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Elastic Diaphragm Encoded Keyboards and 5475 Data Entry Keyboard Theory-Maintenance Manual

SY27-0073-1

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Preface

This manual covers both the theory of operation and the maintenance for keyboards using Elastic Diaphragm Switches. It is intended for use by the Customer Engineer.

The manual is divided into two major parts: Part 1 contains the FE Theory of Operation and Part 2 contains the FE Maintenance Documentation. In addition, Appendix A covers information peculiar to the 5475 keyboard and its use with a system. This information consists of keyboard layouts, connector and code charts, diagnostic flowcharts, and differences from the basic keyboard. Information peculiar to other keyboards and their use with a system is covered in the using system's documentation.

No companion or prerequisite manuals are necessary for use with this publication.

Second Edition (March 1971)

This is a major revision of, and makes obsolete, SY27-0073-0. It includes additional line drawings to enhance both the theory and maintenance sections. Associated changes to the text and illustrations are indicated by a vertical line to the left of the change. New material, added to Parts 1 and 2, covers the new encode board and elastic diaphragm switch assembly. These additions, being entirely new, are not marked with vertical lines; they can be easily located by use of the table of contents or the index.

Changes are periodically made to the specifications herein; any such changes will be reported in subsequent revisions or Technical Newsletters.

This manual has been prepared by the IBM Systems Development Division, Publications Center, Department E01, Building 060, Research Triangle Park, North Carolina 27709. A form for reader's comments is provided at the back of this publication. If the form has been removed, comments may be sent to the above address.

Contents

Illustrations

INTRODUCTION

The keyboard is a manual entry device providing coded outputs to the using system through cable connections. Different models provide various codes, key configurations, and control keys for the using system (Figure 1-1). A circuit board creates output codes that are compatible with the coding scheme of the system. The system samples the bit output lines and signals the keyboard reset. The keyboard can be used for entering data or for inquiry by the use of the data keys. The keyboard control keys can format data or can control functions for various output devices.

Keyboard interlocking prevents pressing two latch keys at the same time or pressing a second latch key before a keyboard cycle is complete. The using system locks the keyboard when it is not in use. It is locked when power is off.

Refer to the keyboard pictured in Figure 1-1 for locations and orientations used throughout this manual.

FUNCTIONAL UNITS

The information usually found in the Functional Units section has been incorporated in the Principles of Operation section.

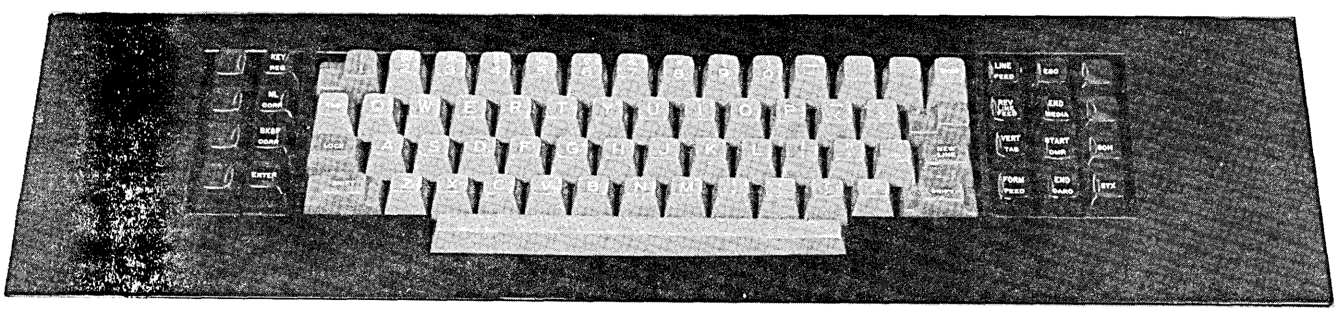
PRINCIPLES OF OPERATION

Key Mechanisms

The keyboard may include three types of keys, depending on the model: latch keys, momentary keys, and typamatic keys. A latch key provides one coded output to the interface lines each time the key is pressed. All graphic keys and some control keys use the latch key mechanism. A momentary key provides an output to the interface only while the key is held down. Most control keys or function keys use the momentary key mechanism. When a repetitive function is desired, graphic or control keys use the typamatic key mechanism.

Latch Key Operation

Pressing a latch key (Figure 1-2) pivots the keylever on its fulcrum rod. The dobber transfers the downward motion to the interposer. A latch spring rests against the rear of the interposer. As the interposer moves down at the rear, the latch spring moves forward over the interposer (Figure 1-3). The latch spring latches the interposer down and closes the associated elastic diaphragm switch (EDS). Closing an EDS makes a circuit to the encode circuit board, which generates coded outputs and a signal indicating data is available.



- All locations and directions are referenced from the operator
- Front of the keyboard - Portion closest to the operator
- Right and left of the keyboard - Operators right and left
- Key rows - First row is farthest from the operator and the fourth row is the closest to the operator

Figure 1-1. Keyboard: Elastic Diaphragm Encoded (Example)

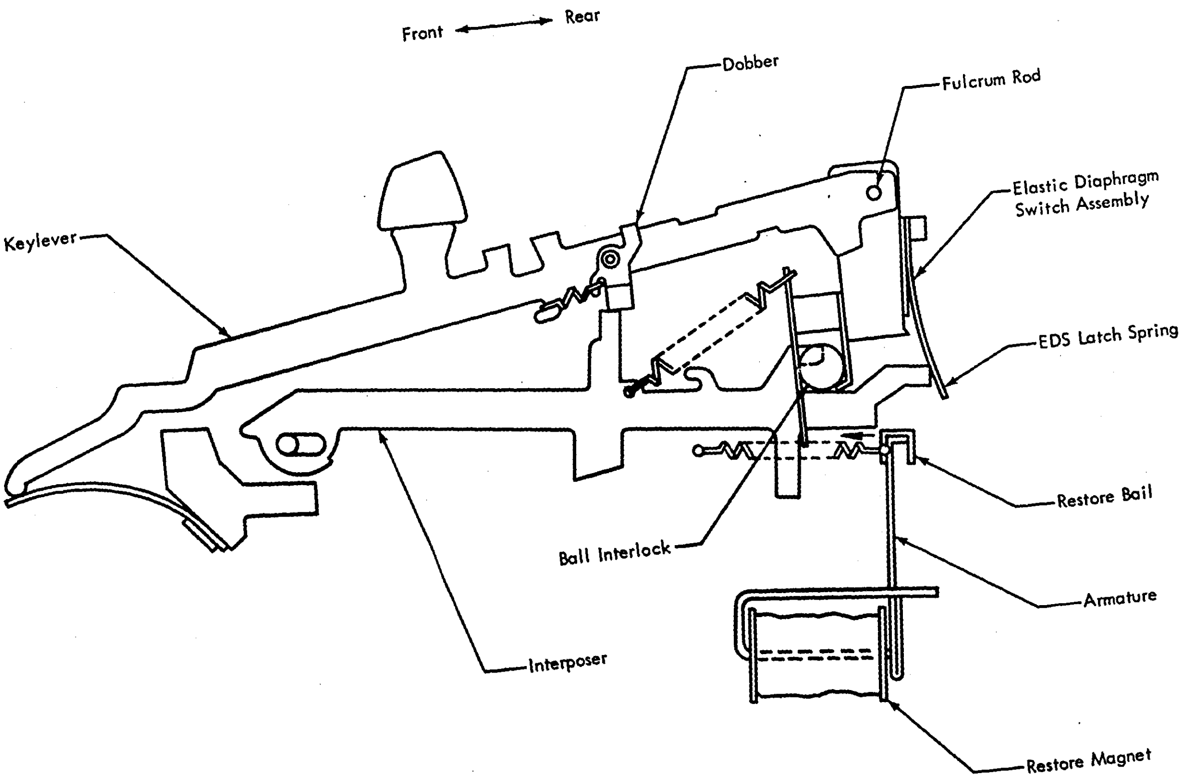


Figure 1-2. Latch Key (Normal Position)

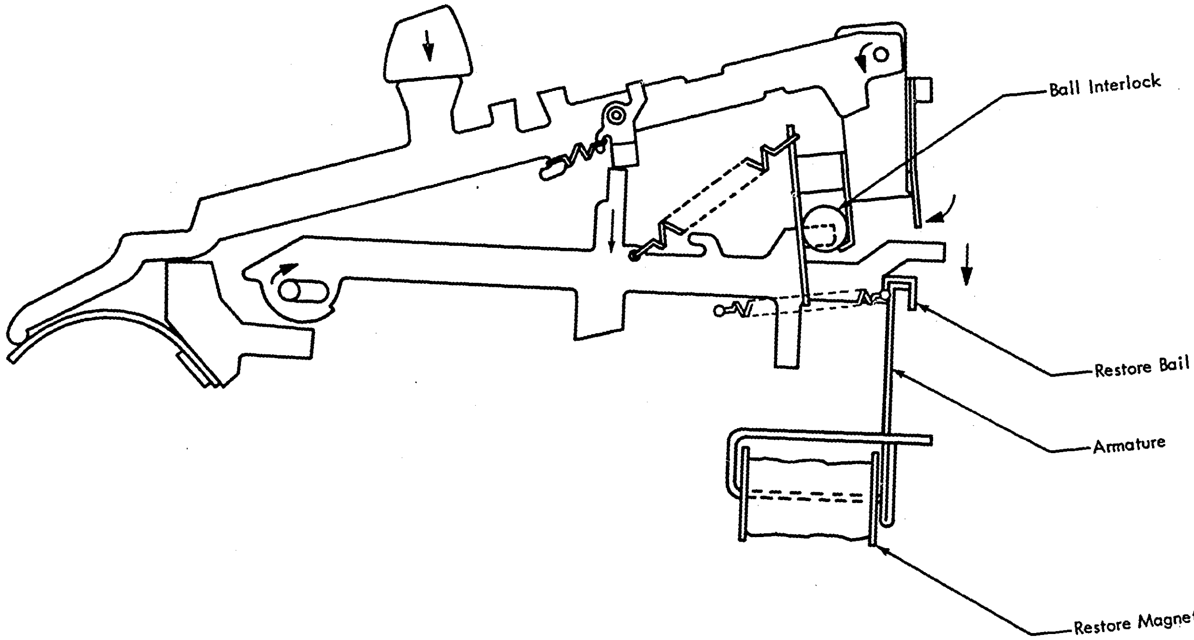


Figure 1-3. Latch Key (Operated Position)

When the 'data available' signal and the data character are accepted by the system, power to the restore magnets is dropped. The keyboard restoring bail moves to the front of the keyboard (under spring tension) carrying the latched interposer with it. An elongated interposer pivot hole allows the interposer to move to the front, clearing the latch spring (Figure 1-4). The interposer return spring forces the interposer up off of the bail and behind the latch spring. The interposer pushes the latch spring to the rear, allowing the EDS to open.

As the interposer moves to the rear, the interposer projection strikes the dobber, and pivots it from its rest position. When the keylever is released, it pivots upward and the dobber return spring restores the dobber to its normal position above the interposer.

As the bail moves to the front, it moves under all the unoperated interposers (Figure 1-2) and prevents them from operating. While the keyboard restore bail travels toward its forward stop, the bail contacts (which are EDS switches) close, providing the 'bail contact' or 'restore' signal to the system, or keyboard logic. This indicates the bail has traveled its full restoring stroke and the restore magnets can again be energized. The keyboard remains locked and the 'bail contact' or 'restore' signal remains until the restore bail magnets are picked and sealed.

The 'bail contact' or 'restore' signal drops the 'data available' signal and holds it reset. These electronic interlocks allow the time for the EDS switch to open. Thus, there is only one output from the keyboard for each latch key pressed.

The keyboard is locked by the ball interlock (Figures 1-3 and 1-5) while the interposer is latched down. An operated interposer goes between the interlocking balls and takes up the clearance between the balls. Other interposers can not be operated until the first one is restored because the balls can not separate to allow another interposer to enter. The keyboard is locked by the restore bail during restore time. Therefore, the next key cycle can begin only when the restore magnets are again picked and sealed.

