# GS2000 Based Module Programming

# User Guide

*Using UART or SPI Interface*

**GS2K-EVB-FP-UG-001206**

*Modules*

**GS2011M and GS2100M**

**GainSpan® 802.11b/g/n Ultra-Low Power WiFi® Series Modules**

Contact Information

In an effort to improve the quality of this document, please notify GainSpan Technical Assistance at 1.408.627.6500 in North America or +91 80 42526503 outside North America.

# Table of Contents

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# About This Manual

This manual provides guidelines for programming the Flash memory on the GainSpan® GS2011M and GS2100M modules through either the UART or SPI interface on the GS2000 evaluation board.

Refer to the following sections:

# Revision History

This version of the *GainSpan GS2000 Based Module Programming User Guide* contains the following new information listed in Table 1, page 6.

**Table 1   Revision History**

| Version | Date | Remarks |
|---|---|---|
| 1.0 | November 2013 | Initial Release |
| 1.1 | February 2014 | Updated flash programming instructions. See 2.3  Programming the Evaluation Boards, page 28. |
| 1.2 | April 2014 | Updated instructions for building binaries using the SDK Builder. See 2.1  Building Binaries Using the SDK Builder Application, page 20. |
| 1.3 | May 2014 | Updated DOS flash programming instructions. See 2.3.4  Programming the Module Flash Using DOS, page 39. |
| 1.4 | June 2014 | Updated GUI application to support 921600 Baud Rate, Program same firmware image at multiple locations. See 2.3.2  Programming Firmware Image to Multiple Locations, page 34 and 2.3.3  Programming the Module on the Evaluation Board Using 921600 Baud Rate, page 36. |
| 1.4.1 | September 2014 | Updated Serial Flash Programmer for GS2000 screen capture and instructions to support version 1.2.2. See 2.3.1  Programming the Module Using GUI Application, page 28. |
| 1.4.2 | October 2014 | Updated instructions to include additional screen captures representing programming the GS2000 module. See 2.3.1  Programming the Module Using GUI Application, page 28 . |
| 1.5 | December 2014 | Added DOS instructions for programming the evaluation boards using 115200 and 921600 Baud Rate settings. See 2.5  Programming the Module Using DOS for UART Interface, page 43 and 2.8  Programming the Module Using DOS for SPI Interface, page 66. |

## Audience

This manual is designed for software engineers who want to program the on-board Flash to evaluate and run Serial-to-WiFi or Temperature and Light Sensor applications for their environment using DOS or Graphical User Interface procedures. These modules can be programmed using UART or SPI interface procedures.

## 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 8, 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.<br><br>`AT XXXX` |
| Proportional font description | Gives specific details about a parameter.<br><br>`<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.<br><br>`[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.<br><br>`<ESC>C` |
| <CR> Carriage return | Each command is terminated by a carriage return. |
| <LF> Line feed | Each command is terminated by a line feed. |

**Table 2   Document Text Conventions (Continued)**

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

Table 3, page 10, 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 11 includes the part number, documentation name, and a description of the document. The documents are available on the GainSpan Portal. Refer to Accessing the GainSpan Portal, page 16 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 utilizing either UART or SPI interface for 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 Based Module Software Developer Kit (SDK) Builder User Guide | Provides instructions that allow OEMs to configure and generate custom firmware binary images. |
| 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. |
| GS2K-IP2WIFI-APP-PRG-RG-001247 | GainSpan GS2000 Based Module IP-to-WiFi Adapter Application Programmer Reference Guide | Provides a complete listing of AT serial commands, including configuration examples for initiating, maintaining, and evaluation GainSpan IP-to-WiFi GS2000 based modules. |

## 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 13 are available on the GainSpan Portal. Refer to Accessing the GainSpan Portal, page 16 for details.

**Table 5   Other Documents and References**

| Title | Description |
|---|---|
| Schematics | GS2000 Based Module Evaluation Board schematics supporting:<br>• GS2011M<br>• GS2100M |
| Module Firmware and Programming Utilities | • Serial-to-WiFi (S2W) based firmware<br>• Temperature and Light Sensor (TLS) based firmware<br>  – For use with GS2011M EVK only<br>• Firmware Release Notes<br>• 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.<br>  – 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 14, 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 <br> China: Chinasupport@gainspan.com <br> Asia: Asiasupport@gainspan.com |
| Postal Address | GainSpan Corporation <br> 3590 North First Street <br> Suite 300 <br> 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).

# Chapter 1  GS2K Evaluation Board Overview

This chapter provides an overview of the GainSpan® Evaluation Board (EVB) based on the GS2011M or GS2100M ultra-low power wireless module solution for WiFi networks.

## 1.1 Introduction

The EVB provides customers the means to evaluate the capabilities of GainSpan ultra-low power wireless module solutions for WiFi® networks. The Serial-to-WiFi embedded software on the modules allows devices to easily add WiFi capabilities to their products.

The evaluation board comes with preloaded Serial-to-WiFi firmware that supports limited station AP mode, with built-in web server for provisioning the device.

The following steps are outlined in this user guide to program the firmware and related files onto the evaluation board using the programming utility provided:

## 1.2 Requirements

The following hardware and software are needed to program the GS2000 evaluation boards.

- For UART Interface Programming:
    - GS2011M or GS2100M Evaluation Board
    - mini-USB Cable
    - gs2k_flashprogram GUI and DOS application
    - SDK Builder - to build firmware binaries
    - Tera Term VT or similar terminal emulation software

- For SPI Interface Programming:
    - GS2011M or GS2100M Evaluation Board
    - Cheetah SPI Host Adapter (High-Speed USB to SPI Interface)
    - mini-USB Cable
    - gs2k_flashprogram GUI and DOS application
    - SDK Builder - to build firmware binaries
    - Tera Term VT or similar terminal emulation software
    - TotalPhaseUSB Drivers for Cheetah SPI Host Adapter - download the latest at: http://www.totalphase.com/products/usb-drivers-windows

# Chapter 2  Programming Modules on the Evaluation Board

This chapter provides step-by-step instructions on how to program the modules and evaluation board using the *gs2k_flashprogram* GUI application or DOS procedures with a new/different firmware image via UART or SPI interface connections.

**ESD ALERT!**  *Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.*

**NOTE:**  *GainSpan recommends you copy the contents of the flash program utilities to a created folder on your C:\drive.*

## 2.1 Building Binaries Using the SDK Builder Application

The SDK Builder application allows you to build binaries to program the flash for the GS2011M and GS2100M. To use the SDK Builder application, perform the following:

1. Open a web browser, and enter the following website at: www.gainspan.com, and click on the **USER LOGIN** button at the top right corner of the GainSpan web page (see Figure 1, page 20).

**Figure 1   Logging Into Your GainSpan Account**

2. The GainSpan User Sign In screen will display (see Figure 2, page 21). Enter your **Email** and **Password** and click **SIGN IN**.

**Figure 2   Sign In To Your GainSpan Account**

3. The **Getting Started** will guide you through helpful tips on how to program GainSpan products, search for support documentation, and navigate through the website. It will also give you a link directly to the SDK Builder (see Figure 3, page 22).

**Figure 3   Getting Started**

4.  You can also click on the **SDK Builder** and select a GainSpan module to create the firmware. For this example we are going to select **GS2000** (see Figure 4, page 23).

**Figure 4   Select GainSpan Module to Create Firmware**
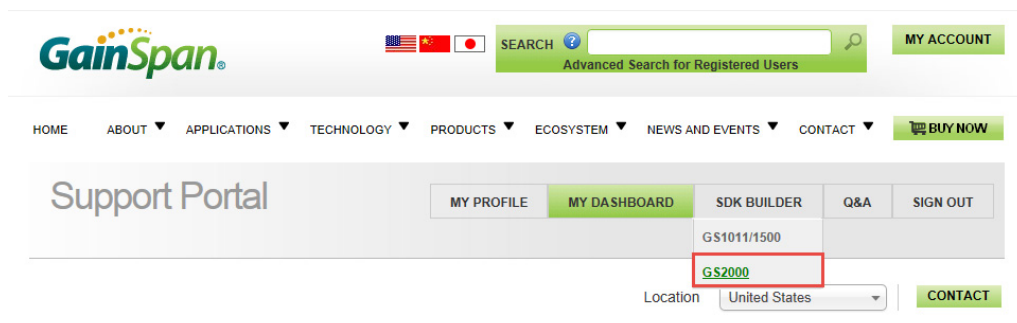


5.  The GainSpan SDK Builder Welcome screen displays links that give a brief explanation of the SDK Builder and Documentation (see Figure 5, page 23).

**Figure 5   GainSpan SDK Builder Welcome**
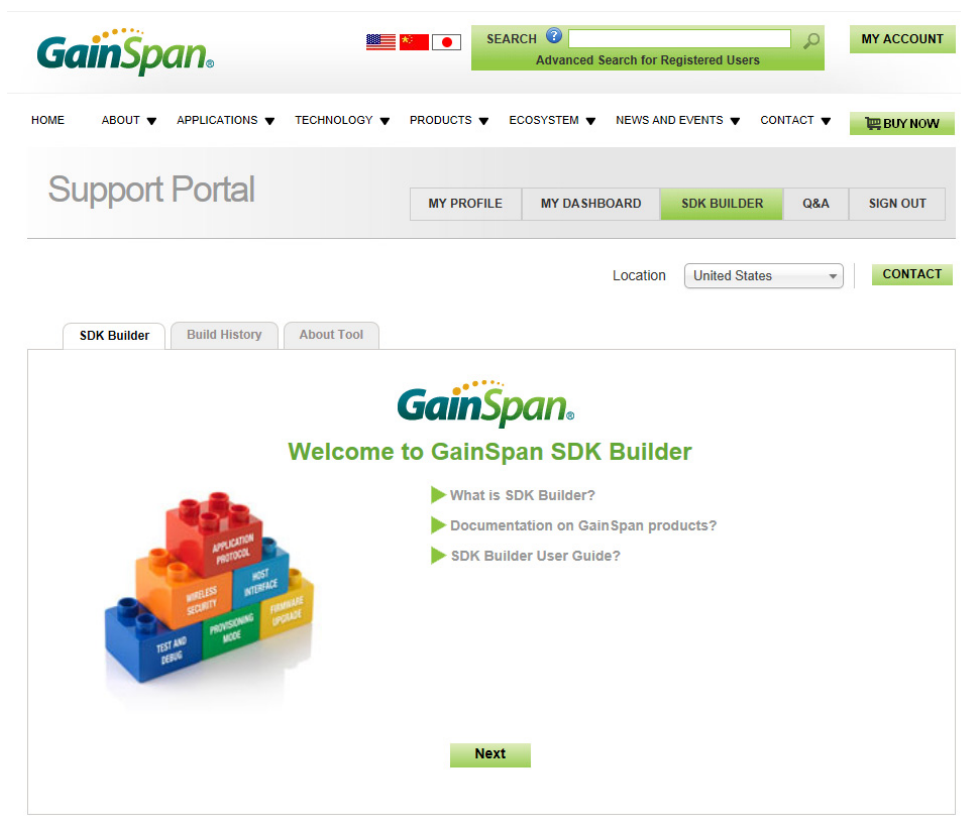


6.  Click the **Next** button to select your SDK Builder configuration.

7. The GainSpan SDK Builder Configuration screen allows you to select your firmware configuration options and submit your build. For details and description of each field, refer to the *GainSpan GS2000 Based Module Software Developer Kit (SDK) Builder User Guide*.

8. When the SDK Builder completes the process, it will compile and build your custom software. You will be notified through your email account once the build image is ready for download under the **Build History** tab.

9. Login to your GainSpan SDK Builder account and download the files.

10. Open or Save the Zip binary files to a created directory on your C:\drive, and unzip (Figure 6, page 24).

**Figure 6   Firmware Binary Files**
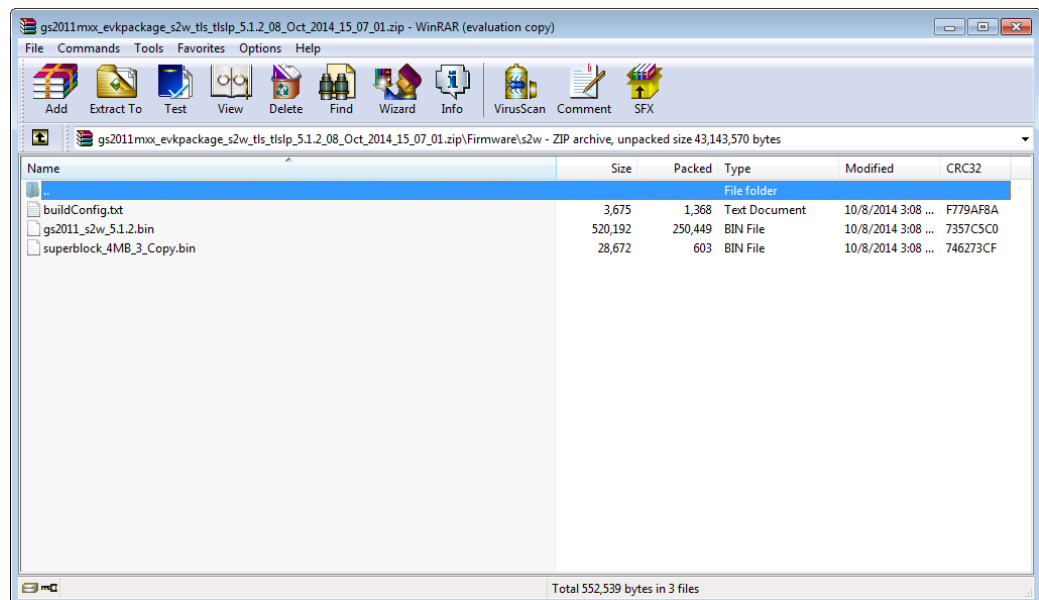
11. The firmware binary files for the module are displayed (see Figure 7, page 25). The created binary files are used to program the module using the GUI program.

**Figure 7   Binary Files Created Using the SDK Builder**
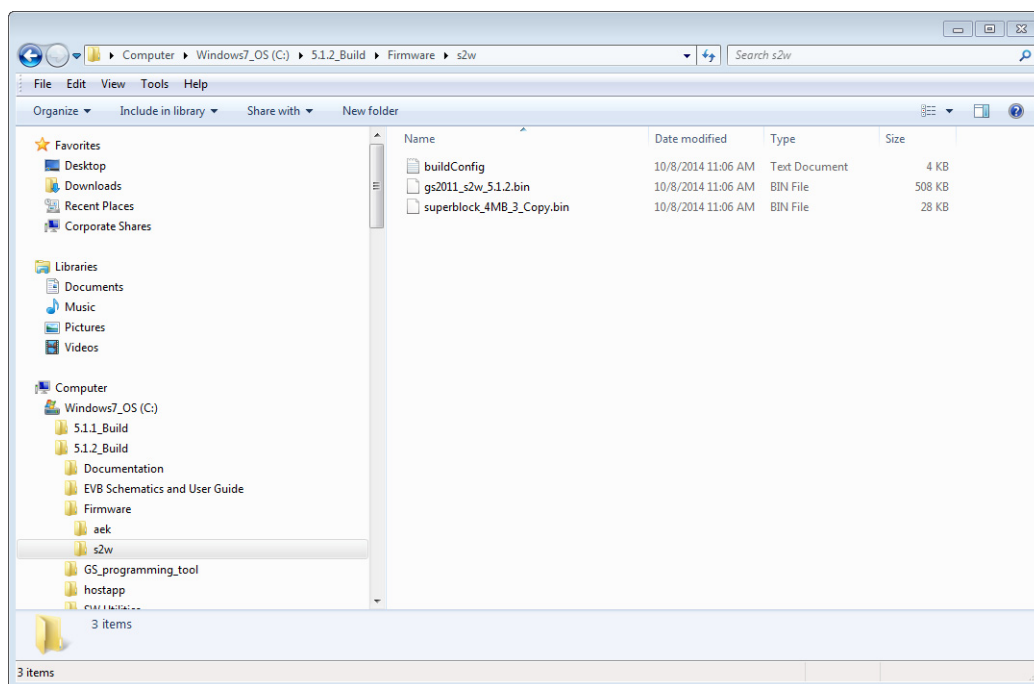


For instructions how to program the flash using DOS, refer to 2.5  Programming the Module Using DOS for UART Interface, page 43 and 2.8  Programming the Module Using DOS for SPI Interface, page 66.

## 2.2  Preparing the Evaluation Boards for UART Interface

### 2.2.1  GS2011M Evaluation Board

> **ALERT!**  *Make sure you unplug/plug the mini-USB cable with the ON/OFF switch in the OFF position.*

The following steps will guide you through programming the GS2011M evaluation board with the Serial-to-WiFi binaries using UART interface (see 1.2  Requirements, page 18):

1. Plug the mini-USB cable into the **USB0** port as shown in Figure 8, page 26.

2. Plug the other end of the mini-USB cable into a **USB** port on your computer.

3. Turn the PROGRAM/RUN switch on the GS2011M to the **PROGRAM** position.

4. Turn the ON/OFF power switch on the GS2011M to the **ON** position. The Program Flash LED will be lit **RED**, indicating that the module is ready to be programmed.

