

Minimum Specifications for Taxi Security Systems

CAMERA SYSTEM

Introduction

This specification establishes the minimum requirements for a security camera system to be fitted in a taxi for the purpose of recording images of persons in or about a taxi.

Camera System Construction

1. The internal camera head(s) shall not have any sharp edges and shall be positioned such that passengers or drivers cannot come into contact with the housings during normal operations.
2. The serial number and date of manufacture shall be marked externally, and an electronic serial number recorded internally.
3. The camera system shall have a real time clock function which is able to be synchronised with a GPS derived time stamp message.
4. The camera shall time tag all images with UTC.
5. The camera system shall either have an in-built GPS receiver, or a serial port for acceptance of NMEA defined GGA and RMC sentence reports.

System Environmental Requirements

6. The camera system shall function over a temperature range of -5°C to $+60^{\circ}\text{C}$ at 0 to 85% relative humidity non-condensing.
7. The camera system shall conform to relevant EMC standards
 - a) AS/NZS CISPR 25:2008
 - b) ISO 10605:2001
 - c) ISO 7637-2:2004

8. Images from the camera system shall be capable of being recovered following submersion in 5% saline water at a depth of 6 metres for a minimum period of 72 hours.
9. Images from the camera system shall be capable of being recovered following 5 minutes exposure of the camera system within a furnace operating at 538°C .
10. Images from the camera system shall be capable of being recovered following failure of the vehicle electrical system.

System Power

11. The camera system shall be powered and fully operational whenever the vehicle is being hired or available for hire.
12. The camera system shall not be wired through a kill switch, except when the ignition is disabled by operation of a kill switch in the engine bay.
13. The re-boot time for the camera system to become fully operational from a powered off or power save state shall be no more than 3 seconds. This parameter shall also apply should the camera system be exposed to repetitive transitory brown-outs associated with engine cranking.
14. The camera system may enter a power save mode if no door, ignition or meter activity is sensed in a period of 60 minutes. During a power save mode, no images are taken, but all trigger events shall be monitored. If any trigger event occurs, the camera system shall be fully operational within 3 seconds.

Interface Requirements

15. The camera system alarm and tracking system alarm shall use common alarm switches such that operation of either switch will initiate

- alarm processes in both camera and tracking systems.
16. The debounce period for the activation of the tracking system and camera system alarm shall be the same, and be within 1 second. It is acceptable practice for the alarm to be wired to one device only, if that device then forwards the alarm condition to the other device.
 17. Two alarm switches shall be provided, each with identical function, one dashboard mounted and the other floor mounted (see installation section for details on position of switches).
 18. The camera system shall have necessary vehicle interfaces to sense a door open and door close event, including any passenger entry door, driver door, sliding door or tailgate. This function shall not be wired through vehicle interior lamps or be dependent on the setting of any other control available to the driver or passenger.
 19. The camera system shall detect both the ignition and meter “on” and “off” states.
 20. Serial data connections between the camera system and vehicle management system or to MDT are acceptable means to detect events provided they meet the functional requirements.
- available of the taxi driver and the head and shoulders of all passenger seating positions.
25. Two externally mounted camera heads shall separately provide a view of any person approaching between 300mm and 5 metres distant from both the driver’s and front passenger’s window within an angle of approach of 120° from the centre of the door.
 26. All camera heads shall be mounted in such a manner so as to readily prevent misalignment of the field of view, except in the case of a vehicle accident or other severe impact.
 27. The camera heads and any exposed cables and connectors shall be tamper proof.
 28. The field of view of any camera head shall not be obscured, or be capable of being obscured either permanently or temporarily, by any sun visor, wind shield or any other fitting or equipment installed inside or outside the vehicle.
 29. The dashboard alarm switch shall be located to the right of the steering column, in a position which is not in the direct vision of any passenger.
 30. The floor alarm switch shall be located on the left side of the driver’s foot well.

Installation

21. The installation of the camera system shall not affect the compliance of the taxi with all relevant requirements of the Road Transport (Vehicle Registration) Regulation 1998 and the Australian Design Rules.
 22. The camera controller shall be mounted in a concealed space where visual or physical contact with occupants or luggage is not possible.
 23. The internal camera head(s) shall be readily visible to passengers in the vehicle.
 24. The internal camera head(s) shall be fitted such that a clear and unobstructed view is
31. When the camera system is operating in conjunction with the alarm there must be no overt indication given to any passenger that an alarm sequence has been initiated.
 32. The driver shall have a visual indicator showing when the system is operational and when there is a malfunction. This indicator shall incorporate the following features:
 - a) Normal display state – green LED and red LED not illuminated unless valid image capture in progress.
 - b) Valid image capture – green LED flashing with 250 ms duration.
 - c) All alarm memories locked – alternating red and green LED flashing with 500 ms duration for each colour.

- d) Camera system fault – green off, red LED flashing once per second with 250 ms duration.
33. The visual indicator shall not be used for any other purpose.

