LiDAS
Life Detection Assisting System

Installation Guide

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REVISION HISTORY

Version	Date	Description
0.10D	5/5/2020	First Draft
0.11D	6/8/2020	Updated document with figures

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User Manual

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1. List of Components

1.1 UCD SENSOR

Unattended Child Detection (UCD) sensors are mounted on the bus or van head liner above alternating seat benches after inserting the UCD into the Senor Housing holder (see Section 1.2). The position and total number of UCD sensors depends on the height and vehicle size. The top side of each sensor is labelled with Software version, Frequency used and Node number of the UCD. The odd number nodes are installed on the left side (behind the driver) and even number nodes on the right side of the vehicle. Transceiver antennas are located on the bottom side of the UCD (see Figure 1). While installing, the bottom side must face the seats.

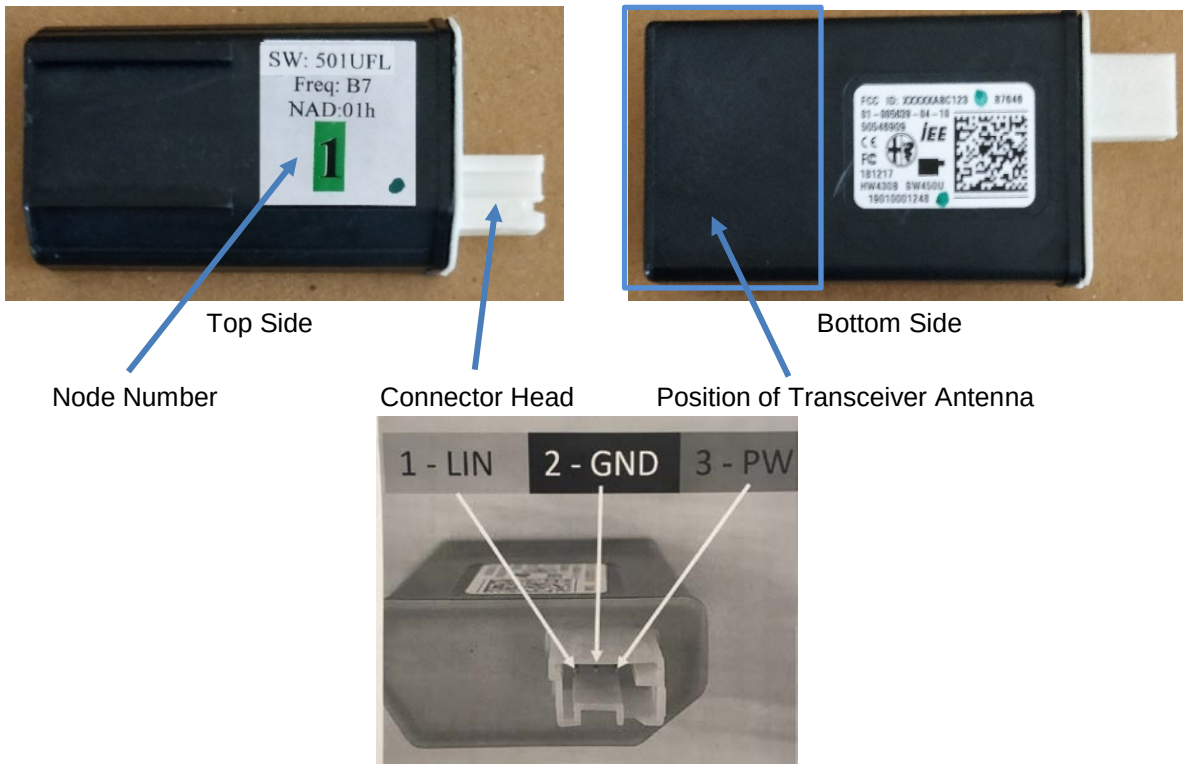

Figure 1:UCD Sensor Top and Bottom View and Pin Information

1.2 Sensor Housing

The UCD Sensors are secured within the sensor housing before installing on the vehicle. It has a 'U' shaped notch on both sides (circled in red in Figure 2 below). Depending on convenience, one of these notches will be cut out to route the wiring to the sensor. The LIN network harness must be connected to the UCD sensor before installation of the sensor and its housing to the vehicle. The housing has a custom locking mechanism that holds the sensor. Use two screws, one on either side of sensor housing to mount the housing to the headliner.

