Technical Documentation Package

2.09 - System Maintenance Manual

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Version: 5.2CO.5

Date: 10-Mar-2017 17:06

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Please be advised that this document may make reference to the following DemocracySuite® functionalities:

- AIMS Data Translator
- Avalue tablets
- ImageCast® X DRE w/ VVPAT
- EMS Enterprise configuration
- Election Data Exchange Station (EDES)
- ImageCast® Evolution
- ImageCast® Evolution Dual Monitor functionality
- ImageCast® Listener
- ImageCast® Precinct
- ImageCast® Precinct Audio
- ImageCast® Precinct Ballot Marking Device (BMD)
- ImageCast® Precinct BMD Audio
- Rank Choice Voting (RCV)
- Recall Issues
- Mode 2 asymmetric cryptography
- Mode 3 asymmetric cryptography
- NYS General and Primary Ballot Template
- Modem and transmission functionality
- WinEDS Importer

These functionalities are not components of the current DemocracySuite® 5.2-CO certification campaign, and should be disregarded throughout the document.

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Revision history

Version	Date	Comment
Current Version(v. 5)	Mar 10, 2017 15:28	Nenad Peric: Added notice of confidentiality
v. 4	Mar 10, 2017 15:27	Nenad Peric: Added 5.2 information to all sections
v. 3	Mar 10, 2017 15:27	Nenad Peric: Added content
v. 2	Mar 10, 2017 15:27	Nenad Peric: Created document structure
v. 1	Mar 10, 2017 15:26	Nenad Peric

Sections in this document

- 2.9.1 Introduction
- 2.9.2 Maintenance Procedures
- 2.9.3 Maintenance Equipment
- 2.9.4 Parts and Materials
- 2.9.5 Maintenance Facilities and Support

1 2.9.1 Introduction

This chapter provides the following information, which includes a concept of operations that fully describes such items as the following, as specified in paragraph 2.9.1 of the VVSG 1.0 (2005) standard: Volume II.

- Electrical and Mechanical Functions
- Ballot Handling and Reading
- Vote Selection and Casting of Ballot
- Transmission of Data over Network
- Handling of Data in Processor and Memory Units
- Initiation and Control of Data Output
- Acquisition and Use of Test and Diagnostic Information

1.1 Electrical and Mechanical Functions

This subchapter describes the electrical and mechanical functions of the equipment, as specified in paragraph 2.9.1 of the VVSG 1.0 (2005) standard: Volume II, item a.

The ImageCast® X operates as Ballot Marking Device. It is based on COTS parts that include:

- Android device
- Laser printer
- Smart Card Writer/Reader

Optional components:

- ATI
- Tecla

Interactive accessibility is enabled with additional third-party components.

Accessible voting is provided by a Tecla or ATI device and additional accessories:

- Four-switch accessible device - joystick
- Two-switch accessible devices - paddles or sips & puff

In addition, a headset is included for audio voting sessions.

1.2 Ballot Handling and Reading

This subchapter describes how the processes of ballot handling and reading are performed, as specified in paragraph 2.9.1 of the VVSG 1.0 (2005) standard: Volume II, item b.

This does not apply to the ImageCast® X ballot marking platform.

1.3 Vote Selection and Casting of Ballot

This subchapter describes how vote selection and casting of the ballot are performed, as specified in paragraph 2.9.1 of the VVSG 1.0 (2005) standard: Volume II, item c.

Vote selection is done by allowing the voter to select voting options using a touch-based interface on the touch-screen of the tablet.

Accessible voting is provided by allowing a voter to listen and/or view the voting options and select their choices using a combination of accessible devices.

Once a voter has finished making their selections, a laser printer produces a ballot that is handled as all other paper ballots.

1.4 Transmission of Data over Network

This subchapter describes how transmission of data over a network is performed, as specified in paragraph 2.9.1 of the VVSG 1.0 (2005) standard: Volume II, item d.

Currently, there is no transmission of data over a network.

1.5 Handling of Data in Processor and Memory Units

This subchapter describes how data is handled in the processor and memory units, as specified in paragraph 2.9.1 of the VVSG 1.0 (2005) standard: Volume II, item e.

