Transport Certification Australia

TELEMATICS DEVICE

Functional and Technical Specification
Version 4.1

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4.1	March 2020	Changed title to Telematics Device Functional and Technical Specification. Changed ‘in-vehicle unit’ to ‘telematics device’ throughout document.

ABOUT US

Transport Certification Australia (TCA) is the Australian entity responsible for providing assurance in the use of telematics and related intelligent technologies.

We manage the National Telematics Framework, which brings producers, providers and consumers together on a common digital business platform.

The National Telematics Framework:

- Provides a national platform for the use of telematics and related intelligent technologies
- Supports different applications across regulatory, contractual and commercial needs
- Supports different levels of assurance
- Is outcome-focussed and encourages innovation.

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1 INTRODUCTION

1.1 Purpose of this Specification

1.1.1 This specification serves to describe the functional and technical requirements of a telematics device. Any device that meets these requirements is considered to be a telematics device, be that a tablet, computing and communications platform, in situ to the vehicle or aftermarket.

1.1.2 Telematics means integrated systems of information, communications and sensors to exchange data and information between vehicles and other locations, including vehicle to infrastructure (V2I) applications, vehicle to vehicle (V2V) applications, and vehicle to elsewhere (V2X) applications.

1.1.3 The functional and technical requirements contained in this specification can be used by two types of stakeholders:

- suppliers and providers (referred to as applicants in this specification) seeking TCA type-approval of a telematics device; and
- end users wanting to reference this specification when assessing the merits of, or compare the differences between, individual telematics devices offered by suppliers or providers.

1.2 Specification Overview

1.2.1 The philosophy of this specification is to focus on performance-based outcomes, without being solution oriented. Applicants are encouraged to consider innovative ways of meeting the requirements in this specification.

1.2.2 This specification commences with the Introduction (Section 1), followed by the Background concerning the telematics device and links to telematics applications made available through the National Telematics Framework (Section 2).

1.2.3 Section 3 describes the broad uses of this specification.

1.2.4 Section 4 describes the Nomenclature and Section 5 includes References.

1.2.5 Section 6 contains the common requirements for the type-approval of a telematics device at either Level 2 or Level 3 Assurance (for definitions of levels of assurance, see 2.2.1). Requirements in this section are referred to as Part A and are prefixed by an ‘A’ (e.g. A.1.5).

1.2.6 Section 7 contains the specific requirements for the type-approval of a telematics device at Level 2 Assurance. Requirements in this section are referred to as Part B and are prefixed by a ‘B’ (e.g. B.1.5).

1.2.7 Section 8 contains the specific requirements for the type-approval of a telematics device at Level 3 Assurance. Requirements in this section are referred to as Part C and are prefixed by a ‘C’ (e.g. C.1.5).

1.2.8 This specification includes the following appendices:

- Appendix A: Acronyms and Definitions; and
- Appendix B: Requirements for the Provision of Telematics Devices to TCA.

2 BACKGROUND

2.1 Telematics Device

2.1.1 A telematics device might not be a single device. In the context of this specification, a telematics device is the collection of core functions as described in this section.

2.1.2 Typically, a telematics device is supported via an external power supply (envisaged to be the vehicle's power supply) and will collect data from a number of sources and sensors, generate and store records and transmit the records.

2.1.3 The format of the telematics device data records is defined in the *Telematics Business-to-Business Data Exchange Functional and Technical Specification*. The frequency of the transmission of telematics device data records is dependent on application(s) of the National Telematics Framework and as such are not defined in this specification.

2.1.4 At a minimum, the telematics device comprises:

- a GNSS receiver and antenna;
- a data storage capability;
- a communications device and antenna;
- a connection to the external power supply; and
- a connection to the vehicle ignition.

Note:

i) *Suitable GNSS must provide publicly available measures of health and historical performance. Information on suitable GNSS may be obtained from TCA.*

ii) *When using multi-GNSS, type-approval will be based on a given configuration of satellite constellations. Multiple configurations are permitted but will be subject to separate type-approval.*

2.1.5 The telematics device may contain other components and functions to deliver application-specific requirements.

2.1.6 The telematics device may interface with telematics and intelligent technologies such as vehicle management systems and Cooperative Intelligent Transport Systems (C-ITS) to deliver application-specific requirements.

2.1.7 Applicants are encouraged to consider innovative ways of meeting the various requirements of this specification. This will enable the type-approved telematics device to draw upon the best available technology and encourage redevelopment, rather than restricting the telematics device to technology that was available at a particular time.

2.1.8 The telematics device collects data on date and time, and vehicle position. The telematics device may collect other data as specified by applications of the National Telematics Framework (such as vehicle speed). The telematics device may also collect other data as required by the level of assurance of the application (such as vehicle direction of travel for a Level 3 Assurance application).

2.1.9 The telematics device shall process its collected data to produce telematics device data records which are stored for transmission. The telematics device data records produced are dependent on the application or scheme, or uses of the telematics device, or as required by the level of assurance of the application.

