Section 4: OBA-2 Maintenance

INTRODUCTION

This section of the service manual provides a general description of the Rowe OBA-2 Bill Acceptor (OBA) including a physical description and a functional description.

The OBA-2 Bill Acceptor accepts valid U.S. currency in $1, $5 denominations. The OBA-2 rejects and returns unacceptable currency to the customer.

The bill acceptor interfaces with the central control computer, which sends and receives messages concerning the acceptance, rejection, and validation of currency.

PHYSICAL DESCRIPTION

The bill acceptor consists of three major components. These are: The bill transport mechanism, the bill stacker, and the OBA control unit *(see figure 4-1)*.

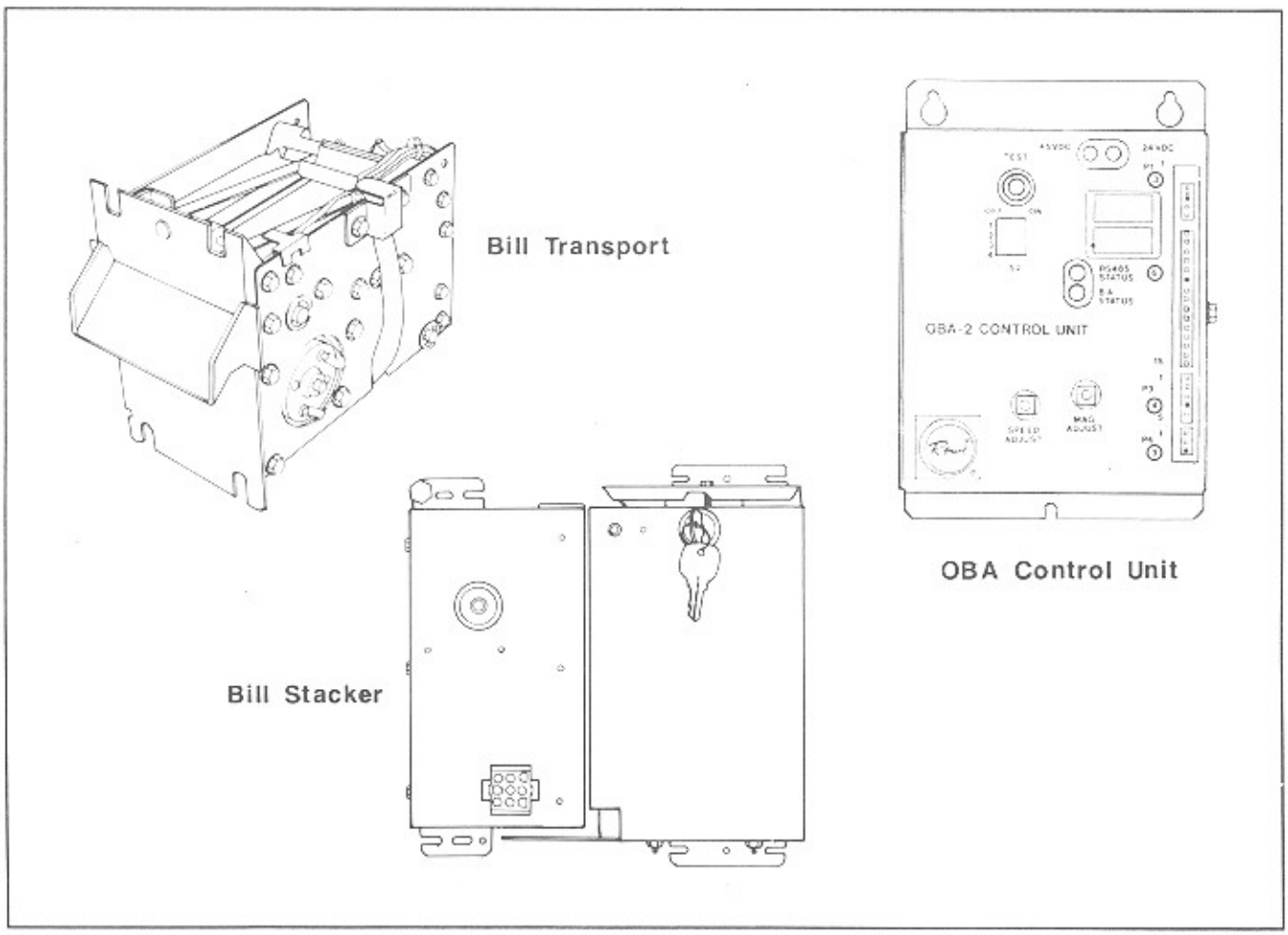


Figure 4-1. Bill Acceptor Components

Bill Transport Mechanism

This device mechanically transports the currency from the bill acceptor opening past various sensors. These sensors scan the bill for validation information and relay it to the OBA control board *(see figure 4-2 and 4-3)*.

DRIVE BELTS

A D.C. motor, a series of rollers, and pulleys and belts carry the bills from the bill inlet through the bill acceptor. The drive belts provide long life and reliable operation while requiring very little maintenance.

The main drive belt and lower bill transporting belts are cogged for more reliable operation, while adjustable idle pulleys are used to maintain correct tension. Upper transporting belts are of a stretch type, which require no adjustment. As the bill moves along the path from the opening to the stacker it is trapped between the upper and lower transporting belts. This provides a sure and non-slip movement through the transport mechanism.

OPTICAL SENSORS

Three optical sensors are used to communicate bill information to the OBA control unit while the

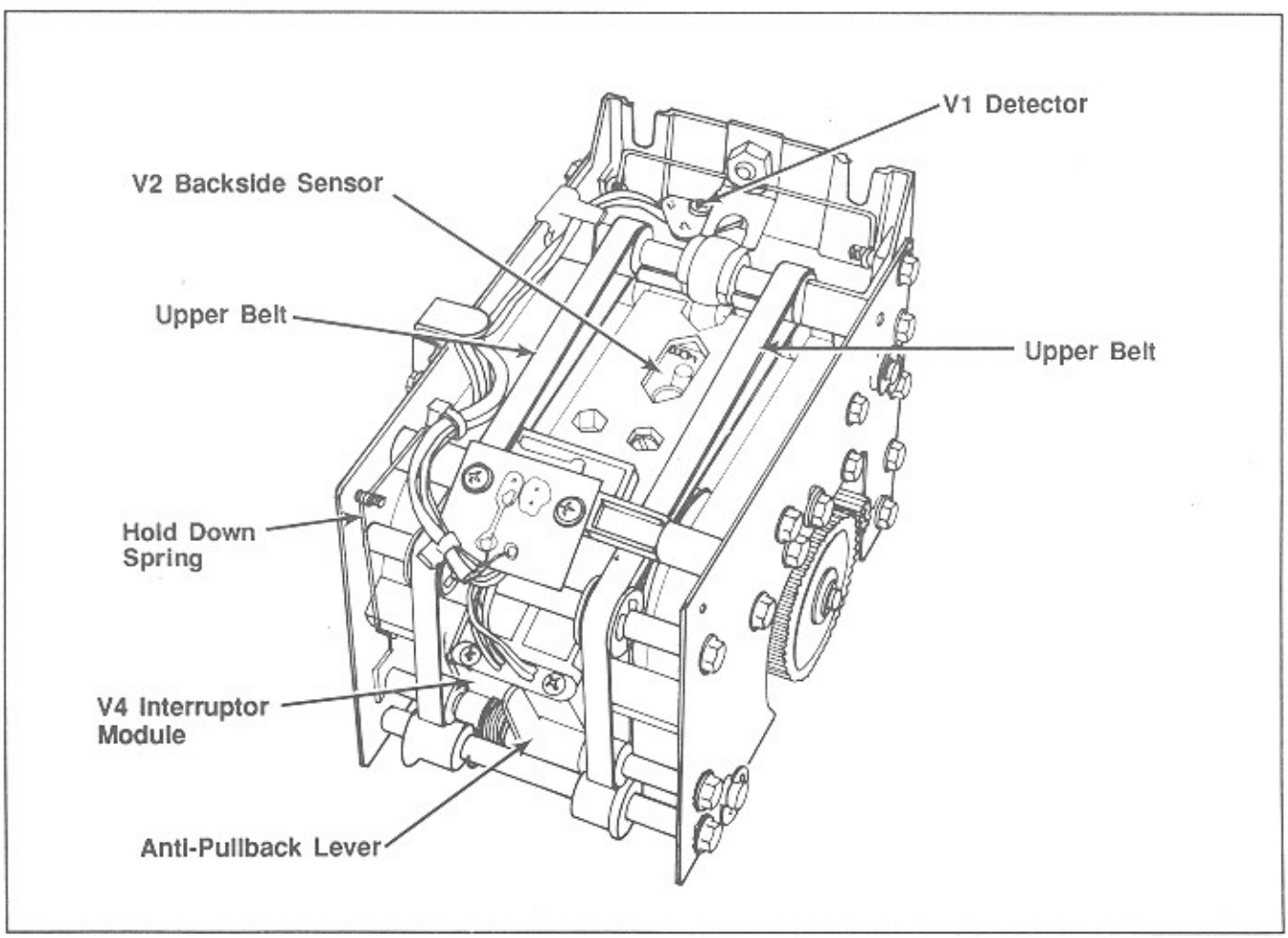


Figure 4-2. Bill Transport Unit
Top View

bill is in the transport mechanism. Two of the three sensors used in the bill acceptor are used for establishing bill position within the transport mechanism path. The third provides validation data from the bill as it passes through the transport. These sensors, referred to hereafter as V1, V2 and V4, are arranged so that, beginning from the bill acceptor opening, the numbers ascend as the bill moves farther away from the opening.

V1 is used to sense the presence of a bill in the transport opening. V2 is used for obtaining precise information from the underside of the bill. V4 is used to make a precise determination of the bill position. All three of the optical sensors are of the infrared type.