Currently, no results data is stored on the system.

1.6 Initiation and Control of Data Output

This subchapter provides the following information for how data output is initiated and controlled, as specified in paragraph 2.9.1 of the VVSG 1.0 (2005) standard: Volume II, item f:

Results data is not stored in the system. It is producing marked paper ballots.

1.7 Acquisition and Use of Test and Diagnostic Information

This subchapter describes how test and diagnostic information is acquired and used, as specified in paragraph 2.9.1 of the VVSG 1.0 (2005) standard: Volume II, item h.

The ImageCast® X System is based on COTS modules. All Test and the Diagnostic information are provided by components vendors.

2 2.9.2 Maintenance Procedures

2.1 2.9.2.1 Preventive Maintenance Procedures

This chapter defines the following Preventive Maintenance Procedures, as specified in paragraph 2.9.2.1 of the VVSG 1.0 (2005) standard: Volume II:

- Equipment Utilized
- Software/Firmware Updates
- Battery Care and Service
- Confirming Correct Software Versions
- Personnel and Skills Required
- Preventive Maintenance Schedule

This includes the following information for each of the above procedures:

- Task(s) - please see the above list.
- Personnel required - the above Tasks require a Maintenance Technician. For more detailed information on the skills required, please see 2.10 Democracy Suite® Personnel Deployment & Training Requirements: Personnel: Preventive Maintenance Tasks.
- Maintenance tasks to be coordinated with Dominion Voting Systems - none

2.1.1 Equipment Utilized

All parts of ImageCast® X ballot marking platform are as follows:

- ImageCast® X (device) - Samsung Galaxy Note PRO 12.2 Wi-Fi SM-P900
- ImageCast® X (device) - aValue 15.6" or 21.5"
- Smart Card Reader/Encoder - Advanced Card Systems Holdings Limited
- Sphere - Armadillo sphere with enclosure
- Printer:
    - Canon LBP151dw
- Tecla: Device for ADA voters:

- Paddles
- Joystick
- Audio
- Sip & puff
- Headphones
- ATI: Device for ADA voters:
  - Paddles
  - Audio
  - Sip & puff
  - Headphones

The ImageCast R X ballot marking platform components are easy to maintain because of modern plastics and durable finishes. The recommended maintenance procedures include:

- Storing ImageCast® X equipment in a dry, clean environment
- Keeping the batteries charged
- Checking the ImageCast® X devices' battery status on a regular basis.

2.1.2 Software/Firmware Updates

The following update processes apply to both Voting System Test Lab and jurisdictions using the ImageCast® X whenever an update on a system release is required.

- Incorporating hardware upgrades - new hardware upgrades are installed by Dominion Voting Systems-supplied Maintenance Technicians.
- Incorporating new software releases - new software releases are installed by Dominion Voting Systems-supplied Level 1 technician.

2.1.3 Battery Care and Service

This subchapter defines the following tasks to be performed for Battery Care and Service, as specified in paragraph 2.9.2.1 of the VVSG 1.0 (2005) standard: Volume II, item a:

- Battery care
- Charging the battery
- Disposal of used batteries

Battery Care

It is recommended by Dominion Voting Systems to include electrical wiring to the storage area so the ImageCast® X device, Tecla, and Server may be plugged into AC power for battery charging periodically.

To maximize battery life and performance it is important that devices stored in a storage area are turned off and battery charging is performed periodically.

ImageCast® X Battery Care

Battery charging can be performed while the ImageCast R X devices are stored by making part of the warehouse procedure to connect power cords to each ImageCast® X device and to a switched AC power source.

In the worst case, fully discharged batteries take up to 12 hours to recharge. Dominion Voting Systems recommends that the warehouse is equipped with switched AC power for the storage area and that each device is charged for 12 hours each month, to ensure they are ready for use.

Tecla Battery Care

Battery charging can be performed while Tecla devices are stored by making part of the warehouse procedure to connect power cords to each Tecla device and to a switched AC power source. Dominion Voting Systems recommends that the warehouse is equipped with switched AC power for the storage area and that each device is charged for 12 hours each month, to ensure that they are ready for use.

