SecuRemote® Multiprotocol Bluetooth Smart, ANT, NFC Module
SRU563 DATASHEET

1. DESCRIPTION

Now available for design in, the Delphian Systems' SRU563 Short Range Bluetooth Smart module brings mesh networking support to the Bluetooth Smart environment.

The SRU563 is a multiprotocol Bluetooth® Smart module with ANT practical mesh network support and up to +4 dBm Tx power. The SRU563 has an integrated 2.4GHz radio subsystem, includes a mature dual protocol software stack supporting BLE 4.2, GATT based profiles and ANT with mesh networking attributes. It contains an ARM® Cortex® M4F microcontroller with 512KB flash memory and 64KB RAM, removing the requirement for an external microcontroller. Up to 400KB of memory is available for custom application development using the *SecuRemote*® API. Access to the BLE/ANT stack over the *SecuRemote*® AT Command Set UART interface speed evaluation and product development.

Delphian Systems' supports your product development with mobile app developers, firmware developers and cloud service professional, all available to help you to build your custom IoT applications for iOS and Android.

2. FEATURES

- Industry Leading Wireless Range from integrated chip antenna
- Built in nRF52832 single-chip 2.4GHz Bluetooth Smart System on a Chip
- Fully supports ANT and Bluetooth Smart SoftDevice S132 2.0.1 from Nordic Semi
- Bluetooth Compliant Transmit Power: +4 to -20dBm in 4dB steps

- BT 4.2 compliant.
- RF Receive Sensitivity (BLE): -96dBm
- RF Receive Sensitivity (ANT): -92.5dBm
- Miniature Size: 12mm x 18mm x 2.3mm
- Operating Voltage: 1.7V to 3.6V
- Operating temperature: -25 to +65° C

- FCC (USA) : 2AEHJSRU563 *(Under Process)*
- IC: 20053-SRU563 *(Under Process)* (Canada)which may be reused – **no need to certify your own radio**
- Future Certifications: CE (Europe)
- Integrated ARM Cortex M4F 32 bit Microcontroller
- Memory: 512KB Flash, 64KB RAM
- 8 Configurable ADC Channels
- Timer/counter : 5 x 32bit, 3 x 24bit RTC
- SPI Master/Slave, I2C, UART
- Low Power Comparator
- CPU Independent Programmable Peripheral Interconnect (PPI)\
- NFC-A tag interface
- Quadrature Decoder (QDEC)
- AES HW Encryption
- Real Time Counter(RTC)
- RoHS compliant
- ESD Hardened Antenna port
- ESD Hardened Vdd

The information in this document is subject to change without notice.

3. APPLICATIONS

- IoT Applications
- High Security Access Controls
- Home and Building Automation
- Personal Area Networks such as Health fitness sensor, key-fobs, wrist watches
- Beacons, Smart Tag
- Industrial Controls
- Medical (ex Heart – Rate Monitor, Blood Pressure Sensor, Blood Glucose Meter)
- Temperature sensing, monitoring
- Flood Alarm
- Heating Control
- Process Monitoring and Control
- Industrial Wireless Sensor Networks
- Toys
- Mobile Accessories
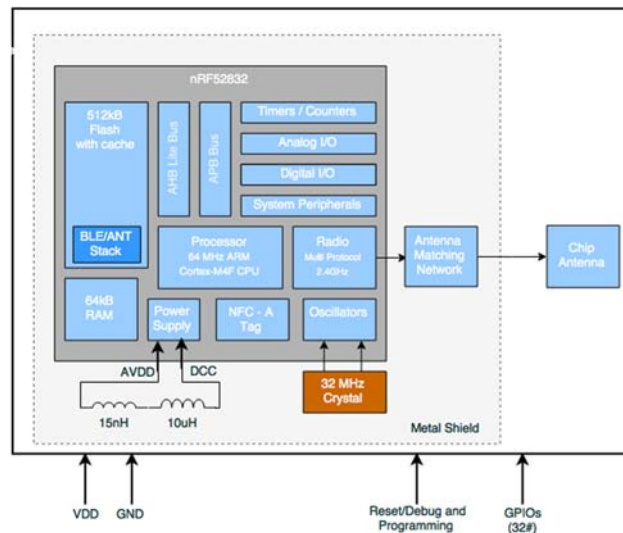- All Bluetooth Smart Applications

4. BLOCK DIAGRAM

Figure 1 Block diagram of SRU563

The information in this document is subject to change without notice.

