IGT Part Number: 821-450-02

JCM Validator and Tester

Field Service Training Guide

Model DBV-45, 145 and 147

International Game Technology

Reno, Nevada

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About This Manual

The *JCM Validator and Tester Field Service Training Guide* contains information on various procedures performed on JCM-manufactured validators and VM-401 testers used by service technicians.

- **Section 1, JCM Validator** – gives introductory information, including component identification, about JCM validator models DBV-45, DBV-145 and DBV-147.

- **Section 2, Troubleshooting and Maintenance** – describes typical service procedures for both regular maintenance and error conditions like jammed bills.

- **Section 3, VM-401 Tester and Calibration Procedures** – outlines the steps taken to make adjustments to critical functions of the JCM bill acceptor with the use of the VM-401 tester unit.

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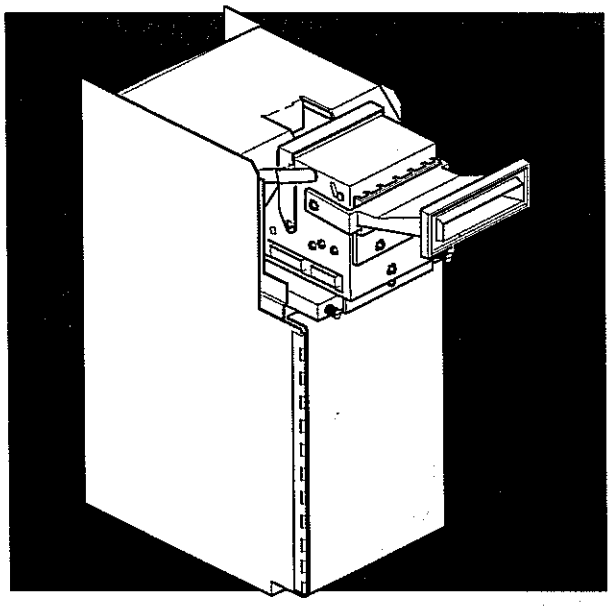


Section 1

JCM Validator

Models DBV-45, DBV-145 and DBV-147

❑ Overview

A bill acceptor is a device that allows the machine to issue credits in exchange for selected paper currency. It is enabled only when the game is in the idle mode and the machine door is closed. The validator will not accept bills during game play or when the number of credits on the credit meter is greater than or equal to the maximum credits allowed.

Credits are accumulated on the credit meter when a bill is accepted. The game software determines the maximum number of credits a player may accumulate on the credit meter.

A typical bill acceptor transaction consists of five steps: bill detection, transport, recognition, validation and storage.

When a bill is inserted into the validator portion of the bill acceptor, it breaks a light sensor path. This causes the microprocessor to enable the sensors and start the gearbox/motor assembly. As the bill is pulled into the assembly, the reflective and transmissive sensors optically scan the bill and transmit data to the microprocessor. A magnetic sensor also scans the bill for correct magnetic properties.

Once the magnetic and optical parameters have been determined, the motor stops and the microprocessor determines if the bill matches predetermined criteria for valid currency. If a match is not determined, the motor direction reverses and the bill is rejected and returned through the slot in the front of the validator. If a match is determined, the bill is accepted and transported to the stacker assembly for storage and the **CREDIT METER** increments in credit mode. The **WINNER PAID** meter increments in non-credit mode (see Figure 1-1 for bill acceptor assembly).

There are three models of the JCM bill acceptor covered in this manual:

- **DBV-45** – This model accepts U.S. $1, $5, $10 and $20 bills either face up or down. The control program is stored on a removable EPROM.
- **DBV-145** – This model accepts U.S. $1, $5, $10, $20, $50 and new or old style $100 bills face up only. The control program is stored on a removable EPROM.
- **DBV-147** – This model accepts U.S. $1, $5, $10, $20, $50 and new or old style $100 bills face up only. The control program is stored on a nonremovable flash memory device and is downloaded through a PC.

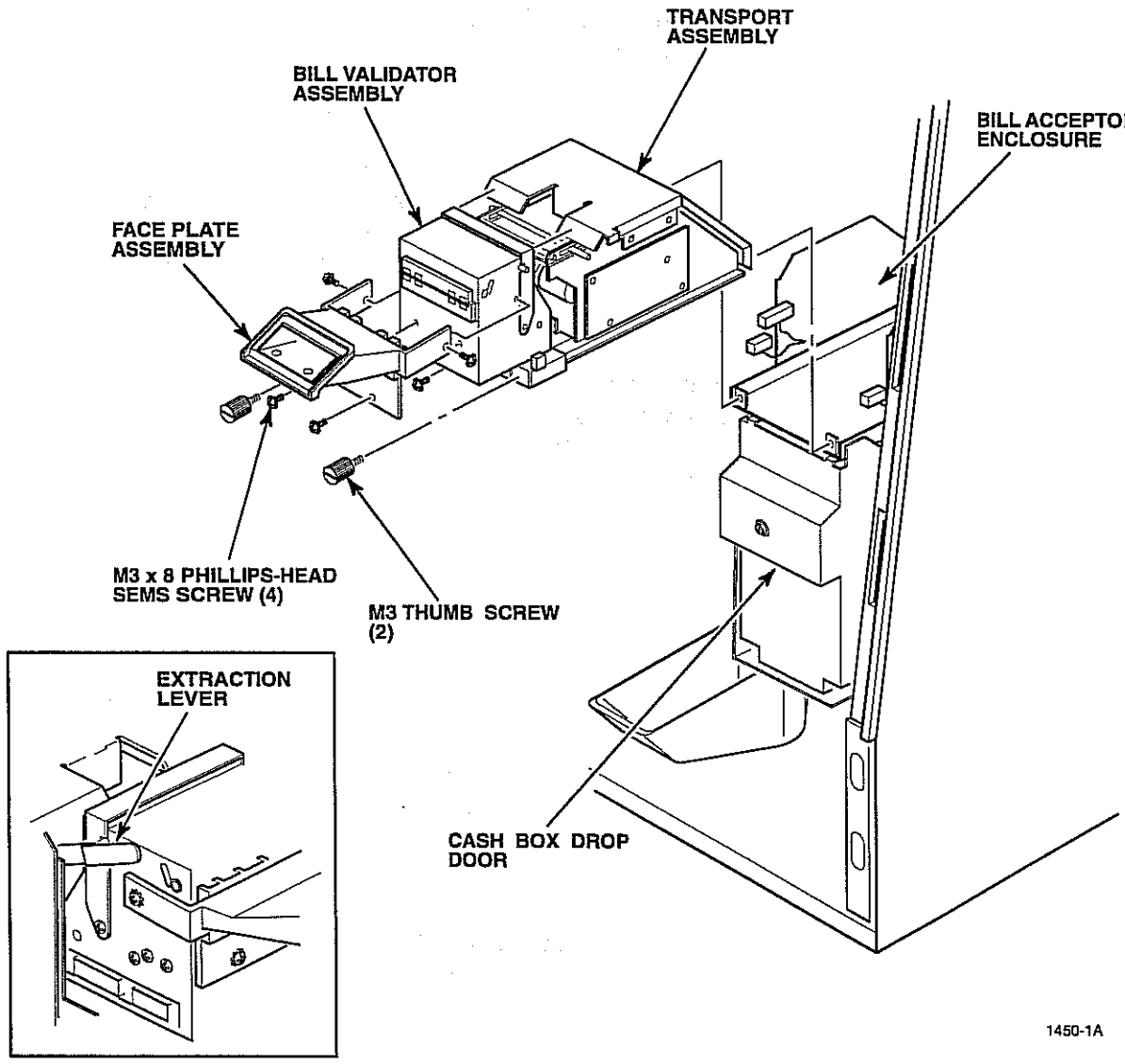


Figure 1-1. JCM Bill Acceptor Assembly.

❑ Features of the JCM Validator

- **Bill Acceptance** – The DBV-45 validator accepts a bill either face up or face down (see Figure 1-2 for proper bill orientation). The DBV-145/147 models accept bills face up only. Once inserted, the bill is validated within two seconds, with a minimum acceptance ratio of 90 percent.

Note: *In newer software versions capable of accepting the old and new style currency (i.e. $50 and $100), bills are accepted only face up with the top of the portrait to the right (the second orientation shown in Figure 1-2).*

- **Escrowing** – Escrowing is the period of time in which the microprocessor determines a bill's validity after it has been inserted into the validator and scanned. If the bill is found to be valid, it is accepted and transported to the stacker assembly for storage. If it is determined that the bill is invalid, the bill is returned (see Figure 1-3).

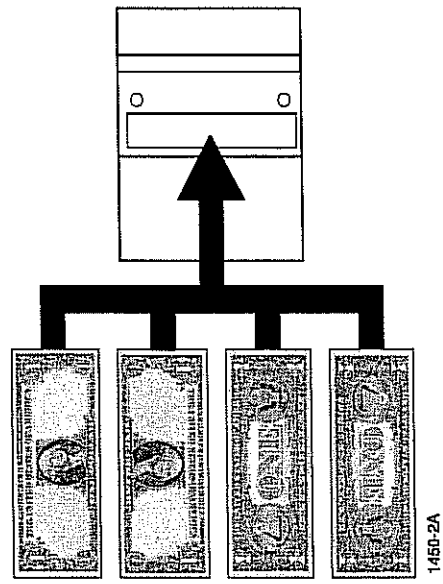


Figure 1-2. Bill Orientation – DBV-45 Only.

- **Denomination Selection** – Bill denomination selections can be made using a DIP switch located on the bottom of the validator. Different bill acceptor models accept different combinations of bills.
- **Cash Box Security** – The cash box has two locks, making it difficult for unauthorized persons to remove the bills. The cash box holds approximately 600 bills.

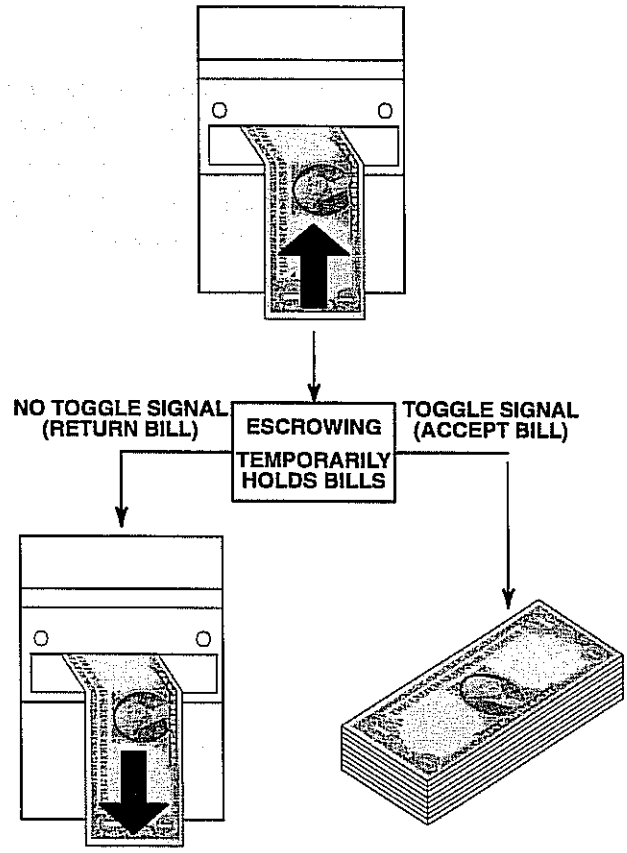


Figure 1-3. Escrowing.

❑ Power Supply

Exact location of the power supply varies depending on the machine in which the JCM bill acceptor is installed.

The power connector contains nine pins (see Figure 1-4). Pins 1, 2, 3 and 5 go to the processor board for enable/disable input and vend output signals. Pins 7 and 8 are used for the 110 VAC line voltage to the power supply.

The interface connector has six pins and is used to supply the 12 VDC from the power supply to the bill validator (see Figure 1-4).

Note: *DBV-147 bill acceptors used in Game King machines do not use the separate power supply. These units are powered directly through the main machine power system.*

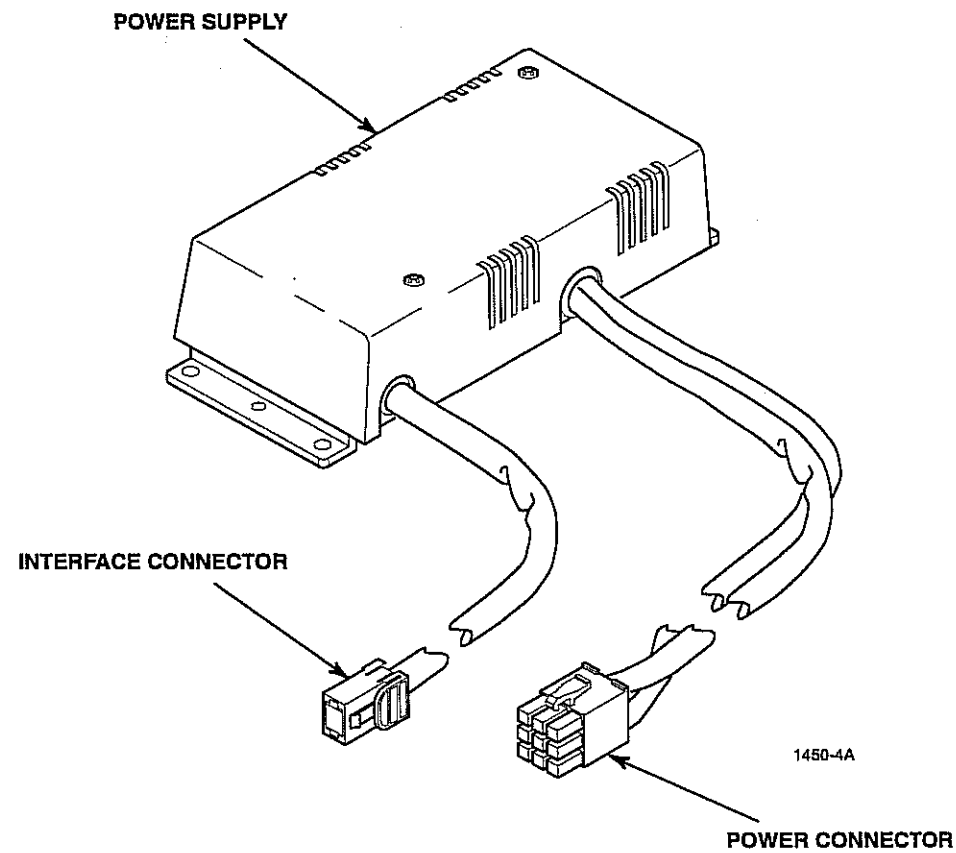
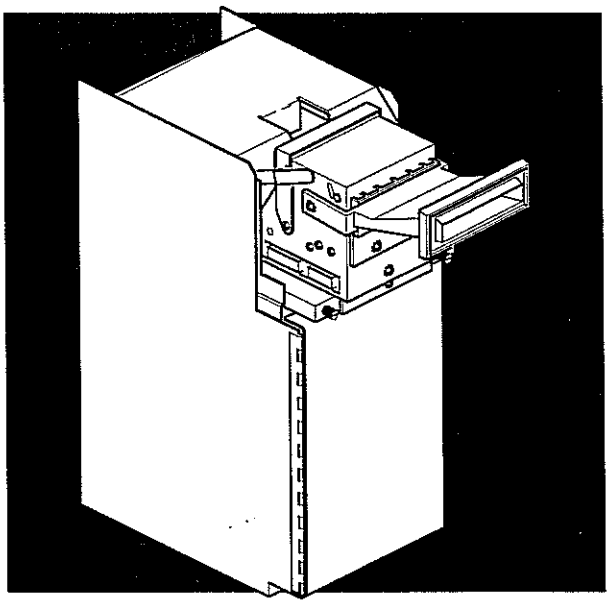


Figure 1-4. Power Supply.



