Blind Spot Information System Radar
General Design Specification

Document Number: 000-101863

Revision History

Revision	Date	Author	Description
A	12/21/2022	A. LaVita	Added DoC and released

1. Purpose and Product Usage:

The Blind Spot Information System (BLIS) warns the rider against collisions that may occur due to a lane change maneuver. BLIS is intended to supplement the vehicle's rear-view mirrors, not eliminate the need for such mirrors. BLIS is intended to detect vehicles to the rear and sides of the subject vehicle and warn the rider if a lane change is not recommended. BLIS is not meant to encourage aggressive driving and the absence of a warning will not guarantee that the rider can safely make a lane change maneuver.

1.1 Detailed Radar Description

The BLIS radar tracking system operates within the 76-81 GHz frequency-band or its subsets (pertaining to FCC part 95, subpart M), and used for short-range vehicular radar target tracking. The radar is based on Vayyar's VYYR7202 RF SoC.

The radar subassembly is a multi-antenna MIMO-radars, transmitting reference signals,receiving the radio signals reflected from the objects at the positions to be determined, and comparing the reflected signals with the reference signals.

The information is gathered by transmitting the reference signals from an array of antennas, concurrently collecting the signals by an array of receiving antennas, and comparing them to reference signals in order to determine the distance and direction to the objects of interest. The signal generation, recording and processing is performed by a Vayyar's VYYR7202 multi channel RF transceiver SoC.

The recorded signals are processed either on a DSP embedded within the radar VYYR7202 chip or on a hosting device, to obtain spatial information about the environment, detect objects in the vicinity of the radar, and characterize their position and various properties (velocity, shape, object classification etc).

1.1.1 Frequency Range and Modulation

The radar module is operating within the 76-81GHz frequency-band, where the certified profile operates near 77.2-78.2GHz. The radar signals used can either be an FMCW or a stepped-frequency CW modulated signals.

1.1.2 Antennae and Array

The radar PCBA incorporates a MIMO-array of up to 20 transmitting (Tx) and 20 receiving (Rx) antennas. The antenna array is composed of antenna elements embedded into the main printed circuit board. The antennas are not replaceable, and no provisions are made to add external antennas.

The actual number of antennas used is configured by the SW (the certified profile utilized 16 transmitters). During typical operation, multiple Tx-antennas transmit at a time, and multiple RX-antennas are collecting and recording the received RF signals.

1.1.3 Antenna Gain

Single element's gain of nearly 4.5dBi at 78GHz.

Multiple antennas transmitting concurrently translate into effective gain of 4.5dBi + 10*log10(Ntx).

The profile certified utilizes 16 transmitting antennas, i.e. the effective gain is = 16.5dBi.
Polarization – linear