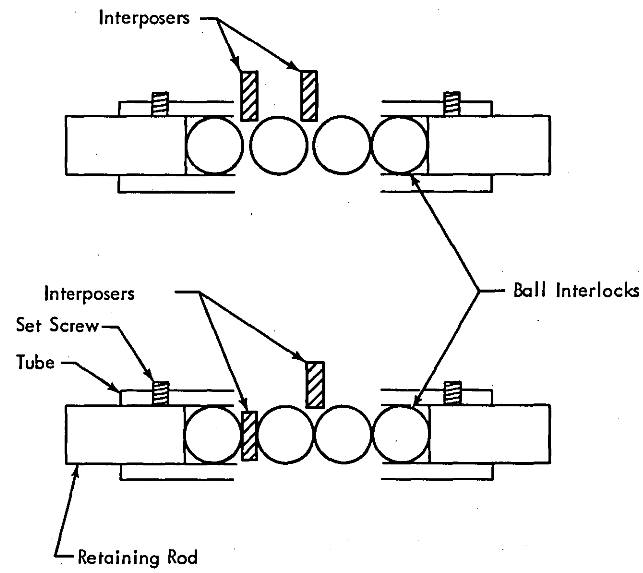


Figure 1-5. Ball Interlocks

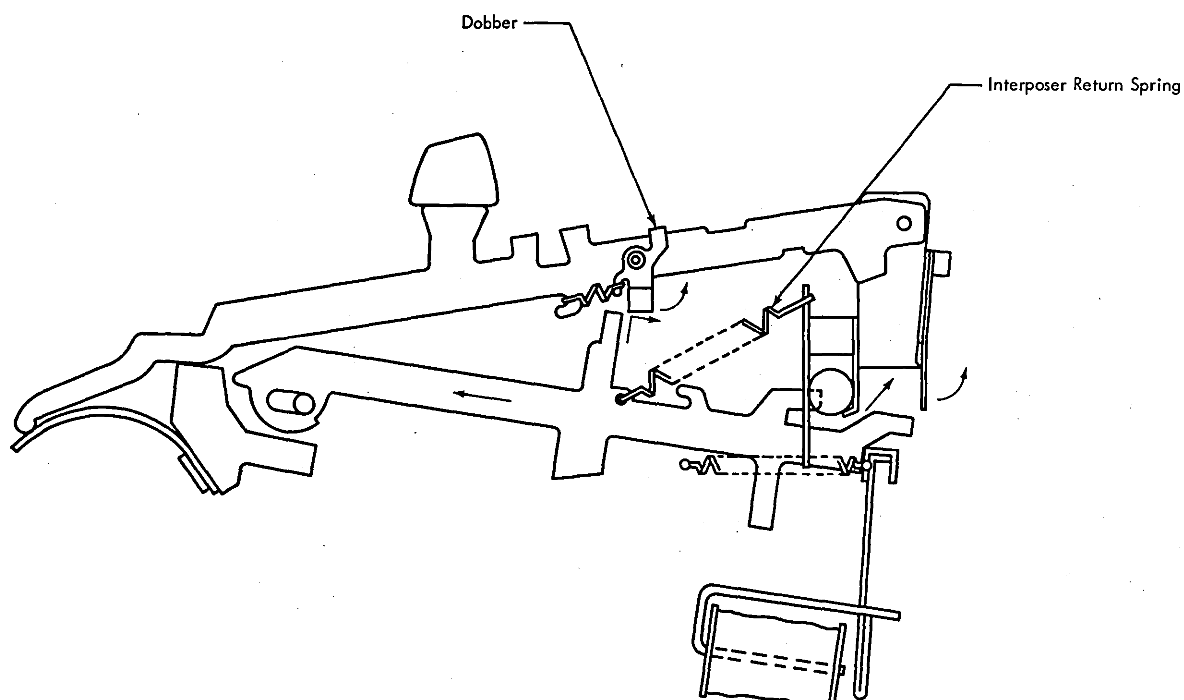


Figure 1-4. Latch Key (Restoring)

Momentary Key Operation

Momentary control keys do not provide a coded output to the interface bit lines, but do activate a control line to the keyboard interface. The momentary key interposer, unlike the latch key interposer, has a link (Figure 1-6) that operates on the latch spring, and the pivot hole is not elongated.

As the key is pressed, the dobber moves the interposer down, causing the link to pivot (Figure 1-6). The latch spring closes the EDS as it follows the arc ot the link (Figure 1-7). The interposer is not latched down by the latch spring, and the using system determines if a keyboard restore cycle occurs as a result of pressing a momentary key. The circuit through the EDS remains closed as long as the key is held down.

When the key is released, the interposer is restored by its return spring and the link cams the latch spring away from the EDS.

Typamatic Key Operation

When a typamatic key is held down with a slightly more than normal pressure, it permits automatic repetition of a graphic, space, or function key. Normal pressure on the key causes only one operation, as with a standard latch-type key.

The typamatic keylever (Figure 1-8) has a typamatic latch pivoting on the keylever at the front. When the keylever is pressed, the typamatic latch downstop strikes the top of the interposer fulcrum. This is the normal stop for the typamatic keylever, and actions of the dobber, interposer, and switch are identical to a standard latch key mechanism. Additional pressure on the keylever overcomes the typamatic latch spring tension, causing the latch to pivot downward from the keylever. The turned-over ear on the typamatic latch then strikes the top of the interposer projection, and holds the interposer down in the latched position. When the restore magnet is de-energized during this cycle, the restore bail moves the interposer to the front. The turned-over ear pivots down behind the interposer projection (Figure 1-9) and holds the interposer forward. The interposer remains in this position, with the EDS closed, until the key is released. Data is sampled by the system until the interposer is restored and the EDS switch opens.

When the keylever is released, the interposer restores immediately. The interposer return spring pulls the interposer to the rear of the keyboard, where it strikes the latch spring and allows the switch to open. The electronic circuits complete the keyboard cycle that may already be in progress by providing proper timing for the data lines and the 'data available' signal (refer to the timing chart for the 5475 in Appendix A).

Another method can begin a typamatic operation. If the keylever is not pressed to its limit soon enough, a full restore cycle occurs. The dobber is out of position because the keylever is down. If the keylever is pressed to its limit at this time, the turned-over ear of the typamatic latch will strike the interposer projection. The interposer will move down and latch under the latch spring. As the restore portion of the cycle begins, the interposer will again move behind the turned-over ear of the typamatic latch and will be held in this position until the key is released. The remainder of the operation is the same as the first repeat operation described.

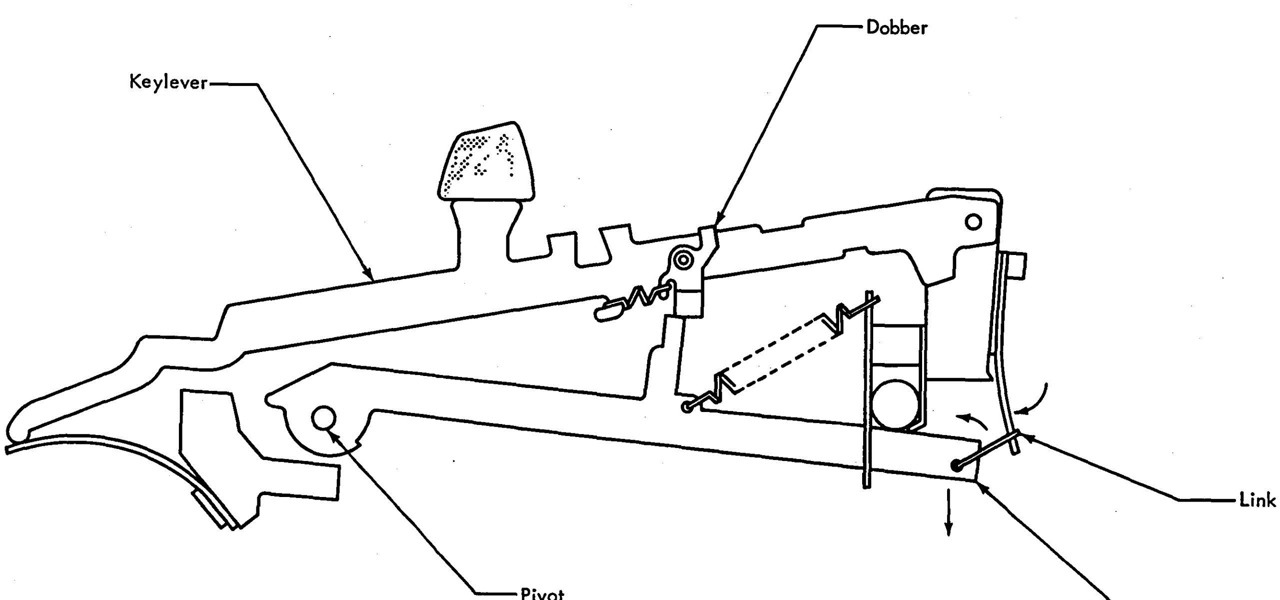


Figure 1-6. Momentary Key (Normal Position)

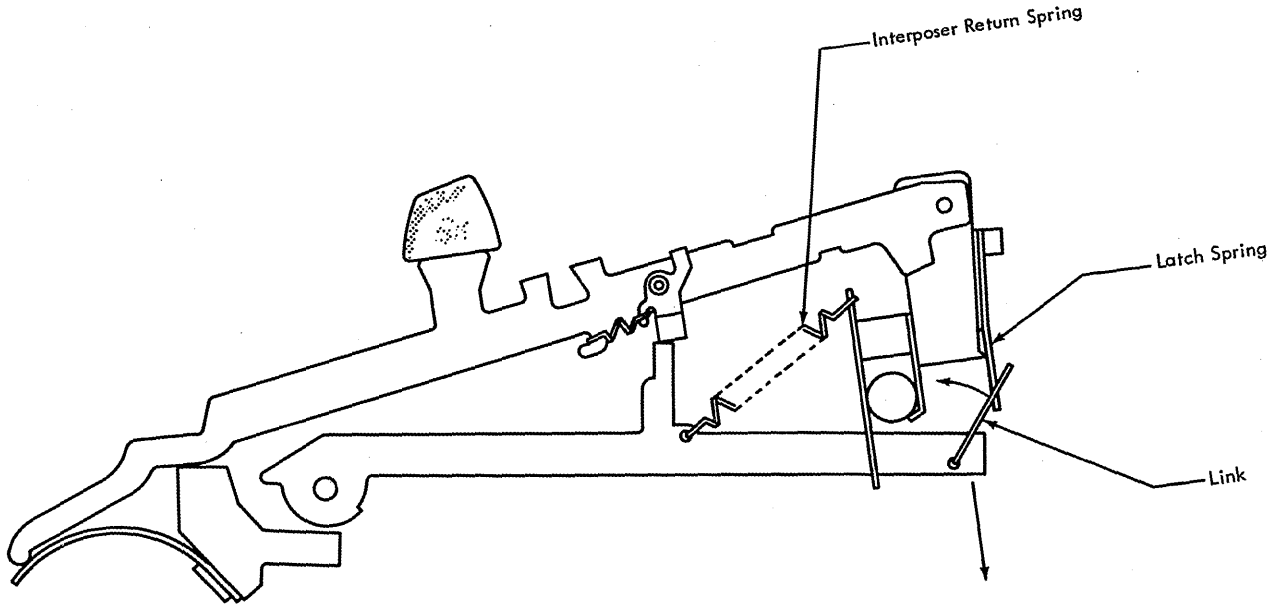


Figure 1-7. Momentary Key (Operated Position)

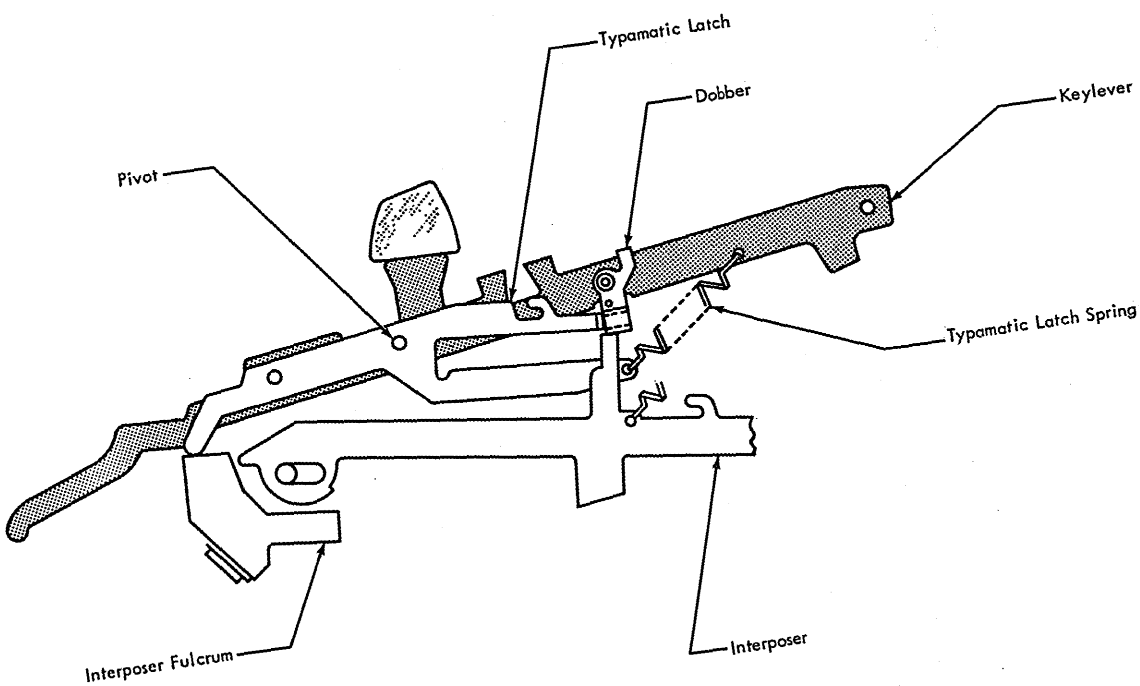


Figure 1-8. Typamatic Key (Single Cycle Operation)

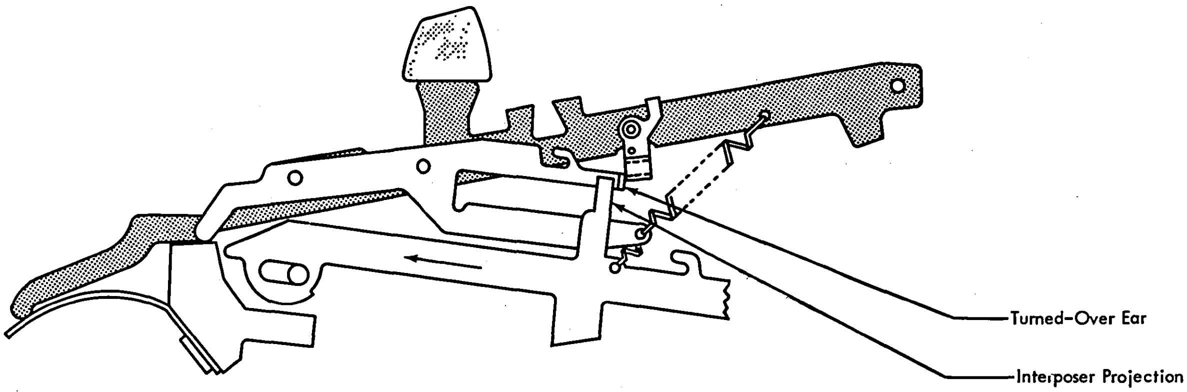


Figure 1-9. Typamatic Key (Repeat Operation)

Elastic Diaphragm Switch (Old Style)

The EDS (elastic diaphragm switch assembly) consists of a substrate, a separator, an elastic diaphragm, a Mylar* spacer, a slotted clamp, a spacer, an actuator spring, a beveled spacer, a latch spring, and a clamp (see Figures 1-10A and 1-10B). The substrate is flexible plastic, with copper-ribbon land patterns running from the EDS to the encode circuit board assembly (Figure 1-11). The land patterns laminated on the substrate terminate at one end in a solder connection to the encode circuit board and at the other end behind a hole in the separator. The end behind the separator hole is the N/O contact of an elastic diaphragm switch. The plastic diaphragm of the switch has a laminated conductor that is electrically common to all the switch positions. The separator layer, which separates the substrate and diaphragm, contains holes aligned with each of these contacts. The substrate, separator, and elastic diaphragm are clamped together to the rear of the keylever support (Figure 1-10B). When a latch spring is released, the elastic diaphragm is pressed through the hole in the separator by the actuator spring projection. The diaphragm common conductor contacts the N/O contact on the substrate, which completes the circuit to the encode circuit board.