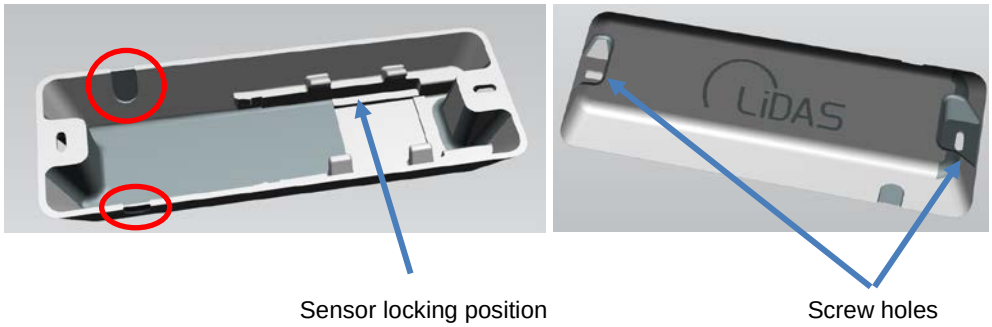

Figure 2: Sensor Housing

1.3 Central Control Unit

The Central Control Unit (CCU) is a box type structure with size 20 cm X 12 cm X 5 cm. It is connected to UCD sensors, LiDAS System Battery, Vehicle Ignition, Driver Interface Module and the Global System for Mobile communications (GSM) Module. The CCU is placed in a protective housing and can be located in an appropriate, non-intrusive location. A typical location is behind the driver seat.

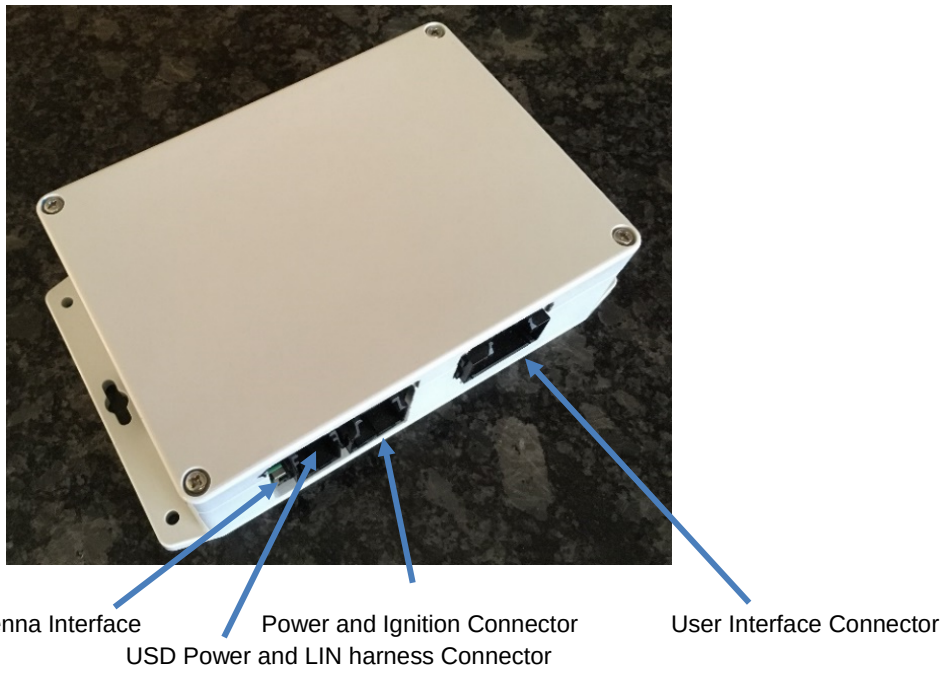

Figure 3:Central Control Unit

1.4 Driver interface

The Driver Interface is a small cylindrical unit mounted on the dashboard or any other driver accessible area that does not obstruct the driver's vision of the road. The module is connected to the CCU unit with a long wire harness. The wiring will be routed through the existing panelling to prevent any damage or tampering.

