

32 AND 33 KEYBOARD

PRINCIPLES OF OPERATION

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1. GENERAL

1.01 This section is issued to provide principles of operation for the 32 and 33 keyboard and to present the principles as a separate section.

1.02 The teletypewriter code used to transmit messages is described in the appropriate typing unit section. This keyboard section outlines in general terms the overall operation of the keyboard and explains in detail the operation of the components that make it up.

1.03 References to "left," "right," "front," or "rear," etc, consider the keyboard to be viewed from a position where the spacebar faces up and the contact mechanism is located to the viewer's right.

1.04 In the illustrations, fixed pivots are solid black, and floating pivots—those mounted on parts that move—are cross-hatched.

2. TRANSMISSION

GENERAL

2.01 Transmission of messages is accomplished by an operator selectively depressing the keys and spacebar of the keyboard in the same manner as in typing. The downward movement of each key or the spacebar is translated by a codebar mechanism into mechanical arrangement corresponding to the code combination representing the character on the keytop. The mechanical arrangements set up the code combinations in a set of keyboard contacts, and, by parallel output, the code combinations are transmitted to a distributor mechanism. A universal mechanism trips a distributor clutch, and a distributor mechanism then translates the parallel output from the keyboard contacts into corresponding start-stop signal for application to the transmission facilities.

Note: For a further discussion of transmission principles, see the appropriate typing unit section.

KEYBOARD

2.02 In conjunction with a distributor mechanism, the keyboard provides facilities for transmitting messages by the manual operation of a group of keys. The 32 and 33 keyboards are described in the appropriate keyboard section.