MAGNETIC HEAD

The magnetic head checks the magnetic properties of the incoming bill. A spring loaded pressure roller insures intimate contact between the bill and the magnetic head.

ANTI-PULL-BACK LEVER

This lever prevents the bill from being removed by the customer after the bill has been accepted as valid. It also works in conjunction with the V4 sensor to determine the bill's position.

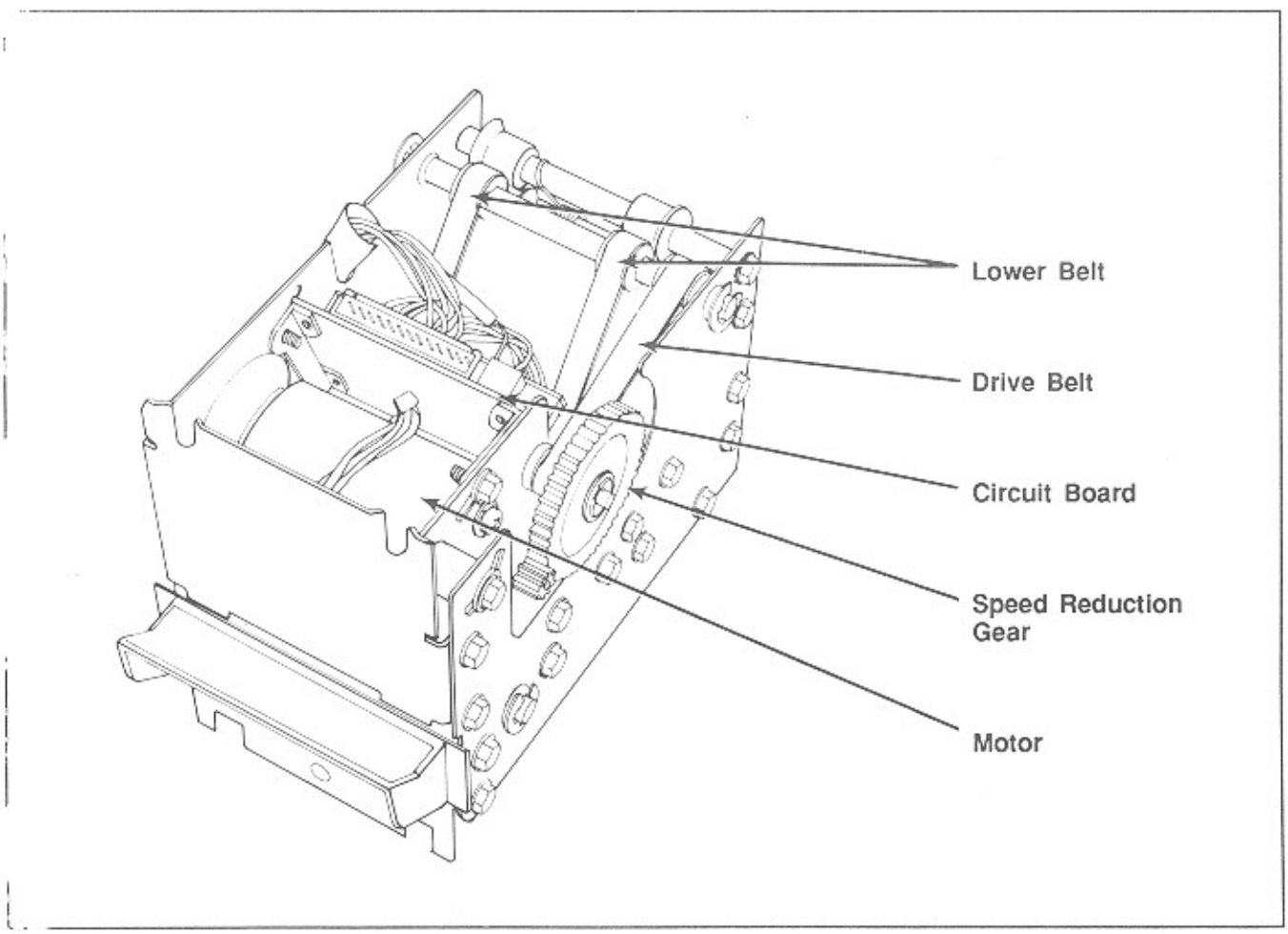


Figure 4-3. Bill Transport Unit
Bottom View

Bill Stacker

The stacker accepts bills from the transport mechanism and stacks them in a locked bill box. The stacker uses a D.C. motor to drive a metal platen, which via a mechanical linkage, pushes the bill into the bill box. A cam-actuated switch signals the OBA control unit as to the position of the platen. The platen may be in either the HOME or the OFF HOME position. An OFF HOME signal received by the control unit while it is in STANDBY, prompts it to reset the platen and return it to its HOME position (*See functional description in this section*).

OBA Control Unit

This module contains the electronic circuit board and micro-computer. It directs the operations of the various parts of the bill acceptor, but it in turn is directed by the central control computer. It also contains all the necessary circuitry for connecting the bill transport to the bill stacker *(see figure 4-4)*.

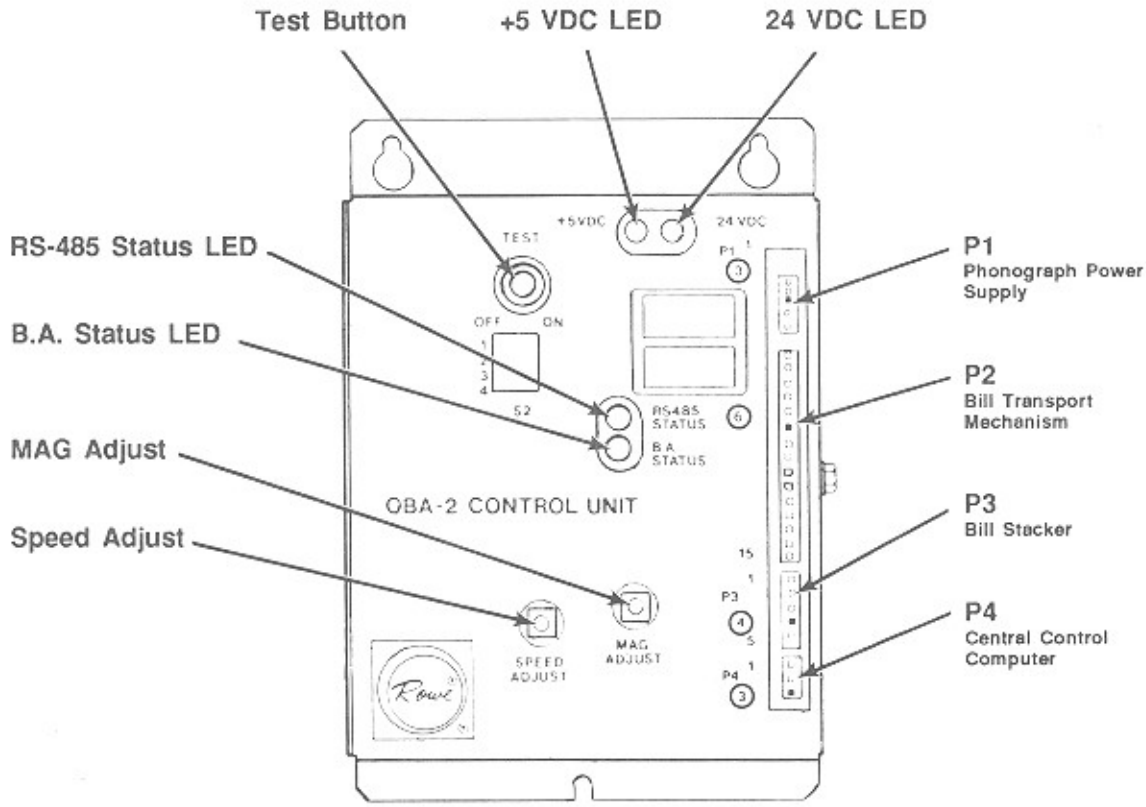


Figure 4-4. OBA Controller

CONNECTORS

Four connectors, labelled P1, P2, P3, and P4 connect the three major modules or components of the bill acceptor to each other and to the central control computer.

P1 connects the OBA control unit to the phonograph power supply via the CCC.

P2 connects the bill transport mechanism to the OBA control unit.

P3 connects the bill stacker to the OBA control unit.

P4 connects the OBA control unit to the central control computer.

Adjustments on the OBA control unit *(see Electrical Adjustments for a detailed explanation of adjustment procedures).*

MAG ADJUST

Allows adjustment of the magnetic amplifier circuitry for optimum performance. The amplifier is used in conjunction with the magnetic head in the bill transport mechanism for checking specific properties of the bills *(see figure 4-4).*

TEST BUTTON

If this button *(see figure 4-4)* is depressed when the unit is in the idle (STANDBY) state it activates the motor speed adjustment mode. This allows the rate at which the bill is fed through the transport mechanism to be adjusted for optimum performance. If the bill acceptor is in the SHUTDOWN mode rather than the STANDBY mode, pushing the TEST button will reset it and put it back into STANDBY (*see Functional Description in this section*).

VISUAL INDICATORS

Refer to figure 4-4 for the location of these indicators.

RS-485 STATUS LED - This LED indicates the status of the communications link. If the LED is not on, the bill acceptor is in the RECEIVE mode, waiting for a command from the central control computer. When the LED is on, the bill acceptor is in the TRANSMIT mode and is sending information to the central control computer.

BA STATUS LED - This LED indicated whether the bill acceptor is in the SHUTDOWN state or is in operating condition. When not lit, the bill acceptor is in normal operating condition. When lit, the LED indicates that the unit is shutdown due to a fault. The STATUS LED is also used to indicate the correct motor speed when used in conjunction with the MOTOR SPEED ADJUST mode (TEST button depressed).

