



USERGUIDE

M-001-222-03-USG-07-EN

TITAN PULSE800

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1. Document history

Revision	Dateofrelease	Reason	Updatedby	Reviewedby
01A	2024/01/29	1 st Revision-DraftA	M.Conradie	W.Pretorius
01	2024/01/31	1 st Revision-Release	M.Conradie	W.Pretorius
02A	2025/02/14	Updatecertification-DraftA	B. Roodt	W.Pretorius
02	2025/02/14	Updatecertification-Release	B. Roodt	W.Pretorius
03A	2025/03/20	AddedCEmark-DraftA	B. Roodt	W.Bosch
03	2025/03/25	AddedCEmark-Release	B. Roodt	W.Bosch
04A	2025/05/13	AddedENACOMwarning-DraftA	B. Roodt	P.Kruger
04	2025/05/13	AddedENACOMwarning-Release	B. Roodt	P.Kruger
05A	2025/06/03	Updatedgranteecode-DraftA	B. Roodt	F.Maré
05	2025/06/03	Updatedgranteecode-Release	B. Roodt	F.Maré
06A	2025/08/04	Addedsinglemodulenotice-DraftA	B. Roodt	F.Maré
06	2025/08/28	Addedsinglemodulenotice&bands-Release	B. Roodt	
07A	2025/08/29	AddedtestedLTEbands-DraftA	B.Roodt	F.Maré
07	2025/08/29	AddedtestedLTEbands-Release	B. Roodt	

2. Distribution

Name	Company	Role
Any employee	EpirocDigitalSafetySolutionsSouthAfrica Pty Ltd	Originator
DigitalSolutionDivision, PartsandServicesDivision	Epiroc	Discretionarydistribution

3. Approval

Name	Title	Date	Sign
H.duPlessis	EngineeringManager		

4. Scope

This document is a user's guide (USG) to describe the function of the Titan Pulse800(M-001-222-03). It providestheuserwiththerelevant electricalandmechanicalspecificationsandguidestheuseronthesetupandinstallation of the device.

5. Intellectualpropertynotice

The information in this document contains intellectual property developed and owned by Epiroc Digital Safety SolutionsSouthAfricaPty Ltdisconfidential,privileged,and onlyfortheinformationofthe intendedrecipientand may not be used, published, or redistributed without the prior written consent of Epiroc Digital Safety Solutions South Africa Pty Ltd.

6. Manufacturer details

Manufacturer details	
Name	EpirocDigitalSafetySolutionsSouthAfricaPtyLtd
Address	Unit1AgnonePark,53AdrianaCrescent,Centurion,0157,SouthAfrica
PhoneNumber	+2712661 4828

Table1:Manufacturerdetails

7. Certification details

Certification Details	
FCCID	2BPRY-22203V1
ICID	32678-22203V1

Table2:Certification Details

7.1 Declaration of Conformity in accordance with Directive 2014/53/EU

M-001-222-03 (Titan Pulse800) complies with the essential requirements and other relevant provisions of Directive 2014/53/EU, when used for its intended purpose.

The following marking applies to M-001-222-03 (Titan Pulse800):



Figure1:CEmark

7.2 Declaration of Conformity in accordance with 47 CFR part 15

M-001-222-03 (Titan Pulse800) complies with the essential requirements and other relevant provisions of 47 CFR part 15, when used for its intended purpose.

The following marking applies to M-001-222-03 (Titan Pulse800):



Figure2:FCCmark

8. Specification of accessories

Specification of accessories	
Unit	M-001-222-03
Includes	PCB Assembly X2 mounting screws
Excludes	Enclosure u.FL antenna

Table3:Specification of accessories

9. Abbreviations

The abbreviations listed in Table 4 are used throughout the document.

