

Bluetooth Xpress (BGX) Migration Guide

Lyra Series

User Guide

v1.2

1 INTRODUCTION

Laird Connectivity's [Lyra S](#) and [Lyra P](#) module family and hardware platform is based on the EFR32BG22 SoC fully supporting the existing Bluetooth Xpress (BGX) software solution from Silicon Labs:

"Bluetooth Xpress (BGX) devices are modules that provide a host microcontroller with a Bluetooth Low Energy (BLE) connection to another Bluetooth Xpress module device or a smart phone. Bluetooth Xpress modules such as Lyra, BGX220 and BGX13 are designed to substantially reduce design effort and aid time-to-market in applications that require BLE connectivity to other BLE capable devices.

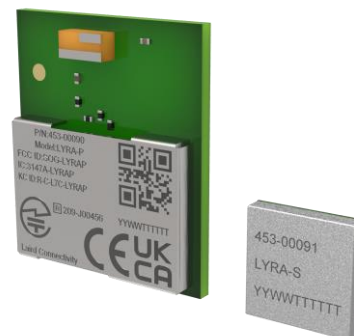
A host microprocessor communicates with a Bluetooth Xpress module via a serial interface. A host microcontroller can configure the module and stream data to and from connected Bluetooth devices. Application operation may be customized by setting individual configuration variables.

Bluetooth Xpress modules use the Xpress command API to enable host control, together with variables to enable host configuration. Beyond commands and variables, Bluetooth Xpress modules provide a rich feature set for wireless and peripheral command and control."

This user guide is intended for customers with existing BGX designs or who are currently developing a product based on the BGX220 or BGX13 module. This document focuses on deploying Bluetooth Xpress firmware onto our Lyra modules and assumes that you are familiar with the Bluetooth Xpress command line interface.

Note: Silicon Labs' BGX220 and BGX13 series modules are officially end-of-life (EOL) with a 6-month last time buy opportunity ending March 6 of 2023. Laird Connectivity's Lyra S and Lyra P series are a 99% drop-in replacement for the BGX220 modules and are compatible (with some redesign efforts) with the BGX13 modules. Please refer [here](#) (BGX220) and [here](#) (BGX13) for the official End of Life Notifications from Silabs.

**Bluetooth
Xpress**



2 QUICK LINKS

- [Wireless Xpress Modules BGX220](#),
- [Wireless Xpress Modules BGX13](#),
- [Bluetooth Wireless Xpress \(BGX\) Online API Documentation](#),
- [EFR32BG22 Bluetooth SoC for Bluetooth 5 – Silicon Labs](#),
- [Wireless Xpress Overview – Silicon Labs](#).

3 REQUIREMENTS

For this user guide, please prepare the following:

- Any Lyra PCB hardware that is based on our Lyra modules or DVKs.
- Download the latest available Bluetooth Xpress (BGX) firmware images for Lyra.
- Hardware support for programming via the SWD and/or Serial DFU (UART) interface.
- Wireless Starter Kit Mainboard – SLWSTK6103A, available at:
→ <https://www.silabs.com/development-tools/wireless/bluetooth/bgm220-wireless-starter-kit>.
- Simplicity Debug Adapter Board – SLSDA001A, available at:
→ <https://www.silabs.com/development-tools/mcu/32-bit/simplicity-debug-adapter>.

4 OVERVIEW

The Lyra S or Lyra P modules with the Bluetooth Xpress (BGX) software solution provided by Silicon Labs enables customers to port their existing BGX13 or BGX220 designs and application to our Lyra series. Before continuing, please review our Lyra module datasheets under <http://www.lairdconnect.com/lyra-series> carefully. Please also refer to the individual [BGX13S](#), [BGX220S](#), [BGX13P](#) and [BGX220P](#) datasheets for comparison.