1.2 Environmental

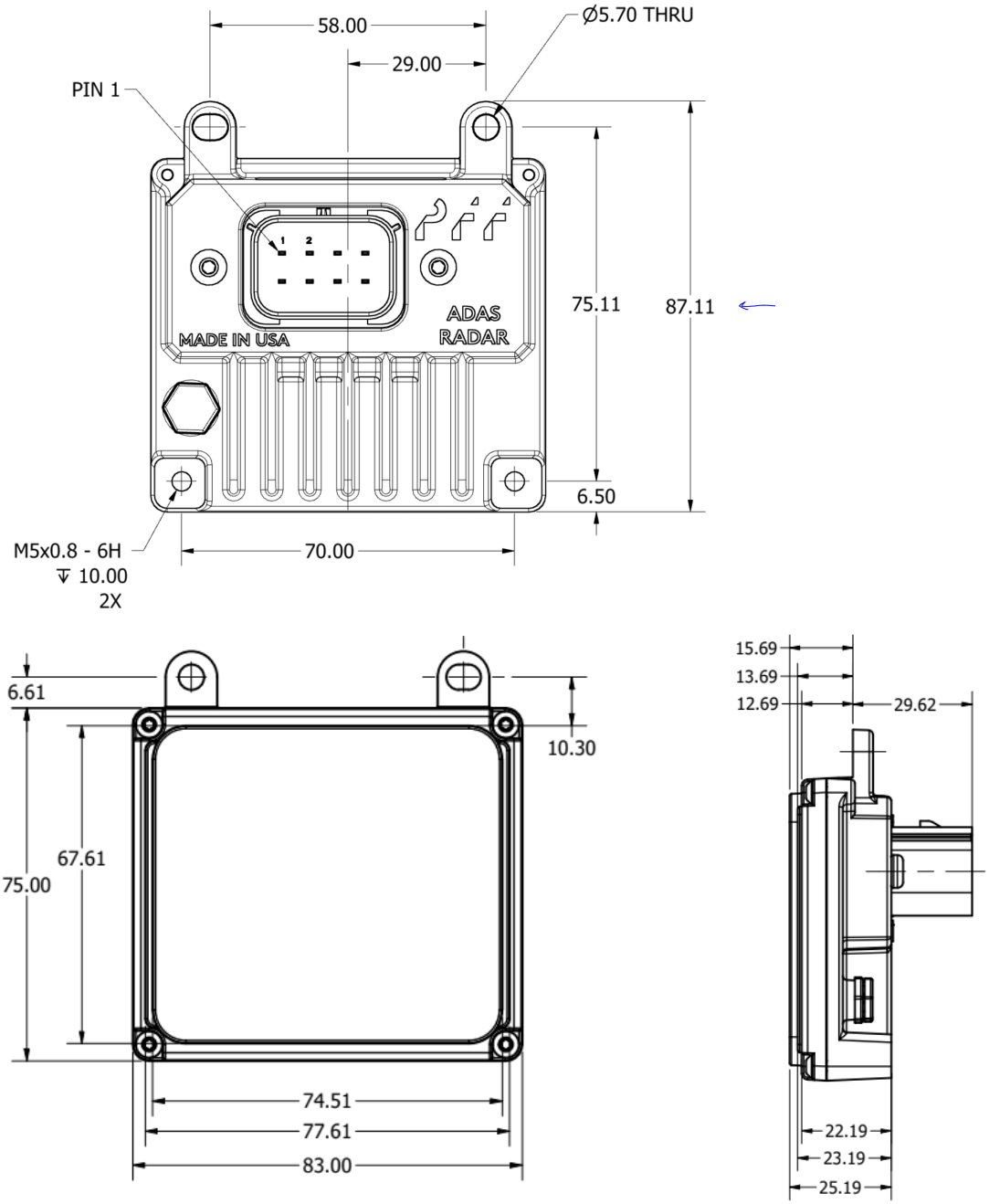
- Operating Temperature: -20° C to 80° C
- Intrusion Protection: IP67 - Intended for Outdoor Use
- Approved for use in wet locations and exposure to direct weather conditions
- Humidity 20-95%rh
- Altitude up to 2750m
- Vibration: Piaggio Standard 4308, Class 2. 4 hours each on 3 axes (X, Y, Z) for A) Frequency from 10 to 60 Hz with constant shift of 1.5mm P-P, and B) Frequency from 60-200 Hz with acceleration of 10 g constant peak.

1.3 Physical Characteristics

1.3.1 Overall Characteristics

- Size: 83.0mm wide x 87.1mm tall x 25.2mm deep (45.4mm including connector)
- Location: Fits under saddle at rear of vehicle in center
- Weight: 0.2 kg
- User clearance from radome front during normal operation: 2.31 cm

1.3.2 Mounting Dimensions



1.4 Electrical Connections

This unit is intended for OEM use and is not intended for any aftermarket applications. This unit must be part of the original vehicle design and part of the original vehicle harness. This can not be wired into an existing harness.