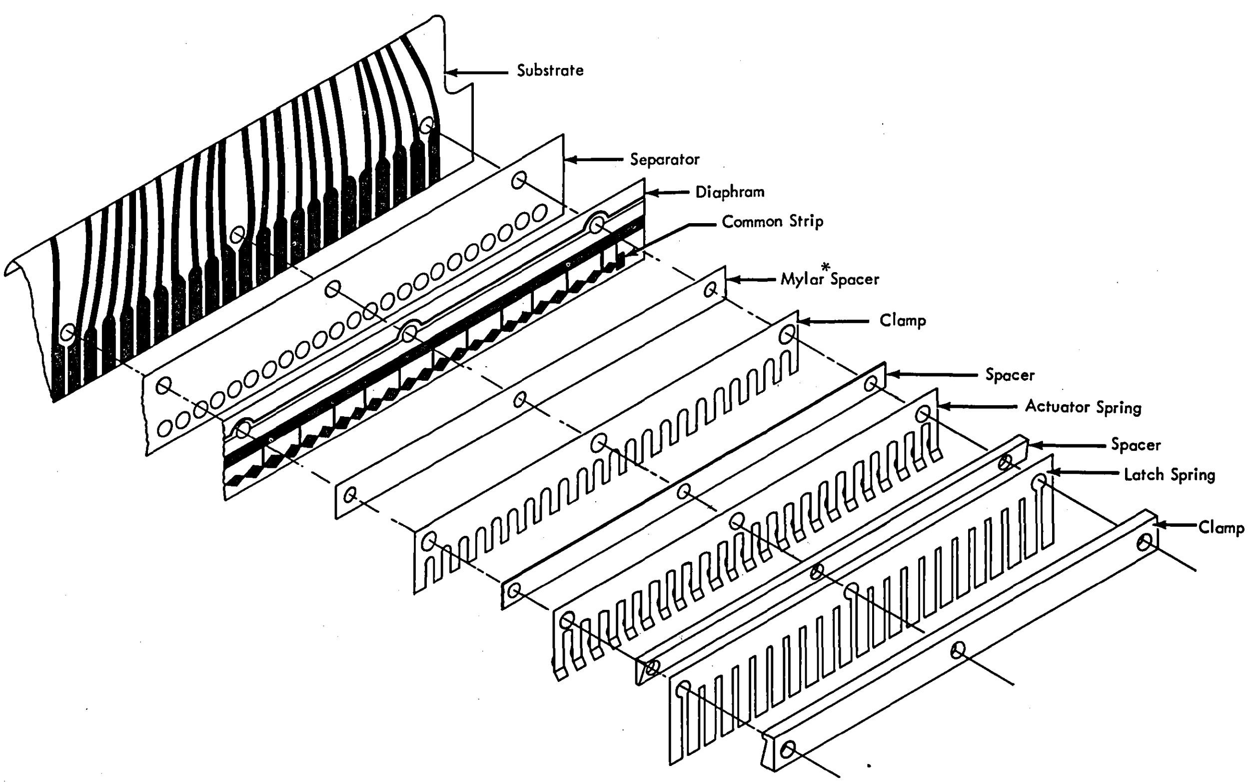


Figure 1-10A. Elastic Diaphragm Switch Asm. (EDS)

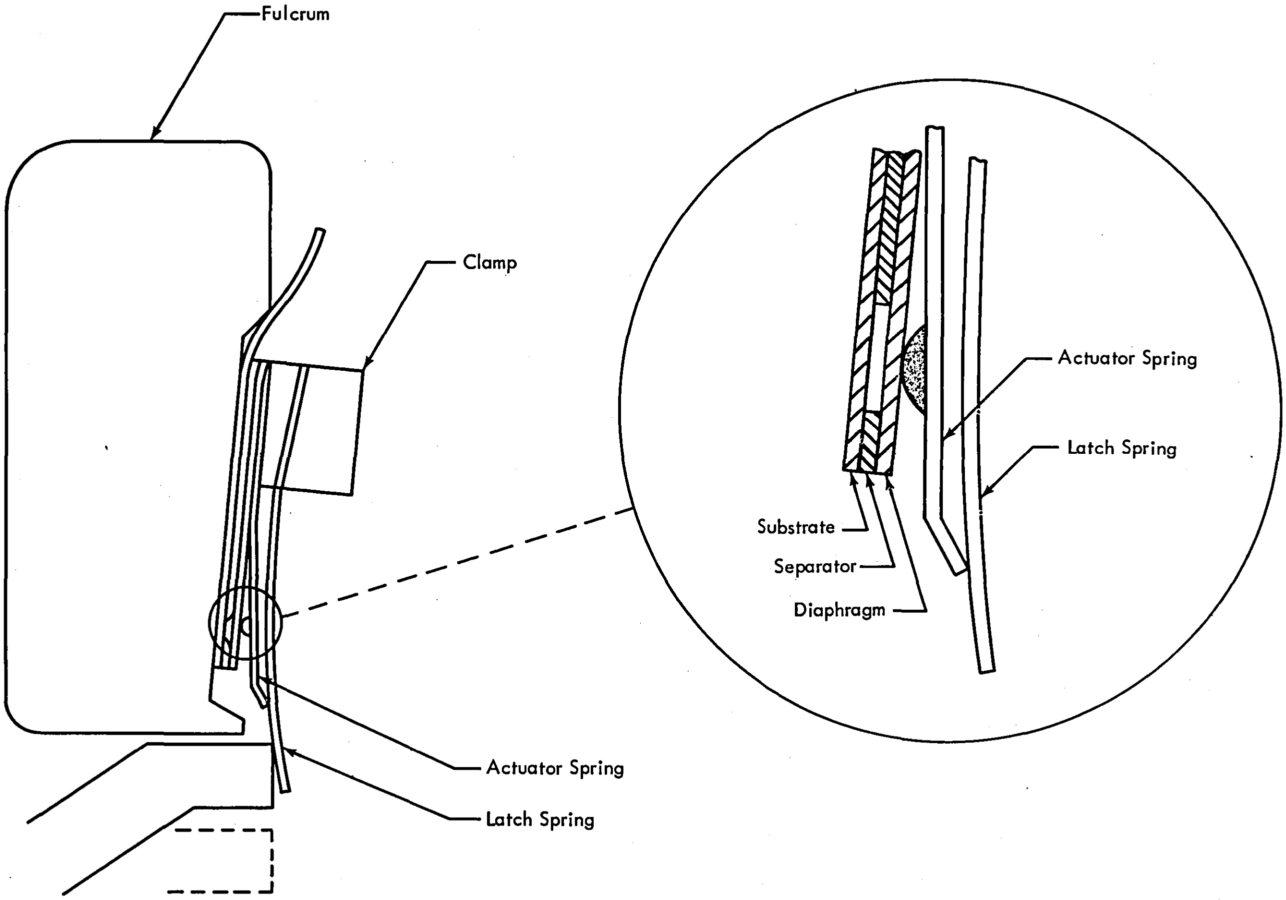


Figure 1-10B. Elastic Diaphragm Switch Asm. (EDS)

Encode Circuit Board (Old Style)

The encode circuit board (Figure 1-12) attaches to the top of the keyboard side frames and can be pivoted for access to the mechanical portions of the keyboard. The SLD logic circuits receive inputs from the elastic disphragm switches to initiate outputs to the using system. Control inputs from the using system control keyboard operations. SLD logic encodes the inputs from the EDS into the code of the using system and routes these codes to the system interface. Connection to the interface is through pluggable SLD connectors at either side of the circuit board.

The elastic diaphragm switch completes a circuit through the encode board diode matrix or logic block depending on the model (Figure 1-13). This input ANDs with the shift mode (uppercase or lowercase) and sets the appropriate bit latches. The 'bit' latch outputs are ORed to generate a 'data available' signal. 'Data available' indicates to the system that a key is down and the 'bit' lines are up.

In some models, the 'data available' signal is the hold and reset for the 'bit' latches. When accepting data, the system drops its hold on the restore magnets. The restore bail then operates the restore bail interposer, closing the bail contacts (Figure 1-14), which generate a 'bail contact' signal in the encode board. 'Bail contact' resets the 'bit' latches.

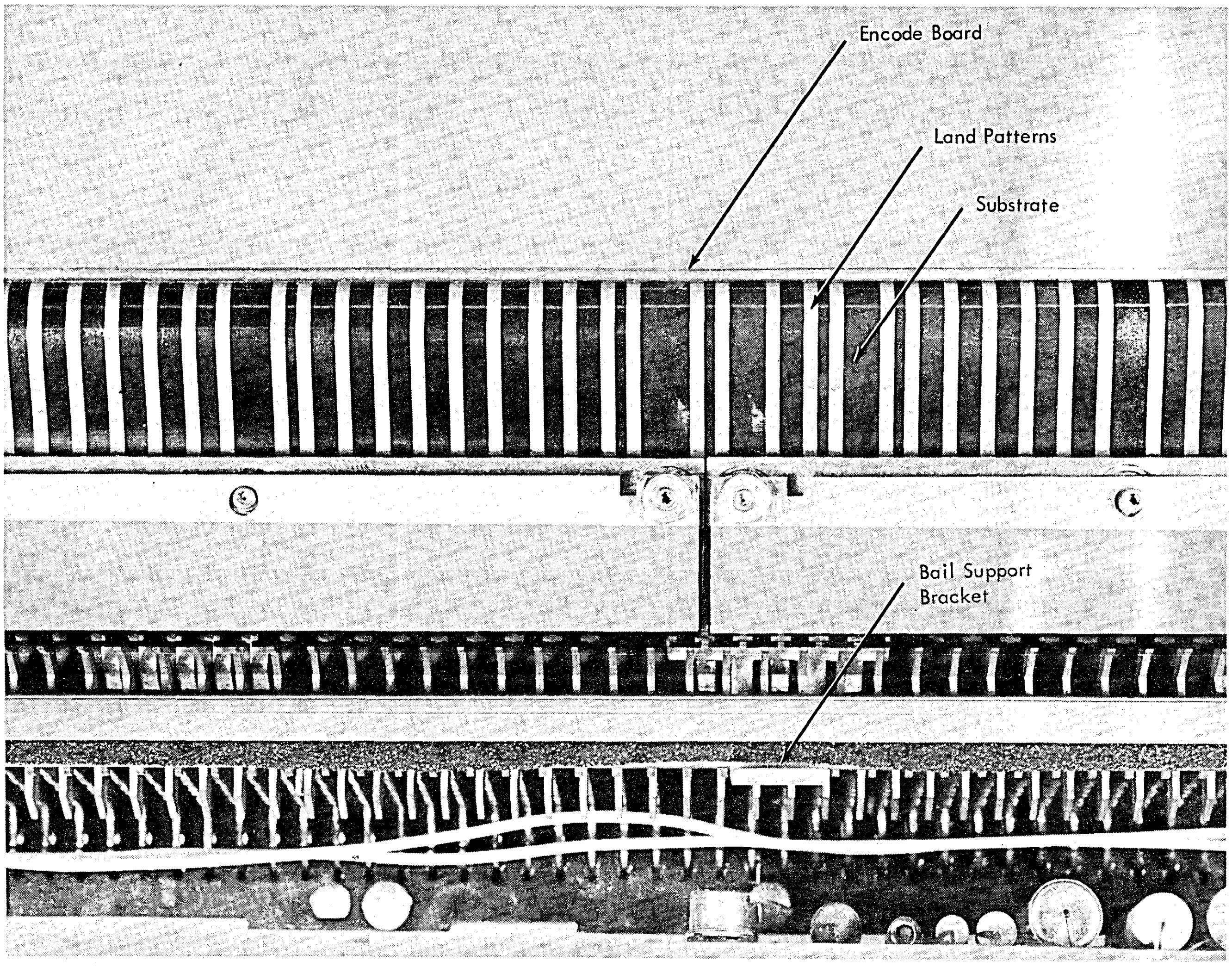
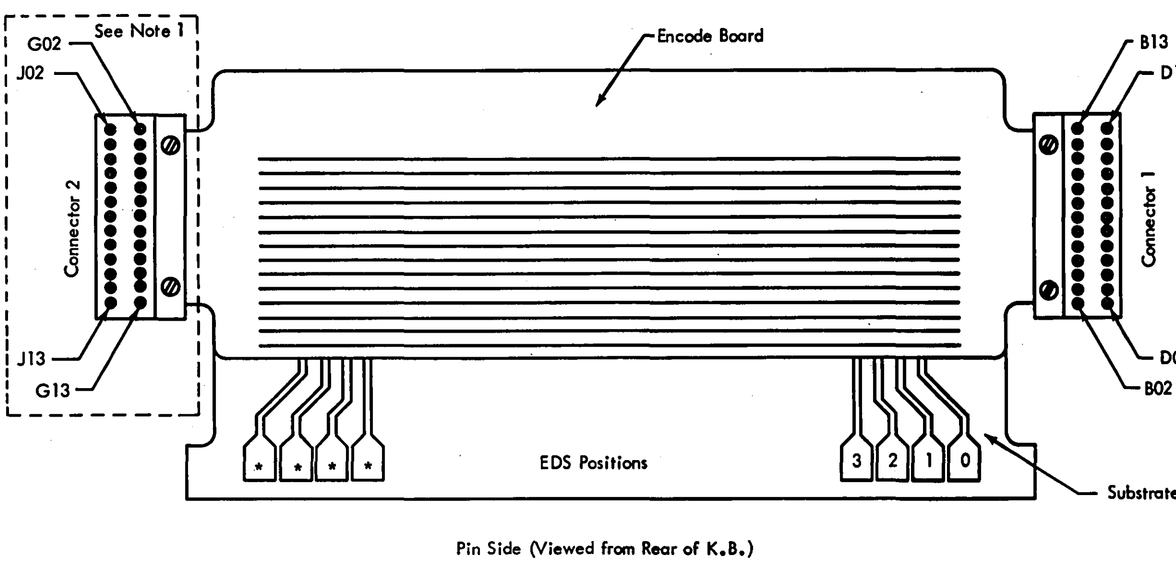
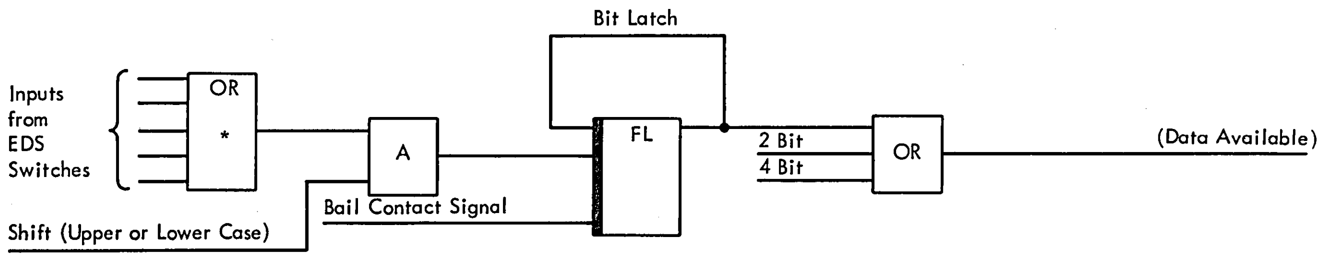


