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## Mobile License Plate Reader System Standard for Law Enforcement

NIJ Standard-100x.00

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NCJ xxxxxx

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### Special Technical Committee

This standard was developed by a Special Technical Committee of practitioners, technical experts, and others with experience in standards development and conformity assessment. Committee members, their organizations, and their professional affiliations are listed in Table 1 and Table 2.

**Table 1. Practitioners**

Type	Name	Organization	Professional Affiliation

**Table 2. Technical Experts and Others**

Type	Name	Organization	Expertise
Federal			
Federal			
Federal			
Federal			

Federal			
Federal			
Federal			
Private			
Private			
Private			
Private			
Private			

### **Advisory Working Group**

The work of the Special Technical Committee was reviewed by an Advisory Working Group (AWG) made up of senior-level representatives from stakeholder organizations and individuals with experience in standards development and conformity assessment. Organizations represented on the AWG are listed in Table 3 below.

**Table 3. AWG Members**

<b>Organization</b>
Federal Bureau of Investigation (FBI)
FBI/NIJ Scientific Working Group on Imaging Technology
Fraternal Order of Police
International Association of Chiefs of Police
Law Enforcement and Emergency Services Video Association
National Institute of Standards and Technology/Law Enforcement Standards Office
National Sheriffs' Association
U.S. Customs and Border Protection

### Steering Committee

The Steering Committee generally directed the effort and helped to ensure coordination among relevant federal programs. The following were the members of the Steering Committee (shown in Table 4 with their respective organizations during the development of this document).

**Table 4. Steering Committee Members**

Member	Organization	Title
Kristina Rose, Chair	U.S. Department of Justice, Office of Justice Programs, National Institute of Justice	Deputy Director
Pamela Cammarata	U.S. Department of Justice, Office of Justice Programs, Bureau of Justice Assistance	Associate Deputy Director
Marc Caplan	U.S. Department of Homeland Security, Science and Technology Directorate, Support to the Homeland Security Enterprise and First Responders Group	Chief of Innovative Technology Programs
Phillip Mattson	U.S. Department of Homeland Security, Science and Technology Directorate, Office of Standards	Acting Director
Bernard Melekian	U.S. Department of Justice, Office of Community Oriented Policing Services	Director
Gary Rogers	U.S. Department of Homeland Security, Federal Emergency Management Agency	Senior Policy Advisor
Mark Stolorow	U.S. Department of Commerce, National Institute of Standards and Technology, Law Enforcement Standards Office	Director

## FOREWORD

This document is a voluntary performance standard for vehicle-mounted license plate reader (LPR) systems for use by law enforcement agencies. It defines both performance requirements and the methods used to test performance. A supplier or other entity may claim that a particular LPR system model satisfies this National Institute of Justice (NIJ) standard by meeting the requirements of *Law Enforcement Mobile License Plate Reader System Supplier's Declaration of Conformity Requirements*, NIJ CR-100x.00. Both this standard and the associated Supplier's Declaration of Conformity requirements document are produced as a part of the Standards and Testing Program of the U.S. Department of Justice, Office of Justice Programs, NIJ, as is a third associated document, *Law Enforcement Mobile License Plate Reader System Selection and Application Guide*, NIJ Guide-100x.00.

All requirements stated in this standard, including those that explicitly employ mandatory language (e.g., "shall") are those necessary to satisfy the standard. Nothing in this document is intended to require or imply that commercially available license plate reader systems for use by law enforcement agencies must satisfy this standard.

This document is a performance and testing standard and, therefore, provides precise and detailed test methods. Requirements for supplier's declaration of conformity are provided in a separate document, *Law Enforcement Mobile License Plate Reader System Supplier's Declaration of Conformity Requirements*, NIJ CR-100x.00. Those seeking guidance concerning the selection and application of LPR systems for law enforcement should refer to the most recent version of the *Law Enforcement Mobile License Plate Reader System Selection and Application Guide*, NIJ Guide-100x.00, which explains the standard in nontechnical language and provides guidance into selecting, procuring, using, and maintaining LPR systems.

Although agencies are advised always to require their procurements to meet or exceed the most recent and up-to-date version of this standard, this does not necessarily mean that an agency should remove license plate reader systems that they currently have in use from service, as an LPR that does not meet current standards may well be better than no LPR at all.

NIJ standards are subject to continued research, development and testing, and review and modification as appropriate on an ongoing basis. Users of this standard are advised to consult the NIJ Standards and Testing Program webpage, accessed from [www.nij.gov/standards](http://www.nij.gov/standards), on a regular basis to determine whether the documents have been revised or superseded.

Technical comments and recommended revisions are welcome. Please send all written comments and suggestions to: Director, National Institute of Justice, Office of Justice Programs, U.S. Department of Justice, 810 Seventh St., N.W., Washington, DC, 20531, ATTN: NIJ Standards and Testing Program.

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Nothing in this document is intended to create any legal or procedural rights enforceable against the United States. Moreover, nothing in this document creates any obligation for manufacturers, suppliers, criminal justice agencies, or others to follow or adopt this voluntary equipment standard.

## **CONTENTS**

To be added



## ACRONYMS

DHS	U.S. Department of Homeland Security
DME	Digital Multimedia Evidence
DOJ	U.S. Department of Justice
DVR	Digital Video Recorder
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FCC	Federal Communications Commission
FIPS	Federal Information Processing Standard
FOV	Field of View
FPS	Frames Per Second
GOP	Group of pictures
IACP	International Association of Chiefs of Police
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IP	Internet protocol
LPR	License Plate Reader
ISO	International Standards Organization
LCPM	linear pulse-code modulation
MPEG	Moving Picture Experts Group
MXF	Material Exchange Format
NIEM	National Information Exchange Model
NIJ	National Institute of Justice, U.S. Department of Justice
NIST	National Institute of Standards and Technology, U.S. Department of Commerce
NTSC	National Television System Committee
RGB	Red green blue
SAE	Society of Automotive Engineers
SI	System Internationale
SWGIT	Scientific Working Group on Imaging Technologies
UL	Underwriters Laboratories Inc.
U.S.	United States
USB	Universal Serial Bus
WAV	Waveform Audio File
XML	Extensible Markup Language

## SYMBOLS AND ABBREVIATIONS

A	ampere		in	inch		rf	radio frequency
cd	candela		IR	infrared		RH	relative humidity
cm	centimeter		kHZ	kilo Hertz		V	volt
dB	decibel		lm	lumen		VAC	volts, alternating current
°C	degree Celsius		lux	lumens per meter <sup>2</sup>		W	watt
°F	degree Fahrenheit		m	meter			
ft	foot		min.	minute			
ft/s	foot per second		mm	millimeter			
<b>g</b>	acceleration		mph	miles per hour			
g	gram		m/s	meter per second			
Hz	Hertz		ms	millisecond			

## **1. SCOPE, PURPOSE AND APPLICATION**

### **1.1 Scope**

- 1.1.1 This document is a voluntary standard. All requirements stated in this standard, including those that explicitly employ mandatory language (e.g., “shall”) are those necessary to satisfy the standard. Nothing in this document is intended to require or imply that a commercially available mobile License Plate Reader (LPR) system for use by law enforcement agencies must satisfy this standard. A supplier or other entity may claim that a particular LPR system model satisfies this National Institute of Justice (NIJ) standard by meeting the requirements of *Law Enforcement Mobile License Plate Reader System Supplier’s Declaration of Conformity Requirements*, NIJ CR-100x.00.
- 1.1.2 This standard specifies the minimum requirements for form and fit, performance, testing, documentation, and labeling of vehicle-mounted LPR models used by law enforcement officers for detecting, capturing, and interpreting images of license plates utilizing optical character recognition (OCR) and comparing data with an alert list.
- 1.1.3 The form and fit requirements and performance requirements of this standard shall be met for a complete LPR. Accessories are not required to meet the form and fit requirements and performance requirements of this standard.
- 1.1.4 This standard shall not be understood as addressing all safety concerns associated with the use of LPRs. Users of this standard should be aware of all safety issues associated with their use. User information related to these issues is provided in the *Law Enforcement Mobile License Plate Reader System License Plate Reader Selection and Application Guide*, NIJ Guide-100x.00.
- 1.1.5 This standard shall not be understood as addressing the safety concerns (if any) associated with its use by testing facilities.
- 1.1.6 No supplier, manufacturer, or other entity shall claim compliance with only selected portions of this standard. The LPR model shall meet all applicable stated requirements.
- 1.1.7 Nothing herein shall be understood to restrict any supplier from exceeding the requirements of this standard.
- 1.1.8 As appropriate (e.g., for models that employ materials or forms of construction not anticipated when this standard was developed or are not addressed by this standard), NIJ may modify the test methods of the standard or establish new ones.

### **1.2 Purpose**

- 1.2.1 The purpose of this NIJ standard is to specify minimum requirements for vehicle-mounted LPRs used by law enforcement agencies to detect, capture, and interpret images of license plates utilizing optical character recognition (OCR) and compare data with an alert list.
- 1.2.2 The standard identifies test methods for verifying the minimum performance requirements are met.
- 1.2.3 The purpose of the test methods in this standard is to assess performance, and the test methods shall not be understood to specify performance levels for all situations in which systems may be used.

1.3 **Application**

- 1.3.1 This standard applies to vehicle-mounted LPR systems, in this document referred to as Mobile LPR.
- 1.3.2 This standard does not apply to portable or fixed LPR systems.
- 1.3.3 This standard does not address performance classifications or levels of systems

## **2. References**

### **2.1 Associated Publications**

The following document is a companion publication to NIJ Standard-100x.00 and NIJ CR-100x.00.

NIJ Guide-100x.00. *Law Enforcement Mobile License Plate Reader System Selection and Application Guide*. Washington, DC: U.S. Department of Justice, National Institute of Justice.