When creating a harness design, the following considerations must be made:

- The CAN bus must have termination to a nominal 100-120 Ohms
- Supply must be connected to the Ignition for turning the unit on or off
- Ignition must be a stable supply of power, as any drop below the minimum voltage will cause the module to restart
- Do not connect directly to battery sources as the unit is not able to turn off or perform any low power states
- This unit must be on a fused power source. Fuse size must be calculated with the other devices on the same protected line
- Power Consumption: 10.5W
- Power in per PG 7431 Ed. 7. Nominal 13.5 Vdc Operating range 8-16.5 Vdc
- Short Range Radar equipment operating in the 76.68 – 76.95 GHz band

CONNECTOR PIN DESCRIPTIONS				
NO.	PIN TYPE	DIRECTION	SPEC	FUNCTION
1	DIGITAL	INPUT	ACTIVE HI	LEFT TURN
2	DIGITAL	INPUT	ACTIVE HI	RIGHT TURN
3	DIGITAL	OUTPUT	ACTIVE HI	LEFT LED
4	DIGITAL	OUTPUT	ACTIVE HI	RIGHT LED
5	SUPPLY			IGNITION
6	CAN*			CAN-H
7	CAN*			CAN-L
8	GROUND			GROUND

* CAN CONNECTIONS COMPLIANT WITH ISO 11898 1/2

1.5 Sensor Performance

Objects that are moving at approach speeds of up to 30m/s are detected. Warning activation must be provided within 200ms of an approaching vehicle that meets the criteria of a hazard. This system utilizes a minimum system update rate of 10Hz including data capture, analysis, and warning.

1.6 Manufacture Information

The units are assembled and tested in the United States by Piaggio Fast Forward. Contacting us can be done through the following:

info@piaggiofastforward.com

Piaggio Fast Forward | 52 Roland Street | Boston, MA 02129

1.7 EU Restrictions

This product has been so constructed that the product complies with the requirement of RED Article 10(2) as it can be operated in at least one Member State (Italy) as examined and the product is compliant with Article 10(10) as it has no restrictions on putting into service in all EU Member States.

1.8 Radar Safety

SAFETY WARNING: *DO NOT OPEN OR ALTER the radar unit from original provide packaging*

For safety, this device requires that users have 2.31 cm distance from the radome front during normal operations.

The unit must be used in the intended manner outlined in Section 1 and in the environments that are outlined in this section. The user can not change, open or alter the device or its packaging to meet their product needs. This is a radar system that has been tested to operate safely in its current packaging without alterations of any kind. Any changes to the product package or operating range will deem the product to be unsafe for operation and not compliant with any of the safety standards outlined above.

2. Reference Standards

The BLIS unit model R02129-BLIS is compliant with the following standards. A Certificate of Conformity is located in Appendix A of this document.

Certification	Standards
FC	• See Section 2.1 for operation and compliance
RED testing and certifications for EU	• ECE R10 6th Edition • EN 301 489-1 V2.2.3 ETSI EN 301 489-51 V2.1.1 • EN 61010-1: 2010/A1:2019 • EN 62321:2009 • EN 50581:2012 • EN 302 264 V2.1.1 • EN 62311:2008 • EN 301 091-2 V1.3.2 • EN 303 396 V1.1.1
REACH RoHS COMPLIANT	PFF procurement has certified that the following product is RoHS and Reach compliant
CE	This device conforms with the relevant Union harmonization legislation

PFF ensures that radio equipment is constructed so that it can be operated in Italy without infringing applicable requirements on the use of radio spectrum.

2.1 FCC/ISEL Decorations

2.1.1 Information for the user for operation and compliance with Chapter 15 of the FCC Rules and ISEL

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.

The user is not authorized to make any modifications to the equipment. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

In addition, this equipment contains a radar sensing unit which conforms to the requirements of Part 95, Subpart M of the FCC rules. The user is permitted to operate this unit without an individual license subject to the terms of Part 15 listed above.