Figure 1-11. Elastic Diaphragm Switch Substrate



*Can have up to 88 positions
Note 1 Some models do not have two connectors–Connector 1 will always be in the same location

Figure 1-12. Encode Board (Old Style)



*Note: Some Models Use Diode Matrix in Place of SLD Logic

Figure 1-13. Encode Circuits (Example)

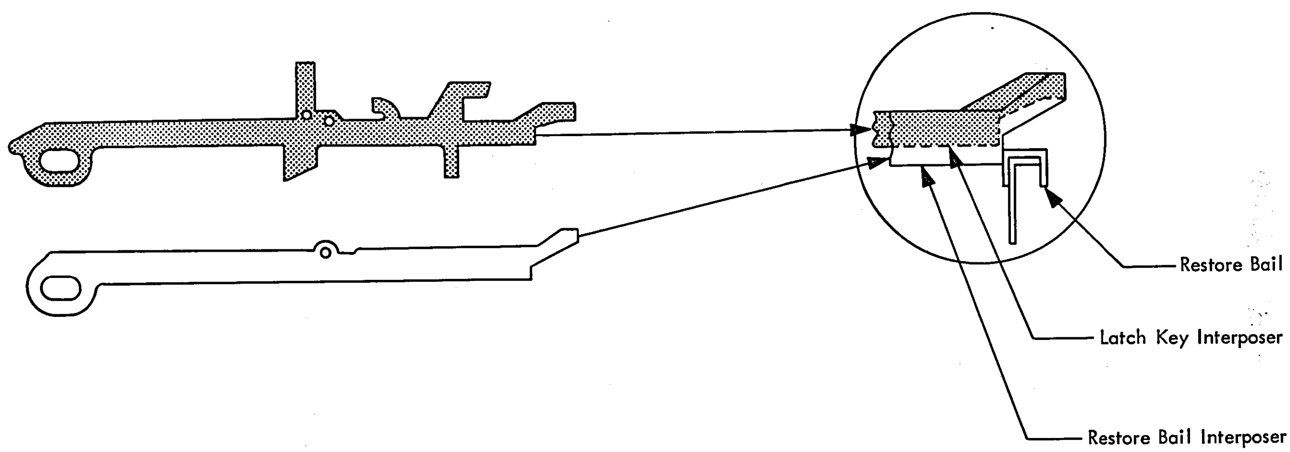


Figure 1-14. Restore Bail Interposer and Latch Key Interposer Comparison

Bail Drive Card

A SMS drive card, mounted below the keyboard, is used to drive the restore bail magnets. It is controlled by the using system. The using system prevents the flow of current through the magnets which restores the keyboard during operation or locks the keyboard when not in use.

Shift Key

The SHIFT key shifts the keyboard into uppercase, causing the character key output to be coded differently. The shift key operates the same as any momentary key. The SHIFT key is not interlocked because other keys must be operated with it.

Some models have a SHIFT key LOCK (Figure 1-15) that allows continuous uppercase operation. When the LOCK key is pressed, the turned-over ear pivots the latch against the lock bar. Additional pressure causes the keylever to

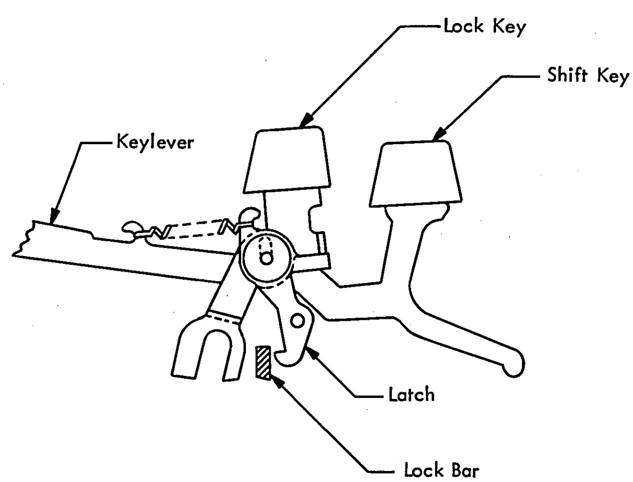


Figure 1-15. Shift Key Lock Mechanism

pivot down and the latch to slide along the lock bar. As the latching surface of the latch passes the lock bar, it pivots under the lock bar and latches in this position as pressure is released on the LOCK key. To release the lock, the SHIFT key is pressed. The latch moves free of the lock bar and returns to its normal position under spring tension.

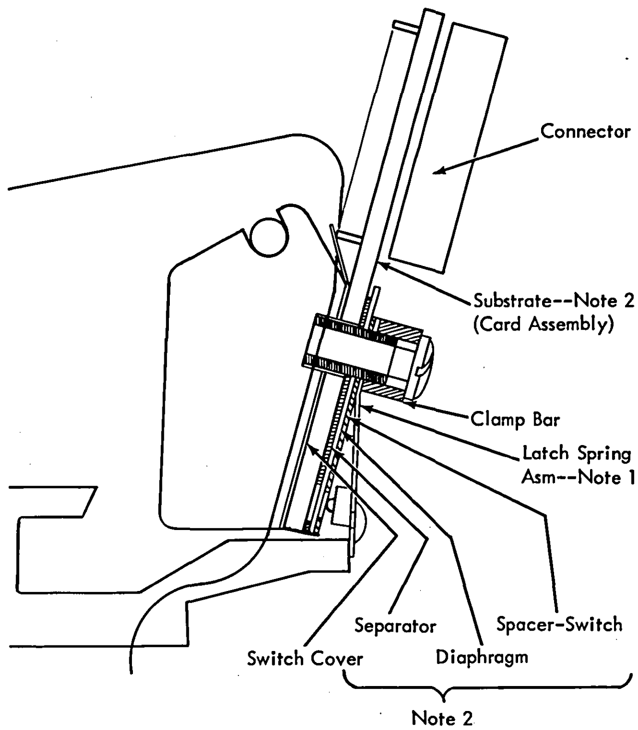
The binary counter, driven by a free running oscillator, generates counts to scan the horizontal and vertical lines of the switch matrix. When the scan coincides with a switch closure, the data selector generates 'scan complete', which stops the counter. The output of each ROS address (counter output) is stored in a 4-bit register. When 'scan complete' occurs, the bits stored in the register (A, B, C, and D) from the previous ROS address and the bits from the present ROS address (1, 2, 4, and 8) make up the 8 bits of the character. 'Scan complete' also brings up 'any data', which tells the using system that data is on the 'bit' lines. A 'reset' line is generated to reset the counter.

Invalid characters are detected before the set of 'any data'. 'Any data' is timed to ensure valid data on the data bus; and timing ensures that 'scan complete' is ignored, during count transitions, to prevent false addressing.

New Encode Circuit Board and Switch Assembly

Some models of the keyboard have a redesigned encode board and switch assembly (Figure 1-16). This board is mounted on the rear of the keyboard instead of on the top, and does not have a flexible substrate. The components of the new board are the substrate, separator, diaphragm, switch spacer, and latch assembly. Operation of the switch assembly is the same as with the old board.

The encode board portion of the assembly uses T^2L logic in place of SLD logic, and has a different theory to produce the same output lines (Figure 1-17). A ROS (read only storage) unit, programmed for the proper output code, is used instead of the 'bit' latches, and is addressed for each switch position. A switch matrix, a seven-bit binary counter, and a data selector generate the ROS address and take the place of the AND/OR circuits used to set 'bit' latches.



Notes:
1. The Latch Spring Assembly provides the combined functions of the Activator and Latch Springs of the previous design.
2. The Logic Card and Switch are Factory-Assembled and to be replaced as a unit.

Figure 1-16. Redesigned Encode Board and Switch Assembly

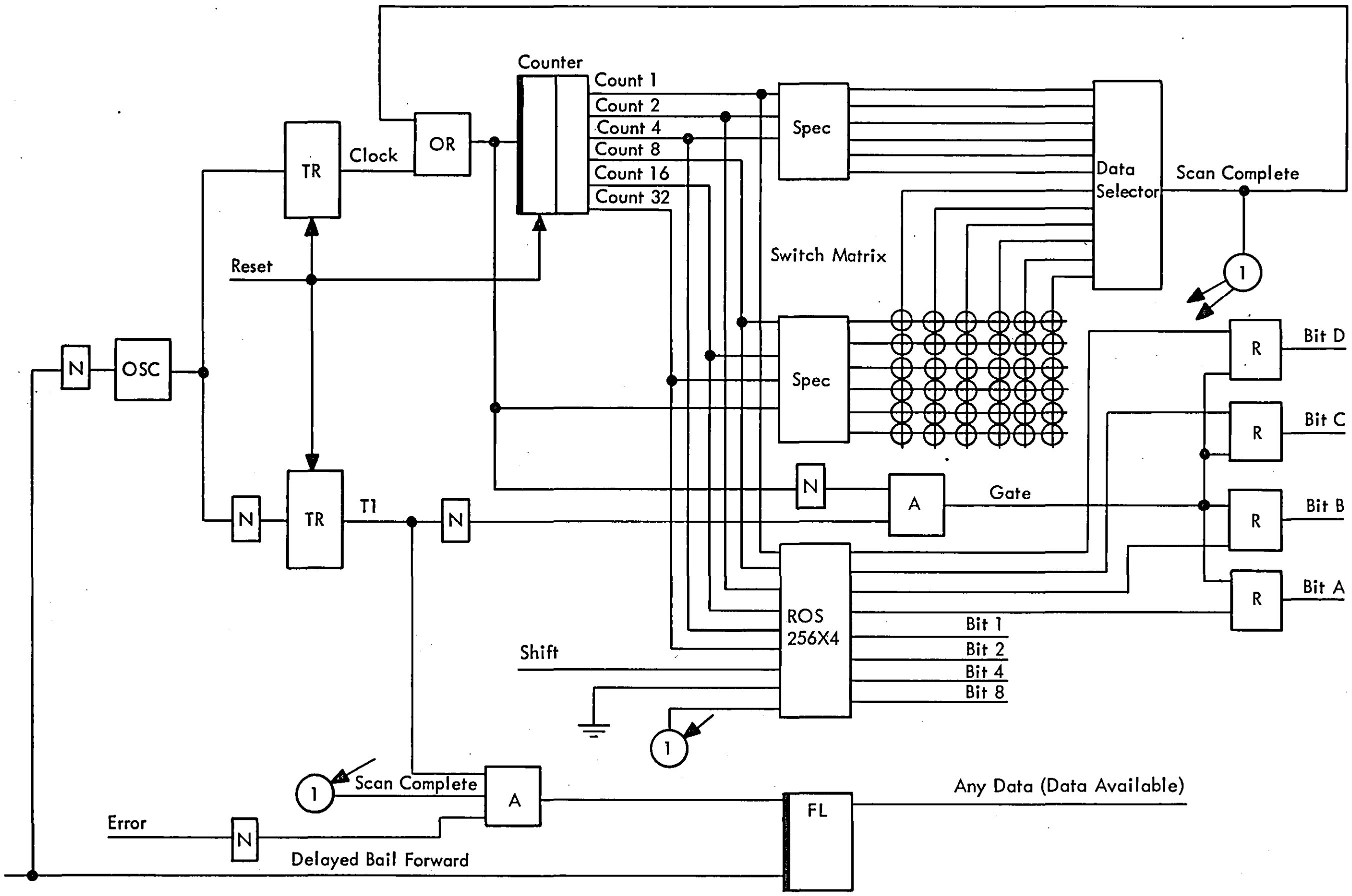


Figure 1-17. Encode Circuits (New Style Encode Board)

PREVENTIVE MAINTENANCE

CAUTION
Remove power before performing PM or removing keyboard.

