

CERTIFICATE OF CALIBRATION

ISSUED BY: Racelogic Ltd

DATE OF ISSUE: 21-MAY-25

CERTIFICATE NUMBER: 110234



21354

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Louis Perriss
(017)
Calibration Engineer &
Approved Signatory
(Electronically)

Customer		Model	VB4D-V1
Location	Japan	Description	GNSS Data Equipment
Recalibration (Y/N)	N/A (New Unit)	Serial Number	A24328
Date of Receipt	N/A (New Unit)	Process Instruction Issue	10
Date of Calibration	21-MAY-25		
Temperature	22 °C ± 3 °C		
Relative Humidity	40 %rh ± 20 %rh		

Calibration Procedure

The Unit Under Test was subjected to the latest Production Process Instruction Calibration procedure as detailed above against the reference standards.

Equipment Used

	Equipment	Serial Number	CAL Cert No.	CAL Due
Simulation of GPS	C052	093442	106635	17-SEP-25
Analogue Voltage Measurement	C041	4576207	4461090005	14-OCT-25
Digital Frequency Measurement	C028	400562	4461090003	14-OCT-25
10MHz Reference Measurement	C026	319946	4581930004	17-MAR-26
10MHz Reference Generator	TF346/4	21072481		

Calibration Summary

The results within this certificate only relate to the Unit Under Test, as detailed above, which has Passed to the Manufacturer's Specification at the measured points with due consideration of the measurement uncertainty and in accordance with the agreed and applied Decision Rule.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Agreed and applied Decision Rule used to determine compliance

A Binary Statement Decision Rule with Simple Acceptance is used. Assessment of conformance using ILAC-G8:09/2019 Pass based on the measured value being within the specification limits conformance probability percentage greater than 95%
Ref: Racelogic UKAS Laboratory Document 1 – Decision Rules latest Issue

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Results (As found)

Analogue Voltage Output Signals

Analogue output voltages are calibrated against simulated parameters across the Analogue output range, as detailed in the tables below.

Applied Speed	Analogue Voltage Output 1 (Maximum Output set to 5 V at 100km/h)			
	Nominal Value	Measured Value	Tolerance	Uncertainty
30 km/h	1.500 V	1.5006 V	±0.005 V	±0.0005 V
60 km/h	3.000 V	3.0010 V	±0.005 V	±0.0005 V
100 km/h	5.000 V	5.0013 V	±0.005 V	±0.0005 V

Applied Speed	Analogue Voltage Output 2 (Maximum Output set to 5 V at 100km/h)			
	Nominal Value	Measured Value	Tolerance	Uncertainty
30 km/h	1.500 V	1.5001 V	±0.005 V	±0.0005 V
60 km/h	3.000 V	3.0003 V	±0.005 V	±0.0005 V
100 km/h	5.000 V	5.0002 V	±0.005 V	±0.0005 V

Digital Frequency Output Signals

Digital output frequencies are calibrated against simulated parameters as detailed in the tables below, the Digital output is configured to 25 Hz per km/h.

Applied Speed	Digital Frequency Output 1			
	Nominal Value	Measured Value	Tolerance	Uncertainty
30 km/h	750 Hz	750 Hz	±2.5 Hz	±1 Hz
60 km/h	1500 Hz	1500 Hz	±2.5 Hz	±1 Hz
100 km/h	2500 Hz	2500 Hz	±2.5 Hz	±1 Hz

Analogue to Digital Converter Input Signals

Analogue to Digital Converter Input voltages are calibrated against applied voltages, as detailed in the table below.

Analogue to Digital Input Channel	Analogue to Digital Input Voltage			
	Nominal 5 V Voltmeter Measured voltage = 5.0788 V			
	Nominal Value	Unit Indicated Voltage	Tolerance	Uncertainty
Channel 1	5 V	5.0787 V	±0.001 V	±0.0005 V
Channel 2	5 V	5.0789 V	±0.001 V	±0.0005 V
Channel 3	5 V	5.0791 V	±0.001 V	±0.0005 V
Channel 4	5 V	5.0789 V	±0.001 V	±0.0005 V

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GNSS Simulation

The Production Process Instruction Calibration procedure covers measured Velocity and Heading by the Unit over a simulated test course.