5 BLUETOOTH XPRESS (BGX) PINOUT CONFIGURATION AND PIN FUNCTIONS FOR LYRA

Bluetooth Xpress firmware controls the pin assignments on Lyra S and Lyra P modules. Once the Bluetooth Xpress (BGX) software is programmed and gets executed on the modules it will configure the pins as shown in the following sections.

Note: Both Lyra modules are not 100% pin-to-pin compatible with legacy BGX13 modules. However, Lyra is almost 99% pin-to-pin compliant with the BGX220 series, with the exception of the BOOT pin configuration.

5.1 Lyra S Pinout and Pin Functions for Bluetooth Xpress (BGX)

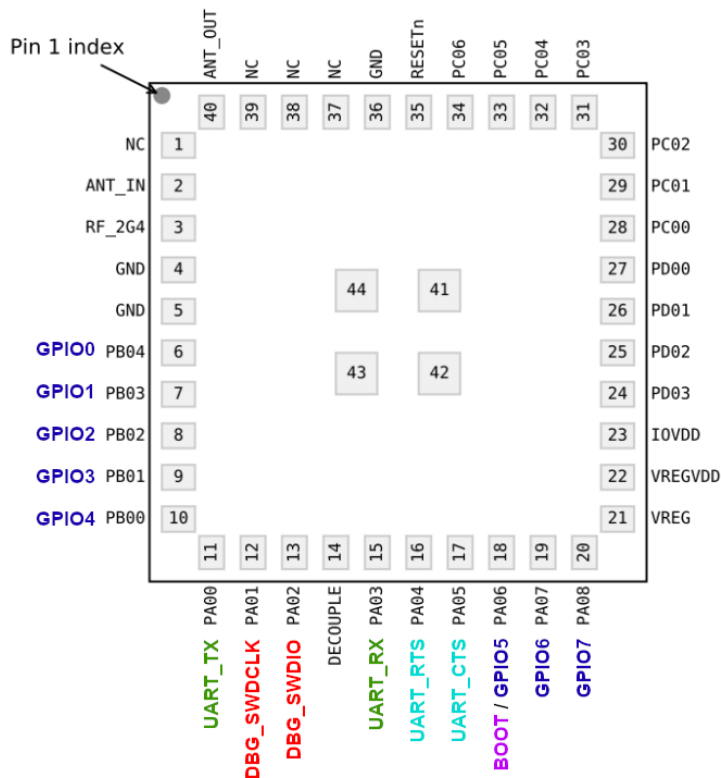


Figure 1: Lyra S Pinout for Bluetooth Xpress (BGX)

Table 1: Lyra S Pin Functions for Bluetooth Xpress (BGX)

Pin Name	Pin(s)	Description	Pin Name	Pin(s)	Description
NC	1	Not Connected	IOVDD	23	I/O Power Supply
ANT_IN	2	Antenna Input	NC	24 (PD03)	Not Connected
RF_2G4	3	2.4 GHz RF Input/Output	NC	25 (PD02)	Not Connected
GND	4	Ground	NC	26 (PD01)	Not Connected
GND	5	Ground	NC	27 (PD00)	Not Connected
GPIO0	6 (PB04)	Pin with input/output functionality configured through the command API.	NC	28 (PC00)	Not Connected