Charging the Battery

Charging the ImageCast® X Battery

To charge ImageCast® X device's internal battery, the device must be plugged into an AC power outlet. While the ImageCast® X device is connected to AC power and charging, the battery image briefly displays on screen to indicate that charging is in progress. Dominion Voting Systems recommends that you perform the charging procedure on the ImageCast R X device once a month and for a charging duration of 12 hours.

Charging the Tecla Battery

To charge the Tecla device internal battery, the Tecla device must be plugged into AC power. While the Tecla device is connected to AC power for charging, the orange light indicator appears to indicate that battery charging is in progress.

Disposal of Used Batteries

Dispose of used batteries according to the manufacturer's instructions where applicable. The ImageCast® X device and Tecla device use internal batteries. If a laptop computer is used as a server, the laptop computer has a replaceable battery.

> ⚠ **Caution**
>
> Danger of explosion if the battery is not correctly disposed of.

Battery Care

It is recommended by Dominion Voting Systems to include electrical wiring to the storage area so the ImageCast® X device, Tecla, and Server may be plugged into AC power for battery charging periodically.

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ImageCast® X Battery Care

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In the worst case, fully discharged batteries take up to 12 hours to recharge. Dominion Voting Systems recommends that the warehouse is equipped with switched AC power for the storage area and that each device is charged for 12 hours each month, to ensure they are ready for use.

Tecla Battery Care

Battery charging can be performed while Tecla devices are stored by making part of the warehouse procedure to connect power cords to each Tecla device and to a switched AC power source. Dominion Voting Systems recommends that the warehouse is equipped with switched AC power for the storage area and that each device is charged for 12 hours each month, to ensure that they are ready for use.

Charging the Battery

Charging the ImageCast® X Battery

To charge ImageCast® X device's internal battery, the device must be plugged into an AC power outlet. While the ImageCast® X device is connected to AC power and charging, the battery image briefly displays on screen to indicate that charging is in progress. Dominion Voting Systems recommends that you perform the charging procedure on the ImageCast R X device once a month and for a charging duration of 12 hours.

Charging the Tecla Battery

To charge the Tecla device internal battery, the Tecla device must be plugged into AC power. While the Tecla device is connected to AC power for charging, the orange light indicator appears to indicate that battery charging is in progress.

Disposal of Used Batteries

Dispose of used batteries according to the manufacturer's instructions where applicable. The ImageCast® X device and Tecla device use internal batteries. If a laptop computer is used as a server, the laptop computer has a replaceable battery.

> ⚠ **Caution**
>
> Danger of explosion if the battery is not correctly disposed of.

2.1.4 Confirming Correct Software Versions

This subchapter defines the procedures for confirming the ImageCast® X software components are the correct state-certified and Dominion Voting Systems verified versions.

Check the version numbers of the following software components

- Device model and build
- ImageCast® X application
- Google Text-to-speech engine

This feature is accessible from the device's **Settings** screen and is intended for county workers. It shows the software version number for the ImageCast® X ballot marking platform device model number, used software components versions and ImageCast® X application version.

Device Model and Build

Use the following procedure:

1. From the device's Home screen or Applications screen, go to Settings.

2. In the Settings screen, tap the General tab.

3. In the General tab, tap About device.

4. In the Details about device screen, confirm the version numbers for the model number, and build number.

5. The ImageCast R X ballot marking platform is tested and verified to work on devices with the following:

   a. aValue 15.6" and 21.5" model number - byt_t_crv2

   b. aValue 15.6" and 21.5" build number - KTU84P.BCX11-V0.0.98 dev-keys

   c. Note Pro model number - SM-P900

   d. Note Pro build number - KOT49H.P900XXUAOB1

ImageCast R X application

Use the following procedure:

1. From the device's **Home** screen or **Applications** screen, go to **Settings**.

2. In the **Settings** screen, tap the **General** tab.

3. In the **General** tab, tap **Application manager**.

4. In the **Application manager** details screen, tap **ImageCast® X**.

5. In **App info** screen for **ImageCast® X**, confirm the version number is **5.2**

Google Text-to-speech engine

Use the following procedure:

1. From the device's **Home** screen or **Applications** screen, go to **Settings**.

2. In the **Settings** screen, tap the **General** tab.

3. In the **General** tab, tap **Application manager**.

4. In **Application manager details** screen, tap **Google Text-to-speech** engine.

5. In App info screen for Google Text-to-speech engine, confirm the version number is **3.8.16**

2.1.5 Personnel and Skills Required

The skill level required for the individual preventive maintenance tasks is indicated in table 3.1.

