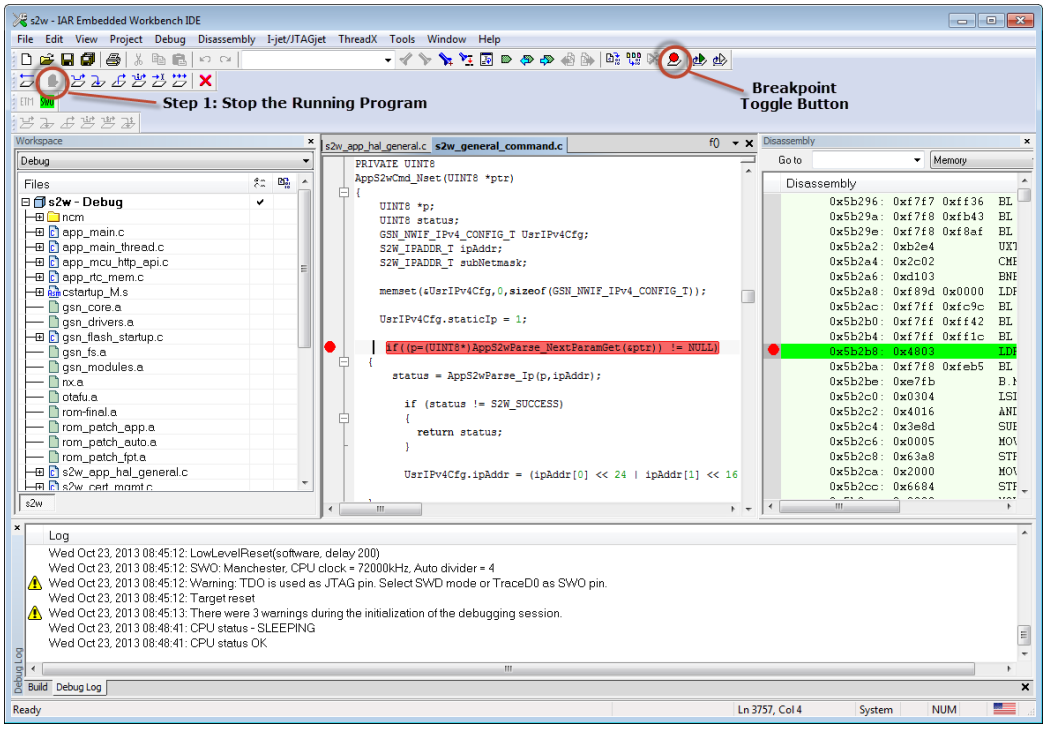
6.3.1 Placing Breakpoints into Code

To place a breakpoint into a code, perform the following:

1. Open a file and place the cursor on that specified line and press the breakpoint button (see Figure 49, page 72). In this example a debug statement has been introduced and a breakpoint has been set to that particular line. This will be triggered when you issue the following command.