SecuRemote® Multiprotocol Bluetooth Smart, ANT, NFC Module
SRU563 DATASHEET

Table of Contents

5. DEVELOPING WITH SECUREMOTE®SMART BLUETOOTH® POWERED PRODUCTS

The SRU563 module series uses the nRF52832 SOC from Nordic Semiconductor. The SRU563 supports Nordic's SoftDevice S132 2.0.1. Users may download copies of this datasheet, application notes, sample applications and firmware from http://www.delphiansystems.com

In addition, Delphian Systems can support OEMs in following areas:

1. Embedded Bluetooth firmware development
2. Application development for iOS and Android
3. Cloud services (connectivity and device management portal)
4. Bluetooth end product hardware design
5. Support for product development using SRU23x modules
6. Transition to mass production

6. DEVELOPING SRU563 POWERED PRODUCTS

SRU563 supports three approaches for developers to get started quickly designing Bluetooth Smart powered products.

1. Developers can utilize the same development environment supported by Nordic Semiconductor nRF52 family of devices, migrating their software to the SRU563.

2. Developers may program the SRU563 for BLE,ANT and NFC functions by accessing the *SecuRemote*® AT command set over a UART interface.

3. Developers can build and embed their application code using the *SecuRemote*® API and library of BLE/ANT functions.
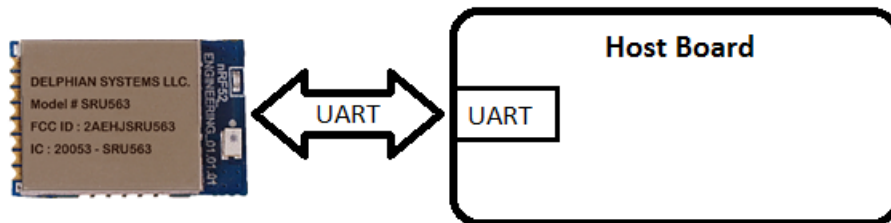
AT Command based product development

Figure 2 Interface diagram between SRU563 and Host Controller

- Delphian Systems provides the complete AT Command set for Bluetooth Smart, ANT and NFC base application development.
- Please refer to the www.delphiansystems.com website to access the SR Module AT Commands document and application notes with example projects.
- Developing application on Bluetooth Smart, ANT and NFC using AT Command set which does not require extensive experience with either protocol to begin product development.

SR-API based product development

- SRU563 has a Cortex®-M4F ARM® processor with 512KB Flash and 64KB RAM so users can develop custom applications without using an external host controller.
- Delphian systems has provided the *SecuRemote*® API for custom application development. Please refer to the www.delphiansystems.com to access the SR Module Software API document for more details.
- SRU563 has NFC along with Bluetooth Low Energy SoC. The on chip NFC-A tag allows the developers to incorporate 'touch-to-pair' functionality in their designs.
- A developer should possess a good working knowledge on BLE, ANT and Keil IDE.
- SRU563 modules support the Serial Wire Debug (SWD) interface (SWDCLK and SWDIO/RESET) for programming and debugging of the module.

The information in this document is subject to change without notice.