> **NOTE:**  *Refer to the GS2000 Based Module Evaluation Board Hardware User Guide for a list of components, jumpers, switches, and LEDs.*

> **NOTE:**  *GS2000 Evaluation Board versions may differ from the picture below.*

**Figure 8   Setting Up the GS2011M Evaluation Board to Program Flash Using UART**
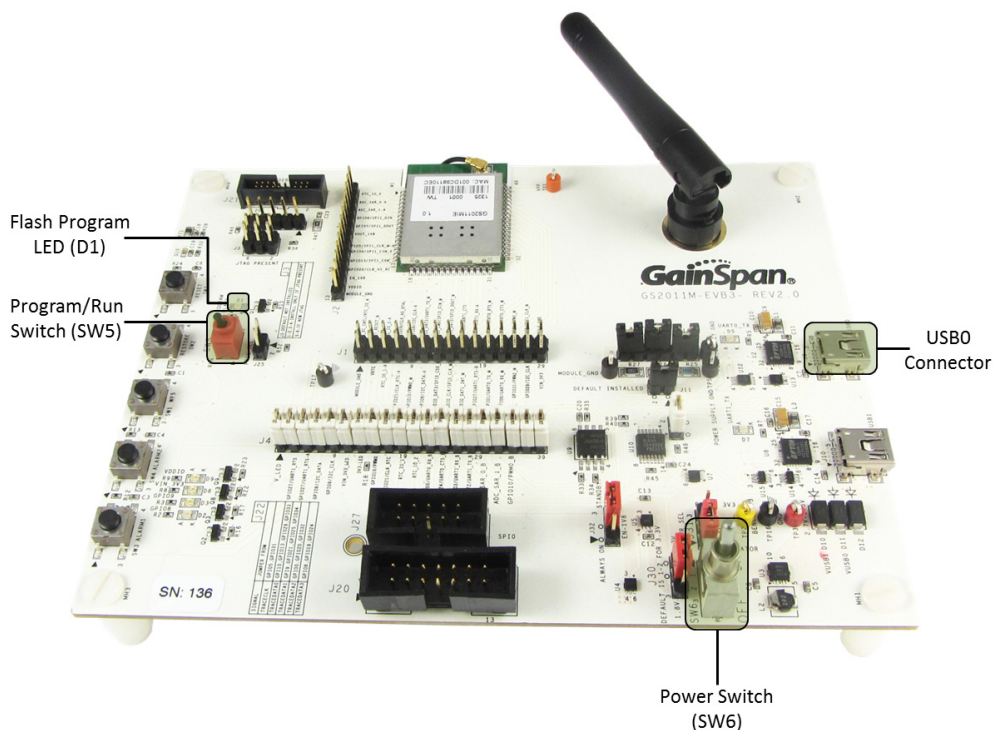
## 2.2.2 GS2100M Evaluation Board

*ALERT!* *Make sure you unplug/plug the mini-USB cable with the ON/OFF switch in the OFF position.*

The following steps will guide you through programming the GS2100M evaluation board with the Serial-to-WiFi binaries using UART interface (see 1.2 Requirements, page 18):

1. Plug the mini-USB cable into the **USB0** port as shown in Figure 9, page 27.

2. Plug the other end of the mini-USB cable into a **USB** port on your computer.

3. Turn the PROGRAM/RUN switch on the GS2100M to the **PROGRAM** position.

4. Turn the ON/OFF power switch on the GS2100M to the **ON** position. The Program Flash LED will be lit **RED**, indicating that the module is ready to be programmed.

*NOTE:* *Refer to the GS2000 Based Module Evaluation Board Hardware User Guide for a list of components, jumpers, switches, and LEDs.*

*NOTE:* *GS2000 Evaluation Board versions may differ from the picture below.*

**Figure 9   Setting Up the GS2100M Evaluation Board to Program Flash Using UART**
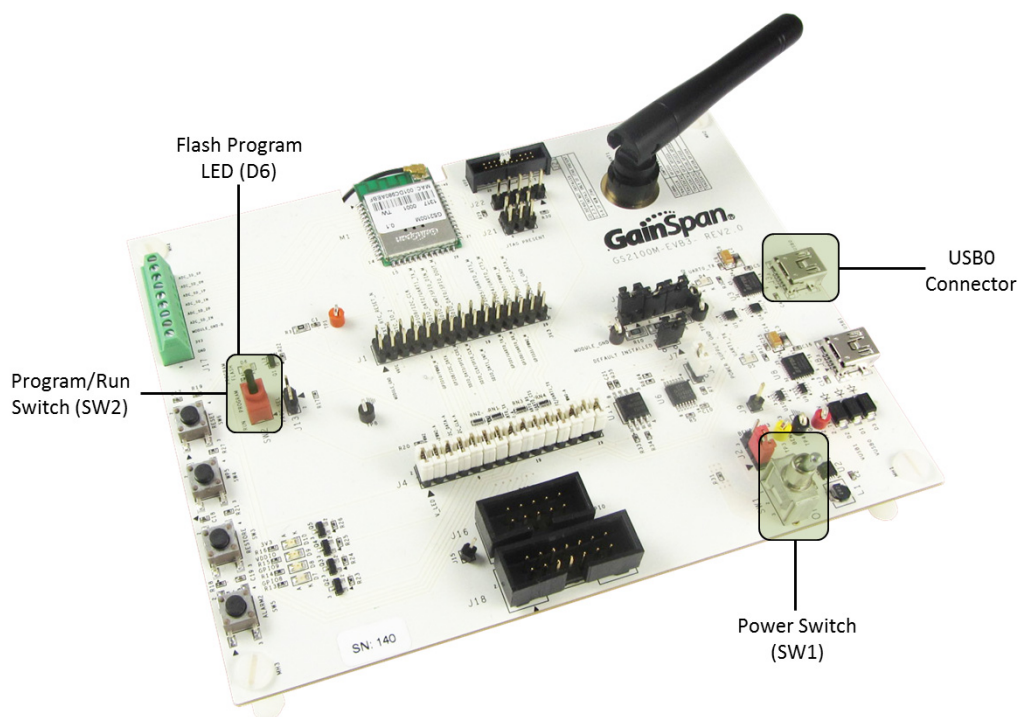
## 2.3 Programming the Evaluation Boards Using the GUI Application

The GainSpan GS2011M and GS2100M evaluation boards are programmed using the GS2000 Graphical User Interface (GUI) application.

> **NOTE:** *The following instructions are the same for programming the flash with different firmware types after the appropriate file name is chosen.*

To program the Flash using the GUI application, perform the following:

1. Open the location where your SDK package resides on your C:\drive. Refer to the *GainSpan GS2000 Based Module Software Developer Kit (SDK) Builder User Guide* for instructions on how to build SDK packages.

2. Open the **GS_programming_tool** folder, select and click on the **gs2k_flashprogram** application (see Figure 10, page 28).

**Figure 10   gs2k_flashprogram Application**
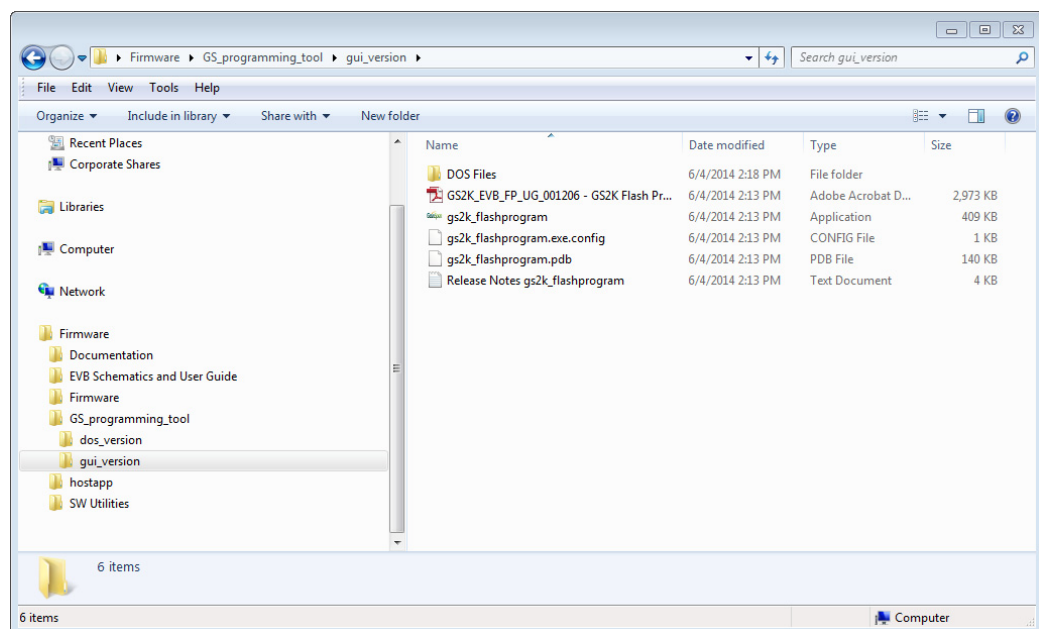


3. The **Serial Flash Programmer** window will display (see Figure 11, page 29).

**Figure 11   gs2k_flashprogram Application**
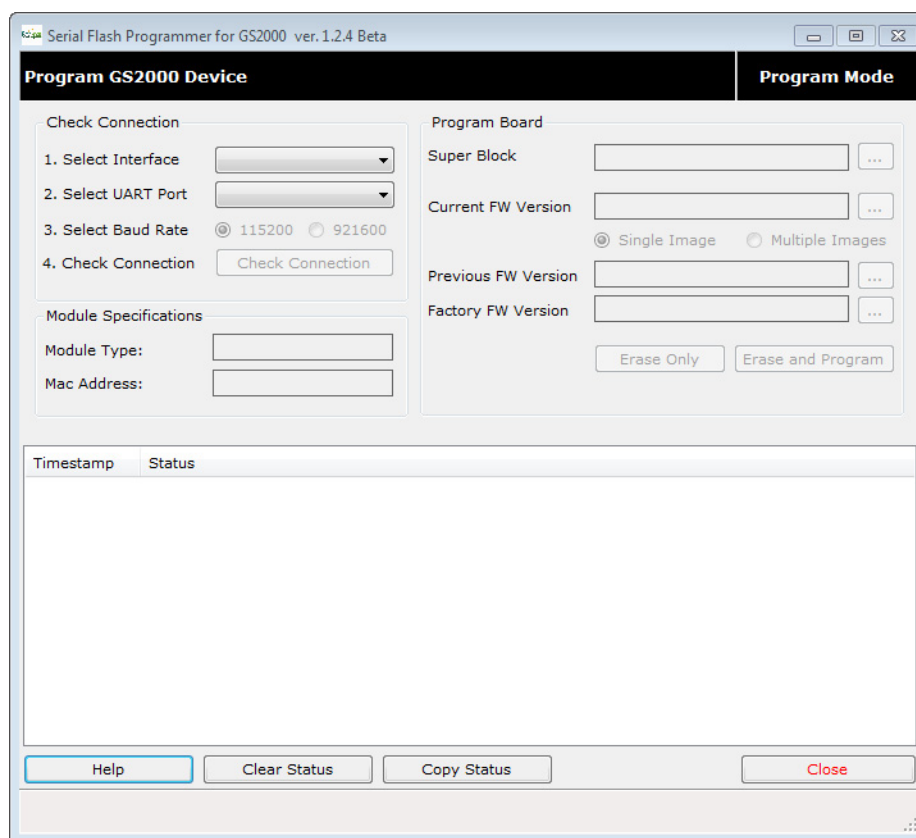


4. Turn the PROGRAM/RUN switch to the **PROGRAM** mode and turn the ON/OFF power switch **ON**. The Program Flash LED will be lit **RED**, indicating the board is ready for programming the module flash.

## 2.4 Programming the Module Using the UART Interface

For programming the GS2011M, GS2011MxxS, and GS2100M modules using UART interface, perform the following:

1. Select the **Single UART Interface** from the pull-down tab.

2. Select the **UART port**.

3. Select **Baud Rate**. The Baud Rate 115200 will automatically be selected. When selecting 921600 Baud Rate there are additional hardware instructions that need to be followed. Refer to 2.4.2 Programming the Module Using 921600 Baud Rate - UART, page 40.

4. Click the **Check Connection** button. The software will communicate with the GS2011M or GS2100M evaluation board to check the connection and display the **Module Specifications** (Module Type and Mac Address of the module). A **Green** check will display at the bottom of the screen indicating the Connection and Communication with the board is successful along with the selections specified (see Figure 12, page 30).

**Figure 12    Communicating with the GainSpan Module - (UART)**
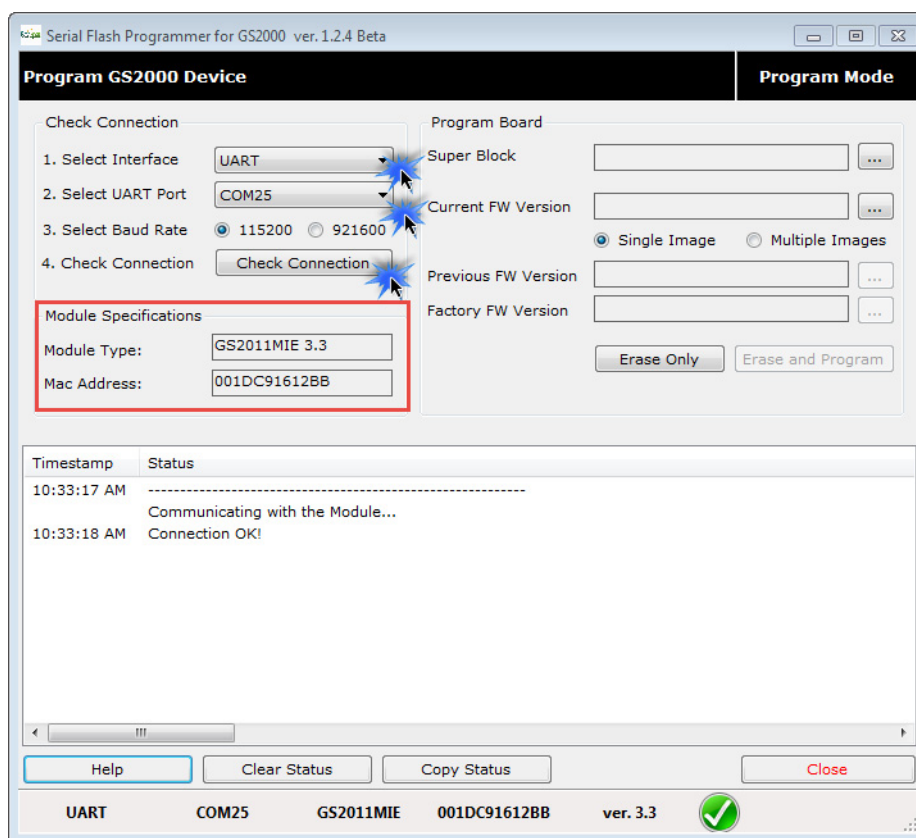
5.  Select the Firmware and Binaries to program the board with a Single Image. Click the **Browse (...)** buttons next to the **Super Block** and **Current FW Version** to download (see Figure 13, page 31).

**Figure 13   Select Super Block and Firmware Single Image Binaries - (UART)**
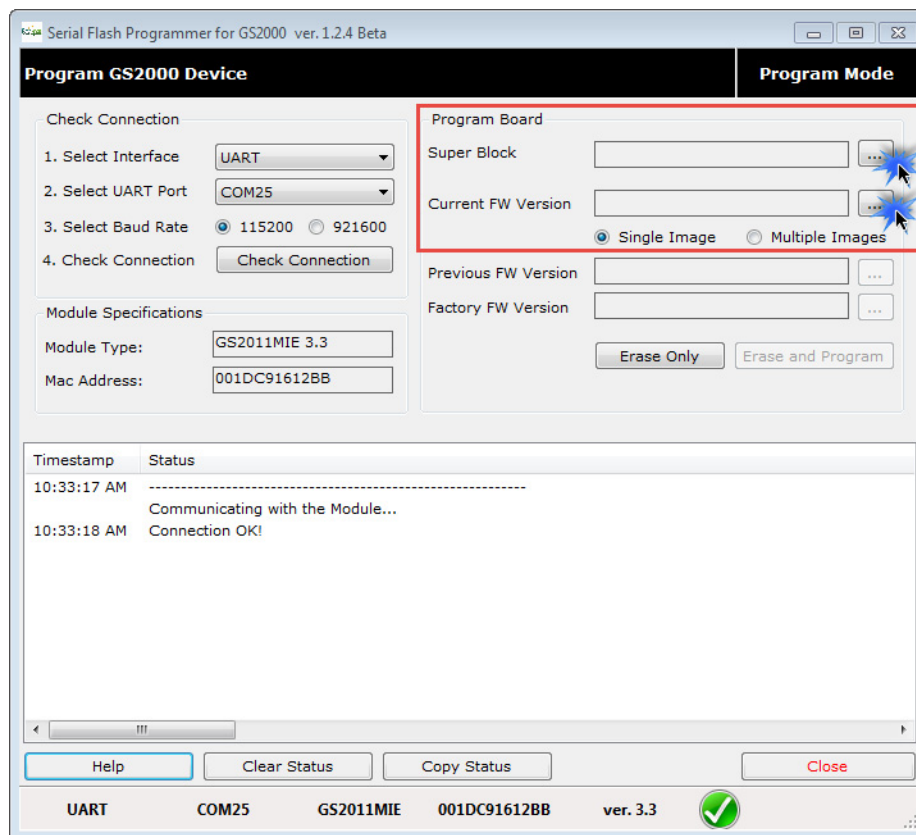
6. Select Single Image to program. This will program the module with a single firmware binary image. *This is the default and recommended method* (see Figure 14, page 32). For instructions on how to program the board with multiple images, refer to 2.4.1 Programming the Module With Multiple Images - UART, page 35.

**Figure 14   Selecting Single Image Firmware - (UART)**
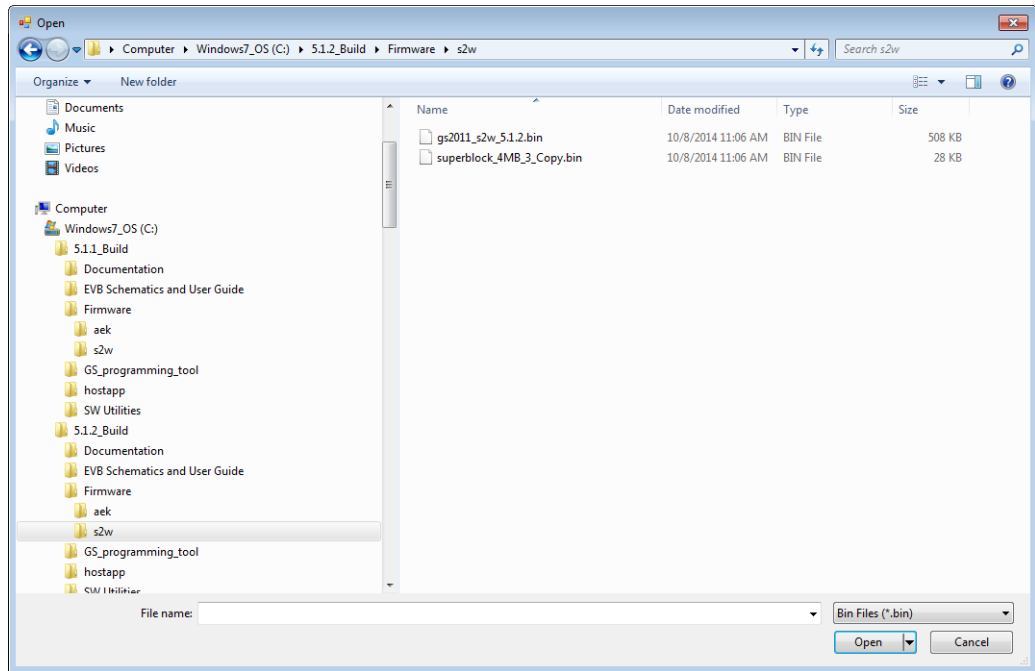


7. Once selected, a message will display indicating that a valid Super Block and Firmware Image have been selected (see Figure 15, page 33).

