

# JCM<sup>®</sup> TRAINING OVERVIEW

DBV<sup>®</sup> Series  
DBV-400 Banknote Validator

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# DBV-400 Banknote Validator

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# OVERVIEW

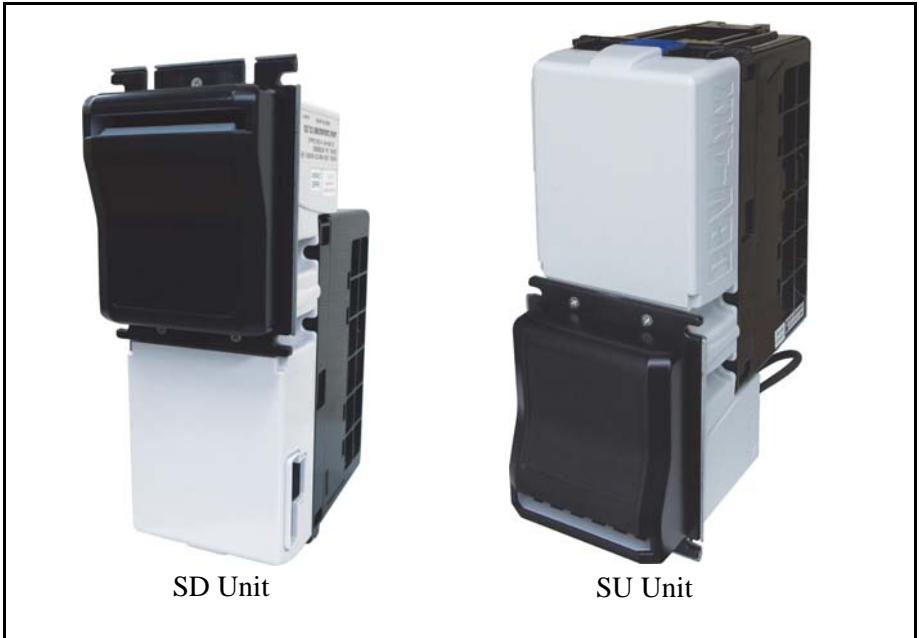
This training course addresses the following JCM DBV-400 device versions:

**Table 1** DBV-400 Banknote Validator Versions

Device	Version Difference
DBV-400 SU	Upstack Unit
DBV-400 SD	Downstack Unit

## DBV-400 SU AND SD UNITS

Figure 1 illustrates the DBV-400 SD and SU Banknote Validator Units.



**Figure 1** Typical DBV-400 SD and SU Units

## Lecture Notes

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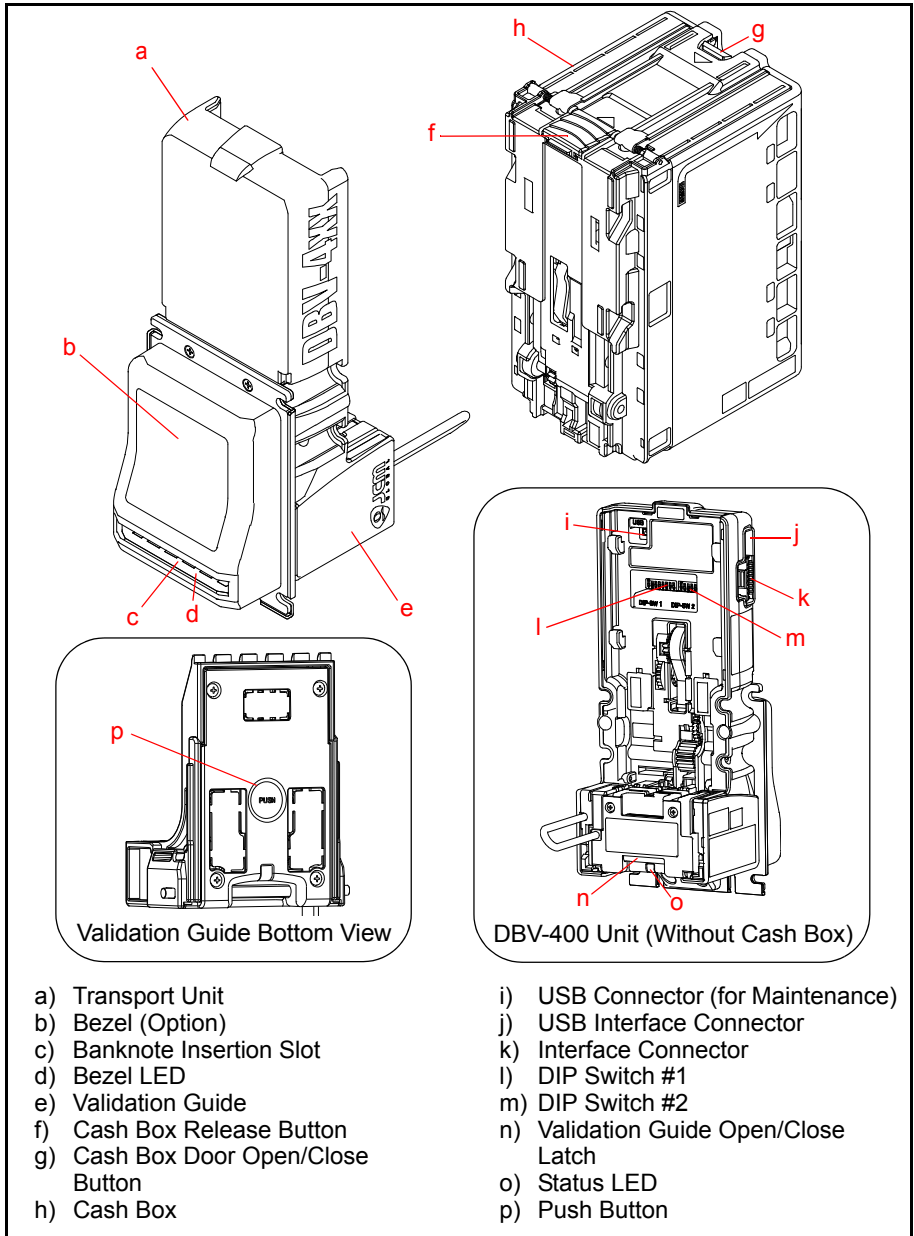
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# COMPONENT LOCATIONS