### **2.2 Referenced Publications**

The following references form a basis for and provide support for the requirements and procedures described in this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies, including any amendments.

2.2.1 International Electrotechnical Commission International Electrotechnical Commission IEC 62368-1: 2014 (Edition 2.0), *Audio/video, information and communication technology equipment - Part 1: Safety requirements*.

2.2.2 National Institute of Justice

NIJ CR-100x.00. *Law Enforcement Mobile License Plate Reader System Supplier's Declaration of Conformity Requirements*. Washington, DC: U.S. Department of Justice, National Institute of Justice.

2.2.3 National Institute of Standards and Technology

Federal Information Processing Standards Publication (FIPS PUB) 140-3. *Security Requirements for Cryptographic Modules*, U.S. Department of Commerce, National Institute of Standards and Technology.

FIPS PUB 180-4. *Secure Hash Standard*, U.S. Department of Commerce, National Institute of Standards and Technology.

FIPS PUB 197. *Advanced Encryption Standard*, U.S. Department of Commerce, National Institute of Standards and Technology.

FIPS PUB 46-3. *Data Encryption Standard*, U.S. Department of Commerce, National Institute of Standards and Technology.

### 3. DEFINITIONS

#### 3.1 General

The definitions contained in this chapter shall apply to these terms as used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings, unless the context unmistakably indicates otherwise.

#### 3.2 Definitions

- 3.2.1 **Accessories:** Any supplier-recommended or aftermarket items (including software) that can be attached to or interfaced with the system.
- 3.2.2 **Administrating Agency:** The agency responsible for administering the LPR project and holds contract and ownership of the data center contract where LPR data resides.
- 3.2.3 **Administrator level:** An unrestricted level of system access and privileges, including, but not limited to, assigning authorized user access levels, user-defined fields, and DME export and distribution.
- 3.2.4 **Alert List:** A file containing a listing of plates that are associated with known or suspected criminal activity. Alert list is sometimes referred to a “hot list.”
- 3.2.5 **Authorized user level:** A limited level of system access as defined by the administrator. There may be more than one such level.
- 3.2.6 **Backend or Back Office:** An application used to manage, access, and query LPR data. Also includes the dispatch application used to display plate alerts and reads from fixed LPRs.
- 3.2.7 **Begin Shift:** A process required at the beginning of each users shift where new alert lists, user information, and updates are downloaded. Depending on the agency configuration this transmission is done via broadband connection or flash drive.
- 3.2.8 **Camera:** The image acquisition device comprised of at least an image sensor and a lens.
- 3.2.9 **Capture:** The process of acquiring and recording the DME from a natural event.
- 3.2.10 **Codec:** A device/program capable of encoding and/or decoding digital data. Codecs encode a stream or signal for transmission, storage or encryption, and decode it for viewing and listening.
- 3.2.11 **Compliant:** The condition of an LPR model meeting or exceeding all applicable requirements of this standard, as determined pursuant and subject to the LPR standard.
- 3.2.12 **Component:** Any material, part, or subassembly used in construction of an LPR.
- 3.2.13 **Compression:** The reduction of data used to represent DME.
- 3.2.14 **Data file:** A set of binary information representing DME.
- 3.2.15 **Date/time stamping:** A software feature that automatically inserts the date and time into the data file.
- 3.2.16 **Default settings:** Controls and settings established by the supplier prior to delivery of an LPR (i.e., factory settings).

- 3.2.17 **Digital image:** A picture represented by discrete numerical values organized in a two-dimensional array or video stream.
- 3.2.18 **Digital multimedia evidence (DME):** Data representing images, audio essence, video essence, metadata and any other information attached to a digital file.
- 3.2.19 **DME audit log:** A National Information Exchange Model (NIEM)-compliant list of all import/export activities, including dates and times, type, affected files, and hash functions of affected files.
- 3.2.20 **DME recorder:** May be either a digital video recorder or a network recorder.
- 3.2.21 **Digital recording:** The storage of a stream of information as discrete bits.
- 3.2.22 **Digital sample:** A value or set of values at a point in time and/or space.
- 3.2.23 **Display:** Synonymous with *monitor*.
- 3.2.24 **Download:** The process of receiving data from another digital source.
- 3.2.25 **Duplicate:** An exact reproduction of the original data validated through a hash function.
- 3.2.26 **End Shift:** A process required at the end of each users shift where all collected LPR data are uploaded into the LPR database. Depending on the agency configuration this transmission is done via broadband connection or flash drive.
- 3.2.27 **Export:** To copy, duplicate, or move information from within a device or system to a physical or logical location outside that device or system.
- 3.2.28 **Field of view (FOV):** The horizontal angular extent of a scene imaged by the video camera. FOV depends on the focal length of the camera lens and the size of the camera's imager chip.
- 3.2.29 **First instance recording:** Image information and metadata recorded directly from the sensors.
- 3.2.30 **Format:** The specific structure for the data in a file.
- 3.2.31 **Hash function:** A mathematical formula that generates a unique number based on the data in a file and is used to verify the data's integrity.
- 3.2.32 **Hard shutdown:** Interruption of all power to the system by a mechanically-operated manual switch as opposed to soft shutdown (See Section 3.2.64, *Soft Shutdown*).
- 3.2.33 **Image**<sup>1</sup>: A bit stream duplicate of the original data. An imitation or representation of a person or thing, drawn, painted, photographed, etc. (Taken from SWGDE, SWGIT)
- 3.2.34 **Image capture:** Upon triggering, the acquisition of a plate image, a contextual image, and associated metadata; image capture occurs at the camera.
- 3.2.35 **Indication:** A signal to the user providing awareness of system status, errors, or problems.

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<sup>1</sup> Refer to <https://www.swgit.org/pdf/SWGDE%20and%20SWGIT%20Digital%20and%20Multimedia%20Evidence%20Glossary?docID=60>.

- 3.2.36 **Indicator:** A visible or audible device on the system used to provide awareness to the user of a state change, status, or condition (e.g., recording).
- 3.2.37 **Industry standard file format:** Format that is viewable and playable without the need for proprietary codecs, players, or viewers available only from the supplier.
- 3.2.38 **Integrity:** (1) The reliability and accuracy of DME throughout its lifecycle. (2) The degree to which a system or component prevents degradation of, unauthorized access to, or modification of DME.
- 3.2.39 **Interoperable:** Able to be shared among criminal justice agencies in an industry standard file format.
- 3.2.40 **Interoperability:** The ability to be shared among criminal justice agencies in an industry standard file format.
- 3.2.41 **License Plate Reader (LPR):** A set of equipment used to detect, capture, and interpret license plate images utilizing OCR and to compare data with an alert list. (See Section 3.2.47, *Mobile License Plate Reader*) The equipment may include the following:
1. One or more LPR camera units
  2. Processor for converting the images to text
  3. Optical Character Recognition (OCR) engine
  4. GPS receiver
  5. Brackets or mounting hardware
  6. Connection cables
- 3.2.42 **LPR Camera Unit:** Consisting of a housing which includes a color contextual camera and lens to capture the surrounding view and may include an infrared (IR) camera and lens to capture retro reflective license plate images and infrared illuminators.
- 3.2.43 **LPR Database:** A collection of LPR data. Also stores data sets for the administration of the various users and LPR systems.
- 3.2.44 **LPR Software:** Application in the vehicle that displays plate alerts and reads to users. Also may connect to the LPR database to retrieve information and transmit LPR data in a broadband environment.
- 3.2.45 **Manufacturer:** A commercial enterprise engaged in fabricating a product.
- 3.2.46 **Metadata:** Data embedded within or associated with a file that describes information about, or related to, the file or its directory. This may include, but is not limited to, locations where the content is stored, dates, times, application-specific information, and permissions.<sup>A</sup> It is data about data.
- 3.2.47 **Mobile License Plate Reader:** Intended for use in a moving motor vehicle (i.e., camera is moving) and typically mounted semi-permanently to a marked patrol vehicle. A mobile LPR typically includes one to four cameras and the configuration is set at the discretion of the contributing agency based on driving patterns and street configurations.

- 3.2.48 **Model:** The supplier's design, with unique specifications and characteristics, of a particular item.
- 3.2.49 **Monitor:** Device for viewing live and recorded video or still images.
- 3.2.50 **National information exchange model (NIEM)<sup>2</sup>:** A federal, state, local and tribal interagency initiative providing a foundation for seamless information exchange; an Extensible Markup Language (XML)-based information exchange framework and reference model designed as a core set of building blocks used as a consistent baseline for creating exchange documents and transactions across government.
- 3.2.51 **Pixel:** A picture element.
- 3.2.52 **Product:** One unit of a particular model.
- 3.2.53 **Product label:** A marking(s) affixed by a supplier to each unit of a compliant model or to its packaging that contains required model information and the statement of conformity.
- 3.2.54 **Proprietary:** A characteristic of a technique, technology, or device owned and controlled by a company or other party and thereby only usable or adaptable as allowed by that party.
- 3.2.55 **Read (noun):** Alphanumeric data from the OCR representing the conversion of the plate image to text, not including metadata.
- 3.2.56 **Record (noun):** Data including the read and metadata (e.g., time, date, location); record is not synonymous with read.
- 3.2.57 **Record (verb):** Process of writing DME to recording media.
- 3.2.58 **Recording Media:** Any object to which DME is written and from which DME can be retrieved.
- Nonremovable Recording Media: Any data storage housed within a device that cannot be removed from said device without its disassembly.
  - Removable Recording Media: Any portable data storage device designed for removal from a system without disassembly of the system or the storage device.
- 3.2.59 **Reliability:** The extent to which a process can repeatedly produce the same effective output, with a central tendency and an acceptable dispersion, for consistent input settings. Information from such a system is said to be *reliable*.
- 3.2.60 **Resolution:** Measure of the output quality of an image; capability of distinguishing between two adjacent elements of an image such as lines (referred to as *spatial resolution*) or pixels (referred to as *pixel resolution*).
- 3.2.61 **Sample:** A complete unit to be tested (following conditioning as specified in this standard). A sample is representative of a model.
- 3.2.62 **Shall:** Indicates a mandatory requirement for the purposes of this voluntary standard.