Figure 4: User Interface Unit with Connector

Alternative driver interface will be available with 7-inch text screen

1.5 T Harness

The T-Shaped wiring harness is used to interface individual sensors to the LIN network. One T- harness is used to connect one sensor to the LIN network. A system with 'n' number of sensors will need 'n' number of harnesses. The horizontal side of the 'T' harness will have a male connector on one side and female on the other. The vertical line of the 'T' connects to the sensor head.

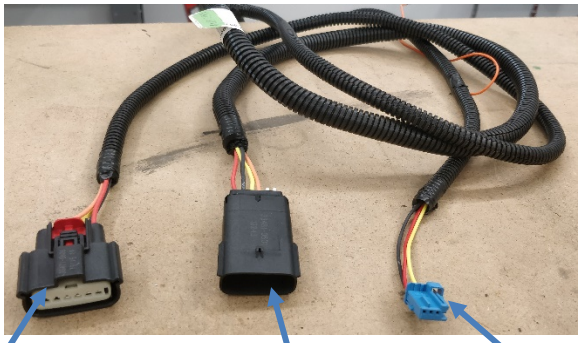

Figure 5: T Harness

1.6 GSM Modem

The GSM module performs the required cell phone communication. The GSM module is connected to the Universal Serial Bus (USB) port of the CCU and is located inside the CCU housing.

Figure 6: GSM Module

This will be replaced with an antenna unit

1.7 LiDAS System Battery

LiDAS system battery is connected in parallel to the vehicle battery and connected to the CCU. This battery provides necessary power for the CCU. The battery is also located inside the housing. Use 12 V, ODYSSEY PC545 battery.

SPECIFICATIONS

20Hr Nominal Capacity (Ah)	13
Reserve Capacity Minutes	18
Dimensions L x W x H (mm)	117.8 x 85.9 x 131.3
Weight (kg)	5.2

Figure 7: LiDAS System Battery Unit

1.8 CCU and Battery Housing

CCU and battery housing secure the CCU, Battery and GSM modules. This is a plastic box type structure with a lid.

Figure 8: CCU and Battery Housing

1.9 Bracket

The bracket holds the CCU and Battery housing to the vehicle using fasteners and screws. It provides a solid attachment of housing to the vehicle body and securely holds the CCU and LiDAS system battery modules without movement in the housing.

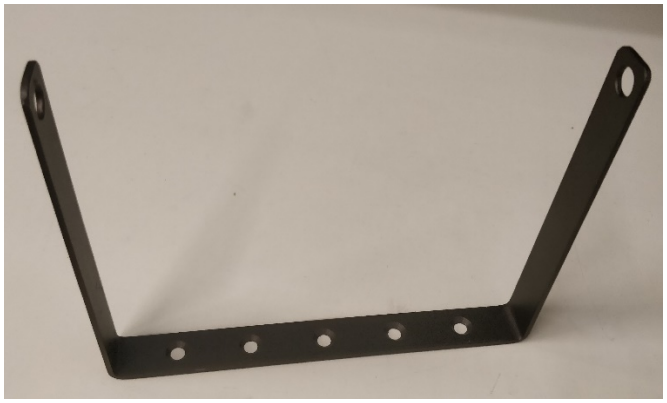

Figure 9: Housing Bracket

1.10 Fastener and Screws

One sensor housing will need two screws for mounting
Battery housing will need fasteners and screws for securing the housing
Two screws used for installing driver interface