7. PIN DESCRIPTION:

A. Module Schematic View
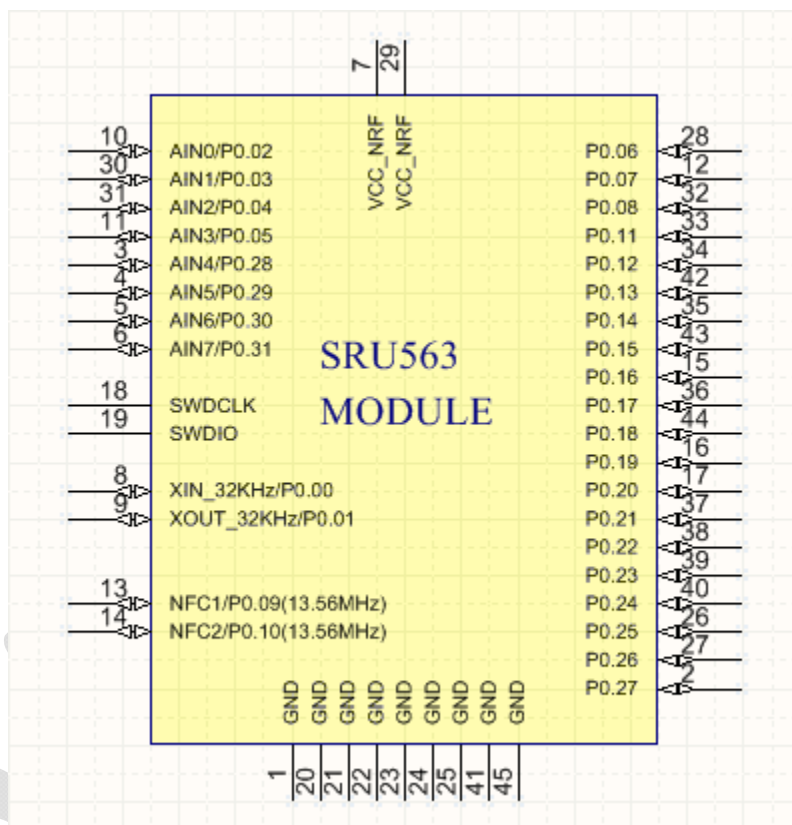
Figure 3 Schematic view of SRU563

The information in this document is subject to change without notice.

SRU563-DS-0216-001   Copyright © 2016 Delphian Systems   Page 6 of 19

B. Pin Descriptions

Module Pin	Pin Name	I/O Type	Description
1	GND	Ground	Ground
2	P0.27	Digital I/O	Digital Input/output
3	AIN4/P0.28	Analog Input/ Digital I/O	Analog Input, Digital Input/output
4	AIN5/P0.29	Analog Input/ Digital I/O	Analog Input, Digital Input/output
5	AIN6/P0.30	Analog Input/ Digital I/O	Analog Input, Digital Input/output
6	AIN7/P0.31	Analog Input/ Digital I/O	Analog Input, Digital Input/output
7	VCC_NRF	PI	Power Supply
8	XIN_32KHz/P0.00	Analog Input/ Digital I/O	Connection for 32.768 kHz crystal, Digital Input/output
9	XOUT_32KHz/P0.01	Analog Input/ Digital I/O	Connection for 32.768 kHz crystal, Digital Input/output
10	AIN0/P0.02	Analog Input/ Digital I/O	Analog Input, Digital Input/output
11	AIN3/P0.05	Analog Input/ Digital I/O	Analog Input, Digital Input/output
12	P0.07	Digital I/O	Digital Input/output
13	NFC1/P0.09(13.56MHz)	Digital I/O, NFC Input	Digital Input/output, NFC antenna connection
14	NFC2/P0.10(13.56MHz)	Digital I/O, NFC Input	Digital Input/output, NFC antenna connection
15	P0.16	Digital I/O	Digital Input/output
16	P0.19	Digital I/O	Digital Input/output
17	P0.20	Digital I/O	Digital Input/output
18	SWDCLK	Digital Input	Hardware debug and flash programming I/O
19	SWDIO	Digital I/O	Hardware debug and flash programming I/O
20	GND	Ground	Ground
21	GND	Ground	Ground
22	GND	Ground	Ground
23	GND	Ground	Ground
24	GND	Ground	Ground
25	GND	Ground	Ground
26	P0.25	Digital I/O	Digital Input/output

The information in this document is subject to change without notice.