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<sup>2</sup> Refer to <http://www.NIEM.gov>.



- 3.2.63 **Should:** Indicates a recommendation that is advised, but not required, for the purposes of this voluntary standard
- 3.2.64 **Soft Shutdown:** Process of removing power from the system in a controlled manner that allows necessary system tasks to be performed.
- 3.2.65 **Supplier:** The party that is responsible for ensuring that products meet and, if applicable, continue to meet, the requirements on which the supplier's declaration is based.
- 3.2.66 **System audit log:** A list used to track system events, such as boot up, diagnostic failures, and/or status changes.
- 3.2.67 **System-level components:** Camera unit(s) (containing contextual camera and infrared camera), processor, user interface, storage, power system, and housing/mounting hardware that make up the LPR. Refer to Appendix A.
- 3.2.68 **Time/date stamping:** Synonymous with *date/time stamping*.
- 3.2.69 **Trigger:** A user-definable setting of the LPR that initiates image capture.
- 3.2.70 **Unique image:** Change occurs from one picture to the next.
- 3.2.71 **Verification:** The process of confirming the accuracy of any duplicate of the DME compared to the original DME. This process normally includes the application of a type of hash function.
- 3.2.72 **Virtual Private Network (VPN):** Used to create a secure connection between agencies and the LPR database.

## **4. FORM AND FIT REQUIREMENTS**

### **4.1 General LPR Model Requirements**

- 4.1.1 LPR models shall meet or exceed the applicable requirements specified in this section.
- 4.1.2 The supplier shall declare the components of an LPR model and its operating configuration in terms of number of cameras.
- 4.1.3 For power draw, the supplier shall declare power draw for an LPR model in available operating configurations (e.g., 1-camera, 2-camera, 3-camera, 4-camera).
- 4.1.4 The system shall have the capability of recording all DME in digital file format to recording media and electronically exporting all DME. For any digital file format that is proprietary, the supplier shall provide in the software the capability for an authorized user to redact a copy of the original DME.
- 4.1.5 For systems incorporating encrypted line wired and wireless security, evidence of a certificate of compliance for the validation of encryption algorithms (e.g., FIPS 197 or 46-3) or validation of security requirements for cryptographic modules (e.g., FIPS 140-3) shall be provided.
- 4.1.6 The supplier shall document how the LPR either maintains synchronization to or is synchronized periodically with a known external reference (e.g., U.S. Standard of Time).
- 4.1.7 The system shall be capable of allowing a user, at the administrator level and/or the authorized user level, to input specific information required for the DME Audit Log and System Audit Log.

### **4.2 Mobile LPR Model Requirements**

- 4.2.1 Mobile LPR models shall consist of one or more imaging cameras, capable of producing a plate image for OCR processing and a contextual image, the processor (i.e., software, read/capture algorithm, optical character recognition (OCR), metadata input, and comparison to database), user interface, system storage, the power system, and the housing and mounting hardware. Any other components, including the alert list, the global positioning system (GPS), the time source, and the power source, are considered to be external to the mobile LPR.
- 4.2.2 The supplier shall specify whether the mobile LPR model's processing is self-contained (stand-alone), is performed by other vehicle systems, or is capable of either.

## **5. PERFORMANCE REQUIREMENTS**

### **5.1 Acceptance Criteria for LPR Models**

5.1.1 LPR models shall meet or exceed all applicable performance requirements specified in the categories below:

- General LPR Requirements (Section 5.2)
- Mobile LPR Requirements (Section 5.3)

### **5.2 General LPR Requirements**

5.2.1 The LPR shall be tested as specified in Section 6.2, *LPR Laboratory Tests*, and shall meet all applicable requirements of this section. All data and observations shall be documented and reported.

5.2.1.1 If an LPR uses the MDT for processing, then 20 to 25% of the MDT's processing resources (e.g. random access memory (RAM) and CPU capacity) shall be consumed by a testing process independent of other tests, to simulate the computing device as a shared resource.

5.2.1.2 The LPR shall meet the fire, electrical, thermal, and mechanical safety requirements of IEC 62368-1: 2014, as applicable.

5.2.1.3 The LPR shall be tested as specified in Section 6.2.4, *Access Test Method*, and shall demonstrate the following:

5.2.1.3.1 The LPR shall demonstrate that the original DME cannot be altered at any access level.

5.2.1.3.2 The LPR shall demonstrate the capability for a system administrator to perform the following:

- Change system configuration.
- Activate/deactivate individual cameras or combinations of cameras.
- Manage alert lists and notifications.
- Define the value to be entered into the record when no data is available from the location technology.
- Assign access privileges for alert list administrators, including the following privileges:
  - Manage alert lists and notifications.
  - Manually enter plates (e.g., for amber or silver type alerts) at the system level.
- Assign authorized user permissions to groups or to individuals, including the following:
  - Input user information.
  - Log into the system.
  - Manually enter plates.

- Manually correct a plate read and/or add a state.

All above inputs must be included in the DME Audit Log.

- Manage audit log information.

- 5.2.1.4 The LPR shall be tested as specified in Section 6.2.5, *System Operation Test Method*, and shall demonstrate the following:
- 5.2.1.4.1 The LPR power draw in the supplier-specified operating configuration shall be documented.
- 5.2.1.4.2 The LPR shall indicate to the user that the system is on, and that indication shall at least include a visible indicator on the hardware.
- 5.2.1.4.3 The LPR shall include a graphical user interface (GUI) and demonstrate the capability for the following authorized user controls:
- Quick function checks to verify that the system is working at shift start.
  - Copy function to select data, including at least the OCR interpretation and image(s) from the user interface, for potentially pasting into computer aided dispatch (CAD) or other user interfaces.
  - Flag/identify captures at time of read so that the user can tag images with details. For example, the user should be able to mark individual captures with information about an event related to the image or mark images that include a vehicle of interest.
- 5.2.1.4.4 The LPR shall demonstrate continuously and simultaneously providing the contextual image, the plate image, and the OCR interpretation of the test target on a visual display. The system shall be configurable by the user to provide the above for individual LPR camera units or all LPR camera units simultaneously.
- 5.2.1.4.5 The LPR shall demonstrate the viewing area (minimum and maximum) around the test target for the contextual image.
- 5.2.1.4.6 The LPR shall demonstrate the user's ability to turn off the GUI or minimize the GUI display window.
- 5.2.1.4.7 The LPR shall demonstrate the capability for the user to select a day or night mode to accommodate viewing in sunlight or darkness.
- 5.2.1.4.8 The LPR shall demonstrate the capability to display usage statistics (e.g., reads, alerts, logins, etc.).
- 5.2.1.4.9 The LPR shall demonstrate the capability to output audible and/or visible notifications (display) to the user:
- Location technology is disconnected or has failed or been lost.
  - Any camera is disconnected or has failed.
- 5.2.1.4.10 The LPR shall demonstrate the capability to perform verification (e.g., hash) for exported data.

- 5.2.1.4.11 The LPR shall demonstrate that the data is exportable in an interoperable (i.e., National Information Exchange Model (NIEM)-conforming) format<sup>3</sup>.
- 5.2.1.4.12 The LPR shall demonstrate the capability to import interoperable (i.e., NIEM-conforming) records from other LPRs.
- 5.2.1.4.13 The LPR shall demonstrate the capability to access/receive alert lists from an external source.
- 5.2.1.4.14 The LPR shall demonstrate the software's capability to store records locally (i.e., in the vehicle) until records are transferred to the backend.
- 5.2.1.5 The LPR shall be tested as specified in Section 6.2.6, *Aspect Ratio Procedure*, and shall demonstrate that each contextual image is displayed to the user such that an aspect ratio of  $1:1 \pm 2\%$  is maintained.
- 5.2.1.6 The LPR shall be tested as specified in Section 6.2.7, *Color Fidelity Procedure*, and shall demonstrate that each system contextual camera provides accurate color representation in that RGB values are not be shifted off axis by more than 5%.
- 5.2.1.7 The LPR shall be tested as specified in Section 6.2.8, *Diagnostics Test Method*, and shall demonstrate the following
  - 5.2.1.7.1 The LPR shall demonstrate that a diagnostic is performed at system start up and at configurable intervals to detect any malfunction (i.e., loss of time stamp, or any external references, if any, normally recorded by the system) or loss of functionality of any system-level components.
  - 5.2.1.7.2 The LPR shall demonstrate that any malfunction or loss of functionality is documented in the System Audit Log.
- 5.2.1.8 The LPR shall be tested as specified in Section 6.2.9, *Power Variation Procedure*, and shall demonstrate the capability to operate on standard vehicle DC power and be resistant to power fluctuations. While operating at power line voltages equal to  $\pm 10\%$  of the nominal value, the system shall successfully perform the steps of Section 6.2.10, *LPR Functionality Test*.

### 5.3 Mobile LPR Requirements

- 5.3.1 The LPR shall be tested as specified in Section 6.2.10, *Mobile LPR Field Test*, and shall meet all applicable requirements of this section. All data and observations shall be documented and reported.
  - 5.3.1.1 The LPR shall demonstrate the capability to provide a live view from all types of cameras (e.g., plate read, contextual read), not necessarily simultaneously, upon request of the user, for alignment and troubleshooting purposes.
  - 5.3.1.2 The LPR shall demonstrate the capability to compare reads with an alert list(s).
  - 5.3.1.3 The LPR shall demonstrate that a plate image and a contextual image were captured for each detected test target. The number of detected test targets shall be reported.