2. Tools Required

General working tools like Drill, Screwdriver, Wire Stripper, Crimper

3. Installation Procedure

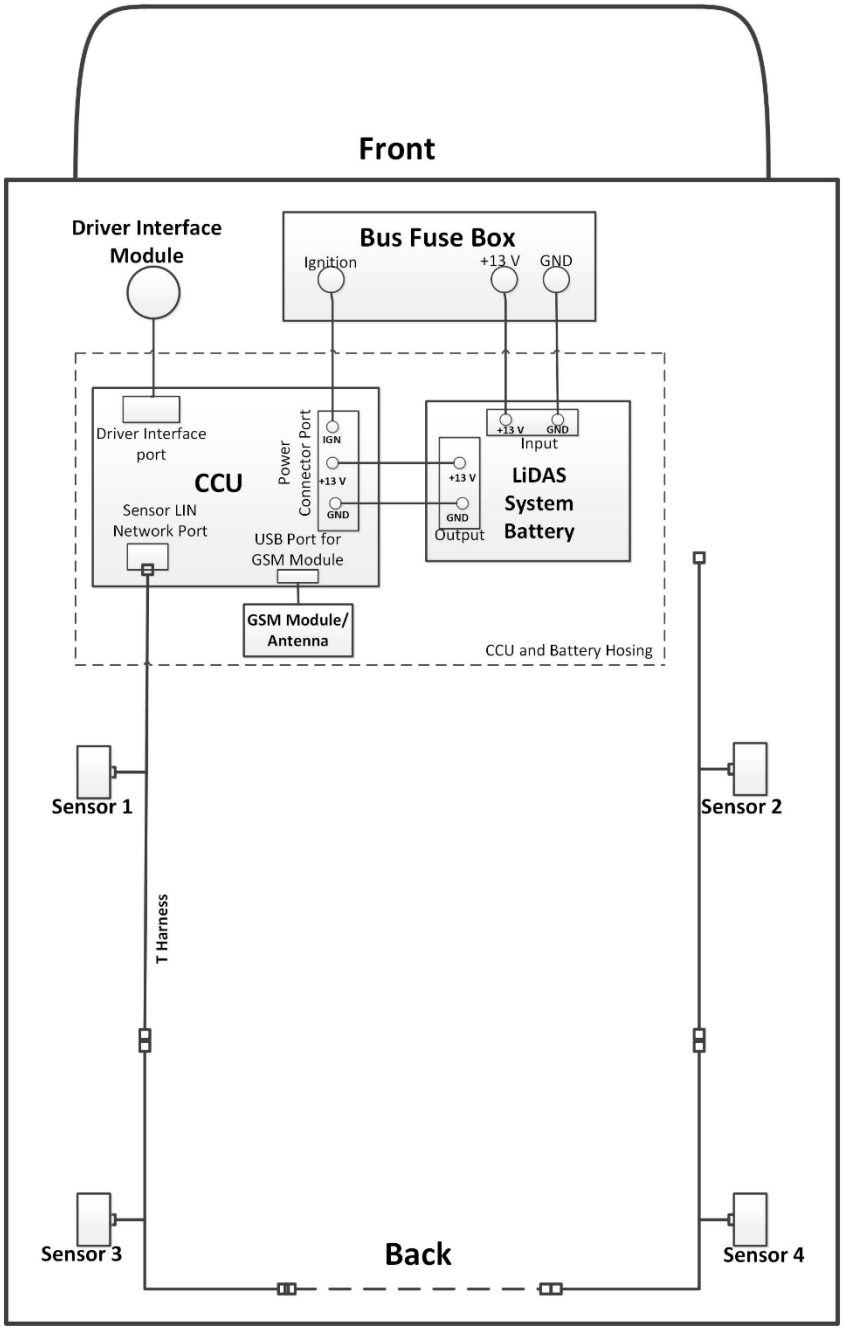

Figure 10: Block Diagram of a Typical LiDAS System

Step 1: Determine the number of UCDs required and Mark appropriate location for UCD sensors

LiDAS system must be installed in such a way that using minimum number(One UCD cover two seat rows separated at a distance of 35 Inches) of UCDs the system should cover total passenger volume and detection field must be within the bus to avoid false detection outside the bus. Figure 11 shows the typical orientation of UCD sensor on school bus. The sensor and its housing should install length wise parallel to the windows and transceiver antenna position of a sensor should be exactly above the seat back rest. Figure 12 shows the detection field of one UCD sensor which is installed as per figure 11. It covers 80° from front to back and 34° from left to right inside the school bus. In Type A, Type C and Type D buses with below dimensions, UCDs are installed above alternating seats for optimum coverage. The typical location is on the headliner closer to window side; approximately 22 cm from window and 75 cm from the seat top.