Abbreviation	Description
COM	Communication
CxD	Machine with sensor to allow proximity detection.
DC	Direct Current
GFSK	Gaussian Frequency Shift Keying
GMT	Greenwich Mean Time
GPIO	General-purpose input/output
ID	Identification
LED	Light Emitting Diode
LF	Low Frequency
NA	Not Applicable
NFC	Near-field Communication
OEM	Original Equipment Manufacturer
OOK	On-Off Keying
PC	Personal Computer
PDS	Proximity Detection System
RF	Radio Frequency
RSSI	Received signal strength indicator
RTC	Real-time Clock
RWM	Read/Write module
UID	Unique Identifier
USB	Universal Serial Bus
VTP	Vehicle to Pedestrian
VTV	Vehicle to Vehicle
UWB	Ultra-Wideband
GNSS	Global Navigation Satellite System

Table 4: Abbreviations

10. Introduction

The Titan Pulse800 forms part of the Titan family of collision avoidance products. The Pulse devices utilize technologies such as LF magnetic field detection, sub-GHz RF, and UWB time-of-flight for threat detection.

The Titan Pulse800 is a module that forms the core of the Pulse devices. It contains the microprocessor and performs all the processing of the sensor. The Titan Pulse800 contains a Wi-Fi/Bluetooth module, GPS module, GSM / LTE module, ethernet PHY controller, NFC EEPROM, NVRAM, eMMC flash and various communication peripherals used to control the circuitry on the baseboard it is plugged into.

When plugged into a compatible baseboard, the Titan Pulse800 provides GNSS location tracking, along with the possibility of connecting to external remote services through its Wi-Fi and GSM. This allows the system access to the internet or an intranet that allows for advanced tracking, configuration, and data transfer. The Titan Pulse800 also allows for ethernet networking when used as a stationary device.

The Titan Pulse800 unit uses CAN bus communication, providing robust communication between devices and allowing dynamic configuration of these devices. It can also easily be configured in field via an NFC reader, without the need to open the enclosure or power the device.

11. Operating principal

The Titan Pulse800 acts as a gateway device between the local system and the global network through its use of Wi-Fi, GSM/LTE, and ethernet, allowing for advanced remote operations and monitoring. Figure 3 provides an illustration of such a system.



Figure 3: Titan Pulse800 gateway operation

12. Application

The Titan Pulse800 will simply slide into an existing connector slot on a wide range of the Titan series products. This feature allows the Titan Pulse800 to immediately provide the product with connect capabilities such as WIFI, ETH, GSM/LTE.

12.1 Functions:

- LTE/GSM communication.
- Integrated dual SIM's, Microsim card optional.
- WIFI 2.4GHz
- Bluetooth
- GNSS with multi-mode dead reckoning.
- Integrated ethernet stack with on-board PHY controller.

12.2 Features:

- Live tracking for surface applications.
- Remote configuration.
- Remote system status view.
- Remote system updates
- Machine to server communication.
- Data logging
- NFC for configuration.

13. Variants

Table 5 describes the different variants of the Titan Pulse800 module.

Variant	Part Numbers	Description
V1	M-001-222-03-V1	Pulse800 Module - GNSS, WIFI, Cellular and Ethernet
V2	M-001-222-03-V2	Pulse800 Module - GNSS, WIFI and Ethernet
V3	M-001-222-03-V3	Pulse800 Module - GNSS, Cellular and Ethernet
V4	M-001-222-03-V4	Pulse800 Module - GNSS and Ethernet
V5	M-001-222-03-V5	Pulse800 Module - WIFI and Ethernet
V6	M-001-222-03-V6	Pulse800 Module - Cellular and Ethernet
V7	M-001-222-03-V7	Pulse800 Module - Ethernet

Table 5: Titan Pulse800 variant descriptions

14. Electrical and Environmental Specifications

14.1 Electrical specifications

Table 6 provides the electrical specifications of the TitanPulse800.

Parameter	Minimum	Nominal	Maximum	Unit
Input voltage	4.8	5	5.2	VDC
Power consumption	1.44	2.5	3.12	W

Table 6: Electrical specifications

14.2 Environmental specifications

The environmental specifications for the TitanPulse800 are provided in Table 7.

Parameter	Minimum	Maximum	Unit
Ambient temperature	0	50	°C

Table 7: Environmental specifications

15. Communications specifications

Table 8 provides the communications specifications of the TitanPulse800 module.

