



# Information Bulletin

PT 405/09.12

## Recommended specifications for Closed Circuit Television (CCTV) fitted in Queensland buses



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## 1 Introduction

- 1.1 This information bulletin sets out the recommended minimum requirements for CCTV (Closed Circuit Television) systems supplied and installed into buses in Queensland. These specifications should not be interpreted as a legal requirement. This document is provided as a guide to suppliers, installers and users of CCTV systems and aims to provide a minimum best practice approach.
- 1.2 Additional information relevant to the use of CCTV systems is contained in the following two information bulletins released by the Department of Transport and Main Roads: (1) "Recommended guidelines for the installation and use of CCTV in Queensland buses"; and (2) "A recommended code of practice for the use of CCTV by operators of passenger transport services and infrastructure".
- 1.3 The principal purpose of a bus CCTV system is to provide for and enhance the safety of bus drivers and passengers and to enhance security over a bus operator's vehicles and equipment.

## 2 Definitions

- 2.1 Alert Button - a device, independent of a duress alarm system which, when activated manually, causes the System to operate in alert mode.
- 2.2 Bus - the bus in which a System is installed.
- 2.3 Cable Marker - a commercially manufactured PVC cable marker having a unique label or number for the purpose of enabling the cable to be clearly identified.
- 2.4 Camera - any camera or cameras which form part of the System, and is to be construed in the plural if the System requires more than one camera to enable the System to comply with the requirements of this specification.
- 2.5 Camera Housing - an enclosure for a camera which is capable of providing for the physical and environmental protection of the camera, the camera lenses and any ancillary equipment.
- 2.6 Date/time stamp - an electronic record of the date and the time that a digital image was recorded which is overlain on or embedded in the digital image.
- 2.7 Digital image - a colour or monochromatic digitised image which is contained in or derived from an image recording.
- 2.8 Digital recorder - a device which is capable of making and storing digital recordings on a storage medium.
- 2.9 Digital recording - a recording which comprises one or more image recordings and any data elements that relate to those recordings.
- 2.10 Driver's cabin - the area of the interior of the bus which incorporates the driving seat up to a radial distance of one metre beyond the perimeter of the driving seat.

- 2.11 Image recording – any electronically stored information from which a recorded image is capable of being generated.
- 2.12 Image subject - any person whose image appears in or is otherwise the subject of a digital image.
- 2.13 Storage medium - a device that is capable of storing digital recordings on a permanent basis and from which digital recordings can later be retrieved.
- 2.14 System - a bus CCTV System that complies with these specifications.

### 3 System attributes

#### 3.1 *Capability*

- 3.1.1 The system is to be capable of making digital recordings of the driver's cabin and the entire interior of the bus.
- 3.1.2 The system is to incorporate an alert button for the purpose of enabling the bus driver to manually place the system into alert mode.
- 3.1.3 The system is to be interfaced with the bus's duress alarm system (if fitted), for the purpose of causing the CCTV system to operate in alarm mode.
- 3.1.4 When positioned in the bus driver's seat, a driver is to be able to:
  - a) determine whether the system is functioning; and
  - b) receive warnings from the system of any system malfunctions that may indicate the loss of any digital recordings.
- 3.1.5 Audio recording is permitted.
- 3.1.6 Where the system is fitted with image recording viewing monitors for bus passengers, the system must be capable of integrating with the vehicle-locating technology of a real-time passenger information system, if applicable.

#### 3.2 *System reliability*

- 3.2.1 The system is to be:
  - a) fully functional in all operational and environmental conditions that might be encountered in the operation of the bus; and
  - b) resistant to vibration (1G to 500 Hz) and have a Mean Time Between Failure rating of not less than 30,000.
- 3.2.2 The cameras, the digital recorder and the system components are to be capable of withstanding:
  - a) impacts of at least 60J; and
  - b) ambient temperatures from  $-15^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$  for a minimum period of 12 hours and be fully operational thereafter.
- 3.2.3 The system is to be capable of retaining such image recordings as may already be stored on the storage medium for not less than seven days after the power source has been removed. The digital recorder is to be housed in a vandal-resistant, key-lockable recorder enclosure and kept in a secure and protected location within the bus.
- 3.2.4 The recorder enclosure is to be capable of:
  - a) preventing the removal of the storage medium from the system otherwise than by means of the correct key;
  - b) providing for all necessary shock absorption, ventilation and dust filtering to ensure the reliable operation of the digital recorder; and
  - c) preventing the accidental or intentional admittance or introduction of any foreign matter into the digital recorder while it is sealed.