## COMPONENT NAMES

Figure 2 illustrates the DBV-400 Component Names and Locations.



**Figure 2** DBV-400 Component Names

## DIP SWITCH SETTINGS

Table 2 lists the default Configuration Settings for the DBV-400 DIP Switch Block #1.

**Table 2** DIP Switch Block #1 Configuration Settings\*

Switch No.	Switch ON	Switch OFF
1	VEND 1 INHIBIT	VEND 1 ACCEPT
2	VEND 2 INHIBIT	VEND 2 ACCEPT
3	VEND 3 INHIBIT	VEND 3 ACCEPT
4	VEND 4 INHIBIT	VEND 4 ACCEPT
5	VEND 5 INHIBIT	VEND 5 ACCEPT
6	VEND 6 INHIBIT	VEND 6 ACCEPT
7	OFF	OFF
8	TEST MODE	OFF (OPERATING MODE)

\* See the Software Information Sheet (SIS) for proper Switch Settings.

## COMMUNICATION SETTINGS

The DBV-400 Banknote Validator supports the following communication interface types:

- Photo-Coupler (9600 bps)
- Pulse
- TTL (38400 bps)
- USB 2.0\*
- RS-232C (38400 bps)

\* USB Communications requires an external harness for USB connection.

Table 3 lists the Configuration Settings for DIP Switch Block #2.

**Table 3** DIP Switch Block #2 Configuration Settings

Switch No	DIP Switch #2*								
	ID-003			ID-0D3		ID-002			
	Photo Coupler	TTL	RS-232C	Decimal Places=2 Scaling Factor=1	Decimal Places = 0 Scaling Factor = 1	50ms/ 300 ms	50ms/ 50ms	80ms/ 120ms	150ms/ 180ms
1	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	ON
2	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	ON
3	OFF	OFF	OFF	OFF	OFF	OFF - 1 Dollar = 1 Pulse ON - 1 Dollar = 4 Pulses			
4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
5	OFF	OFF	OFF	ON = Sleep Mode A† / OFF = Disabled **		OFF	OFF	OFF	OFF
6	OFF	OFF	OFF	ON = Sleep Mode B‡ / OFF = Disabled **		OFF	OFF	OFF	OFF
7	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON

\* For the correct DIP Switch Block #2 Settings for other protocols, check the Software Information Sheet (SIS) for the specific protocol.

† Sleep Mode A awakens when an External Signal is received from the Host.

‡ Sleep Mode B awakens when the Entrance Sensor detects a Banknote.

\*\*Sleep Mode Disabled = Both Switches 5 & 6 OFF / Sleep Modes A & B Enabled = Switches 5 & 6 ON.

## SETTING THE LED BEZEL DEFAULT COLOR SETTING

To set or change the LED Bezel default color setting, proceed as follows:



**NOTE:** Before changing settings, record the current settings of DIP Switches #1 through #8 in DIP Switch Block #2. These settings will need to be restored in order to complete this procedure.

1. Remove power from the DBV-400 Banknote Validator Unit.
2. Set the DBV-400 DIP Switch Block #1 (Switches #1, #4, #5, #6, #7 and #8) to ON.
3. Restore power to the DBV-400 Banknote Validator Unit.
4. Select the desired Solid Bezel LED Color by setting DIP Switch Block #2 as indicated in Table 4 below.