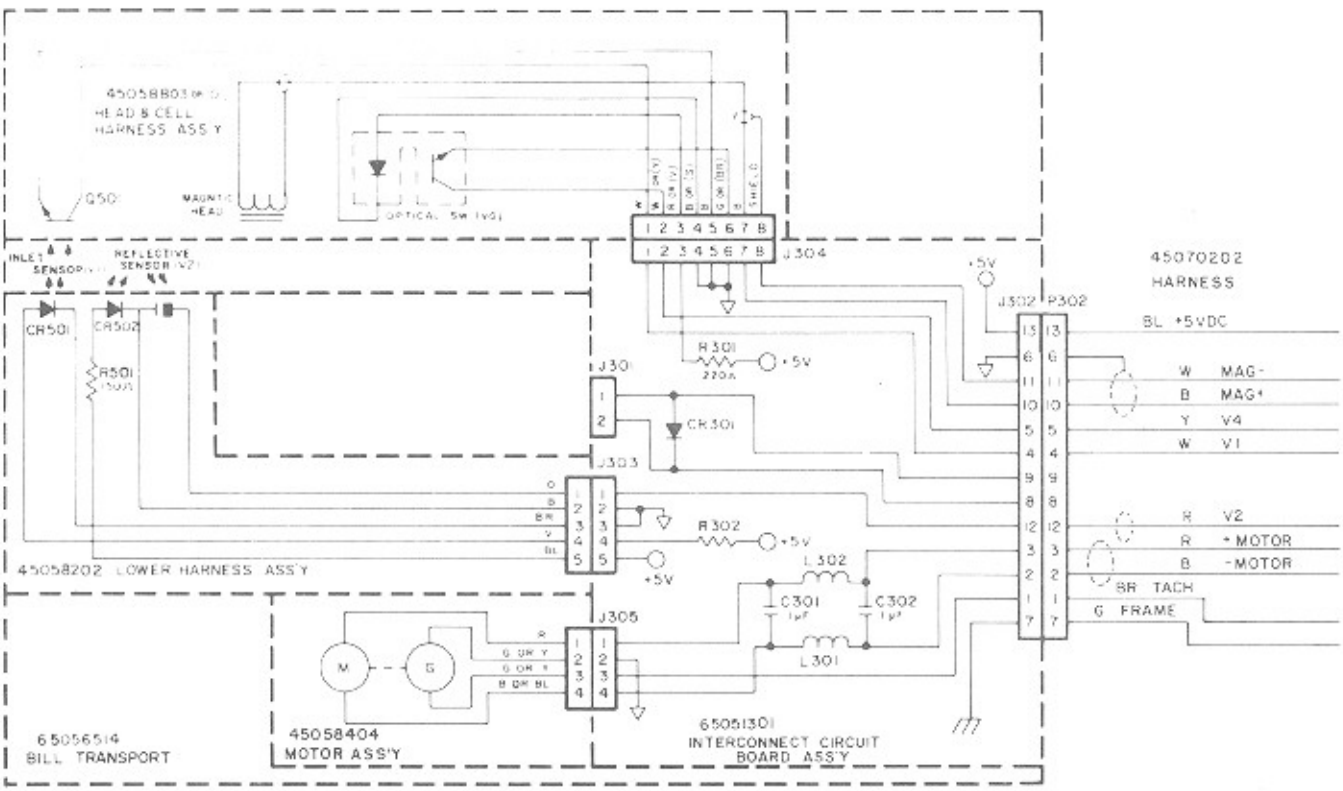
+5VDC AND +24 VDC LED'S - When lit, these indicate the normal presence of the system voltages.

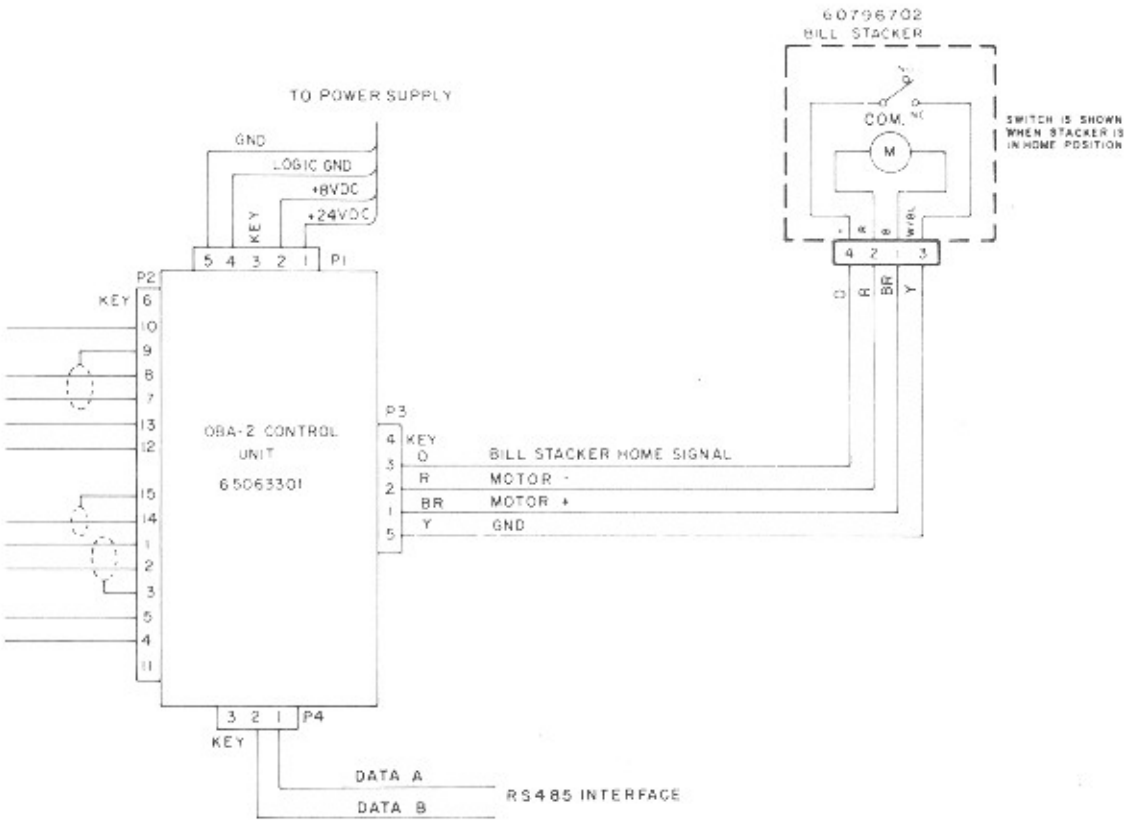
FUNCTIONAL DESCRIPTION

The following is a sequential description of the operation of the bill acceptor. This description gives a basic understanding of how the bill acceptor normally operates and can be used as an aid in troubleshooting *(see figure 4-5, the OBA Block Diagram).*

Bill Acceptor In Standby Mode

When the power is first supplied to the bill acceptor, in normal operation, the bill acceptor immediately assumes a passive or idle state. It will not attempt to accept bills until it receives an ENABLE command from the central control computer. Though it is not able to accept bills it is not completely idle; it is continually checking the various sensors in the bill transport and bill stacker mechanisms. If it sees an incorrect signal it takes the appropriate actions, as described in the following paragraphs:


45058803
HEAD & CELL
HARNESS ASS'Y
Q501
MAGNETIC HEAD
OPTICAL SW (V3)
INLET SENSOR (V1)
REFLECTIVE SENSOR (V2)
CR501
CR502
R501
J304
1 2 3 4 5 6 7 8
+5V
45070202
HARNESS
J302 P302
BL +5VDC
W MAG-
B MAG+
Y V4
W V1
R V2
R +MOTOR
B -MOTOR
BR TACH
G FRAME
R301
220Δ
J301
CR301
J303
R302
L302
C301
1μF
C302
1μF
L301
45058202 LOWER HARNESS ASS'Y
J305
M
G
65056514
BILL TRANSPORT
45058404
MOTOR ASS'Y
65051301
INTERCONNECT CIRCUIT
BOARD ASS'Y



For Equivalent Engineering Drawing See 65057024-Q2 B

Figure 4-5. OBA-2 Block Diagram

PROBLEMS THAT MAY ARISE IN THE STANDBY MODE:

V4 Sensor Is Active

The bill acceptor assumes that something is trapped in the bill transport path if this sensor is active while in the STANDBY mode. It then begins the reject sequence to remove the trapped object from the path (*see Reject Sequence in this section*).

Stacker Home Switch Not Activated

The bill acceptor turns on the stacker motor and attempts to return the stacker platen to its HOME position. If successful, the bill acceptor returns to the STANDBY mode. If unsuccessful, it shuts itself down *(see Shutdown Sequence in this section for additional information on this subject).*

ACTIONS TAKEN BY THE BILL ACCEPTOk TO CORRECT THESE PROBLEMS:

Reject Sequence

In order to clear the bill transport mechanism and purge any objects from the path, the bill acceptor turns on its transport motor in the reverse direction. If the bill acceptor is following a normal bill rejection sequence, it will reject the bill and return it the bill acceptor opening. It will place it so that it can be easily grasped by the customer. If the customer retrieves the bill within five seconds and all other sensors indicate that the transport path is clear, the bill acceptor returns to the STANDBY mode. A BILL REJECT message and a REJECT code is sent to the central control computer indicating the cause of the rejection (*see Troubleshooting in this section for an explanation of the REJECT codes*). If the track is not clear, the bill acceptor begins the self-clearing sequence.

Self-Clearing Sequence

Upon failing to clear the transport path as described, the bill acceptor begins a self-clearing sequence. This consists of a series of reverse-forward-reverse cycles to dislodge and object trapped in the transport. If this procedure ;is successful the bill acceptor returns to the STANDBY mode. If the track is not cleared after 10 cycles the unit will shutdown.