Section 2

Troubleshooting and Maintenance
Model DBV-45, DBV-145 and DBV-147

❑ Face Plate Service Indicators

The following procedures offer solutions to common problems encountered with the JCM bill acceptor..

Refer to the appropriate maintenance procedures or electronic diagrams and parts manuals for further information on any procedure or other information not covered in this section.

Lit

When the red or green LEDs or the bill denomination light stay lit constantly, the validator is enabled and ready to accept bills.

- If the validator will not accept bills or rejects them immediately, replace the validator assembly.
- If the validator accepts the bill, retains it momentarily and then rejects it, check the following items:

  Clean the sensors

  Check the DIP switch settings

  Check the game software country code setting

  Perform the calibration procedures
- If these procedures fail to correct the problem, replace the validator assembly. If the condition continues, replace the power supply. If the problem persists, replace the machine processor board.

Not Lit

If the LEDs or bill denomination light are not lit:

1. Check for a blown 24 VAC fuse in the machine (DBV-147 only).
2. Replace the validator power supply (DBV-45/145 only).
3. Replace the red, green or bill denomination light assembly or wiring.
4. Replace the entire validator assembly.

Note: *At installation, check to see that the game EPROM communication protocol matches the bill acceptor (ID022, ID023 etc.).*

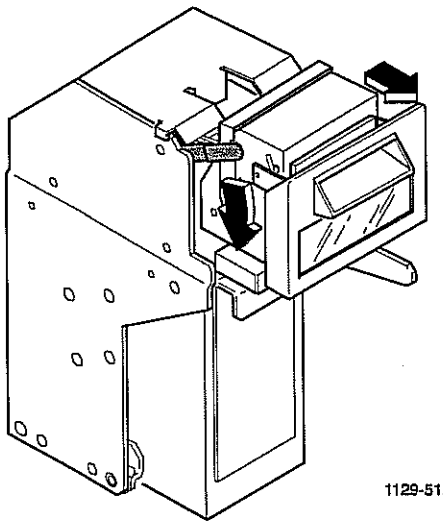
❑ Removing Jammed Bills

Use the following procedures to remove jammed bills from the bill acceptor.

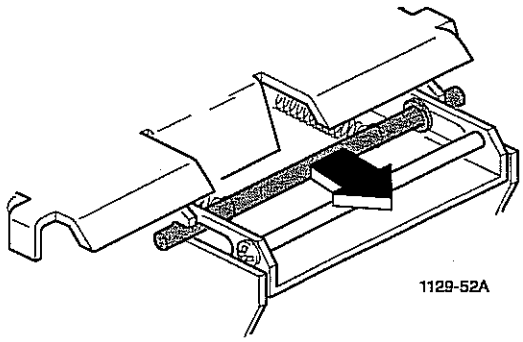
Transport Assembly Jams

See Figures 1-1 and 2-1 and refer to the following procedure to remove jammed bills from the JCM bill validator.

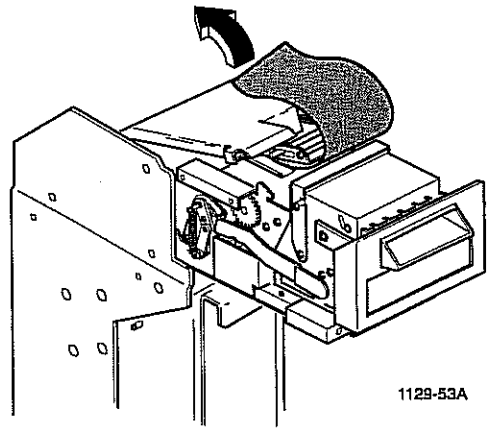
1. Open the machine door and turn the **power off**. Loosen the two retaining screws.
2. Disconnect the 6-pin and 14-pin connectors located on the left side of the bill validator assembly and the 4-pin connector located on the right side.
3. Push down on the extraction lever and slide the bill validator/transport assembly out of the machine.
4. Pull forward on the spring-loaded rod located at the top of the transport assembly and open the cover of the transport assembly by lifting up.
5. Remove any bills jammed in the transport path.
6. Release the securing lever on the top of the validator by rotating it toward the transport assembly.
7. Lift and rotate the upper scanner.
8. Remove any jammed bills.
9. Lower the upper scanner and engage the securing lever.
10. Close the cover of the transport assembly and verify that the spring-loaded rod is engaged.
11. Slide the bill validator/transport assembly into the enclosure as far as possible and lift the extraction lever to engage the unit in the chassis.
12. Connect the 6-pin and 14-pin connectors located on the left side of the bill validator assembly and the 4-pin connector located on the right.
13. Replace the two retaining screws and close the machine door.
14. Turn the **power on**. If excessive noise is present, turn the **power off** and reseat the bill validator/transport assembly.



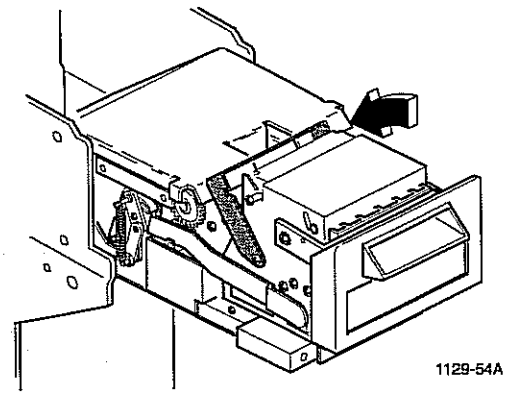
1. Removing the Bill Validator



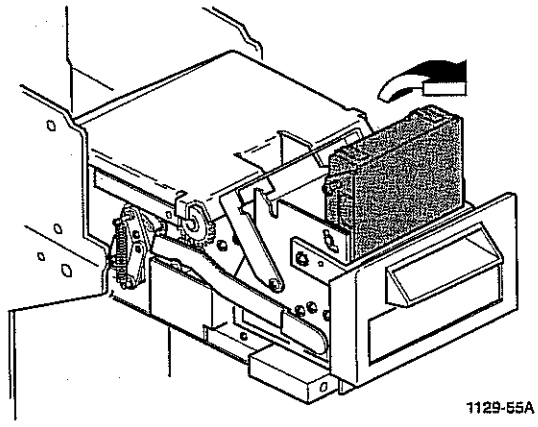
2. Releasing the Spring-Loaded Rod



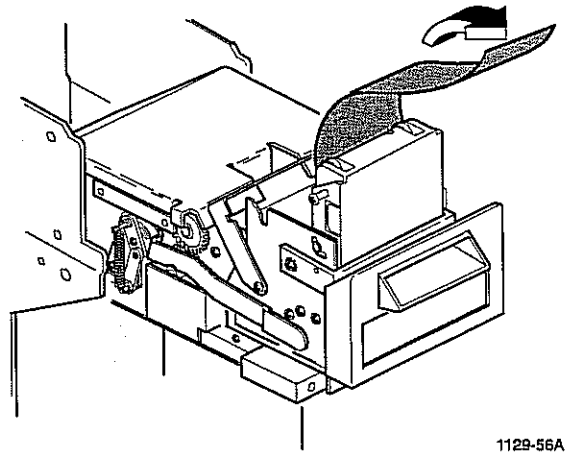
3. Removing Bills in Transport



4. Releasing the Securing Lever



5. Lifting the Upper Scanner Unit



6. Removing Bills Beneath Scanner

Figure 2-1. Clearing Jammed Bills.

Stacker/Cash Box Assembly Jams

Note: *Check to be sure that bills are not caught between the transport assembly and cash box. Bills jammed in this area may be torn when the jam is cleared.*

Refer to the following procedures and see Figure 2-2 to remove stacker/cash box assembly jams.

1. Open the front door, unlock and open the cash box door.
2. Remove the cash box and rotate it so that the entry door faces up.
3. Open the cash box, push down on the stacker plate and remove all visible bills and debris from the stacker/cash box.
4. Close and replace the cash box assembly. Close and lock the cash box door. Close and lock the machine door, and verify bill acceptor operation.

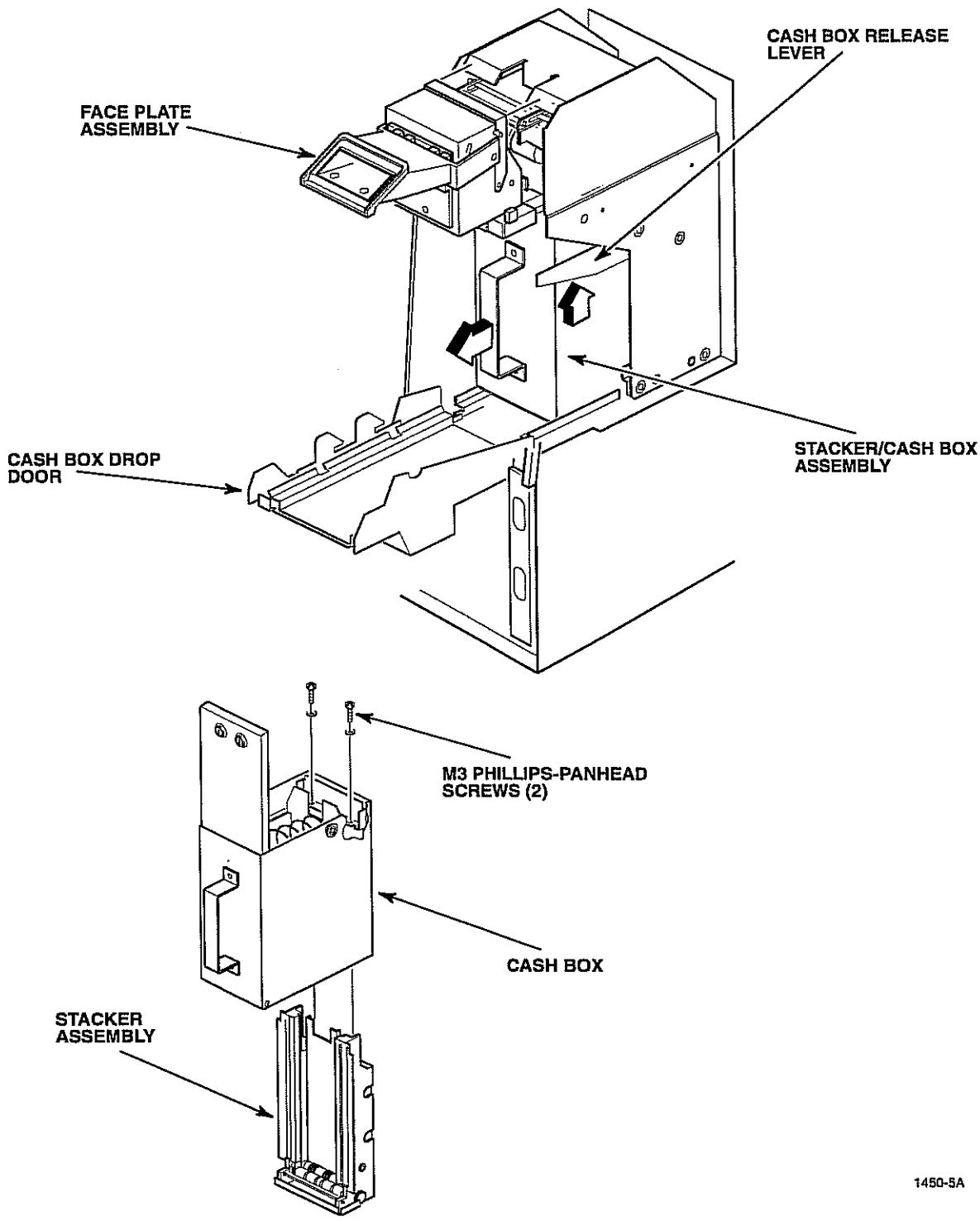


Figure 2-2. Stacker/Cash Box Assembly Removal/Replacement.

❑ Stacker Assembly Removal & Replacement

The following procedures for removing and replacing the stacker assembly can also be performed with only the belly panel door opened, rather than the main machine door. See Figure 2-2 and proceed as follows.

Removal Procedures

1. Unlock (if necessary) and open the cash box door.
2. Grip the cash box handle with one hand and push up on the cash box release lever with the other hand. Pull the cash box straight out from the enclosure.
3. Rotate the cash box so that the cash box entry door faces up.
4. Open the cash box. Remove the two M3 Phillips head mounting screws from the end of the stacker assembly.
5. Lift the cash box assembly (it may be necessary to depress the stacker plate).

Replacement Procedures

1. Set the replacement stacker assembly on its end so its orientation matches that of the cash box.
2. Place the cash box assembly over the stacker assembly, so that the stacker fits into place within the cash box.
3. Attach the stacker assembly to the cash box assembly with the two M3 Phillips-panhead screws at the end of the stacker assembly. Tighten both screws securely.
4. Close the cash box door and replace the cash box. Test the bill acceptor operation.

❑ Precautions

- Torn, wrinkled, or wet bills may jam the validator.
- The validator uses sophisticated electronic parts. Care should be taken to prevent the validator from getting wet.
- Keep the validator away from dust. Dust may deteriorate the accuracy of bill validation.

❑ Collecting Bills

1. Obtain access to the cash box.
2. Grip the cash box handle with one hand and lift up on the cash box release lever. Pull the cash box straight out from the enclosure.
3. Open the cash box cover and remove the bills.

❑ Cleaning

Bill jamming or inaccuracy of bill validation may be the result of a dirty sensor. See Figure 2-3 and refer to the following procedure to clean the bill validator.

1. Open the machine door and turn the **power off**.
2. Remove or loosen the two retaining screws.
3. Disconnect the 6-pin and 14-pin connectors located on the left side of the bill validator assembly and the 4-pin connector located on the right side.
4. Push down on the extraction lever.
5. Slide the bill validator/transport assembly out of the machine.
6. Clean the bill path and drive belts using a lint-free cloth moistened with a mild, **non-ammonia** cleaner.

Notes: *Do not spray cleaners directly onto the interior of the bill validator. Do not use alcohol-based cleaners on rubber parts.*

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7. Remove any debris from the pinch roller and magnetic sensor using household transparent tape, making sure that no sticky residue remains on surfaces.
8. Clean all optics with a cotton swab soaked in mild isopropyl alcohol (do not exceed a 30 percent concentration). **Do not** get isopropyl alcohol on the drive belts.

Note: *When cleaning sensors, do not use strong solvents such as thinners or acetone.*

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9. Close the upper scanner assembly and the top of the transport assembly. Reassemble and install the bill validator.
10. Turn the **power on**, close the machine door and verify correct bill acceptor operation.