**Figure 15   Valid Super Block and Firmware Single Image Selected - (UART)**
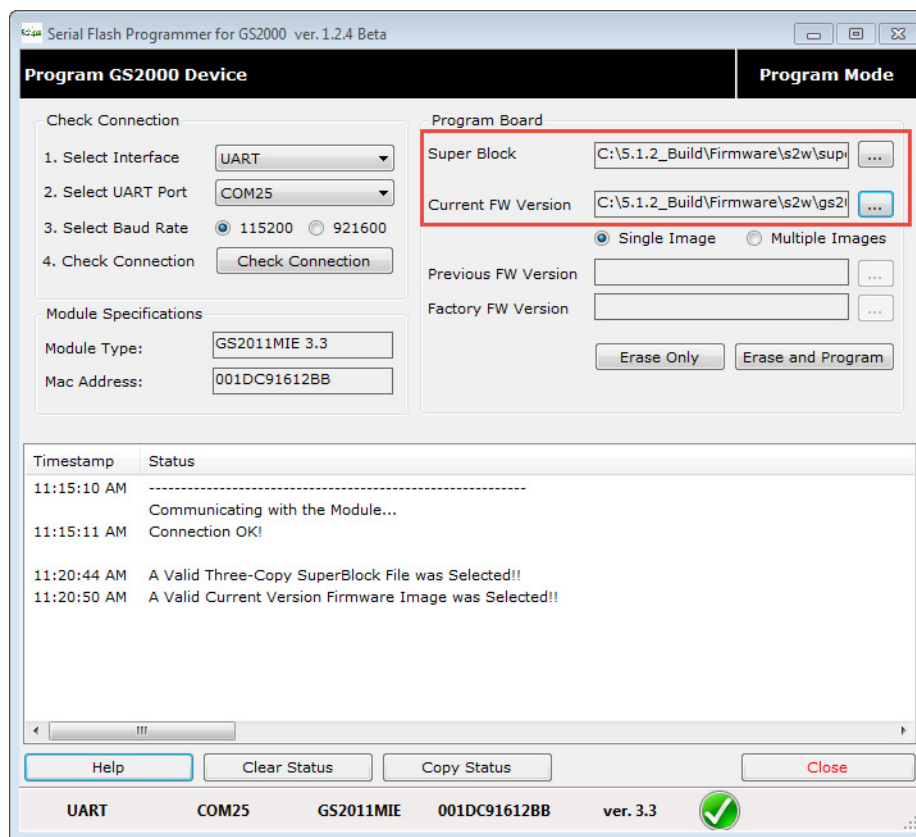
8. Click the **Erase and Program** button. The GUI software will go through a process of programming the module flash with the new firmware and binaries. When complete a **Green** check will display indicating the flash has been programmed successfully (see Figure 16, page 34).

**Figure 16  Programming Single Image Complete - (UART)**



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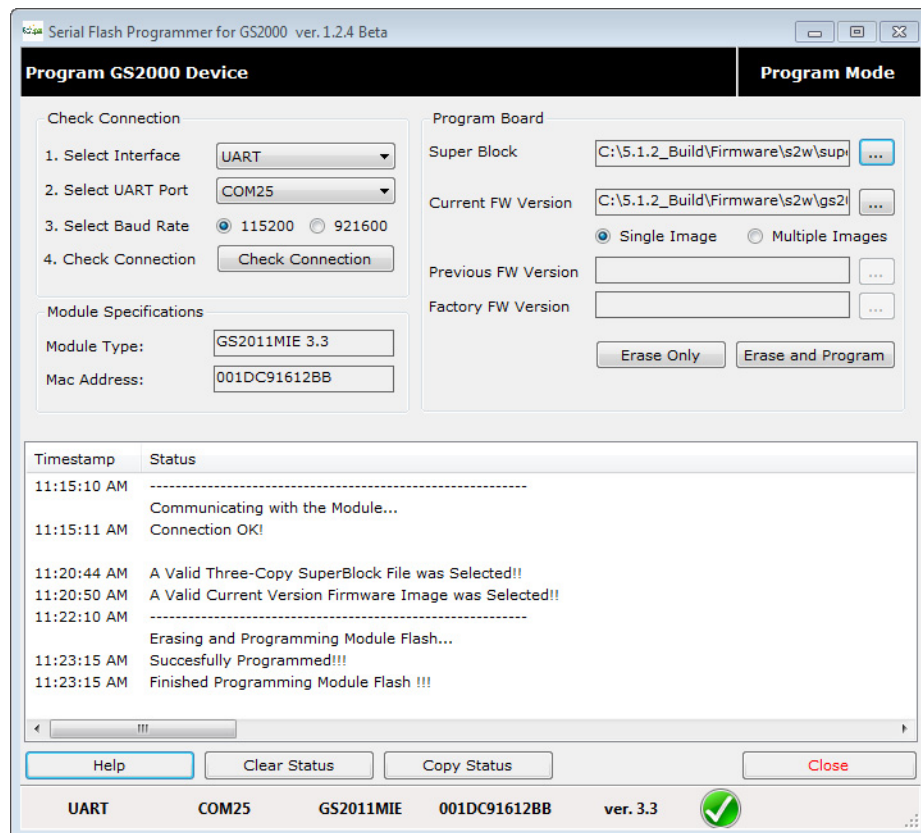
**NOTE:**  *The Erase Flash button will erase the entire flash on the module.*

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9. Click the **Close** button. Turn the ON/OFF switch to the **OFF** position. Turn the PROGRAM/RUN switch to the **RUN** position. Turn the ON/OFF switch back to the **ON** position.

The GS2011M or GS2100M is now ready to be verified. Refer to Chapter 3 Associating and Verifying, page 73.

To program the module flash using DOS, follow the instructions in 2.5 Programming the Module Using DOS for UART Interface, page 43.

For instructions on how to program the module using the SPI interface, refer to 2.7 Programming the Module Using the SPI Interface, page 56.

## 2.4.1 Programming the Module With Multiple Images - UART

Programming the evaluation board with multiple images is used when you want to have previous or factory default versions of firmware binaries programmed onto the same board. For example, if a current build isn't working for your environment, you can revert back to a previous build.

To program multiple images using UART interface, perform the following:

1. Follow the instructions for connecting to an Interface, UART port, Baud Rate, and Check Connection to communicate with the board (see 2.3 Programming the Evaluation Boards Using the GUI Application, page 28).

2. Select the **Multiple Images** button, and select the Firmware and Binaries to program the board. Click the **Browse (...)** buttons next to the Super Block and Current FW Version to download (see Figure 17, page 35 and Figure 18, page 36).

*NOTE:* The Super Block and Current FW Version should be the latest version when programming multiple images.

**Figure 17   Select Super Block and Firmware Multiple Image Binaries - (UART)**
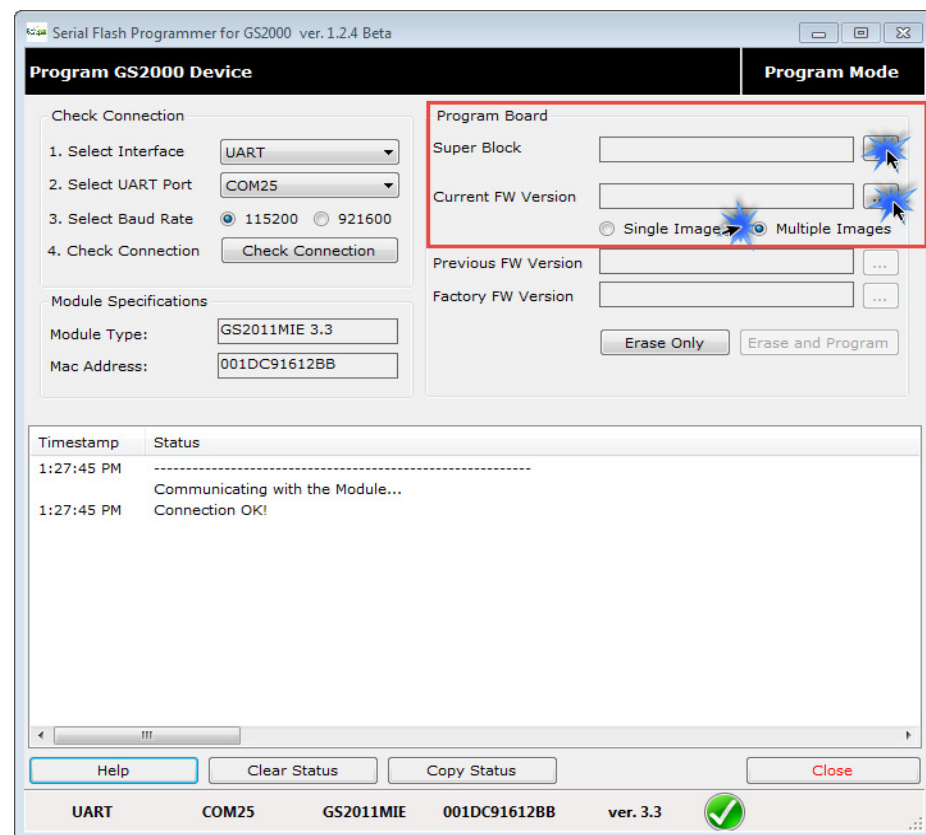
3. Select the Super Block and Current FW Version to program the board (see Figure 18, page 36). For the Multiple Images, version 5.1.2 was selected.

**Figure 18    Selecting Super Block and Current Firmware Version - (UART)**
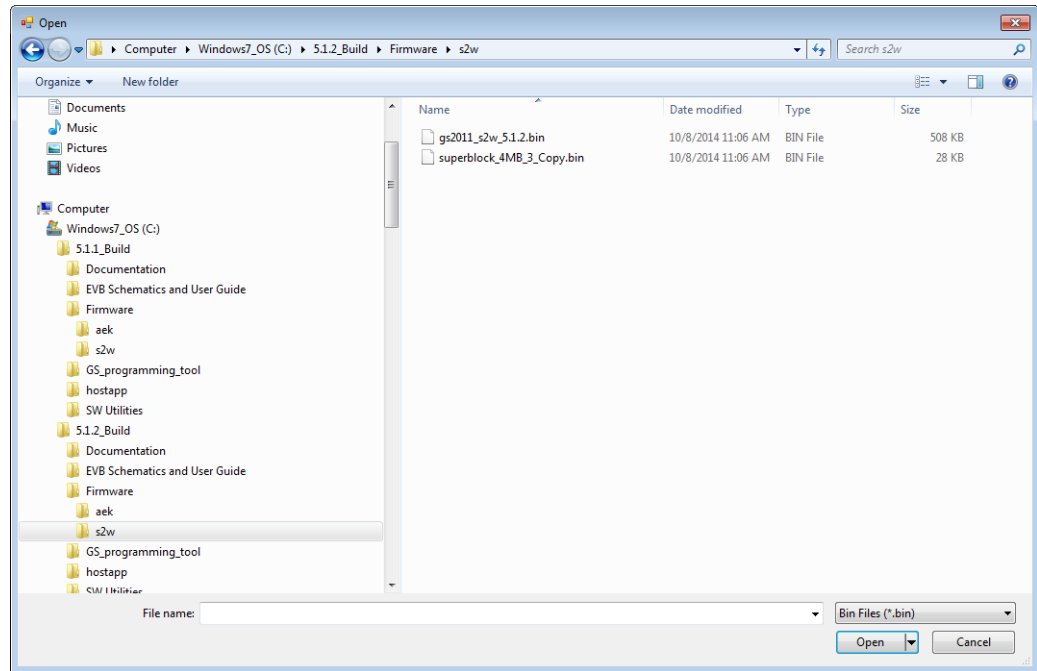


4. Once selected a message will display indicating that a valid Super Block and Firmware Image have been selected.

5. Select the **Previous FW Version** and/or **Factory FW Version**. Click the **Browse (...)** button next to the **Previous FW Version** and/or **Factory FW Version**. For the previous and factory firmware versions, 5.1.1 was selected (see Figure 19, page 37 and Figure 20, page 38).

**Figure 19   Selecting Previous and Factory Firmware Versions - (UART)**
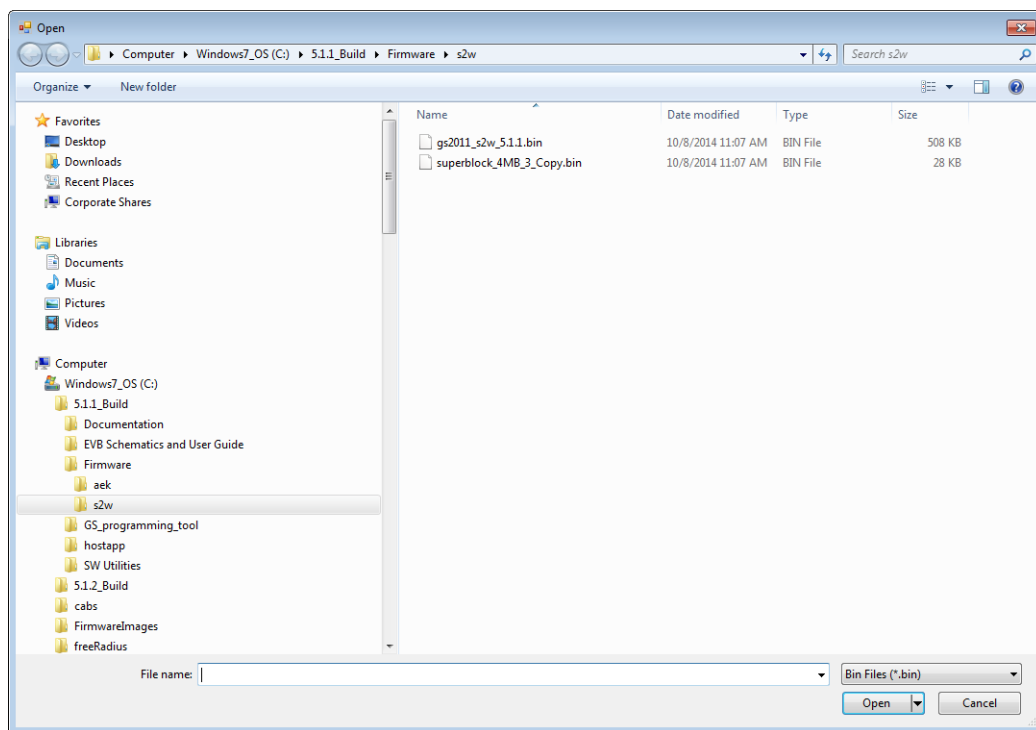
**Figure 20   Valid Multiple Images Selected - (UART)**
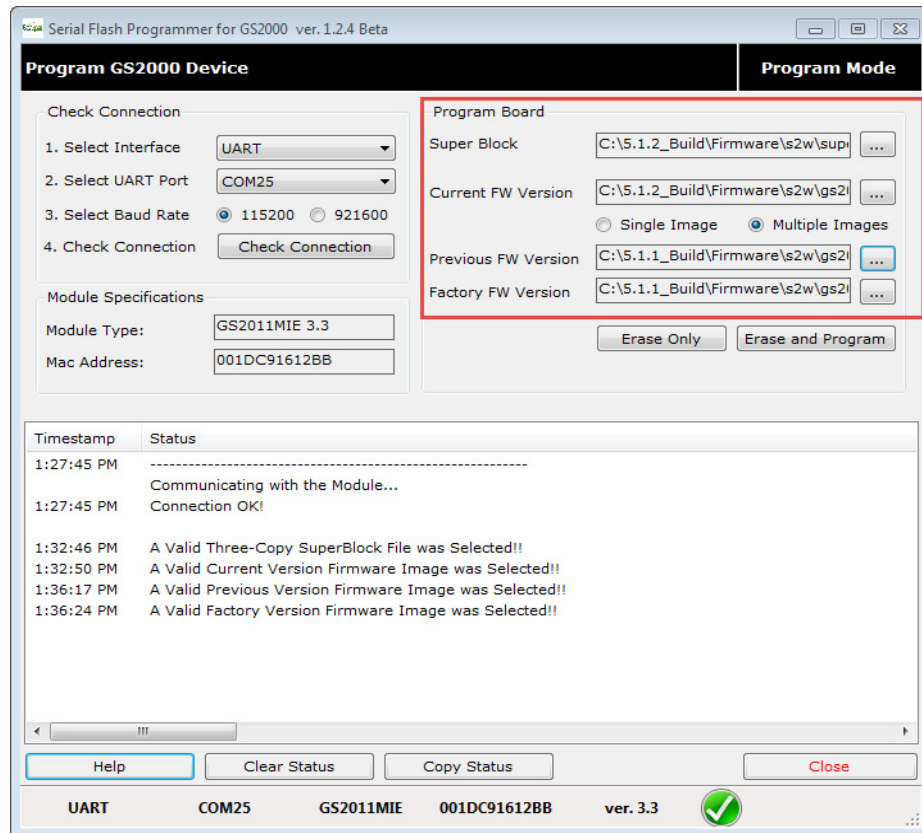


6.  Click the **Erase and Program** button. The GUI software will go through a process of programming the module flash with the current firmware and binaries, and previous and factory versions for Multiple Images. When complete a **Green** check will display indicating the flash has been programmed successfully (see Figure 21, page 39).

**Figure 21   Programming Multiple Images Complete - (UART)**
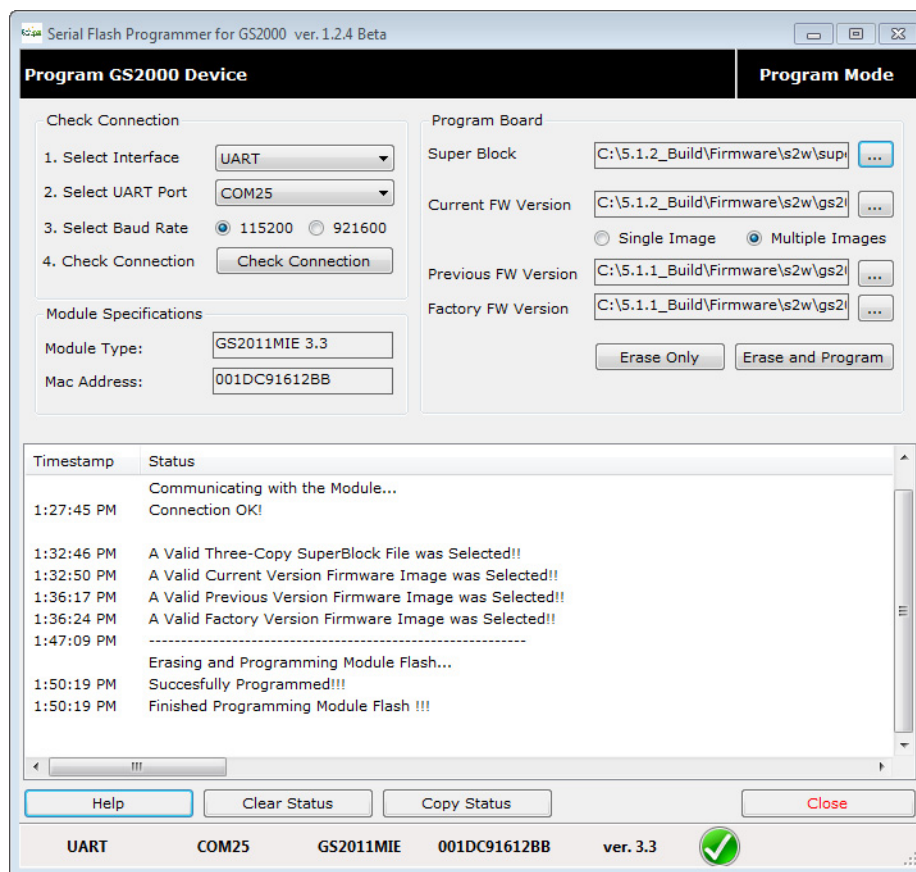


> **NOTE:** *The Erase Flash button will erase the entire flash on the module.*

7.  Click the **Close** button. Turn the ON/OFF switch to the **OFF** position. Turn the PROGRAM/RUN switch to the **RUN** position. Turn the ON/OFF switch back to the **ON** position.