A. Codebar Mechanism

2.03 The codebar mechanism is illustrated in Figure 1.

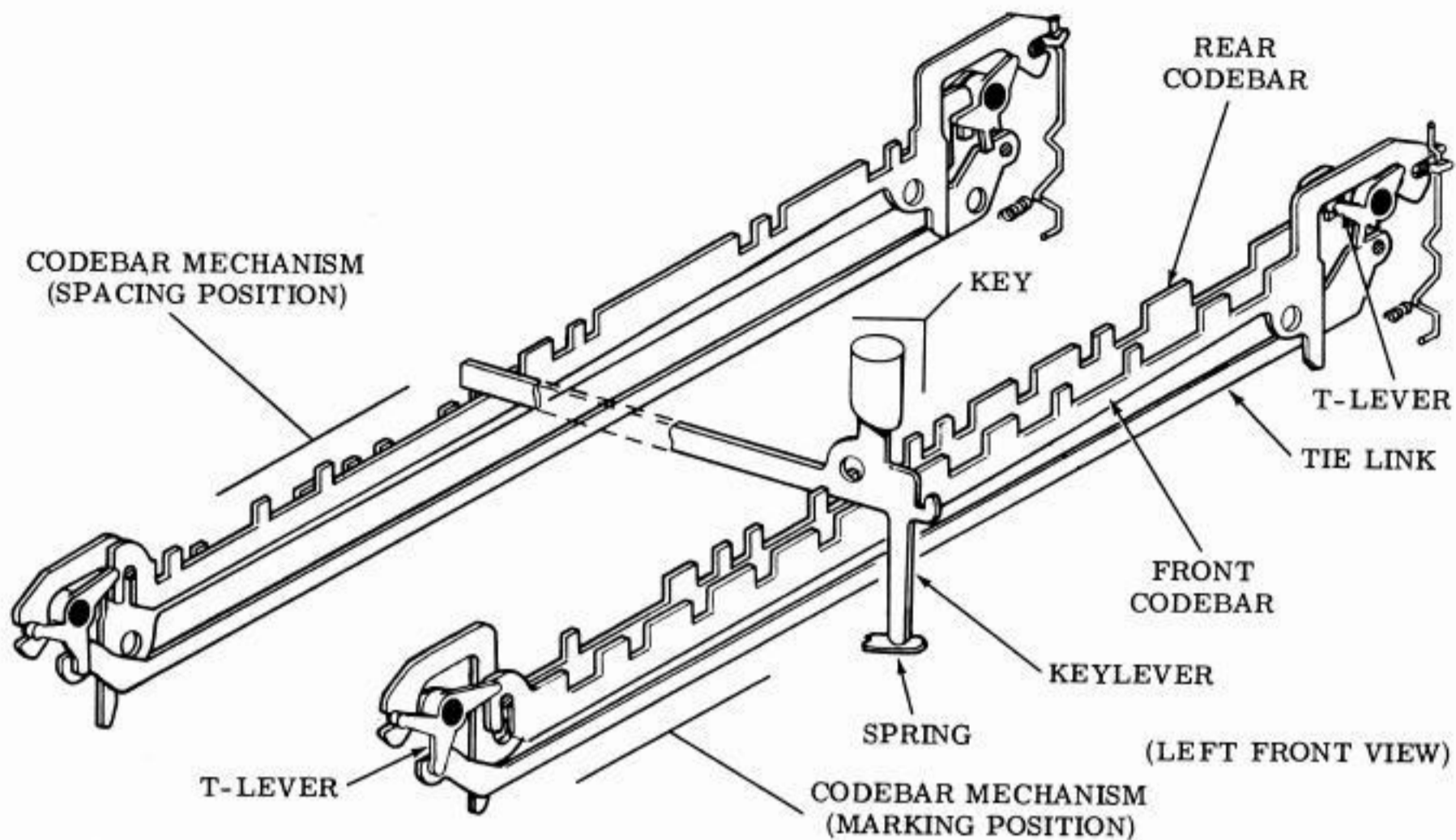


Figure 1 - Codebar Mechanism

2.04 For each intelligence element of the code, there is a codebar submechanism which consists of a front codebar, rear codebar, a tie link, and two T-levers. The mechanisms are numbered from rear to front according to the corresponding code elements—1 through 5 for the 32 keyboards and 1 through 8 for 33 keyboards. In addition, there is a universal codebar mechanism (Figure 2), consisting of one codebar, a tie link, and two T-levers.

2.05 The codebars have slots in their top edges which codes them so they are selectively depressed by the keys' keylevers. Each mechanism has a marking and a spacing position. In the marking position, the front codebar is down, the rear codebar is up, and the right T-lever is in the clockwise position. The spacing position is the opposite: front codebar up, rear codebar down, and right T-lever in counterclockwise position.

2.06 The two codebars in each mechanism are complementary coded so that, at any keylever position, where one has a slot, the

other is solid. When a key is depressed, it is returned to its up position by a leaf spring. However, the code combination representing the key's character remains in the codebar mechanisms. When a new key is depressed, only the mechanisms whose code elements differ from those of the preceding combination are operated as illustrated.

2.07 Assume that a letter has just been transmitted—"S" for a 32 keyboard or "E" for a 33 keyboard. The "S" (1-3--) or "E" (1-3---78) code combination remains in the codebar mechanisms. Now assume that another key is depressed—"D" (1--4-) for a 32 keyboard or "I" (1--4--78) for a 33 keyboard. The keylever of the key depressed encounters a slot in the rear codebar of the no. 1 codebar mechanism of the 32 keyboard or the no. 1, 7, and 8 codebar mechanisms of the 33 keyboard. Thus, the codebar mechanisms remain marking. In the case of the no. 2 and 5 codebar mechanisms for the 32 keyboard or the no. 2, 5, and 6 codebar mechanisms for the 33 keyboard, the keylever encounters a slot in the front codebar, and they remain spacing.