Maintenance Task	Skill Level Required	Number of Persons
Internal Battery Charging	Level 0	1
Printer cartridge (toner) replacement	Level 0	1
Software/firmware update	Level 1	1

2.1.6 Preventive Maintenance Schedule

There are several maintenance procedures that need to be completed on schedule. The following schedule outlines the activities and when they should be performed.

1. On a monthly basis - recharge the ImageCast® X component's batteries.

2. Once every three months - inspect system parts and functions.

3. Prior to each election:

    a. Perform maintenance diagnostics

    b. Perform the Pre-LAT

4. Following the election - recharge the system component's batteries.

Procedures to Be Performed Once a Month

The Preventive Maintenance procedure to be performed once a month includes recharging the system component's batteries as per sub-section Charging the Battery.

Procedures to Be Performed Once Every Three Months

The Preventive Maintenance procedure to be performed once a month includes recharging the system component's batteries as per subsection Charging the Battery .

Preparing ImageCast® X Ballot Marking Platform for an Election

This subchapter defines the Preventive Maintenance procedures for preparing the ImageCast® X ballot marking platform for an election. For the following preparatory procedures, please see 2.08 - System Operations Procedures.

Procedures to Be Performed After the Devices Return from an Election

This subchapter defines the Preventive Maintenance procedure to be performed after the ImageCast® X ballot marking platform device's return from an election.

1. Check the units for shipping damage. Check for broken or missing legs, power cords and anything else associated with the devices.

2. Power-up the unit and check the LCD/touchscreen assembly for proper operation and cleanliness.

3. Charge the battery for 12 hours.

2.2 2.9.2.2 Corrective Maintenance Procedures

This chapter identifies the following Corrective Maintenance Procedures, as specified in paragraph 2.9.2.2 of the VVSG 1.0 (2005) standard: Volume II:

- Steps to Replace Failed/Deficient Equipment
- Steps to Correct Deficiencies/Faulty Operations in Software
- Necessary Modifications for Software Coordination
- 2.09 Personnel and Skills Required
- Maintenance Tasks to Be Coordinated with Dominion Voting Systems

2.2.1 Steps to Replace Failed/Deficient Equipment

These steps can be performed by Level 1 technician:

- Diagnosis of Faulty Hardware
- Testing to Verify Correction of Problems

2.2.2 Steps to Correct Deficiencies/Faulty Operations in Software

These steps can be performed by Level 1 technician:

- Diagnosis of Faulty Software

- Testing to Verify Correction of Problems

2.2.3 Necessary Modifications for Software Coordination

Please see section Software/Firmware Updates.

2.2.4 2.09 Personnel and Skills Required

The skill level required for the individual corrective maintenance tasks is indicated in the table.

Maintenance Task	Skill Level Required	Number of Persons
Battery Replacement	Level 1	1
Aligning and Testing the Voter Card Reader	Level 0	1
Diagnosis of Faulty Software	Level 1	1
Testing to Verify Correction of Problems	Level 1	1
Printer cartridge (toner) replacement	Level 0	1

2.2.5 Maintenance Tasks to Be Coordinated with Dominion Voting Systems

For replacement parts, please contact Dominion Voting Systems at:

Dominion Voting Systems
215 Spadina Ave., Suite 200
Toronto, Ontario, Canada
Telephone: 416-762-8683
Facsimile: 416-762-8663

IMPORTANT: These procedures should be performed by a Maintenance Technician.

WARNING! When disassembling the system, or replacing components, verify that the system is disconnected from the AC power outlet.