Shutdown Sequence

Several things may cause a shutdown of the bill acceptor. In the instance above an unsuccessful attempt by the bill acceptor to clear an object lodged in the transport path will initiate a SHUTDOWN sequence. In the event of a shutdown the bill acceptor turns everything off except the STATUS LED, which turns ON to indicate a fault condition. A SHUTDOWN message is sent to the central control computer along with an error code indication the cause of the fault (*see Troubleshooting in this section for a complete explanation of the FAULT codes).*

Bill Acceptance Mode

The following is a description of the operations that occur when the bill acceptor is in the BILL ACCEPTANCE mode. These are not the only operations that can occur in this mode however. The reject, self-clearing and shutdown sequences as previously described can occur as well.

An acceptance cycle starts when a bill is inserted into the transport. The transport motor starts in a forward direction and continues until the trailing edge of the bill passes the magnetic head. If the bill fails any of the required magnetic or optical checks it is immediately rejected and

returned to the customer. If the bill passes all of the checks the transport stops and the OBA then waits for a STATUS REQUEST from the central control computer and, upon receiving it, transmits a BILL IN ESCROW message containing the correct code for the bill validated. If a STATUS REQUEST is not received within two seconds, the bill is rejected. After sending the BILL IN ESCROW information, the bill acceptor waits for either the ACCEPT or REJECT command from the central control computer.

After receiving the ACCEPT command, the bill acceptor activates the transport motor and moves the bill from the transport mechanism to the bill stacker. The bill is monitored to ensure that the bill movement through the mechanism is correct. If the bill does not clear the transport mechanism within a specified time the bill is rejected and returned to the customer.

The stacker motor is now activated and the home switch monitored to ensure that the bill stacker platen leaves the home position, stacks the bill in the bill box and returns to the home position. If the stacker platen does not leave the home position within 750 milliseconds or if it does not return within 2.5 seconds, the bill acceptor begins its shutdown sequence.

Upon completion of the stacking process the bill acceptor sends a BILL ACCEPTED message to the central control computer and is then ready to begin another bill acceptance sequence.

PRICING

For overall pricing, see *Pricing in Section 2.*

Maintenance And Adjustments

ELECTRICAL ADJUSTMENTS

The electrical adjustments on the bill acceptor are factory set and should not be changed under normal operating conditions. However, replacing a bill transport or control unit requires a recalibration of the system as follows:

Motor Speed Adjustment

Refer to figure 4-4 for the locations of the electrical adjustments.

1. Depress the TEST button on the OBA control unit.
2. Turn the SPEED ADJUST control either clockwise or counterclockwise until the B.A. STATUS LED reaches its brightest and steadiest condition.

Mag Adjust

Refer to figure 4-4 for the locations of the electrical adjustments.

1. Set the MAG ADJUST control 1/8-turn back from the full clockwise position.
2. Depress the TEST button momentarily and release.
3. If the B.A. STATUS LED blinks rapidly several times after you release the TEST button, turn the MAG ADJUST control slightly counterclockwise and repeat step 2.
4. If the B.A. STATUS LED remains OFF after releasing the TEST button, the MAG ADJUST is correct.

ROUTINE MAINTENANCE

Cleaning

Since environmental conditions vary considerably, no prescribed maintenance schedule is set. Instead, the following items should be inspected periodically and cleaned as necessary:

BILL INLET AND TRACK

These surfaces should be wiped with a soft, clean, lint-free cloth.

V2 Sensor

The V2 backside sensor, which includes both an emitter and a detector, should be kept clean to ensure that all valid bills will be accepted. A soft cloth or cotton swab moistened with denatured alcohol can be used for this purpose.

Magnetic Head

Due to the abrasive nature of currency, the magnetic head does not normally require cleaning. If the magnetic head does collect dirt, the dirt may be removed with a cotton swab saturated with denatured alcohol.

Drive Belts

Drive belts can be cleaned by wiping them with a clean lint-free cloth moistened with denatured alcohol. Do not soak belts in a solvent.

Bill Stacker

Use a clean cloth to remove any excess dirt from the stacker, platen, and surrounding areas.

Lubrication

BILL STACKER

The bill stacker does not require lubrication.

BILL TRANSPORT MECHANISM

The bill transport mechanism does not require lubrication with normal use. If the transport mechanism is difficult to turn or if the transport mechanism is excessively noisy, apply one drop of light machine oil to each nyliner bearing and to any shaft location that supports a plastic roller.

Mechanical Adjustments

BILL STACKER

The bill stacker does not normally require adjustment. If the computer control unit indicates a problem involving the HOME switch while in SHUTDOWN mode (*see Troubleshooting in this section*), then the switch adjustment may be checked by performing the following procedures (*see figure 4-6*):

1. Rotate the cam so that the switch actuator rest on the high point of the stacker motor cam.

2. Place a .040-inch gauge between the cam and the actuator. The bottom of the actuator should rest against the switch case. If the adjustment is incorrect, reposition the switch by loosening its two mounting screws.

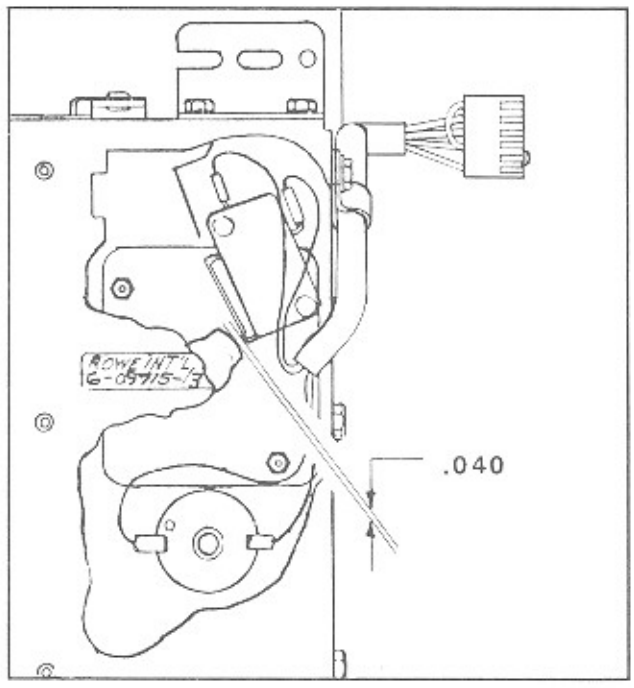


Figure 4-6. Stacker Home Switch Adjustment

BILL TRANSPORT MECHANISM

The transport mechanism does not require any initial set-up or routine adjustment. If any slipping or binding occurs in the mechanism, make the following adjustments:

DRIVE BELT TENSION ADJUSTMENT

Refer to figure 4-7 before doing this adjustment.

Adjust the drive belt tension as follows:
(For OBA transport units without an idler pulley)

1. Loosen machine screws A, B, and C to the point that the motor mounting assembly can rotate around machine screw B.

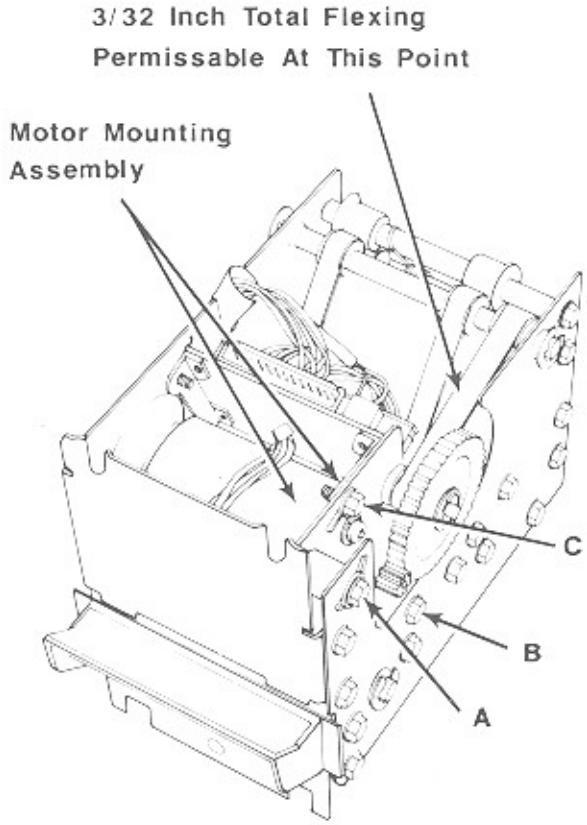


Figure 4-7. Drive Belt Tension

2. Rotate motor mounting assembly until the drive belt flexes a total of approximately 3/32-inch in mid span between the gear pulley and the drive shaft pulley.

3. Tighten the machine screws in the following order: A, B, then C. Recheck the belt tension.

4. If machine screw A is at the end of its slot and the drive belt is still too loose, the belt has stretched and must be replaced.

LOWER BELT TENSION ADJUSTMENT

Refer to figure 4-8 before doing this adjustment.