2.1.10 If required by the application, consistent with the level of assurance, the telematics device shall also collect data identifying malfunctions, attempts at tampering and/or tampering.

2.1.11 Additional application-specific data can be appended to the telematics device data records produced, or be reported as separate records.

2.2 Levels of Assurance

2.2.1 A telematics device may be used at different levels of assurance in the National Telematics Framework:

- Level 1: Self-assessment of performance-based requirements (lowest assurance).
- Level 2: Independent assessment of performance-based requirements, including type-approval of device and certification of Application Service Providers (medium assurance).
- Level 3: Independent assessment of the performance-based requirements, including type-approval of device, certification of Application Service Providers and provision of certificate-based evidence (highest assurance).

Note:

i) *This specification contains requirements for telematics devices used at Level 2 Assurance or Level 3 Assurance. Telematics devices suitable for use only at Level 1 Assurance have minimal requirements and are out of scope of this specification.*

ii) *A telematics device suitable for use at a higher level of assurance can also be used in applications at lower levels of assurance (for example, a telematics device used in an application at Level 3 Assurance can also be used in applications at Level 2 and Level 1 Assurance).*

For more information on levels of assurance, see *National Telematics Framework – Levels of Assurance*.

3 USE OF THIS SPECIFICATION

3.1 General

3.1.1 TCA believes this publication to be correct at time of printing and does not accept responsibility for any consequences arising from the use of information herein. Readers should rely on their own skills and judgment to apply information to particular issues.

3.1.2 TCA accepts no responsibility and provides no assurance whatsoever for private use or reference to this specification (i.e. not in conjunction with TCA) including to manufacturers or developers using or referring to this specification to manufacture or develop telematics devices or to end users or purchasers of telematics devices manufactured or developed using or referring to this specification. For assurance that a telematics device meets the requirements of this specification, the owner of the telematics device may apply to TCA for type-approval of the telematics device.

3.1.3 TCA will publish details of type-approved telematics devices including, as applicable, applications for which they are approved for use.

3.2 Use of this Specification by Applicants (Suppliers or Providers)

3.2.1 The requirements contained in Sections 6 and 7 of this specification shall apply to all telematics devices for use at Level 2 Assurance and presented to TCA for type-approval assessment.

3.2.2 The requirements contained in Sections 6 and 8 of this specification shall apply to all telematics devices for use at Level 3 Assurance and presented to TCA for type-approval assessment.

3.2.3 TCA will assist applicants in the determination of which level of assurance a telematics device should be assessed at, as well as which optional requirements will apply, based on current and future use of the telematics device to support applications of the National Telematics Framework.

3.2.4 The need to meet requirements in Sections 6 and 7 (Level 2 Assurance) or Sections 6 and 8 (Level 3 Assurance) will be determined by the level of assurance of National Telematics Framework applications. Application specifications will contain information about the level of assurance and the functional and technical requirements of telematics devices.

Note: If the telematics device will be used in multiple applications, the applicant must satisfy the application which has the highest level of assurance.

3.3 Use of this Specification by End Users

3.3.1 This specification can be used by end users to:

- acquire/purchase telematics devices already type-approved by TCA:
  - Type-approved telematics devices are published on the TCA website.
  - TCA also publishes the applications (and levels of assurance) which are supported by each type-approved telematics device.
- acquire/purchase telematics devices that are not type-approved by TCA:
  - By referencing this specification when assessing the merits of, or to compare the differences between, individual telematics devices offered by suppliers or providers.
  - It is solely the responsibility of end users to satisfy themselves whether a telematics device meets this specification and as applicable, any application(s) requirements.

4 NOMENCLATURE

4.1 In this specification:

- all references to Global Navigation Satellite Systems (GNSS) extend to include the Global Positioning System (GPS), other constellations and multi-GNSS environments;
- all references to software include software in any form or medium, including firmware and operating systems, unless otherwise qualified; and
- where the context so requires it, references to the Authorised Person shall, before the telematics device has been type-approved by TCA, be a reference to that party as an applicant for telematics device type-approval.

4.2 Requirements clauses within this specification that are denoted by:

- 'shall' are requirements that must be met;
- 'should' are requirements that should desirably be met; and
- 'will' are obligations that will be met by other parties.

4.3 Notes are included by way of clarification and apply to the immediately preceding requirement.

4.4 Optional requirements are marked with an asterisk within parentheses (*) at the beginning of the requirement. Optional requirements may be needed to support specific applications or schemes of the National Telematics Framework.