**NOTE:** To change the Bezel LED Color from a SOLID ON to a Flashing (ON/OFF) display, set the DIP Switch Block #2 Switches (Table 4) ON for the desired LED Color, then set Switch #8 ON to enable the Flashing function for the selected LED Color.

**Table 4 LED Bezel Color Settings**

Bezel LED Color	DIP Switch Block #2 Settings							
	1	2	3	4	5	6	7	8
GREEN	ON							
CYAN		ON						
BLUE			ON					
MAGENTA				ON				
WHITE					ON			
YELLOW						ON		
RED							ON	
GRADIENT (FADING)	ON	ON	ON	ON	ON	ON	ON	
LED OFF	ON	ON	ON	ON	ON	ON	ON	ON

5. Set DIP Switch Block #1 Switch #8 to OFF to save the Bezel LED color configuration.
6. Remove power from the DBV-400 Banknote Validator Unit.
7. Reset all DIP Switch settings on DIP Switch Block #1 and Block #2 to the original settings.



**NOTE:** The DBV-400 Bezel LED Color can also be changed by pressing the PUSH Button (refer to Figure 2 p on Page 4) on the bottom of the Unit. Each time the button is pressed, the Bezel LED Color increments to the next color selection shown in Table 4.

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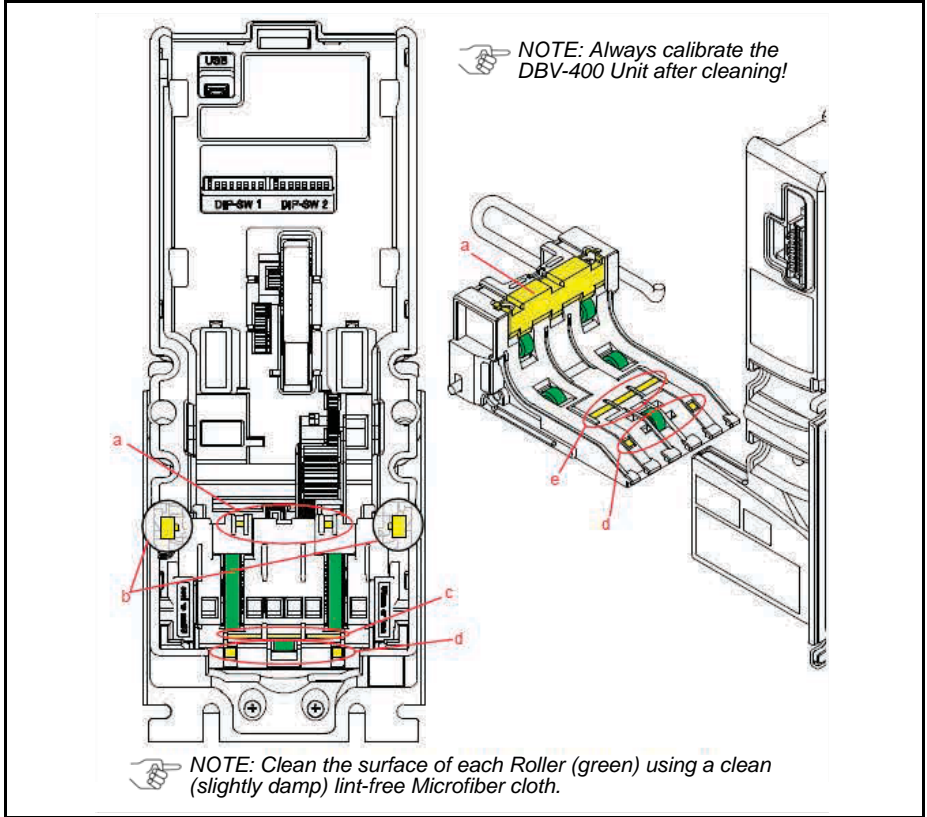
## SENSOR AND ROLLER CLEANING PROCEDURE

To clean the DBV-400 Unit, gently wipe the Sensors and Rollers using a clean (slightly damp) lint-free Microfiber cloth.



**NOTE:** DO NOT use Alcohol, solvents, citrus-based products or scouring agents. These items may cause damage to the Validation Section Sensors and Rollers.

1. Turn the DBV-400 Unit Power OFF.
2. Remove the Validation Guide.
3. Clean the Lens of each Sensor (yellow) and the Rollers (green). (See Figure 3 for Locations and Table 5 for Cleaning Methods.)
4. Calibrate the DBV-400 Unit after cleaning.