The GS2011M or GS2100M is now ready to be verified. Refer to Chapter 3 Associating and Verifying, page 73.

For instructions on how to program the module using the SPI interface, refer to 2.7  Programming the Module Using the SPI Interface, page 56.

## 2.4.2  Programming the Module Using 921600 Baud Rate - UART

To program the GS2000 module on the evaluation board using Baud Rate 921600, perform the following:

1.  Turn the ON/OFF switch on the evaluation board to the **OFF** position.

2.  Install a jumper on pin **J25** on the GS2011M (see Figure 22, page 40) evaluation board and pin **J13** on the GS2100M (see Figure 23, page 41) evaluation board and then power **ON** the board.

> **NOTE:** *Refer to the GS2000 Based Module Evaluation Board Hardware User Guide for a list of components, jumpers, switches, and LEDs.*

> **NOTE:** *GS2000 Evaluation Board versions may differ from the picture below.*

**Figure 22   GS2011M Baud Rate Jumper Settings - (UART)**
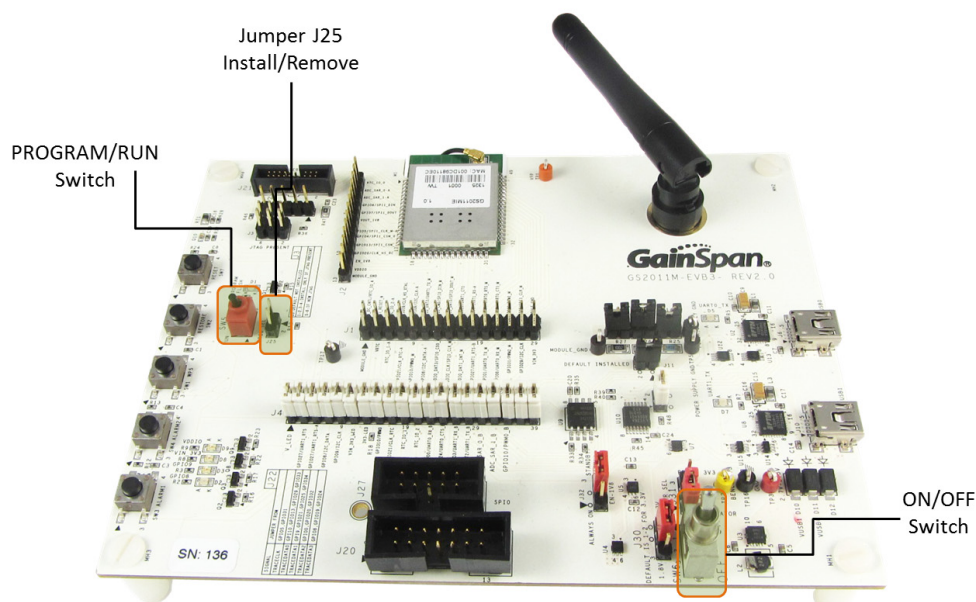


> **NOTE:** *The Jumper does not need to be installed on the evaluation boards when programming the Flash using SPI Interface.*

**Figure 23   GS2100M Baud Rate Jumper Settings - (UART)**
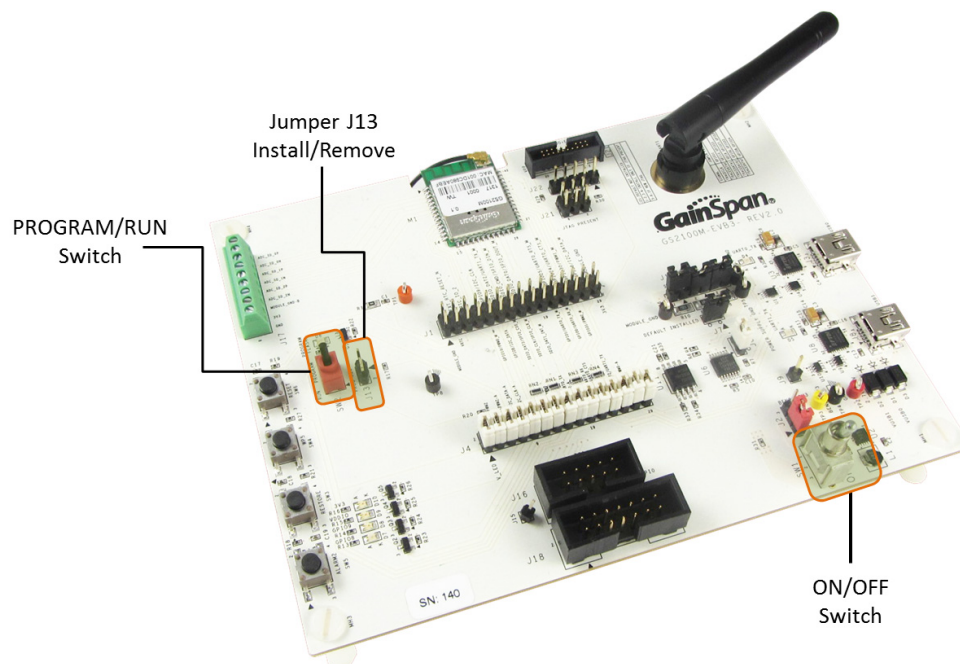


> **NOTE:**  *The Jumper does not need to be installed on the evaluation boards when programming the Flash using SPI Interface.*

3.   Select the Baud Rate **921600** (see Figure 24, page 42).

**Figure 24   Selecting 921600 Baud Rate - (UART)**
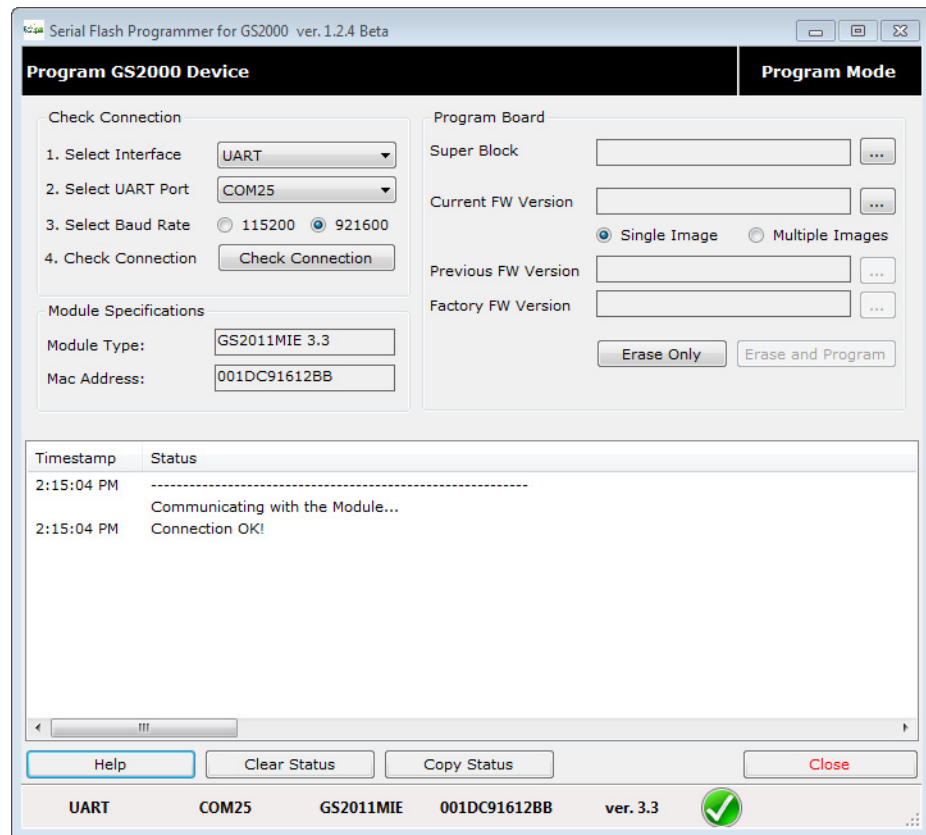


4.   Continue with programming the Flash for Single or Multiple Images. Refer to 2.4  Programming the Module Using the UART Interface, page 30 and 2.4.1  Programming the Module With Multiple Images - UART, page 35.

5.   When complete, turn the ON/OFF switch on the evaluation board to the **OFF** position.

6.   Remove the jumper on pin **J25** on the GS2011M evaluation board (see Figure 22, page 40) or pin **J13** on the GS2100M (see Figure 23, page 41) evaluation board.

> **NOTE:**  *Refer to the GS2000 Based Module Evaluation Board Hardware User Guide for a list of components, jumpers, switches, and LEDs.*

> **NOTE:**  *The board will not run if these jumpers are installed with the PROGRAM switch in RUN mode.*

7.   Turn the PROGRAM/RUN switch to the **RUN** position. Turn the ON/OFF switch to the **ON** position. The evaluation board is now ready to be verified as well as accept AT commands. Refer to Chapter 3 Associating and Verifying, page 73.

## 2.5 Programming the Module Using DOS for UART Interface

The following instructions are used to program the flash on the GS2011M and GS2100M evaluation boards using the DOS procedure for UART interface using different Baud Rates (115200 or 921600). The **gs_flashprogram_DOS_UART_115K** and **9121K** scripts are located under the DOS folder (see Figure 25, page 43).
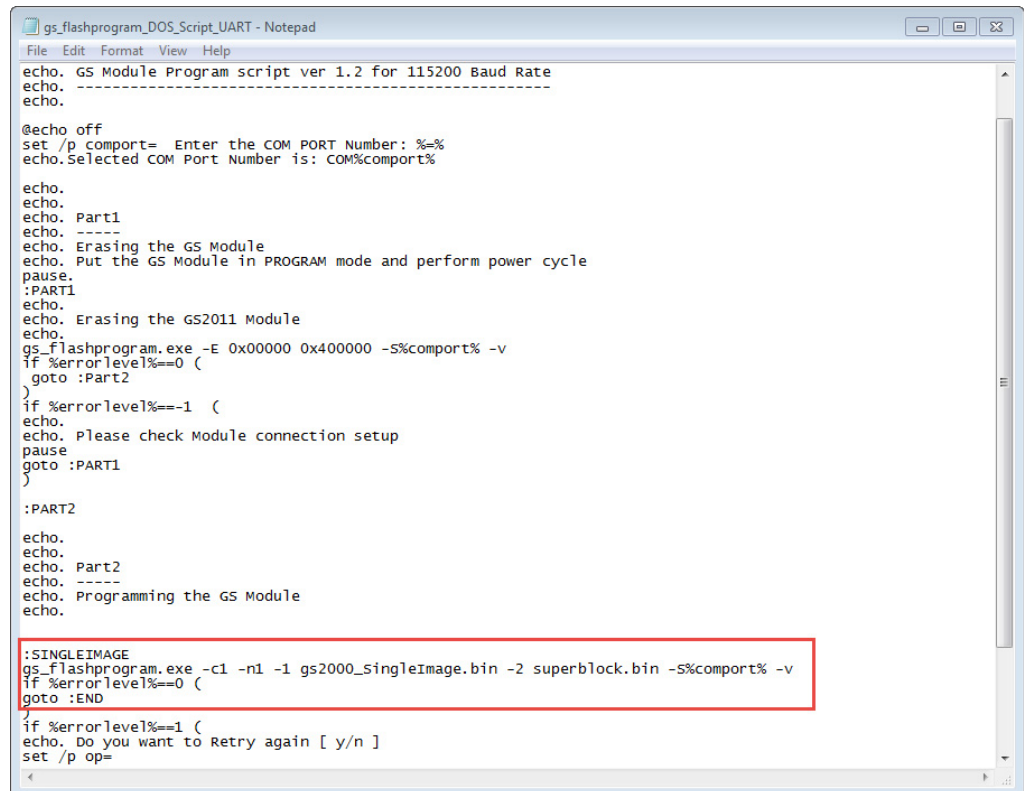
**Figure 25   GS_Flashprogram DOS Script for 115200 or 921600 Baud Rate - (UART)**
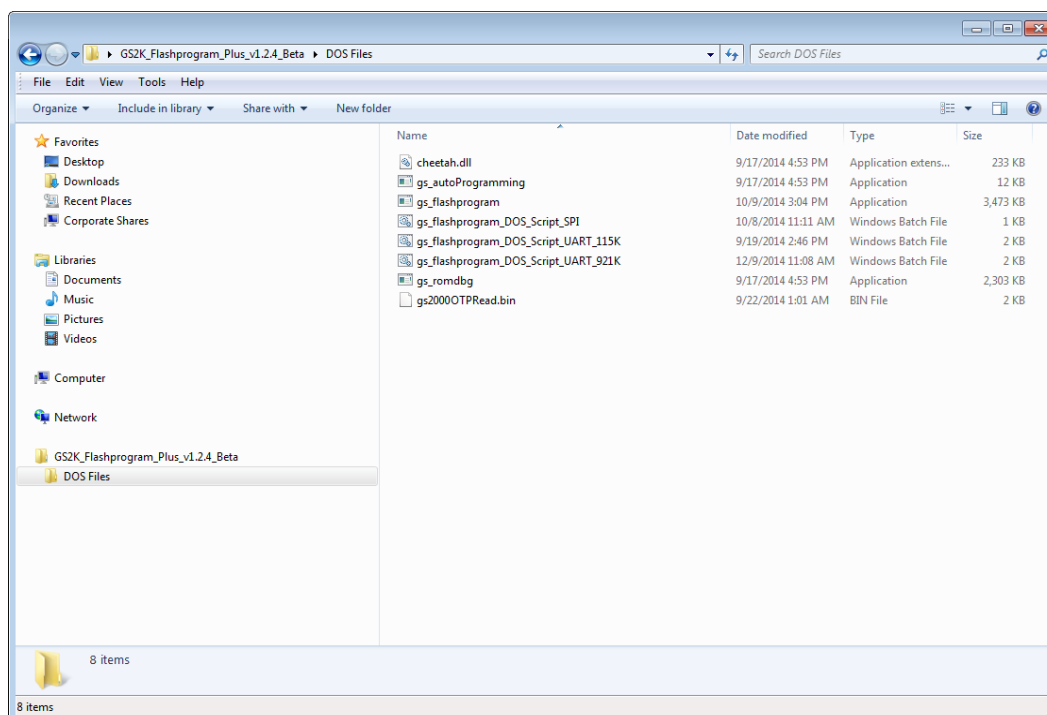
## 2.5.1 Programming the Module Using DOS 115200 Baud Rate - UART

1. Select **gs_flashprogram_DOS_Script_UART_115K** and right-mouse click on the batch file and select Edit. This will open the DOS script for UART 115K in a text editing tool like Notepad. Scroll down until you reach the **SINGLEIMAGE** script binary files (see Figure 26, page 44).

**Figure 26   Edit gs_flashprogram DOS Script for 115200 Baud Rate - (UART)**

2. Edit the binary file names (see Figure 27, page 45) to match the binary file names that where created in the build (see Figure 7, page 25) from the SDK Builder. For this example the names reflect the GS2011M.

**Figure 27   Edited GS2011M Binary File Names for 115200 Baud Rate - (UART)**



3. Click the **Save** button. To verify that the DOS script file has been updated, reopen the DOS folder under the **gs2k_Flashprogram_Plus** folder and reopen in Notepad.

4. Copy the two binary files from the build created with the SDK Builder to the DOS folder (see Figure 28, page 46). Refer to Figure 7, page 25 to for the binary files to be copied.

**Figure 28   Copy Super Block and Firmware Binary Files to DOS Folder for 115200 Baud Rate - (UART)**
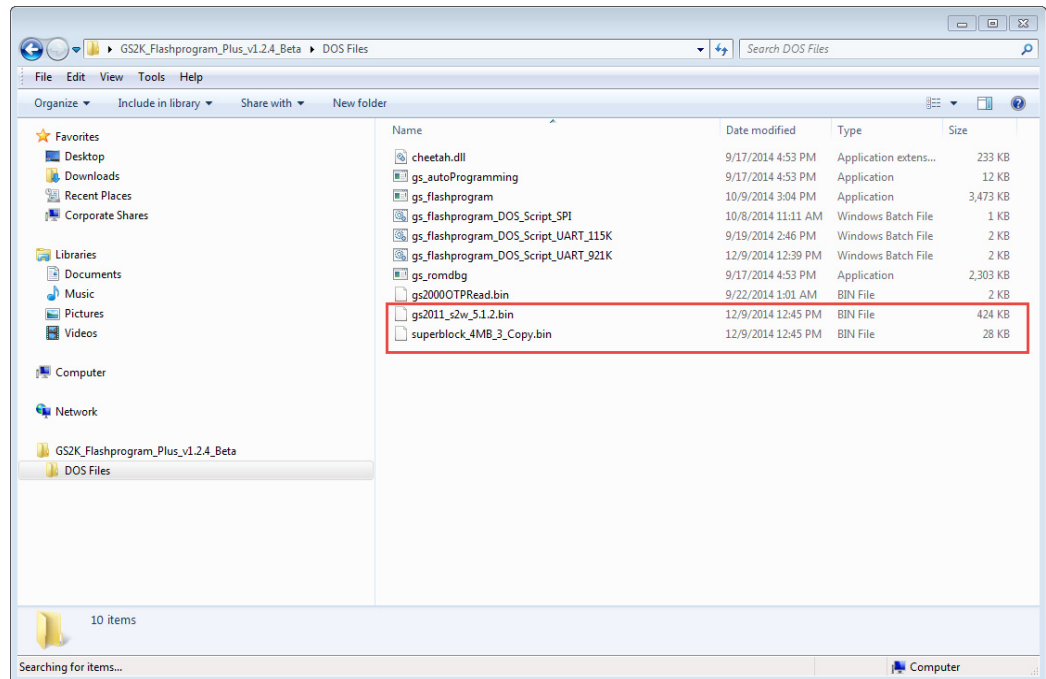
5. To run the GainSpan flash program DOS version, click on the DOS script UART batch file.