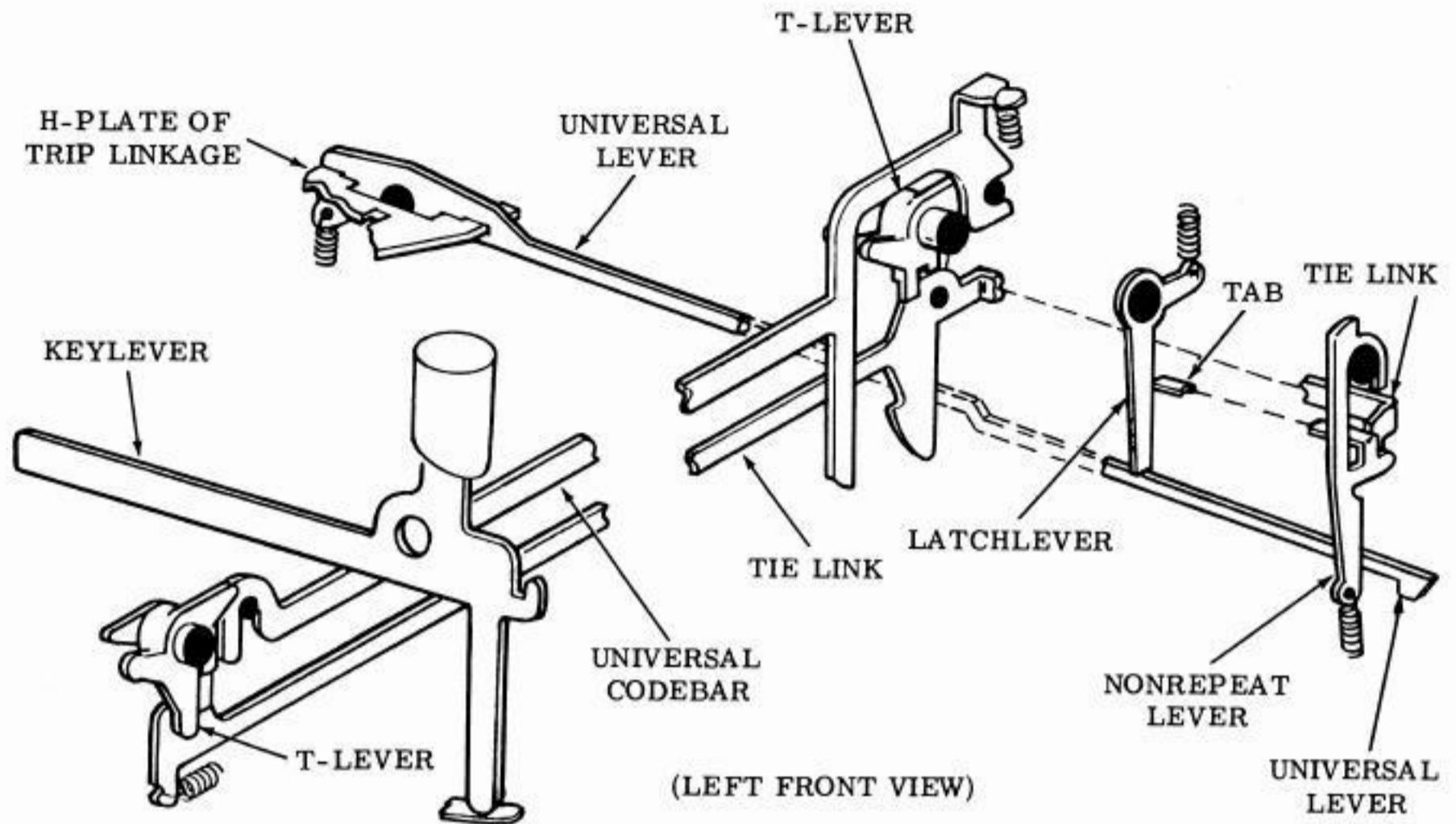


Figure 2 - Universal Codebar Mechanism

In the case of the no. 3 codebar mechanism in either the 32 or 33 keyboard, the keylever encounters the solid portion of the rear codebar and shifts it to its spacing position. In a similar manner, the keylever encounters the solid portion of the front codebar of the no. 4 codebar mechanism of either the 32 and 33 keyboard and shifts it to the marking position.

2.08 Since each code combination is different and is locked in the codebar mechanisms, the complementary coding of the codebars serves as an interlock for the keylevers. When one keylever is depressed, another cannot be depressed because it will be blocked by the solid portion of one or more codebars.

B. Universal Mechanism

2.09 The universal codebar mechanism is illustrated in Figure 2.

2.10 As a keylever nears the bottom of its travel, it depresses a codebar which is part of the universal codebar mechanism.