27	P0.26	Digital I/O	Digital Input/output
28	P0.06	Digital I/O	Digital Input/output
29	VCC_NRF	PI	Power Supply
30	AIN1/P0.03	Analog Input/ Digital I/O	Analog Input, Digital Input/output
31	AIN2/P0.04	Analog Input/ Digital I/O	Analog Input, Digital Input/output
32	P0.08	Digital I/O	Digital Input/output
33	P0.11	Digital I/O	Digital Input/output
34	P0.12	Digital I/O	Digital Input/output
35	P0.14	Digital I/O	Digital Input/output
36	P0.17	Digital I/O	Digital Input/output
37	P0.21	Digital I/O	Digital Input/output
38	P0.22	Digital I/O	Digital Input/output
39	P0.23	Digital I/O	Digital Input/output
40	P0.24	Digital I/O	Digital Input/output
41	GND	Ground	Ground
42	P0.13	Digital I/O	Digital Input/output
43	P0.15	Digital I/O	Digital Input/output
44	P0.18	Digital I/O	Digital Input/output
45	GND	Ground	Ground

Table 1 Pin Descriptions

PI = Power Input
I = Input
Reserved = Not Used
IO = Bi-directional Input Output Port
RF = Bi-directional RF Port
GND=Ground
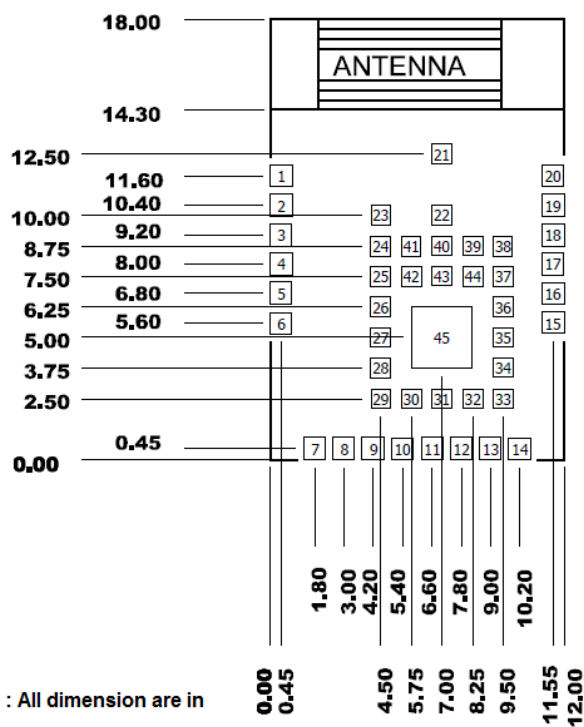
C. Module TOP View

Figure 4 TOP View of SRU563

D. Mechanical Dimension:

No.	Item	Dimension	Tolerance
1.	Length	18.00 mm	+/- 0.20
2.	Width	12.00 mm	+/- 0.20
3.	Height	2.3 mm	+/- 0.20

The information in this document is subject to change without notice.

8. ELECTRICAL SPECIFICAITON:

A. Absolute Maximum Ratings

Symbol	Description	Min	Max	Unit
VDD	Input supply Voltage	1.8	3.6	V

Table 2 Absolute Maximum Ratings[1]

B. Recommended Operating Conditions

Test conditions: Ambient Temp = 25°C, Tx power = +4 dBm

Symbol	Min	Typ	Max	Unit	Conditions
VDD	1.8	3.0	3.6	V	
Sleep Current Without RAM retention	-	0.7	-	uA	VDC=3.0V, Temp=25C
Sleep Current With RAM retention		1.0		uA	VDC=3.0V, Temp=25C
TX Current @ 0dBm		7.1		mA	VDC=3.0V, Temp=25C
RX Current		6.5		mA	VDC=3.0V, Temp=25C

Table 3 Recommended Operating Conditions

---

[1] Under no circumstances should exceeding the ratings specified in the Absolute Maximum Ratings section be allowed. Stressing the module beyond these limits may result permanent damage to the module that is not covered by the warranty.