6. The **GS Module Program Script** screen will display (see Figure 29, page 47). For running UART, enter the **COM** port number assigned to the module and press the **Enter** key.

**Figure 29   Running GS Module Program DOS Script for 115200 Baud Rate - (UART)**
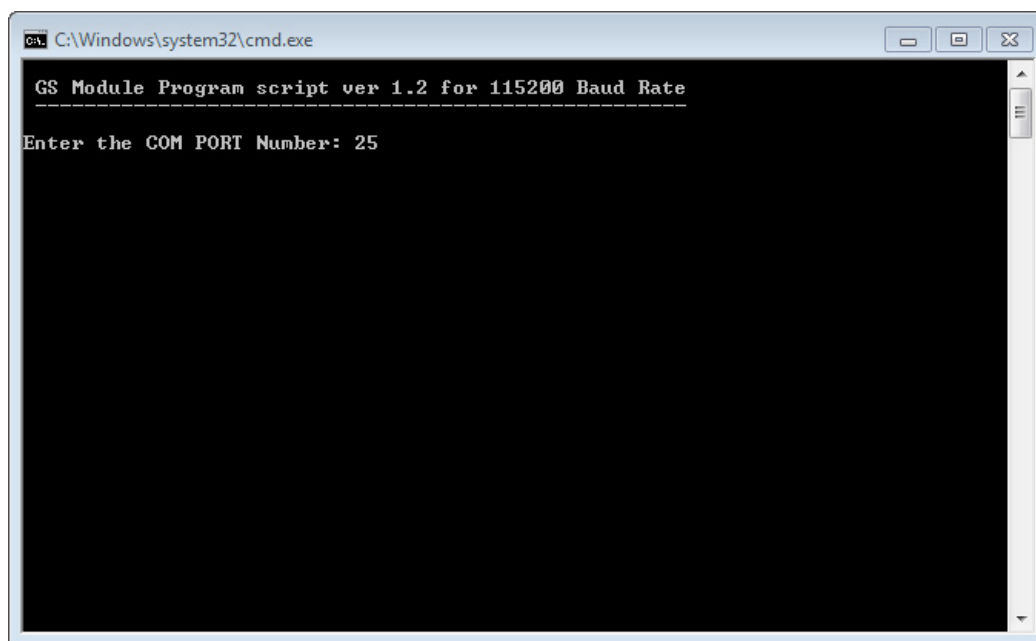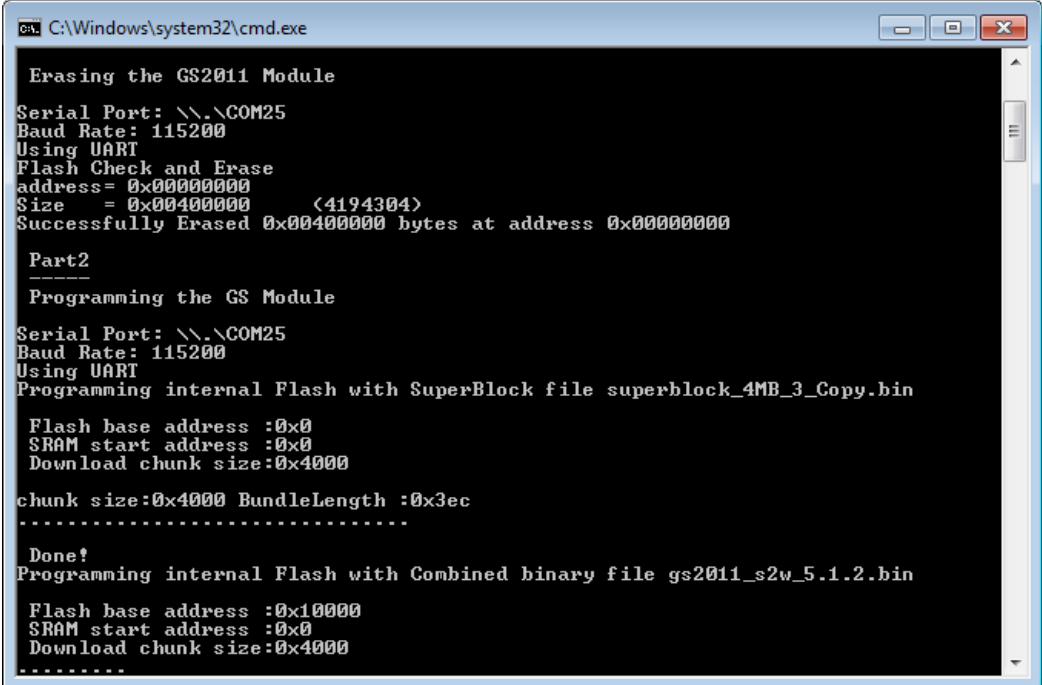


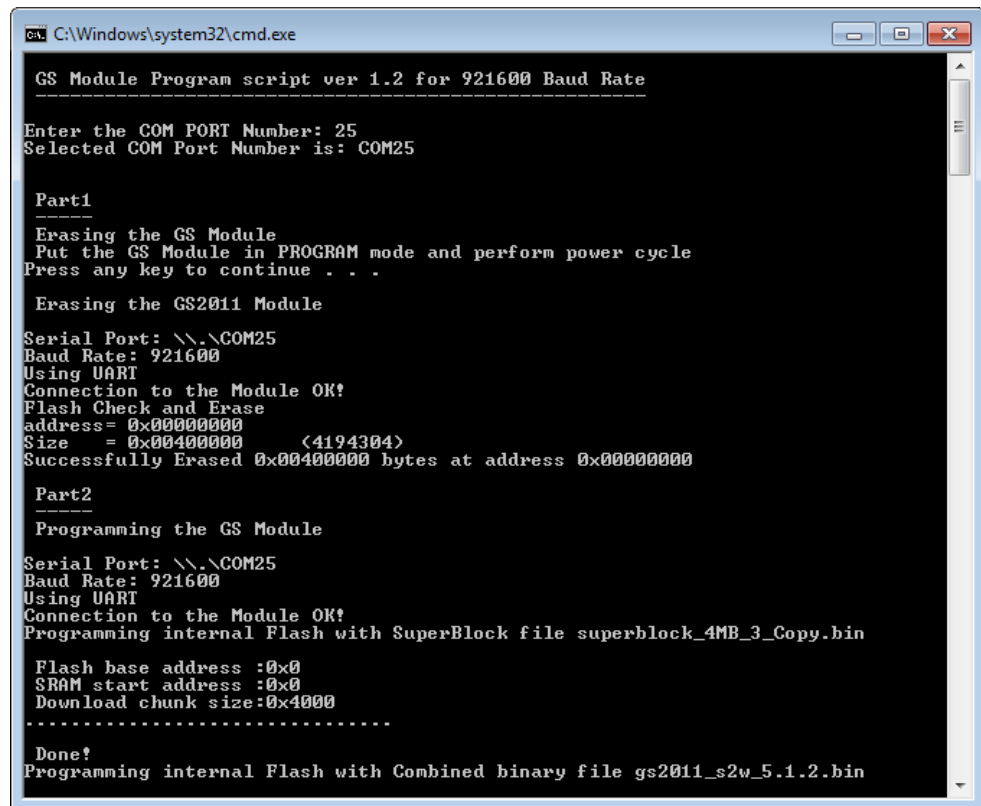> **NOTE:** *Remove jumper on pin J25 on the GS2011M evaluation board and pin J13 on the GS2100M evaluation board when selecting 115200 Baud Rate for DOS programming.*

7. Press any key to continue programming the flash for UART (see Figure 30, page 48). This will take several minutes.

> **NOTE:** *If the evaluation board was not in PROGRAM mode, the programming utility will indicate a timeout.*

**Figure 30   Programming the Flash Using DOS for 115200 Baud Rate - (UART)**



8.  When complete, a message will display indicating the module is successfully programmed. Press any key to close the DOS programming screen. Turn the ON/OFF switch on the evaluation board to the **OFF** position.

Refer to Chapter 3 Associating and Verifying, page 73 to verify that the evaluation board has been programmed.

## 2.5.2 Programming the Module Using DOS 921600 Baud Rate - UART

1. Select **gs_flashprogram_DOS_Script_UART_921K** and right-mouse click on the batch file and select Edit. This will open the DOS script for UART 921K in a text editing tool like Notepad. Scroll down until you reach the **SINGLEIMAGE** script binary files (see Figure 31, page 49).

**Figure 31   Edit gs_flashprogram DOS Script for 921600 Baud Rate - (UART)**

2. Edit the binary file names (see Figure 32, page 50) to match the binary file names that where created in the build (see Figure 7, page 25) from the SDK Builder. For this example the names reflect the GS2011M.

**Figure 32   Edited GS2011M Binary File Names for 921600 Baud Rate - (UART)**



3. Click the **Save** button. To verify that the DOS script file has been updated, reopen the DOS folder under the **gs2k_Flashprogram_Plus** folder and reopen in Notepad.

4. Copy the two binary files from the build created with the SDK Builder to the DOS folder (see Figure 33, page 51). Refer to Figure 7, page 25 to for the binary files to be copied.

**Figure 33   Copy Super Block and Firmware Binary Files to DOS Folder for 921600 Baud Rate - (UART)**
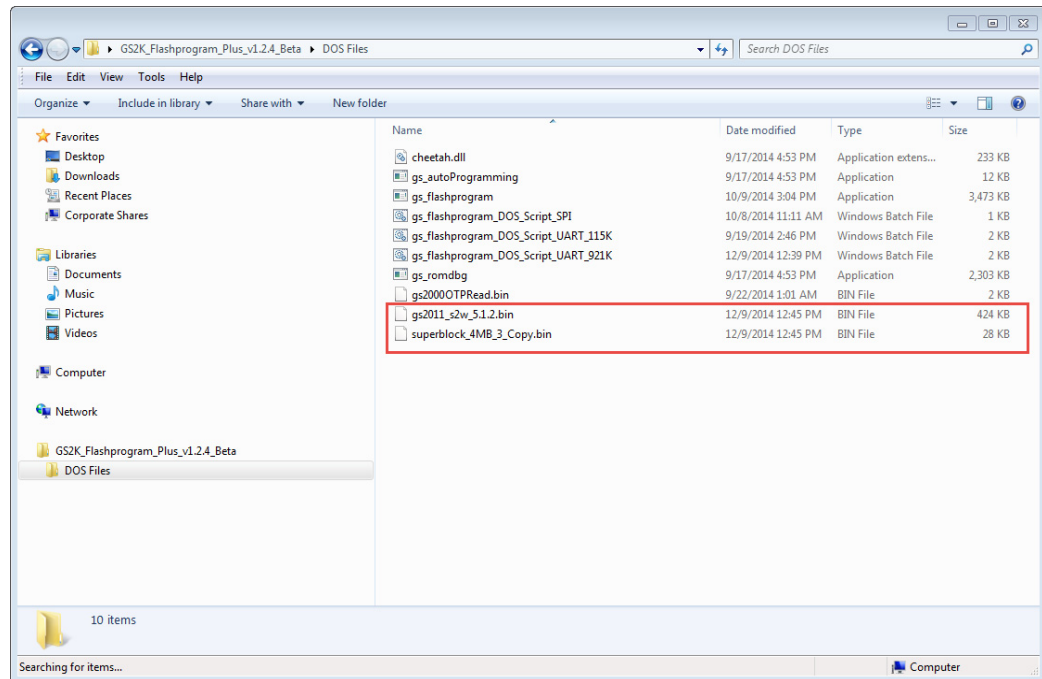
5. To run the GainSpan flash program DOS version, click on the DOS script UART batch file.

6. The **GS Module Program Script** screen will display (see Figure 34, page 52). For running UART, enter the **COM** port number assigned to the module and press the **Enter** key.

**Figure 34  Running GS Module Program DOS Script for 921600 Baud Rate - (UART)**
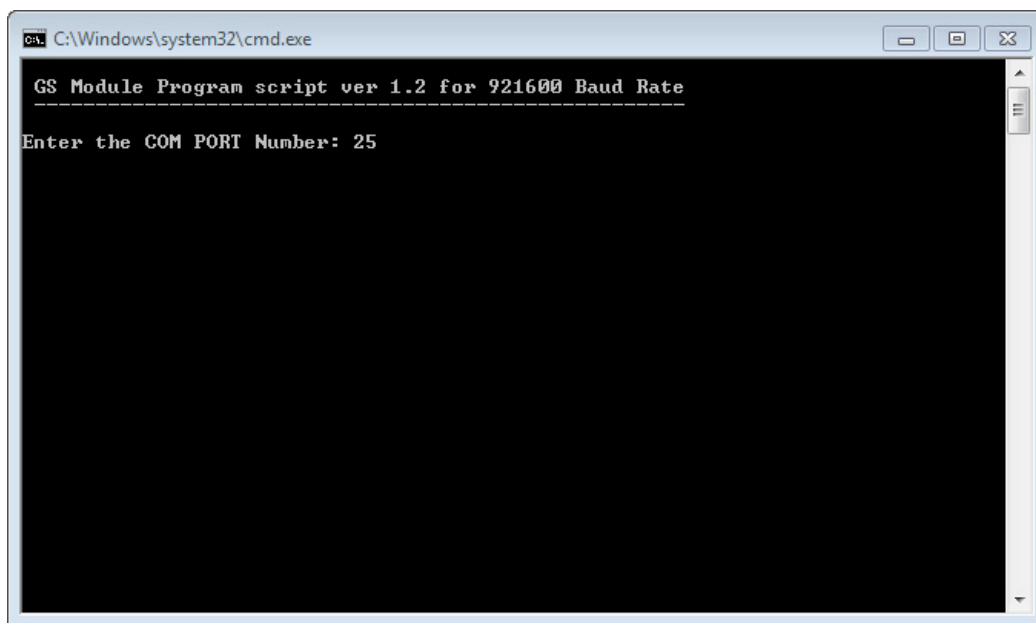


> **NOTE:**  Install a jumper on pin J25 on the GS2011M evaluation board and pin J13 on the GS2100M evaluation board when selecting 921600 Baud Rate for DOS programming.

7. Press any key to continue programming the flash for UART (see Figure 35, page 53). This will take several minutes.

> **NOTE:**  If the evaluation board was not in PROGRAM mode, the programming utility will indicate a timeout.

**Figure 35   Programming the Flash Using DOS for 921600 Baud Rate - (UART)**



8.  When complete, a message will display indicating the module is successfully programmed. Press any key to close the DOS programming screen. Turn the ON/OFF switch on the evaluation board to the **OFF** position.

Refer to Chapter 3 Associating and Verifying, page 73 to verify that the evaluation board has been programmed.

## 2.6 Preparing the Evaluation Boards for SPI Interface

### 2.6.1 GS2011M Evaluation Board

**ALERT!** *Make sure you unplug/plug the mini-USB cable from the USB0 port and the Cheetah SPI Host Adapter from the SPI0 connector with the ON/OFF switch in the OFF position.*

The following steps will guide you through programming the GS2011M evaluation board with the Serial-to-WiFi binaries using the SPI Host Adapter:

1. Plug the mini-USB cable into the **USB0** port as shown in Figure 36, page 54.

2. Plug the other end of the mini-USB cable into a **USB** port on your computer.

3. Plug the ribbon cable into the SPI0 connector on the GS2011M board (see Figure 36, page 54).

4. Plug the USB 2.0 cable into the Cheetah SPI Host Adapter and plug the other end into a USB port on your computer (see Figure 36, page 54).

5. Download the Cheetah SPI Host Adapter Device Drivers (see 1.2 Requirements, page 18).

6. Turn the PROGRAM/RUN switch on the GS2011M to the **PROGRAM** position.

7. Turn the ON/OFF power switch on the GS2011M to the **ON** position. The Program Flash LED will be lit **RED**, indicating that the module is ready to be programmed.

**NOTE:** *Refer to the GS2000 Based Module Evaluation Board Hardware User Guide for a list of components, jumpers, switches, and LEDs.*

**Figure 36   Setting Up the GS2011M Evaluation Board to Program Flash Using SPI**
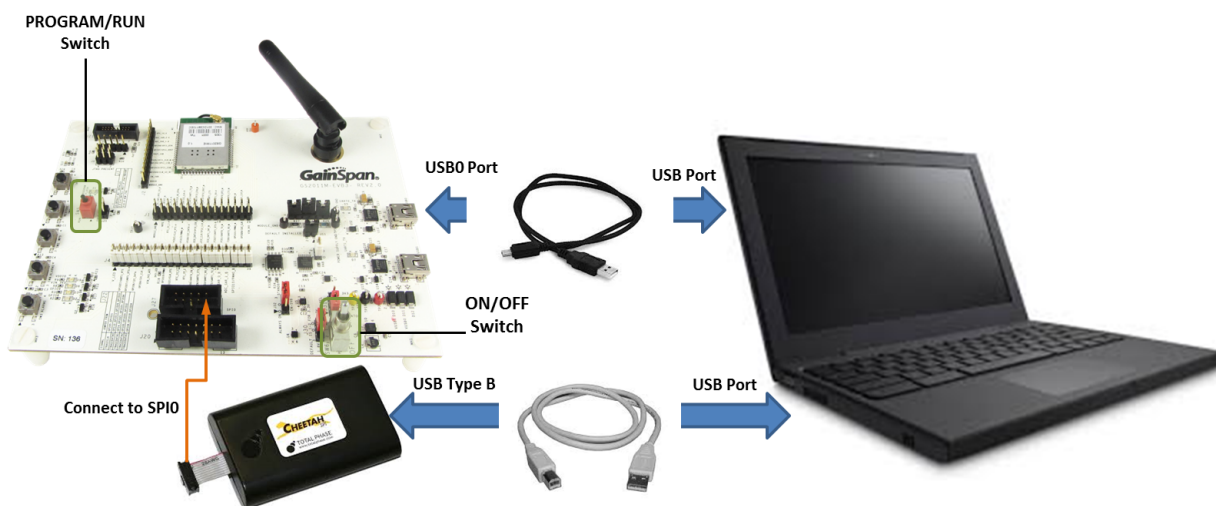
## 2.6.2 GS2100M Evaluation Board

> **ALERT!** *Make sure you unplug/plug the mini-USB cable from the USB0 port and the Cheetah SPI Host Adapter from the SPI0 connector with the ON/OFF switch in the OFF position.*

The following steps will guide you through programming the GS2100M evaluation board with the Serial-to-WiFi binaries using the SPI Host Adapter (see 1.2 Requirements, page 18):

1. Plug the mini-USB cable into the **USB0** port as shown in Figure 37, page 55.

2. Plug the other end of the mini-USB cable into a **USB** port on your computer.

3. Plug the ribbon cable into the SPI0 connector on the GS2100M board (see Figure 37, page 55).

4. Plug the USB 2.0 cable into the Cheetah SPI Host Adapter and plug the other end into a USB port on your computer (see Figure 37, page 55).