5 REFERENCES

5.1 Documents referenced in this specification are listed below:

- Transport Certification Australia (TCA) 2018, *National Telematics Framework – Levels of Assurance*, Transport Certification Australia. Melbourne;
- Degrees of protection provided by enclosures (IP code), AS 60529-2004, Standards Australia;
- Electromagnetic compatibility (EMC) – Part 4-3:Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test, AS/NZS IEC 61000.4.3:2013, Standards Australia;
- Radiocommunications (Radionavigation – Satellite Service) Class Licence 2015, Australian Communications and Media Authority;
- Regulation No 10 of the Economic Commission for Europe of the United Nations (UNECE) – Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility, Rev.5, 16 October 2014 (UNECE Regulation No10);
- Road Vehicles – Electrical disturbances from conduction and coupling, Part 3: Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines, ISO 7637-3:2016, ISO 2016; and
- Vehicle immobilizers, AS/NZS 4601:1999, Standards Australia.

6 COMMON REQUIREMENTS FOR TELEMATICS DEVICE TYPE-APPROVAL (LEVEL 2 OR 3 ASSURANCE)

6.1 Overview

6.1.1 This section contains the common functional and technical requirements for the use of telematics devices at either Level 2 or Level 3 Assurance. The section consists of the following:

- Physical Characteristics
- Environmental Characteristics
- Data Collection
- Record Generation
- Data Security
- Data Transfer
- Installation, Operation and Maintenance
- Provision of Telematics Device and Documentation for Type-Approval.

Note:

i) *For specific requirements for the use of telematics devices at Level 2 Assurance, see Section 7.*

ii) *For specific requirements for the use of telematics devices at Level 3 Assurance, see Section 8.*

6.1.2 TCA will assist applicants in the determination of which level of assurance a telematics device should be assessed at, as well as which optional requirements will apply, based on expected usage of the telematics device and which applications of the National Telematics Framework are to be supported.

6.1.3 Optional requirements are marked with an asterisk within parentheses (*) at the beginning of the requirement.

6.2 Requirements

PHYSICAL CHARACTERISTICS

A.1 Telematics Device

A.1.1 A telematics device shall be capable of being connected physically or wirelessly to the respective vehicle.

A.1.2 The telematics device shall have the capability to provide evidence of any unauthorised removal or opening of the telematics device.

A.2 Telematics Device Identifier

A.2.1 Each telematics device shall have a unique identifier that will be used to identify it.

Note: The identifier may be the serial number of the specific telematics device.

A.2.2 Data from each telematics device shall be able to be linked to the telematics device that produced the data.

A.2.3 The telematics device identifier shall be visibly etched or marked on the outside casing of the unit in such a manner that it cannot be modified or removed without being evident.

A.2.4 The telematics device identifier shall not be able to be set or altered by any person other than the applicant or otherwise tampered with.

ENVIRONMENTAL CHARACTERISTICS

A.3 Suitability for Use in Vehicles

A.3.1 The applicant shall provide to TCA evidence of compliance with the following standards or their equivalents in relation to the telematics device:

a. for radiated emissions, UNECE Regulation No.10, Rev. 5, sections 6.5 and 6.6, or Australian Communications and Media Authority (ACMA) Regulatory Compliance Mark; and

b. for conducted emissions, UNECE Regulation No.10, Rev. 5, section 6.7, Table 1 using the pulse amplitude level for both 12V and 24V systems, as appropriate, or ACMA Regulatory Compliance Mark.

A.4 Telematics Device GNSS Capability

A.4.1 The telematics device GNSS receiver and GNSS antenna shall comply with the Radiocommunications (Radionavigation – Satellite Service) Class Licence 2015 – the Australian Communications and Media Authority.

A.4.2 The telematics device GNSS antenna shall be capable of being mounted in a position that meets the manufacturer's specification for the vehicle combination.

A.4.3 The telematics device GNSS antenna shall be capable of being mounted in a position that:

a. meets the needs of the application; and

b. meets requirements A.7 to A.8.

A.5 Non-Type-Approved Functionality in Telematics Device

A.5.1 It shall be permissible for non-type-approved functionality to be accommodated within the telematics device.

Note: The telematics device will be assessed with any additional functionality enabled to ensure that the functionality does not materially impact the ability of the telematics device to meet the requirements of this specification.

DATA COLLECTION

A.6 Data

A.6.1 The telematics device shall collect the following data:

a. date and time data (see A.7); and

b. position data (see A.8).

A.7 Date and Time Data

A.7.1 The telematics device shall collect and store date and time data as UTC.

A.7.2 The date and time shall be stored with a resolution of at least 1 second.

A.8 Position Data

A.8.1 The telematics device GNSS receiver shall determine latitude/longitude position of the vehicle.

A.8.2 The resolution of the stored latitude/longitude position calculated by the telematics device GNSS receiver shall be to 0.00001 degrees or better.

RECORD GENERATION

A.9 Telematics Device Data Records

A.9.1 The telematics device shall process the collected data to produce the following telematics device data records which are stored for later transmission:

a. telematics device position records (see A.10); and

b. (*) telematics device speed records (if the telematics device generates telematics device speed records) (see A.11).

Note: The format and production of telematics device data records is dependent on the number and type of applications or uses of the telematics device.