2.1.2 Information for the user for operation and compliance with Chapter 15 of the FCC Rules and ISEL CAN ICES-3 (B)/NMB-3(B)

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s license-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.

When standing still you should maintain a distance of at least 2.31 cm from the front of the radome to comply with RF exposure limits.

Cet appareil contient un ou des émetteurs/récepteurs exempts de licence conformes aux RSS exempts de licence d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes :

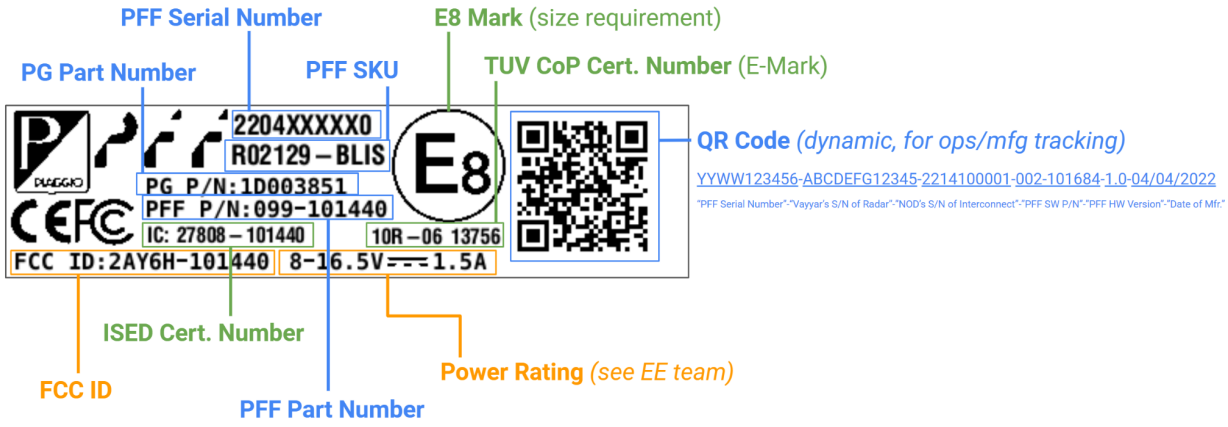
Cet appareil ne doit pas provoquer d'interférences ;

Cet appareil doit accepter toutes les interférences, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

Lorsque vous êtes immobile, vous devez maintenir une distance d'au moins 2,31 cm par rapport à l'avant du radôme pour respecter les limites d'exposition aux RF.

3. Product Marking

The top side of every BLIS radar unit is marked with important identifiers that will be used to track the product. Below is a detailed description of the information that is recorded in the product label.



Appendix A - Declaration of Conformity

Hereby, Piaggio Fast Forward declares that this R02129-BLIS is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

EU DECLARATION OF CONFORMITY

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Piaggio Fast Forward Inc
52 Roland Street
Charlestown, MA 02129, USA

Product Name: Blind Spot Information System *(BLIS)*
Product Number: R02129-BLIS
HW Version: A
SW Version: 1.8.11

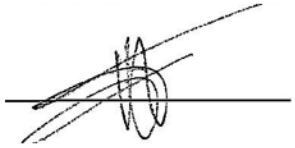
The object of the declaration described below is in conformity with the relevant European Union harmonization legislation:

References to the relevant harmonized standards used or references to the technical specifications in relation to which conformity is declared

- EN 62311:2008
- EN 61010-1: 2010/A1:2019
- ECE RIO 6th Edition
- EN 301 489-1 V2.2.3 ETSI EN 301 489-51 \../21 .1
- EN 62321:2009
- EN 50581 :2012
- EN 301 091-1 V2.1.1
- EN 301 091-2 V1.3.2
- EN 303 396 V1.1.1

The notified body: TÜV SUD America under document number CB-22-141 i01

Performed: Conformity assessment of the technical construction file and issued the certificate number *NB01 116984 0001 Rev.00*



26 May 2022

Jean-Claude Coutant
Chief Technology Officer

Date

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