Perform preventive maintenance to the keyboard during unscheduled interruptions when possible. If unscheduled interruptions do not occur in a twelve month period, a preventive maintenance schedule must be provided. The keyboard can be removed from its mounting (remove power first) for easy servicing. Cable connections on the left and right sides of the keyboard, and plug-on connectors for the drive card, make removal easy.

Lubrication

Always lubricate with number 23 grease.. Grease the following points every twelve months:

- Keylever pivots
- Keylever leaf and return springs
- Front interposer guide combs
- Space bar shaft pivots and keylever tab
- Dobber pivots
- Space bar pivots
- Restore bail armature pivots
- Reset drive spring anchors
- Latch spring and momentary link connections
- Interposer latch spring tips
- Shift bar shaft pivots

Cleaning

Clean the unit before each lubrication and when the environment indicates it is necessary.

MAINTENANCE

CAUTION
In locating troubles in the circuit portion of the keyboard, do not use a test light; it could cause damage to the circuits. Also when using an ohmmeter, take care to prevent shorting pins or overloading the circuits. Do not use the ohmmeter on less than R X 100.0 scale.

Maintenance consists of adjusting mechanical parts and replacing worn parts. When troubles are in the encode board or the magnet driver card, these items must be replaced. Trouble with the EDS may require replacing the separator and the diaphragm, or adjusting or replacing the actuator or the latch spring.

Test points for troubleshooting EDS switches and the encode board are in the keyboard logics for the using system.

CHECKS, ADJUSTMENTS, AND REMOVALS

Key Lever

Checks

The keylever, when pressed, should move around its pivot at the rear of the keyboard until the lever bottoms in the front guide comb. When released, it should rise until the lever strikes the upstop rod in the front comb (Figure 2-1). The dobber should clear the interposer and should return to its rest position above the interposer projection when the key is released.

Note: Unused key positions require their elastic diaphragm switches to be either open or closed. If the switches are to be held open, the keylevers are blocked by a plastic lockout (Part 5994922) to prevent the operation of the interposer. Closed switches do not have interposers and are held closed continuously by the latch spring assembly.

Adjustment

There is no keylever adjustment to meet keylever travel called for in the checks. Failure to meet these conditions indicates some defect in the keylever operation or with the associated mechanisms. Refer to the diagnostic flowchart in Appendix A or the diagnostic flowchart for the specific system. For dobber clearance, refer to "Adjustment–Latch Key".

Removal

1. Loosen the two front and the two rear encode board mounting screws, and tilt the board to the rear of the keyboard (old style only).
2. Remove keybutton from the keylever that is to be replaced.
3. Remove other keybuttons that extend over the keylever that is to be replaced.

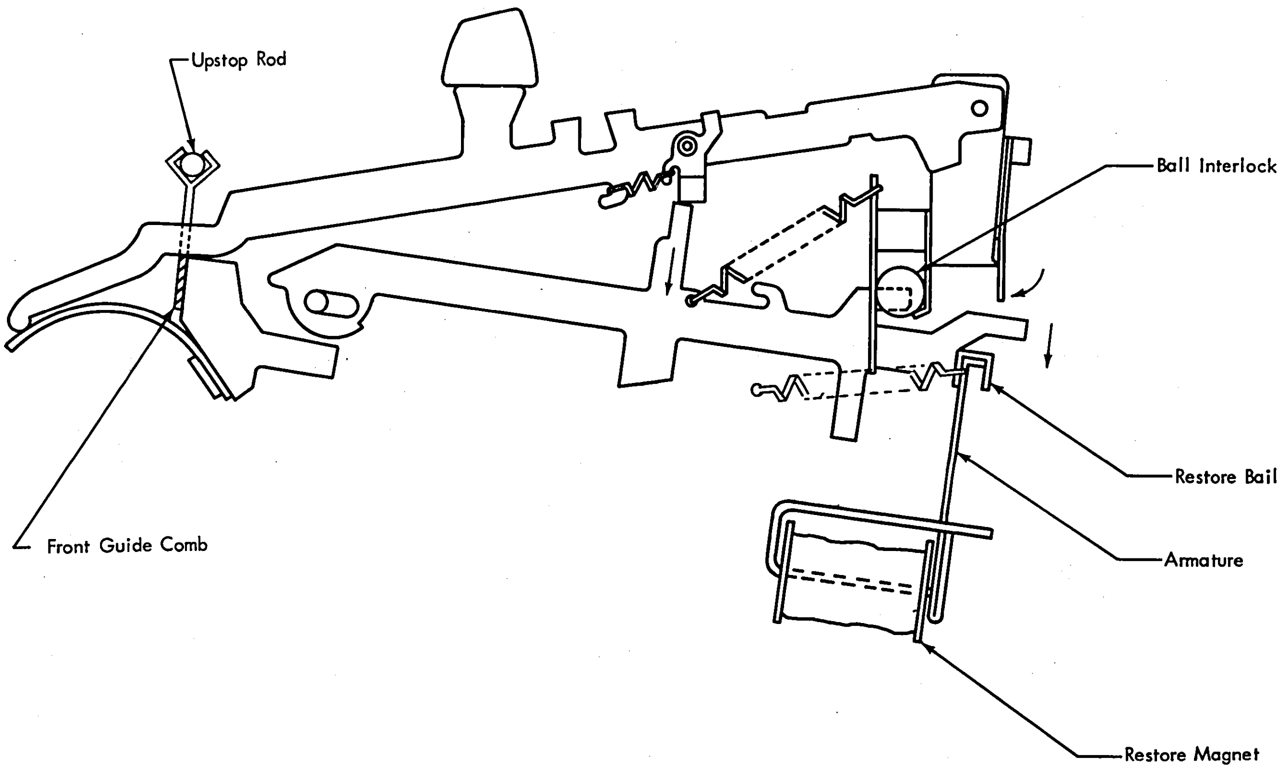


Figure 2-1. Latch Key Adjustments

4. Pull out the pivot rod with pliers or use a follower rod to push it out until the keylever is free.
5. Raise the pivot end of the keylever to be removed and work it to the rear until it clears the upstop rod. Work the keylever out of the keyboard.
6. Replace in the reverse order.
7. Perform checks and necessary adjustments.

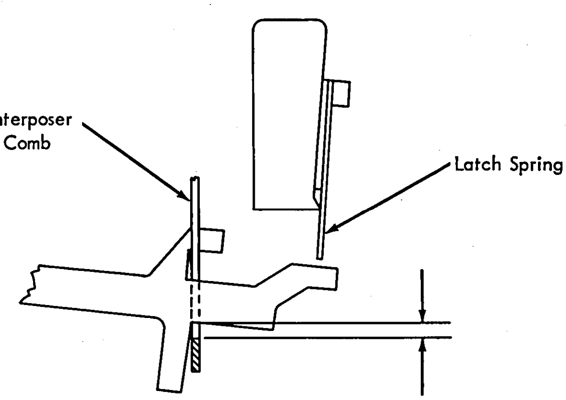


Figure 2-2. Interposer to Guide Comb Clearance

Interposer

Checks

The interposer should be latched by the EDS latch spring before the downward motion of the keylever is complete. When the keylever hits its downstop, the interposer should have some travel left before it bottoms on the guide comb slot at the rear of the keyboard.

Adjustment—Latch Key

The interposer tip must clear the EDS latch spring, and must be at least 0.005 inch above the bottom of the interposer guide comb slot (Figure 2-2) when the keylever is fully operated. To obtain these conditions, the keylever must be formed. If the interposer is not traveling far enough, form the keylever (Figure 2-3) by placing pliers across the projections provided on the keylever. Squeeze gently to obtain the desired position of the dobber. If the interposer is traveling too far, form the keylever (Figure 2-4) by placing pliers on one projection and a screwdriver between the projections then spreading the projections. Hold the screwdriver tip against the pliers and the shank against the opposite projection applying force to spread the projections.

The theory of this adjustment is to raise or lower the tail of the keylever, thus changing the relative position of the dobber. The travel of the keylever is not affected. If the tail is raised, it will strike the upstop sooner and the dobber will be lower and closer to the interposer. The opposite is true if the tail is lower; it will strike the upstop later and the dobber will be further from the interposer.

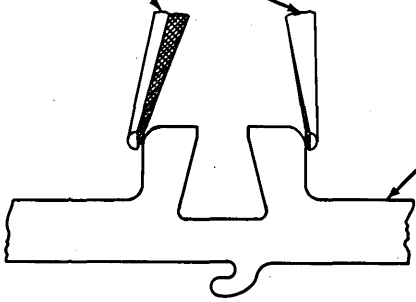


Figure 2-3. Dobber Adjustment (To Lower Dobber)

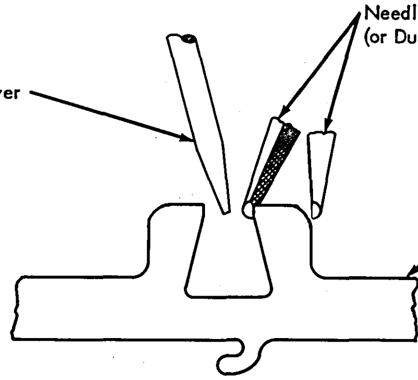


Figure 2-4. Dobber Adjustment (To Raise Dobber)

Adjustment—Momentary Key

Momentary key interposers must travel at least 0.025 inch before the switch closes, and must have a minimum overtravel of 0.005 inch. The keylever is to be adjusted to obtain these dimensions, and it may be necessary to form the momentary link to obtain the proper overtravel (Figure 2-5).

Removal

1. Loosen the front and rear encode board screws and tilt the encode board up and to the rear of the keyboard (old style only).
2. Remove the keylever upstop rod.
3. Remove the spacebar rod.
4. Raise the keylevers evenly.
5. Pull out the interposer pivot rod with pliers or push it out with a follower rod.
6. Remove the spring from the interposer to be removed.
7. Raise the pivot end of the interposer and remove to the front of the keyboard.
8. Replace in the reverse order.
9. Perform checks and necessary adjustments.

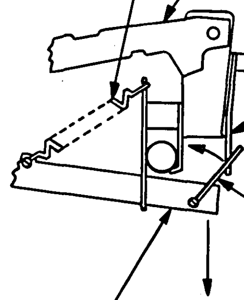


Figure 2-5. Momentary Key Interposer Overtravel

Restore Bail and Magnet Assembly

Checks

The bail should clear the restored interposers when it passes beneath them. The interposers should clear the bail when they are latched and should be restored fully when the magnets are not energized.

CAUTION
Magnet yoke nuts are not to be tightened more than finger tight plus 1/4 turn.

Adjustments

Each bail spring should require 130 to 170 grams of force to pull its end of the bail away from the stop with the magnet not energized. The top surface of the bail (Figure 2-6) should be 0.015 inch ± 0.014 inch below the interposers when the magnets are energized. There is no adjustment for the top surface of the bail other than the play in the yoke mounting holes. The restore surface of the bail should be 0.015 to 0.030 inch from the restore surface of the interposer with the magnets energized. Adjust the restore surface clearance by positioning the magnet yoke assemblies within the side frames. It may be necessary to form the feeler gage to make this adjustment as the magnet yoke interferes with the gage.

Adjust the bail stops to allow proper restoring of the interposers. Place a 0.020 inch shim between the bail and the bail stop (Figure 2-7). When the bail is operated, the interposers should restore. The interposers should not restore with a 0.030 inch shim between the bail and the bail stop.

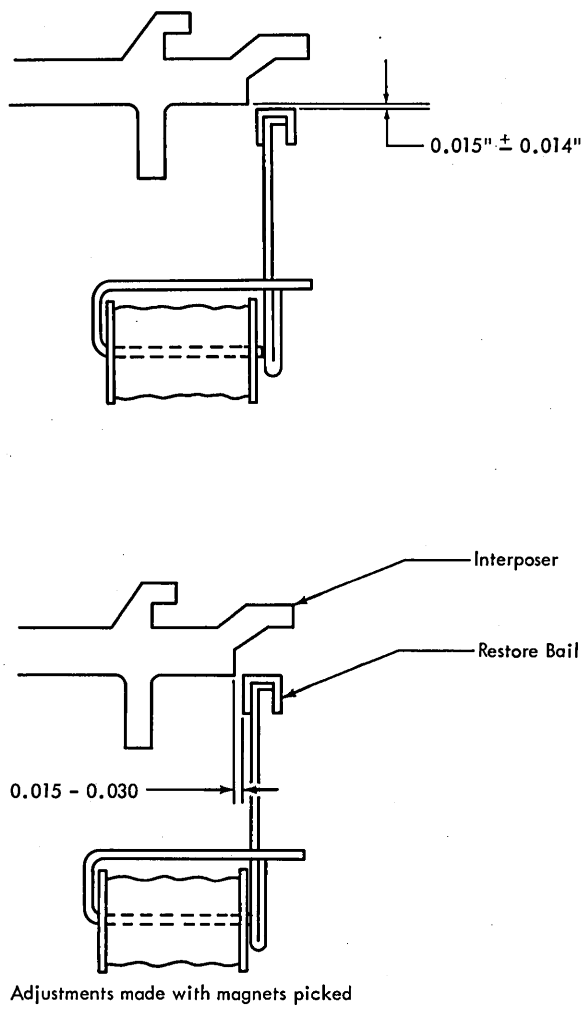


Figure 2-6. Bail Adjustments

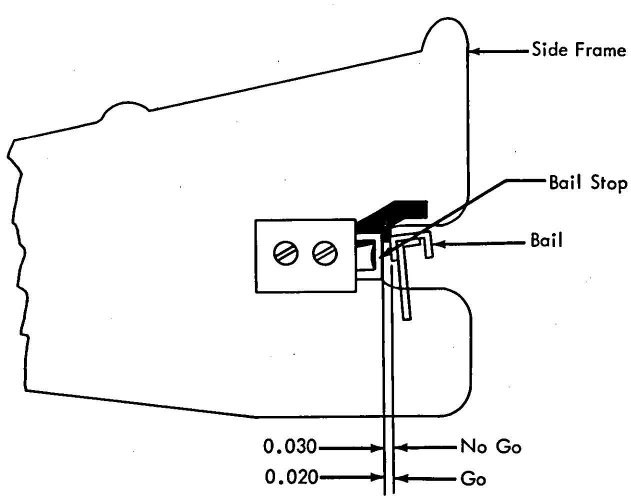


Figure 2-7. Bail Stop Adjustment

EDS, Latch Spring, and Actuator (Old Style)

Checks

Check the switch condition by placing a block between the bail stop and the bail to prevent restoring. Then press a key allowing a switch to close and remain closed, and check across the switch for continuity or voltage.