**Figure 3** DBV-400 Sensor and Roller Locations

**Table 5** DBV-400 Sensor and Roller Cleaning Methods

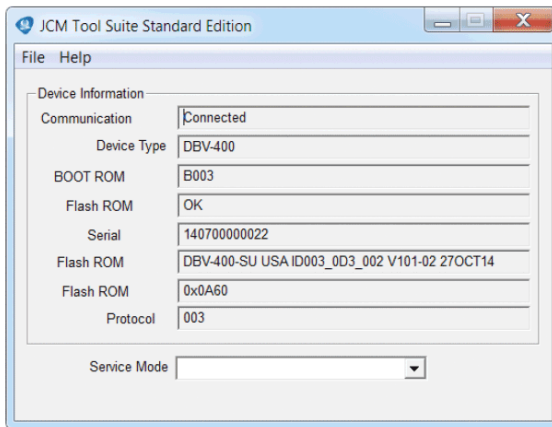
Label	Sensor Description	Cleaning Method
a	Exit Sensor	Wipe Sensors (yellow areas) clean using a clean (slightly damp) lint-free Micro-fiber cloth.  Wipe Rollers (green areas) clean using a clean (slightly damp) lint-free Microfiber cloth.
b	Side Sensor	
c	Inside Sensor	
d	Entrance Sensor	
e	Outside Sensor	

## JCM TOOL SUITE STANDARD EDITION

Figure 4 illustrates the JCM Tool Suite Standard Edition's Main Screen.



*NOTE: For DBV-400, JCM Tool Suite Version 1.29 or higher is required.*



**Figure 4** JCM Tool Suite Main Screen

The JCM Tool Suite Standard Edition supports the following operational modes and User-selectable Functions, under the “Service Mode” drop-down Menu:

The available Service Mode Functions include:

- Normal Mode or Operational Mode (All DIP Switch Block #1 Switches = OFF):
  - Download
  - Statistics
  - Event Log View
- Test Mode (DIP Switch Block #1 Switch #8 = ON):
  - Download
  - Statistics
  - Sensor Adjustment
  - Performance Test
  - Event Log View



*NOTE: All Diagnostics Tests can also be performed by setting various DIP Switch settings. For more information on setting the DIP Switches for testing, refer to Section 6 of the DBV® Series DBV-400 Operation and Maintenance Manual (P/N 960-000180R {EDP #233427}).*

Use a Standard USB Type-A to Mini-B Cable between the PC and DBV-400.

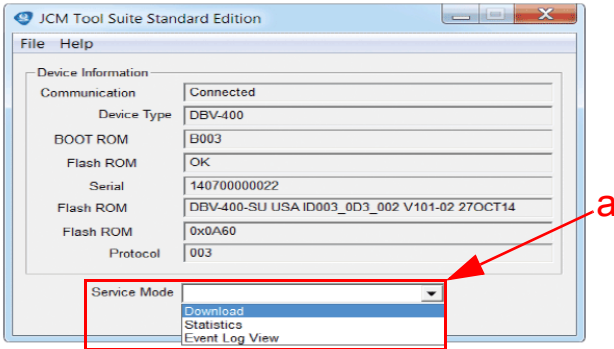
1. Remove the Cash Box.
2. Connect the Mini-B cable to the USB Port by the DIP Switches.
3. Connect the Type-A connector to the USB Port on the PC.
4. Apply power to the DBV-400 Unit.
5. Open the JCM Tool Suite Application. When connected, the Device Information Fields will be filled in, as shown in Figure 4.



## SOFTWARE DOWNLOAD PROCEDURE

To update the Software Version in the DBV-400 Unit:

1. Click the “Service Mode” drop-down menu (Figure 5 a), then click Download.



**Figure 5** JCM Service Mode Drop-Down Menu

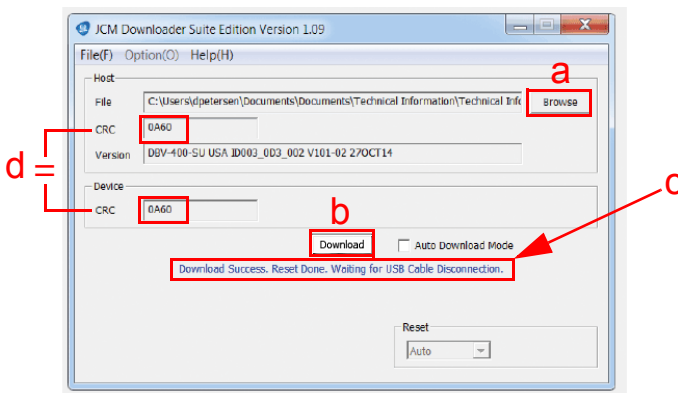
The JCM Downloader Suite Edition display appears (Figure 6).

2. To select the file to download, click Browse  (Figure 6 a).
  3. From the folder that contains the DBV-400 download file, click the DBV-400 Download file name, then click the Open  screen button.
- The JCM Downloader Suite Edition display reappears.
4. Click Download  to start the file transfer (Figure 6 b).