The information in this document is subject to change without notice.

C. General Specification:

Characteristic	Description
Model Name	SRU563
Product Description	Bluetooth Smart Wireless Module
Dimension	12.0 mm x 18.0 mm x 2.3 mm (W*L*T)
Interface	SPI, TWI, UART
Operating temperature	-25°C to +65°C
Storage temperature	-25°C to +65°C
Humidity	Operating Humidity 10% to 95% Non-Condensing Storage Humidity 5% to 95% Non-Condensing
Weight	0.2 g +/- 0.01g

Table 4 General Characteristics

D. Bluetooth Low Energy RF Characteristics

Feature	Description
Bluetooth Standard	Bluetooth 4.2
Host Interface	SPI, TWI, UART
Antenna Reference	Chip
Frequency Band	2.402 GHz ~ 2.480 GHz
Number of Channels	40 channels
Modulation	GFSK

Table 5 Bluetooth General Specifications

E. NFC Characteristics

Description	Min	Typ	Max	Unit
Frequency		13.56		MHz
Data Rate		106		kbps
NFC Pin Current			80	mA
Antenna Reference	Antenna provided with Nordic Semiconductor nRF52 DK (Part No# 400178)			

Table 7 NFC General Specifications

The information in this document is subject to change without notice.

9. ASSEMBLY GUIDELINE:

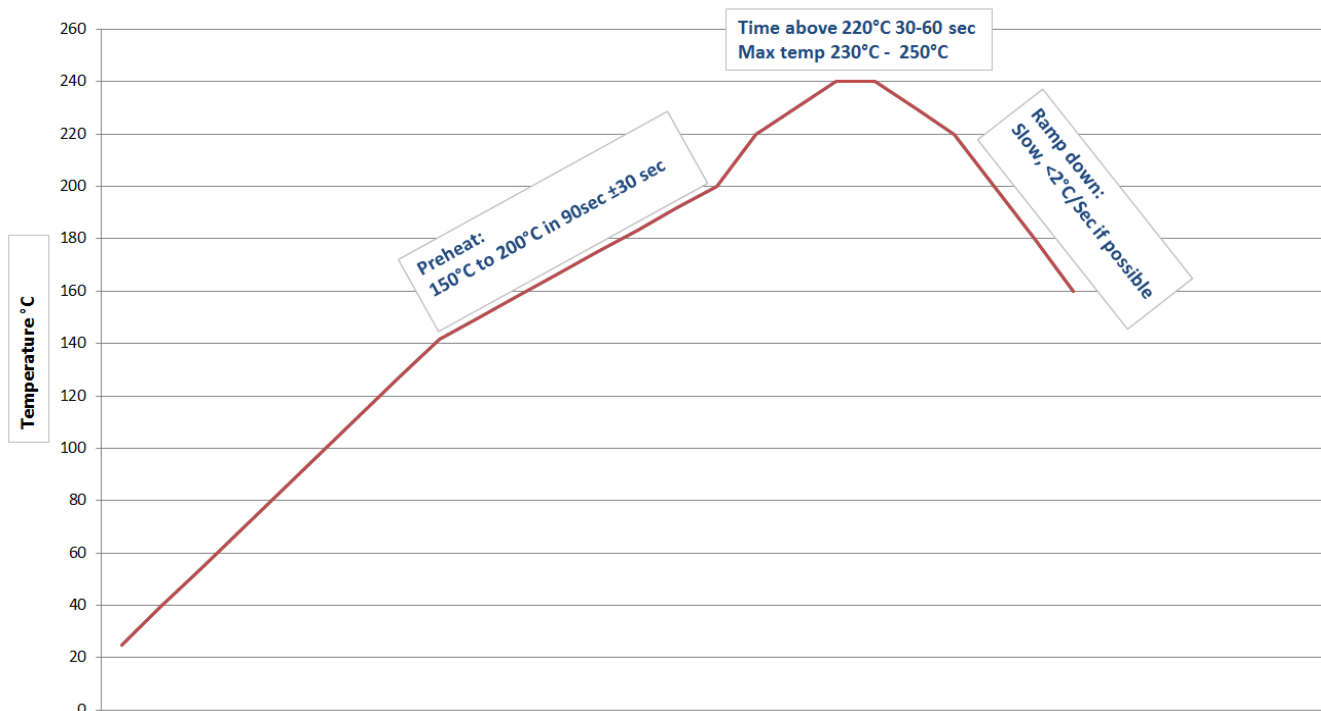### A. RECOMMENDED REFLOW PROFILE FOR LEAD FREE SOLDER

Figure 5 Recommended Soldering Profile

Note: The quality of solder joints on the surface mount pads where they contact the host board should meet the appropriate IPC Specification. See IPC-A-610-D Acceptability of Electronic Assemblies, section 8.2.1 "Bottom Only Terminations."

The information in this document is subject to change without notice.

B. CLEANING

In general, cleaning the populated modules is strongly discouraged. Residuals under the module cannot be easily removed with any cleaning process.

- Cleaning with water can lead to capillary effects where water is absorbed into the gap between the host board and the module. The combination of soldering flux residuals and encapsulated water could lead to short circuits between neighboring pads. Water could also damage any stickers or labels.

- Cleaning with alcohol or a similar organic solvent will likely flood soldering flux residuals into the RF shield, which is not accessible for post-washing inspection. The solvent could also damage any stickers or labels.

- Ultrasonic cleaning could damage the module permanently.

C. OPTICAL INSPECTION

After soldering the Module to the host board, consider optical inspection to check the following:

- Proper alignment and centering of the module over the pads.