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<sup>3</sup> Appendix B includes the NIEM-based field mapping.

- 5.3.1.4 The LPR shall demonstrate the capability to accurately interpret plate images. The number of accurate reads for each test run shall be reported.
- 5.3.1.5 The LPR shall demonstrate that each read produces a record.
- 5.3.1.6 The LPR shall demonstrate that a contextual image is provided for every record in an industry standard file format to allow export to an external editing program.
- 5.3.1.7 The LPR shall demonstrate that metadata is automatically produced for each record and is locked and synchronized with plate images (both contextual and IR). Metadata shall not be truncated and shall include at least the following information, which is not embedded allowing movement of its location on the screen:
- Time/date for instance of image capture (all cameras) to an accuracy in at least hundredths of seconds.
  - Time/date for OCR (record creation) to an accuracy in at least hundredths of seconds.
  - Longitude and latitude of capture.
  - User-definable installation site (vehicle) identifier.
  - User-definable LPR identifier. The LPR identifier shall be independent of any vehicle, mobile data terminal (MDT), or other external device.
  - LPR camera unit designation for multiple cameras within a system.
  - User input of information.
- 5.3.1.8 The LPR shall demonstrate the ability to provide accurate capture location utilizing location technology (e.g., GPS). The system location technology shall be compliant with an existing standard or shall be demonstrated to meet the performance requirements of an existing standard. The supplier shall identify the standard that is used.
- 5.3.1.9 The LPR shall demonstrate that sequencing of images/records represents chronological order of image capture and that the location and time/date information are representative of the instance of image capture (detection of plate). The time/date stamp shall have accuracy in at least hundredths of seconds.
- 5.3.1.10 The LPR shall demonstrate the capability to perform a user-configurable query of statistics (e.g., vehicle counts, reads, alerts, etc.).
- 5.3.1.11 The LPR shall demonstrate the capability to output an exportable report in an industry standard file format (e.g., comma-separated values (CSV)) that is user-sortable by field, perform counts, and view records.
- 5.3.1.12 The LPR shall demonstrate the capability for a user to power down the system from within the vehicle passenger compartment. Shutdown shall occur in less than 15 minutes following either (1) vehicle shut off, (2) operation of a physical switch, or (3) a software option for the system inside the passenger compartment.
- 5.3.1.12.1 The LPR shall demonstrate the capability to produce an audible alert. The system shall provide the capability for the user to (1) acknowledge and silence an audible

alert and (2) mute the audible alerts, and these capabilities shall be independent of operating system.

5.3.1.12.2 The LPR shall demonstrate that the System Audit Log includes all system-level events, software updates, hardware changes, and a copy of the metadata.

5.3.1.12.3 The LPR shall poll all system-level components and automatically record into the System Audit Log all system-level details and events, including the following, at least each time status changes:

- Date and time of event.
- Location of event.
- Hardware identification, including supplier and model number.
- Software version.
- Firmware version.
- System status change (e.g., boot up, power on).
- System-level component status change indicators (e.g., camera failure; changes to input/output ports, components, or application programming interfaces (APIs); loss of location signal).
- Alert list downloads into LPR.
- Local alert list uploads to main server.
- Alert list identifier for alert lists manually created locally by the user (creator and information included in it and why).
- Queries performed on the system, including individual identification, date/time, search criteria (query)

5.3.1.12.4 The LPR System Audit Log shall be exported via the same method that the alert list is imported into the LPR.

5.3.1.12.5 The LPR System Audit Log shall demonstrate the capability to manually record at least the following:

- Installation site (vehicle) identifier.
- User-definable LPR identifier.
- LPR camera unit designation for multiple cameras within a system.
- User identification.

5.3.1.12.6 The LPR shall demonstrate the capability to display the System Audit Log.

5.3.1.12.7 The LPR shall demonstrate that the DME Audit Log includes the following:

- User identification and logging in/out.
- Hash or other verification shall be computed for the duplicate using an industry-standard method and shall be defined and provided with the duplicate.

- The calculated hash of the duplicate should be recorded as part of the audit log, as well as the hash of the original file.

5.3.1.13 Identification of the source of the DME, including the installation site identifier, central processing unit (CPU), hardware identification, etc.



## **6. Test Methods**

### 6.1 General

6.1.1 Performance requirement pass/fail criteria shall be as stated in Chapter 5, Performance Requirements.

6.1.2 Unless the context unmistakably indicates otherwise, an indication that an action is to “follow” something else, or otherwise is to occur after something else, should be understood to mean that the subsequent action should occur immediately after the preceding event.

6.1.3 Unless otherwise specified within a test method, testing shall be conducted at ambient conditions within the temperature range of 16° C to 27° C (60° F to 80° F) and 20% to 60% rh.

6.1.4 Each test shall be performed on a single sample representative of the model unless otherwise specified within the individual test procedure.

6.1.5 All test data and observations shall be documented and reported, including supplier, model number, identification of all system-level components, settings, and accessories tested.

6.1.6 The supplier shall provide LPRs and the laptop with LPR software installed for testing.

6.1.7 The system shall be set up and operated according to the supplier’s instructions. All default factory settings for the sample shall be documented.

6.1.8 For any tests requiring an observer to view and assess a recorded image, the individual shall have 20/20 or better vision (corrected or uncorrected).

### 6.2 LPR Laboratory Tests

6.2.1 No specific sequence is required for individual test methods; however, it is recommended that safety tests be performed first.

#### 6.2.2 Sample Systems

6.2.2.1 One or more LPRs shall be put through the testing. Each system under test (SUT) shall have be provided by the supplier with the maximum number of cameras supported by the system and shall be fully described in the test report.

#### 6.2.3 Initial Conditions

6.2.3.1 Affix the camera unit(s) to a stable mount with each unit directed toward the test target location.

6.2.3.2 Connect the LPR components according to supplier instructions.

6.2.3.3 Power up the LPR and test equipment.

6.2.3.4 Position the light source above the camera unit(s) at a 45-degree angle with respect to the test target. Illuminate the test target with the light source.

6.2.3.5 Verify proper operation by viewing an image on the video display of the scene being captured by each camera unit.

6.2.3.6 Test Equipment

- Test Targets: Specified within each test method.
- Light source for test targets: Illumination source of 500 to 2,000 lux and at a color correlated daylight temperature of 5,600 K.

#### 6.2.4 Security and Access Test Method

6.2.4.1 The purpose of this test method is to demonstrate the following allowed or restricted access:

- Administrator access level: modify time/date stamp change, modify audit logs, change system configuration, delete original DME, overwrite DME for unintentional or irrelevant recording.
- Authorized user level does not have the above described access.

6.2.4.2 Procedure

6.2.4.2.1 Attempt to configure system functions at the administrator access level, and assess whether those system functions can be configured at the administrator access level. Attempt to configure those same system functions at the authorized user access level, and assess whether those system functions can be configured at the authorized user access level.

6.2.4.2.2 Assign permission for the same subset of system functions to the authorized user access level, and assess whether those permissions are successfully assigned and configurable at the authorized user access level.

6.2.4.2.3 For a different subset of system functions other than those for which permissions were assigned above, attempt to configure those system functions at the authorized user access level, and assess whether those system functions are configurable at the authorized user access level.

6.2.4.2.4 Attempt to erase, modify, or overwrite previously recorded original DME at the administrator access level and the authorized user access level.

6.2.4.3 Report

6.2.4.3.1 Each trial result and observations shall be documented and reported.

## 6.2.5 System Operation Test Method

6.2.5.1 Test Targets: 50 license plates (having characteristics to be defined).

6.2.5.2 Procedure

6.2.5.2.1 Position the test target on a non-reflective flat surface approximately 3.0 m (10 ft) from the camera unit(s). Measurement scales shall be positioned behind the test

target extending from the center vertically and horizontally, capable of showing at least 10-feet horizontally with markings visible at no less than 12-inch increments.

6.2.5.2.2 Measure the power draw in terms of voltage and current of the SUT.

6.2.5.2.3 Check for indications that the system is on and document the types of indicators (e.g., visible).

6.2.5.2.4 Using the GUI, perform the following steps:

- (1) Verify that all available indicators are functioning.
- (2) Copy the record and paste into a text file.
- (3) Copy the OCR interpretation and paste into a text file.
- (4) Copy the contextual image and paste into an application that supports images.
- (5) Copy the plate image and paste into an application that supports images.
- (6) Flag a record and add notes associated with the record.
- (7) Verify that all camera images and OCR interpretations can be simultaneously displayed.
- (8) Using the scales behind the test target, determine the viewing area around the test target.
- (9) Turn the GUI off, turn it on, and minimize the display window.
- (10) Switch the GUI from day to night mode and back to day mode.
- (11) Block the incoming positioning signal to defeat system location technology, and document the position information in the record.
- (12) Generate a usage report and export it as part of the test report.
- (13) Disconnect the location technology and verify notification to the user.
- (14) Disconnect any camera and verify notification to the user.
- (15) Export a report from the system and compare that report to the NIEM-based field mapping.
- (16) Import the NIEM-compliant record<sup>4</sup>.
- (17) Import the alert list.

6.2.5.3 Report

6.2.5.3.1 Each trial result and observations shall be documented and reported.

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<sup>4</sup> To be made available on a public website.

## 6.2.6 Aspect Ratio Test Method

6.2.6.1 Test target: 3-inch to 10-inch diameter sphere having a smooth surface, of solid dark color, such as black.

6.2.6.2 Procedure

6.2.6.2.1 Suspend the sphere in front of a background having contrasting color from the sphere that allows the sphere to be distinguished from the background. The sphere shall be positioned relative to the contextual camera such that the sphere is in the center with all edges of the sphere in view and so that the sphere encompasses approximately 75% of the horizontal samples of the field of view.