Parameter	Modulation/Format	
USB2.0	480Mbps	USB2.0
Ethernet	100Mbps	IEEE802.3
Wi-Fi	2.4	IEEE802.11b/g/n
Bluetooth	2.4GHz	BLEv5.0
GNSS	4 concurrent GNSS	BeiDou, GPS/QZSS, Galileo, GLONASS
Cellular	LTE/GSM	B5/B7/B12

Table 8: Communications specifications

15.1 GNSS specifications

Table 9 provides the GNSS specifications for the Titan Pulse 800 module.

Parameter	Description
GNSS	BeiDou, Galileo, GLONASS, GNSS / QZSS
Number of concurrent GNSS	4
GNSS channels	GPS L1 C/A, QZSS L1 C/A/S, GLONASS L1 OF BeiDou B1I (1561.098 MHz) only, Galileo E1B/C SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN
UDR	Yes
ADR	Yes
Navigation Rate	Up to 50 Hz
Radiotype	Module
Operational Frequency range	1559 MHz to 1610 MHz
Operating Frequencies	GPS: 1575.42 MHz Galileo: 1575.42 MHz GLONASS: 1602 MHz BDS: 1561.098 MHz
Channel bandwidth	GPS: 20.46 MHz Galileo: 24.552 MHz GLONASS: 562.5 kHz BDS: 4.092 MHz

Table 9: GNSS specifications

15.2 Wi-Fi specifications

Table 10 provides the Wi-Fi specifications of the Titan Pulse 800 module.

Parameter	Description
Wi-Fi	2.4 GHz
IEEE 802.11 standards	b/g/n
Max Wi-Fi range	300m
Output power EIRP	15 dBm
End-to-end security	Yes
Security	WPA/WPA2
Radiotype	Module
Operational Frequency range	1559 MHz to 1610 MHz
Operating Frequencies	2.4 GHz: 2.4 GHz to 2.4835 GHz
Modulation	16-QAM
MAX Power output	2.4 GHz: 10 dBm

Table 10: Wi-Fi specifications

15.3 Bluetooth specifications

Table 11 provides the Bluetooth specifications of the Titan Pulse 800.

Parameter	Description
Bluetooth qualification	V5.0
Bluetooth low energy	Yes
Operating frequency band	2.4 GHz to 2.483.5 GHz
Output power EIRP	10 dBm

Table 11: Bluetooth specifications

15.4 Cellular specifications

Table 12 provides the cellular specifications of the Titan Pulse 800.

Parameter	Description
LTE FDD bands	5/7/12
GSM/GPRS bands	850/900/1800/1900
Output power EIRP	23 dBm
Modulation	16-QAM
Dual SIM	Yes

Table 12: Cellular specifications

Table 13 provides the tested cellular bands of the Titan Pulse 800.

Parameter	Description
FCC tested LTE bands	5/7/12
CE tested LTE bands	1/3/7

Table 13: Cellular tested bands

16. Updating firmware

This section describes how to update the bootloader and the application of the Titan Pulse 800.

16.1 Updating Bootloader

To update the bootloader of the Titan Pulse 800, follow the steps below:

- Plug the Titan Pulse 800 into a compatible baseboard and supply it with power.
- Connect an ST-Link between the PC and the Titan Pulse 800.
- Open STM32CubeProgrammer or other preferred firmware flashing software.
- Click the “Open file” button and select the bootloader (.hex) file that you would like to program onto the unit. Refer to Figure 4.
- Click the “Connect” button and verify that the program is connected to the unit. Refer to Figure 5.
- Click the “Download” button and wait for the file to be loaded onto the device. If successful, the dialog prompt will be displayed as shown in Figure 6.