Pin Name	Pin(s)	Description	Pin Name	Pin(s)	Description
GPIO1	7 (PB03)	Pin with input/output functionality configured through the command API.	NC	29 (PC01)	Not Connected
GPIO2	8 (PB02)	Pin with input/output functionality configured through the command API.	NC	30 (PC02)	Not Connected
GPIO3	9 (PB01)	Pin with input/output functionality configured through the command API.	NC	31 (PC03)	Not Connected
GPIO4	10 (PB00)	Pin with input/output functionality configured through the command API.	NC	32 (PC04)	Not Connected
UART_TX	11 (PA00)	Digital Output	NC	33 (PC05)	Not Connected
DBG_SWDCLK	12 (PA01)	SWD Interface used for debugging and programming Lyra.	NC	34 (PC06)	Not Connected
DBG_SWDIO	13 (PA02)	SWD Interface used for debugging and programming Lyra.	RESETn	35	Reset Pin. The RESETn pin is internally pulled up to VREG (DVDD).
DECOUPLE	14	Decouple output for on-chip voltage regulator. This pin is internally decoupled, and should be left disconnected.	GND	36	Ground
UART_RX	15 (PA03)	Digital Input	NC	37	Not Connected
UART_RTS	16 (PA04)	Digital Output	NC	38	Not Connected
UART_CTS	17 (PA05)	Digital Input	NC	39	Not Connected
BOOT* / GPIO5	18 (PA06)	Active-low digital input to force module entrance into DFU bootloader state upon device reset. See command API documentation for functional detail. Pin with input/output functionality configured through the command API.	ANT_OUT	40	Antenna Output
GPIO6	19 (PA07)	Pin with input/output functionality configured through the command API.	GND	41	Ground
GPIO7	20 (PA08)	Pin with input/output functionality configured through the command API.	GND	42	Ground
VREG	21	Regulated supply voltage. This pin is internally connected to the SoC DVDD, RFVDD, and PAVDD supply lines. It is not intended to power external circuitry.	GND	43	Ground
VREGVDD	22	Module input power supply. This pin is internally connected to the SoC AVDD and VREGVDD supply lines.	GND	44	Ground

[*] Note Due to different bootloaders pre-programmed in factory, it is very important to verify the BOOT pin against your current hardware design, especially when migrating from a BGX13S or BGX220S module to avoid any potential conflicts or unexpected behaviours in your existing application. For Lyra S the BOOT pin is 18 (PA06) by default.

Whenever possible, we highly recommend implementing the BOOT pin which enables firmware programming via Serial DFU (UART). If not used, leave the BOOT pin unconnected in an open-circuit state *OR* connect it to VDD.

For compatibility reasons, Laird Connectivity also provides the original (legacy) BGX220 Series Wireless Xpress bootloader which is using pin 25 (PD02) instead of pin 18 (PA06) for BOOT. It is part of the latest GA release, please refer to our [Lyra Series - Firmware Options and Upgrade Methods User Guide](#) for more details.