- Proper solder joints on all pads.

- Excessive solder or contacts to neighboring pads, or vias.

D. REWORK

The module can be unsoldered from the host board if the Moisture Sensitivity Level (MSL) requirements are met as described in this datasheet.

> **Never attempt a rework on the module itself, e.g. replacing individual components. Such actions will terminate warranty coverage.**

E. SHIPPING, HANDLING, AND STORAGE

Shipping

Bulk orders of the modules are delivered in reels of 1,000.

Handling

The modules contain a highly sensitive electronic circuitry. Handling without proper ESD protection may damage the module permanently.

F. Moisture Sensitivity Level (MSL)

Per J-STD-020, devices rated as MSL 4 and not stored in a sealed bag with desiccant pack should be baked prior to use.

After opening packaging, devices that will be subjected to reflow must be mounted within 72 hours of factory conditions (<30°C and 60% RH) or stored at <10% RH.

Bake devices for 48 hours at 125°C.

G. Storage

Please use this product within 6 months after receipt. Any product used after 6 months of receipt needs to have solderability confirmed before use.

The product shall be stored without opening the packing under the ambient temperature from

The information in this document is subject to change without notice.

5 Cto 35 C and humidity from 20 to 70%RH. (Packing materials, in particular, may be deformed at the temperatures above this range.)

Do not store in salty air or in an environment with a high concentration of corrosive gas, such as Cl2, H2S, NH3, SO2, or NOX.

Do not store in direct sunlight.

The product should not be subject to excessive mechanical shock.

H. REPEATING REFLOW SOLDERING

Only a single reflow soldering process is encouraged for host boards.

The information in this document is subject to change without notice.

10.   REGULATORY STATEMENTS

10.1   FCC Statement:

This device has been tested and found to comply with 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 or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the 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.

Operation is subjected to the following two conditions: (1) This device may no cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Note: Modification to this product will void the user's authority to operate this equipment.
Note: Modification to this product will void the users' authority to operate this equipment.