5. Download the Cheetah SPI Host Adapter Device Drivers (see 1.2 Requirements, page 18).

6. Turn the PROGRAM/RUN switch on the GS2100M to the **PROGRAM** position.

7. Turn the ON/OFF power switch on the GS2100M to the **ON** position. The Program Flash LED will be lit **RED**, indicating that the module is ready to be programmed.

> **NOTE:** *Refer to the GS2000 Based Module Evaluation Board Hardware User Guide for a list of components, jumpers, switches, and LEDs.*

**Figure 37   Setting Up the GS2100M Evaluation Board to Program Flash Using SPI**
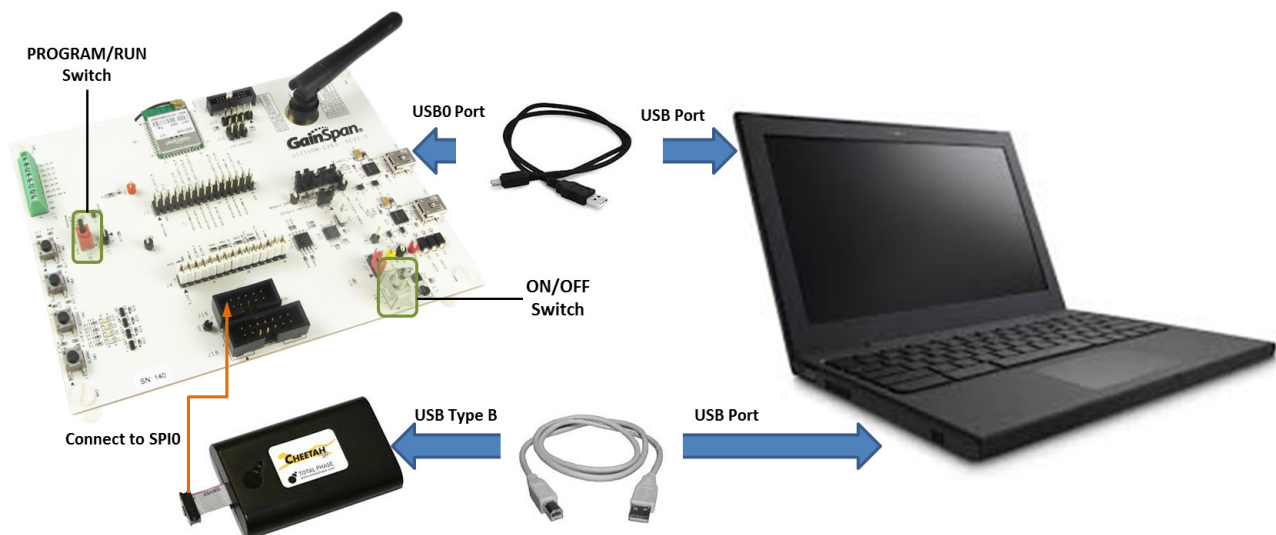
## 2.7 Programming the Module Using the SPI Interface

For programming the GS2011M, GS2011MxxS, and GS2100M modules using SPI interface, perform the following:

1. Follow the instructions in 2.3  Programming the Evaluation Boards Using the GUI Application, page 28 to start the **gs2k_flashprogram** GUI application.

2. Select the **SPI** interface.

**NOTE:**  *When selecting SPI interface, the Port and Baud Rate will automatically be selected via the Cheetah SPI Host Adapter.*

3. Click the **Check Connection** button. The software will communicate with the GS2011M or GS2100M evaluation board to check the connection and display the **Module Specifications** (Module Type and Mac Address of the module). A **Green** check will display at the bottom of the screen indicating the Connection and Communication with the board is successful (see Figure 38, page 56).

**Figure 38   Communicating with the GainSpan Module - (SPI)**
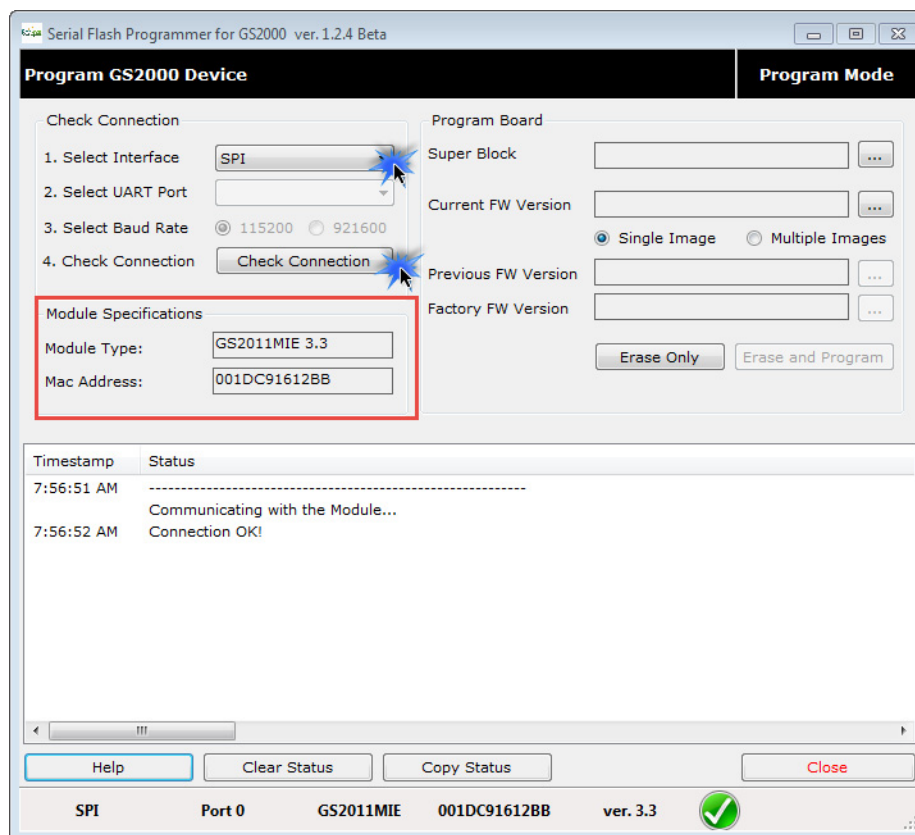
4.   Select the Firmware and Binaries to program the board with a Single Image. Click the **Browse (...)** buttons next to the **Super Block** and **Current FW Version** to download (see Figure 39, page 57).

**Figure 39    Select Super Block and Firmware Single Image Binaries - (SPI)**
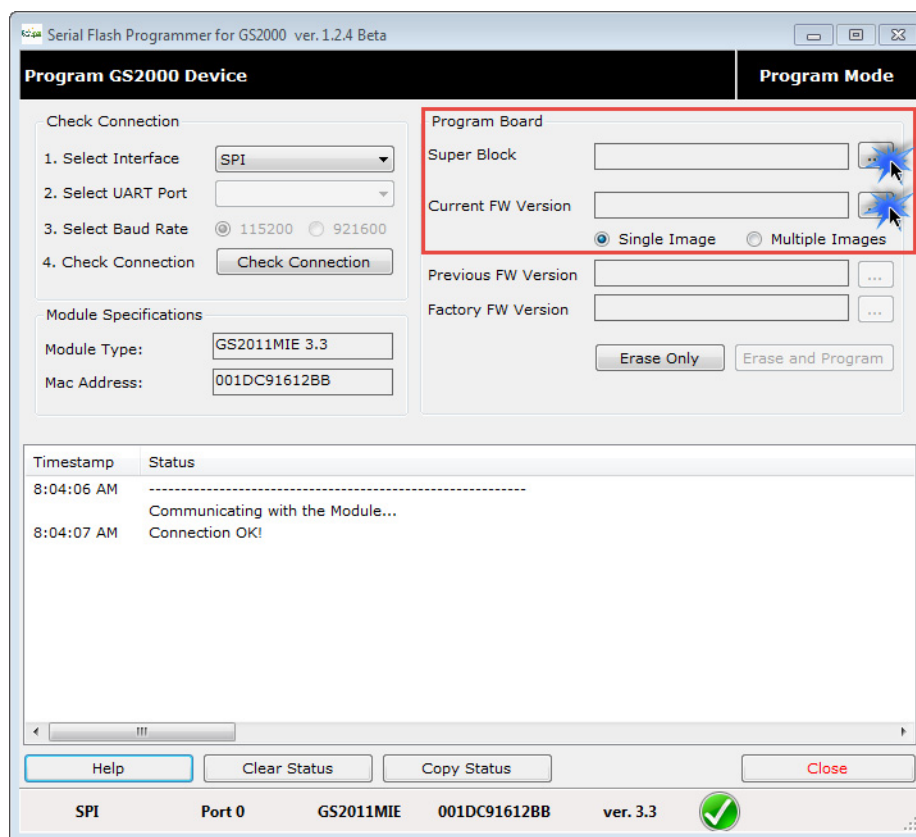
5. Select **Single Image** to program. This will program the module with a single firmware binary image. *This is the default and recommended method* (See Figure 40, page 58). For instructions on how to program the board with multiple images, refer to 2.7.1 Programming the Module With Multiple Images - SPI, page 61.

**Figure 40   Select Single Image Firmware - (SPI)**
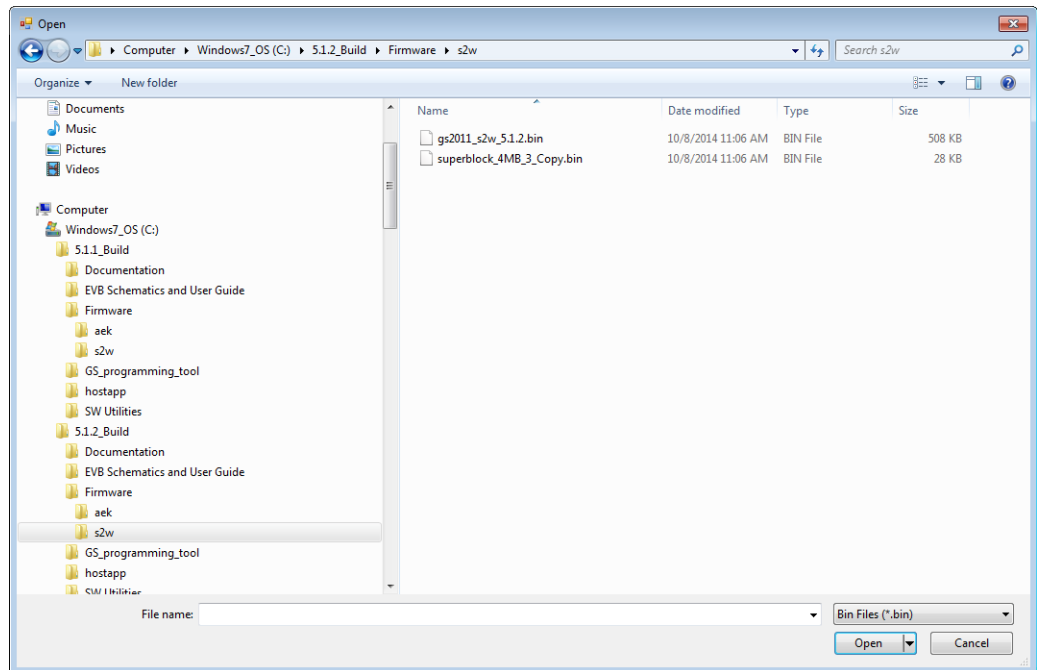
6.  Once selected, a message will display indicating that a valid Super Block and Firmware Image have been selected (see Figure 41, page 59).

**Figure 41   Valid Super Block and Firmware Images Selected - (SPI)**
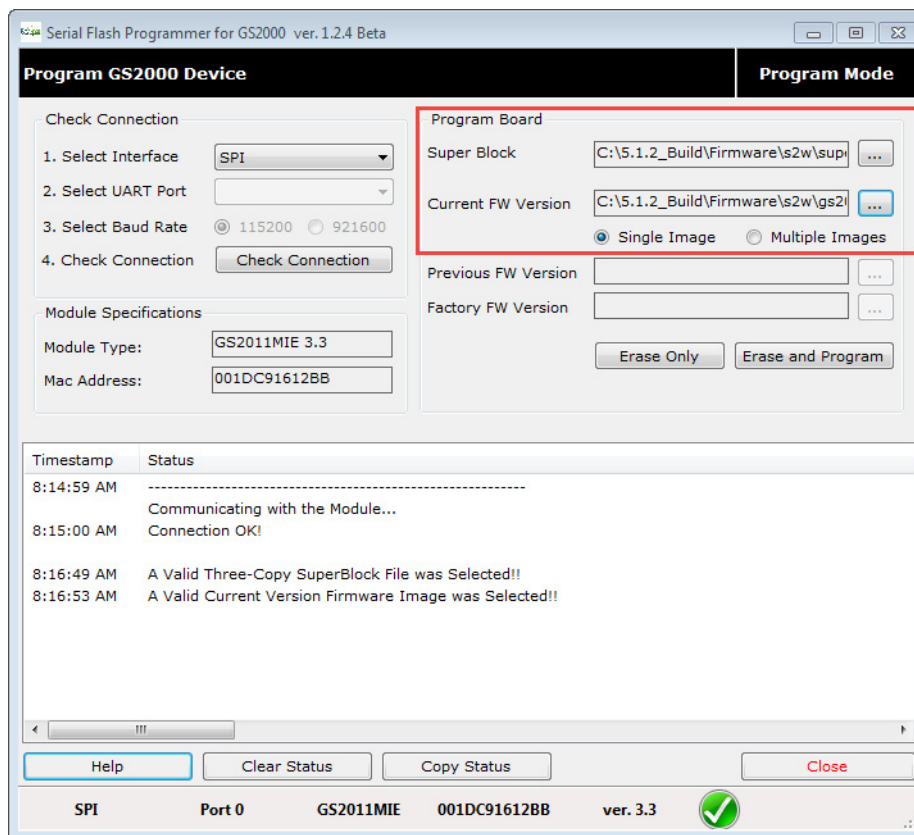
7.  Click the **Erase** and **Program** button. The GUI software will go through a process of programming the module flash with the new firmware and binaries. When complete a Green check will display indicating the flash has been programmed successfully (see Figure 42, page 60).

**Figure 42   Programming Single Image Complete - (SPI)**
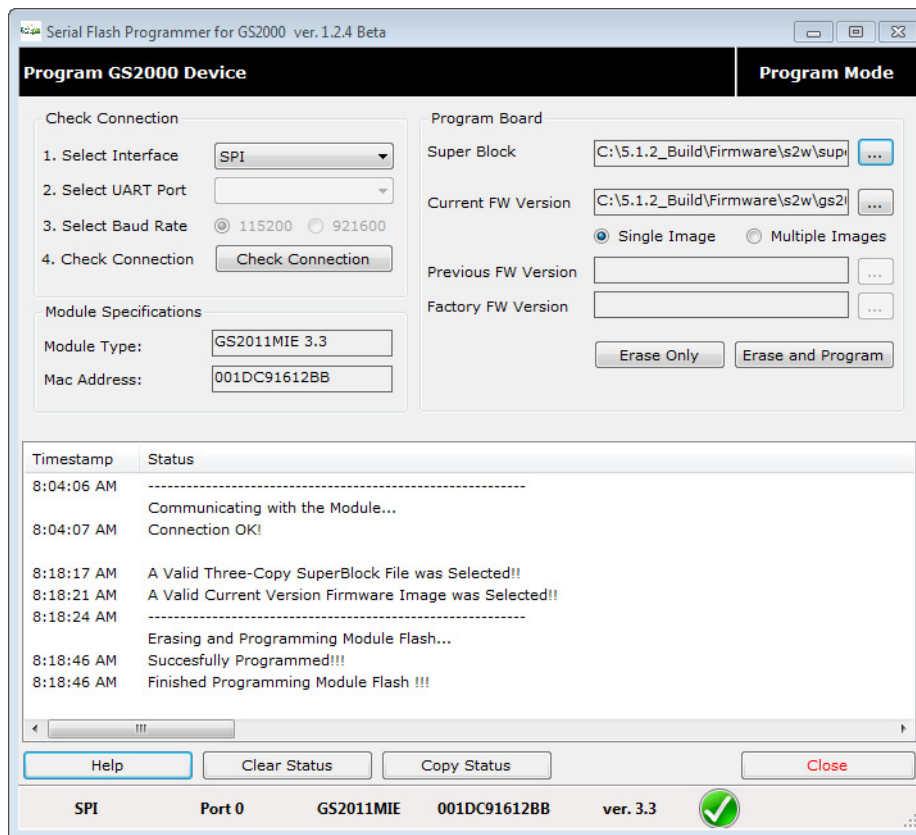


NOTE:  *The Erase Flash button will erase the entire flash on the module.*

8.  Click the **Close** button. Turn the ON/OFF switch to the **OFF** position. Turn the PROGRAM/RUN switch to the RUN position. Turn the ON/OFF switch back to the **ON** position.

The GS2011M or GS2100M is now ready to be verified. Refer to Chapter 3 Associating and Verifying, page 73.

To program the module flash using DOS for SPI, follow the instructions in 2.8 Programming the Module Using DOS for SPI Interface, page 66

## 2.7.1 Programming the Module With Multiple Images - SPI

Programming the evaluation board with multiple images is used when you want to have previous or factory default versions of firmware binaries programmed onto the same board. For example, if a current build isn't working for your environment, you can revert back to a previous build.

To program multiple images, perform the following:

1. Select **SPI** Interface.

2. Click the **Check Connection** button. The software will communicate with the GS2011M or GS2100M evaluation board to check the connection and display the **Module Specifications** (Module Type and Mac Address of the module). A **Green** check will display at the bottom of the screen indicating the Connection and Communication with the board is successful.

3. Select the **Multiple Images** button, and select the Firmware and Binaries to program the board. Click the **Browse (...)** buttons next to the Super Block and Current FW Version to download (see Figure 43, page 61 and Figure 44, page 62).

