Intelligent BTv4.0 Dual-Mode USB Dongle

Part # BT900–US

HARDWARE INTEGRATION GUIDE

VERSION 1.0

global solutions: local support ™

BT900-US Hardware Integration Guide
Intelligent BTv4.0 Dual Mode Module

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REVISION HISTORY

Version	Revision Date	Change History
1.0		Initial Version

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1 OVERVIEW AND KEY FEATURES

BT900 Series modules from Laird Technologies make it easy to add Classic BT and Bluetooth Low Energy (BLE) functionality to small, portable, power-conscious devices, including those powered by batteries. The fully approved, programmable modules feature Laird's innovative, event-driven *smart*BASIC programming language, which significantly reduces OEM development risk and speeds time to market.

Based on the Cambridge Silicon Radio (CSR) 8811 silicon and a low power Cortex M3 microcontroller, the BT900 modules provide exceptionally low power consumption with outstanding wireless range, all within a compact footprint of 19 mm x 12.5 mm. The modules incorporate all the hardware and firmware required to support development of Dual Mode applications, including:

- Complete radio hardware
- UART, I2C, SPI, ADC, and GPIO interfaces
- Embedded BTv4.0 software stack
  - Classic BT profile - SPP
  - GATT Client & Peripheral Modes

What makes the modules truly innovative is *smart*BASIC, an event-driven programming language that enables standalone operation of the module. Laird has extended the implementation of *smart*BASIC from the popular BL6xx series of single mode BLE modules into the BT900 series. This allows developers the flexibility of utilising the Core and BLE specific *smart*BASIC functions from the BL6xx series to create fully interchangeable BLE applications between these product ranges.

Without the need for any external processor, a simple *smart*BASIC application encapsulates the complete end-to-end process of reading, writing, and processing of sensor data and then using Classic Bluetooth or BLE to transfer it to / from any Bluetooth device. Ultimately *smart*BASIC accelerates initial development, creation of prototypes, and mass production by providing you with your own Bluetooth expert within the module.

In addition to carrying FCC modular, IC, CE and MIC approvals, BT900 modules are fully qualified as a Bluetooth product, enabling designers to integrate the modules in devices without the need for further Bluetooth testing. A low-cost developer's kit including simple software tools simplifies module integration and guarantees the fastest route to market.

1.1 Features & Benefits ✴ ✅RoHS

- Bluetooth v4.0 - Dual Mode (Classic Bluetooth and BLE)
- External or Internal Antennas
- smartBASIC programming language
- Full Bluetooth EPL
- Compact Footprint
- Programmable TX power 8dBm to -20dBm
- RX sensitivity: -90dBm
- Ultra low power consumption
- TX: 85 mA peak (at +8dBm)
- Standby Doze: 2.7mA (see Note2 in Error! Reference source not found.
- Deep Sleep: 233uA
- UART, GPIO, ADC, PWM, FREQ output, TIMERS, I2C, and SPI interfaces
- Fast Time to Market
- FCC, CE, IC, and Japan certified; other certs on request
- No external components required

1.2 Application Areas

- Medical devices
- Wellness devices
- Automotive Diagnostic Equipment
- Bar Code Scanners
- Industrial Cable Replacement
- Home automation

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2 SPECIFICATION

2.1 Specification Summary

Table 1: Specifications

Categories	Feature	Implementation
Wireless Specification	Bluetooth®	V4.0 – Dual-Mode
	Frequency	2.402 - 2.480 GHz
	Transmit Power	+ 8 dBm (maximum) Configurable down to -20 dBm
	Receive Sensitivity	-90 dBm (typical)
	Link Budget	98 dB
	Raw Data Rates (Air)	3 Mbps (Classic BT – BR/EDR)
Host Interface and Peripherals	UART Interface	TX, RX, CTS, RTS DTR, DSR, DCD, RI can be implemented in *smart*BASIC- using General Purpose I/O Default 115200, N, ,8, 1 From 1,200 to 921600 RX buffer size (1024 bytes)
	GPIO	18 (maximum – configurable) lines. O/P drive strength (4 mA) Pull-up resistor (33 KOhms) control (via *smart*BASIC) Read pin-level
	I2C Interface	1 (configurable from GPIO total). Up to 400 kbps
	SPI	1 (configurable from GPIO total). Up to 4 Mbps
	ADC Interface	2 channels (configured from GPIO total). Up to 12-bit resolution Conversion time 2.0uS (at VCC 2.7V to 3.6V) Reference voltage AVCC (external, same as VCC) pre-scaling to match BL600 ADC
	PWM or FREQ output	Output a PWM or FREQ on up to 3 GPIO output pins. PWM output duty cycle: 0%-100% PWM output frequency: 500 kHz FREQ output frequency: 0 MHz to 4 MHz (50% duty cycle)
	Wi-Fi-BT coexistence	3 dedicated pins
Profiles	Classic Bluetooth	SPP (Serial Port Profile) –Greater than 500kbps
	Bluetooth Low Energy	GATT Client & Peripheral – Any Custom Services
Maximum Connections	Classic Bluetooth	7 clients
	Bluetooth Low Energy	5 clients
Programmability	*smart*BASIC	On-board programming language similar to BASIC
	*smart*BASIC application	Via UART or Over the Air