- 3.2.5 The digital recorder is to be configured such that it does not require the changing of the storage medium during any operational journey. The recorder enclosure or the storage medium are to be capable of protecting any digital recording against such events as may be reasonably anticipated that have the potential to damage or cause the loss of the digital recording.
- 3.2.6 Without limiting clause 29, the following events may be reasonably anticipated:
- a) the submersion of the recorder enclosure or the storage medium in water to a depth of up to six metres;
  - b) fire on board the bus; and
  - c) a heavy impact on the storage medium such as in the case of a typical motor vehicle accident or by an object such as a suitcase.

### 3.3 **System elements**

- 3.3.1 As a minimum, the system is to include the following system elements:
- a) a sufficient number of cameras to enable the system to be capable of meeting the requirements of this specification;
  - b) a suitable camera housing for each camera;
  - c) a digital recorder; and
  - d) such components as are necessary for the effective functioning of the system.
- 3.3.2 Each of the following is a system component:
- a) all camera lenses, the storage medium, indicator lights and sounders, control equipment, interfaces, portable monitors, housings, enclosures, and power supplies;
  - b) all cabling, cable support, tamper resistant fixings, hardware, conduits, and interconnection between devices and equipment;
  - c) such extensions as are necessary to existing cabling and interconnection between the CCTV system and other systems installed on the bus; and
  - d) such electrical wiring as is necessary to provide power to the equipment.
- 3.3.3 The cameras and the digital recorder are not to be capable of being adjusted or removed otherwise than by means of specialised tools.
- 3.3.4 The system is not to be capable of:
- a) obstructing access to any existing equipment in any part of the bus;
  - b) restricting or obstructing any seating, standing and access spaces, including those comprising the driver's cabin; or
  - c) interfering with the bus driver's vision or view of mirrors, or the otherwise normal operation of the bus.
- 3.3.5 The system is to be capable of being easily tested by a suitably trained person to ensure that:
- a) the field of view of each camera is correctly adjusted;
  - b) all scenes are in focus;
  - c) all features are operating; and
  - d) digital recordings are made in accordance with this specification.

- 3.3.6 The system is to be installed and configured in such a manner, or utilising such ancillary devices as may be necessary, to ensure that:
- a) it is protected against reverse polarity, short circuit and high voltage transients likely to be encountered in the bus's systems or equipment (including electrical systems, ticketing equipment, etc); and
  - b) any other systems or equipment which are installed or are likely to be operated on the bus:
    - i. do not cause any interference to the operation of the CCTV system or to any system element, and
    - ii. are not subjected to any interference by the operation of the system or by any system element.
- 3.3.7 The system is to be of a modular design such that any critical system element may be quickly and easily removed for repair and to enable a service-component to be installed so as to restore system functionality.
- 3.3.8 The camera system shall be supplied with adhesive backed, weather proof and ultra-violet resistant sets of signs that shall be affixed to all entry points of the bus and conspicuously placed in the interior of the bus so that all occupants are made aware they are under CCTV and, if applicable, audio surveillance.

## 3.4 **Performance**

### 3.4.1 **Digital recorder**

- The storage medium is to be capable of storing:
  - a) not less than 24 hours of continuous image recordings from each camera separately at 25 images per second; and
  - b) not less than 24 hours of synchronised digital recordings.
- The digital recorder is to be capable of:
  - a) making image recordings from each camera at separately programmable rates of up to:
    - i. 6 frames per second in normal mode, and
    - ii. 25 frames per second in alarm mode or in alert mode.
  - b) automatically overwriting digital recordings made during normal mode operation once the storage medium has reached its recording capacity; and
  - c) automatically recording or encrypting the data elements on any image recording made by the system.
- For the purpose of subclause 40(c), the data elements are:
  - a) the date/time stamp; and
  - b) the registration number of the bus.

### 3.4.2 **Digital recordings**

- The system is to be capable of enabling the extraction and downloading of digital recordings to a Windows-based computer or a Macintosh computer with associated proprietary software and/or hardware either from on board the bus or by means of an exchangeable storage medium.
- Access to proprietary software used to download images shall be restricted to prevent the unauthorised recovery of images.
- Where applicable, the digital recorder is to synchronise each audio recording made with the image recording to which it relates.