Adjust the lower belt tension as follows:

1. Loosen the four hex-head screws holding the ends of the idler pulley shaft and the take-up brackets.

2. Remove the circuit board by removing the three screws that hold the brackets and unplug the three connectors.

3. Push down on the idler pulleys until the belt flexes about 3/16 of an inch.

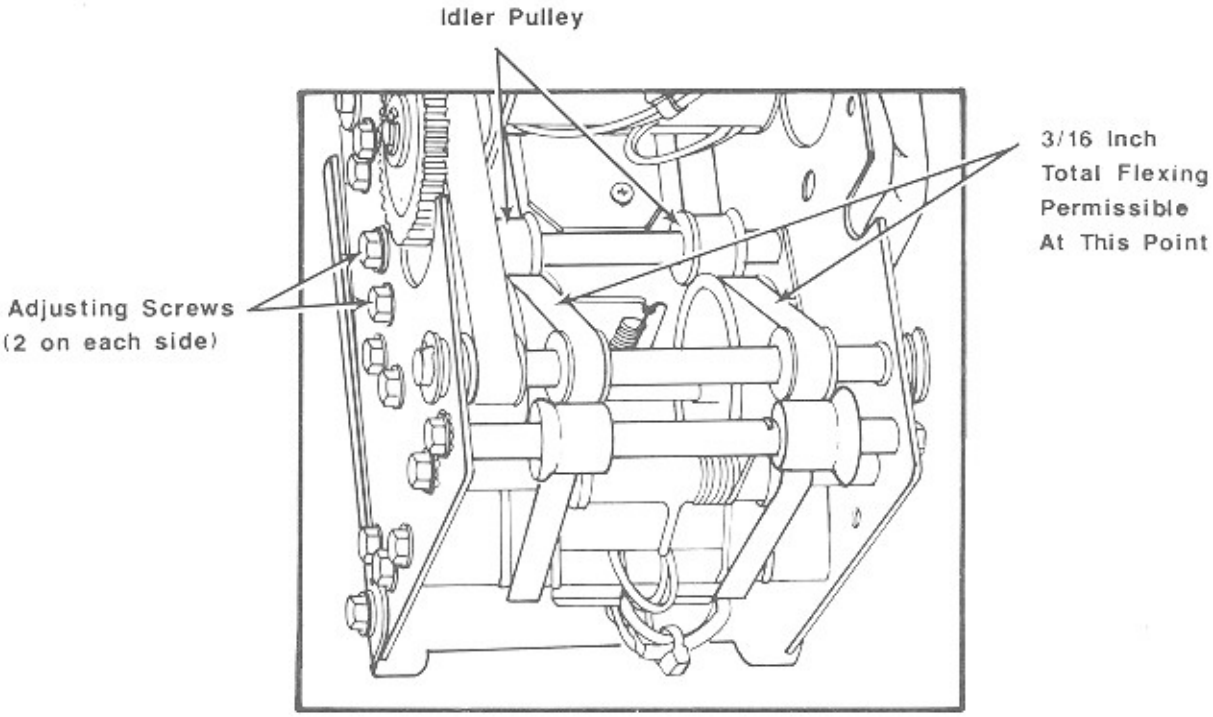


Figure 4-8. Lower Belt Tension Adjustment

4. Tighten all four screws and check the belt tension again. The tension must be equal on both belts.

5. Replace the circuit board and plug in the three connectors.

6. If the adjusting screws are against the ends of the slots and the timing belts are still loose, the transport should be returned to an authorized service center.

GEAR BACKLASH ADJUSTMENT

A degree of backlash should exist between the gears, as *shown in figure 4-9.*

To adjust the gear backlash:

1. Loosen the two Phillips-head screws holding the motor. Move the motor to give the correct backlash. This adjustment is not critical, but make sure that backlash is present at all points, as you rotate the gears.

2. Tighten the two screws and recheck the gear backlash.

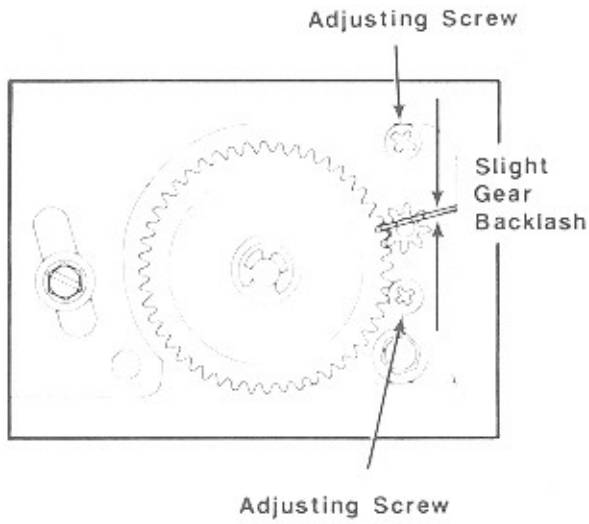


Figure 4-9. Gear Backlash Adjustment

MAGNETIC HEAD ALIGNMENT

The magnetic head is aligned with the harness and holder assembly at the factory. If a problem with the head develops, the harness and holder assembly must be replaced. Order the Harness And Holder assembly, Part Number 45059801.

Installing A New Harness And Holder Assembly

WARNING:

To avoid serious eye injury, wear safety glasses or goggles while removing and installing the tension springs that hold the harness and holder assembly.

Refer to *figure 4-10A* during removal and installation of the harness and holder assembly unless you are told to refer to *figure 4-10B*.

REMOVING A DEFECTIVE HARNESS AND HOLDER ASSEMBLY

1. Unplug the harness from the transport circuit board.
2. Loosen both cable clamp screws, and remove one so that the harness can slip out from under the cable clamp.
3. Remove the screw from the V1 detector circuit board and pull the V1 circuit board away from the OBA casting (keep the screw, you will need it to install the new assembly).
4. While wearing eye protection: Carefully slide the tension springs off of the two cover hinge screws.
5. Remove the two screws and shoulder washers that are used as a hinge for the OBA cover.
6. Remove the screw from each end of the crowned roller shaft and slide the shaft out from under the upper belts.
7. Slide the harness and holder assembly toward the front of the OBA slightly so that you can slide one side of the holder and harness assembly out from under the upper belts. Throw this assembly away.

INSTALLING A REPLACEMENT HOLDER AND HARNESS ASSEMBLY

1. Slide the new harness and holder assembly under the upper belts and align the assembly with the lower track by placing the "V" on the holder over the "V" on the lower track as shown in *figure 4-10B*.
2. Slide the crowned roller shaft into position over the holder and harness assembly.
3. Insert the screws into the ends of the crowned roller shaft and tighten the screws.
4. Make sure that the "V" on the harness and holder assembly is resting over the lower track on both sides of the harness and holder assembly.
5. Attach the V1 detector to the OBA casting.

6. Route the harness under the cable clamp, attach the cable clamp screw that you removed in *Step 2*, of the removal procedure and tighten both cable clamp screws.

7. Plug the free end of the harness into the transport circuit board.

8. Re-install the OBA cover by attaching the two screws and shoulder washers that were removed in *Step 5* of the removal procedure.

9. While wearing eye protection, carefully slide the tension springs back on the two cover hinge screws (The short end of the spring wire should rest on the mag. head holder shaft).

10. Check the upper belt paths of both upper belts to make sure that the upper belts are riding on the center of all of the pulleys.