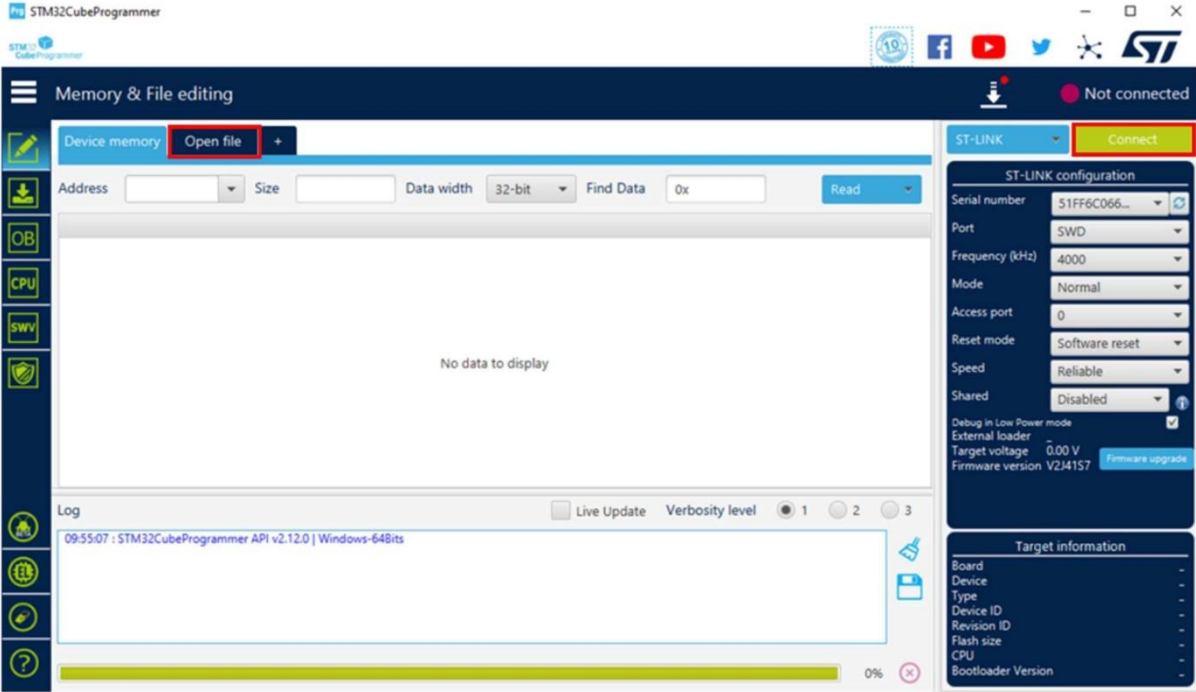


Figure4:Bootloaderprocess.