A.10 Telematics Device Position Records

A.10.1 The telematics device shall generate telematics device position records from the data collected by the telematics device that details the position data for the vehicle being monitored.

A.10.2 Telematics device position records shall be continuously generated and stored at time intervals set by the specific application when the vehicle is in operation.

A.10.3 Telematics device position records shall include vehicle position data, data/time of generation, and any other data as specified by the application.

A.11 Telematics Device Speed Records

A.11.1 (*) If the telematics device monitors speed, the telematics device shall either:

a. generate telematics device speed records from the data collected by the telematics device that details the speed data for the vehicle being monitored, or

b. insert speed data into each position record.

Note: Subclause (a) is recommended only where event-based generation of telematics device speed records is used, such as for speed threshold or geofenced areas. Otherwise, for periodic measurements, it is recommended to include speed data in position records.

A.11.2 (*) If the telematics device monitors speed via telematics device speed records, the telematics device shall, while the vehicle is in operation, generate telematics device speed records, set by the specific application.

A.11.3 (*) If the telematics device generates telematics device speed records, telematics device speed records shall include vehicle speed and position data, data/time of generation, and any other data as specified by the application.

DATA SECURITY

A.12 Data Security and Confidentiality Measures

A.12.1 It shall not be possible for collected or stored data or software memory within the telematics device to be accessible or capable of being manipulated by any person, device or system (including anything attached or used to enter data into the telematics device) other than that authorised by the applicant. Security and confidentiality of data stored in the telematics device shall be maintained at all times.

A.13 Telematics Device Communications Capability

A.13.1 The telematics device shall be capable of communicating remotely.

A.13.2 The channel for the transmission of telematics device data records shall be secure and guarantee standards for privacy and data integrity and minimise the risk of interception by third parties, at a level consistent with services provided by Australian licensed telecommunications carriers.

DATA TRANSFER

A.14 Transfer of Data from Telematics Device

A.14.1 If the vehicle is out of communication coverage or not in operation at the time of the scheduled data transfer, then data transfer shall commence within 5 minutes of when the communication network becomes available and the vehicle is in operation.

A.14.2 The communications protocol used to transfer data from the telematics device shall support:

a. authentication of the telematics device and the receiving system;

b. non-repudiation of the origin and integrity of each telematics device data record; and

c. reliability, such that each telematics device data record is delivered:

i) without data error(s); and

ii) exactly once (i.e. without loss or duplication).

Note: More information may be obtained from TCA concerning authentication and non-repudiation mechanisms such as cryptographic hash algorithms, message authentication codes, digital signatures and cyclic redundancy checks.

A.14.3 The algorithms used to achieve A.14.2 shall be robust, and shall be documented to the satisfaction of TCA.

INSTALLATION, OPERATION AND MAINTENANCE

A.15 Installation, Operation and Maintenance

A.15.1 A telematics device shall have procedures for the installation, operation and maintenance such that the telematics device does not interfere with the normal, safe operation of the vehicle. The documentation may include a requirement for consultation with the vehicle's manufacturer before activity associated with the installation, operation and maintenance of the telematics device.

A.15.2 The applicant shall provide documentation pertaining to the installation, operation and maintenance of the telematics device for use by the Authorised Person.

A.15.3 Installation and maintenance (if applicable) functions shall include access controls and shall only be available to an Authorised Person.

A.15.4 Operation functions may include access controls set by an Authorised Person.

A.15.5 The applicant shall have the capability to apply software updates to a telematics device within a timeframe identified by the applicant.

A.15.6 The applicant shall document the current telematics device software version and a hardware version.

A.15.7 The applicant shall have the capability to establish the telematics device hardware and software version associated with each telematics device data record.

A.16 Documentation

A.16.1 The applicant shall provide telematics device documentation to support the requirements of this specification.

A.16.2 This documentation shall, to the satisfaction of TCA:

a. document the telematics device and its components, cabling and their interfaces; and

b. describe critical operational, support and rectification processes.

A.16.3 This documentation shall be inclusive of, at a minimum:

a. installation procedures;

b. operation procedures inclusive of a user guideline; and

c. maintenance procedures (if applicable).

PROVISION OF TELEMATICS DEVICE AND DOCUMENTATION FOR TYPE-APPROVAL

A.17 Telematics Devices for Type-Approval

A.17.1 To facilitate telematics device type-approval testing, two telematics devices shall be provided to TCA. The applicant shall adhere to the requirements in Appendix B detailing the supply of these telematics devices.

7 SPECIFIC REQUIREMENTS FOR TELEMATICS DEVICE TYPE-APPROVAL AT LEVEL 2 ASSURANCE

7.1 Overview

7.1.1 This section contains specific functional and technical requirements for the use of telematics devices at Level 2 Assurance. The section consists of the following:

- Data Collection
- Data Storage
- Data Transfer
- Installation, Operation and Maintenance.

Note: For common requirements for the use of telematics devices at Level 2 or 3 Assurance, see Section 6.