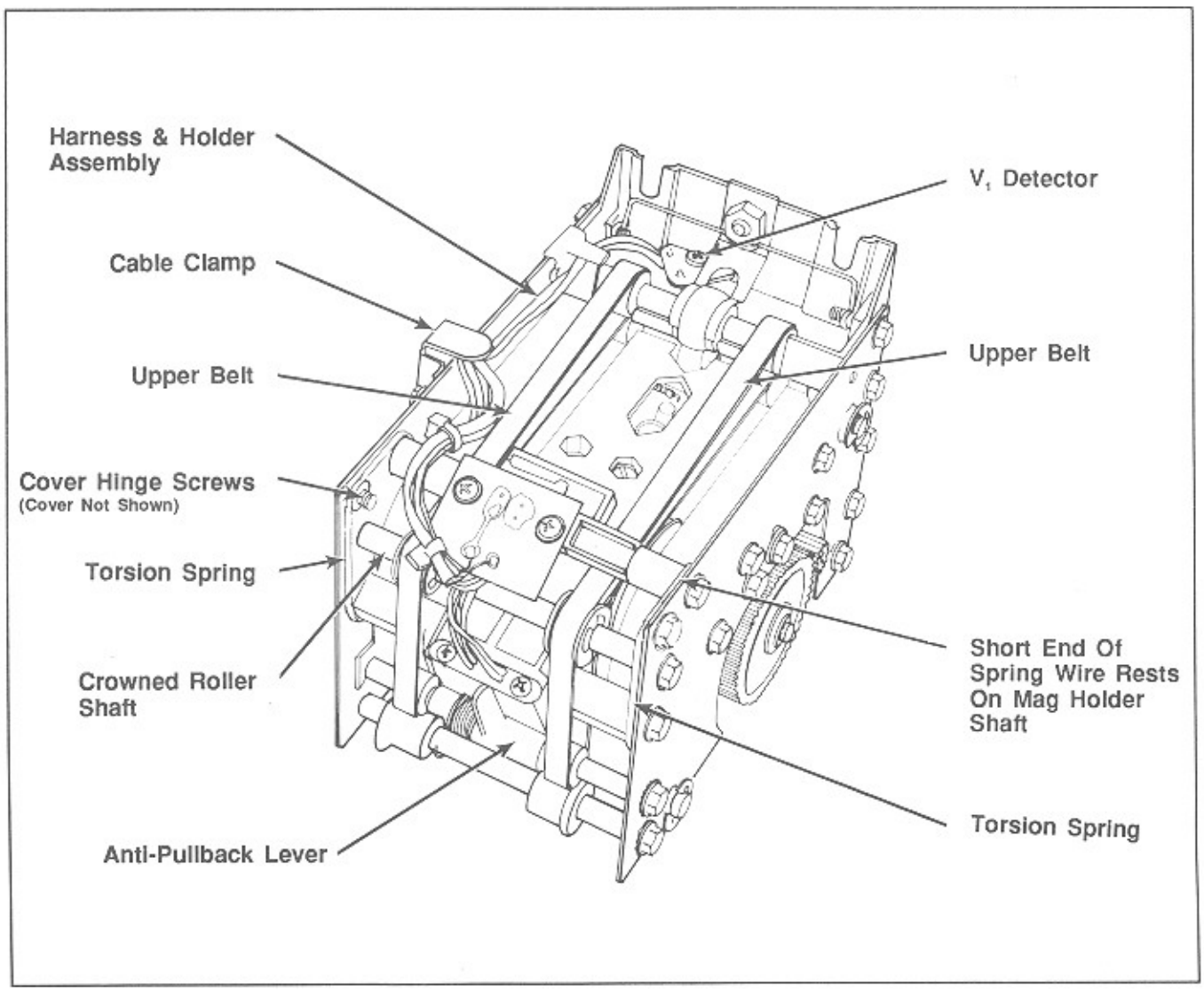


Figure 4-10A. Head And Holder Assembly Removal

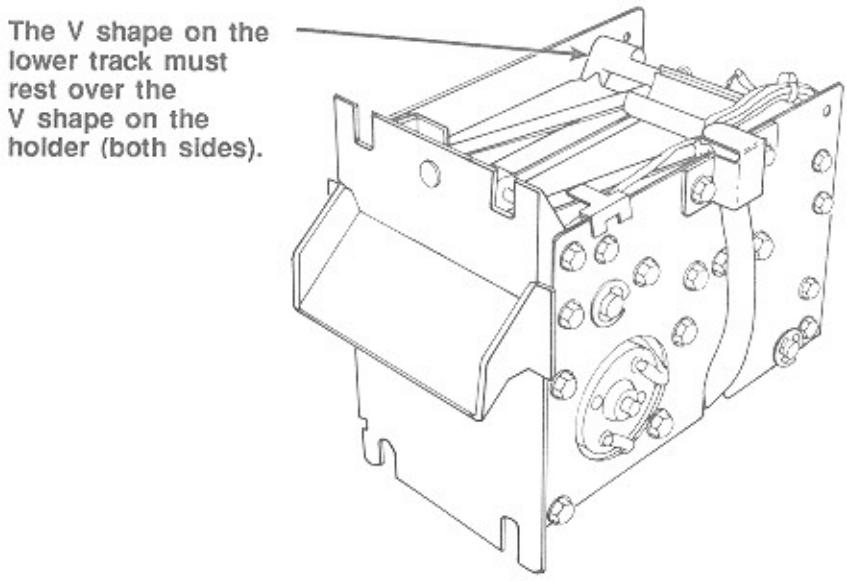


Figure 4-10B. Head And Holder Alignment

CREASING ROLLER POSITION

The creasing roller shaft should always be positioned so that the creasing rollers spin freely (*see figure 4-11*). They should not contact either lower timing belt. When making this adjustment, or when you are assembling the creasing roller shaft, hold the shaft away from the lower belts while tightening the two mounting screws. After tightening, always re-check to be sure that the creasing rollers spin freely.

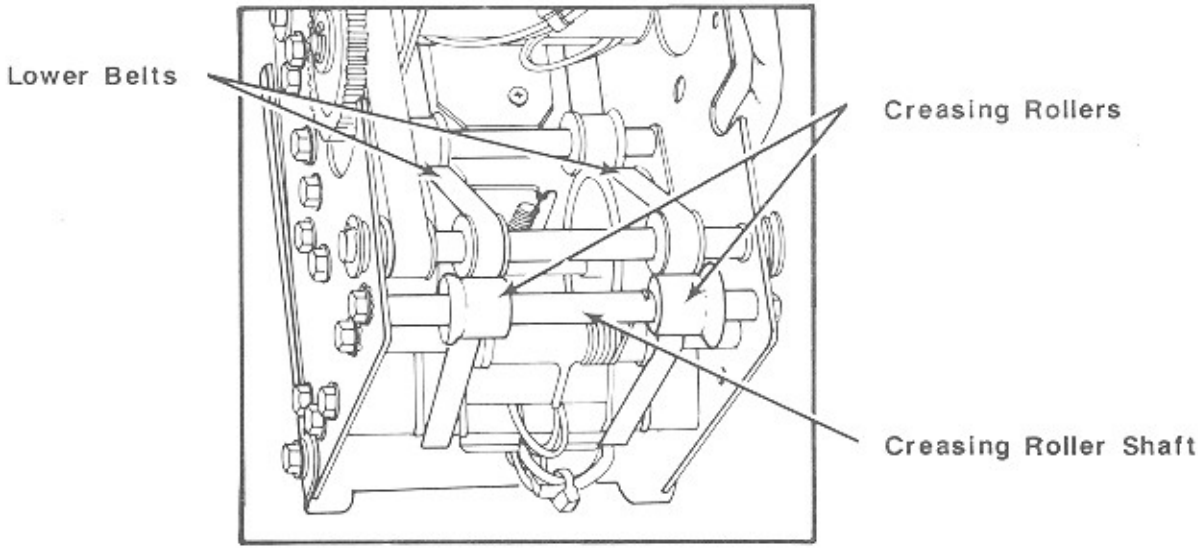


Figure 4-11. Creasing Roller Position

BILL ACCEPTOR HEIGHT AND FRONT TO BACK ADJUSTMENT

These two adjustments can affect each other. If you need to make one of these adjustments, be sure to read the entire procedure to determine whether you need to do any additional steps.

OBA-2 Height

Perform this procedure only if the OBA-2 height is incorrect.

1. Locate the hex-head screw in the vertical slot on the left side of the OBA-2 mounting plate and compartment divider. Tape a small piece of paper next to the slot and mark the position of the center of the screw on the paper (this will serve as a reference point).

2. Close the top door and estimate the vertical distance that the OBA-2 is high or low.

3. Loosen the hex-head screw and the three similar screws on the right side of the divider and, using the reference mark, slide the OBA-2 up or down by the amount that you estimated the OBA-2 height to be in error. Tighten one of the screws and recheck the OBA-2 height. If the height is acceptable, tighten the other three screws. If the height is not acceptable, repeat steps 2 and 3 until the height is acceptable.

4. Check the OBA-2 front-to-back clearance and make the following adjustment if necessary.

OBA-2/STACKER FRONT TO BACK CLEARANCE

1. Loosen the wing nut on the left side of the OBA-2 mounting bracket and slide the OBA-2 transport out approximately 1-1/2 inches.

2. Loosen the four stacker mounting screws on the right side of the divider plate and slide the stacker toward the rear of the phonograph as far as it will go.

3. Slowly close the top door so that it pushes the OBA-2 transport back into the phonograph. Open the top door and tighten the wing nut on the transport mounting bracket.

4. Slide the stacker toward the OBA-2 transport until the stacker engages the transport and tighten the four mounting screws.

5. Check the OBA-2 height and make the adjustment if necessary.

Refer to figure 4-12, the OBA Schematic Diagram, as you troubleshoot electrical problems on the OBA control unit.

Table 4-1. OBA Troubleshooting Chart

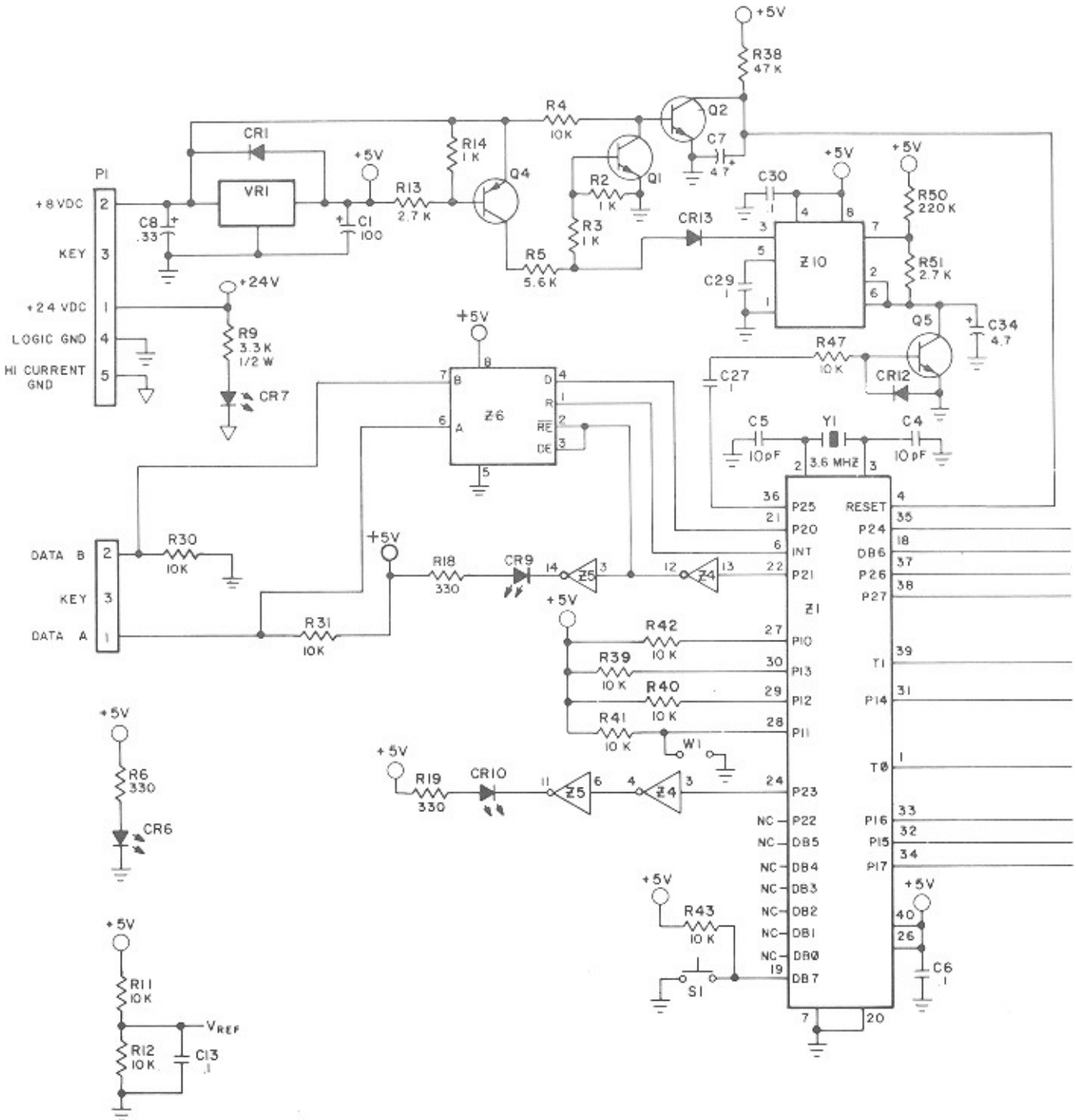
Trouble	Symptom	Probable Cause
Transport motor does not start when a bill is inserted.	The +5 V or +24 V LED on the OBA control unit is not lit.	1. A defective power supply 2. A defective harness to the OBA 3. A defective OBA control unit
	Transport does not start, but a clicking sound is heard in the OBA control unit	1. An object is jammed in the transport mechanism 2. A defective transport
	No sound or other indication that the transport is trying to run	1. A defective V1 cell in the transport 2. A defective OBA control unit 3. A defective CCC
	The BA STATUS LED is blinking	The OBA is not operational due to a FAULT condition: See the next problem
The OBA is in SHUTDOWN mode (er 80). In this state, the BA STATUS LED will alternate between STEADY ON and FLASHING (on for 1 second and then flash one or more time). The number of flashes indicates the cause of the shutdown. Also, a SHUTDOWN message with the indicated FAULT code will be sent to the CCC.	The BA STATUS LED flashes once. The FAULT code is 41.	1. An object is in the transport covering the V1 cell 2. A defective transport 3. A defective OBA control unit
	The BA STATUS LED flashes 4 times. The FAULT code is 44.	1. An object is in the transport activating the anti-pull-back lever 2. A defective transport 3. A defective OBA control unit
	The BA STATUS LED flashes 5 times. The FAULT code is 48 or 49.	1. The bill stacker is full 2. The bill stacker is jammed in the OFF HOME position 3. The bill stacker HOME switch is out of adjustment 4. A defective bill stacker 5. A defective OBA control unit