Adjustments

Remove the latch spring (1st three steps of removal procedure). Form the actuator spring, at the clamp, to close when a force of 5 to 15 grams is applied to its tip (Figure 2-8). The actuator tip should be 0.020 to 0.035 inch from the fulcrum stop. Replace the latch spring and adjust the actuator tip to close the switch when the latch spring is 0.007 to 0.028 inch from the fulcrum stop.

Removal

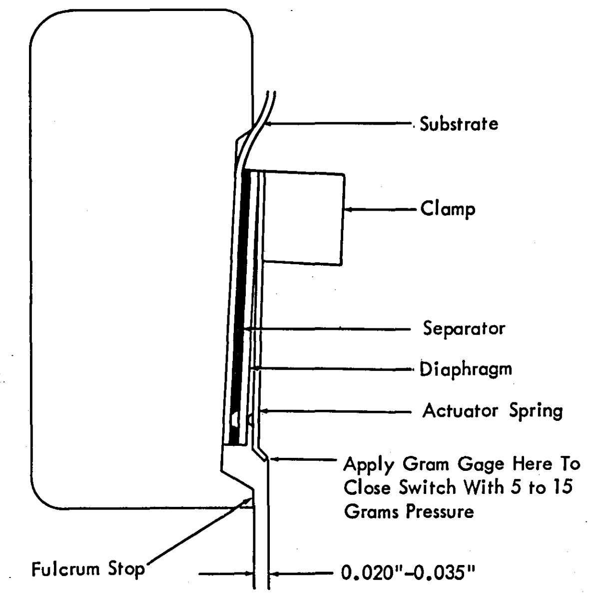
1. Remove nuts from the threaded studs extending through the clamp.
2. Remove the guard and the clamp.
3. Remove the latch spring. (Replace the clamp and nuts if this is for the actuator spring adjustment procedure.)
4. Remove the wedge-shaped spacer.
5. Remove the actuator spring.
6. Remove the following parts if the diaphragm or the substrate is to be replaced:

   spacer
   slotted clamp
   Mylar* spacer
   diaphragm (stop here for diaphragm replacement)
   separator
   substrate

7. Replace in the reverse order. Refer to the following section for replacement of the substrate and/or encode board.

Replacing the Encode Board and/or Substrate (Old Style)

1. Clean the gold-plated areas of the diaphragm and the substrate and both sides of the separator. Use either Isopropyl Alcohol (Part 2200200) or tape developer and cleaner (Part 517960) for cleaning. The cleaner should be applied with a lint free cloth (Part 2108930) or tissues (Part 2123106). Do not apply the cleaning solution for more than a few seconds,
2. Mount the switch assembly to the fulcrum bar H (Figure 2-9). Tighten the nuts from right to left as viewed from the rear of the keyboard.
3. Form the substrate uniformly forward to the position shown in Figure 2-9.
4. Slide the encode board assembly in the direction A until slots B fit over screws C. Tighten the screws lightly to hold the board in place.



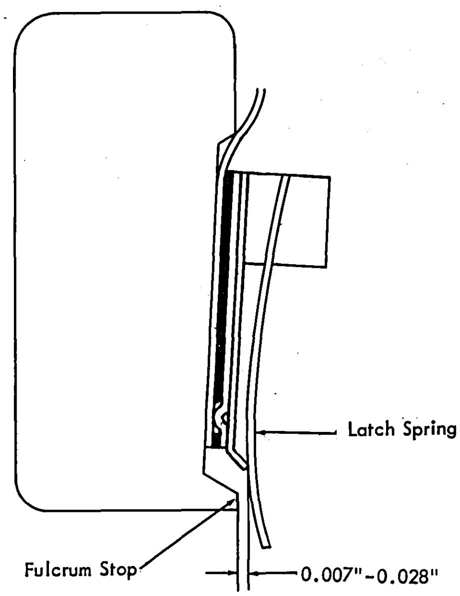


Figure 2-8. Latch Spring and Actuator Adjustment (Old Style)

5. Place screws D into holes E and tighten screws D and C.
6. Refer to EDS and Interposer adjustment sections for final adjustment.

New Encode Board and Switch Assembly

Checking consists of a visual check for switch closure and a check for an output on the bit lines. No adjustments are necessary. Removal is accomplished by removing the screws that hold the assembly to the keyboard. Replace in the reverse order.

Ball Interlock Assembly

Adjustment

Adjust the ball interlocks by means of the two retaining rods held by set-screws (Figure 2-10). Press down the last interlocking interposer on the left. Push the interposer against the left side of the guide comb. Back out the set-screw and push the rod in until the balls between the rod and the interposer are touching and have no play between them, then tighten the set-screw. Use the same

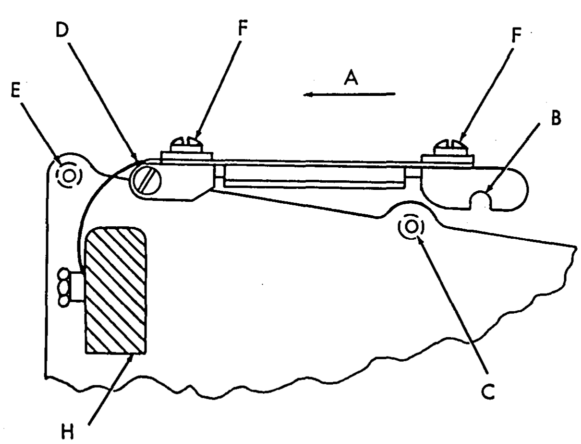


Figure 2-9. Encode Board & Diaphragm Replacement (Old Style)

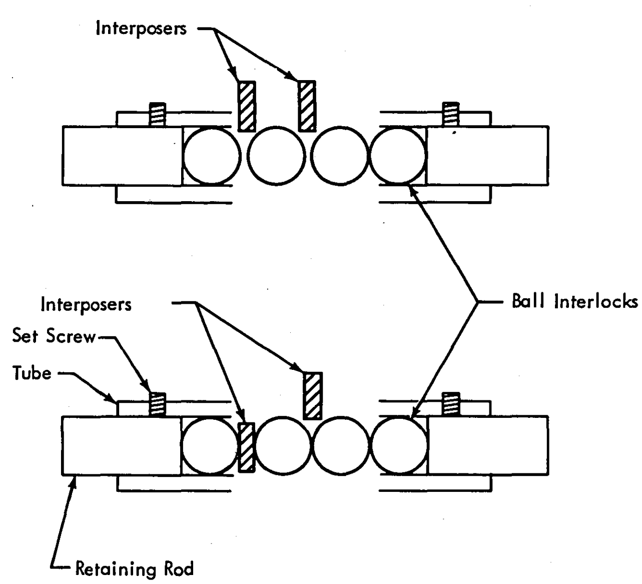


Figure 2-10. Ball Interlock Assembly Adjustment

procedure on the right side using the last interposer to the right against the right side of the guide comb and using the right adjusting rod. Make sure that the adjusting rods do not back out as the set-screws are tightened.

Spacebar Assembly

Adjustment

Adjust the spacebar guide stud for a clearance of 0.032 to 0.062 inch between the spacebar and the fourth row of keys. This adjustment is to be made when the keys are pressed so that the bottoms of the keys are in line with the bottom of the spacebar. Adjust the spacebar operating tab (Figure 2-11) by forming it to allow 0.002 to 0.015 inch clearance between the tab and the adjacent keylevers.

Shift Key Mechanism

Adjustment

Form the SHIFT key keylever to assure closure of the shift contact (see interposer adjustment) when the SHIFT key is pressed to its limit. On keyboards with a shift LOCK, adjust the lock mechanism to close the shift contact when locked.

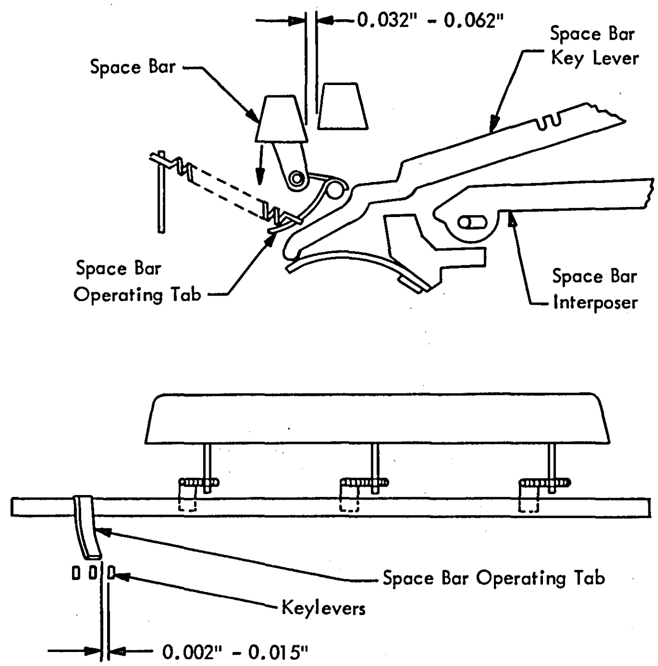


Figure 2-11. Space Bar Operating Tab Adjustment (Old Style)

The 5475 Keyboard is the manual entry device for the System/3. It creates punched cards via the multifunction card unit that is connected on-line with the system.

The 5475 is a keyboard composed of up to 55 keys aligned in an operator-oriented format similar to the keypunch (Figure A-1). Two types of keys are used: latch keys and momentary keys. These keys are described in the "Principles of Operation" section of this manual. There is no shift lock as on some models. Output is the System/3 card code (Figure A-2). The interface line, which indicates that bit lines are up, is called 'any data'.

Variable electrical and mechanical timings are shown in relation to the maximum time between key cycles (Figure A-3). Timing durations are determined as follows:

- EDS Closure–Closes as soon as the interposer clears the latch spring. It remains closed until the restore is nearly complete. Time of restore is determined by the system and is, therefore, variable.
- Bit Lines–Coincident with the EDS closure.
- Any Data–Brought up by the bit lines and reset by 'bail contact'. Restore is controlled by the system; thus the rise of 'bail contact' is available.
- Restore Magnet–De-energized when the system accepts data and picked when the bail closes the bail contacts. Mechanical travel time of the bail determines the time the contacts close.
- Bail Contact Signal–Begins when the restore bail interposer closes the contacts and drops when the circuit delay times out after the contacts open. Duration is variable depending on the time the contacts are held closed by the restore bail.
- Ball Interlock–Interlocks when the interposer enters between the balls. Removed when the bail restores the interposer. Duration is variable depending on system restore time or the operator.
- Bail Interlock–Duration is directly related to the mechanical travel of the bail. Begins as bail passes beneath the interposers and ends when it clears the interposers on the return.

A control panel is contained within the covers and provides operator control and unit status (Figure A-4). The panel is mounted above and to the rear of the keyboard and consists of the following:

1. Lights with status indicated
   a. Program Level 1
   b. Program Level 2
   c. Error
   d. Column Indicator
2. Switches and Control Provided
   a. Auto Record-Auto Release
   b. Auto Dup-Auto Skip
   c. Print
   d. Record Erase–Momentary Action
   e. Program
   f. Program Load–Momentary Action

Interface connector lines and drive card connector lines and their pin locations are shown in Figure A-5 (5475 Interface Connectors). The connectors for the control panel switches and lights are shown in Figure A-6 (5475 Control Panel Connectors).

A diagnostic flowchart is included to aid in the location of keyboard troubles (Figure A-7).