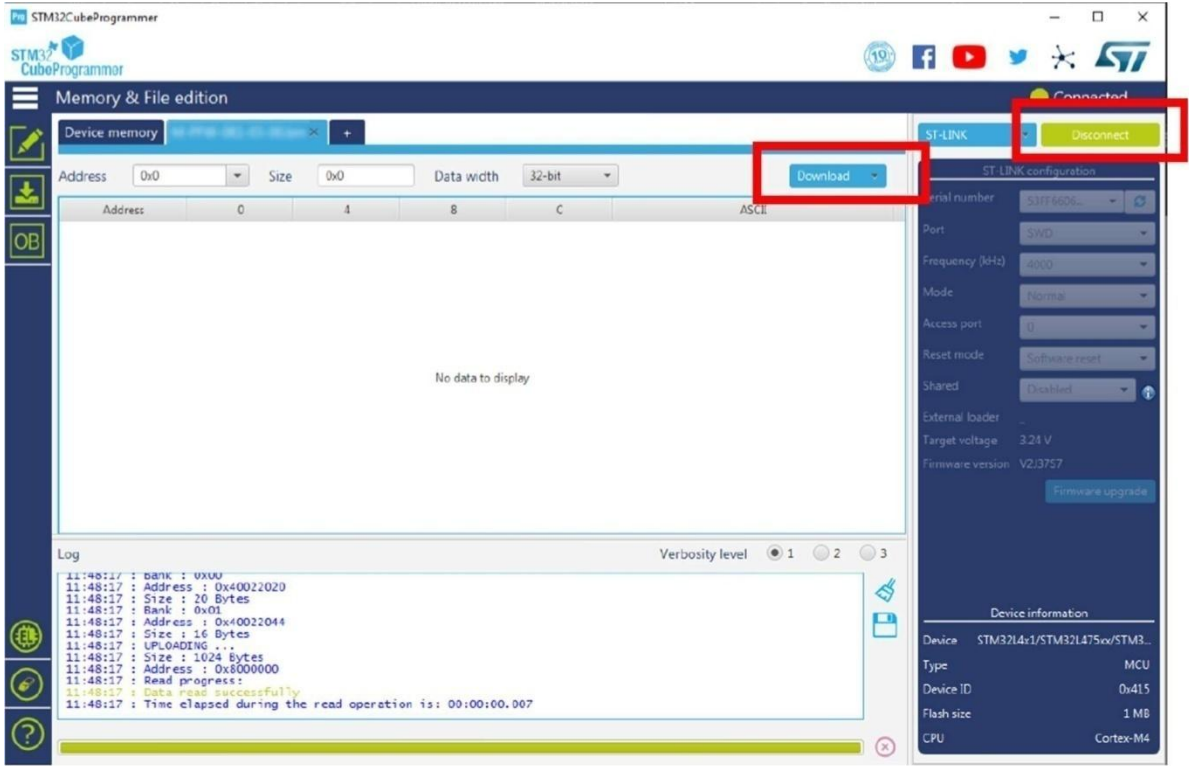


Figure5:Unitconnectedanddownloadbutton.

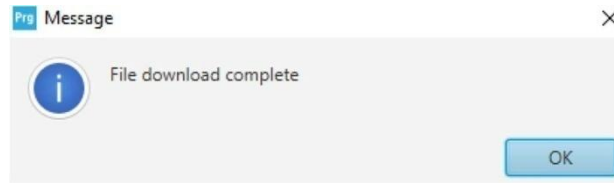


Figure6:Bootloadersuccessfullyloadeddialogprompt.

16.2 Updating application firmware.

To update the application firmware of the TitanPulse800, follow the steps below:

- Plug the TitanPulse800 into a compatible baseboard and supply it with power.
- Either connect to the baseboard's USB port or use a USB-to-CAN converter on the CANbus.
- Open the latest version of the Bootload Utility software and select the interface used.
- Select the correct COM Port and file for the device as shown in Figure 7.
- Use the 'Bootload' button to load the application firmware.

Figure7:Load application firmware.

17. Installation and Operation

This section describes the installation and operation of the TitanPulse800.

17.1 Connections

The TitanPulse800 contains a PCIe connector that fits into a Titan series product. The TitanPulse800 also contains u.FL connectors to connect various antennas. Figure 8 shows the PCIe connector on the unit.

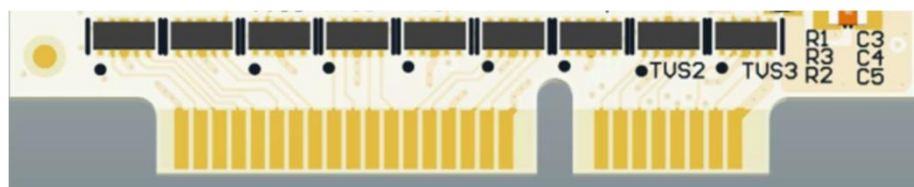


Figure8: TitanPulse800 PCIe connector

Figure 9 shows the u.FL antenna connectors on the unit, while Table 14 shows the use of each connector.

Figure 9: Titan Pulse 800 u.FL antenna connectors

Connector Number	Description
1	Wi-Fi/Bluetooth
2	GNSS
3	GSM/LTE

Table 14: u.FL antenna connectors

17.2 Communication

The Titan Pulse 800 communicates using a proprietary unified, standard command protocol over a FDCAN bus. This protocol is based on a polled instruction set, as well as optional auto-forwarded packets. The Titan Pulse 800 FDCAN bus is the only external wired communication used to communicate with host units and other Pulse units. The Titan Pulse 800 needs to be plugged into a baseboard with a FDCAN transceiver to enable its FDCAN capability.

The Titan Pulse 800 also communicates through UART and USB. These interfaces are used to communicate with modules on the baseboard or is brought out through a connector on the baseboard.

The Titan Pulse 800 also contains a Wi-Fi / Bluetooth transceiver, GNSS receiver, GSM / LTE transceiver, and ethernet transceiver, which is used to communicate with external services and enable advanced capabilities.

17.3 Status LED colours

Table 15 describes the status LED function for the Titan Pulse 800.