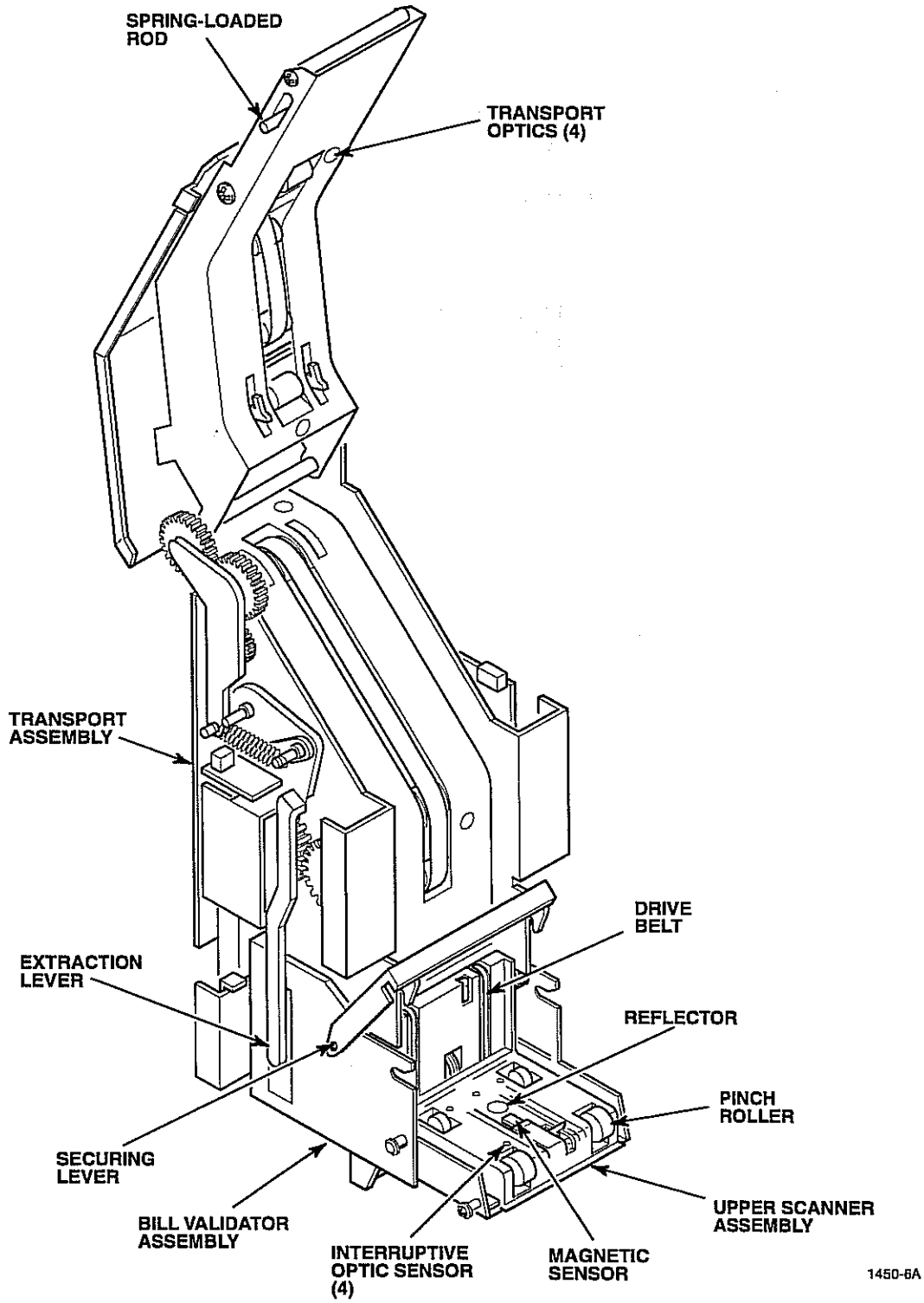
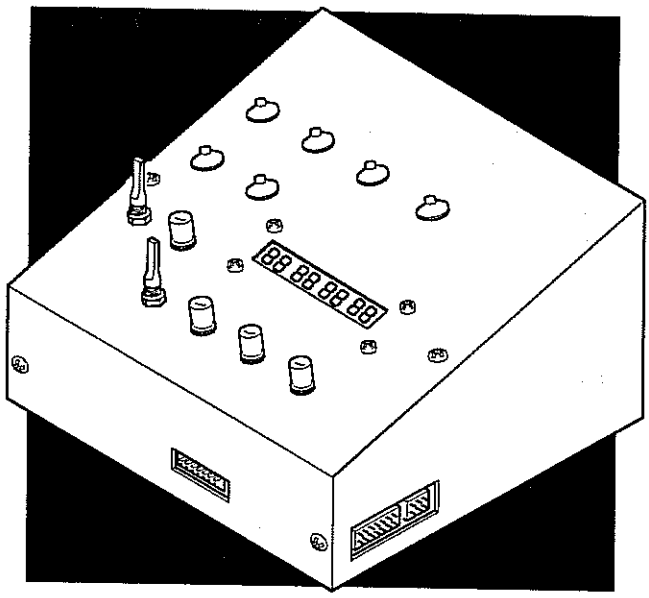


Figure 2-3. Cleaning the JCM Bill Validator & Transport Assemblies.



Section 3

VM-401 Tester and Calibration Procedures

❑ Overview

The VM-401 tester allows the adjustment of the bill acceptor sensors, magnetic head, and verification of the mechanical operation of the head and stacker assemblies.

Note: *To perform the calibration on DBV-147 bill acceptors, two additional harnesses must be obtained: p/n 607-553-00 – LED Harness and p/n 619-477-00 – DC Power Harness (See Figure 3-3). These harnesses are available from IGT.*

The VM-401 tester is available as a complete package with the exception of the two harnesses required for the testing of the model DBV-147 bill acceptor. Refer to Table 3-1 for the IGT part numbers of the test equipment.

Table 3-1
IGT Part Numbers for JCM Test Equipment

IGT Part Number	Description
549-035-90	VM-401 Tester and Accessories
549-048-90*	MG-03 Magnetic Sensor Calibrator
607-553-00	DBV-147 LED Harness
619-477-00	DBV-147 Power Harness

*The MG-03 Magnetic Sensor Calibrator is included in the VM-401 package.

Required tools

- VM-401 tester and accessories
- Oscilloscope
- Digital volt-ohm meter (DVM)
- Small Phillips-head screwdriver
- Flathead screwdriver

VM-401 Tester Features

The VM-401 tester includes:

- VM-401 test monitor control box (Figure 3-1)
- MG-03 magnetic head tester with board (Figure 3-2)
- 14x14 pin I/F harness (VM-401 tester to validator head at connector CN2) (Figure 3-1)
- 6x6 pin power harness (VM-401 tester to validator head at connector CN1) (Figure 3-1)
- Two 10-foot power cords (one for VM-401 tester and one for MG-03 magnetic head tester) (Figure 3-1)
- Check pin board (Figure 3-4)
- 12x12 check pin board harness (Figure 3-4)
- White reference paper assembly (with holder) KS-005 (Figure 3-5)
- Black reference paper assembly (with holder) KS-006 (Figure 3-5)
- White reference paper assembly (with holder) KS-013 (Figure 3-5)
- Black reference paper assembly (with holder) KS-014 (Figure 3-5)
- White reference paper assembly (spare)
- Black reference paper assembly (spare)

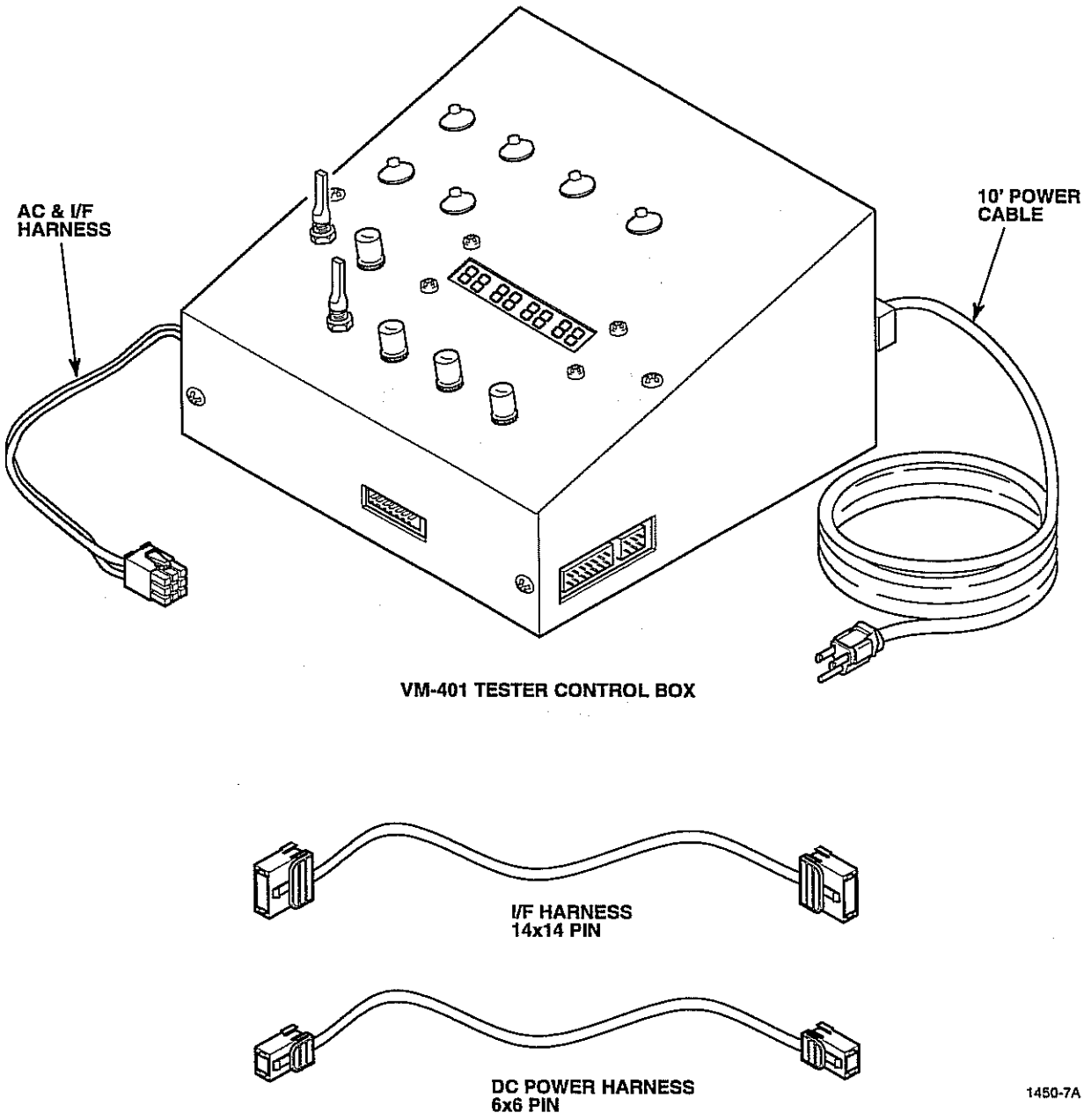


Figure 3-1. VM-401 Tester Control Box with Harnesses.

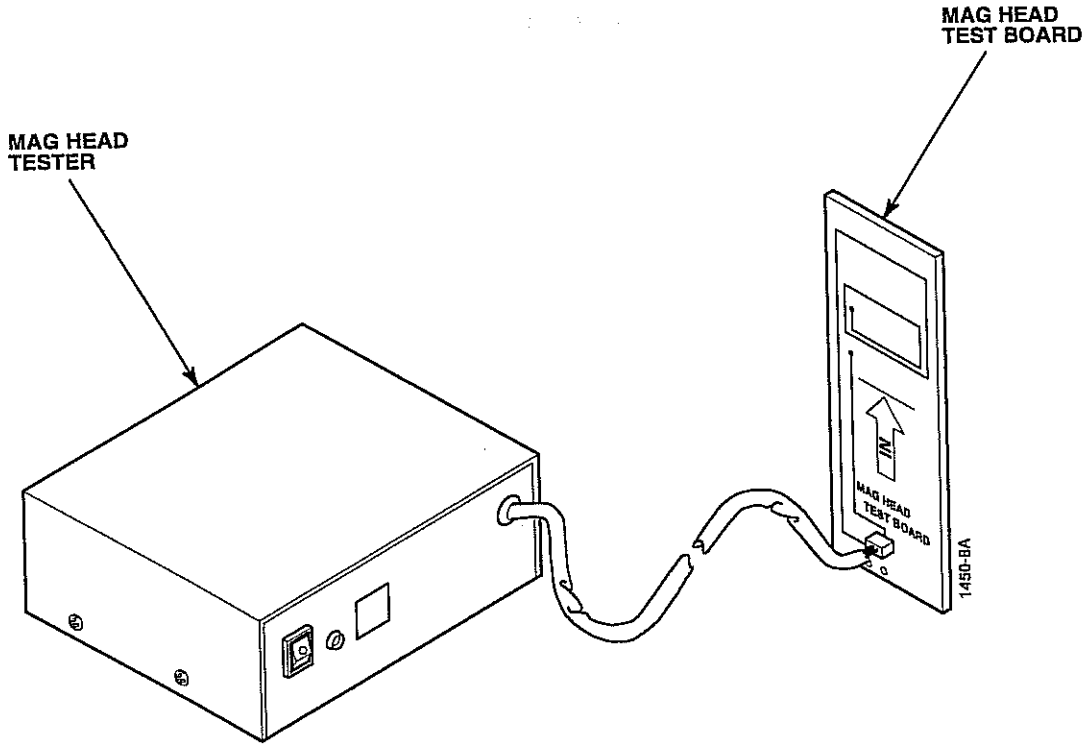


Figure 3-2. MG-03 Magnetic Head Tester with Board.

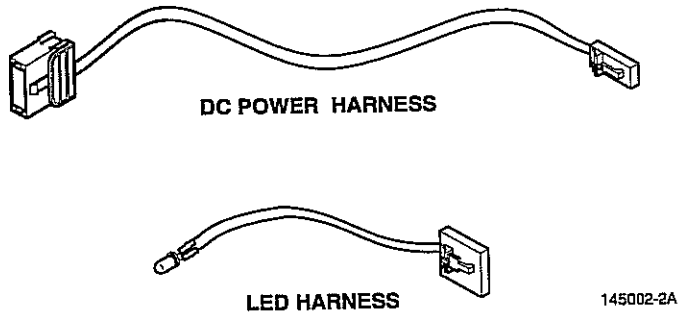


Figure 3-3. DBV-147 Harnesses.

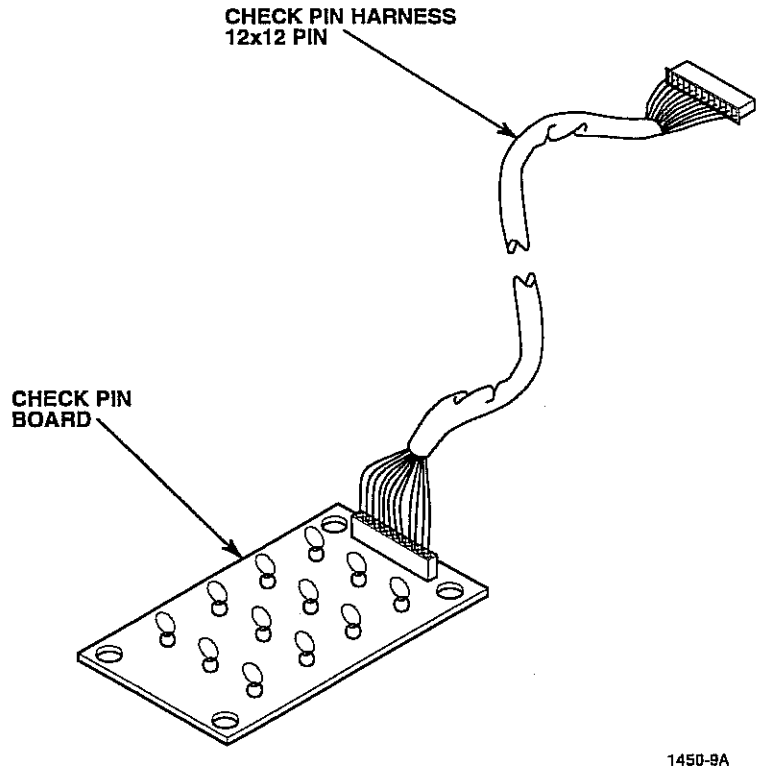


Figure 3-4. Check Pin Board with Harness.