7.1.2 TCA will assist applicants in the determination of which level of assurance a telematics device should be assessed at, as well as which optional requirements will apply, based on expected usage of the telematics device and which applications of the National Telematics Framework are to be supported.

7.1.3 Optional requirements are marked with an asterisk within parentheses (*) at the beginning of the requirement.

7.2 Requirements

DATA COLLECTION

B.1 Data

B.1.1 In addition to data specified in A.6.1, the telematics device shall collect the following data:

a. date and time data (see B.2);

b. position data (see B.3); and

c. (*) speed data (if the telematics device monitors speed) (see B.4).

B.2 Date and Time Data

B.2.1 The date and time data collected by the telematics device shall be within:

a. 1 second from UTC when using GNSS signals; and

b. 10 seconds from UTC when not using GNSS signals for 24 hours.

Note: Subclause (b) is assessed upon loss of a GNSS signal after a fix has been made and not when the telematics device is first powered on.

B.3 Position Data

B.3.1 The latitude/longitude position calculated by the telematics device GNSS receiver shall not deviate by more than 13 metres from the absolute horizontal position Australia-wide average for at least 95% of the observations.

Note: Any included quality indicators (e.g. HDOP) will be considered when assessing this requirement.

B.4 Speed Data

B.4.1 (*) If the telematics device monitors speed, speed shall be accurate to within 3.0 km/h for at least 99.5% of observations when travelling greater than 40 km/h.

Note: Any included quality indicators (e.g. HDOP) will be considered when assessing this requirement.

B.4.2 (*) If the telematics device monitors speed, the resolution of the vehicle speed data recorded by the telematics device shall be to 1 km/h or better.

DATA STORAGE

B.5 Telematics Device Data Record Storage Capability

B.5.1 The telematics device shall be capable of storing all data collected during typical operation for at least 6 hours.

Note: Collected data includes any position records, speed records (as applicable), additional data as specified by applications and any other data collected.

DATA TRANSFER

B.6 Transfer of Data from Telematics Device

B.6.1 The communications protocol used to transfer data from the telematics device shall support reconstruction of the sequence that records were generated by the telematics device.

B.6.2 The algorithm used to achieve B.6.1 shall be robust, and shall be documented to the satisfaction of TCA.

INSTALLATION, OPERATION AND MAINTENANCE

B.7 Documentation

B.7.1 The applicant shall provide procedures to monitor the health and performance of the telematics device, including indicators of device malfunction and/or circumvention. These procedures shall be documented to the satisfaction of TCA.

8 SPECIFIC REQUIREMENTS FOR TELEMATICS DEVICE TYPE-APPROVAL AT LEVEL 3 ASSURANCE

8.1 Overview

8.1.1 This section contains the functional requirements for the use of devices at Level 3 Assurance. The section consists of the following:

- Physical Characteristics
- Environmental Characteristics
- Data Collection
- Record Generation
- Data Storage
- Data Transfer.

Note: For common requirements for the use of telematics devices at Level 2 or 3 Assurance, see Section 6.

8.1.2 TCA will assist applicants in the determination of which level of assurance a telematics device should be assessed at, as well as which optional requirements will apply, based on expected usage of the telematics device and which applications of the National Telematics Framework are to be supported.

8.1.3 Optional requirements are marked with an asterisk within parentheses (*) at the beginning of the requirement.

8.2 Requirements

PHYSICAL CHARACTERISTICS

C.1 Telematics Device Identifier

C.1.1 The telematics device identifier, or alternative data that allows the telematics device to be uniquely identified, shall be stored in the read-only memory of the telematics device.

ENVIRONMENTAL CHARACTERISTICS

C.2 Suitability for Use in Vehicles

C.2.1 The applicant shall provide to TCA evidence of compliance with the following standards or their equivalents, or in-field performance evidence, in relation to the telematics device:

a. the vibration requirements specified in AS/NZS 4601:1999 Type 1 paragraph 3.3.4;

b. the impact requirements specified in AS/NZS 4601:1999 paragraph 3.3.5;

c. the temperature and humidity requirements specified in AS/NZS 4601:1999 paragraphs 2.2.5.2 and 3.3.2;

d. for components exposed to the elements, the dust and water ingress protection requirements of IP66, Table 7, Item 6 and Clause 13.4 and Table 8, Item 6 and Clause 14.2.6 as defined in AS 60529-2004 (IEC 60529 Ed 2.1:2001);

e. for components mounted in the cabin, the dust and water ingress protection requirements of IP44, Table 7, Item 4 Clause 13.4 and Table 8, Item 4 and Clause 14.2.4 as defined in AS 60529-2004 (IEC 60529 Ed 2.1:2001);

f. for radiated immunity, AS/NZS IEC 61000.4.3:2013, paragraph 5, Table 1 where the test field strength is 50 V/m over a frequency range of 80 MHz to 1000 MHz and the test is conducted for set and unset states such that the telematics device and/or trailer identification device (TID) shall remain in a state where all functions perform as designed during and after exposure;

g. for conducted immunity for conducted disturbances along supply lines, UNECE Regulation No.10, Rev. 5, section 6.9 with functional status “A”, Table 2; and

h. for conducted immunity for conducted disturbances on signal lines, ISO 7637-3:2016, the test pulses a through b shall be applied at a severity level III for either Table B.1 12V or Table B.2 24V powered telematics devices and/or TIDs or both, as appropriate, in both the set and unset states with the test duration 5 min, such that the telematics device and/or TID shall remain in a state where all functions perform as designed during and after exposure.