> **NOTE:** *The Super Block and Current FW Version should be the latest version when programming multiple images.*

**Figure 43   Select Super Block and Firmware Multiple Image Binaries - (SPI)**
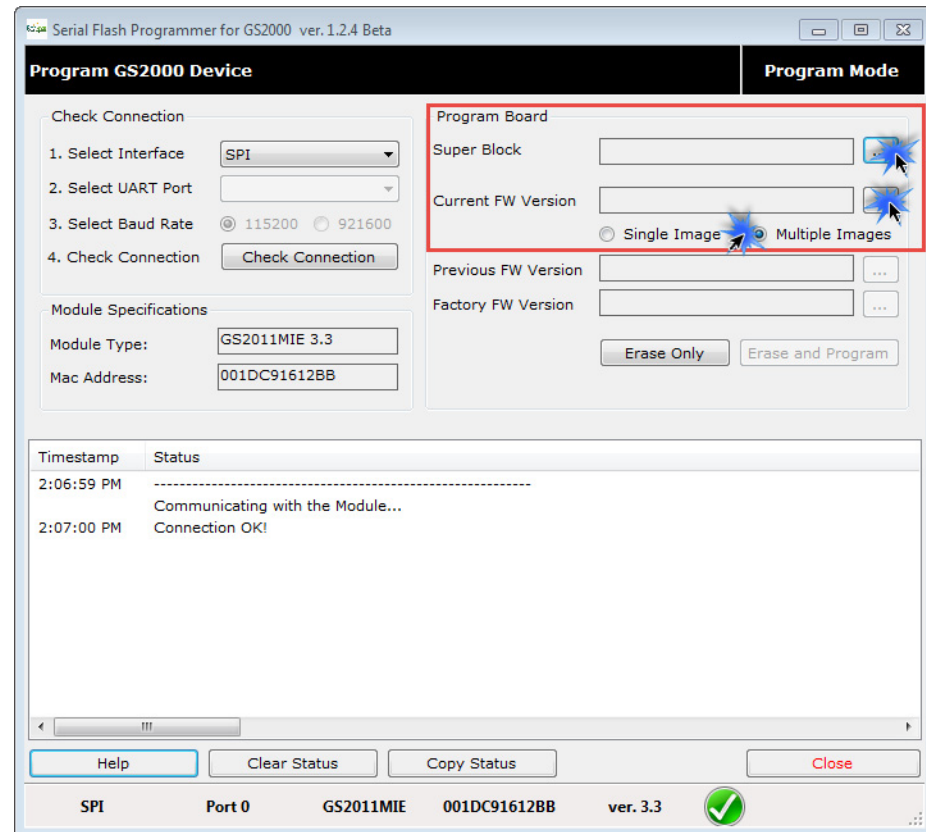
4. Select the **Super Block** and **Current FW Version** to program the board (see Figure 44, page 62). For the Multiple Images, version 5.1.2 was selected.

**Figure 44   Selecting Super Block and Current Firmware Version - (SPI)**
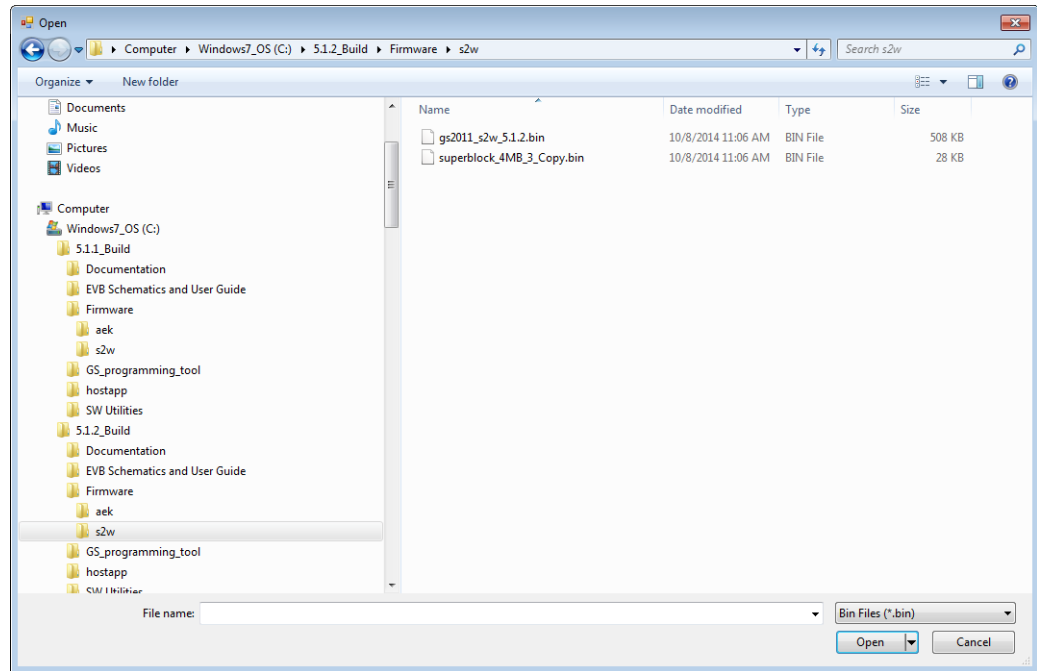


5. Once selected a message will display indicating that a valid Super Block and Firmware Image have been selected.

6. Select the **Previous FW Version** and/or **Factory FW Version**. Click the **Browse (...)** button next to the **Previous FW Version** and/or **Factory FW Version**. For the previous and factory firmware versions, 5.1.1 was selected (see Figure 45, page 63 and Figure 46, page 64).

**Figure 45   Selecting Previous and Factory Firmware Versions - (SPI)**
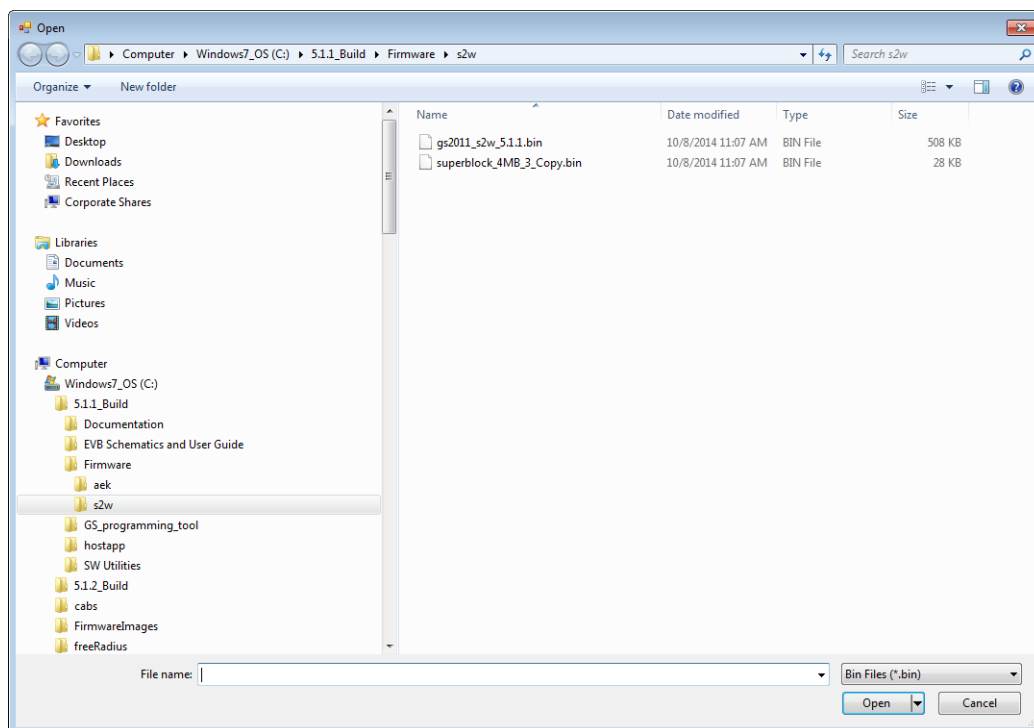
**Figure 46   Valid Multiple Images Selected - (SPI)**
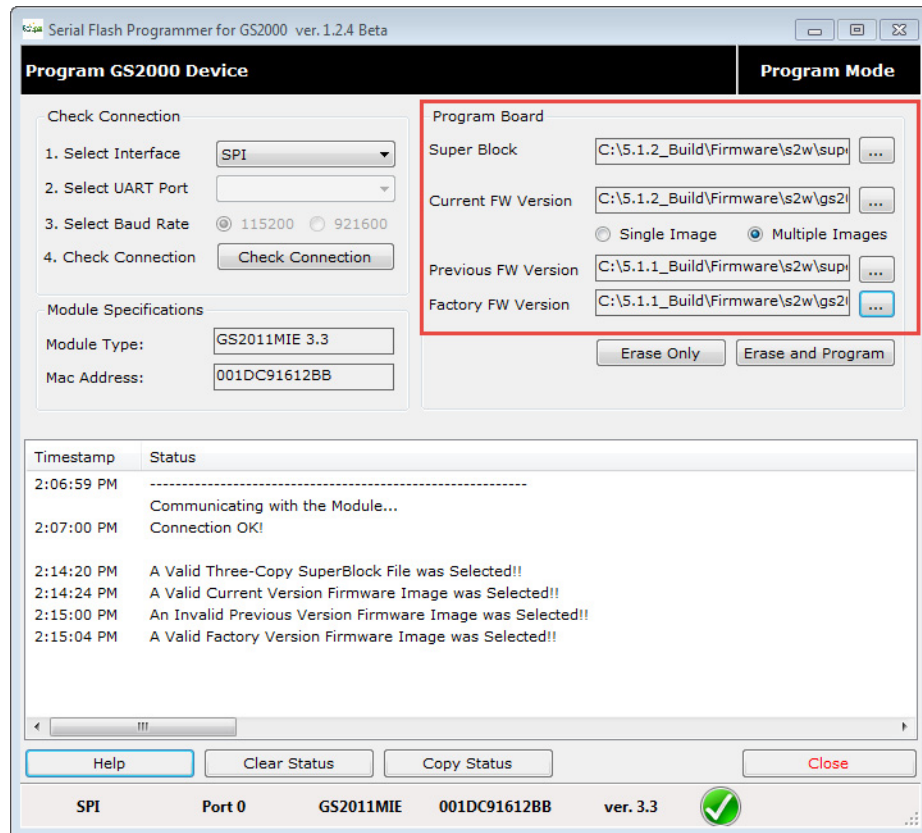


7.   Click the **Erase and Program** button. The GUI software will go through a process of programming the module flash with the current firmware and binaries, and previous and factory versions for Multiple Images. When complete a **Green** check will display indicating the flash has been programmed successfully (see Figure 47, page 65).

**Figure 47   Programming Multiple Images Complete - (SPI)**
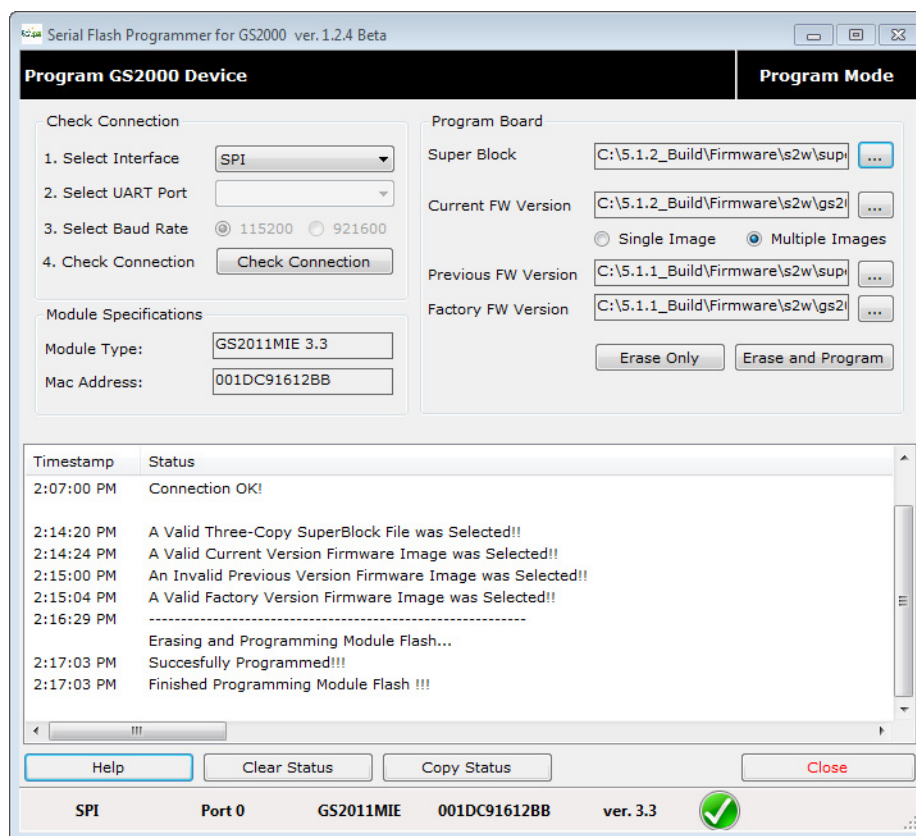


NOTE:  The Erase Flash button will erase the entire flash on the module.

8.  Click the **Close** button. Turn the ON/OFF switch to the **OFF** position. Turn the
    PROGRAM/RUN switch to the **RUN** position. Turn the ON/OFF switch back to the
    **ON** position.

The GS2011M or GS2100M is now ready to be verified. Refer to Chapter 3 Associating
and Verifying, page 73.

For instructions on how to program the module using the SPI interface, refer to
2.7  Programming the Module Using the SPI Interface, page 56.

## 2.8  Programming the Module Using DOS for SPI Interface

The following instructions are used to program the flash on the GS2011M and GS2100M evaluation boards using the DOS procedure for SPI interface.
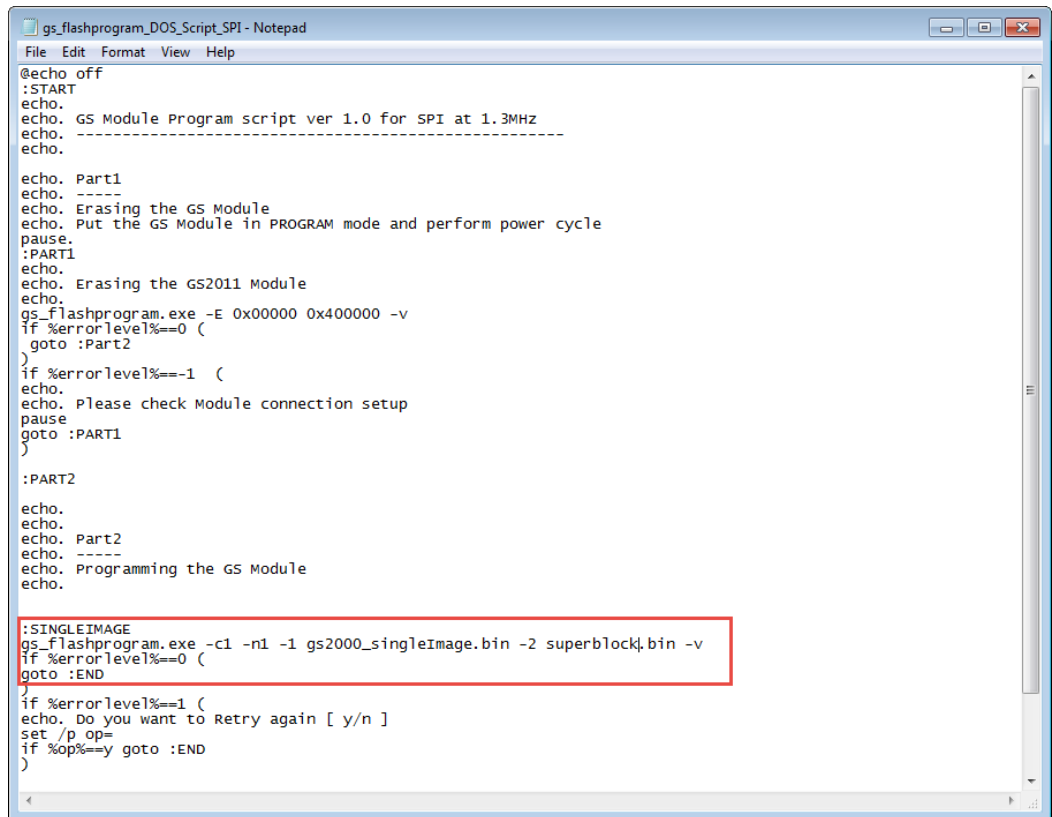
1.  Locate the **SPI** script under the DOS folder (see Figure 48, page 66). The DOS folder is located under **gs2k_flashprogram_plus** directory.

**Figure 48   GS_Flashprogram DOS Script - (SPI)**
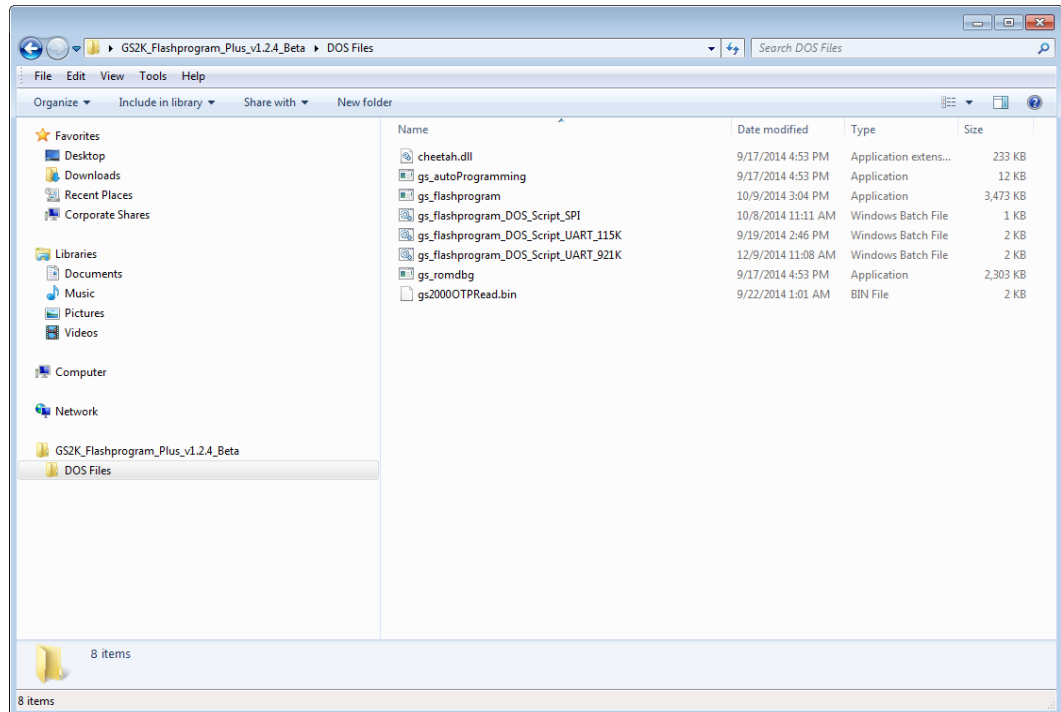
2.   Select **gs_flashprogram_DOS_Script_SPI** and right-mouse click on the batch file and select Edit. This will open the DOS script for SPI in a text editing tool like Notepad. Scroll down until you reach the **SINGLEIMAGE** script binary files (see Figure 49, page 67).