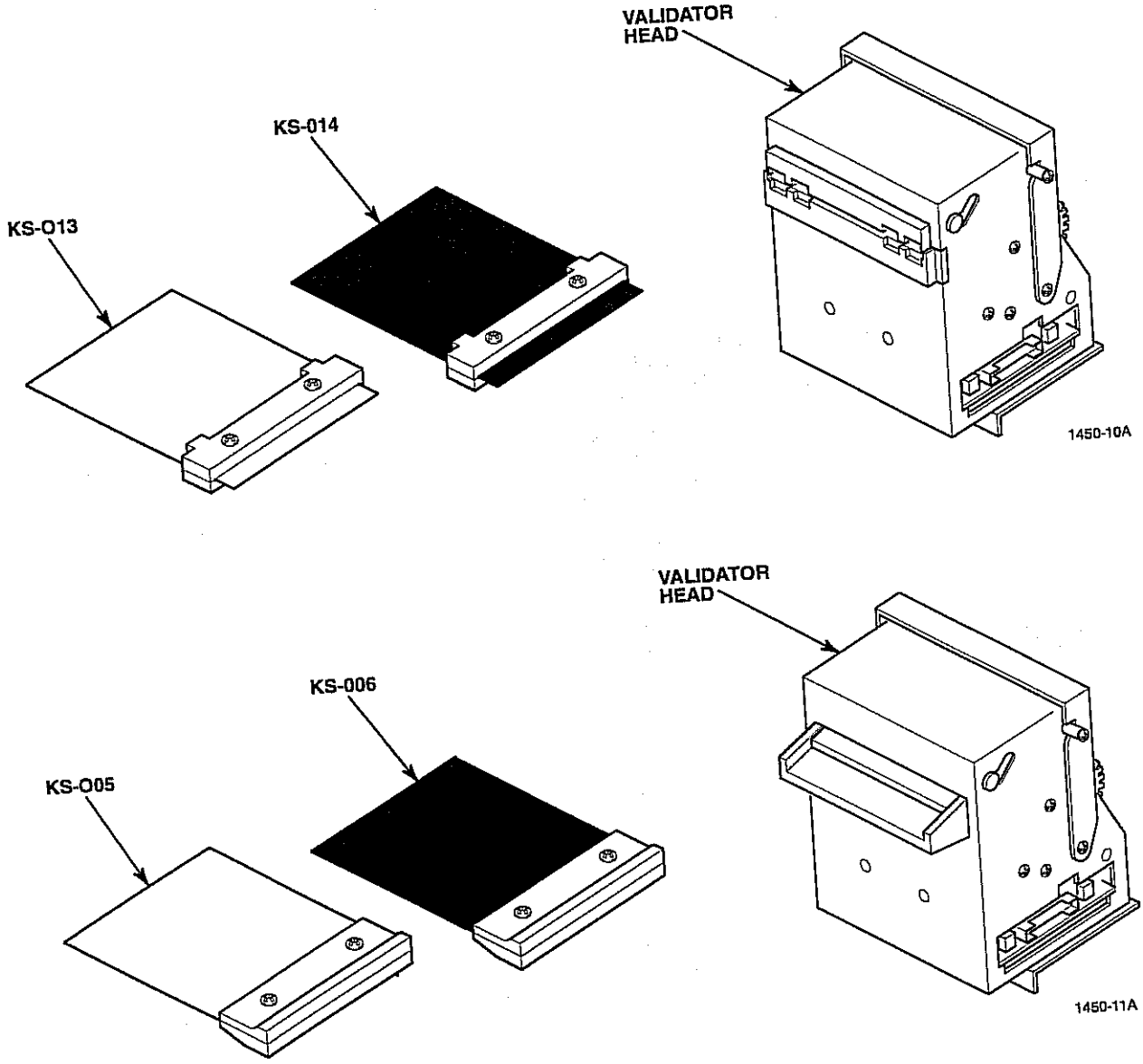


Figure 3-5. Reference Papers.

❑ Operating Switches and Displays

The VM-401 tester control box has several switches, connectors, and displays. For the location of these items, refer to Figure 3-6. A description of the function of each item is listed in Table 3-2.

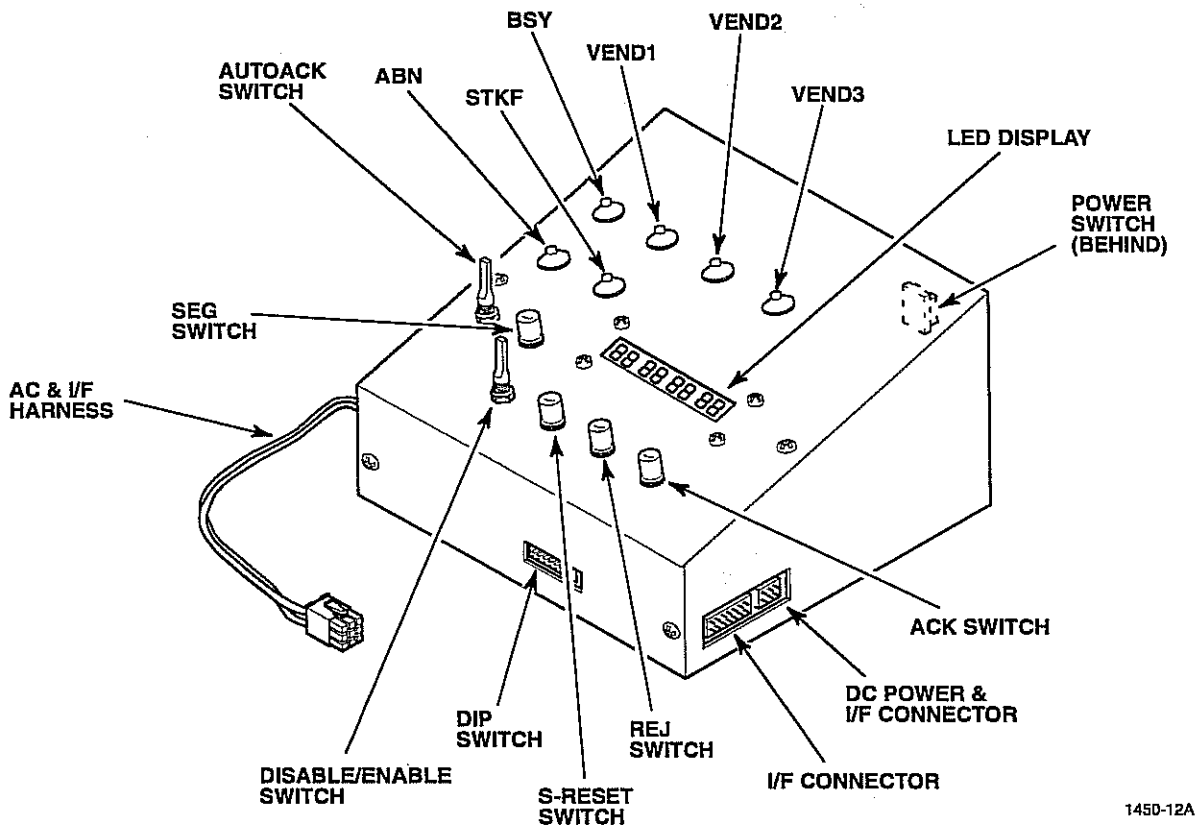


Figure 3-6. VM-401 Tester Control Box Switches and Displays.

Table 3-2
Tester Control Box Switch/Display Functions

Name	Receiving	Performance Test
VEND1	Display of VEND signal code	Display of test results
VEND2		
VEND3		
STKF	Stacker Full Display	
ABN	Abnormal display	Numerical Pulse display of error type
BSY	Display of operational status of validator	
LED Display	Displays Test Codes	Displays error code
ACK Switch	Acknowledge signal	Selects test items
REJ Switch	Reject signal	
S-RESET Switch	Soft Reset signal	
DISABLE/ENABLE Switch	Disable/Enable signal	
AUTOACK Switch	Auto Acknowledge signal	
SEG Switch	Selecting display contents	
DIP SW	Sets Interface Mode of Tester Control Box	
AC & I/F HARNESS	Power Supply For Validator & pulse interface signal	
Power Switch	Power switch	
DC Power & I/F Connector	DC 12V power & pulse interface signal	
I/F Connector	Interface signal	

❑ Assembling Tester and Validator Head

The tester control box, validator head and check pin board are connected as shown in Figure 3-7 for the DBV-45 and DBV-145, and as shown in Figure 3-8 for the DBV-147.

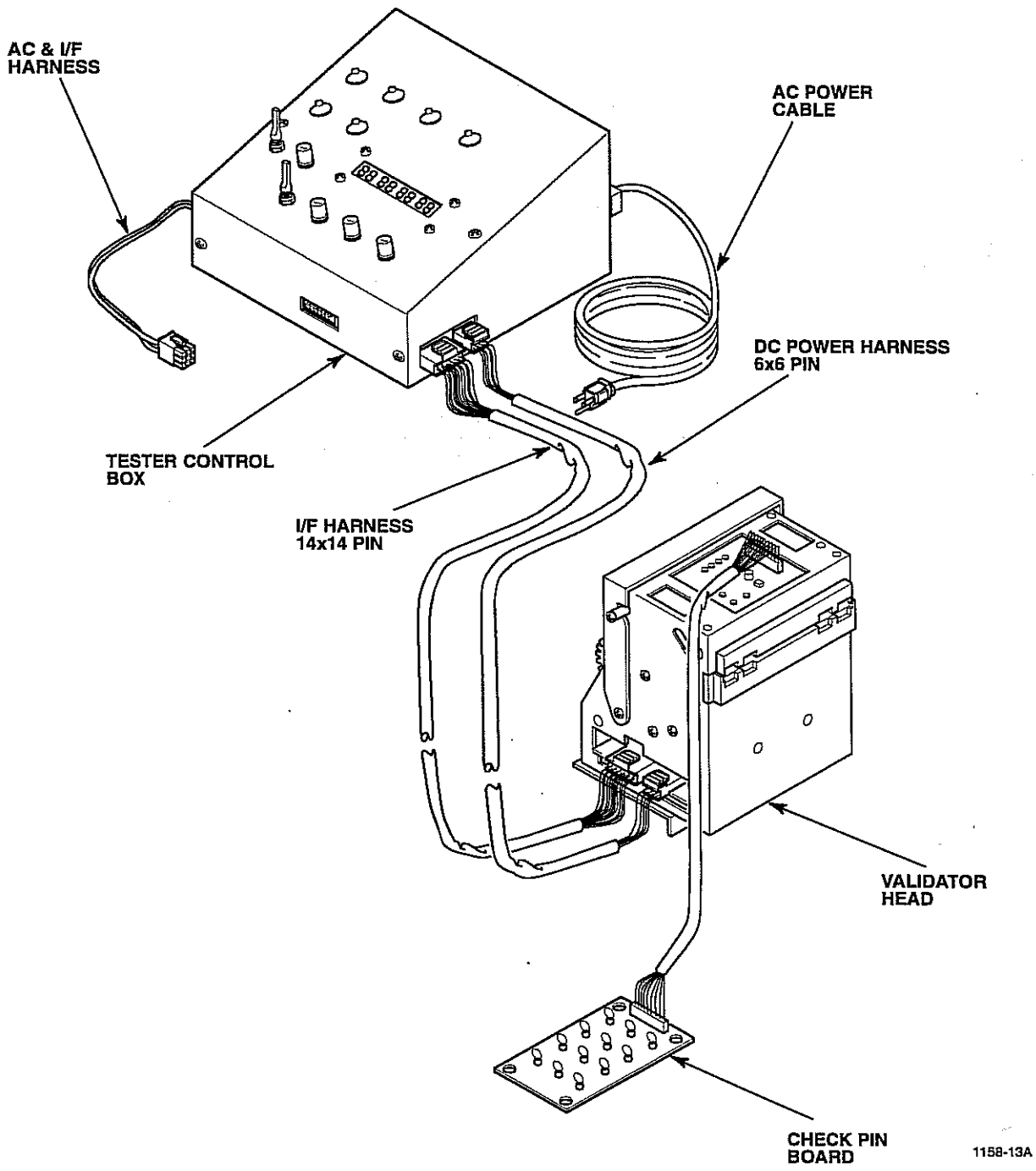


Figure 3-7. Connecting the VM-401 Tester Control Box – DBV-45/145.

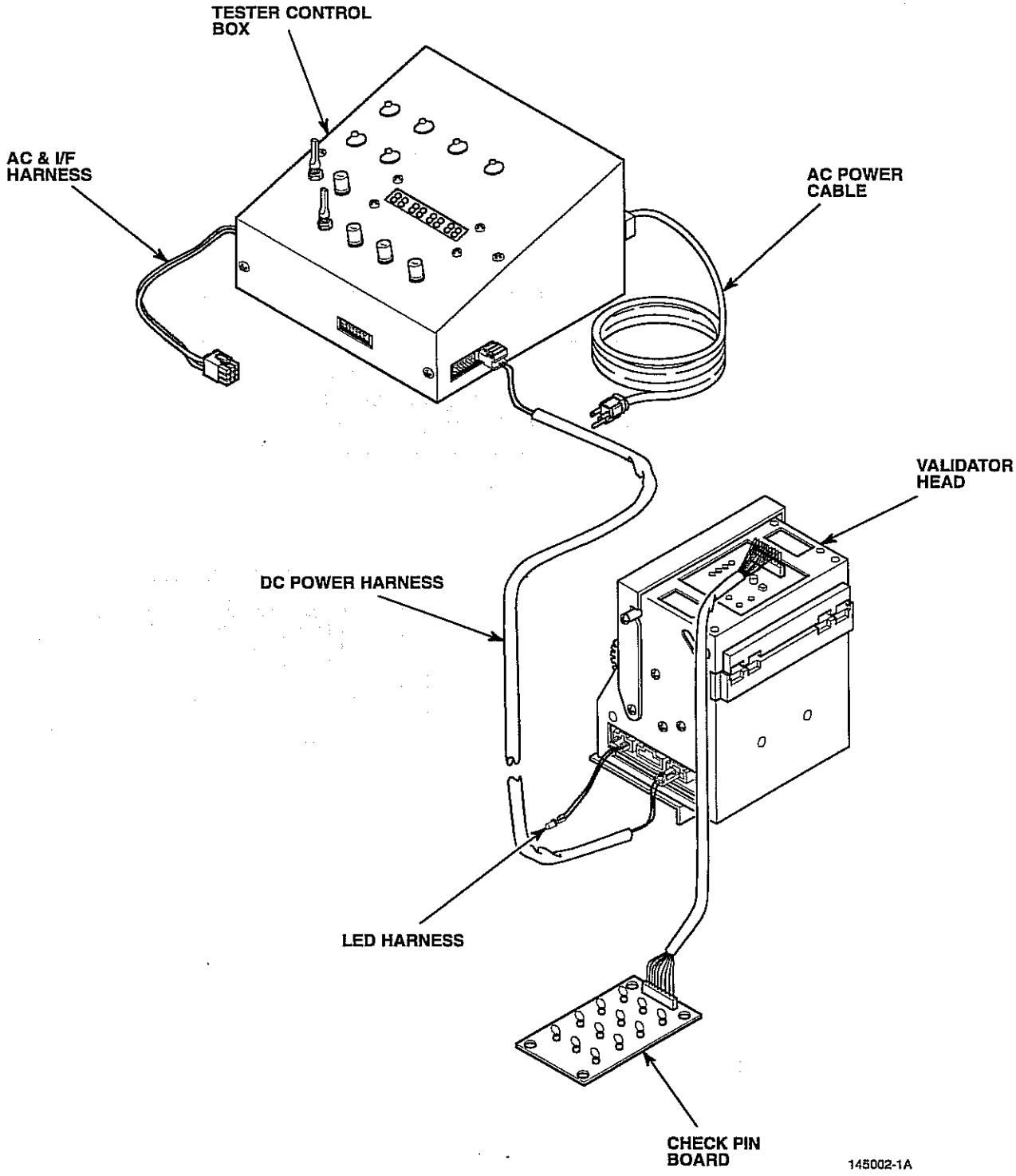


Figure 3-8. Connecting the VM-401 Tester Control Box – DBV-147.