5.2 Lyra P Pinout and Pin Functions for Bluetooth Xpress (BGX)

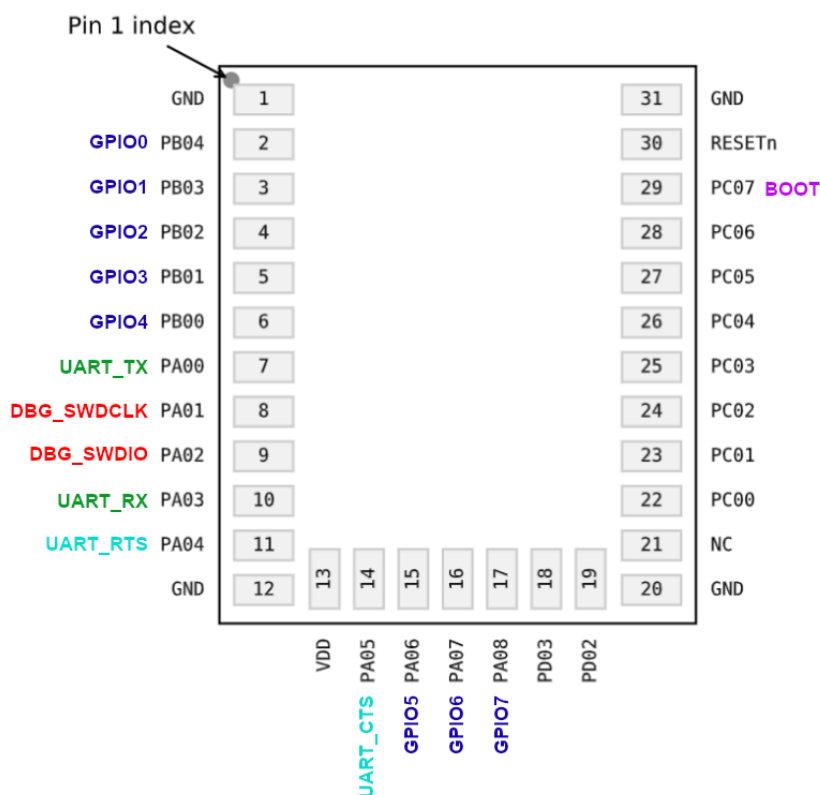


Figure 2: Lyra P Pinout for Bluetooth Xpress (BGX)

Table 2: Lyra P Pin Functions for Bluetooth Xpress (BGX)

Pin Name	Pin(s)	Description	Pin Name	Pin(s)	Description
GND	1	Ground	GPIO7	17 (PA08)	Pin with input/output functionality configured through the command API.
GPIO0	2 (PB04)	Pin with input/output functionality configured through the command API.	NC	18 (PD03)	Not Connected
GPIO1	3 (PB03)	Pin with input/output functionality configured through the command API.	NC	19 (PD02)	Not Connected
GPIO2	4 (PB02)	Pin with input/output functionality configured through the command API.	GND	20	Ground
GPIO3	5 (PB01)	Pin with input/output functionality configured through the command API.	NC	21	Not Connected

Pin Name	Pin(s)	Description	Pin Name	Pin(s)	Description
GPIO4	6 (PB00)	Pin with input/output functionality configured through the command API.	NC	22 (PC00)	Not Connected
UART_TX	7 (PA00)	Digital Output	NC	23 (PC01)	Not Connected
DBG_SWDCLK	8 (PA01)	SWD Interface used for debugging and programming Lyra.	NC	24 (PC02)	Not Connected
DBG_SWDIO	9 (PA02)	SWD Interface used for debugging and programming Lyra.	NC	25 (PC03)	Not Connected
UART_RX	10 (PA03)	Digital Input	NC	26 (PC04)	Not Connected
UART_RTS	11 (PA04)	Digital Output	NC	27 (PC05)	Not Connected
GND	12	Ground	NC	28 (PC06)	Not Connected
VDD	13	Power Supply	BOOT*	29 (PC07)	Active-low digital input to force module entrance into DFU bootloader state upon device reset. See command API documentation for functional detail.
UART_CTS	14 (PA05)	Digital Input	RESETn	30	Reset Pin
GPIO5	15 (PA06)	Pin with input/output functionality configured through the command API.	GND	31	Ground
GPIO6	16 (PA07)	Pin with input/output functionality configured through the command API.			

[*] Note Due to different bootloaders pre-programmed in factory, it is very important to verify the BOOT pin against your current hardware design, especially when migrating from a BGX13P or BGX220P module to avoid any potential conflicts or unexpected behaviours in your existing application. For Lyra P the BOOT pin is 29 (PC07) by default.

Whenever possible, we highly recommend implementing the BOOT pin which enables firmware programming via Serial DFU (UART). If not used, leave the BOOT pin unconnected in an open-circuit state *OR* connect it to VDD.

For compatibility reasons, Laird Connectivity also provides the original (legacy) BGX220 Series Wireless Xpress bootloader which is using pin 19 (PD02) instead of pin 29 (PC07) for BOOT. It is part of the latest GA release, please refer to our [Lyra Series - Firmware Options and Upgrade Methods User Guide](#) for more details.

6 RECOMMENDED WIRELESS XPRESS (BGX) HARDWARE DESIGN FOR LYRA

Both Lyra modules running the Bluetooth Xpress (BGX) solution are controlled over the UART interface as a peripheral to an external host processor. It is highly recommended to connect and implement the RTS / CTS pins for hardware control to guarantee data integrity in your BLE application. Typical power supply, programming and host interface connections are shown and illustrated below.