The codebar, in turn, causes associated T-levers to pivot and a tie link to move to the left. After some free movement, the tie link encounters a tab on a nonrepeat lever and pivots the latter to the left. The tab, in turn, pivots a latchlever which releases a universal lever. Under spring pressure, the universal lever moves up and lifts the nonrepeat lever so that its tab is moved from between the universal tie link and the latchlever. Under spring pressure, the latchlever and nonrepeat lever move back to the right to their unoperated position.

2.11 In its up position, the universal lever locks the right intelligence T-levers in the positions set up by the keylever, permits a contact bail to pivot to its down position and, through a trip linkage, trips the distributor clutch. Near the end of the distributor cycle, the trip linkage moves the universal lever back to its down position where it is latched by the latchlever.

2.12 Should the keylever remain depressed beyond the end of the distributor cycle, when the universal lever moves to its down

position, the nonrepeat lever under spring tension moves down until it hangs up on the top of the universal tie link which is still in its left position. When the keylever is finally released, the tie link moves back to the right and permits the nonrepeat lever to move all the way down so that its tab is again between the tie link and the latchlever. The trip mechanism operates in this way to prevent the distributor clutch from being retripped when a keylever is held down.

C. Keyboard Contact Mechanism

2.13 The keyboard contact mechanism is illustrated in Figure 3.

2.14 The codebar mechanisms set up the code combinations in a set of keyboard contacts. A contact wire is associated with each right T-lever excluding the universal. In the stop condition of the keyboard, a contact bail is held in its up position by the universal lever, and, in turn, holds the contact wires to the right away from the T-levers.