*NOTE: A Blue Barograph will display the download progression. When downloading is complete, the **Download Success, Reset Done, Waiting for USB Cable Disconnection** Message is displayed (Figure 6 c).*

5. Verify that the Host CRC and Device CRC values are identical (Figure 6 d).



**Figure 6** Downloader Suite Display

6. Disconnect the USB Cable used for the Download, and remove power from the DBV-400 Unit.
7. Set the DIP Switches on the DBV-400 Unit to the Operational position.



*NOTE: If the DBV-400 Software becomes corrupted or is not installed (e.g., when changing the CPU Circuit Board), set forced Download Mode by setting DIP Switch Block #1 Switches #6, #7 and #8 ON. (The DIP Switches are located behind the Cash Box; remove the Cash Box to gain access).*

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## CALIBRATION

Calibration of the DBV-400 Unit needs to be performed when any of the following conditions occur:

- When removing and replacing the CPU Circuit Board
- When removing or replacing any Sensors or Sensor Boards
- After cleaning the DBV-400 Unit
- If the Banknote Acceptance rate has decreased.



**NOTE:** KS-095A Reference Paper is specified for use when calibrating the DBV-400.

## VALIDATION SENSOR CALIBRATION

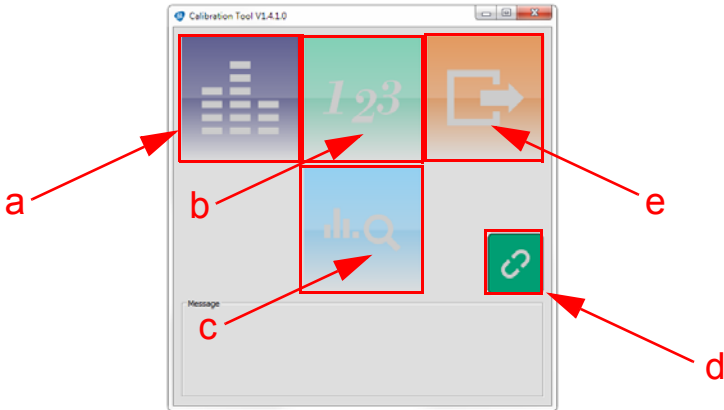
To perform the DBV-400 Validation Sensor Calibration procedure:

1. Disconnect power from the DBV-400 Unit.
2. Set DIP Switch Block #1, Switch # 8 to ON.
3. Restore power to the DBV-400 Unit.



**NOTE:** The DBV-400 Unit's Front Bezel LED will flash **Green**.

4. Connect the USB Type-A to Mini-B cable between your PC's USB port and the Maintenance USB port located on the DBV-400 Unit (Figure 2 i).
5. Launch the "JCM Tool Suite Standard Edition" software application.
6. Click the Service Mode drop-down menu, then click Sensor Adjustment.
7. Confirm that the DBV-400 Calibration Tool is running, as shown in Figure 7.



**Figure 7** DBV-400 Calibration Tool

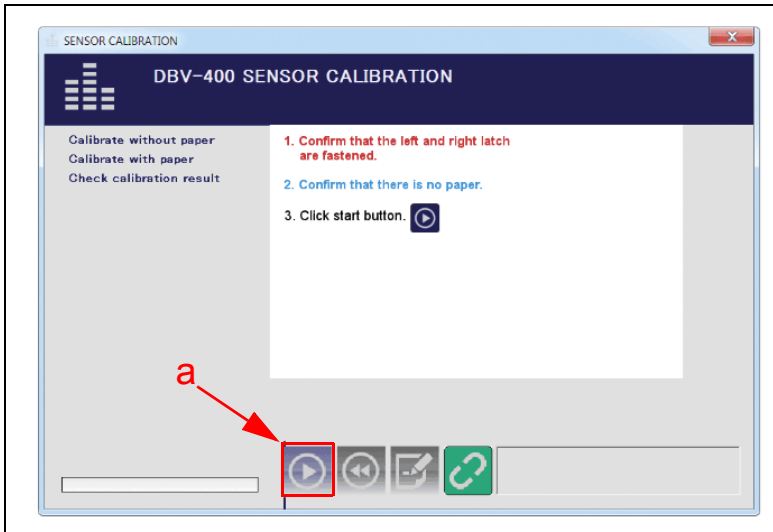
**Table 6** DBV-400 Sensor Calibration Tool Functions

Label	Sensor Description
a	Sensor Calibration Start
b	Serial Number Setting
c	White Level Test
d	USB Connected Indicator
e	Exit Calibration Tool

8. Click the Sensor Calibration function screen button (Figure 7 a).  
The Sensor Calibration screen appears momentarily (refer to Figure 8).



*NOTE: Bill Guides (if installed) will need to be removed.  
Bezel (if installed) will need to be removed.*



**Figure 8** DBV-400 Sensor Calibration Function

9. Follow the onscreen prompts and click the Start button (Figure 8 a) to begin the DBV-400 Validation Sensor Calibration.