- Any digital recording extracted from the system is to retain sufficient integrity checking facilities to enable it to be determined whether the digital recording has been in any way interfered with or otherwise manipulated to alter or attempt to alter any digital image, audio recording or data element contained in the digital recording.
- Any digital recording is to be capable of being saved in a format that facilitates playback on any Windows-based computer or any Macintosh computer without the need for specialist software to be installed on the computer.
- Any image recording is to be capable of being:
  - a) downloaded in full or in part in AVI or MPEG format, at the highest available recorded resolution;
  - b) synchronised, independent of the frame or image rate, with any audio recordings that relate directly to the image recording; and
  - c) saved as a digital image in the form of a windows bitmap file at the highest available recorded resolution.

## 4 System configuration

### 4.1 *Fitting and installation*

- 4.1.1 The system shall be fully operational, that is be capable of capturing and storing images, with an input voltage of between 9 and 18 volts DC (12V system) and 18 and 28 volts (24V system).
- 4.1.2 The system is to be protected against short circuits in the power supply and other input cables so as to ensure that any accidental or intentional destruction of wiring does not cause:
  - a) any damage to the system or the storage medium;
  - b) the loss of any digital recording that is already stored on the storage medium; or
  - c) any interference to any of the other systems or equipment on the bus.
- 4.1.3 The system is to incorporate a double pole key switch for the purpose of enabling the power supply to the system to be readily disconnected during bus maintenance and welding operations, without the risk of accidental disconnection during the normal operation of the bus.
- 4.1.4 The positioning of the double pole key switch is to be such that its status (being “power on” or “power off”) can be seen readily and clearly by the driver of the bus.
- 4.1.5 All system elements are to:
  - a) have readily accessible fuses or other approved circuit interruption devices to protect cabling from fault currents; and
  - b) comply with, and be installed in a professional manner in accordance with, the relevant Australian Standards and manufacturers’ instructions.
- 4.1.6 The wiring that connects the system elements is to be in accordance with the recommendations of the manufacturer of the system and such Australian Standards as may apply.
- 4.1.7 The wiring that connects the system elements is not to incorporate any joints unless the wiring could not reasonably be configured without the incorporation of such joints.
- 4.1.8 The incorporation of joints in the wiring is subject to the following restrictions:
  - a) joints are to be made such that the integrity of the cabling is maintained, including insulation resistance and shielding;
  - b) soldered joints are to be encased in a heat-shrink covering to maintain the integrity of the insulation;
  - c) a joint is not to be made in any location unless the joint can be accessed readily for servicing;

- d) cable terminations at system devices are to be made by means of connectors that are endorsed by the manufacturer of the system as being suitable for the type of cable being used; and
  - e) for the purpose of paragraph (d) above, a connector is not to be a crimp connector.
- 4.1.9 Each cable is to bear a cable marker at both ends of the cable and at every junction point in the cable.
- 4.1.10 Any schematic drawing or input / output list prepared for the purpose of this specification is to clearly show the location of each cable marker.
- 4.1.11 The installation of the camera system and accessories (that is infra-red units on “B” pillars) shall not affect the continued compliance of the bus with all other relevant legislative requirements (for example, the *Transport Operations (Passenger Transport) Act 1994*, *Transport Operations (Passenger Transport) Regulation 2005*, *Transport Operations (Passenger Transport) Standard 2010*, *Transport Operations (Road Use Management – Vehicle Standards and Safety) Regulation 1999* and the Australian Design Rules.

## **4.2 Indicator light**

- 4.2.1 The system is to incorporate an indicator light for the purpose of indicating to the bus driver whether the system is operational and whether there is any malfunction.
- 4.2.2 The indicator light is to incorporate the following minimum features:
- a) normal display state – green;
  - b) system fault – oscillating red LED flashing until fault cleared.
- 4.2.3 The indicator light is not to be capable of being readily identifiable by any passenger as being part of the system.

## **4.3 Cameras**

### **4.3.1 Camera functionality**

- Each camera is to be capable of making clear image recordings of not less than 1 CIF (352 x 288 pixels) up to the target distance.
- In this part:
  - a) Clear, in relation to an image recording, means that any constituent digital image is of sufficient clarity to enable the recognition and identification of image subjects within the maximum usable distance and the target distance, as the case may be;
  - b) maximum usable distance means the maximum distance from the camera lens to a point at which the size of the face of an image subject comprises not less than 7.5 per cent of the area of the digital image; and
  - c) target distance means the distance from the camera lens to a point at which the size of the face of an image subject comprises not less than 11 per cent of the area of the digital image.