❑ Setting DIP Switches

In order for the VM-401 tester to function, both the validator and the VM-401 tester control box DIP switches must be properly set.

Validator

Set all DIP switches on the validator to ON (see Figure 3-9).

Note: *For DBV-147 validator heads, set DIP switches 1 through 7 OFF and 8 to ON, apply power to the tester, then set DIP switches 1 through 7 to ON to enter calibrate mode.*

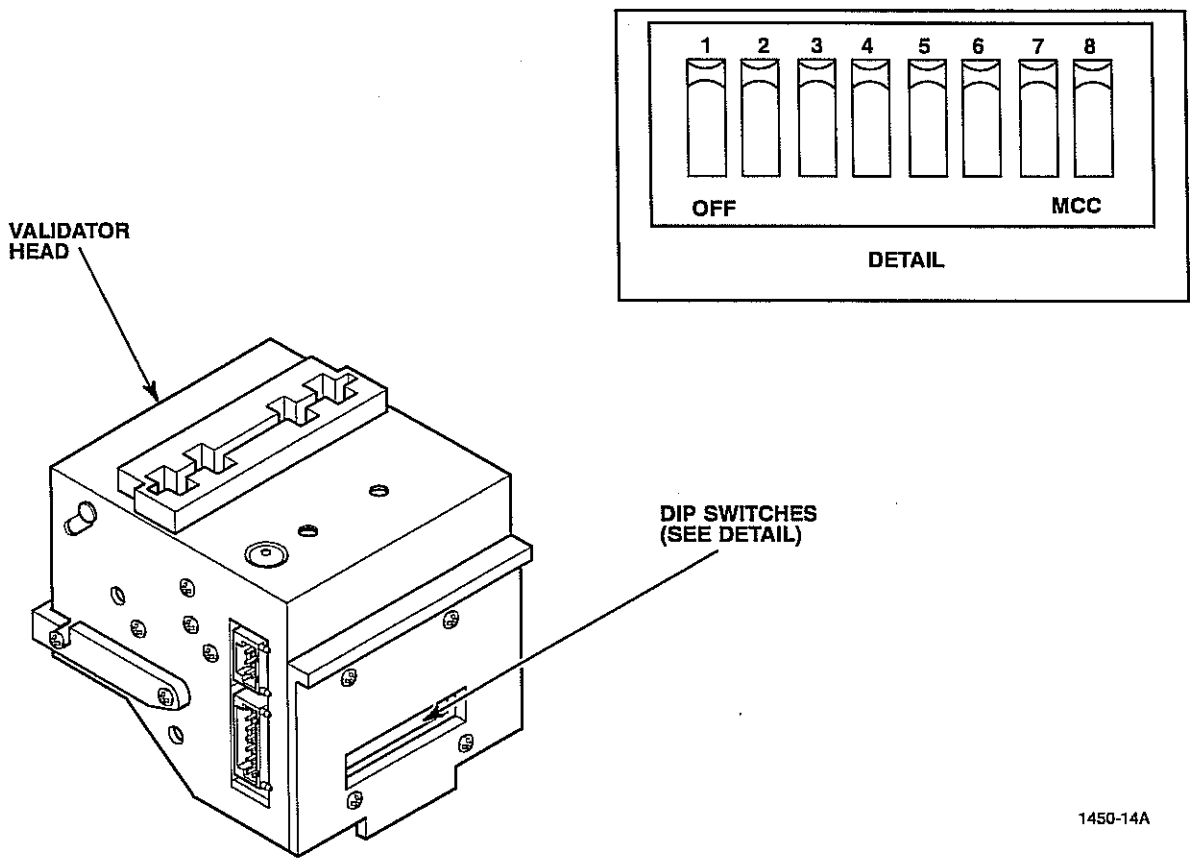


Figure 3-9. Validator DIP Switch Settings.

VM-401 Tester Control Box

Set all DIP switches on the tester control box to ON (see Figure 3-10).

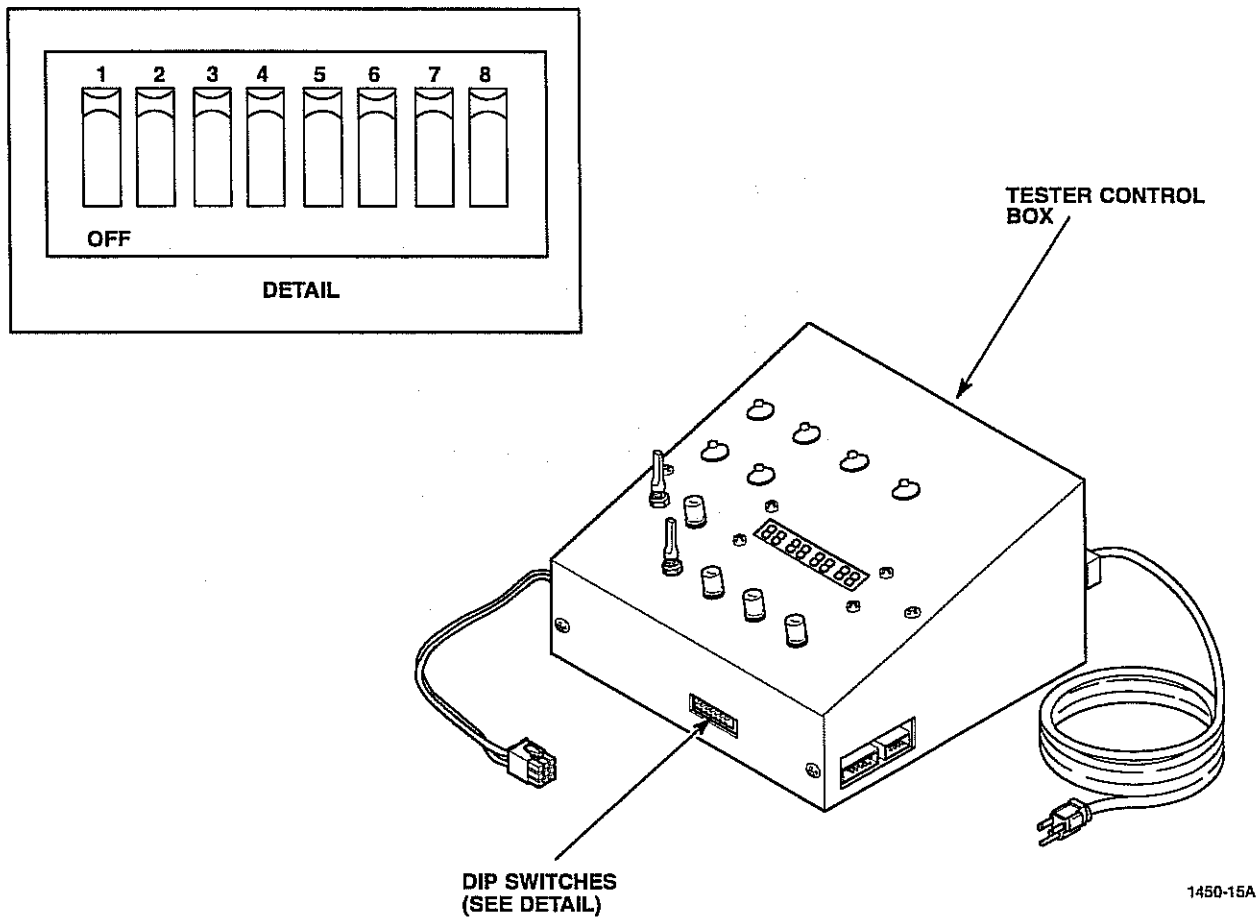


Figure 3-10. VM-401 Tester Control Box DIP Switch Settings.

❑ Setting Up the VM-401 Tester Control Box

1. Set the D/E Switch (Disable/Enable) to ENABLE.
2. Turn power ON.

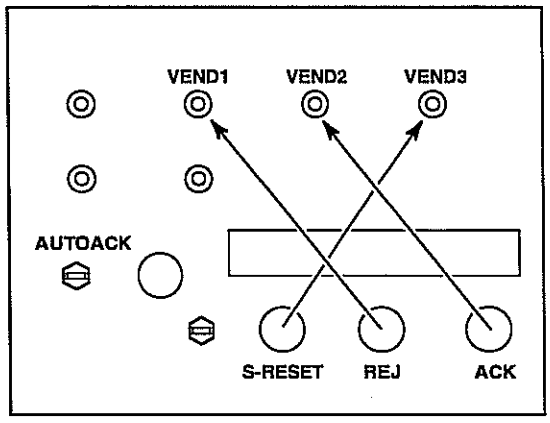
Note: *The reading* ***no.00*** *appears on the LED display. The BUSY LED lights, and the VEND 1* through *3 and S-Full LEDs blink.*

3. Turn the D/E switch to DISABLE.

Note: *The reading* ***no.01*** *is displayed on the LED display. Now, each sensor can be adjusted.*

To verify that the connection between the VM-401 tester control box and the validator are functioning, press each switch and confirm that the VEND LEDs come on. (See Figure 3-11 for information about switches and their corresponding LEDs.)

Note: *In the test mode, the ACK and AUTOACK switches are interlocked. During normal operations, the AUTOACK switch should be kept in the OFF position.*



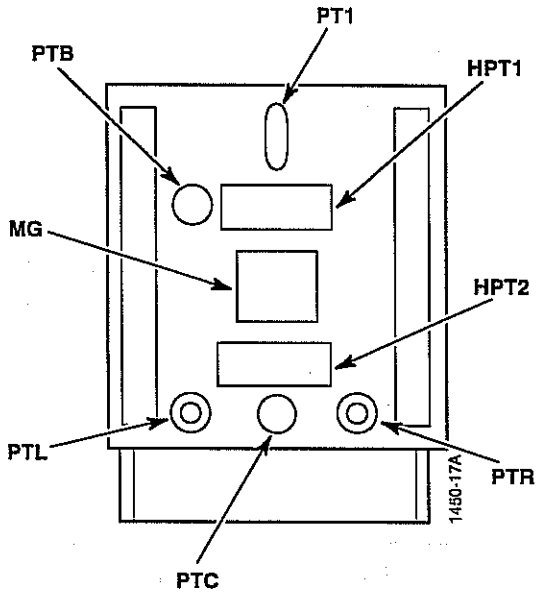
Switch	LED on Control Box	Display
Press REJ	VEND1 will be lit.	No. 02
Press ACK (or move AUTOACK to the ON position)	VEND2 will be lit.	No. 03
Press S-RESET	VEND3 will be lit.	No. 05

Figure 3-11. Relationship Between Tester Switches and LED Displays.

❑ Location of Sensors and Associated Variable Resistors

Location of Sensors

Figure 3-12 illustrates the locations of various sensors. The accompanying table lists the function of each individual sensor.

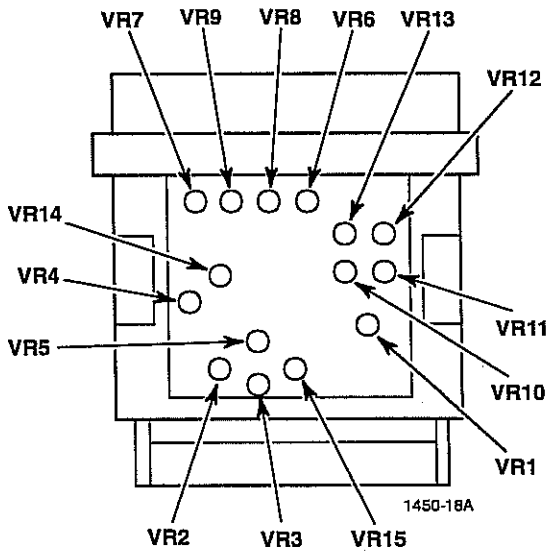


Name	Function
PTR	Entrance sensor, bill transmission pattern
PTL	Entrance sensor, bill transmission pattern
PTC	Entrance sensor, bill transmission pattern
PTB	Bill detection sensor
HPT1	Reflection pattern (surface side)
HPT2	Reflection pattern (reverse side)
MG	Magnetic pattern
PT1	Bill transit detection sensor

Figure 3-12. Sensor Locations and Functions.

Location of Variable Resistors for Adjusting Sensors

Figure 3-13 illustrates the physical locations of variable resistors on the validator. The accompanying table lists the relationships between the variable resistors and their relative sensors. Table 3-3 gives an overview of all the switch and variable resistor settings required to make the adjustments described in the following pages.



Variable Resistor	Sensors
VR1	MAG HEAD gain
VR2	HPT1 black level
VR3	HPT2 black level
VR4	HPT1 white level
VR5	HPT2 white level
VR6	PTR IR monitor level
VR7	PTR RED monitor level
VR8	PTR IR data level
VR9	PTR RED data level
VR10	PTL IR monitor level
VR11	PTL RED monitor level
VR12	PTL IR data level
VR13	PTL RED data level
VR14	PTB level
VR15	PTC level

Figure 3-13. Variable Resistor Locations and Relative Sensors.

Table 3-3
Overall Tester Adjustments

	AUTOACK SW*	INSERT	CHECK PIN	VOLUME	ADJUSTMENT VALUE
HPT1 (B)	OFF	Black Card	P2	VR2	0.1V ± .02
HPT2 (B)	OFF		P3	VR3	0.1V ± .02
HPT1 (W)	OFF	White Card	P4	VR4	3V ± .05
HPT2 (W)	OFF		P5	VR5	3V ± .05
PTB	OFF	White Card	P6	VR14	1.5V ± .05
PTC	OFF		P7	VR15	1.5V ± .05
PTR*	ON	White Card	P8	VR8	1.5V ± .05
				VR9	1.5V ± .05
	OFF	No Card	P8	VR6	1.5V ± .05
				VR7	1.5V ± .05
PTL*	ON	White Card	P9	VR12	1.5V ± .05
				VR13	1.5V ± .05
	OFF	No Card	P9	VR10	1.5V ± .05
				VR11	1.5V ± .05
MAG	OFF	MG-03	P1	VR1	1.0V ± .10 Peak-to-Peak Waveform

* On DBV-147 units, use DIP switch 1 on the validator head to simulate the function of the AUTOACK switch on the VM-401 tester.

❑ Adjusting the Reflection Sensors

Adjusting the Black Level

To adjust reflection sensors HPT1 and HPT2 (black level), use the following procedure. For both adjustments, the AUTOACK switch (DIP switch 1 on DBV-147) must be in the OFF position.

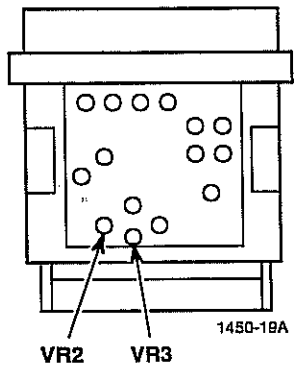


Figure 3-14.