6.1 Lyra S Design for Bluetooth Xpress (BGX)

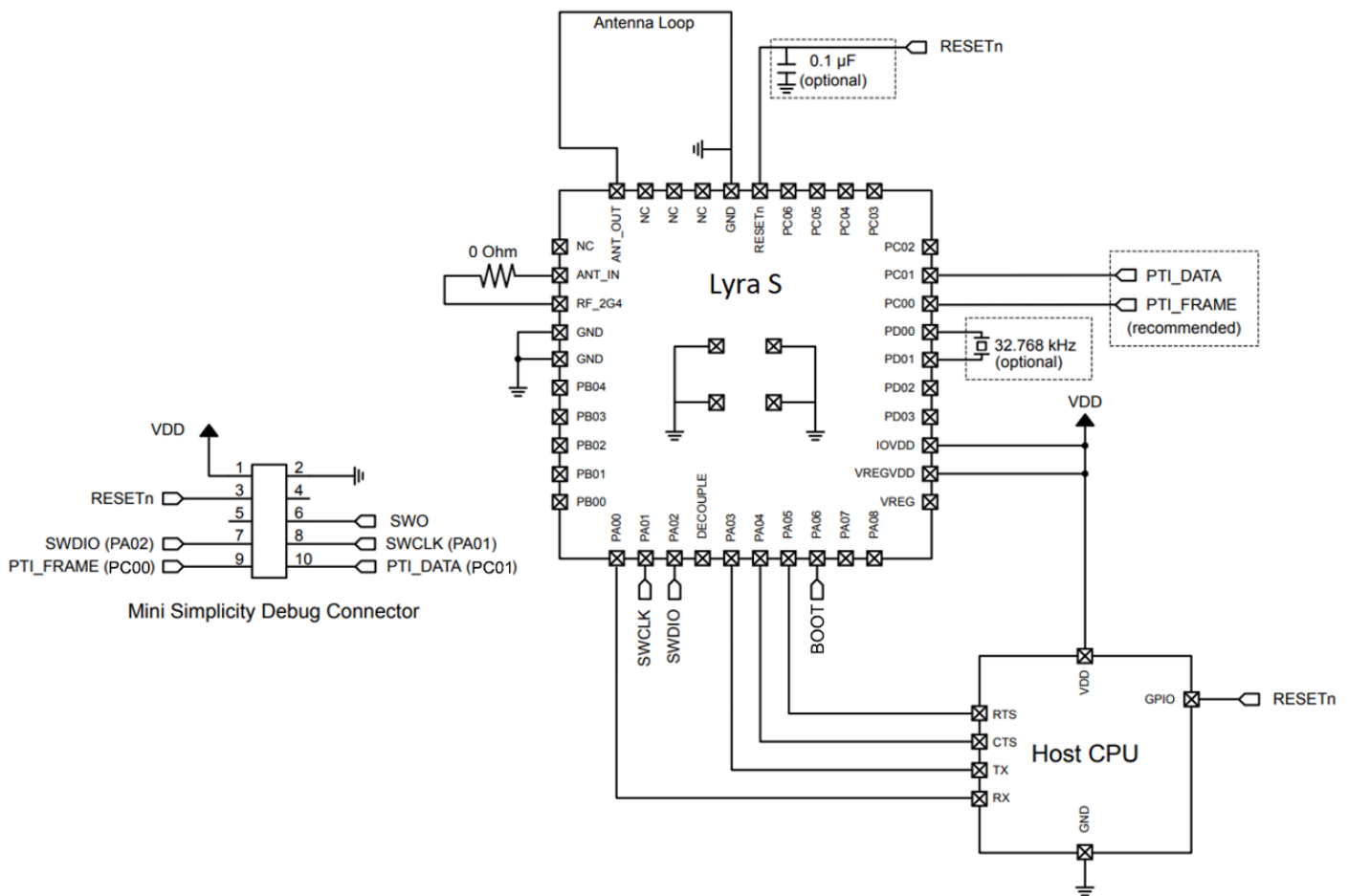


Figure 3: Typical Bluetooth Xpress (BGX) Connection Diagram for Lyra S

6.2 Lyra P Design for Bluetooth Xpress (BGX)

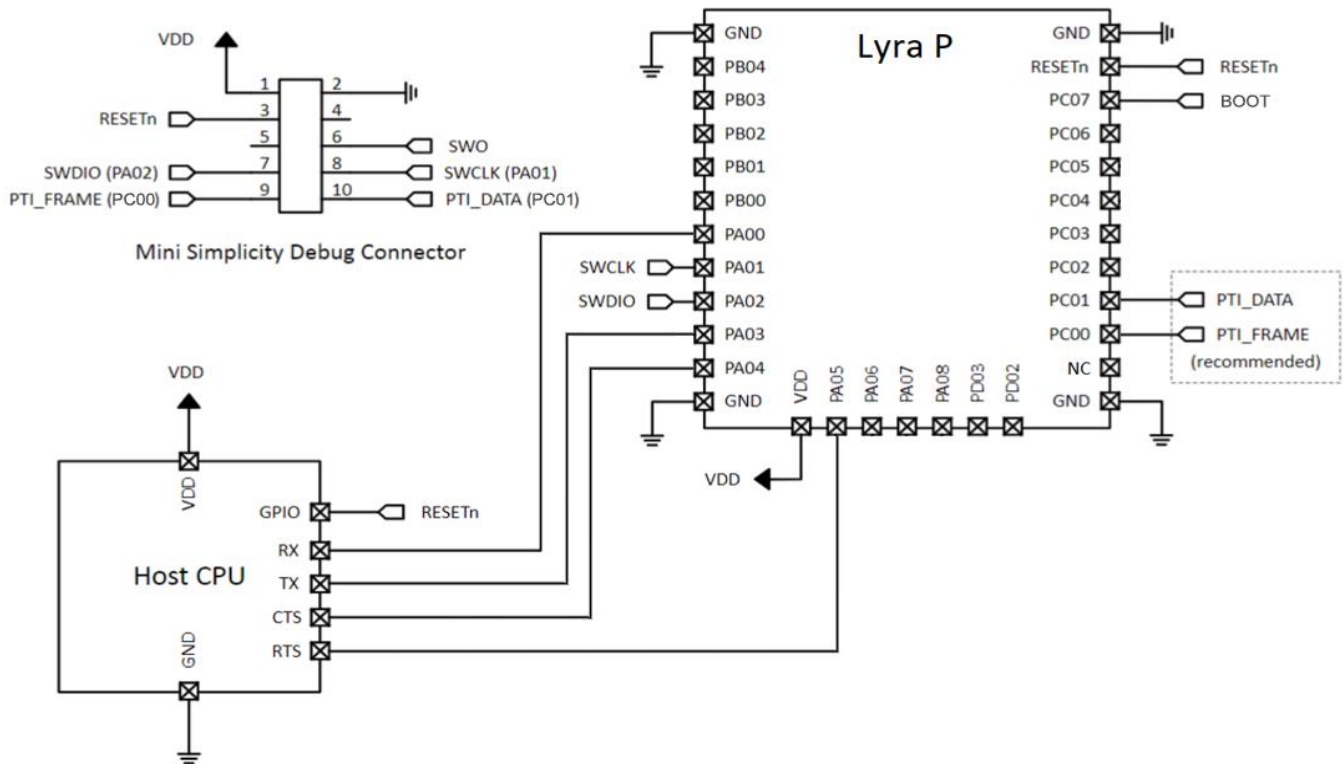


Figure 4: Typical Bluetooth Xpress (BGX) Connection Diagram for Lyra P

7 DEPLOY OUR LYRA MODULES WITH BLUETOOTH XPRESS (BGX)

7.1 Software and Firmware

By default, our Lyra DVKs ship completely empty and erased with no bootloader and no application. All Lyra modules ship with a bootloader preprogrammed, but with no application. Therefore, customers must program their Lyra modules with the Bluetooth Xpress (BGX) software solution from Silicon Labs on their own.