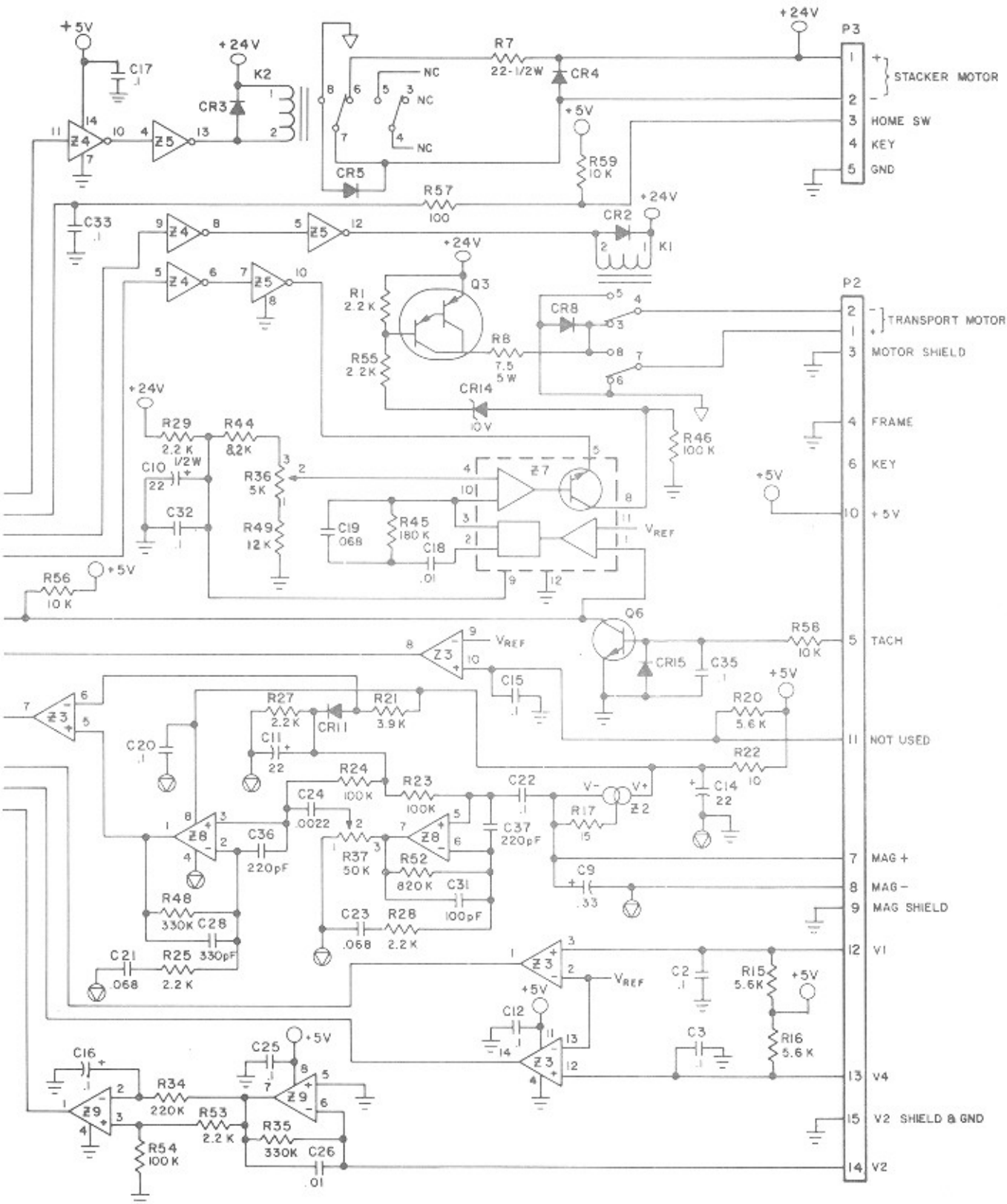
Table 4-1. OBA Troubleshooting Chart
Continued

Trouble	Symptom	Probable Cause
The bill acceptor rejects a large number of valid bills. If the rejected bill is allowed to remain in the transport opening, the BA STATUS LED will flash one or more times to indicate the cause of the rejection.	BA STATUS LED flashes 1 time after rejecting the bill	1. A defective V1 or V4 cell in the transport 2. A defective OBA control unit
	BA STATUS LED flashes twice after rejecting the bill	1. A defective V2 cell in the transport 2. A defective control unit
	BA STATUS LED flashes 4 times after rejecting the bill	1. An object is lodged in the transport 2. A binding anti-pull-back lever 3. A defective V4 cell in the transport 4. A defective OBA control unit
	BA STATUS LED flashes 5 times after rejecting the bill	1. The MAG. ADJUST control is set too low 2. The motor speed is incorrectly adjusted 3. A defective magnetic head or transport 4. A defective OBA control unit
	BA STATUS LED flashes 6 times after rejecting the bill	1. MAG. ADJUST may be either too low or too high (*see the Mag. Adjust procedure*) 2. A defective harness connection at P1, Pins 3 or 4 3. A defective motor or magnetic head in the transport 4. A defective OBA control unit 5. A defective power supply (+24 VDC) from the CCC
	BA STATUS LED flashes 7 times after rejecting the bill	1. The motor speed is not correct 2. A defective transport 3. A defective OBA control unit

Table 4-1. OBA Troubleshooting Chart
Continued

Trouble	Symptom	Probable Cause
Bills jam frequently	Any bill transporting failure	1. The anti-pull-back lever is not operating freely 2. The bill pressure roller is binding 3. The transport inlet or track surfaces contain projections, rough spots, or dirt 4. The transport belts are out of adjustment or dirty 5. The transport belts are not centered on the rollers 6. The transport upper input roller does not move up and down freely 7. A defective power supply (+24 VDC) from the CCC 8. Creasing rollers "tight" to timing belts.


P1
+8VDC
KEY
+24 VDC
LOGIC GND
HI CURRENT GND
CR1
VR1
C8 .33
C1 100
R13 2.7 K
R14 1 K
Q4
R4 10K
Q2
R38 47 K
C7 4.7
Q1
R2 1 K
R3 1 K
R5 5.6 K
CR13
Z10
C30 .1
R50 220 K
R51 2.7 K
C29 .1
Q5
C34 4.7
R47 10 K
CR12
C27 .1
R9 3.3 K 1/2 W
CR7
Z6
C5 10pF
Y1 3.6 MHZ
C4 10pF
DATA B
KEY
DATA A
R30 10K
R31 10K
R18 330
CR9
Z5
Z4
Z1
R42 10 K
R39 10 K
R40 10 K
R41 10 K
W1
R19 330
CR10
R6 330
CR6
R11 10K
R12 10K
C13 .1
VREF
R43 10 K
S1
C6 .1
RESET
INT
TI
T0
P25
P20
P21
P10
P13
P12
P11
P23
P22
P24
DB6
P26
P27
P14
P16
P15
P17
DB5
DB4
DB3
DB2
DB1
DB0
DB7
NC
+5V
+24V