Colour	Meaning
 Green	Broadcasting RF message.
 Blue	Undefined.
 Violet	Transmitting LF field.
 White	Undefined.
 Red	Undefined.
 Yellow	Undefined.
 Cyan	Undefined.
 RGB	Bootloader mode when flashing RGB colours.

Table 15: Titan Pulse 800 status LED colours

18. Parameters

The parameters of the Titan Pulse800 can be configured using USB or CAN. The below shows list of parameters for the Titan Pulse800. All other parameters are not applicable and should be left at default values.

Category	Parameter	Value
Tag Settings	TagType	Select based on application
Tag Settings	CAN Slave ID	Configure based on application
Tag Settings	Vehicle ID	Configure based on application
Tag Settings	LFBroadcastInterval	500
Tag Settings	LFPower	100
TagFunctionFlags	TagEnable	True
TagFunctionFlags	Heartbeat	True
TagFunctionFlags	Always on	True
TagFunctionFlags	CAN Termination	True
LFFlags	Transmit LF field	True
LFFlags	Use New LF	True

Table 16: Parameters.

16. System maintenance

This section describes the maintenance process that needs to be followed for a Titan Pulse800.

16.1 Physical inspection

The Titan Pulse800 should be visually inspected for any notable discrepancies. This includes damage to the components, or any other anomalies that might influence the sensor's functionality.

16.2 Power test

The Titan Pulse800 can be powered using a tested Titan series baseboard. Ensure that Status LED on the Titan Pulse800 lights up. The status LED should be amber and go green once the Titan Pulse800 detects the baseboard.

17. Mechanical Specifications

This section provides the mechanical information pertaining to the Titan Pulse800. All the measurements are in millimetres (mm).

17.1 Product drawings

Figure 10 shows the top and side views of the Titan Pulse800 module.

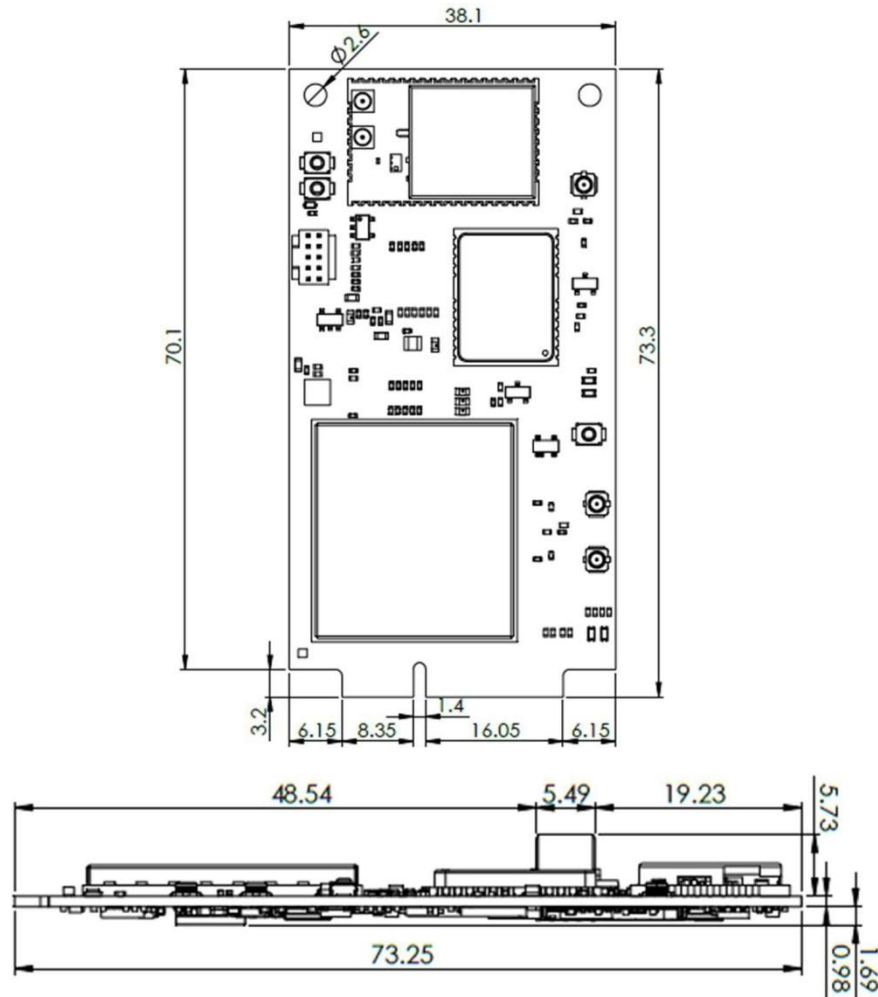


Figure10:TitanPulse800dimensions.