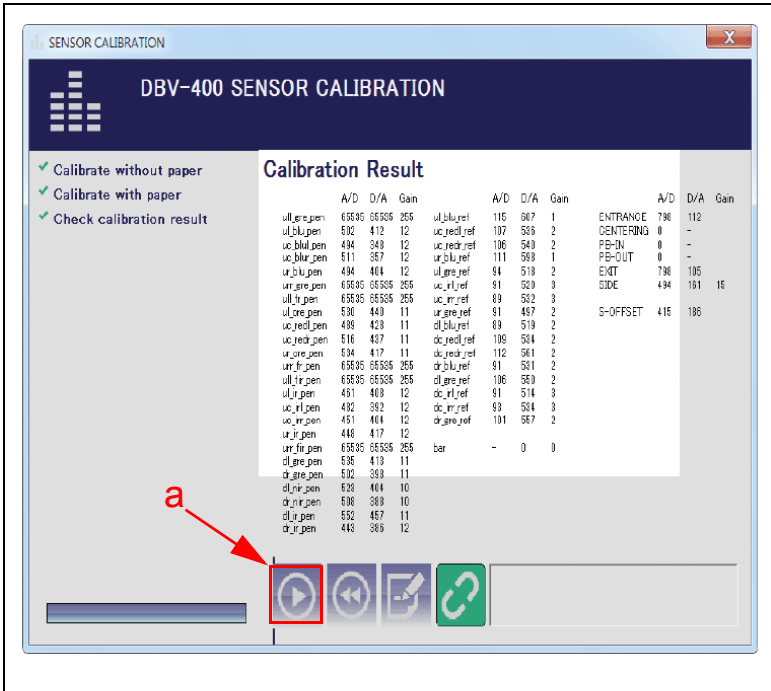


*NOTE: KS-95A Reference Paper must be used for Calibration of the DBV-400.*


10. When prompted to Change Serial Number?, click Yes if the Serial Number recorded on the CPU Circuit Board needs to be changed; otherwise, click No to complete Calibration.

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11. When the Sensor Calibration Screen appears (Figure 9), click the Start button (Figure 9 a) to save the Calibration Settings to EEPROM.



**Figure 9** DBV-400 Sensor Calibration Results

12. When the "Write EEPROM Succeeded" prompt appears, click the "OK" screen button to close the screen. Then click the Close box  to close the Sensor Calibration Screen and complete the Calibration process.

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# PERFORMANCE TESTING PROCEDURES


## PERFORMANCE TESTING

### Available Tests Using the JCM Tool Suite Application

 *NOTE: Additional tests are available using DIP Switch Performance Testing Procedures.*


- Transport Motor Normal Rotation
- Transport Motor Reverse Rotation
- Stacking
- Sensor Test
- DIP Switch 1 Test
- DIP Switch 2 Test
- LED Test

To run Performance Tests, proceed as follows:

1. Disconnect the DBV-400 Unit from its power source.
2. Set DIP Switch Block #1, Switch #8 ON.
3. Reconnect the the DBV-400 Unit to its power source.
4. Remove the DBV-400 Unit’s Cash Box to access the Maintenance USB Port.
5. Connect a USB Type-A to Mini-B cable between the PC’s USB Port and the DBV-400 Maintenance USB Port.
6. Launch the “JCM Tool Suite Standard Edition” software application.
7. Click the Service Mode drop-down menu, then select Performance Test (refer to Figure 10 on the following page).
8. Click on the desired Performance Test in the left column (e.g., STACK TEST).
9. Click the “Start”  Button to begin the Performance Test.

Test Results are displayed in the Performance Test window (right column).

10. Click the “Stop” Button to end the selected Performance Test.

 *NOTE: Repeat Steps 8 through 10 above to run additional Performance Tests.*

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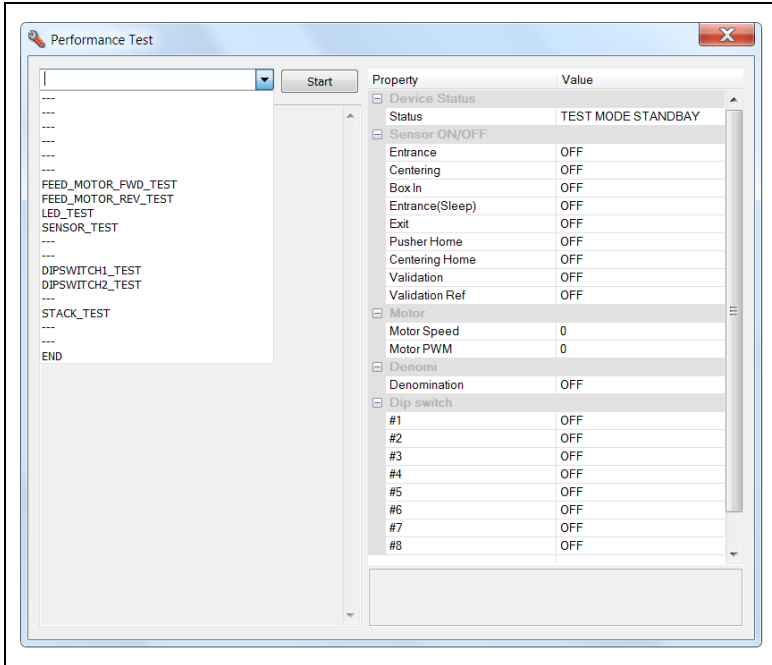
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The Performance Test window appears as shown below.