BUS TYPICAL DIMENSIONS

Seat Cushion to Ceiling (Inches)	57 - 59
Single cushion width (Inches)	39
Floor to side ceiling height (lowest part) (Inches)	75
Width of bus (window to window) (Inches)	90
Typical distance between seat rows (front of cushion to front of cushion) (Inches)	35

Figure 11: Typical orientation of UCD sensor

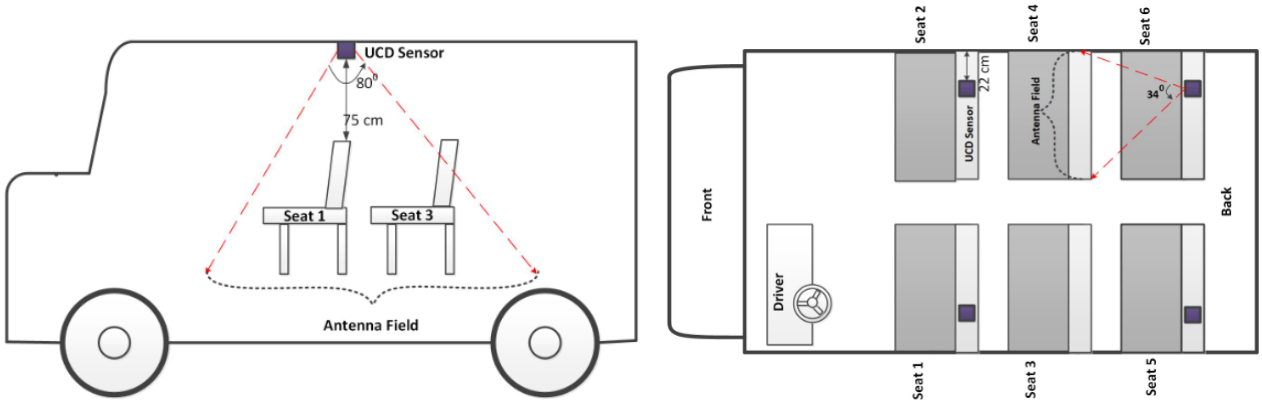

Figure 12: Detection field of single UCD

Step 2: Find an appropriate non-intrusive location for the CCU and battery housing

A typical location for the CCU and battery housing is behind the driver seat. Other nonintrusive locations may also be utilized, such as under the first passenger seat behind the driver.

Step 3: Find appropriate location for driver interface unit

The Driver Interface Unit can be mounted on the dashboard or in an area that is accessible by the driver but does not obstruct the driver's vision of the road. A long wire harness will be connected to the module to establish the connection between the CCU unit and the driver interface.

Step 4: Route all the wiring harness from CCU and battery housing location

The wiring should be routed either through the inside of the bus panel (advised) or should be covered with appropriate cable concealer. The sensor harness should be secured in such a way that the harness is not susceptible to any motion. Wiring harness if allowed to move freely can rub on metallic or sharp edges causing damage to the wiring and result in sensor failure. Use a tie strap as required to bundle and attach the harness to the bus to prevent any slack in the wire. The main three connections and its harness route are listed below.

- CCU module to sensors (LIN network)

  Remove the wire channel panel and install the T-Harness through the panel to obtain the connection between CCU module and the sensors.

Figure 13: Wire Channel Panel for Route the Sensor Harness

- CCU to Driver interface
- CCU to School bus Fuse box.

Step 5: Connect individual sensors to respective T harness sensor connector

Keep in mind that UCDs with odd node numbers are installed on left side of the bus (driver side) and even node numbers are on right side.