1. Insert the black reference paper (KS-006 or KS-014) into the validator head.
2. Adjust the HPT1 black level by doing the following:
   a. Connect the DVM to P2 and ground on the check pin board.
   b. Adjust VR2 (Figure 3-14) for 0.10 VDC ± 0.05 VDC.
3. Adjust the HPT2 black level by doing the following:
   a. Connect the DVM to P3 and ground on the check pin board.
   b. Adjust VR3 (Figure 3-14) for 0.10 VDC ± 0.05 VDC.
   c. Remove the black reflection paper.

Adjusting the White Level

To adjust reflection sensors HPT1 and HPT2 (white level), use the following procedure. For both adjustments, the AUTOACK switch (DIP switch 1 on DBV-147) must be in the OFF position.

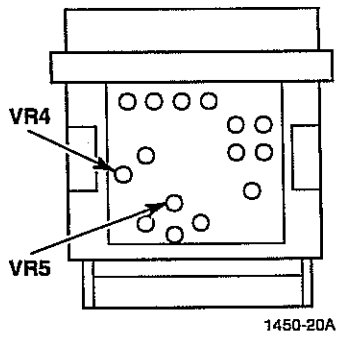


Figure 3-15.

1. Insert the white reference paper (KS-005 or KS-013) into the validator head.
2. Adjust the HPT1 white level by doing the following:
   a. Connect the DVM to P4 and ground on the check pin board.
   b. Adjust VR4 (Figure 3-15) for 3.00 VDC ± 0.05 VDC.
3. Adjust the HPT2 white level by doing the following:
   a. Connect the DVM to P5 and ground on the check pin board.
   b. Adjust VR5 (Figure 3-15) for 3.00 VDC ± 0.05 VDC.

❑ Adjusting Transmission Sensors

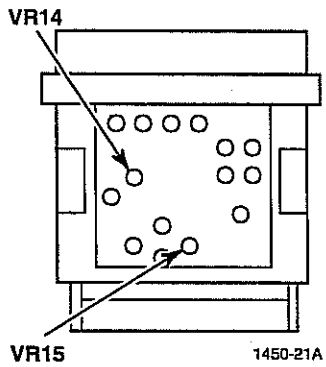


Figure 3-16.

To adjust transmission sensors PTB and PTC, use the following procedure. For both adjustments, the AUTOACK switch (DIP switch 1 on DBV-147) must be in the OFF position.

1. If the white reference paper was removed, insert the white reference paper (KS-005 or KS-013) into the validator head.
2. Adjust the PTB by doing the following:
   a. Connect the DVM to P6 and ground on the check pin board.
   b. Adjust VR14 (Figure 3-16) for 1.50 VDC $\pm$ 0.05 VDC.
3. Adjust the PTC by doing the following:
   a. Connect the DVM to P7 and ground on the check pin board.
   b. Adjust VR15 (Figure 3-16) for 1.50 VDC $\pm$ 0.05 VDC.

❑ Adjusting the Two-Color Sensors

Adjusting Data Level

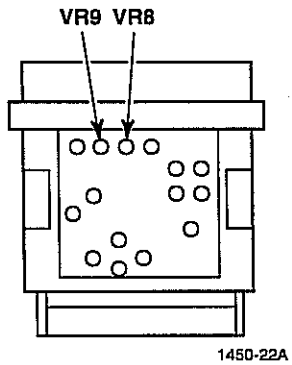


Figure 3-17.

The two-color sensor's IR and RED colors alternately flash on and off at intervals of 1 ms and 0.5 ms, respectively (see Figure 3-18). To adjust the data level for the PTR and PTL two-color sensors, observe the following procedure.

1. Insert the white reference paper (KS-005 or KS-013) into the tray.
2. Move the tester control box AUTOACK switch (DIP switch 1 on DBV-147) to ON.
3. Adjust the PTR's IR color by doing the following:
   a. Connect the oscilloscope and DVM to P8 and ground on the check pin board.
   b. Adjust VR8 (Figure 3-17) for 1.50 VDC ± 0.05 VDC.
4. Adjust the PTR's RED color by doing the following:
   a. Connect the oscilloscope and DVM to P8 on the check pin board.
   b. Adjust VR9 (Figure 3-17) for 1.50 VDC± 0.05 VDC.

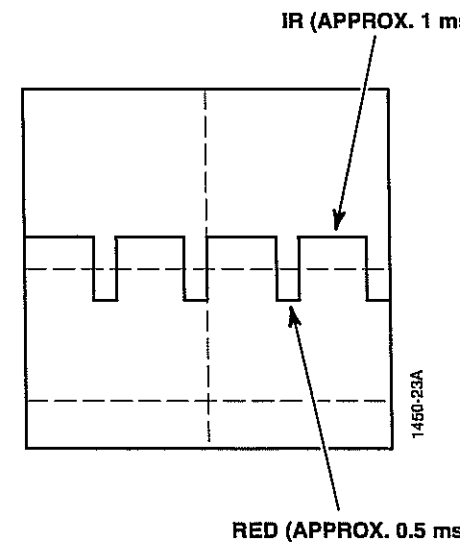


Figure 3-18. IR/RED Two-Color Sensor Flash Pattern.

Note: *The waveform for DC voltage on the oscilloscope must look similar to the pattern illustrated in Figure 3-19. If it does not, adjust VR8 and VR9 to obtain this waveform and +1.50 VDC on the DVM.*

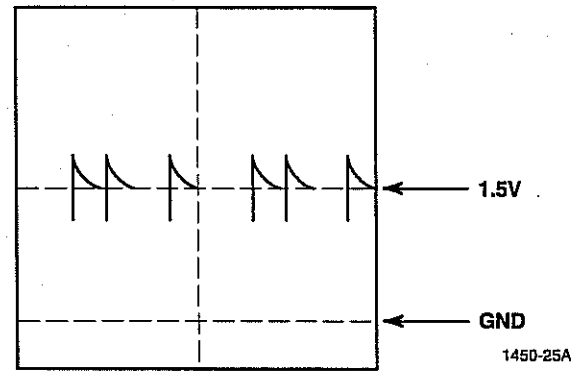


Figure 3-19. Correct DC Voltage Waveform.

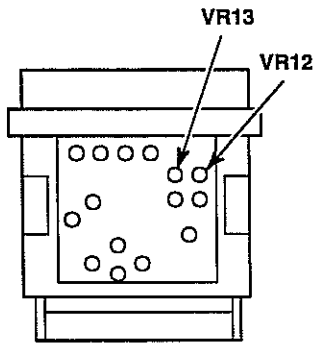


Figure 3-20.

5. Adjust the PTL's IR color by doing the following:

   a. Connect the oscilloscope and DVM to P9 on the check pin board.

   b. Adjust VR12 (Figure 3-20) for 1.50 VDC ± 0.05 VDC.

6. Adjust the PTL's RED color by doing the following:

   a. Connect the oscilloscope and DVM to P9 on the check pin board.

   b. Adjust VR13 (Figure 3-20) for 1.50 VDC ± 0.05 VDC.

Note: *The waveform for DC voltage on the oscilloscope must look similar to Figure 3-19. If it does not, adjust VR12 and VR13 to obtain this waveform and +1.50 VDC on the DVM.*

Adjusting Monitor Level

The two-color sensor's IR and RED colors flash on and off at intervals of 1 ms and 0.5 ms, respectively (see Figure 3-18). To adjust the monitor level for the sensor, observe the following procedure.

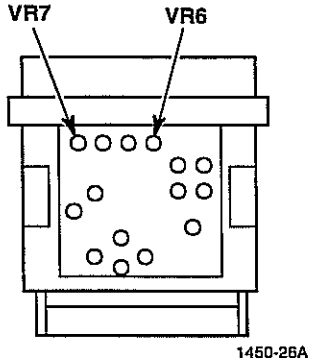


Figure 3-21.

1. Move the tester control box AUTOACK switch (DIP switch 1 on DBV-147) to OFF.
2. Remove the reference paper.
3. Adjust the PTR's IR color by doing the following:
   a. Connect the oscilloscope and DVM to P8 on the check pin board.
   b. Adjust VR6 (Figure 3-21) for 1.50 VDC ± 0.05 VDC.
4. Adjust the PTR's RED color by doing the following:
   a. Connect the oscilloscope and DVM to P8 on the check pin board.
   b. Adjust VR7 (Figure 3-21) for 1.50 VDC ± 0.05 VDC.

Note: *The waveform for DC voltage on the oscilloscope must look similar to the pattern illustrated in Figure 3-19. If it does not, adjust VR6 and VR7 to obtain this waveform and +1.50 VDC on the DVM.*

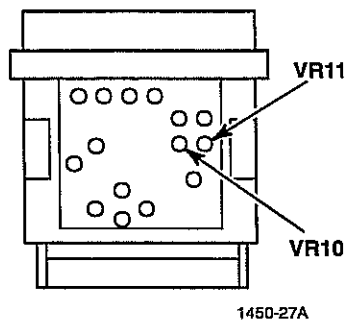


Figure 3-22.

5. Adjust the PTL's IR color by doing the following:
   a. Connect the oscilloscope and DVM to P9 on the check pin board.
   b. Adjust VR10 (Figure 3-22) for 1.50 VDC ± 0.05 VDC.
6. Adjust the PTL's RED color by doing the following:
   a. Connect the oscilloscope and DVM to P9 on the check pin board.
   b. Adjust VR11 (Figure 3-22) for 1.50 VDC ± 0.05 VDC.

Note: *The waveform for DC voltage on the oscilloscope must look similar to Figure 3-19. If it does not, adjust VR10 and VR11 to obtain this waveform and +1.50 VDC on the DVM.*

❑ Adjusting the Magnetic Sensor

To perform these adjustments, the MAG head test board needs to be connected to the MAG head tester, as illustrated in Figure 3-2. Proceed as follows.

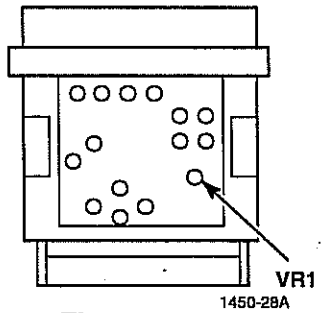


Figure 3-23.

1. Make sure the AUTOACK switch (DIP switch 1 on DBV-147) is OFF.
2. Turn the MAG head tester power ON.
3. Connect the oscilloscope to P1 and ground on the check pin board.
4. Insert the MAG test board into the validator head.
5. While watching the oscilloscope for maximum peak-to-peak voltage, slowly slide the MAG head test board in and out of the validator head.
6. Adjust VR1 (Figure 3-23) for a peak-to-peak value of 1.0 VAC. A waveform that falls short of maximum peak height (see Figure 3-24) indicates that further adjustment is required. An acceptable peak-to-peak waveform is illustrated in Figure 3-25.

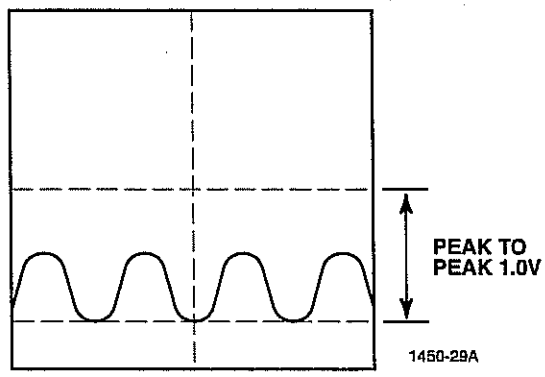


Figure 3-24. Unacceptable Waveform.

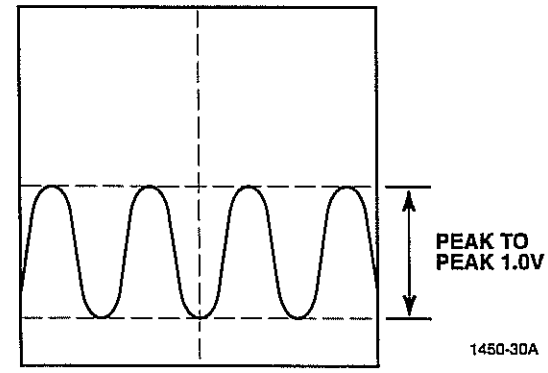


Figure 3-25. Peak-to-Peak 1.0V Waveform.

7. Remove the MAG head test board and confirm that the peak-to-peak value of the noise level is not more than 200 mV. (See Figure 3-26.)

Note: *If the peak-to-peak value of the noise level at this stage is more than 200 mV, replace the sensor board.*

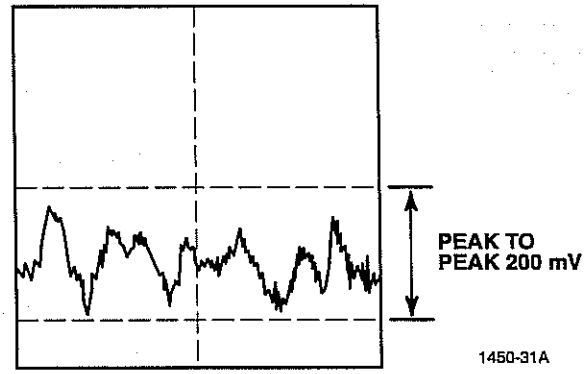


Figure 3-26. Peak-to-Peak 200 mV Waveform.

8. Confirm that the validator head motor noise level is no more than 500 mV peak to peak. To do this, take the following steps:

   a. Turn the D/E switch on the validator tester control box to ENABLE to start motor rotation.

   b. Look at the oscilloscope to confirm that the peak-to-peak value is less than 500 mV. (See Figure 3-27.)

   c. When finished, turn the D/E switch to DISABLE.

Note: *If the peak-to-peak value of the noise level at this stage is more than 500 mV, replace the validator head motor.*

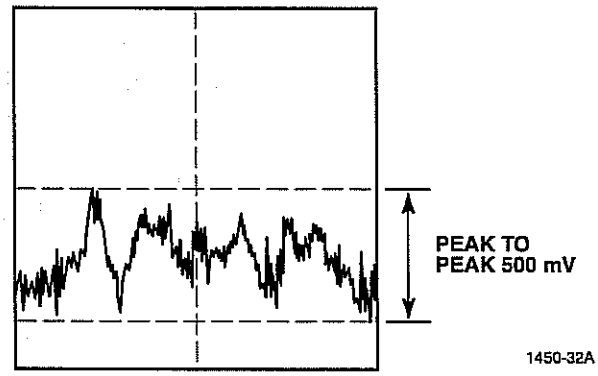


Figure 3-27. Peak-to-Peak 500 mV Waveform.

❑ Functional Testing – DBV-45/145

If the validator head transport and stacker assemblies are both connected to the tester, the following tests can be performed.

The items being tested, as shown in Table 3-4, are set when the D/E switch is turned to ENABLE and the REJ, ACK, and S-RESET switches are depressed as indicated.

Turning the D/E switch to DISABLE releases the settings, and returns to OFF or **waiting status.**

Note: *When Test* ***No. 08*** *is selected, the only way to reset is by turning the power off for the tester control box.*

If an error occurs during the test, the test will stop and the VEND 1 to 3 and S-FULL LEDs will blink.