C.2.2 If the nature of telematics device installation renders any equipment in C.2.1a to C.2.1h not applicable or unnecessary, that requirement shall not apply.

DATA COLLECTION

C.3 Data

C.3.1 In addition to data specified in A.6.1, the telematics device shall collect the following data:

a. GNSS quality data (see C.4);

b. date and time data (see C.5)

c. position data (see C.6)

d. direction of travel data (see C.7);

e. (*) GNSS speed data (if the telematics device monitors speed) (see C.8); and

f. alarm status data (see C.9).

C.4 GNSS Quality Data

C.4.1 GNSS quality shall be measured by the number of satellites used and the horizontal dilution of precision (HDOP).

Note: 'Used' means the number of satellites whose signal is received and taken into account by the telematics device in the determination of data.

C.4.2 The telematics device GNSS receiver shall demonstrate GNSS quality to the level exhibited by the Reference System, or better. Specifically:

a. the HDOP shall not be more than 0.1 greater than that of the Reference System for at least 95% of the observations when using:

i) at least four satellites; and

ii) the same number of satellites as the Reference System.

b. the number of satellites used by the telematics device's GNSS receiver shall be minus one (-1) or better than the total number used by the Reference System for at least 95% of observations, at a fixed mask angle (selected according to manufacturer's recommendation) of between 5 and 20 degrees.

Note:

i) *TCA will define the GNSS quality comparison assessment location and duration.*

ii) *TCA will use a Reference System for GNSS quality comparison purposes, for telematics device type-approval.*

C.4.3 The assessment of GNSS quality data shall be based on the number of satellites used separately for each of the GNSS and/or the multi-GNSS environments sought for type-approval.

Note: Each proposed GNSS or multi-GNSS environment will be assessed separately.

C.4.4 The HDOP from the telematics device GNSS receiver shall be measured and stored to a resolution of 0.1 or better.

C.4.5 If HDOP cannot be established (for example, if satellites are not visible), the default HDOP value shall be used in any corresponding measurement.

C.5 Date and Time Data

C.5.1 The telematics device shall have an internal clock that functions independently of the supporting external power supply.

C.5.2 In the event the external power supply fails or shuts down, the telematics device internal clock shall function for a period of at least 7 days.

C.5.3 The accuracy of the telematics device internal clock shall be such that in any 7 day period it does not deviate from the date and time by more than:

a. 1 second, when using GNSS signals;

b. 10 seconds per day, when not using GNSS signals; and

c. 20 seconds per day, when not using GNSS signals and the telematics device has no connection to the external power supply.

C.6 Position Data

C.6.1 The latitude/longitude position calculated by the telematics device GNSS receiver shall not deviate by more than 13 metres from the absolute horizontal position Australia-wide average for at least 95% of the observations when using at least four satellites and an HDOP of < 4.

C.6.2 In the event of interruption to and subsequent reacquisition of GNSS satellite signals, the telematics device GNSS receiver shall on the reacquisition of GNSS satellite signals, commence to collect and store vehicle position:

a. if the interruption is for a period of less than 7 days, within 60 seconds of reacquisition of GNSS satellite signals; and

b. if the interruption is for a period of 7 days or more, within five minutes of reacquisition of GNSS satellite signals.

C.6.3 Vehicle position (latitude/longitude) shall be reported as blank/void if the telematics device used zero satellites, or was unable to determine vehicle position.

C.7 Direction of Travel Data

C.7.1 The telematics device GNSS receiver shall determine direction of travel of the vehicle.

C.7.2 The direction of travel determined by the telematics device GNSS receiver shall not deviate from the actual direction of travel by more than 4 degrees for at least 95% of the observations when using at least four satellites and an HDOP of < 4.

C.7.3 The resolution of direction of travel determined by the telematics device GNSS receiver and recorded by the telematics device shall be to 1 degree or better.

Note: The assessment of direction of travel of the telematics device GNSS receiver will only be made when travelling speeds in excess of 30 km/h.

C.8 GNSS Speed Data

C.8.1 (*) If the telematics device monitors speed, vehicle speed shall be measured by a GNSS-derived method.

C.8.2 (*) If the telematics device monitors speed, GNSS-reported speed shall be accurate to within 3.0 km/h for at least 99.5% of observations when using at least four satellites and an HDOP of < 4 and travelling greater than 40 km/h.