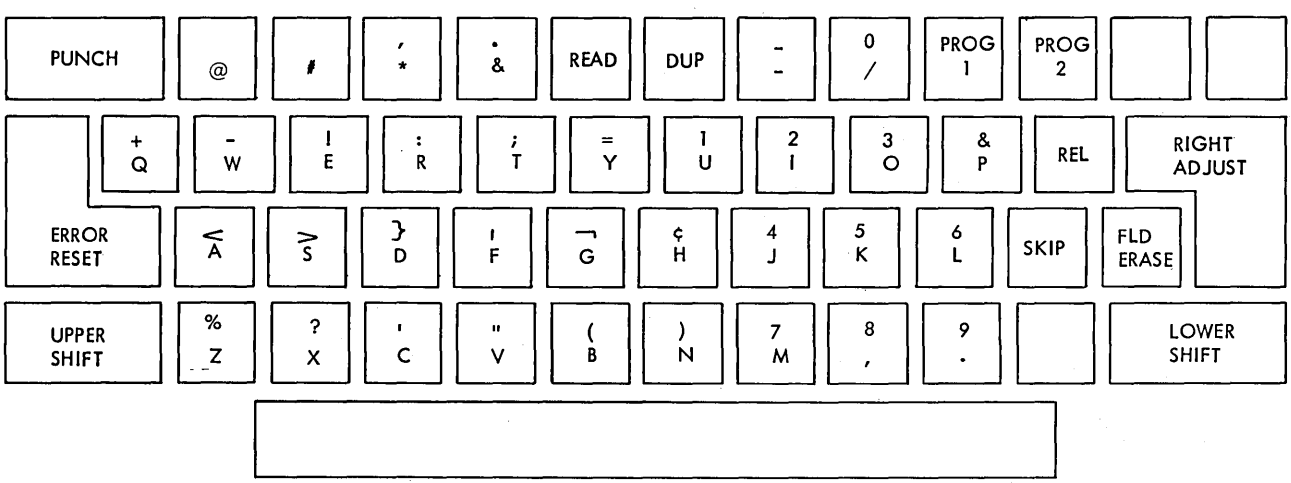


Figure A-1. 5475 Keyboard Arrangement

CHAR	BITS						SHIFT
space							
1						1	U
2					2		U
3					2	1	U
4				4			U
5				4		1	U
6				4	2		U
7				4	2	1	U
8			8				U
9			8			1	U
0		A					U
A	B	A				1	L
B	B	A			2		L
C	B	A			2	1	L
D	B	A		4			L
E	B	A		4		1	L
F	B	A		4	2		L
G	B	A		4	2	1	L
H	B	A	8				L
I	B	A	8			1	L
J	B					1	L
K	B				2		L
L	B				2	1	L
M	B			4			L
N	B			4		1	L
O	B			4	2		L
P	B			4	2	1	L
Q	B		8				L
R	B		8			1	L
S		A			2		L
T		A			2	1	L
U		A		4			L
V		A		4		1	L
W		A		4	2		L
X		A		4	2	1	L
Y		A	8				L
Z		A	8			1	L
:			8		2		U
#			8		2	1	L
@			8	4			L
'			8	4		1	U
=			8	4	2		U
"			8	4	2	1	U
/		A				1	L
&		A	8		2		U
,		A	8		2	1	L
%		A	8	4			U
–		A	8	4		1	U
>		A	8	4	2		U
?		A	8	4	2	1	U
-	B						L
!	B		8		2		U
$	B		8		2	1	U
*	B		8	4			L
)	B		8	4		1	U
;	B		8	4	2		U
¬	B		8	4	2	1	U
{	B	A					U
¢	B	A	8		2		U
.	B	A	8		2	1	L
<	B	A	8	4			U
(	B	A	8	4		1	U
+	B	A	8	4	2		U
|	B	A	8	4	2	1	U

NOTE: Space and characters '0 - 9' are the only codes valid in "Programmed Numeric Shift".

Figure A-2. System/3 Card Code

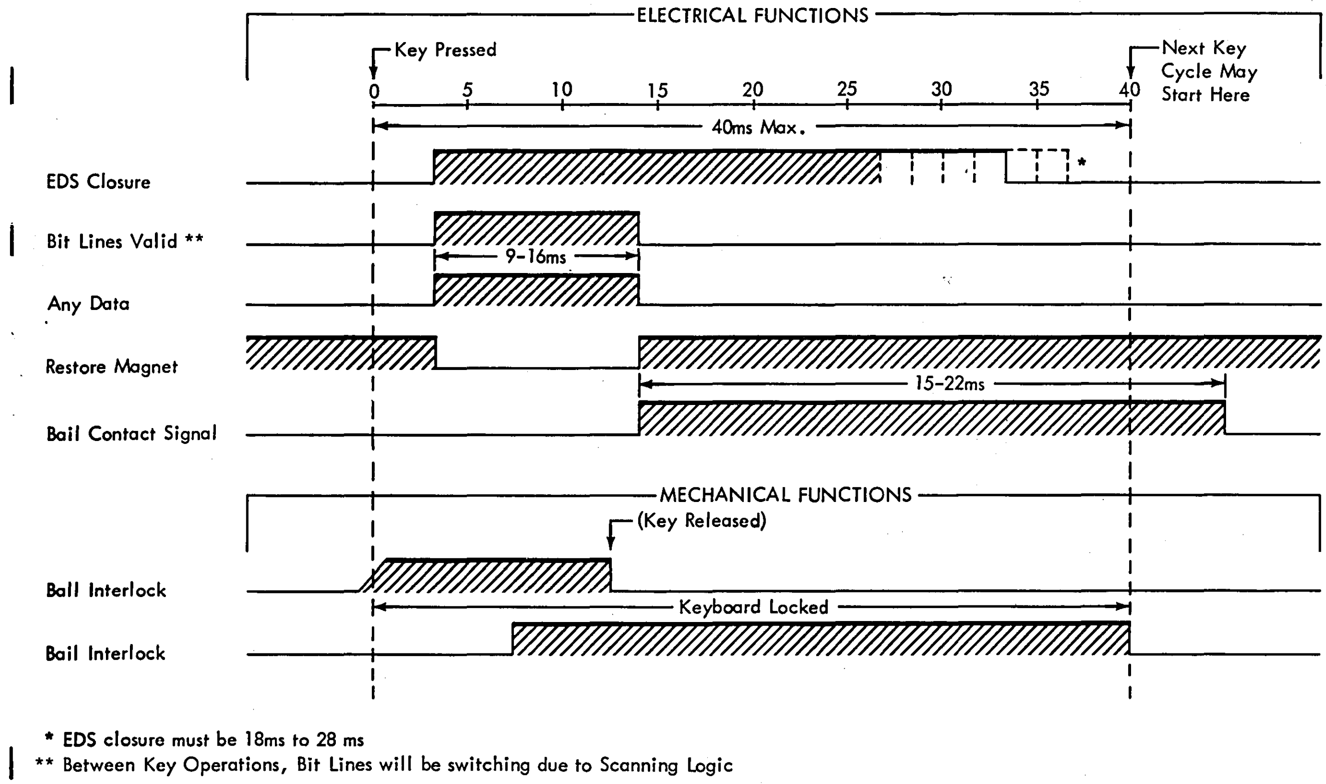


Figure A-3. 5475 Electrical & Mechanical Timings

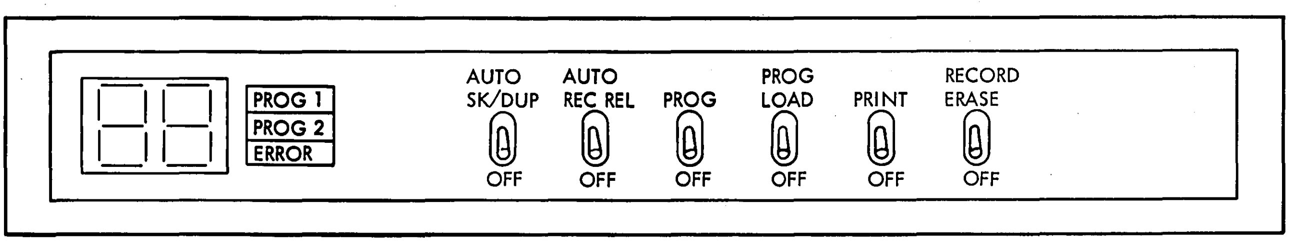


Figure A-4. Control Panel

INTERFACE CONNECTORS--Encode Board

Connector 1

Line	Pin
+ Bit C	B03
+ Bit D	D12
+ 6 volts	B05, D03, D05, D09, D10, D11
DC Ground	D08
- Any Data	B07
- Invalid Char	D06
- Multi Punch	D02
- Delayed Bail Forward	B12
+ Program Switch	B08
- Program Lower Shift	D07
+ Prog Num Shift	D04
- Error Reset	B02
- Dup	D13
- Read	B13
- Lower Shift Key	B09
- C, - D Bit	B04

Connector 2

Line	Pin
+ Bit 1	J09
+ Bit 2	G10
+ Bit 4	J06
+ Bit 8	G08
+ Bit A	G04
+ Bit B	G03
+ 6 volts	G05, J03, G02, J04, J05
- Program 1	J07
- Program 2	J02
- Field Erase	G09
- Release	G07
- Aux Dup	J11
- Skip	J12
- Right Adjust	G12
DC Ground	J08

Drive Card Connector

Line	Pin
+ Reset	M
DC Ground	Q
+ 24 volts dc	K

Figure A-5. 5475 Interface Connectors

SLD Socket 1 --Control Panel

Line		Pin
Error Indicator		D02
Prog 1 Indicator		B03
Prog 2 Indicator		D04
Indicator Common		D03
Auto Sk/Dup	N/O	D06
	N/C	B07
	Com	D10
Auto Rec/Rel	N/O	D07
	N/C	B09
	Com	D10
Record - Erase	N/O	B10
	N/C	D11
	Com	D10
Prog Load	N/C	B11
	Com	B12
Prog	N/O	D12
	N/C	D13
	Com	B12
Print	N/C	B13
	Com	B12

SLD Socket 2--Control Panel Column Indicator

Line	Pin
Tens E	B10
Tens D	D13
Tens F	B08
Tens C	B09
Tens B	B13
Tens G	D09
Tens A	D12
Tens Common	B05
Units E	B03
Units F	D02
Units D	D07
Units C	D04
Units G	B02
Units B	D06
Units A	D05
Units Common	B04

Column Indicator

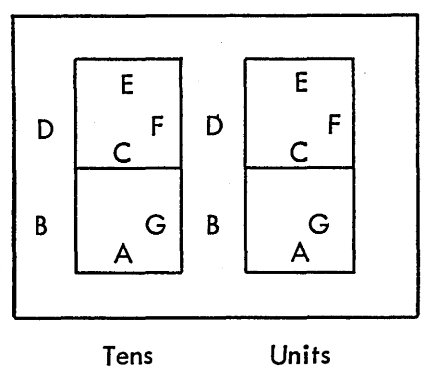


Figure A-6. Control Panel Connectors

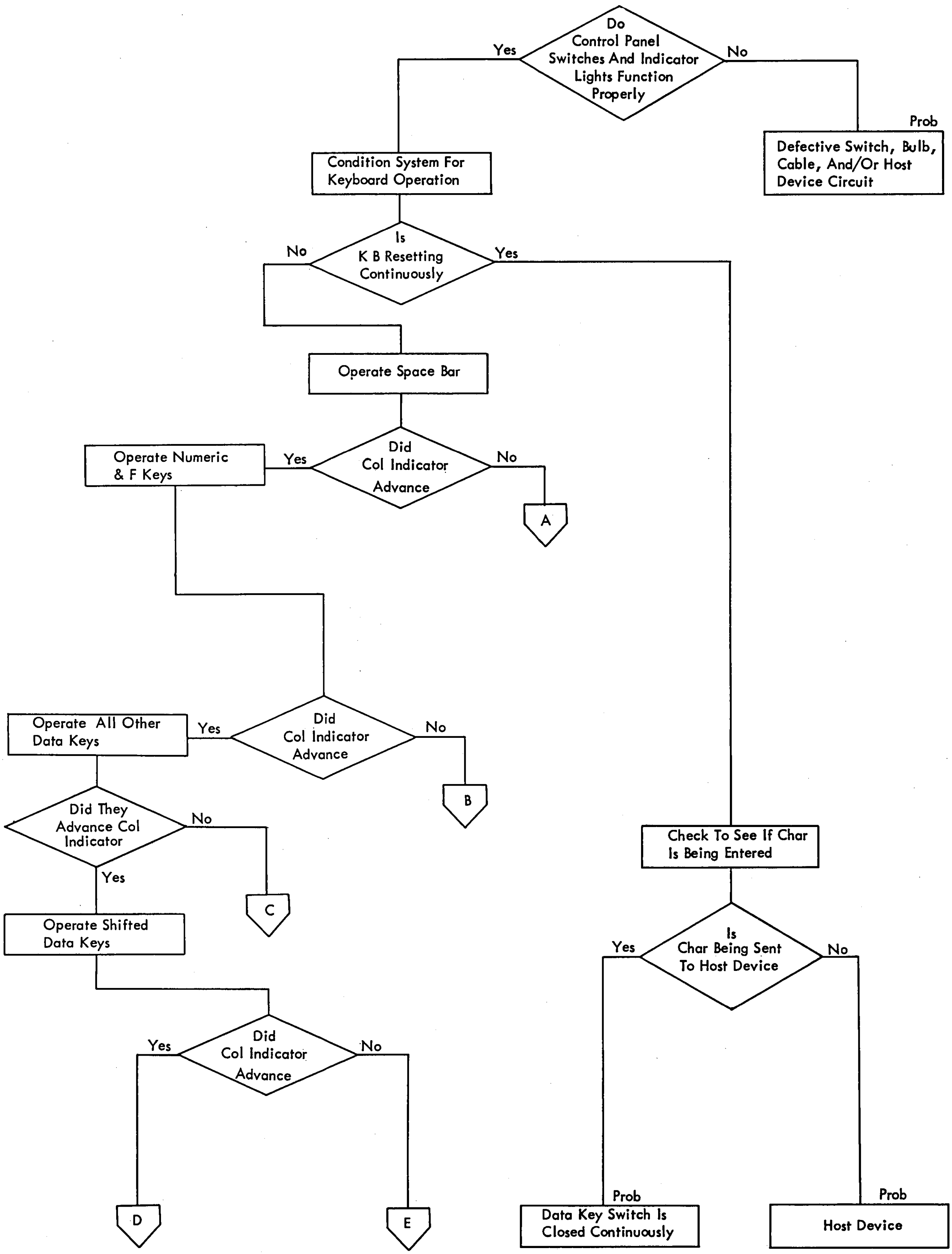


Figure A-7. 5475 Keyboard Diagnostic Flow Chart (Part 1 of 4)