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Categories	Feature	Implementation
Control Protocols		Any that can be implemented using *smart*BASIC vSP – Virtual Serial Port for BLE – Command Mode Only
FW upgrade	*smart*BASIC runtime engine FW upgrade	Via UART
Coexistence	802.11 (Wi-Fi)	3 wire CSR schemes supported (Unity-3 for classic BT, Unity-3e for BLE)
Operating Modes	Self-contained Run Mode	Selected by nAutoRUN pin status: LOW (0V). Then runs $autorun$ (*smart*BASIC application) if it exists.
	Interactive Development Mode	HIGH (VCC). Then runs via at+run (and "file name" of *smart*BASIC application script).
Supply Voltage	Supply	Nominal 5VDC
Power Consumption	Current	Max Peak Current (TX Power @ +8 dBm TX): 85 mA
		Standby Doze (waitevent) – 2.7mA (at 4MHz clock) (Note 5)
		Deep Sleep – 233 uA (external signal wakeup) See Note 5
	User Configurable Clocking	User configurable clocking (40MHz, 20MHz, 4MHz), so user can reduce current consumption further.
Physical	Dimensions	50.7mm x 18.5mm x 10.4mm
Environmental	Operating	-40°C to +85°C
	Storage	-40°C to +85°C
Miscellaneous	Lead Free	Lead-free and RoHS compliant
	Warranty	One Year
Development Tools	Development Kit	Development board and free software tools
Software Tools	Utilities	Windows, Android and iOS applications UART Firmware Upgrade
Approvals	Bluetooth®	Complete Declaration ID
	FCC / IC / CE / MIC	All BT900 Series

Note 1: DSR, DTR, RI, and DCD can be implemented in the *smart*BASIC application.

Note 2: With I2C interface selected, pull-up resistors on I2C SDA and I2C SCL MUST be connected externally as per I2C standard.

Note 3: SPI interface consists of SPI MOSI, SPI MISO and SPI CLK. SPI CS is created by customer using any spare SIO pin within their *smart*BASIC application script allowing multi-dropping.

Note 4: BT900 module comes loaded with *smart*BASIC runtime engine FW, but does not come loaded with any *smart*BASIC application script (as that is dependent on customer end application or use). Laird provides many sample *smart*BASIC applications covering the services listed.

Note 5: Deep sleep consumes 233uA of power when the BT900 internal radio chip 32.768kHz is used. The *smart*BASIC runtime engine firmware (v9.1.2.0) has SIO (DIO default function) input pins that are PULL-UP enabled by default. You may disable the internal PULL_UP through a *smart*BASIC

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application script. Lower Power consumption may be achieved when all SIO pins are set as outputs and low (in your *smart*BASIC application script). In deep sleep 7uA can be achieved if all SIO pins are set as output and low.

3 FCC AND IC REGULATORY STATEMENTS

Model	US/FCC	CANADA/IC
BT900-US	SQGBT900US	3147A-BT900US

PART #	FORM FACTOR	TX OUTPUT	ANTENNA
BT900-US	USB Dongle	8 dBm	Ceramic, Integrated

3.1 Power Exposure Information

Federal Communication Commission (FCC) Radiation Exposure Statement:
This EUT is in compliance with SAR for general population/uncontrolled exposure limits in ANSI/IEEE C95.1-1999 and had been tested in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C.

This transceiver must not be co-located or operating in conjunction with any other antenna, transmitter, or external amplifiers. Further testing / evaluation of the end product will be required if the OEM's device violates any of these requirements.

The BT900 is fully approved for mobile and portable applications.

3.2 Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:

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FCC Radiation Exposure Statement:

The product comply with the US portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

3.3 Industry Canada statement

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes:
(1) Ce dispositif ne peut causer d'interférences; et(2) Ce dispositif doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

Radiation Exposure Statement:

The product comply with the Canada portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

Déclaration d'exposition aux radiations:
Le produit est conforme aux limites d'exposition pour les appareils portables RF pour les Etats-Unis et le Canada établies pour un environnement non contrôlé. Le produit est sûr pour un fonctionnement tel que décrit dans ce manuel. La réduction aux expositions RF peut être augmentée si l'appareil peut être conservé aussi loin que possible du corps de l'utilisateur ou que le dispositif est réglé sur la puissance de sortie la plus faible si une telle fonction est disponible.