C.8.3 (*) If the telematics device monitors speed, the resolution of the vehicle speed data recorded by the telematics device shall be to 0.1 km/h or better.

C.9 Alarm Status Data

C.9.1 The connection of the telematics device to the external power supply shall be monitored and reported upon in accordance with C.13.1a and C.13.1b.

C.9.2 Movement of the vehicle shall be detected and reported upon in accordance with C.13.1c and C.13.1d, using two different features independent from the GNSS signal.

Note: The purpose of the independent movement features is to be able to facilitate the detection of movement of the vehicle independently of the GNSS satellite signal.

C.9.3 One independent feature to facilitate the indication of vehicle movement shall be the ignition status. The other independent movement feature to facilitate the detection of vehicle movement shall, subject to the approval of TCA, be one of the following sensors:

a. the engine control module (ECM);

b. a secure odometer;

c. an internal component of the telematics device; or

d. some other such independent movement sensor.

C.9.4 The applicant shall document its chosen method of independent movement detection and connection.

C.9.5 The connection of the independent movement features to the telematics device shall be monitored and reported upon in accordance with C.13.1e through C.13.1h.

Note: The connection of the independent movement features to the telematics device is monitored to detect an attempt to disconnect and/or remove the telematics device.

C.9.6 Access to the data in the telematics device shall be monitored and reported upon in accordance with C.13.1i.

C.9.7 Access to telematics device software shall be monitored and reported upon in accordance with C.13.1j.

C.9.8 The connection of the GNSS antenna shall be monitored and reported upon in accordance with C.13.1k and C.13.1l.

C.9.9 For requirements C.9.5 to C.9.8, if the telematics device is designed in such a way that prevents disconnection or access (as applicable), that requirement shall not apply.

RECORD GENERATION

C.10 Telematics Device Data Records

C.10.1 The telematics device shall process the collected data to produce telematics device alarm records which are stored for later transmission (see C.13).

C.11 Telematics Device Position Records

C.11.1 Telematics device position records shall include a record number.

C.12 Telematics Device Speed Records

C.12.1 (*) If the telematics device generates telematics device speed records, telematics device speed records shall include a record number.

C.13 Telematics Device Alarm Records

C.13.1 The telematics device shall generate and store telematics device alarm records for each of the following events:

a. the external power supply is disconnected from the telematics device;

b. the external power supply is reconnected to the telematics device;

c. movement is indicated by the ignition while the external power supply is disconnected from the telematics device;

d. movement is detected by the other independent movement sensor while the external power supply is disconnected from the telematics device;

e. the ignition is disconnected from the telematics device (with and without external power being connected);

f. the ignition is reconnected to the telematics device (with and without external power being connected);

g. the other independent movement sensor is disconnected from the telematics device (with and without external power being connected);

h. the other independent movement sensor is reconnected to the telematics device (with and without external power being connected);

i. unauthorised access to data in the telematics device is detected (regardless of whether the vehicle is in operation or not in operation);

j. unauthorised access to telematics device software is detected (regardless of whether the vehicle is in operation or not in operation);

k. the GNSS antenna is disconnected from the telematics device (regardless of whether the vehicle is in operation or not in operation); and

l. the GNSS antenna is reconnected to the telematics device (regardless of whether the vehicle is in operation or not in operation).

C.13.2 Telematics device alarm records shall include the event that triggered the generation of the telematics device alarm record, date/time of generation, and any other data as specified by the application.

C.13.3 Telematics device alarm records shall include a record number.

C.14 Record Numbering

C.14.1 Except where otherwise specified by an application, all telematics device data records shall be assigned record numbers from the one record numbering sequence, with consecutive and increasing record numbers assigned to successive telematics device data records in order of generation.

C.14.2 Where specified by an application, a specific type of telematics device data record shall be assigned record numbers from a separate numbering sequence, with consecutive and increasing record numbers assigned to successive telematics device data records in order of generation.

Note: A separate record numbering sequence may be required where the generation algorithm for a specific type of telematics device data record requires pre-allocation of record numbers and this could impact the ordering and continuity of record numbers for other types of telematics device data records.

C.14.3 (*) If the telematics device generates telematics device speed records, telematics device speed records shall be assigned record numbers from a separate record numbering sequence in accordance with C.14.2.

C.14.4 The separate data record numbering sequences (see C.14.2) used by an telematics device shall:

a. be different, such that record numbers never clash; and

b. each rotate through a large enough cycle to ensure that the same record number shall not be issued more than once every 12 months.

DATA STORAGE

C.15 Telematics Device Data Record Storage Capability

C.15.1 The telematics device shall be capable of storing sufficient data records to address the needs of any one specific application, noting:

a. that there may be more than one such application associated with the telematics device;

b. that there may be other applications or usage of the telematics device; and

c. the frequency of transfer of data from the telematics device.

C.15.2 As a minimum, the telematics device shall be capable of storing:

a. at least 20,000 telematics device position and telematics device alarm records (combined); and

b. (*) at least 6,000 telematics device speed records (if the telematics device generates telematics device speed records).