- Each camera is to have a fixed field of view lens with sufficient focal length selected and adjusted to enable the system to be capable of making image recordings, up to the maximum usable distance, of the driver's cabin and the interior area of the bus.
- Each camera lens is to:
  - a) have an auto iris or electronic iris facility such that the clarity of digital images is not diminished by light fluctuations; and
  - b) be interchangeable so as to facilitate such changes in the required area of coverage as may be required from time to time.
- A camera lens may be a varifocal lens provided that the focal length and focus adjustments are capable of being effectively locked in positions such that there is no risk of them being changed by vibrations.
- The configuration of each camera is to be such that the camera makes clear image recordings of any image subject standing or sitting in a position at the target distance, but in any case not further than the maximum usable distance.
- The system is to incorporate an infrared illumination capability which, from various positions in the bus, enables the required scene illuminance to be maintained during all operational conditions (darkness to bright sunlight).
- Each camera is to incorporate such appropriate filters as are necessary for the purpose of preventing the degradation of any image recording which might otherwise be caused by the use of infrared illumination.
- The system is to incorporate a day/night switching mechanism that automatically switches the operation of the system to monochromatic image during any low light period.
- A low light period means any time that:
  - a) the illuminance level falls below 1 lux; or
  - b) infrared illumination is in use.
- Each camera is to be enclosed in an appropriate camera housing and mounted at a location and height so as to:
  - a) have an auto iris or electronic iris facility such that the clarity of digital images is not diminished by light fluctuations; and
  - b) be interchangeable so as to facilitate such changes in the required area of coverage as may be required from time to time.
- The fields of view, focus and functionality of each camera are to be determinable by means of the temporary connection of a portable monitor to enable the carrying out of any service or maintenance or the verification of any function.
- For the purpose of clause 73, any connection device for a portable monitor is to be placed in an easily accessible location.
- Each camera and its camera housing are not to be capable of being adversely affected by condensation resulting from changes in temperature or humidity.
- The field of view of any camera is not to be capable of being affected by the position of a sun-visor or any other equipment within the bus.

## 5 System operation

### 5.1 System mode

- 5.1.1 For the purpose of this specification:
- a) normal mode means the operation of the system under normal operational circumstances in accordance with the requirements of this specification, but does not include the operation of the system in either the alert mode or alarm mode;
  - b) alert mode means the operation of the system in accordance with section 5.2 and alarm mode means the operation of the system in accordance with section 5.3.

### 5.2 Digital recorder

- 5.2.1 The digital recorder is to be capable of being programmed by means of proprietary software to enable its settings to be adjusted so as to easily accommodate changes to the requirements set out in this specification for the making, storage and retrieval of digital recordings.
- 5.2.2 The system is to operate in normal mode whenever the bus's ignition is activated, and for at least thirty minutes after the ignition has been deactivated except in the circumstances specified in clauses sections 5.2 and 5.3.
- 5.2.3 The activation of the alert button is to cause the system to operate in alert mode.
- 5.2.4 The activation of the duress alarm is to cause the system to operate in alarm mode and to continue to operate in alarm mode until the duress alarm is deactivated, after which the system is to automatically recommence operating in normal mode.

### 5.3 Alert mode

- 5.3.1 The requirements set out in this clause for alert mode operation are additional to the requirements for normal mode operation and, during any time that the system operates in alert mode, prevail to the extent of any inconsistency with the requirements for normal mode operation.
- 5.3.2 The digital recorder is to make digital recordings for a period of not less than 5 minutes, after which the system is to automatically recommence operating in normal mode.
- 5.3.3 Any image recording is to be made:
- a) in colour, except during a low light period; and
  - b) at a frame rate of not less than 25 frames per second.
- 5.3.4 The digital recorder is to store on the storage medium all image recordings made during the time that the system operates in alert mode.
- 5.3.5 The system is to be configured so as to prevent any image recording made in alert mode from being overwritten or deleted from the storage medium other than in accordance with this specification.

## **5.4 Alarm mode**

- 5.4.1 The requirements set out in this clause for alarm mode operation are additional to the requirements for normal mode operation and alert mode operation and, during any time that the system operates in alarm mode, prevail to the extent of any inconsistency with the requirements for normal mode or alert mode operation.
- 5.4.2 The digital recorder is to make digital recordings.
- 5.4.3 Any image recording is to be made:
  - a) in colour, except during a low light period; and
  - b) at a frame rate of not less than 25 frames per second.
- 5.4.4 The digital recorder is to store on the storage medium all digital recordings made during the following periods:
  - a) the 10 minutes immediately preceding the activation of the duress alarm; and
  - b) the entire time that the system operates in alarm mode.
- 5.4.5 The system is to be configured so as to prevent any digital recording made in alarm mode from being overwritten or deleted from the storage medium other than in accordance with this specification.