4 EU DECLARATIONS OF CONFORMITY

4.1 BT900-US

Manufacturer:	Laird
Product:	BT900-US
EU Directive:	RTTE 1995/5/EC
Conformity Assessment:	Annex IV

Table 2: Reference standards used for presumption of conformity

Article Number	Requirement	Reference standard(s)
3.1a	Health and Safety	EN60950-1:2006+A11:2009+A1:2010+A12:2011
3.1b	Protection requirements with respect to electromagnetic compatibility	EN 301 489-1 V1.9.2 (2011-09) EN 301 489-17 V2.2.1 (2012-09) Emissions: EN55022:2006/A1:2007 (Class B) Immunity: EN61000-4-2:2009

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		EN61000-4-3:2006/A1:2008/A2:2010
3.2	Means of the efficient use of the radio frequency spectrum	EN 300 328 V1.8.1 (2012-06)

Declaration:

We, Laird, declare under our sole responsibility that the essential radio test suites have been carried out and that the above product to which this declaration relates is in conformity with all the applicable essential requirements of Article 3 of the EU Directive 1999/5/EC, when used for its intended purpose.

Place of Issue:	Laird Saturn House, Mercury Park Wooburn Green HP100HH, United Kingdom tel: +44 (0)1628 858 940 fax: +44 (0)1628 528 382
Date of Issue:	July 2014
Name of Authorized Person:	Andrew Dobbing, Engineering Manager
Signature:	

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5 ORDERING INFORMATION

Part Number	Description
BT900-US	Single Mode Pluggable USB BLE Module featuring *smart*BASIC – integrated antenna

5.1 General Comments

This is a preliminary datasheet. Please check with Laird for the latest information before commencing a design. If in doubt, ask.

6 BLUETOOTH SIG QUALIFICATION

The BT900-US module is listed on the Bluetooth SIG website as qualified End Products.

Design Name	Owner	Declaration ID	Link to listing on the SIG website
BT900	Laird Technologies	D023116	https://www.bluetooth.org/tpg/QLI_viewQDL.cfm?qid=23116

It is a mandatory requirement of the Bluetooth Special Interest Group (SIG) that every product implementing Bluetooth technology has a Declaration ID. Every Bluetooth design is required to go through the qualification process, even when referencing a Bluetooth Design that already has its own Declaration ID. The Qualification Process requires each company to registered as a member of the Bluetooth SIG – www.bluetooth.org

The following link provides a link to the Bluetooth registration page:
https://www.bluetooth.org/login/register/

For each Bluetooth Design it is necessary to purchase a Declaration ID. This can be done before starting the new qualification, either through invoicing or credit card payment. The fees for the Declaration ID will depend on your membership status, please refer to the following webpage:

https://www.bluetooth.org/en-us/test-qualification/qualification-overview/fees

For a detailed procedure of how to obtain a new Declaration ID for your design, refer to the following document: https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=283698&vId=317486

To start the listing, go to: https://www.bluetooth.org/tpg/QLI_SDoc.cfm

In step 1, select the option, **Reference a Qualified Design** and enter xXXXX in the End Product table entry. You can then select your pre-paid Declaration ID from the drop down menu or go to the Purchase Declaration ID page.

> **Note:** Unless the Declaration ID is pre-paid or purchased with a credit card, you cannot proceed until the SIG invoice is paid.

Once all the relevant sections of step 1 are finished, complete steps 2, 3, and 4 as described in the help document. Your new Design will be listed on the SIG website and you can print your Certificate and DoC.

For further information please refer to the following training material:

https://www.bluetooth.org/en-us/test-qualification/qualification-overview/listing-process-updates

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Additional Assistance

Please contact your local sales representative or our support team for further assistance:

Laird Technologies Connectivity Products Business Unit

Support Centre: http://ews-support.lairdtech.com

Email: wireless.support@lairdtech.com

Phone: Americas: +1-800-492-2320 Option 2

          Europe: +44-1628-858-940

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Laird is the world leader in the design and manufacture of customized, performance-critical products for wireless and other advanced electronics applications.

Laird Technologies partners with its customers to find solutions for applications in various industries such as:

- Network Equipment
- Telecommunications
- Data Communications
- Automotive Electronics
- Computers
- Aerospace
- Military
- Medical Equipment
- Consumer Electronics

Laird offers its customers unique product solutions, dedication to research and development, as well as a seamless network of manufacturing and customer support facilities across the globe.

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