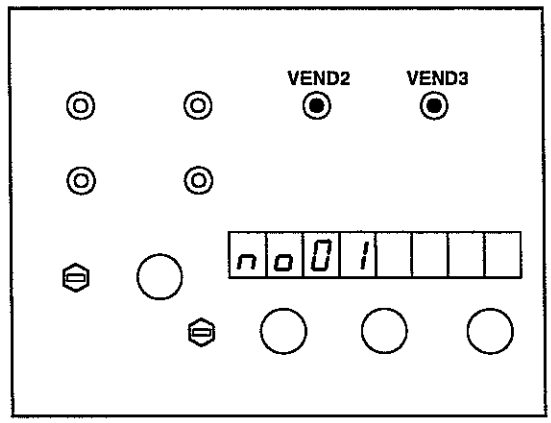
Note: *During the operations test, make sure that the numbers of the set test items and the test items that appear in the segment are in agreement.*

Table 3-4
Functional Testing Switch Settings

No.	RES	ACK	REJ	Contents
01	X	X	X	Test for normal rotation of carrier motor
02	X	X	O	Test for reverse rotation of carrier motor
03	X	O	X	Validator sensor test
04	X	O	X	Stacker performance test
05	O	X	X	Carrier and storage test
06	O	X	O	Solenoid test
07	O	O	X	Stacker sensor test
08	O	O	O	Bill registry test

Test Item No. 01 – Normal Rotation of Carrier Motor

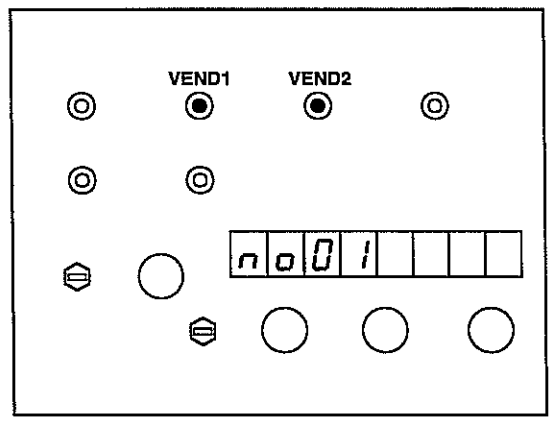
1. Be sure that **no. 01** is displayed on the LED display (see Figure 3-28).
2. Set the D/E switch to ENABLE. Setting the D/E switch to DISABLE turns motor off.
3. If the motor rotates normally, the carrier speed will be displayed on the VEND1 and S-FULL LEDs.



OK

VEND2 and VEND3 will light up.

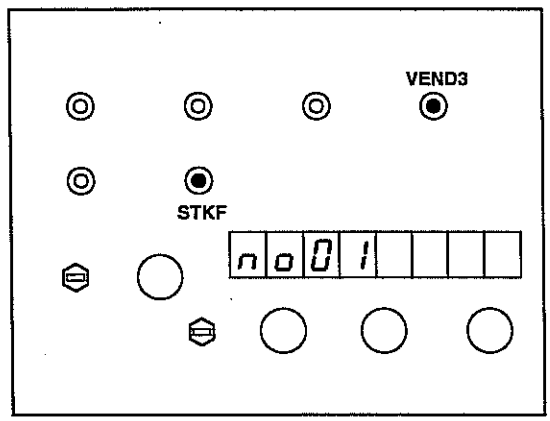
Carrier speed is appropriate



Not Good

VEND1 and VEND2 will light up.

Carrier speed is fast.



Not Good

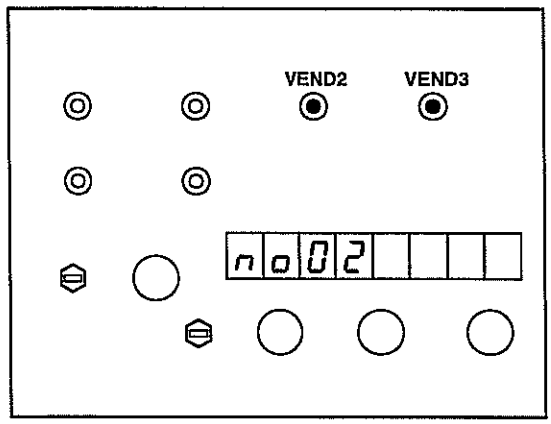
VEND3 and STKF will light up.

Carrier speed is slow.

Figure 3-28. Test No. 01 Displays.

Test Item No. 02 – Reverse Rotation of Carrier Motor

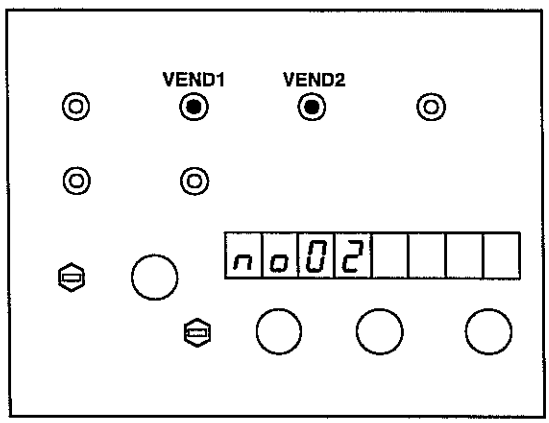
1. Press down the REJ switch on the tester control box while moving the D/E switch to ENABLE.
2. Make sure that **no. 02** is displayed on the LED display (Figure 3-29). Setting the D/E switch to DISABLE turns the motor off.
3. If the motor rotates in reverse, normally the carrier speed will be displayed on the VEND1 and S-FULL LEDs.



OK

VEND2 and VEND3 will light up.

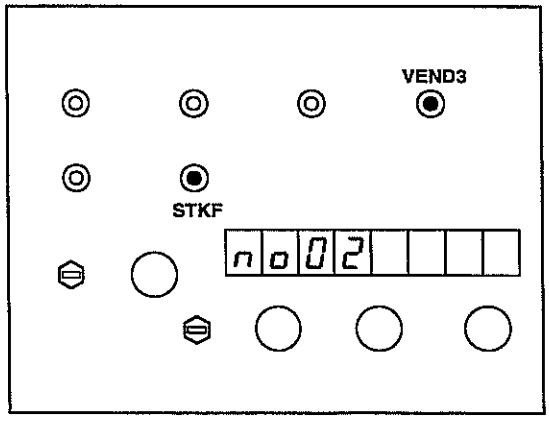
Carrier speed is appropriate.



Not Good

VEND1 and VEND2 will light up.

Carrier speed is fast.



Not Good

VEND3 and STKF will light up.

Carrier speed is slow.

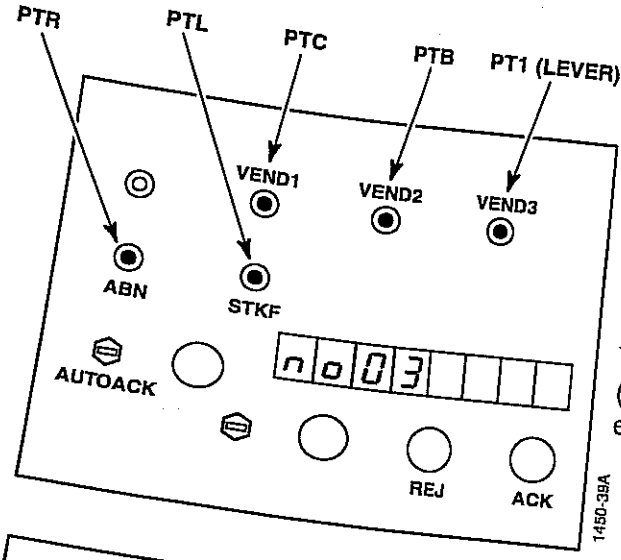
Figure 3-29. Test No. 02 Displays.

Test Item No. 03 – Validator Sensor

1. Press the ACK switch on the tester control box while m
the D/E switch to ENABLE.

2. Make sure that **no. 03** is displayed on the LED display.

The state of each sensor is indicated by the tester control l
LEDs. See Figure 3-30 for an illustration of LED displays
taining to this test, with an accompanying table describing
related LED functions.

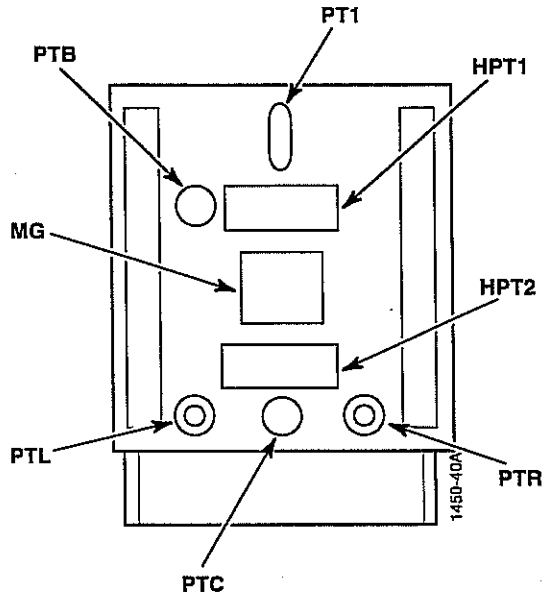


When each sensor is OFF (paper bills are inserted), each LED will light up.

Sensors	LED	Description
PTC	VEND1	Lights up when bill touches PTC
PTB	VEND2	Lights up when bill touches PTB
PTI	VEND3	Lights up when bill touches lever
PTR	ABN	Lights up when bill touches PTR
PTL	S-FULL	Lights up when bill touches PTL

Figure 3-30. Test No. 03 Displays, with Related LED Functions.

Note: *The following output signal checks of the PTR and PTL sensors are possible with the ACK (or AUTOACK) and REJ switches (see Figure 3-31).*



ACK (AUTOACK)	REJ	Output signal of PTR, PTL
OFF	OFF	IR monitor signal
OFF	ON	RED monitor signal
ON	OFF	IR data signal
ON	ON	RED data signal

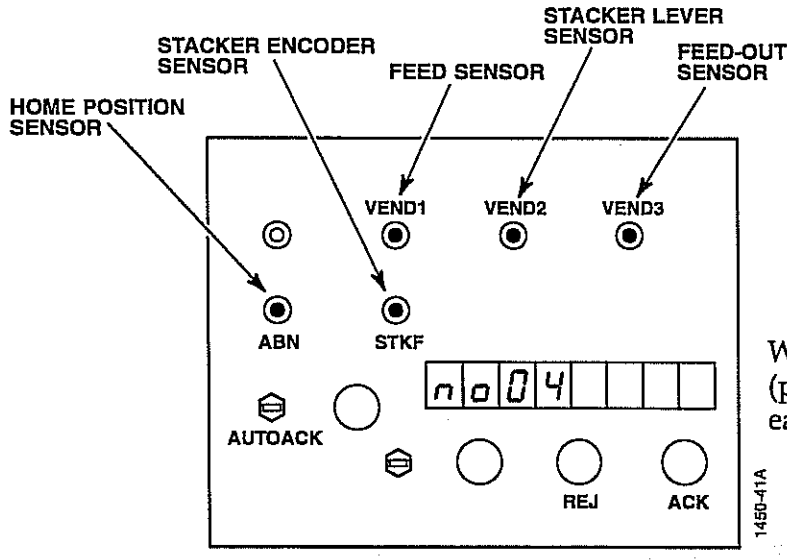
Figure 3-31. Test No. 03 PTR and PTL Signal Checks, with Related Output Signals.

Test Item No. 04 – Stacker Performance

1. Press the REJ and ACK switch on the tester control box while moving the D/E switch to ENABLE.

2. Make sure that **no. 04** is displayed on the LED display (see Figure 3-32).

   The state of each sensor is indicated by the tester control box's LEDs. Table 3-5 summarizes the functions of the various LEDs pertaining to this test.



When each sensor is OFF (paper bills are inserted), each LED will light up.

Figure 3-32. Test No. 04 Displays.

Table 3-5
Stacker Performance Test LED Functions

Sensor	LED	Description
Feed sensor	VEND1	Lights ups when bill touches the feed sensor.
Stacker lever sensor	VEND2	Lights ups when bill touches the lever sensor.
Feed-out sensor	VEND3	Lights ups when bill touches the feed-out sensor.
Home position sensor	ABN	Lights ups when the press unit is at the home position.
Stacker encoder sensor	S-FULL	Lights ups when encoder is not breaking the light opening.

Test Item No. 05 – Carrier And Storage

1. Press the S-RESET switch on the tester control box while moving the D/E switch to ENABLE.

2. Make sure that **no. 05** is displayed on the LED display (see Figure 3-33).

   When a bill is inserted with the proper timing, it is transported through the bill accepter and stacked in the cash box.

When an error in carrier and storage occurs, operations are interrupted and the type of error is indicated by the coded flashing of LEDs VEND1 – VEND3. Table 3-6 summarizes the error conditions indicated by these LEDs.

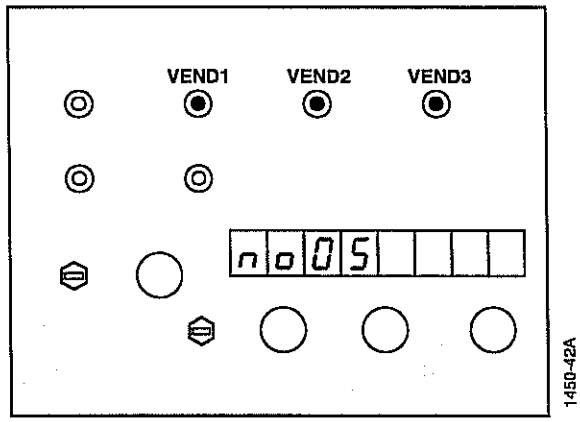


Figure 3-33. Test No. 05 Displays.

Table 3-6
Carrier and Storage Test Error Indicators

Error Code			Type of Abnormality
VEND1	VEND2	VEND2	
O			1. Abnormality in the carrier motor. 2. Abnormality in the encoder sensor.
	O		Abnormality in the stacker solenoid.
O	O		1. Abnormality in the validator sensor. 2. A bill remains inside the validator.
		O	1. Abnormality in the stacker sensor. 2. A bill remains inside the stacker carrier path.
O		O	The stacker box is full.
	O	O	1. Abnormality in the drive unit. 2. Abnormality in the stacker encoder sensor.

Test Item No. 06 – Solenoid

1. Press the REJ and S-RESET switch on the tester control box while moving the D/E switch to ENABLE.
2. Make sure that **no. 06** is displayed on the LED display (see Figure 3-34).
3. Repeatedly turn the solenoid on and off.

   The coded flashing of the tester control box's LEDs are interpreted the same way as they are for the stacker tests **no. 04** and **no. 07** (Refer to Table 3-5).