GPS Simulation Data is provided via a UKAS calibrated GPS simulator using a GPS based 10 MHz Reference Clock as follows:

10 MHz GPS Based Reference Clock

Nominal Frequency	Measured Value	Specification	Uncertainty
10 000 000.00 Hz	10 000 000.00 Hz	±0.10 Hz	±0.02 Hz

The Unit Under Test indicated values for Velocity, Distance and Heading are taken from recorded data.

The Unit outputs are configured as: Analogue: Speed: 5 V at 500 km/h and / or Heading 5 V at 360 ° with Digital: Speed at 25 Hz per km/h and / or Heading at 10 Hz per Degree

The Distance parameters shown are the average calculated by the integration of Speed over 4 periods of 4 second time intervals and meets the specification of 0.05 % and <50 cm per km for Speeds >30km/h.

Simulation of constant Speed by GPS simulator

Applied simulated value	VBOX indicated Parameters			Analogue Output 1 Voltage			
	Measured Speed	Speed Tolerance	Speed Uncertainty	Nominal Value	Measured Value	Tolerance	Uncertainty
0 km/h	0.04 km/h	±0.1 km/h	0.04 km/h	0.000 V	0.0004 V	±0.005 V	±0.0005 V
5 km/h	5.00 km/h	±0.1 km/h	0.07 km/h	0.050 V	0.0500 V	±0.005 V	±0.0005 V
10 km/h	10.00 km/h	±0.1 km/h	0.05 km/h	0.100 V	0.1000 V	±0.005 V	±0.0005 V
30 km/h	30.00 km/h	±0.1 km/h	0.08 km/h	0.300 V	0.3000 V	±0.005 V	±0.0005 V
60 km/h	60.00 km/h	±0.1 km/h	0.05 km/h	0.600 V	0.6001 V	±0.005 V	±0.0005 V
100 km/h	100.00 km/h	±0.1 km/h	0.04 km/h	1.000 V	1.0002 V	±0.005 V	±0.0005 V
200 km/h	200.00 km/h	±0.1 km/h	0.04 km/h	2.000 V	2.0004 V	±0.005 V	±0.0005 V
500 km/h	499.98 km/h	±0.1 km/h	0.04 km/h	5.000 V	5.0010 V	±0.005 V	±0.0005 V

Simulation of Distance from simulated Speed by GPS simulator

This table is included for completeness but is not part of the Racelogic 21354 UKAS Schedule of Accreditation					
Applied simulated value	VBOX indicated Parameters				
	Simulated Distance	Measured Distance	Mean Distance Error	Measured Distance Error	Distance Uncertainty
5 km/h	5.5556 m	5.553 m	-0.003 m	-0.053 %	0.002 m
10 km/h	11.1111 m	11.109 m	-0.003 m	-0.027 %	0.001 m
30 km/h	33.3333 m	33.330 m	-0.004 m	-0.011 %	0.001 m
60 km/h	66.6667 m	66.662 m	-0.005 m	-0.008 %	0.001 m
100 km/h	111.1111 m	111.105 m	-0.007 m	-0.006 %	0.001 m
200 km/h	222.2222 m	222.212 m	-0.011 m	-0.005 %	0.001 m
500 km/h	555.5556 m	555.527 m	-0.030 m	-0.006 %	0.001 m

Simulation of constant Heading by GPS simulator

Applied simulated value	VBOX indicated Heading			Analogue Output 2 Voltage			
	Measured Value	Tolerance	Uncertainty	Nominal Value	Measured Value	Tolerance	Uncertainty
0 °	0.03 °	±0.1 °	0.11 °	0.000 V	0.0014 V	±0.005 V	±0.0005 V
90 °	90.01 °	±0.1 °	0.05 °	1.250 V	1.2500 V	±0.005 V	±0.0005 V
180 °	180.01 °	±0.1 °	0.05 °	2.500 V	2.5001 V	±0.005 V	±0.0005 V
270 °	270.01 °	±0.1 °	0.04 °	3.750 V	3.7501 V	±0.005 V	±0.0005 V

End of Report