For Equivalent Engineering Drawing See 65063209-Q2 C

Figure 4-12A. OBA-2 Circuit Board Schematic

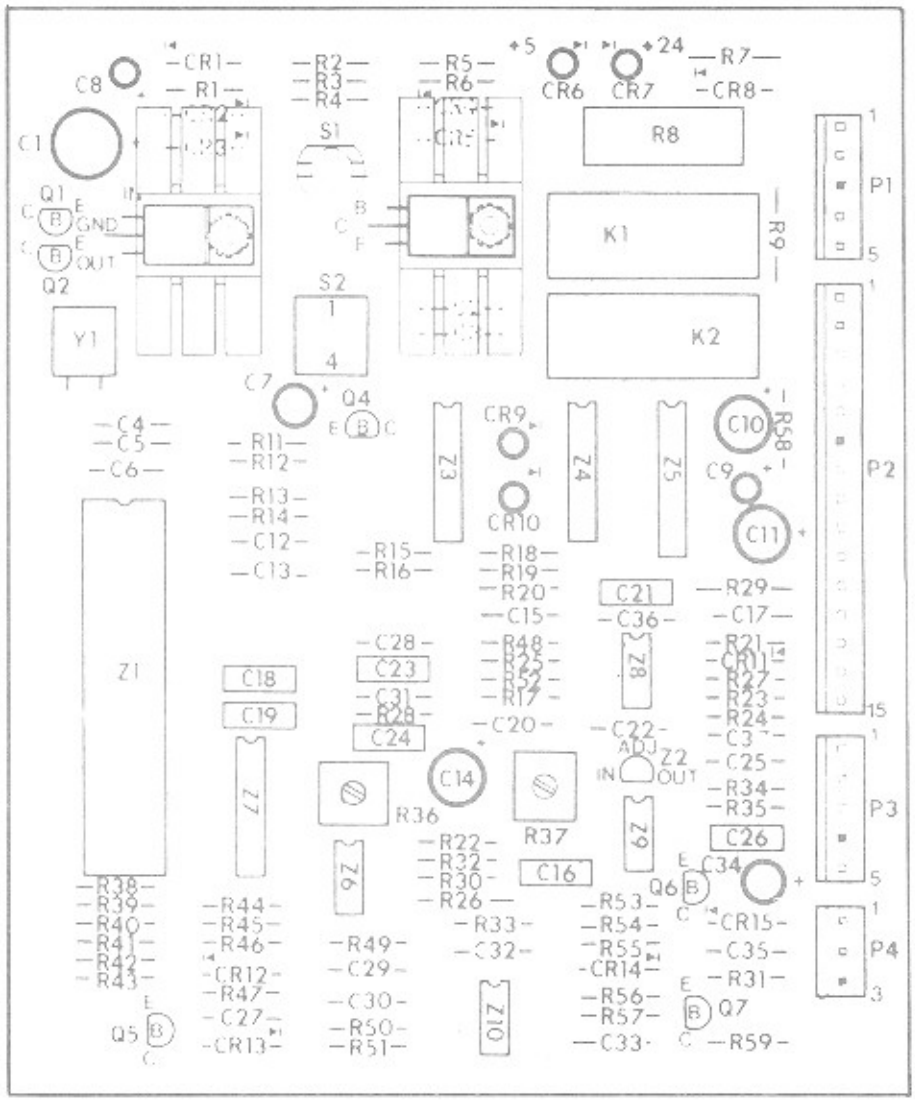


Figure 4-12B. OBA-2 Circuit Board Layout

COMPONENTS LIST FOR
OBA-2 CONTROLLER CIRCUIT BOARD 65063209

C1	Capacitor - Electrolytic	100 mf	70023814
C2	Capacitor - Monolithic	.1 mf	70028514
C3	Capacitor - Monolithic	.1 mf	70028514
C4	Capacitor - Monolithic	10 pf	70028701
C5	Capacitor - Monolithic	10 pf	70028701
C6	Capacitor - Monolithic	.1 mf	70028514
C7	Capacitor - Electrolytic	4.7 mf	70023806
C8	Capacitor - Tantalum	.33 mf	70025119
C9	Capacitor - Tantalum	.33 mf	70025119
C10	Capacitor - Electrolytic	100 mf	70023814
C11	Capacitor - Electrolytic	22 mf	70023810
C12	Capacitor - Monolithic	.1 mf	70028514
C13	Capacitor - Monolithic	.1 mf	70028514
C14	Capacitor - Electrolytic	22 mf	70023810
C15	Capacitor - Monolithic	.1 mf	70028514
C16	Capacitor - Mylar	.1 mf	70021549
C17	Capacitor - Monolithic	.1 mf	70028514
C18	Capacitor - Mylar	.01 mf	70021525
C19	Capacitor - Mylar	.068 mf	70021545
C20	Capacitor - Monolithic	.1 mf	70028514
C21	Capacitor - Mylar	.068 mf	70021545
C22	Capacitor - Monolithic	.1 mf	70028649
C23	Capacitor - Mylar	.068 mf	70021545
C24	Capacitor - Mylar	.0022 mf	70021509
C25	Capacitor - Monolithic	.1 mf	70028514
C26	Capacitor - Mylar	.01 mf	70021525
C27	Capacitor - Monolithic	.1 mf	70028514
C28	Capacitor - Monolithic	330 pf	70028719
C29	Capacitor - Monolithic	.1 mf	70028514
C30	Capacitor - Monolithic	.1 mf	70028514
C31	Capacitor - Monolithic	100 pf	70028713
C32	Capacitor - Monolithic	.1 mf	70028514
C33	Capacitor - Monolithic	.1 mf	70028514
C34	Capacitor - Electrolytic	4.7 mf	70023806
C35	Capacitor - Monolithic	.1 mf	70028514
C36	Capacitor - Monolithic	220 pf	70028606
C37	Capacitor - Monolithic	220 pf	70028606

CR1	Diode - Silicon	70035005
CR2	Diode - Silicon	70035005
CR3	Diode - Silicon	70035005
CR4	Diode - Silicon	70035005
CR5	Diode - Silicon	70035005
CR6	Diode - LED	70035303
CR7	Diode - LED	70035303
CR8	Diode - Silicon	70035005
CR9	Diode - LED	70035305
CR10	Diode - LED	70035303
CR11	Diode - Silicon	70035012
CR12	Diode - Silicon	70035012
CR13	Diode - Silicon	70035012
CR14	Diode - Zener	70035514
CR15	Diode - Silicon	70035012

K1	Relay - DPDT	25191201
K2	Relay - DPDT	25191201

COMPONENTS LIST FOR
OBA-2 CONTROLLER CIRCUIT BOARD 65063209
(Continued)

P1	Polarizing Wafer	5 Circuit	70075005
P2	Polarizing Wafer	15 Circuit	70075015
P3	Polarizing Wafer	5 Circuit	70075005
P4	Polarizing Wafer	3 Circuit	70075003

Q1	Transistor - NPN Silicon	70030007
Q2	Transistor - NPN Silicon	70030007
Q3	Transistor - PNP Silicon	70030805
Q4	Transistor - PNP Silicon	70030104
Q5	Transistor - NPN Silicon	70030007
Q6	Transistor - PNP Silicon	70030007
Q7	NOT USED	

Note: All resistors are ¼ watt 5%, unless otherwise noted.

R1	Resistor - Carbon	2.2 K		79901222
R2	Resistor - Carbon	1 K		79901102
R3	Resistor - Carbon	1 K		79901102
R4	Resistor - Carbon	10 K		79901103
R5	Resistor - Carbon	5.6 K		79901562
R6	Resistor - Carbon	330 Ohm		79901331
R7	Resistor - Carbon	22 Ohm	(½w, 10%)	70010724
R8	Resistor - Carbon	7.5 Ohm	(5w, 10%)	70011008
R9	Resistor - Carbon	3.3 K	(½w, 5%)	79904332
R10	NOT USED			
R11	Resistor - Carbon	10 K		79901103
R12	Resistor - Carbon	10 K		79901103
R13	Resistor - Carbon	2.7 K		79901272
R14	Resistor - Carbon	1 K		79901102
R15	Resistor - Carbon	5.6 K		79901562
R16	Resistor - Carbon	5.6 K		79901562
R17	Resistor - Carbon	15 Ohm		79901150
R18	Resistor - Carbon	330 Ohm		79901331
R19	Resistor - Carbon	330 Ohm		79901331
R20	Resistor - Carbon	5.6 K		79901562
R21	Resistor - Carbon	3.9 K		79901392
R22	Resistor - Carbon	10 Ohm		79901100
R23	Resistor - Carbon	10 K		79901103
R24	Resistor - Carbon	100 K		79901104
R25	Resistor - Carbon	2.2 K		79901222
R26	NOT USED			
R27	Resistor - Carbon	2.2 K		79901222
R28	Resistor - Carbon	2.2 K		79901222
R29	Resistor - Carbon	1.5 K	(½w, 10%)	70010405
R30	Resistor - Carbon	10 K		79901103
R31	Resistor - Carbon	10 K		79901103
R32	NOT USED			
R33	NOT USED			
R34	Resistor - Carbon	220 K		79901224
R35	Resistor - Carbon	330 K		79901334
R36	Potentiometer	5 K		21520706
R37	Potentiometer	50 K		21520702
R38	Resistor - Carbon	47 K		79901473
R39	Resistor - Carbon	10 K		79901103
R40	Resistor - Carbon	10 K		79901103
R41	Resistor - Carbon	10 K		79901103

R42	Resistor - Carbon	10 K	79901103
R43	Resistor - Carbon	10 K	79901103
R44	Resistor - Carbon	8.2 K	79901822
R45	Resistor - Carbon	180 K	79901184
R46	Resistor - Carbon	100 K	79901104
R47	Resistor - Carbon	10 K	79901103
R48	Resistor - Carbon	330 K	79901334
R49	Resistor - Carbon	12 K	79901123
R50	Resistor - Carbon	220 K	79901224
R51	Resistor - Carbon	2.7 K	79901272
R52	Resistor - Carbon	820 K	79901824
R53	Resistor - Carbon	2.2 K	79901222
R54	Resistor - Carbon	100 K	79901104
R55	Resistor - Carbon	2.2 K	79901222
R56	Resistor - Carbon	10 K	79901103
R57	Resistor - Carbon	100 Ohm	79901101
R58	Resistor - Carbon	10 K	79901103
R59	Resistor - Carbon	10 K	79901103
S1	Switch - Push Button		70043502
S2	NOT USED		
VR1	IC - +5 VDC Regulator		70036506
Y1	Crystal - 3.58 MHz		25167308
Z1	IC - Microcomputer - 8 Bit	8049	70039310
Z2	IC - Current Regulator	LM334Z	70037601
Z3	IC - Quad OP Amp	LM324	30800216
Z4	IC - TTL Hex Invertor	7404	70036304
Z5	IC - Darlington Array	ULN2003	70036901
Z6	IC - RS-485 Transceiver	SN75176	70037801
Z7	IC - F/V Converter	LM2917	30800218
Z8	IC - Dual OP Amp	LM358	30800214
Z9	IC - Dual OP Amp	LM358	30800214
Z10	IC - Timer	LM555	70033801