10.2 FCC Important Notes:

(1) FCC Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This equipment complies with Part 15 of the FCC Rules. Operation is subject 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.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in this document.

Caution!

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modification could void the user authority to operate the equipment.

(2) Co-location Warning:

This device and its antenna(s) must not be co-located or operating in conjunction with any other transmitter antenna.

(3) OEM integration instructions：

This device is intended only for OEM integrators under the following conditions:

The information in this document is subject to change without notice.

The antenna and transmitter must not be co-located with any other transmitter or antenna. The module shall be only used with the integral antenna(s) that has been originally tested and certified with this module.

As long as the two (2) conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements with this module installed (for example, digital device emission, PC peripheral requirements, etc.)

In the event that these conditions cannot be met (for example certain laptop configuration or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these and circumstance, the OEM integrator will be responsible for re-evaluating. The end product (including the transmitter) and obtaining a separate FCC authorization.

Caution!

The OEM is still responsible for verifying compliance with FCC Part 15, subpart B limits for unintentional radiators through an accredited test facility.

(4) End product labeling :

The final end product must be labeled in a visible area with the following:

- SRU563: "Contains **FCC ID: 2AEHJSRU563**"

Any similar wording that expresses the same meaning may be used.

The FCC Statement below should also be included on the label. When not possible, the FCC Statement should be included in the User Manual of the host device.

"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. (2) This device must accept any interference received, including interference that may cause undesired operation."

(5) Information regarding the end user manual :

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual (Section 10.2(4)).

10.3 IC Statement:

This device complies with Industry Canada license-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The information in this document is subject to change without notice.

RF exposure warning: The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Avertissement d'exposition RF: L'équipement est conforme aux limites d'exposition aux RF établies pour un incontrôlés environnement. L'antenne (s) utilisée pour ce transmetteur ne doit pas être co-localisés ou onctionner en conjonction avec toute autre antenne ou transmetteur.

10.4 IC Important Notes:

1. The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user manual of the end product.
The user manual which is provided by OEM integrators for end users must include the following information in a prominent location.

2. To comply with IC RF exposure compliance requirements, the antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with IC multi-transmitter product procedures.

3. The final system integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter module except such device has implemented two-ways authentication between module and the host system.

4. The host device shall be properly labelled to identify the module within the host device. The final end product must be labeled in a visible area with the following:

- SRU563: "Contains **IC: 20053-SRU563**"

Any similar wording that expresses the same meaning may be used.
The IC Statement below should also be included on the label. When not possible, the IC Statement should be included in the User Manual of the host device.

"This device complies with Industry Canada license-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le onctionnement."

The information in this document is subject to change without notice.

11. FCC AND IC LABELING

FCC ID: 2AEHJSRU563

IC# 20053-SRU563

CAN ICES-3(B)/NMB-3(B)

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.

Figure 6 FCC and IC ID Labeling on SRU563

12. CONTACTING DELPHIAN SYSTEMS

Headquarters:

Delphian Systems, LLC.

925 Weiland Road, Suite 150

Buffalo Grove, IL 60089   `

Phone: 847-305-8076

Website: www.delphiansystems.com

Technical Support: support@delphiansystems.com

Sales Contact: www.delphiansystems.com/contact

The information in this document is provided in connection with Delphian Systems (hereafter referred to as "Delphian") products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Delphian products. EXCEPT AS SET FORTH IN DELPHIAN'S TERMS AND CONDITIONS OF SALE LOCATED ON DELPHIAN'S WEB SITE, DELPHIAN ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL DELPHIAN BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF DELPHIAN HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. DELPHIAN makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. DELPHIAN does not make any commitment to update the information contained herein. Unless specifically provided otherwise, DELPHIAN products are not suitable for, and shall not be used in, automotive applications. DELPHIAN's products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.

The information in this document is subject to change without notice.