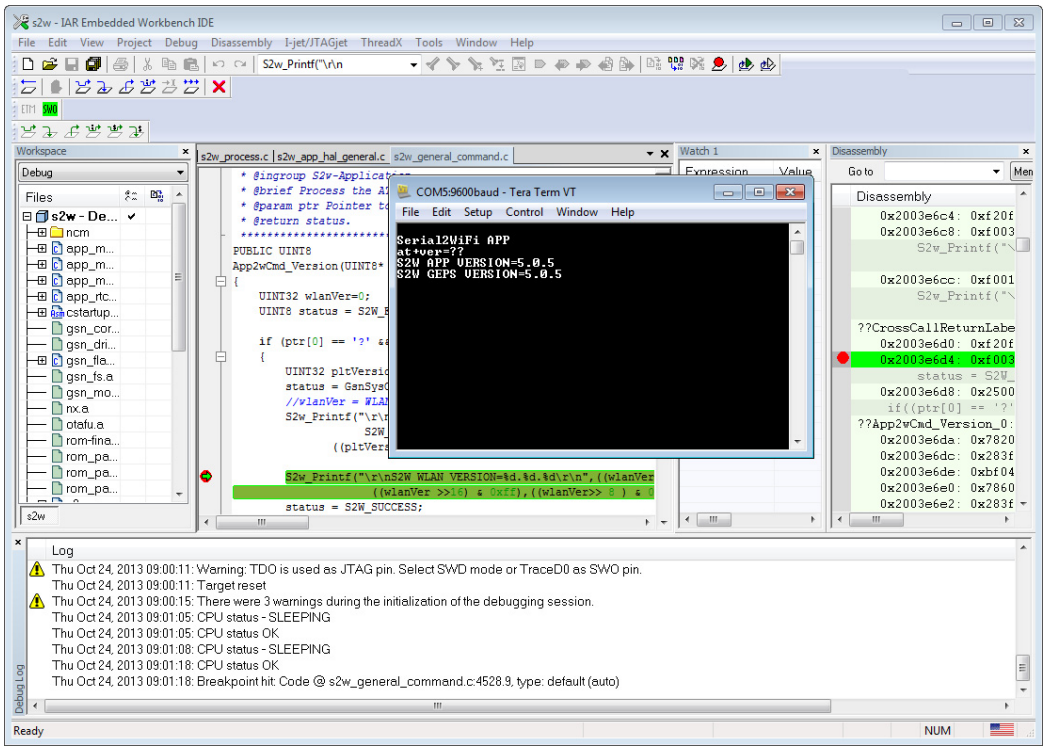
```
AT+VER=??
```

Figure 49 Placing a Breakpoint into Code



2. Click the **Go** button and it will stop at the breakpoint you indicated (the breakpoint will turn green, indicating that the breakpoint has been hit) (see Figure 50, page 73).
3. Perform a **Step over** and you should see the log in the UART Tera Term VT (see Figure 50, page 73).

Figure 50 Hitting a Breakpoint and Receiving Log Information

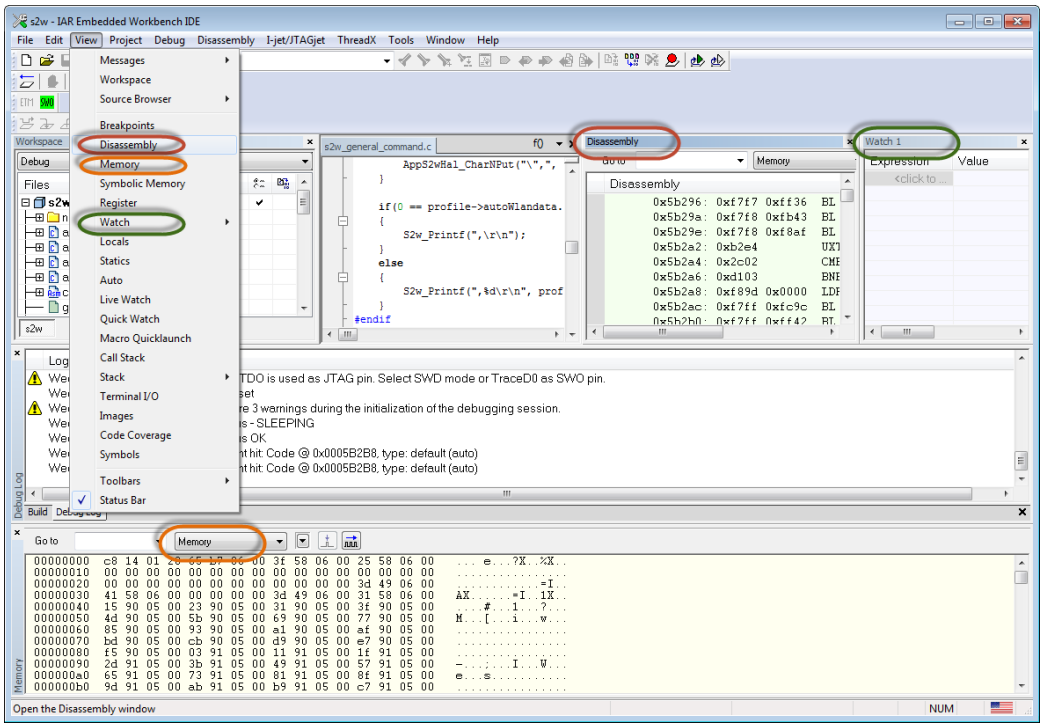


6.3.2 Viewing Assembly Code, Memory Location, and Watch for Variables

To view assembly code memory location, and watch for variables, perform the following:

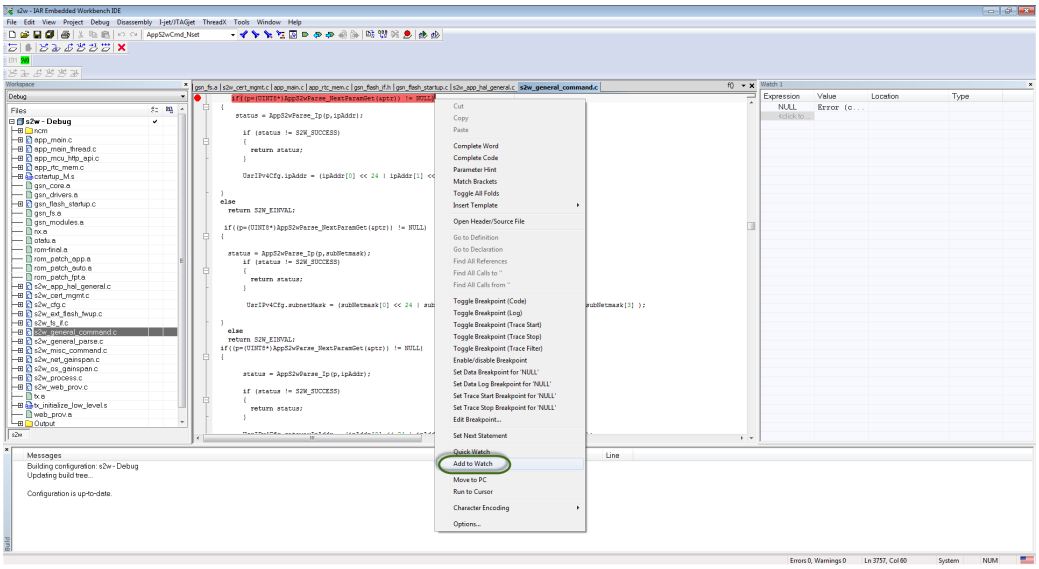
1. Select the **View** tab from the drop-down menu on the IAR Embedded Workbench IDE application. The **Disassembly**, **Memory**, and **Watch** sub-menu selections will display (see Figure 51, page 74).

Figure 51 Viewing Assembly Code, Memory Location, and Watch for Variables



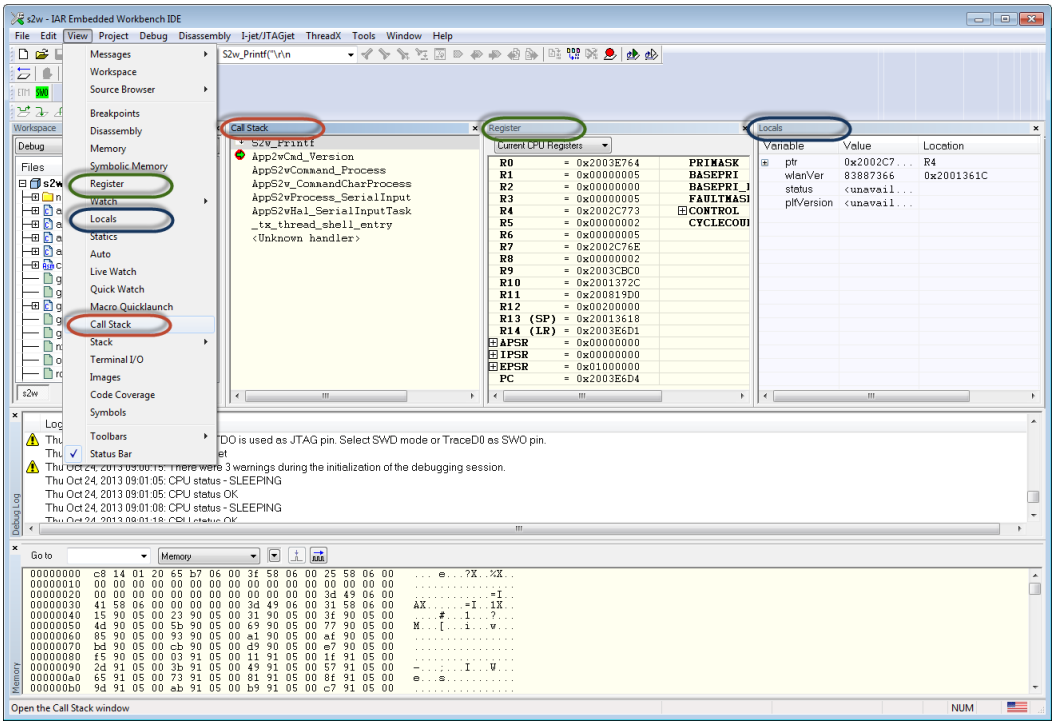
2. To add a variable to watch, right-click on the **Variable** and add to the watch window (see Figure 52, page 75).

Figure 52 Add Variable to Watch



3. To view Call Stack, Register, and Local variables, click on the **View** drop-down menu selection in the IAR Embedded Workbench IDE window and select **Call Stack**, **Register**, and **Locals** (see Figure 53, page 75).

Figure 53 Displaying Call Stack, Register, and Local Variables Information



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