You can obtain the latest available Bluetooth Xpress (BGX) images for Lyra from the [Lyra Product Page](#) under the **Software** section. This will redirect you to a GitHub page under https://github.com/LairdCP/Lyra_Firmware/releases.

Note: Bluetooth Xpress software solution from Silicon Labs is frozen at its current software release v1.3.XXXX.X. It will not receive any further bug fixes or updates. See <https://docs.silabs.com/gecko-os/1/bgx/latest/release-notes> for the full Release Notes.

7.2 Programming Interfaces

The Bluetooth Xpress (BGX) software solution from Silicon Labs must be loaded onto the Lyra S and Lyra P modules via Serial Wire Debug (SWD) interface or directly through Serial DFU (UART) by triggering the BOOT pin.

The BOOT pin is an active-low digital input to force the module into DFU bootloader state upon device reset. It is used to determine when execution of the bootloader is required. Upon reset, execution of the bootloader begins. The state of the BOOT pin is read immediately upon start-up of the bootloader. If **LOW**, execution of the bootloader continues, facilitating firmware update via the UART. If the BOOT pin is **HIGH**, the bootloader will stop execution and pass control to the Bluetooth Xpress (BGX) application. On our Lyra DVKs BTN0 is by default mapped to the BOOT pin for an easier utilization.

The Serial Wire Debug (SWD) interface provides the most flexible, reliable, and fastest way to debug / program / update our Lyra modules. It is not possible to initial program our Lyra modules with the BGX firmware through Over-the-Air (OTA) approach. This is not supported. Please refer to our [Lyra Series - Firmware Options and Upgrade Methods User Guide](#) for more details.

The Serial DFU (UART) interface enables the upload of BGX firmware into Lyra's internal flash while its original bootloader and firmware gets replaced after a reset in case there are no errors. The following two scenarios are supported in the field:

1. Re-programming BGX firmware onto Lyra modules with a present bootloader and application,
2. Re-Programming BGX firmware onto Lyra modules with a present bootloader only.

The Silicon Lab Wireless Starter Kit (SLWSTK6103A) and Simplicity Debug Adapter Board (SLSDA001A) can be used to program our Lyra modules via the SWD interface externally during the production. It's not possible to use our Lyra DVKs to program external Lyra modules. We recommend implementing either the Mini Simplicity Connector or 10-pins Standard Cortex Debug Connector on your final PCB. Refer to the [BGM220 Wireless Gecko Module Starter Kit User Guides](#) and [AN958: Debugging and Programming Interfaces for Custom Designs](#) for more details.

No external debugger or hardware is needed for programming our Lyra DVKs. Both of our Lyra S and P DVKs come with an on-board SEGGER J-Link Debugger that interfaces with the mounted Lyra module through the SWD interface. Please refer to our respective Lyra DVK schematics for more information.

FURTHER INFORMATION

Further information and resources (*including Firmware, Certificates, Reports, Software, Application Notes, User Guide and more*) relating to the Lyra Series module is available on our product page of the Laird website under: <http://www.lairdconnect.com/lyra-series>.

8 REVISION HISTORY

Version	Date	Notes	Contributor(s)	Approver
1.0	4 Apr 2022	Initial Release	Alexander Brezinov	Jonathan Kaye
1.1	19 July 2022	Updated and restructured documentation.	Florian Baumgartl	Jonathan Kaye
1.2	19 Sep 2022	Revised the general design recommendation for the BOOT pin if not used or not connected and added further information for the original (legacy) Wireless Xpress bootloader.	Florian Baumgartl	Jonathan Kaye