6.2.6.2.2 Observe whether the sphere appears to be round (not distorted) in the displayed view of the camera image.

6.2.6.2.3 Repeat the steps above for each contextual camera.

6.2.6.3 Report

6.2.6.3.1 Each trial result and observations shall be documented and reported.

## 6.2.7 Color Fidelity Test Method

6.2.7.1 Test Target and Equipment

- Test target: Society of Motion Picture and Television Engineers (SMPTE) color bar chart.
- Test equipment: Digital vectorscope.

6.2.7.2 Procedure

6.2.7.2.1 Position the test target relative to the contextual camera such that the target is in the center with all edges in view and the target encompasses approximately 75% of the horizontal samples of the field of view.

6.2.7.2.2 Input the video of the test target into the digital vectorscope.

6.2.7.2.3 Observe whether the RGB values are shifted off axis by more than 5%.

6.2.7.2.4 Repeat the steps above for each contextual camera.

6.2.7.3 Report

6.2.7.3.1 Each trial result and observations shall be documented and reported.

## 6.2.8 Diagnostics Test Method

6.2.8.1 Test Target: One license plate.

6.2.8.2 Procedure

6.2.8.2.1 Position the test target on a non-reflective flat surface approximately 3.0 m (10 ft) from the camera unit(s).

6.2.8.2.2 Sequentially introduce the following malfunctions to the system: loss of an external reference and loss of functionality of the recorder, camera(s), displays, and

microphone(s). The system shall indicate any malfunction within 60 seconds of diagnostic completion.

6.2.8.2.3 Download the System Audit Log, and verify that the diagnostic check is documented as being performed upon system startup, at least every 60 seconds, and for every simulated malfunction listed above.

6.2.8.3 Report

6.2.8.3.1 Each trial result and observations shall be documented and reported.

### 6.2.9 Power Variation Test Method

6.2.9.1 Shutdown and remove power from the LPR.

6.2.9.2 Connect the system to a DC power source to the rated supply voltage plus 10% and switch the system on. Perform the *LPR Functionality Test* as specified in Section 6.2.10. Switch the system off. Record observations and results.

6.2.9.3 Decrease the DC power source to the rated supply voltage minus 10% and switch the system on. Perform the *LPR Functionality Test* as specified in Section 6.2.10. Switch the system off and disconnect from the DC power source. Record observations and results.

6.2.9.4 Reporting

6.2.9.4.1 Data, observations, and results shall be documented and reported.

### 6.2.10 LPR Functionality Test

6.2.10.1 Purpose

6.2.10.1.1 The purpose of this test is to assess the system's minimal functionality.

6.2.10.2 Test Target: One license plate.

6.2.10.3 Procedure

6.2.10.3.1 Position the test target on a non-reflective flat surface approximately 3.0 m (10 ft) from the camera unit(s).

6.2.10.3.2 *Steps must be added.*

6.2.10.3.3 View the original DME and verify that it contains images, time/date stamp, and associated metadata.

6.2.10.3.4 Export and acquire all DME according to the supplier's procedure and verify that the uncompressed DME copy, compressed DME, and original DME were acquired.

6.2.10.3.5 All observations and results shall be documented and reported.

## 6.3 Mobile LPR Field Test

### 6.3.1 Overview

6.3.1.1 Test Scenarios

Each LPR shall be evaluated for performance in three test scenarios:

- (1) Basic parking: This scenario simulates cars, with rear license plates, parked perpendicular to the direction of the LPR travel.
- (2) Angled parking: This scenario simulates cars, with rear license plates, parked at an angle to the direction of the LPR travel.
- (3) Parallel parking along city streets with LPR moving at lower speeds: This scenario simulates cars, with rear license plates, parked along a city street parallel to the curb in the same direction as the LPR travel.

#### 6.3.1.2 Sample Systems

One or more LPRs installed on vehicles shall be put through the testing. Each system under test (SUT) shall be fully described on the *LPR SUT Data Sheet*<sup>5</sup>, which shall be provided as part of the test report.

#### 6.3.1.3 Pre-job Briefing

A safety briefing shall be performed prior to beginning the testing, including at least the following topics:

- Overview of hazards that may be encountered during setup and testing.
- Radio communications to inform personnel whenever vehicles are in motion.
- Maintaining a safe distance from the testing area unless performing a specific role for testing.

#### 6.3.1.4 Testing Participants

- 6.3.1.4.1 Test Leader – The Test Leader has authority over all personnel participating during testing and over all activities at the testing site and has responsibility for ensuring safe practices during testing. The Test Leader has “Stop work” authority.
- 6.3.1.4.2 Vehicle Coordinator – The Vehicle Coordinator is responsible for documenting each SUT on the *LPR SUT Data Sheet* and ensuring that each system is ready to be tested.
- 6.3.1.4.3 Scenario Setup Personnel – These individuals are responsible for the positioning of all test targets for each scenario.
- 6.3.1.4.4 Test Administrator – The test administrator is responsible for verifying that all steps are taken in the correct order and as specified to ensure the validity of the test.
- 6.3.1.4.5 Observer – This individual is responsible for documenting results and observations from each test run on the appropriate *Test Run Data Sheets*.
- 6.3.1.4.6 Vehicle Driver – This individual is responsible for verifying that the LPR is ready and functioning properly prior to each test run, driving the vehicle at the specified speed and distance from the test targets, and verifying that the LPR performed as expected during each test run.

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<sup>5</sup> Data sheets are included in Appendix C.

6.3.1.4.7 Speed Taker – This individual is responsible for monitoring and relaying to the Observer the speed of the vehicle at a specified point during each test run as an external verification of the vehicle speed.

6.3.1.5 Test Targets

6.3.1.5.1 A set of 50 license plates shall be used as the test targets:

6.3.1.5.1.1. Option 1: The IACP shall provide a set of 50 license plates as shown in Appendix D.

6.3.1.5.1.2. Option 2: The testing organization or purchaser shall select the test targets based on the license plate characteristics listed below that must be included in the test targets.

- (1) At least 20 plates with solid light background and dark alphanumeric.
- (2) At least 5 plates with solid dark background and light alphanumeric.
- (3) At least 5 plates with dark background having graphics and light alphanumeric.
- (4) At least 5 plates with solid light background having graphics and dark alphanumeric.
- (5) At least 5 with two stacked characters.
- (6) At least 5 flat (i.e., printed) plates.
- (7) At least 5 embossed (i.e., stamped) plates.
- (8) At least 10 with serif font.
- (9) At least 10 with san-serif font.

6.3.1.6 Test Conditions

6.3.1.6.1 Daylight conditions

6.3.1.6.2 No precipitation

6.3.1.6.3 Dry roads

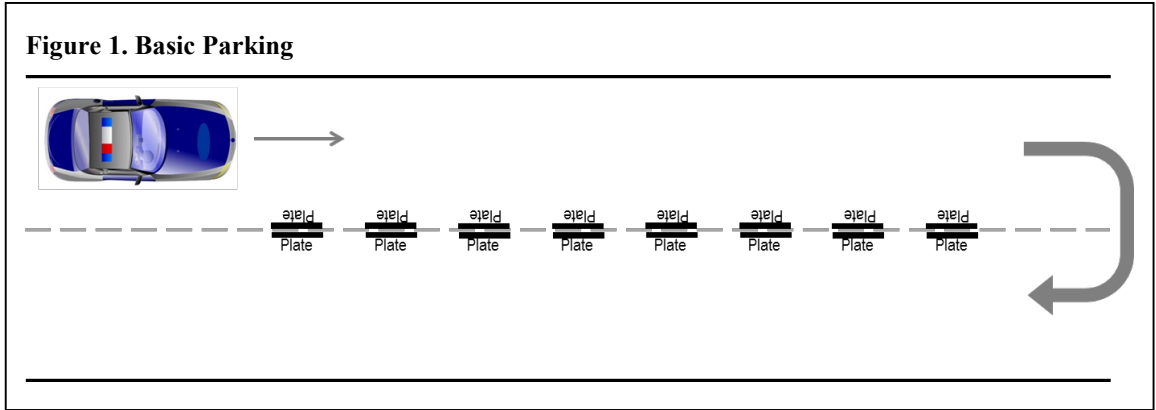
6.3.1.7 Basic Parking Scenario Setup

The *Basic Parking Scenario Setup Sheet* with test target numbers identified is provided, and spacing is as described below and illustrated in Figure 1:

- 50 test target stands with a total of 50 test targets (one per stand).
- Double row of test stands placed back-to-back on the centerline of the test track such that the plates are parallel to the centerline. *Note: Figure 1 does not show all of the required test stands.*
- Distance between each pair of test target stands: 10 feet (left edge to left edge).
- Each test target will be given a position designation of 1 through 50 and positioned in sequential order with respect to the direction of LPR travel.



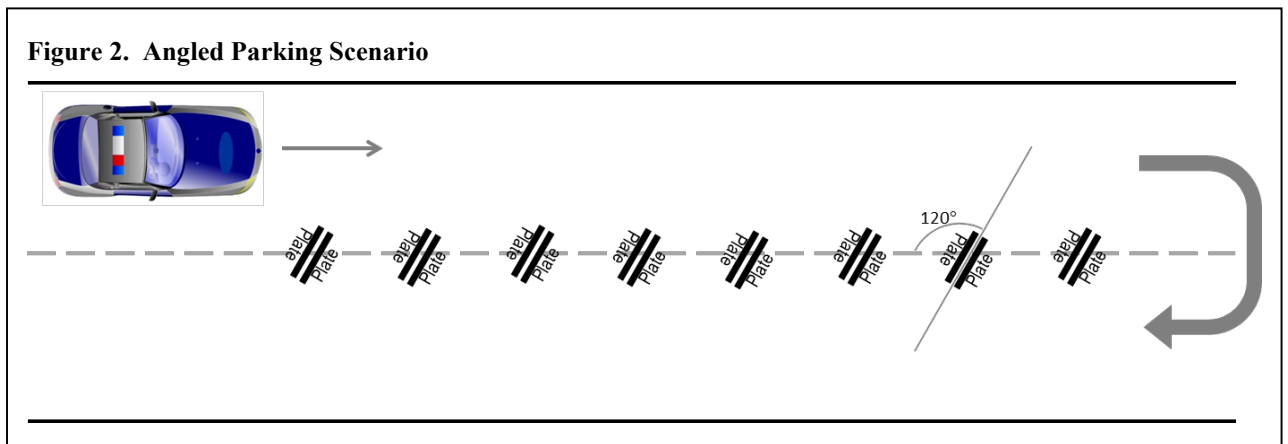
- The vehicle shall be driven at constant speed, centered in the left side lane (with respect to the vehicle direction) of the two-lane track until the first 25 plates are passed. The vehicle shall be turned around, and this step shall be repeated for the next 25 plates.