Image Recording Events

34. The camera shall have provision to store at least 20,000 images or if using a continuous recording system, at least 7 days of storage for images.
35. The recording system shall be configured for event based recording using triggers from the taxi, unless a continuous recording system is used where the same outcome from a trigger based system must be achieved.
36. The maximum interval between any two sequential image captures is 1 second.
37. The camera system shall take background (no trigger) images every 30 seconds whilst not in power save mode.
38. The camera system shall retain in memory any pre-trigger images captured 5 seconds before any trigger.
39. The camera system shall retain in memory the following number and sequence of images from each trigger type and each camera head fitted:
- a) Door open 10 images
 - b) Door close 10 images
 - c) Meter on 10 images and every 30 seconds thereafter whilst on
 - d) Meter off 10 images
 - e) Ignition on 10 images
 - f) Ignition off 10 images
 - g) Alarm on 600 images
40. Where sequential events cause overlap or contention of image capture requirements, such as “door open” event followed by “meter on” event prior to the door event capture sequence being completed, the image recording specifications of the newer event shall override the previous event, and the uncompleted image count from the previous event can be disregarded.

41. Pre-trigger image capture shall not apply to the images resulting from a trigger which restores normal operation after power save mode.
42. Memory for image storage shall be logically partitioned such that the oldest images shall be overwritten first.
43. No part of the memory shall be overwritten unless it is necessary to make provision for an impending image storage action.
44. When an alarm trigger occurs, the images shall be locked in memory. In addition all images in memory captured 1 hour prior to the alarm trigger shall be included in the memory lock.
45. A minimum of five locked memory partitions shall be provided before the camera system indication depicts the “all alarm memories locked” state.

Image Appearance

46. The minimum number of internal camera heads shall be that required to comply with Australian Standard AS4806.2 for facial identification of the driver and all passengers in the taxi.
47. The stored image from all internal heads shall record a minimum of 360 pixels per metre both horizontally and vertically for any seated passenger or driver.
48. The stored image from the external camera heads shall record a minimum of 360 pixels per metre both horizontally and vertically of a person standing 1m from the driver’s or front seat passenger’s window.
49. The camera system shall store images with a minimum of 256 greyscale levels.
50. The camera system shall capture and store monochrome images in memory. The use of colour image devices is permitted, subject to the camera providing an equivalent image resolution and quality to that of a

- monochrome camera in both normal daylight and night time infrared supported conditions.
51. Ancillary infrared illumination shall be provided both within the taxi and on the external camera head such that the required image resolution is maintained in low ambient light conditions.
52. Imaging techniques and focal attributes shall be optimised for use with infrared light.
53. The camera lenses shall have an auto iris or electronic iris facility such that image clarity is not adversely affected by light fluctuations.
54. The images shall maintain focus at any distance from the lens between 300 mm and 3 m for internal camera head(s) and 300 mm to 5m for the external camera heads.
55. All images shall have imprinted on them the following image metadata:
- Taxi Registration Number
 - Camera Serial Number
 - Date and time in UTC within 1 second
 - The event which triggered the image capture
 - The location in coordinates of latitude and longitude accurate to within 10m for 95% of the time.
56. The images stored shall be stored within the camera system on a non volatile media of robust construction.
57. Camera system image information shall be stored such that any generic business or home computer using generic picture viewing or editing software cannot extract, copy or display images stored by the camera or the files downloaded from the camera.
- e) Power system faults
- f) Any persistent internal system errors
- g) Lack of position fix for over 1 hour
59. Any camera fault shall be displayed by the red LED as prescribed in the camera system operational indicators section.
60. Any camera fault condition shall be able to be forwarded to the taxi operator by the following means:
- A normally open contact or open collector NPN transistor junction for interconnection to the MDT. The MDT shall automatically communicate the camera fault condition to the network; the network will in turn communicate the camera fault condition to the taxi operator.
- or**
- As a suitably worded SMS message sent to a prescribed number using a GSM or 3G mobile phone device. The prescribed number shall be that of the taxi operator or his representative.

VEHICLE TRACKING DEVICE AND DURESS ALARM SYSTEM

Introduction

This specification establishes the minimum requirements for a vehicle tracking device and duress alarm system to be fitted in a taxi for the purpose of alerting and providing a network with the position, speed, direction of travel and identification of a taxi anywhere in a licensed area of operation.

General Requirements

61. The vehicle tracking device system, **if required to be fitted** shall operate in conjunction with the duress alarm system, and may use the same GPS system used by the taxi security camera.
62. The taxi shall be fitted with a GPS to determine the position of the taxi and the GPS

Camera System Self Test and Alarms

58. The camera system shall employ a self test methodology to automatically detect and report functional faults in the following areas:
- Lack of image for any head
 - Persistent low image contrast
 - Lack of power drawn by infrared illumination circuits
 - Memory faults