**Figure 49   Edit gs_flashprogram DOS Script - (SPI)**

3. Edit the binary file names (see Figure 50, page 68) to match the binary file names that where created in the build (see Figure 7, page 25) from the SDK Builder. For this example the names reflect the GS2011M.

**Figure 50   Edited GS2011M Binary File Names - (SPI)**



4. Click the **Save** button. To verify that the DOS script file has been updated, reopen the DOS folder under the **gs2k_Flashprogram_Plus** folder and reopen in Notepad.

5. Copy the two binary files from the build created with the SDK Builder to the DOS folder (see Figure 51, page 69). Refer to Figure 7, page 25 to for the binary files to be copied.

**Figure 51   Copy Super Block and Firmware Binary Files to DOS Folder - (SPI)**
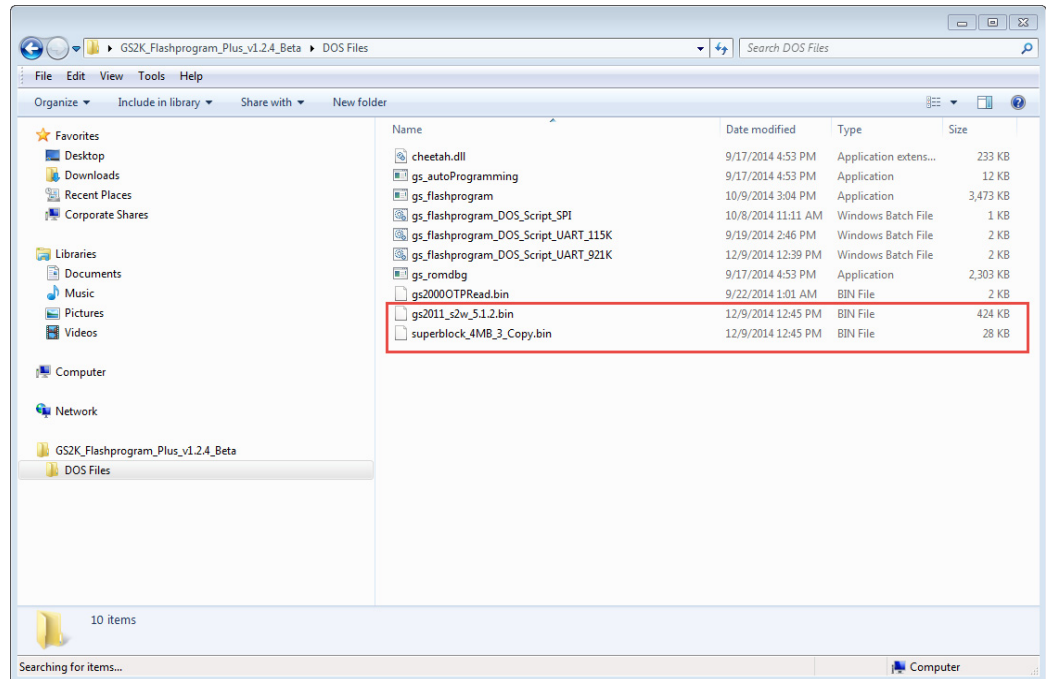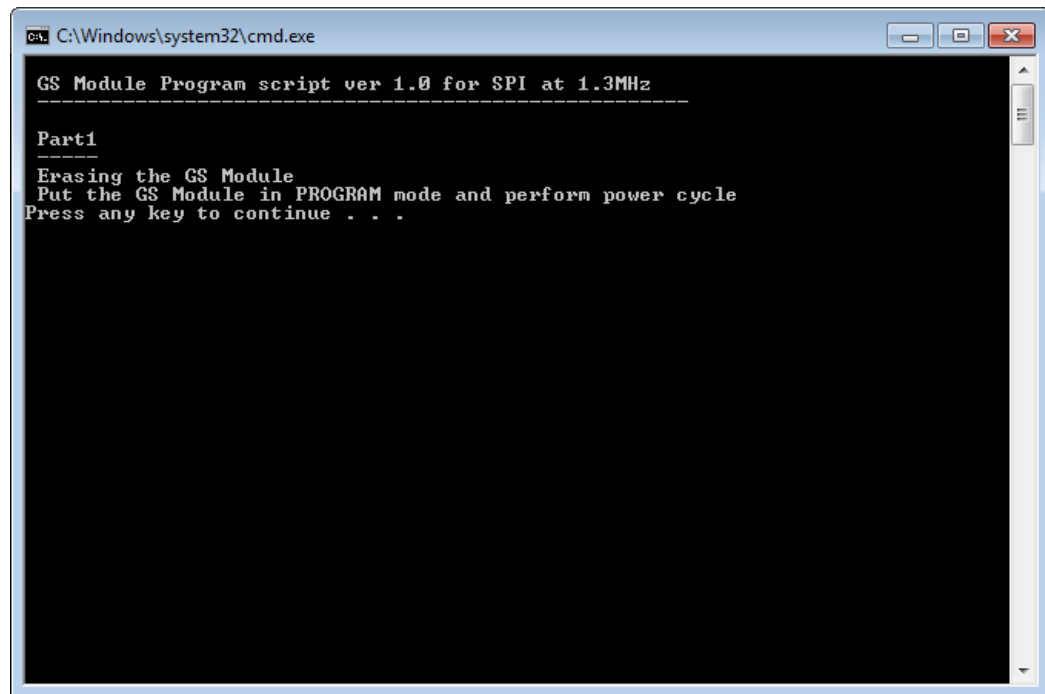
6. To run the GainSpan flash program DOS version, click on the DOS script SPI batch file.

7. The **GS Module Program Script** screen will display (see Figure 52, page 70). For running SPI, you do not need to enter a COM port number.

> **NOTE:** *The Cheetah SPI Host Adapter must be connected to the GainSpan board when running the DOS GS Module Program Script for SPI.*

**Figure 52   Running GS Module Program Script for DOS - (SPI)**



8. Press any key to continue programming the flash for SPI (see Figure 53, page 71). This will take several minutes.

> **NOTE:** *If the evaluation board was not in PROGRAM mode, the programming utility will indicate a timeout.*

*NOTE:* *The Cheetah SPI Host Adapter must be connected to the GainSpan board when programming the Flash using DOS and SPI.*

**Figure 53   Programming the Flash Using DOS - (SPI)**



*NOTE:* *The default clock speed using SPI is 1.3MHz. You can change the clock speed in gs_flashprogram tool Help screen by following the instructions.*

9.  When complete, a message will display indicating the module is successfully programmed.

10. Press any key to close the DOS programming screen. Turn the ON/OFF switch on the evaluation board to the **OFF** position.

Refer to Chapter 3 Associating and Verifying, page 73 to verify that the evaluation board has been programmed.

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# Chapter 3  Associating and Verifying

This chapter provides instructions on associating a GainSpan® GS2000 based module evaluation board to a communication port using Tera Term VT terminal emulator.

- Connecting the Evaluation Board to a Serial COM Port, page 73

## 3.1 Connecting the Evaluation Board to a Serial COM Port

To set up the GS2000 based module evaluation board for Serial-to-WiFi or Temperature and Light Sensor application, perform the following:

> **NOTE:** *If selecting 921600 Baud Rate when programming the Flash, make sure that jumpers J25 (GS2011M) and J13 (GS2100M) are removed. The board will not run if these jumpers are installed with the PROGRAM switch in RUN mode.*

1. Turn the PROGRAM/RUN switch to the **RUN** position.

2. Open the Tera Term VT application from your desktop and select the serial port (COM port) that was assigned to the evaluation board (see Figure 54, page 73).

**Figure 54   Connect the Evaluation Board to a Serial Port (COM Port)**
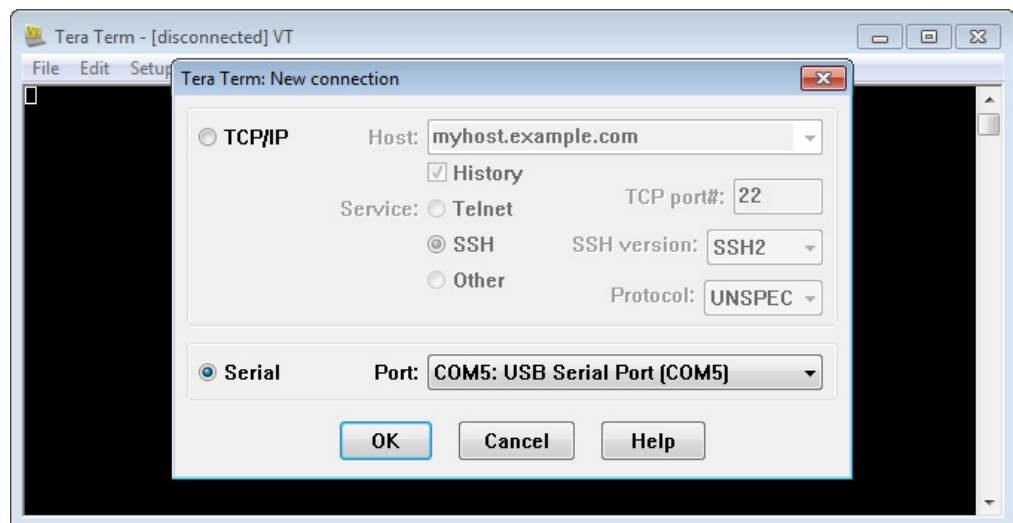


> **NOTE:** *The Tera Term VT software application is included with the EVK and SDK package.*

> **NOTE:** *The Serial Port (COM) should match the port identified.*

3. Select the Serial Port (COM) settings for Serial-to-WiFi (see ).

**Figure 55   Select the Serial Port (COM) Settings for S2W**
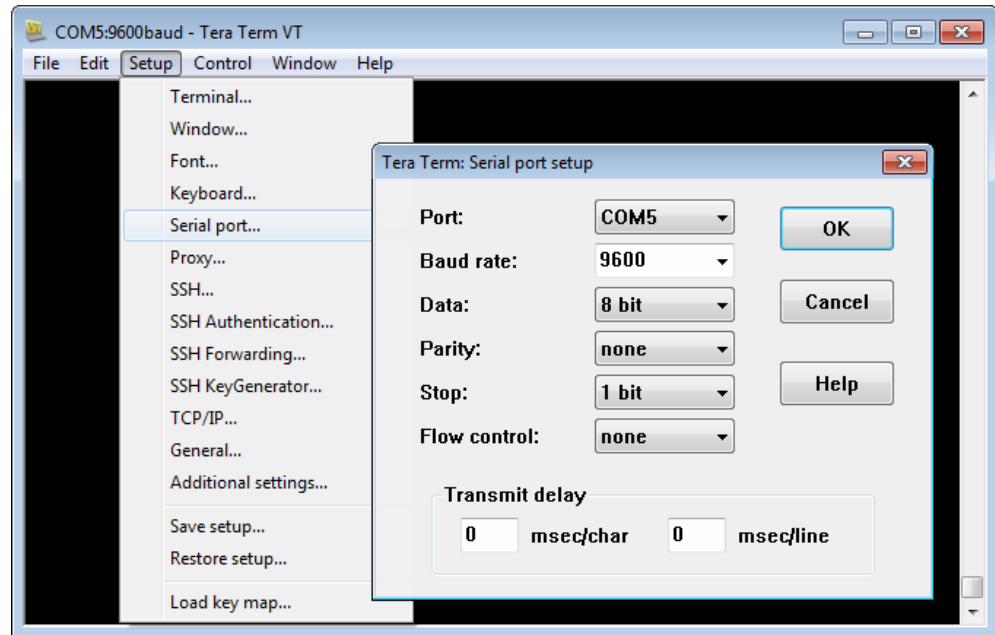


The Serial Port (COM) settings for Serial-to-WiFi are as follows:

– Port: **COM*x*** (*x* is the number of the COM port)

– Baud Rate: **9600**

– Data: **8 bit**

– Parity: **none**

– Stop: **1 bit**

– Flow Control: **none**

> **NOTE:** *If the user builds firmware with a different default baud rate, then choose that baud rate in the above step.*

4.  Turn the ON/OFF switch on the evaluation board to the **ON** position. Figure 56, page 75 shows the Tera Term VT window with the "Serial2WiFi APP" ready prompt.

**Figure 56  Serial-to-WiFi Application Ready Prompt**
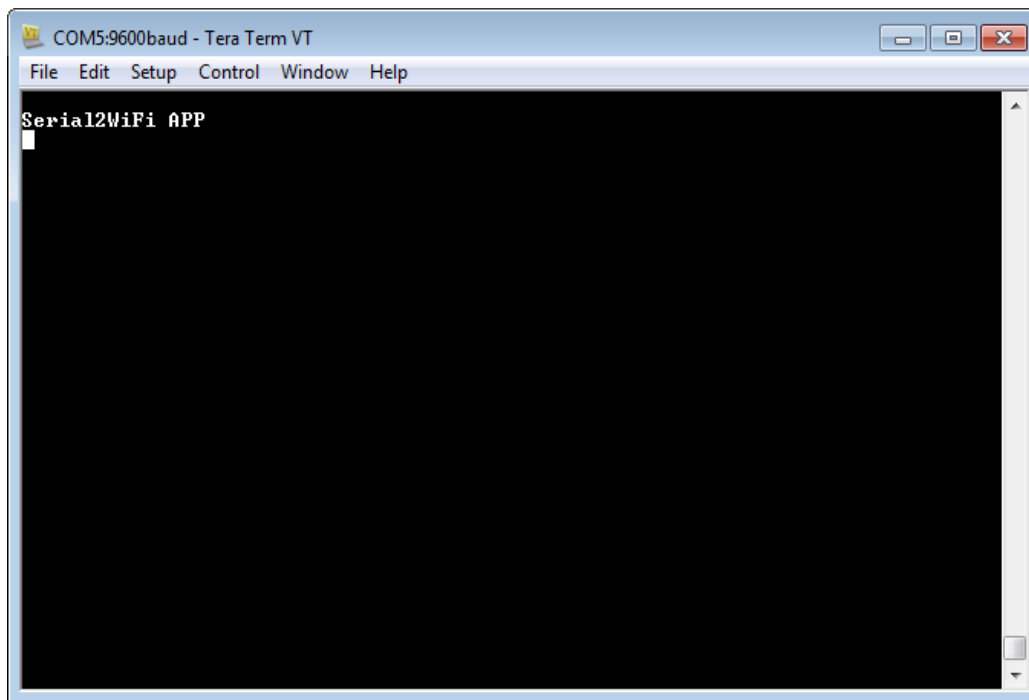


5.  Start the Serial-to-WiFi Application (see Chapter 4 Starting the Serial-to-WiFi Application, page 77).

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# Chapter 4   Starting the Serial-to-WiFi Application

This chapter provides instructions on how to start the Serial-to-WiFi (S2W) application and communicate with the evaluation board.

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## 4.1 Communicating with the Evaluation Board
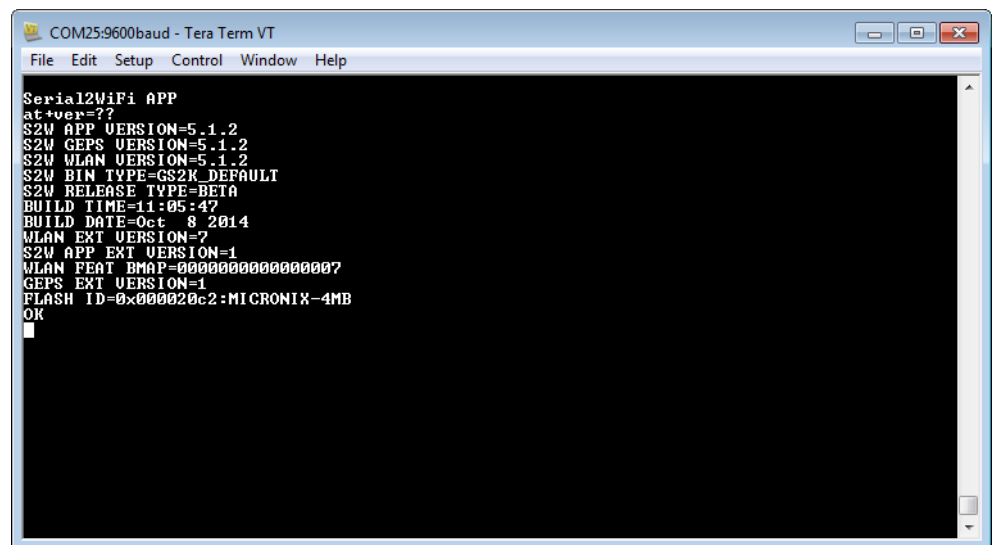
To start the Serial-to-WiFi application, perform the following:

1. In the Tera Term VT window enter the following command to verify the firmware version.

   AT+VER=??

   The evaluation board will respond back with Serial-to-WiFi firmware version information (see ).

**Figure 57   Serial-to-WiFi Firmware Information**



**NOTE:** *When modules are re-programmed on the evaluation board, the MAC ID will be erased. To update the MAC ID to match the number on the module label, issue the command AT+NMAC=<mac address>.*

2.  The evaluation board is now ready for additional Serial-to-WiFi commands to be issued. Figure 58, page 78 shows a sample output of the evaluation board connected to an access point DHCP server.

**Figure 58   Receiving an IP Address from the Access Point DHCP Server**



For more information on how to setup the GS2000 based module evaluation board, refer to the *GainSpan Evaluation Board Quick Start Guide*.

For step-by-step procedures on how to evaluate S2W or TLS firmwares, refer to the following documents:

–   *GainSpan GS2000 Based Module Sample Examples (for using Serial-to-WiFi AT Commands to Create TCP and UDP Connection)*

–   *GainSpan GS2000 Based Module Configuration Examples (for using Serial-to-WiFi Commands to Create HTTP, HTTPS, and EAP Connections)*

–   *Temperature and Light Sensor (TLS) Demo Application Note*