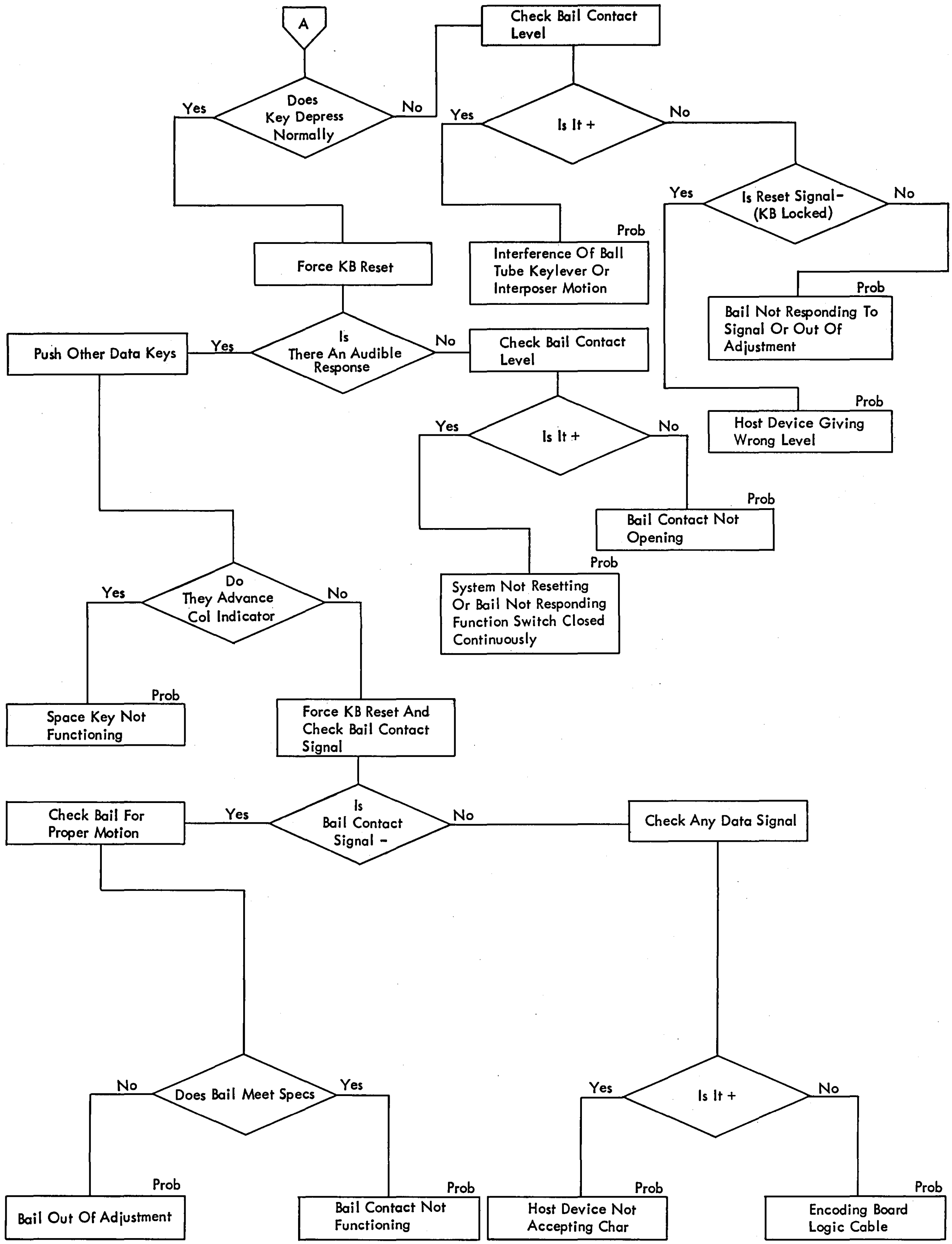
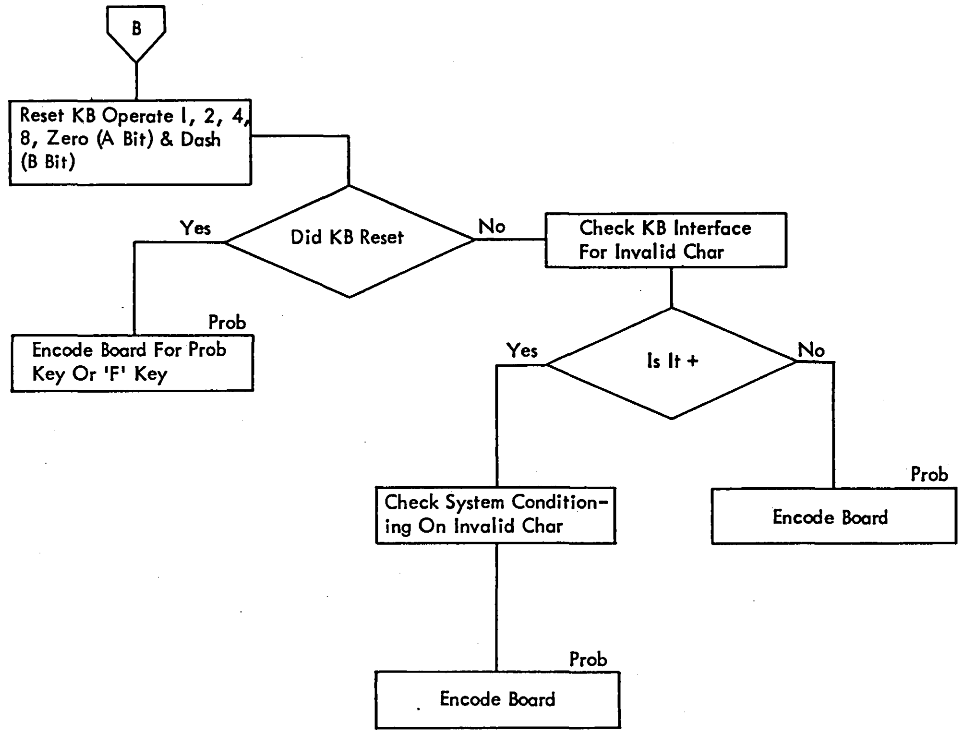


Figure A-7. 5475 Keyboard Diagnostic Flow Chart (Part 2 of 4)



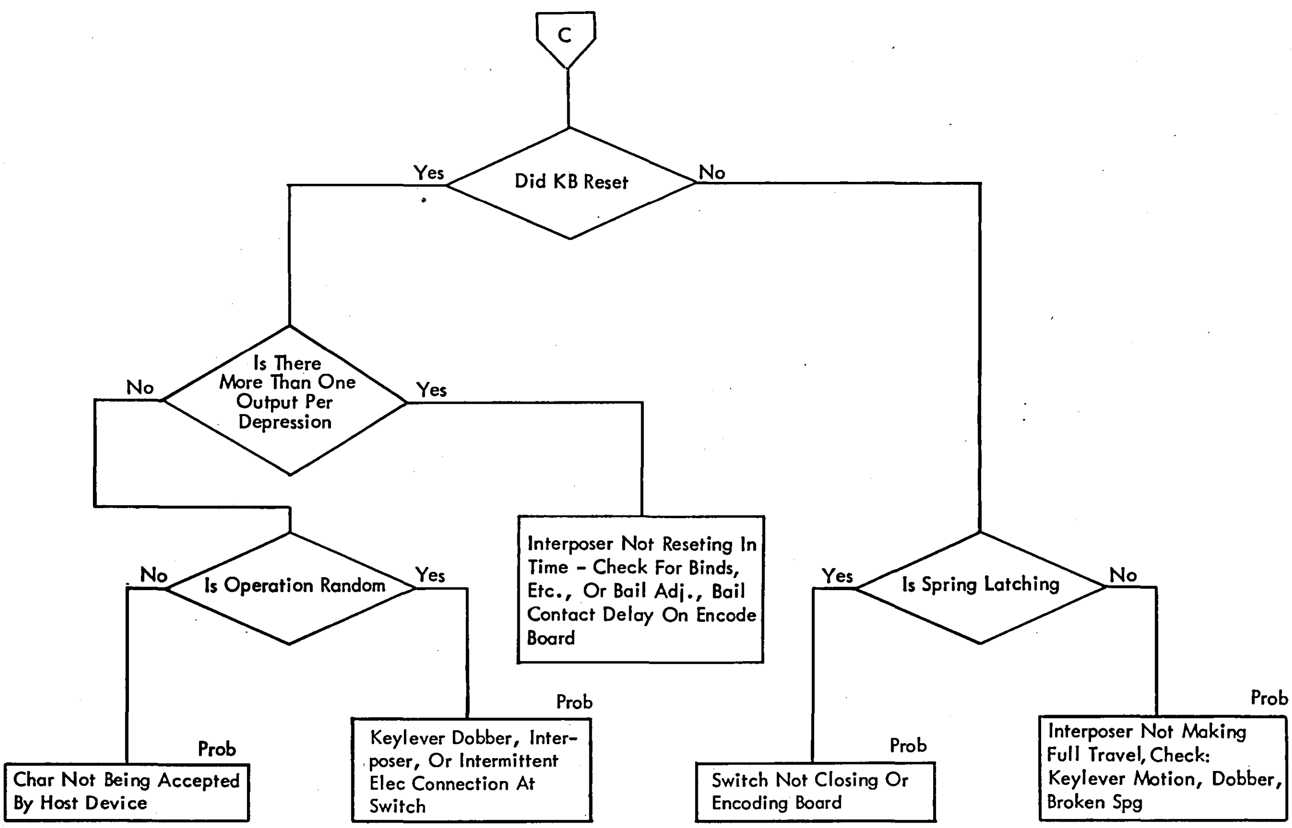


Figure A-7. 5475 Keyboard Diagnostic Flow Chart (Part 3 of 4)

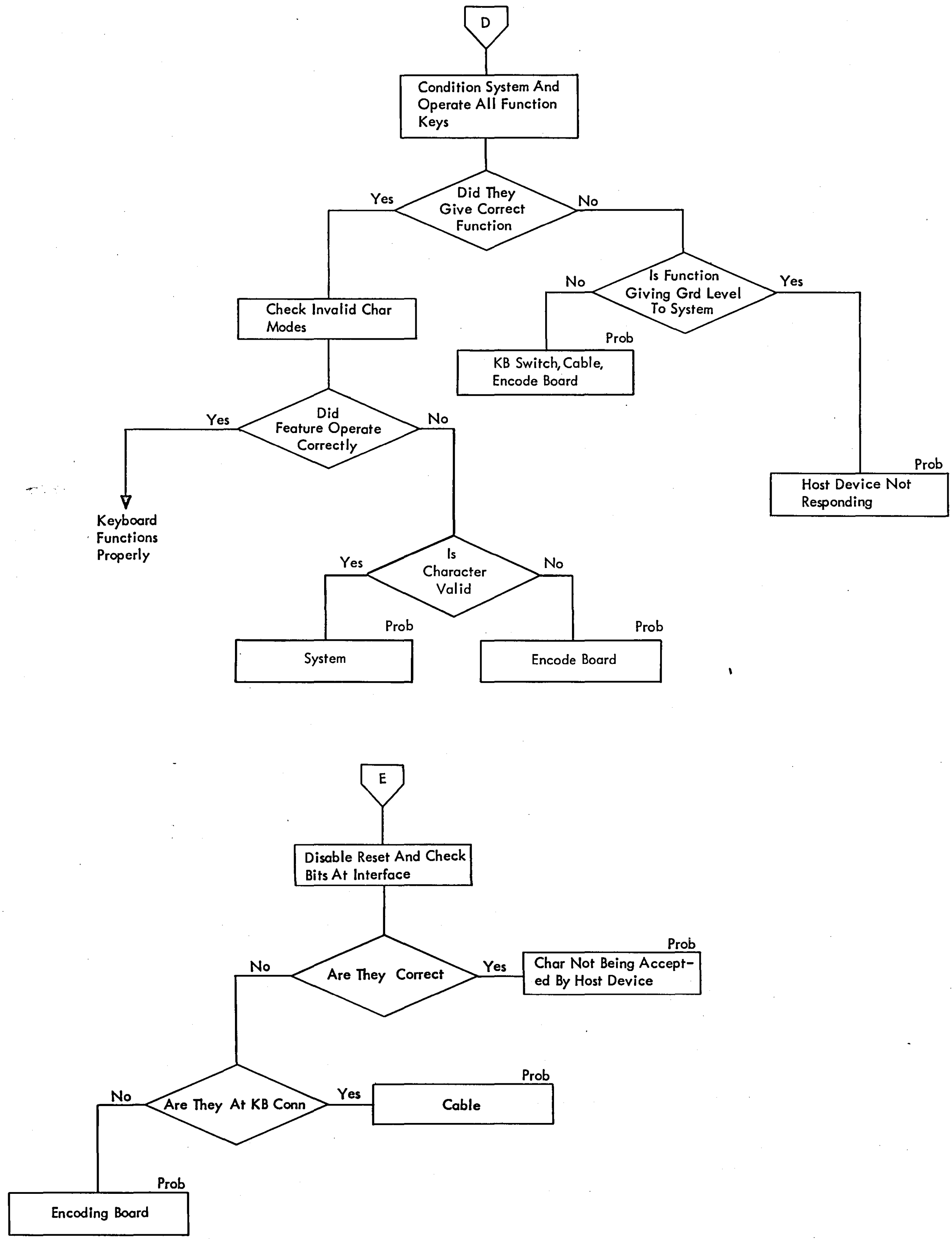


Figure A-7. 5475 Keyboard Diagnostic Flow Chart (Part 4 of 4)

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