- must be assisted with an odometer pulse connection.
63. Upon actuation of either alarm button by the driver, the vehicle position report must be sent to the taxi network by radio as the highest priority transmission. On receipt of a vehicle position report the tracking device shall identify the duress alarm as a priority over any other radio traffic calls and issue a persistent audible and visual alarm until acknowledged by an operator.
64. The vehicle position report update must be re-sent every 5 seconds or less, or until the taxi alarm is negated.
65. A listen in period shall allow audio from the taxi to be monitored by the network operator for a minimum period of 30 seconds. At the end of the 30 second period the vehicle position report shall resume being sent every 5 seconds.
66. The vehicle position report shall use current GPS positioning data each time it is sent.
67. The vehicle tracking device system must also be capable of sending a vehicle position report from any taxi irrespective of the taxi duress alarm status.
68. The information contained in the vehicle position report **for vehicles required to have vehicle tracking devices**, will be graphically displayed on a suitable map at the network control centre, including the display of the speed and heading.
69. A digital map screen at the network, **for vehicles required to have vehicle tracking devices**, must show the taxi on the map within a horizontal position accuracy of less than 10 metres, in 95% of instances.
70. The speed is to be provided in kilometres per hour and is to be accurate within 10 kilometres per hour, in 95% of instances.
71. The heading shall be expressed in degrees clockwise from true North and for a vehicle moving at greater than 5 km/h, the accuracy shall be within 10 degrees, in 95% of instances.

Definitions

The following terms used in this document have the meaning defined below:

Term	Definition
Brown-out	This is a term used for a power fluctuation in the taxi when the voltage cyclically ramps down and up to extreme levels, typically during engine cranking.
Camera Head	This is the imaging device which is mounted inside or outside the taxi, and is connected to the main camera system controller.
Camera System	This is a collective definition for camera heads, camera consoles and all the components, assemblies, cables and interfaces that make up a taxi security camera system.
EMC	Electromagnetic Conformance - standards associated with the emission of undesired radio frequency energy by devices and the level of susceptibility of a device to similar energy.
Debounce Time	This refers to the amount of time a button such as the alarm button must be pressed down and held down before the alarm is considered to be triggered.
GGA and RMC sentence reports	Commonly supported NMEA messages being GGA for GPS position, time and fix, and RMC for transit specific output.
GPS Receiver	Global Positioning System receiver. This specification used this term as a receiving device which reports position, speed, heading, and time in UTC.
HDD	This is the term used for a hard disk drive as used in a computer for file storage.
J-Peg	This is an image file compression format adopted by ISO 10918-1. Metadata may be included in the file header.
Kill Switch	This is a term used to describe a special power isolation switch fitted to the taxi so that equipment such as the MDT and camera can be turned off for maintenance purposes. This is also used to conserve battery power when the taxi is not in service. The switch also disables the engine's electrical system so that the vehicle may not be driven.
LED	Light emitting diode used for indication. In this specification any equivalent device of suitable colour can be used for this function.
LED Flash	A flash is defined as an illumination burst from a LED of not less than ¼ second and not more than ½ second duration.
Listen Period	Is the period of time that an open radio channel to the taxi network Control Centre is provided, for transmission of audible sounds from a covert microphone located in the cabin of a taxi, following the activation of the vehicle duress alarm
NMEA	Is a US based marine communications body, and a de-facto standard for GPS devices to communicate with other devices.
Memory	In this specification the term memory refers explicitly to the media used to store images within the camera system.
Memory Lock	Following alarm activation a portion of the memory containing images from the most recent trip are "locked" and as such these images cannot be overwritten by normal taxi

	operation.
Meta Data	In this specification, the meta data is an information header attached to each image, and contains vital information relevant to the image such as taxi ID, trigger tag, time and other details.
Monochrome	This term describes an image which contains pixel illumination information only. This represents black and white or varying shades of grey with no colour information.
Network	An organisation as defined in section 29A of the Passenger Transport Act 1990, but in the case of a taxi's licensed area of operation within which there is no authorised network, means the accredited operator of the taxi concerned.
Open Collector NPN Transistor Junction	This is a commonly used method used to indicate the means of interfacing logical signal or equipment state to be transmitted from one piece of equipment to another. This is an output device specification suitable for low voltage, low current switching applications.
Pixel	This is the smallest component of an image, generally represented by a small dot or square which has properties of illumination (brightness) and optionally colour.
Power save Mode	This is a particular state of the camera system which will result in significantly less power consumption by the camera by turning off various elements within the camera system, such as infrared illumination and camera heads. This has been specified to ensure that the vehicle battery capacity is preserved when the vehicle is idle for extended periods.
TIFF	This is an image file format owned by Adobe Systems. It can contain a variety of image content, including compressed or uncompressed image data. Metadata may be included in the file header.
Trigger	This is a term describing an "on-off" type of input to a camera sensor for the purposes of triggering an image capture. Typical trigger inputs are door open, meter and alarm press.
UTC	This is a definition of the time reference used by GPS receivers. This time relates almost precisely to Greenwich Mean Time. Cameras will store time in UTC, and a downloader will then be able to precisely nominate NSW standard or NSW daylight savings time at image capture.
Vehicle Position Report	This is a packet of data transmitted from the taxi-cab and received at the taxi network that must include the vehicles registration number, its position, speed, direction of travel, and the time it provides those reports.