### 6.3.1.8 Angled Parking Scenario Setup

The *Angled Parking Scenario Setup Sheet* with test target numbers identified is provided, and spacing is as described below and illustrated in Figure 2:

- 50 test target stands with a total of 50 test targets (one per stand).
- Double row of test stands placed back-to-back on the centerline of the test track such that the plates are at a 120-degree angle to the centerline. *Note: Figure 2 does not show all of the required test stands.*
- Distance between each pair of test target stands: 10 feet (left edge to left edge).
- Each test target will be given a position designation of 1 through 50 and positioned in sequential order with respect to the direction of LPR travel.
- The vehicle shall be driven at constant speed, centered in the left side lane (with respect to the vehicle direction) of the two-lane track until the first 25 plates are

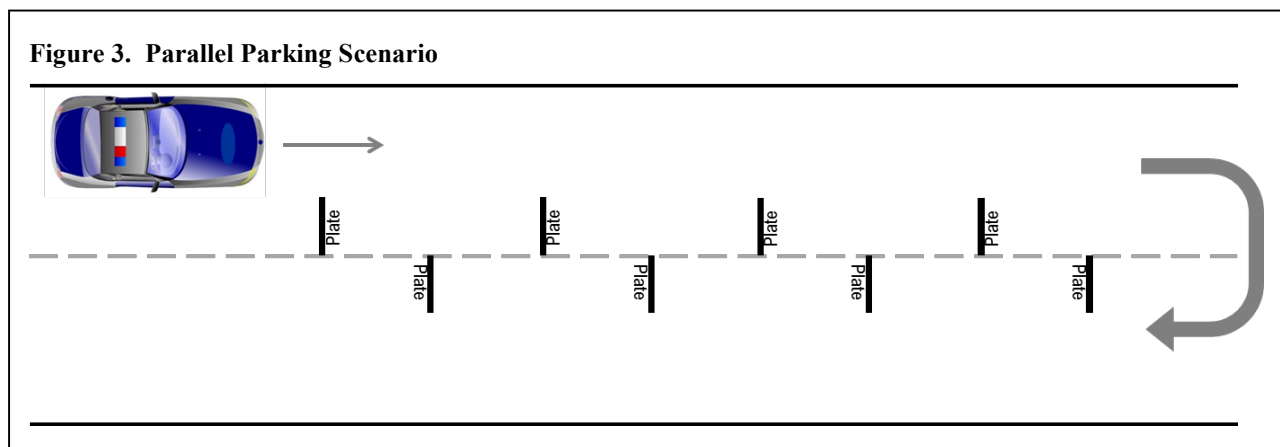


passed. The vehicle shall be turned around, and this step shall be repeated for the next 25 plates.

### 6.3.1.9 Parallel Parking Scenario Setup

The *Parking Scenario Setup Sheet* with test target numbers identified is provided, and spacing is as described below and illustrated in Figure 3:

- 50 test target stands with a total of 50 test targets (one per stand).
- Single row of test target stands with a single test target on each and placed on the centerline of the test track. Test target stands shall be staggered with the inside edge on the centerline. *Note: Figure 3 does not show all of the required test stands.*
- Test target stands with plates positioned as shown in Figure 3 with respect to the direction of LPR travel. *Note: The staggering of stands and positioning of the plates is for the purpose of limiting the time which the LPR camera can view the plate of interest.*
- Distance between each test target stand: 10 feet.
- Each test target will be given a position designation of 1 through 50 and positioned in sequential order with respect to the direction of LPR travel.
- The vehicle shall be driven at constant speed, centered in the left side lane (with respect to the vehicle direction) of the two-lane track until the first 25 plates are passed. The vehicle shall be turned around, and this step shall be repeated for the next 25 plates.



### 6.3.1.10 Test Method

6.3.1.10.1 The Vehicle Coordinator shall complete the *LPR SUT Data Sheet* for each SUT prior to beginning test runs.

6.3.1.10.2 The SUT shall be put through each scenario in test runs performed according to the details below:

- Only one LPR camera unit viewing (i.e., all other LPR camera units shall be masked or turned off) for each test run.
  - Three passes at 15 mph and three passes at 40 mph.
- 6.3.1.10.3 An independent video camera shall be installed on the vehicle and positioned in alignment with the viewing direction of the LPR camera unit in use.
- 6.3.1.10.4 The test setup shall be completed as described in the appropriate scenario.
- 6.3.1.10.5 The Observer shall complete page one of the *Test Run Data Sheet* and complete the subsequent pages as the test run occurs.
- 6.3.1.10.6 The Test Administrator shall verify the following and complete the *Test Run Start Checklist*<sup>6</sup>:
- (1) All personnel ready, including Observer, Vehicle Driver, and Speed Taker.
  - (2) SUT on and operational.
  - (3) START and END slates entered in alert list.
  - (4) LPR camera units masked, if necessary.
  - (5) Independent video camera in place.
- 6.3.1.10.7 The Test Administrator shall perform the following at the start of each pass of a test run:
- (1) Activate independent video camera recording.
  - (2) Show START slate to SUT until an alert is sounded.
  - (3) Speak the SUT time of the alert and the pass identifier.
- 6.3.1.10.8 The Observer shall record on the *Test Run Data Sheet* the following information for each pass of a test run.
- (1) Test identification.
  - (2) Pass identifier.
  - (3) SUT time of alert spoken by Test Administrator.
  - (4) Vehicle speed noted (out).
  - (5) Vehicle speed noted (back).
  - (6) Time from SUT alert of END slate.
- 6.3.1.11 The Test Administrator shall verify that LPR reads from the SUT were recorded and shall stop recording on the independent video camera.
- 6.3.1.12 Data Collection

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<sup>6</sup> Appendix E includes the *Test Run Start Checklist*.

- 6.3.1.12.1 A test report shall be provided for each SUT and shall include lists, data sheets, and electronic files described below:
- 6.3.1.12.2 List of test targets, with state, plate number, and photograph, in the order positioned in the test setup(s).
- 6.3.1.12.3 *Test Run Start Checklist* for each test run.
- 6.3.1.12.4 Data sheets – The *LPR SUT Data Sheet* and *LPR Test Run Data Sheet* shall be completed for each SUT.
- 6.3.1.12.5 Independent video camera – video for each pass of each scenario to verify plate order and position.
- 6.3.1.12.6 LPR SUT data – exported file in format (machine-readable) specified.
- 6.3.1.12.7 LPR results from exported files.
- 6.3.1.12.8 Contextual photos exported from SUT.
- 6.3.1.12.9 Plate images exported from SUT.
- 6.3.1.12.10 OCR – Number of definitive reads (taken from file exported from SUT).
- 6.3.1.12.11 Required metadata (necessary for performing analysis following the test runs).
- 6.3.2 Reporting
  - 6.3.2.1 Data, observations, and results shall be documented and reported.

## **7. Labeling and Information**

### **7.1 General Product Label Requirements for Mobile LPR Models**

- 7.1.1 For each compliant LPR model, the requirements of this section shall be met.
- 7.1.2 The system shall have a product label permanently and visibly attached to, stamped on or printed on the main housing of the system.
- 7.1.3 All text on the required product label shall be at least in English.
- 7.1.4 Symbols and other graphical information shall be permitted to be used to supplement text on the product label(s) and shall be explained in the user information.
- 7.1.5 The housing of the recording unit of the system shall have at least the following information printed legibly on the label(s) in letters at least 3.2 mm (1/8 inch) high:
  - Legal name and legal address of the supplier.
  - Manufacturing location address (city, state/province, country).
  - Date of manufacture (i.e., month and year).
  - LPR model number.
  - Serial number.

## 7.2 Statement of Conformity for Each Compliant Product

7.2.1 A compliant product shall have the following statement of conformity in letters at least 2.5 mm (3/32 inch) high.

7.2.2 The statement shall be included with the user information required in Section 7.3.

“PURSUANT TO NIJ CR-100x.00, THIS LPR MODEL HAS BEEN TESTED AND FOUND TO BE COMPLIANT WITH THE REQUIREMENTS OF NIJ STANDARD-100x.00 (MOBILE LICENSE PLATE READER SYSTEM STANDARD FOR LAW ENFORCEMENT).”

## 7.3 User Information to Be Provided by Supplier of LPR Model

7.3.1 In order for a supplier to have an LPR model tested under this standard, the supplier must agree that, if the model is found to be compliant, it will provide written user information including, but not limited to, warnings, information and instructions with each complete system (and with each system-level component that may be acquired or provided separately).

7.3.2 The supplier shall provide the required user information in such a manner as to make such information clear, prominent, and immediately available to any individual opening the package.