**Figure 10** JCM Tool Suite Performance Test Window



**NOTE:** To test the Pusher Home Sensor:

1. Start the "Sensor Test" in the Performance Test Window.
2. Run the "Stacking Test" with DIP Switch #3 ON and DIP Switch #8 OFF to cycle the Stacker.
2. Verify that the Pusher Home LED Value changes from OFF to ON as the Stacker cycles.

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## PERFORMANCE TESTING

### Available Tests Using DIP Switch Block #1

Table 7 below lists the available Performance Tests using DIP Switch Block #1, and the settings required for each test.

To run Performance Tests using DIP Switch Settings, proceed as follows:

1. Disconnect the DBV-400 Unit from its power source.
2. Remove the DBV-400 Unit's Cash Box.
3. Set DIP Switch Block #1, Switch #8 ON.
4. Reconnect the the DBV-400 Unit to its power source.
5. Set the appropriate DIP Switch(es) to ON as shown in Table 7.
6. Set DIP Switch Block #1, Switch #8 OFF to begin the Performance Test.
7. Confirm correct operation.
8. Set DIP Switch Block #1, Switch #8 ON to end the selected Performance Test.



**NOTE:** To perform the Acceptance Test:  
 1. Turn DIP Switch Block #1 Switch 8 OFF.  
 2. Set the Cash Box onto the DBV-400 Unit.  
 The Acceptance Test will begin automatically.

**Table 7** Performance Tests Using DIP Switch Settings

Test Item	DIP Switch Block #1 Settings								Test Description
	1	2	3	4	5	6	7	8	
Transport Motor Normal Rotation	ON							Enable/Disable	Normal Rotation Speed Test
Transport Motor Reverse Rotation		ON						Enable/Disable	Reverse Rotation Speed Test
Stacking Test			ON					Enable/Disable	Stacking Mechanism Test
Aging Test				ON				Enable/Disable	Full Cycle (see Table 6-5 for interval)
Sensor Test*							ON	Enable/Disable	Test for Each Sensor†
Acceptance, w/ Validation	ON	ON	ON	ON				Enable/Disable	Acceptance with Validation
Acceptance, No Validation	ON	ON	ON	ON		ON		Enable/Disable	Acceptance without Validation
Reject Test	ON	ON	ON	ON	ON		ON	Enable/Disable	Accept and Reject without Validation
DIP Switch #1 Test	ON	ON	ON	ON	ON	ON	ON	Enable/Disable	DIP Switch #1 function check
DIP Switch #2 Test		ON	ON	ON	ON	ON	ON	Enable/Disable	DIP Switch #2 function check
Bezel Status LED Test				ON	ON	ON	ON	Enable/Disable	Status LED function check
Bezel LED Test	Use Push Button on Validator (Bottom)								Bezel LED function check

\* Refer to Table 8 - Sensor Test Procedure and Confirmation on the following page.

† See Figure 2 on page 4 and Figure 3 on page 7 for the component names and sensor locations, respectively.



**Table 8 Sensor Test Procedure and Confirmation**

Bezel LED Color State		Test Procedure*
Detected	Not Detected	
Red	Extinguished	Cover/uncover the Entrance Sensor using a Banknote.
Blue	Extinguished	Cover/uncover the Validation Sensor using a Banknote.
Yellow	Extinguished	Cover/uncover the Exit Sensor using a Banknote.
White	Extinguished	Push down/release the Cash Box DT Lever.(Box In Sensor).

\* Refer to "Component Names" on page 4 and "Sensor and Roller Cleaning Procedure" on page 7 for the component and sensor locations respectively.

## Lecture Notes

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## LED ERROR CODES

### STARTUP ERRORS

Startup Errors can occur during initial power up of the DBV-400 Unit. During Normal Operating Mode, the Bezel LED flashes white; in Performance Test Mode, however, the Bezel LED flashes white intervals. To identify the Startup Error, count the flashes between pauses, then consult Table 9 to determine the Error, Causes and Solutions.