C.15.3 If the volume of data collected and generated prior to transfer from the telematics device exceeds the data storage capacity of the telematics device, new data shall not overwrite stored data.

C.16 Telematics Device External Power Supply Failure/Shutdown

C.16.1 In the event that the external power supply supporting the telematics device fails or shuts down, the telematics device shall be capable of retaining stored data for at least 7 days; and monitoring the status of the ignition and other independent movement sensor for at least 24 hours.

Note: The primary purpose of continuing to monitor after the external power supply fails or shuts down is to facilitate the detection of any disconnection of the telematics device and/or movement of the vehicle independently of the GNSS signal (see C.9).

DATA TRANSFER

C.17 Transfer of Data from Telematics Device

C.17.1 Telematics device data records stored in the telematics device shall only be deleted after such data is transferred from the telematics device and successful receipt is confirmed by the receiving system.

Note: Under normal conditions, the receiving system may be that of the applicant or a third party.

C.17.2 The communications protocol used to transfer data from the telematics device shall support reliability, such that each telematics device data record is delivered in the sequence generated by the telematics device.

C.17.3 The algorithm used to achieve C.17.1 shall be robust, and shall be documented to the satisfaction of TCA.

Appendix A Acronyms and Definitions

Acronyms

Acronym	Definition
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HDOP	horizontal dilution of precision
UTC	Coordinated Universal Time

Definitions

Term	Definition
applicant	A party which has applied for telematics device type-approval.
data record	A discrete and defined set of data elements, including a (unique) record number, and record date time (of data record generation), produced for a device for a data collection period.
Global Navigation Satellite System (GNSS)	Several networks of satellites that transmit high-frequency radio signals containing time and distance data that can be picked up by a receiver, allowing the user to identify the location of the receiver anywhere around the globe.
Global Positioning System (GPS)	A form of GNSS controlled by the US Department of Defense.
horizontal dilution of precision (HDOP)	A measure quantifying the quality of the determination of horizontal position (latitude and longitude) based on the number and geometric distribution of the satellites used in the determination.
independent movement sensor	A sensor which detects movement of a vehicle independent of GNSS signal.
Level 2 Assurance	Independent assessment of performance-based requirements, including type-approval of device and certification of Application Service Providers.
Level 3 Assurance	Independent assessment of the performance-based requirements, including type-approval of device, certification of Application Service Providers and provision of certificate-based evidence.
level of assurance	An assurance level that supports telematics applications and devices, structured around the intended use of a telematics application or device, risks being managed, and the needs and expectations of consumers and other stakeholders.
message authentication code	A code only known and accessible to an Authorised Person that can prove the integrity and origin of data from a source.
operation (in)	A vehicle status when the telematics device's supporting external power supply is connected to the telematics device and the ignition status is ON.
operation (not in)	A vehicle status when the telematics device's supporting external power supply is connected to the telematics device and the ignition status is OFF or the ignition is disconnected.
Reference System	The reference system used by TCA for GNSS quality testing of telematics device s.
scheme	The generic term for a specific use of an application linked to delivering a policy or program objective.
tamper	Conduct towards the telematics device which is intended to prevent the system from functioning correctly.

Term	Definition
telematics	Integrated systems of information, communications and sensors to exchange data and information between vehicles and other locations, including vehicle to infrastructure (V2I) applications, vehicle to vehicle (V2V) applications, and vehicle to elsewhere (V2X) applications.
telematics device	The primary telematics unit which monitors parameters, which may include identity, time, location, speed, vehicle category or mass.
telematics device identifier	A unique identifier assigned to a telematics device which identifies the telematics device and the data from that telematics device.
type-approved telematics device	A telematics device which is of a type that has been approved by TCA.
vehicle position	The latitude and longitude position of a vehicle, to 0.00001 decimal degrees using the Geodetic Datum of Australia 1994 (GDA94) coordinate system.

Appendix B Requirements for the Provision of Telematics Devices to TCA

B.1 General

B.1.1 The requirements contained in this appendix shall apply to all telematics device s presented to TCA for type-approval.

B.1.2 TCA will, if requested, complete and return to the applicant a signed confidentiality agreement in reasonable terms for the protection of the applicant's intellectual property.

B.1.3 The applicant shall provide to TCA all services reasonably required to enable TCA to carry out type-approval.

B.2 TCA Access to Data

B.2.1 For the type-approval assessment the applicant shall provide to TCA:

a. all telematics device data records at daily intervals;

b. all applicable telematics device data at no greater than weekly intervals; and

c. support, procedural guidance, user login account(s) and access to appropriate software tools or utilities to allow the decoding, decryption, decompression, extraction, etc. of data held in any proprietary or custom format, to permit further viewing or analysis of the transmitted data by TCA.

B.2.2 The data referred to in B.2.1a and B.2.1b shall be backed up by the applicant for the duration of the type-approval process.

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