7.3.3 The supplier shall provide at least the following instructions and information with each system:

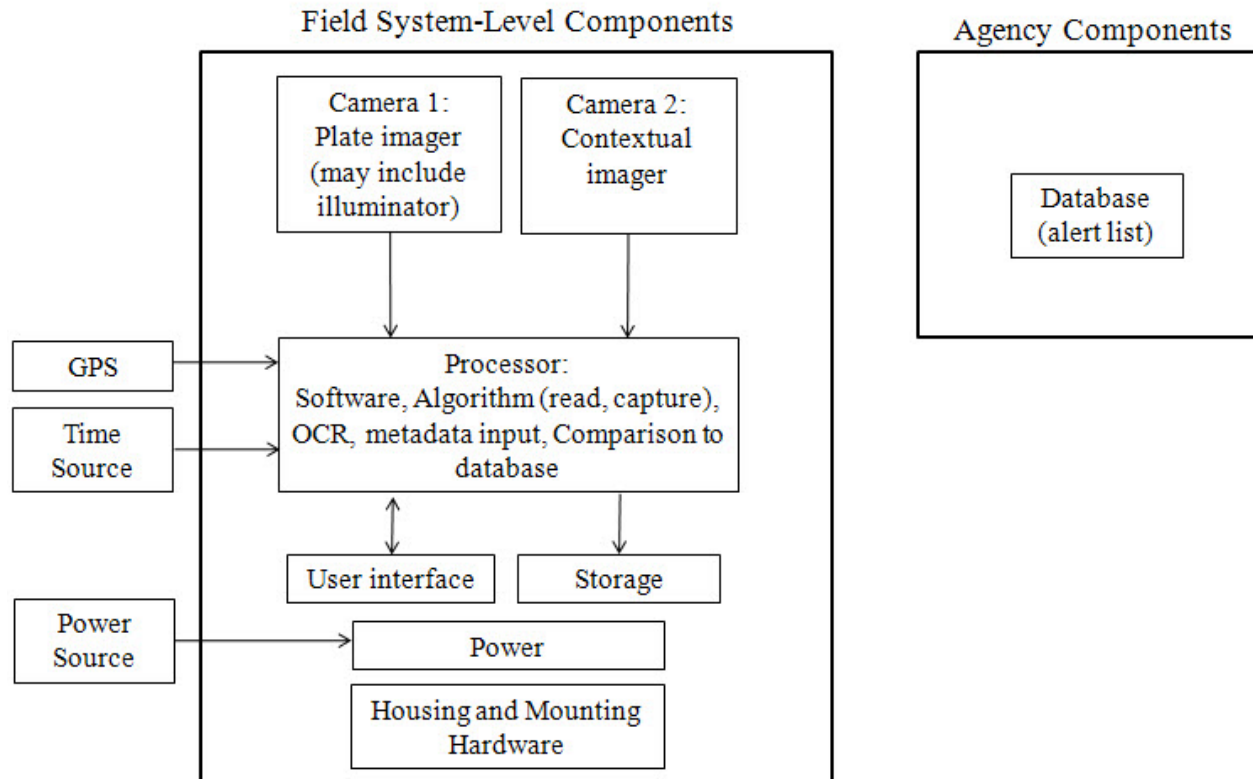
- Information required in Chapter 4.
- System-level components tested with the system. System-level components shall be identified by model number with allowable substitutions (including model numbers and specifications).
- Instructions for proper installation and use as intended by the supplier, including safety considerations and user-definable settings.
- Warranty information.
- Proper care and maintenance instructions, including cleaning, inspection guidelines and frequency, recommended operating temperature range, recommended storage practices and storage life, and cautions.
- If any of the system-level components are not dedicated exclusively to supporting system functionality, it shall be noted that system ability to share resources is not addressed under the scope of this standard. It is recommended that a risk analysis be conducted by the end user to ensure that the system is interoperable with other equipment.
- Guidelines on lifecycle and storage of removable media, if applicable.
- Listing of available system functions configurable at the administrator access level.

## 7.4 Technical Documentation to Be Provided by Supplier

- 7.4.1 In order for a supplier to have an LPR model tested under this standard, the supplier must agree that, if the model is found to be compliant, it will provide technical documentation as set forth in this section for the system on request by the purchaser or prospective purchaser.
- 7.4.2 The technical data package shall contain all data showing compliance of the model with this standard.
- 7.4.3 The technical documentation shall include the supplier name, model number, supplier-replaceable system-level components, and available options and accessories.
- 7.4.4 The technical documentation shall include the following information indicating the system's resistance to environmental conditions:
- Ability to withstand and operate in moisture, humidity, and temperature extremes.
  - Housing or protection to prevent ingress of water and dust.
  - Resistance of cables and connections to mechanical stress, crush, and ingress of dust or moisture.
  - Ability to withstand and operate during mechanical shock, vibration, and impact consistent with the intended operational environment.
  - Ability to operate during electromagnetic/radio frequency (RF) interference from other systems.
- 7.4.5 The technical documentation shall include precautions taken to ensure that any mobile LPR does not produce electromagnetic interference that could impact other vehicle systems.
- 7.4.6 The technical documentation shall address accessories available for use with the system.

Appendix A: Mobile LPR Figure

Figure 3. Mobile LPR Diagram



**Appendix B NIEM-based Field Mapping (LPRD)**

	Description	Path	Required or Optional Field	Data Supplied By
<?xml version="1.0"?>				
<LicensePlateRead xmlns:j="http://www.it.ojp.gov/jxdm/3.0.3" xmlns:lpr="http://www.it.ojp.gov/jxdm/3.0.3/license-plate-reader" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="file:///c:/dev/documentation/iepd/lpr/document-schema.xsd">				
<j:EventDate >1999-01-21</j:EventDate>	The Date of the LPR Read		Required	Vendor
<j:EventTime >13:20:00-05:00</j:EventTime>	The Time of the LPR read down to the 2nd timezone		Required	Vendor
<lpr:LPRSystemID >string</lpr:LPRSystemID>	Description of the type of System Being Used Ex. PIPS, PlateScan, Joe's LPR'us		Required	Vendor
<lpr:ActivityReason>LPR Plate Read</lpr:ActivityReason>			Required	Vendor/ Default value law enforcement use
<lpr:LPREventID >string</lpr:LPREventID>			Required	Vendor
<j:OrganizationORIID>			Required	Vendor
<j:ID >string</j:ID>	Organization ORI or unique identifier		Required	Vendor



<j:IDIssuingAuthorityText >string</j:IDIssuingAuthorityText>	Issuer of ORI, ex FBI, SLED, TBI, CBI, etc..		Optional	Vendor
<j:IDSourceText >string</j:IDSourceText>	Optional		Optional	Vendor
</j:OrganizationORIID>				
<lpr:LPRVehicle>			Required	Vendor
<j:VehicleMakeCode >token</j:VehicleMakeCode>	A code identifying the manufacturer of a vehicle		Optional	Vendor or Warehouse Supplied
<j:VehicleModelCode >token</j:VehicleModelCode>	A code identifying the specific design or type of vehicle made by a manufacturer. Sometimes referred to as the series model.		Optional	Vendor or Warehouse Supplied
<j:VehicleModelYearDate >1998</j:VehicleModelYearDate>	A year which is assigned to a vehicle by the manufacturer.		Optional	Vendor or Warehouse Supplied
<j:VehicleModelCodeText >string</j:VehicleModelCodeText>	A code denoting a family of vehicles within a vehicle make which has a degree of similarity in construction, such as body, chassis, etc. The field does not necessarily contain a standard code; it may contain a value provided by the originator (the manufacturer) of the field.		Optional	Vendor or Warehouse Supplied

<j:VehicleColorPrimaryText >string</j:VehicleColorPrimaryText>	A single, upper-most, front-most, or majority color of a vehicle		Optional	Vendor or Warehouse Supplied
<j:VehicleColorPrimaryCode >token</j:VehicleColorPrimaryCode>	A code identifying a single, upper-most, front-most, or majority color of a vehicle		Optional	Vendor or Warehouse Supplied
<j:VehicleColorSecondaryText >string</j:VehicleColorSecondaryText>	A code identifying the lower-most or rear-most color of a two-tone vehicle or the lesser color of a multi-colored vehicle		Optional	Vendor or Warehouse Supplied
<j:VehicleColorSecondaryCode >token</j:VehicleColorSecondaryCode>	A lower-most or rear-most color of a two-tone vehicle or a lesser color of a multi-colored vehicle		Optional	Vendor or Warehouse Supplied
<j:VehicleDoorQuantity >0</j:VehicleDoorQuantity>	A number of doors of a vehicle		Optional	Vendor or Warehouse Supplied
<j:VehicleLicensePlateID>			Required	Vendor
<j:ID >string</j:ID>	The License Plate Number		Required	Vendor
<j:IDIssuingAuthorityText >string</j:IDIssuingAuthorityText>	The Entityid that issued the plate: state, local, federal, etc...		Required	Vendor
<j:IDSourceText >string</j:IDSourceText>			Optional	Vendor
</j:VehicleLicensePlateID>			Required	Vendor
</lpr:LPRVehicle>			Required	Vendor