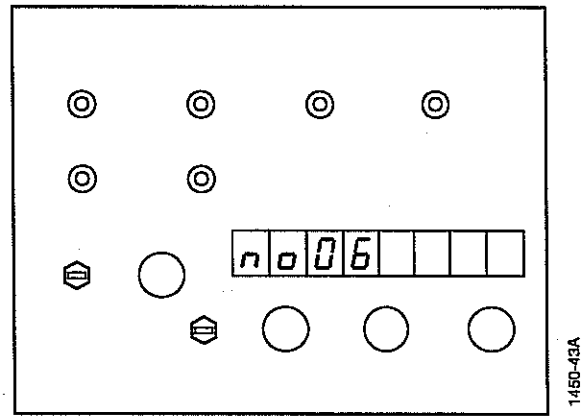


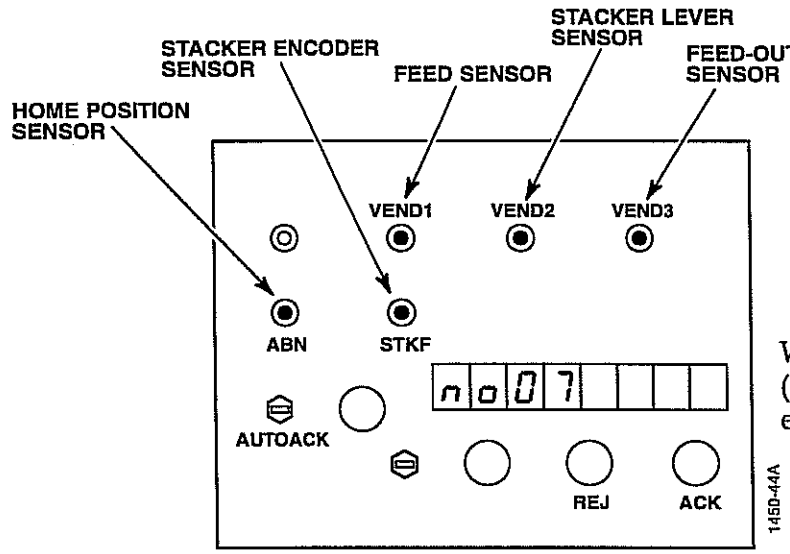
Figure 3-34. Test No. 06 Displays.

Test Item No. 07 – Stacker Sensor

1. Press the ACK and S-RESET switch on the tester control box while moving the D/E switch to ENABLE.

2. Make sure that **no. 07** is displayed on the LED display (see Figure 3-35).

   The state of each sensor is indicated by the tester control box's LEDs. Table 3-7 summarizes the functions of the various LEDs pertaining to this test.



When each sensor is OFF (paper bills are inserted), each LED will light up.

Figure 3-35. Test No. 07 Displays.

Table 3-7
Stacker Sensor Test LED Functions

Sensor	LED	Description
Feed sensor	VEND1	Lights ups when bill touches the feed sensor.
Stacker lever sensor	VEND2	Lights ups when bill touches the lever sensor.
Feed-out sensor	VEND3	Lights ups when bill touches the feed-out sensor.
Home position sensor	ABN	Lights ups when the press unit is at the home position.
Stacker encoder sensor	S-FULL	Lights ups when bill is under slit of the encoder.

Test Item No. 08 – Bill Registry

1. Press the REJ ACK and S-RESET switch on the tester control box while moving the D/E switch to ENABLE.

2. Make sure that **no. 08** is displayed on the LED display (see Figure 3-36).

Note: *When this mode is set, setting the D/E switch to DISABLE will not release the test items,and it will not be possible to return to waiting status for test mode. Only powering down the tester control box exits test* ***no. 08****.*

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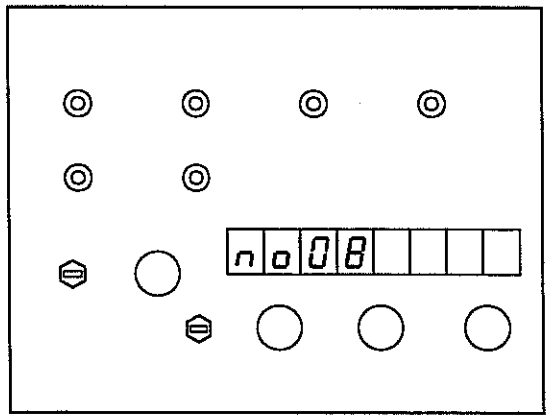
3. The settings of the DIP switches vary, depending on whether the registry test is to be carried out with or without the stacker assembly. To perform the test with the validator only, set DIP switch 8 to the OFF position with the other DIP switches all in the ON position. To perform the test with the validator and stacker, set DIP switch 8 to the ON position – all the DIP switches are in the ON position in this case.



LED	Description
BSY	Lights up during operation of validator.
VEND1 VEND2 VEND3	Displays type of bill in code format.
ABN	Displays error conditions by number of blinks.

Figure 3-36. Test No. 08 Displays and Related LED Functions.

Bill Identification

The validator identifies the denomination of bills that are presented and indicates the denomination on the display. The interface is also indicated by the pattern of VEND LED illumination, as shown in Table 3-8.

Table 3-8
JCM Bill Denomination Interface Code

VEND1	VEND2	VEND2	Type of Bill	Display
O	X	X	$1	1
X	O	X	$5	5
O	O	X	$10	10
X	X	O	$20	20
O	X	O	$50	50
X	O	O	$100	A0

Returned Bills

If a bill is returned, the reason is indicated by the number of times the ABN LED flashes on and off (the cycle is 0.5 seconds), and the return code is also displayed on the segment. This is repeated until the next bill is inserted. Table 3-9 lists the return codes that apply to individual pulse counts.

Table 3-9
Bill Registry Test Return Codes

Number Of Pulses	Reason of Return
1	Insertion not straight.
2	Magnetic pattern error.
3	A sensor other than PTR, PTI and PTC detected a bill while the validator was on standby.
4	The dark-light ratio of the bill is below the fixed value.
5	1. The HPT2 sensor did not detect the bill within the fixed amount of time after it was initially taken in. 2. The PTI and PTB sensors did not detect the bill within the fixed amount of time after it was initially taken in. 3. The stacker sensor did not detect the bill within the fixed amount of time after it was initially taken in. 4. The pulse signal from the encoder sensor was not output. 5. The PTI sensor or PTB sensor detected the bill before the HPT2 sensor did. 6. The PTB sensor did not detect the bill immediately after it passed the HPT2 sensor.
6	The denomination cannot be determined.
7	Error in a photosensor.
8	Level error; the bill is unusually dirty. Two overlapping bills were detected.
9	The bill was returned due to output of the disable signal.
10	Reserved.
11	The PTI or PTB sensor did not detect the bill immediately following completion of data registry.
12	The PTI sensor or the stacker sensor detected a bill when the validator was on standby. The stacker was not in the home position immediately before the VEND signal was output. An error occurred during carrying of a bill in the stacker.
13	The bill is of a length other than specified.
14	Color pattern error.

Error Codes

When an abnormality occurs in the validator, the type of error involved is indicated by the number of times the ABN LED flashes on and off (the cycle is approximately 1 second). However, the code is not displayed on the segment. Table 3-10 lists the error codes that apply to individual pulse counts.

Table 3-10
Bill Registry Test Error Codes

Number Of Pulses	Type of Error
1	The stacker box is full.
2	1. Abnormality in the pusher unit. 2. The signal from the stacker encoder sensor was not output.
3	A bill remains inside the stacker carrier path.
4	A bill remains inside the validator.
5	Carrying speed error.
6	1. Abnormality in the carrier motor. 2. The signal from the validator's encoder sensor was not output.
7	Reserved.
8	Abnormality in the stacker solenoid.

Error Messages

When one of error messages (refer to Table 3-11) **Err20** through **Err26** is displayed, the validator enters the register-inhibit state. Turn the power back on.

The validator also enters the register-inhibit state when error **r.d Err** occurs. To reset the validator, move the D/E switch to the DISABLE position, then back to ENABLE.

Table 3-11
Bill Registry Test Error Messages

SEGMENT	Details
Err00 – Err13	Error messages that are output by the validator during the registry test.
Err20	Improper DIP switch setting.
Err21	Pulse amplitude is too short.
Err22	Duty error; improper DIP switch setting.
Err23	Communications error.
Err24	Error in RAM check.
Err25	Error in ROM check.
Err26	Error in timer check.
r.d Err	Improper pulse count setting.

❑ Functional Testing – DBV-147

The DBV-147 is tested in a slightly different manner since the tester unit only supplies power to the DBV-147. Two tests are available in this mode:

- Validator function only
- Complete bill acceptor function

Begin either test as follows:

1. With power on the tester OFF, set DIP switches on the validator head 1 through 7 OFF and 8 ON.

2. Turn ON power to the tester.

To functionally test the validator head only:

- Set DIP switches 1, 2 and 3 ON, then turn DIP switch 8 OFF.

To functionally test the entire bill acceptor:

- Set DIP switches 1, 2, 3 and 4 ON, then turn DIP switch 8 OFF.

When DIP switch 8 is turned OFF, the validator motor cycles for a few seconds to indicate that the test is enabled. If the entire bill acceptor is being tested, the initialization procedure occurs.

At this time bills may be inserted for the acceptance test. Refer to Table 3-12 for the LED flash code signifying acceptance of a particular bill. Refer to Tables 3-9 and 3-10 for the return codes or error codes that may be encountered.

Table 3-12
DBV-147 Bill Acceptance Codes

Type of Bill	Number of LED Flashes
$1	1
$2	2
$5	3
$10	4
$20	5
$50	6
$100	7

❑ Operating Flowchart

The operating flow chart in Figure 3-37 illustrates the sequence of events carried out during operation of the bill acceptor. After initial power is applied, the bill acceptor will idle in the stand-by mode until a bill is presented for validation.

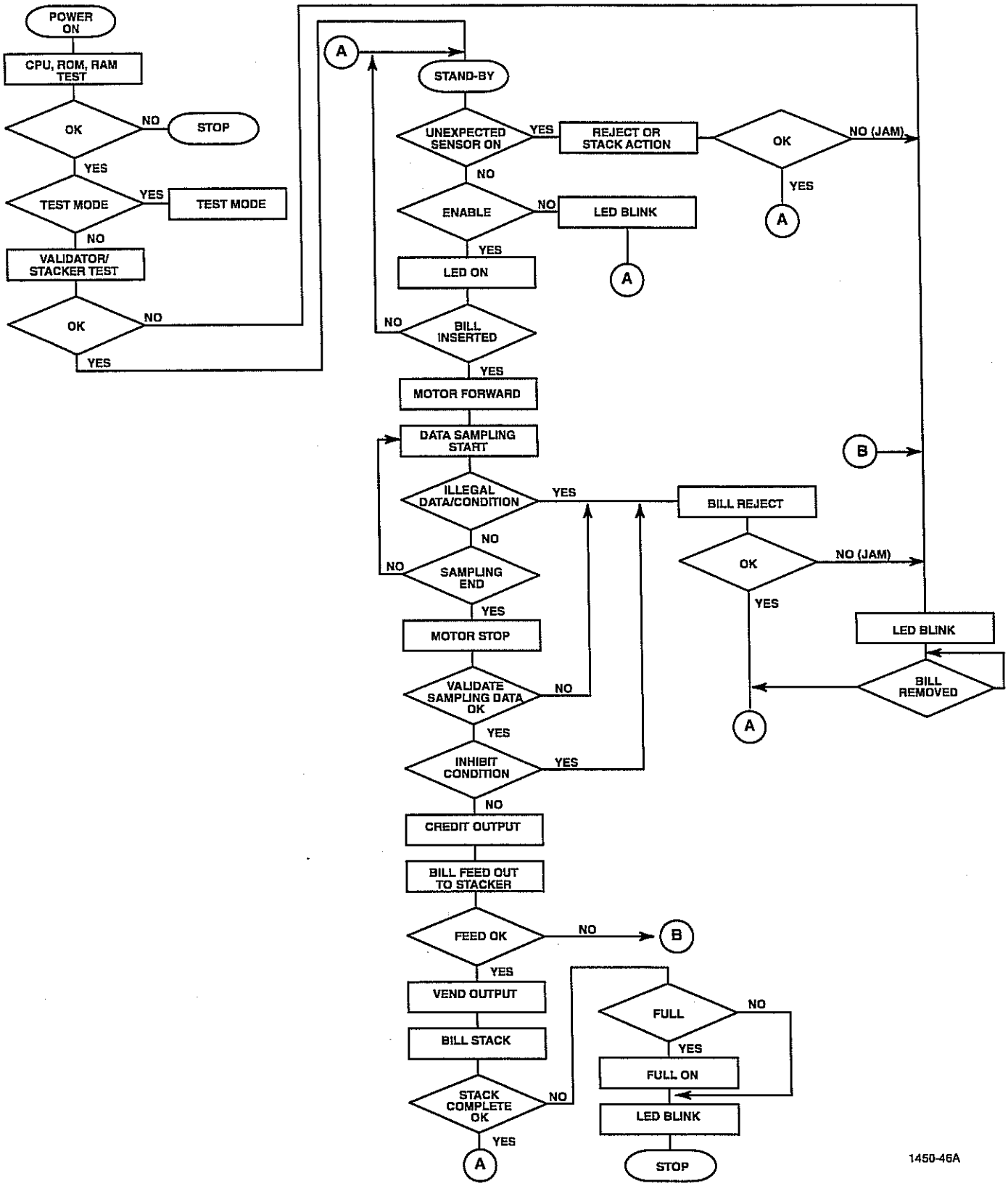


Figure 3-37. Bill Acceptor Operating Flowchart.

❑ Electric Cabling

The JCM bill acceptor is connected from the machine to the JCM power supply, and then to the validator/stacker assemblies. See Figure 3-38 for an illustration of these wiring connections.

Note: *The DBV-147 has no separate power supply, its power comes directly from the machine. Refer to the appropriate electronic diagrams and parts manual for the machine in which this bill acceptor is installed.*

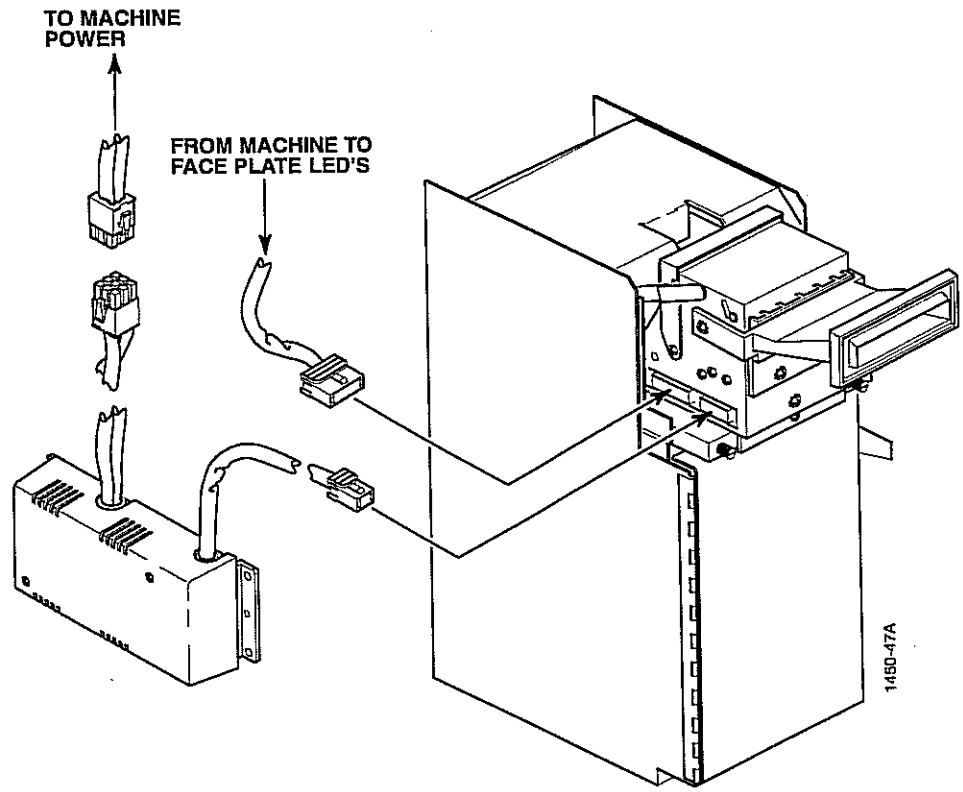


Figure 3-38. JCM Bill Acceptor Wiring Connections.