Step 6: Place CCU and battery inside the CCU housing and make the connections

Below are listed the required connections in the system:

- +13 V and GND terminals of the LiDAS system battery and Ignition wire from bus fuse box to CCU power connector and plug in the power connector to the CCU
- Plug in driver interface module harness to the CCU
- Plug in sensor LIN network harness to the CCU
- LiDAS system battery +13V and GND terminals to vehicle battery via fuse box

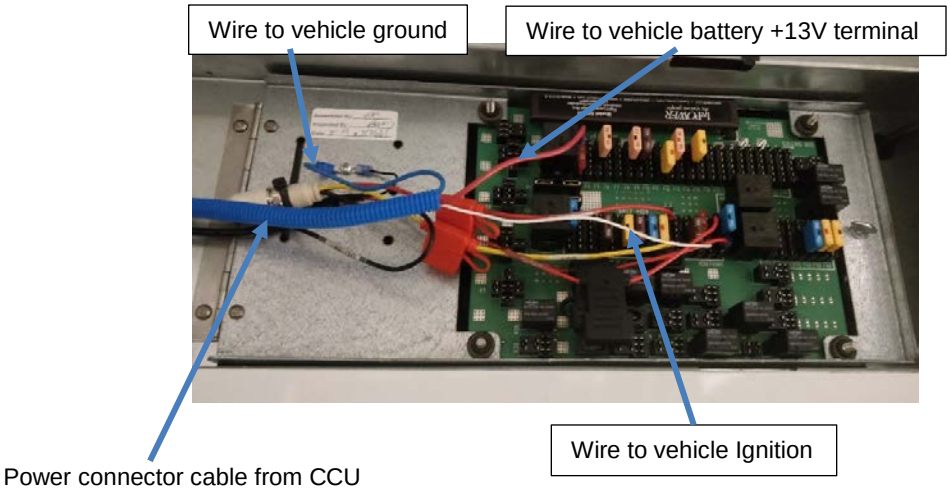

Figure 14: Connection to the bus fuse panel

Step 7: Make sure all the connected sensors and driver interface unit are working

Step 8: Insert the sensors into the sensor housing and install housing to bus headliner

Ensure that the sensor is correctly locked as shown in figure 15 and mount sensor housing to bus headliner using screws.

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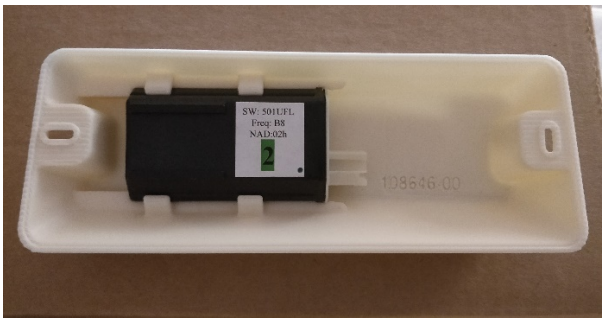

Figure 15: Sensor inserted in housing

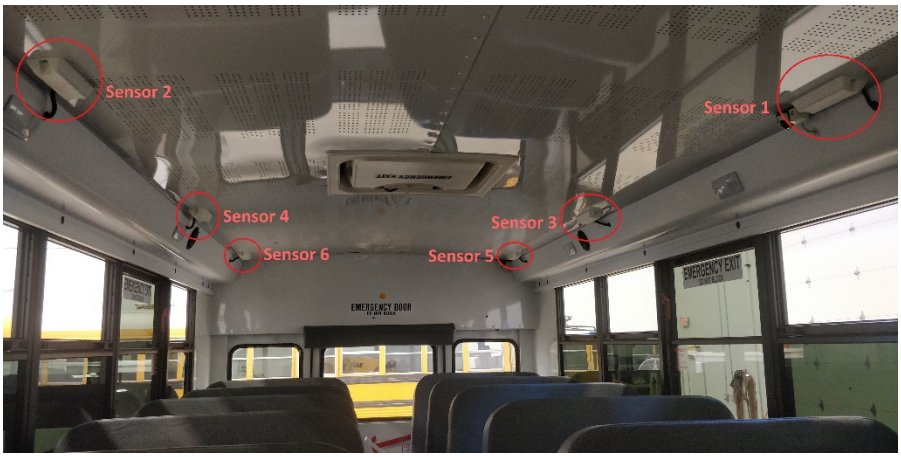

Figure 16: Typical installation of sensor on type A school bus

Step 9: Secure CCU housing with holding brackets and close the CCU housing lid

“Changes or modifications not expressly approved by the manufacturer could void the user’s authority to operate the 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.”

“This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not 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.”