Mobile License Plate Reader System Standard for Law Enforcement

< pr:LPRVehiclePlatePhoto >BASE64BINARY</ pr:LPRVehiclePlatePhoto>	Photograph of the License Plate		Required	Vendor
< pr:LPRGeographicCoordinate>			Required	Vendor
<j:GeographicCoordinateLatitude>	circle around the Earth parallel to the Equator. Values range from -90 degrees (inclusive) at the South Pole to +90 degrees (inclusive) at the North Pole. The value is 0 at the Equator		Required	Vendor
<j:LatitudeDegreeValue>1.23</j:LatitudeDegreeValue>			Required	Vendor
<j:LatitudeMinuteValue>1.23</j:LatitudeMinuteValue>			Required	Vendor
<j:LatitudeSecondValue>1.23</j:LatitudeSecondValue>			Required	Vendor
</j:GeographicCoordinateLatitude>			Required	Vendor
<j:GeographicCoordinateLongitude>	A meridian that is perpendicular to the Equator. Values range from -180 degrees (inclusive) at the International Date Line to +180 (exclusive) just west of the International Date Line. The value is 0		Required	Vendor

	at the Prime Meridian			
<j:LongitudeDegreeValue>1.23</j:LongitudeDegreeValue>			Required	Vendor
<j:LongitudeMinuteValue>1.23</j:LongitudeMinuteValue>			Required	Vendor
<j:LongitudeSecondValue>1.23</j:LongitudeSecondValue>			Required	Vendor
</j:GeographicCoordinateLongitude>			Required	Vendor
</lpr:LPRGeographicCoordinate>			Required	Vendor
<lpr:LPRMetadata>	A name value pair that can be used to store data that has not been identified anywhere else within the specification		Optional	Vendor or Warehouse Supplied
<j:MetadataFieldName >string</j:MetadataFieldName>			Optional	Vendor or Warehouse Supplied
<j:MetadataFieldValueText >string</j:MetadataFieldValueText>			Optional	Vendor or Warehouse Supplied
</lpr:LPRMetadata>			Optional	Vendor or Warehouse Supplied
<lpr:DocumentControlData>			Required	Vendor

<j:DocumentCountryCode.fips10-4 >token</j:DocumentCountryCode.fips10-4>	Country of Origin for the Document		Required	Vendor
</lpr:DocumentControlData>			Required	Vendor
<lpr:LPRVehiclePlateTextCorrection >string</lpr:LPRVehiclePlateTextCorrection>			Optional	Vendor or Warehouse Supplied
<lpr:LPRVehiclePlateStateCorrection >string</lpr:LPRVehiclePlateStateCorrection>			Optional	Vendor or Warehouse Supplied
<lpr:LPRDirection >string</lpr:LPRDirection>	The Direction the vehicle was traveling		Optional	Vendor
<lpr:LPRCameraID >string</lpr:LPRCameraID>	The Identifier of the camera which captured the vehicle image		Optional	Vendor
<lpr:LPRRecordedLane >string</lpr:LPRRecordedLane>	The lane in which the vehicle was travelling when the plate was captured		Optional	Vendor
<lpr:LPRAdditionalPhoto >	Any additional photos of the vehicle		Optional	Vendor
</LicensePlateRead>				

**Appendix C.** Data sheets to be included in the test report for each system under test (SUT)

- (1) LPR SUT Data Sheet.
- (2) LPR Test Run Data Sheet.

**LPR System Under Test (SUT) Data Sheet (page 1)**

*This data sheet shall be completed by the Data Collector, the LPR manufacturer/supplier, or the LPR Operator, and that individual shall be identified as the "Observer".*

Date: \_\_\_\_\_

LPR SUT ID: \_\_\_\_\_

Observer Name: \_\_\_\_\_ Email: \_\_\_\_\_

LPR Manufacturer: \_\_\_\_\_ # LPR Cameras: \_\_\_\_\_ IR Wavelength: \_\_\_\_\_

LPR Model Number: \_\_\_\_\_

LPR Software Version: \_\_\_\_\_

LPR Firmware Version: \_\_\_\_\_

Vehicle make/model: \_\_\_\_\_

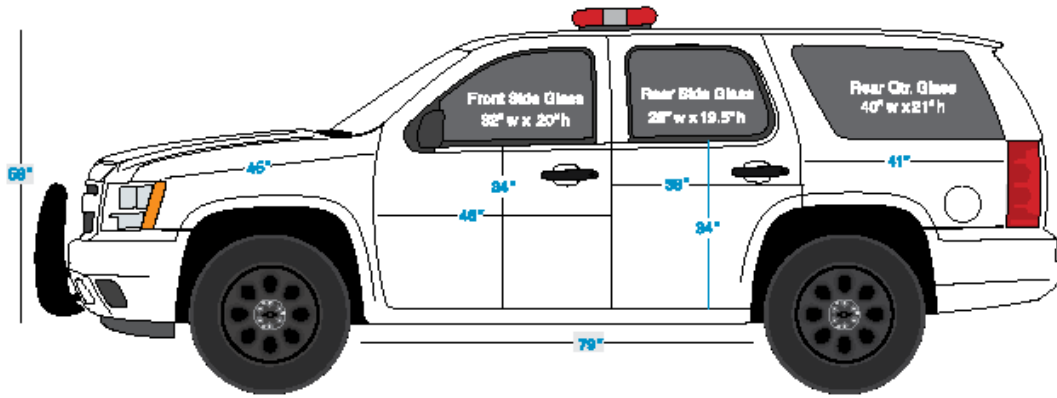
Configuration: (indicate location and orientation on diagram on reverse side)

<b>Camera 1</b>	Height: _____	X Angle: _____	Y Angle: _____	Focal Length: _____ mm
<b>Camera 2</b>	Height: _____	X Angle: _____	Y Angle: _____	Focal Length: _____ mm
<b>Camera 3</b>	Height: _____	X Angle: _____	Y Angle: _____	Focal Length: _____ mm
<b>Camera 4</b>	Height: _____	X Angle: _____	Y Angle: _____	Focal Length: _____ mm

On the following page, indicate position of cameras on the vehicle.

**LPR System Under Test (SUT) Data Sheet (page 2)**

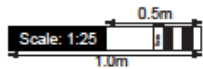
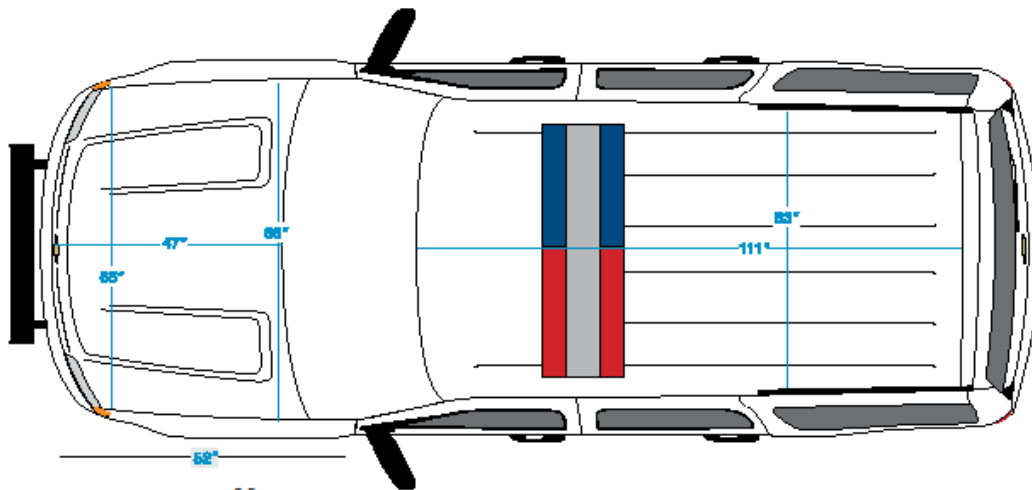
**Chevrolet Tahoe Police Vehicle (2013)**



**Estimated material sizes to wrap:**

- Hood – 70" x 62"
- Front Doors – 60" x 38"
- Rear Doors – 40" x 38"
- Roof – 114" x 55"
- Rear hatch – 65" x 28"

5131



All measurements in millimeters.

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**LPR Test Run Data Sheet (Page 1)**

*The LPR Operator shall complete page 1 of this data sheet for each system under test.*

Test Identification: \_\_\_\_\_

Driver Name: \_\_\_\_\_

In-car Observer Name: \_\_\_\_\_ (if applicable)

Date: \_\_\_\_\_

System Under Test Identifier: \_\_\_\_\_

LPR Manufacturer: \_\_\_\_\_

Location (Longitude and latitude) of test: \_\_\_\_\_

Direction of Starting Vehicle Travel: \_\_\_\_\_

Indicate which LPR camera unit is viewing: \_\_\_\_\_

Weather:     Sunny     Partly Cloudy     Overcast     Other: \_\_\_\_\_

Wind conditions: \_\_\_\_\_                      Temperature: \_\_\_\_\_

Answer the following for only the first test run:

- 1. Observed results from graphical user interface:                       Yes     No
- 2. Contextual image:     Yes                       No
- 3. Plate image:                       Yes                       No
- 4. OCR:                       Yes                       No
- 5. Alert list notification:  Yes                       No
- 6. Time/date stamp:     Yes                       No

7. Location:             Yes             No

**LPR System Test Run Data Sheet (Page 2 – multiples of this page will be needed)**

*The Observer shall complete this page for each system under test.*

Test Identification: \_\_\_\_\_

Observer Name: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ (not from LPR clock)

Pass Identifier (Slate)	Start Time LPR Clock	End Time LPR Clock	Speed out	Speed back	Notes

**Appendix D. Test Run Start Checklist**

Prior to the test run, the Test Administrator shall verify readiness by checking the appropriate answers below:

(1) All personnel ready, including Observer, Vehicle Driver, and Speed Taker.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(2) SUT on and operational.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(3) START and END slates entered in alert list.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(4) LPR camera units masked, if necessary.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(5) Independent video camera in place.	<input type="checkbox"/> Yes	<input type="checkbox"/> No

The Test Administrator shall perform the following at the start of each pass of a test run:

(6) Initiate the test run.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(7) Activate independent video camera recording.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(8) Show START slate to SUT until an alert is sounded.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(9) Speak the SUT time of the alert and the pass identifier.	<input type="checkbox"/> Yes	<input type="checkbox"/> No

The Test Administrator shall perform the following at the end of each test run:

(10) Verify that LPR reads from the SUT were recorded.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(11) Stop recording on the independent video camera.	<input type="checkbox"/> Yes	<input type="checkbox"/> No