**Table 9** DBV-400 Startup Errors, Causes and Solutions

Normal Operation	Performance Test	Error	Causes and Solutions
White (1)	White (1)	Boot Check	Boot Program incorrectly written - CPU Board
White (3)	White (2)	Boot I/F	Boot interface incorrectly written/No Operating Program - Download the software, CPU Board
White (3)	White (3)	CPU Internal RAM	RAM Reading/Writing Error, CPU Board
White (3)	White (4)	External SD RAM	SD-RAM Reading/Writing Error, Download Software, CPU Board
White (3)	White (5)	EEPROM	EEPROM Reading/Writing Error, Calibrate, CPU Board
White (3)	White (6)	Downloading File	Check file for DBV-400, Download proper software
White (3)	White (8)	DC Access	Sensors detected abnormal condition, Clean Sensors, check Stacker.

### OPERATIONAL ERRORS

Operational Errors can occur when the DBV-400 Unit is available to accept Banknotes, and are indicated by the Bezel LED Flashing **Red** or **Magenta**. An Operational Error automatically takes the DBV-400 Unit Out of Service until the error is corrected. To identify the Operational Error, count the flashes between pauses, then consult Table 10 to determine the Error, Causes and Solutions.

**Table 10** DBV-400 Operational Errors, Causes and Solutions

Normal Operation	Performance Test	Error	Causes and Solutions
Red (1)	Red (1)	Stacker Motor Lock	Stacker Motor Speed Error
Red (3)	Red (2)	Pusher Position	Pusher Mechanism not at Home Position
Red (3)	Red (3)	Banknote Jam (Cash Box)	Jam at the Cash Box
Red (3)	Red (4)	Transport Motor Speed	Transport Motor speed incorrect
Red (3)	Red (5)	Transport Motor Lock	Transport Motor inoperative
Red (3)	Red (6)	Fraud Detected	Sensors detected Banknote with abnormal timing

**Table 10** DBV-400 Operational Errors, Causes and Solutions (Continued)

Normal Operation	Performance Test	Error	Causes and Solutions
Magenta (3)	Magenta (1)	Cash Box Full	Empty Cash Box
Magenta (3)	Magenta (2)	Cash Box Removed	Re-seat the Cash Box
Magenta (3)	Magenta (3)	Banknote Jam (Transport)	Banknote accepting/rejecting Sensor blocked

## BANKNOTE REJECT ERRORS

Banknote Reject conditions are indicated by the Bezel LED Flashing Yellow or Green. To identify the Banknote Reject Error, count the flashes between pauses, then consult Table 11 to determine the Error, Causes and Solutions.

**Table 11** DBV-400 Banknote Reject Errors, Causes and Solutions

Normal Operation	Performance Test	Errors	Causes and Solutions
LED Sequence	LED Sequence		
Yellow (2)	Yellow (2)	Magnification Error	Sensors detected improper levels
Yellow (3)	Yellow (3)	Denomination Error	Sensors detected an abnormal Banknote type
Yellow (4)	Yellow (4)	Pattern Error	Sensors detected an abnormal Banknote type
Yellow (5)	Yellow (5)	Photo Level Error	While transporting a Banknote, improper Sensor levels were detected
Yellow (6)	Yellow (6)	Banknote Length Error	Sensors detected the Banknote length was longer or shorter than the specified value
Yellow (7)	Yellow (7)	Pattern Error 1	Sensors detected improper Banknote pattern
Yellow (8)	Yellow (8)	Invalid Banknote Error	Sensors detected the Banknote as invalid
Yellow (9)	Yellow (9)	Pattern Error 2	Sensors detected improper Banknote pattern
Green (3)	Green (1)	Skewed Insertion Error	Banknote has been inserted in an incorrect or crooked direction
Green (3)	Green (2)	Remaining Banknotes Returned	While initializing, a Banknote was detected in the Unit
Green (3)	Green (3)	Transport Timeout Error	Sensors detected improper movement of a Banknote
Green (3)	Green (4)	Banknote Detection Error	Sensors detected a Banknote with abnormal timing
Green (3)	Green (5)	Inhibit Setting	Banknote has been inhibited by a DIP Switch Setting or Host command.
Green (3)	Green (6)	Return Commanded	Banknote was returned in response to a Host Command.

# DBV-400 PARTS LIST

**Table 12 DBV-400 Parts List**

EDP No.	JAC No.	Description
Use JAC # →	501-100218R	UAC Module
G00286	← Use EDP #	Universal Power Supply for UAC
GA0012	← Use EDP #	DBV-400 UAC Harness
Use JAC # →	400-000178R	DBV-400 RS-232 Harness
Use JAC # →	302-100007RA	Power Cord, 2-prong USA
Use JAC # →	302-000001R	USB Male-A to Mini-B Cable
238678	← Use EDP #	Calibration Reference Paper (KS-095A)
239641	← Use EDP #	Mainframe Disassembly Tool (8 Required)
239642	← Use EDP #	Cash Box Disassembly Tool (8 Required)



*NOTE: Product EDP Numbers that begin with "G" designate products developed by JCM-E Germany.*

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