18. Warnings

18.1 FCCStatement

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.

18.2 ICStatement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

- This device may not cause interference.

- This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- L'appareil ne doit pas produire de brouillage;
- L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

18.3 ENACOM warning

18.3.1 Equipment installed in vehicles

- **Resolution 854/2020:** When regulatory identification is not visible due to installation inside vehicles, the identification should be included in manuals or on-board documentation.
- **Resolution 586/2023:** In such cases, identification should be included in the manuals, on-board documentation, or the official website of the manufacturer/importer, as per points II, III, and IV.

18.4 Modification Statement

18.4.1 FCC Warning

Epiroc Digital Safety Solutions South Africa Pty Ltd has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

18.4.2 ISED Warning

Epiroc Digital Safety Solutions South Africa Pty Ltd n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peut annuler le droit d'utilisation de l'appareil par l'utilisateur.

18.5 RSS-GEN 6.8

- 18.5.1 This radio transmitter [IC: 32678-22203V1] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Type of antenna used: External Antenna

Maximum antenna gain: 2.0dBi

Impedance required by antenna: 50Ω

Manufacture: Otto Wireless solutions

18.1 Interference statement

This device complies with Part 15 of the FCC Rules and Industry Canada licence-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.

18.2 Wireless notice

This device complies with FCC/ISED radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the ISED radio frequency (RF) Exposure rules. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme à l'exposition aux radiations FCC / ISED définies pour un environnement non contrôlé et répond aux directives d'exposition de la fréquence de la FCC radiofréquence (RF) et RSS-102 de la fréquence radio (RF) ISED règles d'exposition. L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec une autre antenne ou autre émetteur.

18.3 Requirement for KDB996369D03

18.3.4 List of applicable FCC rules

FCC CFR Title 47 Part 15 Subpart C Section 15.247

FCC CFR Title 47 Part 2

FCC CFR Title 47 Part 22

FCC CFR Title 47 Part 27

FCC CFR Title 47 Part 24

18.3.5 Summarise the specific operational use conditions

The module has been certified for Fix, Mobile, Portable applications. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

18.3.6 Limited module procedures

Not Applicable.

18.3.7 Trace antenna designs

Not Applicable.

18.3.8 RF exposure considerations

This modular 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 modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

18.3.9 Antennas

Stubby antenna with antenna gain 2dBi. The antenna is permanently attached, can't be replaced.

18.3.10 Label and compliance information

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.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: 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 or more 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.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCCID: 2BPRY-22203V1 Contains FCCID: 2BPRY-22203V1."

18.3.11 Information on test modes and additional testing requirements

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247/15.407) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when it contains digital circuitry.

18.3.12 Additional testing, Part 15 Subpart B disclaimer

When testing host product, the host manufacturer should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements.

18.3.13 Note EMI considerations

Host manufacturer is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

18.3.14 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer has to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacturer only needs to do an evaluation (i.e., no C2PC required) when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.

The modular can be installed or integrated in mobile or fixed devices only. This modular cannot be installed in any portable device.

This modular complies with IC 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 modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body. Cette modulaire doit être installée et utilisée à une distance minimum de 20 cm entre le radiateur et le corps de l'utilisateur.

If the IC number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed

module. This exterior label can use wording such as the following: “Contains IC: 32678-22203V1”

The devices must be installed and used in strict accordance with the manufacturer’s instructions as described in the user documentation that comes with the product.

19. Disclaimer

Although great care has been taken to try to ensure that the information contained in this document is accurate, some inaccuracies are inevitable. Neither the authors and editors of Epiroc Digital Safety Solutions South Africa Pty Ltd reviews, nor those responsible for compiling and disseminating this document, are responsible for any adverse consequences of these inaccuracies.

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