Troubleshooting the ImageCast R X ballot marking platform is not an exact science, but more an exercise in common sense. It is a dynamic process of diagnostics, followed in a logical sequence that ultimately yields solutions to problems.

This chapter describes common problems and possible solutions, along with discussions on skill levels and tools to aid in problem resolution.

Rule number one in troubleshooting is to always look for the obvious. For example, you would not tear your machine apart looking for a defective power supply until you are satisfied that the wall outlet you are plugged into is working. A good trouble shooting technique is a step-by-step process of elimination, beginning with the most obvious.

Dominion Voting Systems prescribes the part swapping method as a way to isolate problems. You may suspect that you do have a problem with the power supply. By swapping out the suspect assembly with a known good unit you have a good chance of isolating the problem. You can use this process for practically any assembly in the system. When you have successfully isolated the defective part, Dominion Voting Systems will aid you in securing a replacement, or you may have spares in stock to use to affect the repair.

3 2.9.3 Maintenance Equipment

ImageCast® X does not require any special maintenance equipment other than what is listed in 2.9.4 Parts and Materials and 2.9.5 Maintenance Facilities and Support.

4 2.9.4 Parts and Materials

This chapter provides detailed documentation of the parts and materials needed to operate and maintain the system, as specified in paragraph 2.9.4 of the VVSG 1.0 (2005) standard: Volume II:

- Common Standards
- Paper-Based Systems - N/A

The supplies and spare parts listed in this chapter are items that will normally require replacement because of usage, loss, or wear out. It is recommended that a customer has a quantity in stock.

For parts and materials, please contact Dominion Voting Systems at:

Dominion Voting Systems
215 Spadina Ave., Suite 200
Toronto, Ontario, Canada
Telephone: 416-762-8683
Facsimile: 416-762-8663

4.1 Parts List

4.1.1 Samsung Galaxy Note Pro 12.2

- One (1) Multipurpose paper pack, 8 1/2" x 11", 24 Lb, ream of 500 sheets
- One (1) Power supply (6.3VDC Adaptor)
- One (1) Lava Link Interface unit
- One (1) USB-A to USB-B cord (printer cable)
- Two (2) USB-A to micro USB-B cords
- One (1) Appropriate laser printer cartridge toner
- One (1) Set of headphones with 3.5 mm stereo jack

4.1.2 aValue 15.6" and 21.5"

- One (1) Multipurpose paper pack, 8 1/2" x 11", 24 Lb, ream of 500 sheets
- One (1) Power cable
- One (1) USB-A to USB-B cord (printer cable)

- Two (2) USB-A to micro USB-B cords

- One (1) Appropriate laser printer cartridge toner

- One (1) Set of headphones with 3.5 mm stereo jack

5 2.9.5 Maintenance Facilities and Support

The vendor shall identify all facilities, furnishings, fixtures, and utilities that will be required for equipment maintenance. In addition, vendors shall specify the assumptions made with regard to any parameters that impact the mean time to repair. These factors shall include at a minimum:

- Recommended number and locations of spare devices or components to be kept on hand for repair purposes during periods of system operation

- Recommended number and locations of qualified maintenance personnel who need to be available to support repair calls during system operation

- Organizational affiliation (i.e., jurisdiction, vendor) of qualified maintenance personnel

The measured Availability is greater than 99.5% in implementation These measurements were obtained under situations where:

- MTTR was 0.66 hours.

- The ratio of spare machines to operational machines was 10%.

- One technician was allocated for each set of 25 machines.

- No technician was more than one hour transit time from any unit.

- All technicians used the Help Desk for any action.

- Help Desk support of one person was provided for every ten technicians.

Help Desk staff must be vendor staff. Field Technicians can be vendor staff, but third party staff or jurisdiction staff can attain accreditation by taking training courses offered by the vendor.

All facilities, furnishings, fixtures, and utilities that are required for equipment maintenance are described in 2.9.2.1 Preventive Maintenance Procedures, 2.9.2.2 Corrective Maintenance Procedures, and 2.9.4 Parts and Materials.

Details for Operations Support are provided in 2.8.6 Operations Support.