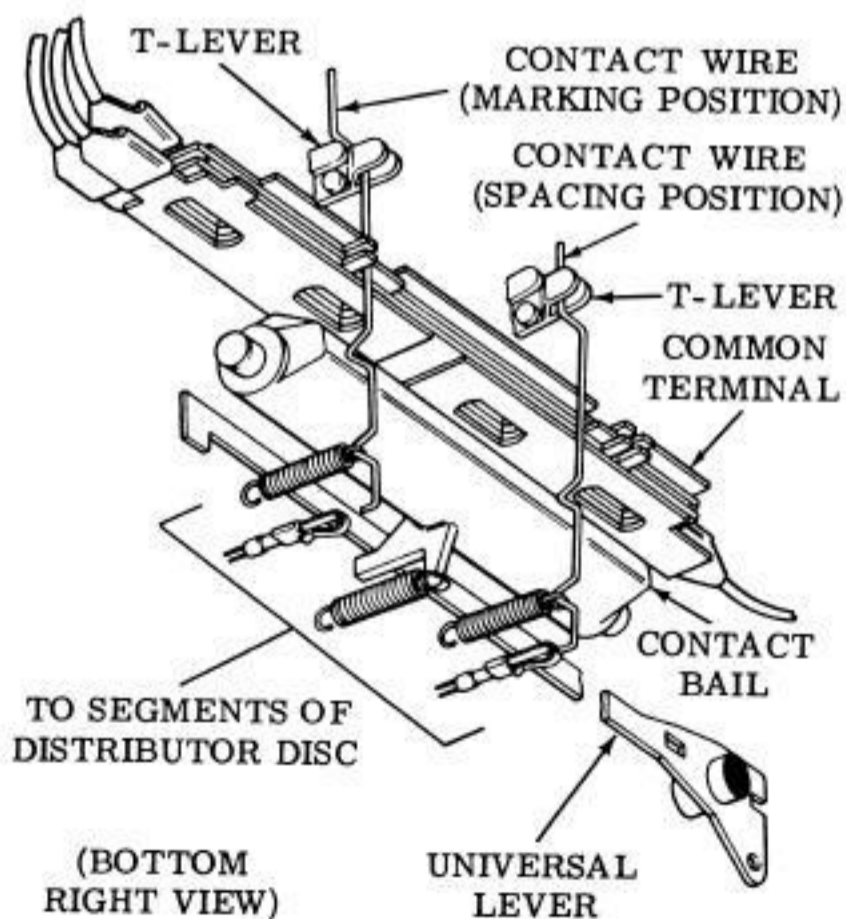


Figure 3 — Keyboard Contact Mechanism

2.15 When a keylever is depressed, a code combination is set up in the codebar mechanisms. The universal lever moves to its up position and permits the contact bail to pivot under spring pressure to its down position. The contact wires associated with the T-levers that are in the marking (clockwise) position are permitted under spring pressure to move to the left against a common terminal. Those associated with the T-levers that are in the spacing (counterclockwise) position are held to the right away from the terminal. For example, if a code combination—"D" (1--4-) for a 32 keyboard or "I" (1--4--78) for 33 keyboard—is in the codebar mechanism as described in 2.07, the no. 1 and 4 contact wires for a 32 keyboard or no. 1, 4, 7, and 8 contact wires for a 33 keyboard are against the common terminal. Similarly the no. 2, 3, and 5 contact wires for a 32 keyboard or the no. 2, 3, 5, and 6 contact wires for a 33 keyboard are away from the common terminal.

2.16 The distributor mechanism converts these positions to start-stop signals. Near the end of the distributor cycle, the universal lever moves back to its down position and pivots the bail to its up position. The bail, in turn, cams the contact wires back to the right and holds them there in the stop position.

D. Line Break

2.17 When a BREAK key is depressed, it pivots a T-lever which opens the break contact (Figure 5). This action opens the signal line until the BREAK key is released.

E. Repeat

2.18 To repeat the transmission of a character, its keylever is held down along with the REPT keylever. The latter holds the nonrepeat lever down where its tab remains between the tie link and the latchlever (Figure 2). The latchlever is held in its left position and does not latch the universal lever at the end of the cycle. The universal lever thus moves up and trips the distributor clutch causing the character to be retransmitted as long as the REPT key is depressed.

EXAMPLE

A. General

2.19 In the stop position, the distributor clutch is disengaged, and the outer brush rests on the distributor disc stop segment.

When a key is depressed, the proper code combination is set up in the keyboard contacts and the universal lever moves to its up position. The motion of the transfer lever is conveyed by an H-plate to a distributor trip linkage on the typing unit. The trip linkage pivots a trip bail which carries a trip lever rearward out of the way of the distributor clutch's shoe lever. The clutch engages and rotates the distributor shaft and brush holder. The outer brush passes over the distributor disc segments on the outer disc in the following order: (1) start, no. 1 through no. 5, and stop for 32 typing units; and (2) start, no. 1 through no. 8, and stop for 33 typing units. Near the end of the distributor shaft's revolution, a roller on the distributor clutch's disc pivots a follower lever which moves the trip bail and lever frontwards. This motion is transferred through the trip linkage and H-plate to the universal lever which is moved to its down position, where it is latched. When the distributor clutch completes its revolution, the shoe lever strikes the trip lever, and the distributor clutch disengages.

2.20 The effect of the above operation is to apply a start-stop code combination to the signal line corresponding to the combination set up in the keyboard contacts.

B. 32 Keyboard

2.21 Figure 4 illustrates a 32 Keyboard arrangement. Figure 5 is simplified schematic of the signal wiring of the 32 keyboard contacts.

2.22 In the stop position, the outer brush rests on the stop distributor disc segment, and current flows in the signal circuit which is closed (the path being from one side of the line through the start distributor disc segment, the inner distributor disc, the brushes, the stop distributor disc segment, the common terminal, and the break contact to the other side of the line). Thus a marking condition exists. Assume again that the "D" key is depressed. The (1--4-) code combination is set up in the keyboard contacts.

2.23 The distributor clutch is tripped, and the brush holder begins its revolution. While the brush is on the start distributor disc segment, the circuit is open, no current flows, and a spacing element is transmitted. While it is on the no. 1 distributor disc segment, the circuit is closed (the signal path being through the start distributor disc segment, the inner distributor disc, the brushes, the no. 1 distributor disc segment, the closed no. 1 contact, the common terminal, and the break contact); thus current flows, and a marking element is transmitted. While the brush is on the no. 2 and no. 3 distributor disc segments, since the no. 2 and no. 3 contacts are open, the circuit is broken, and no current flows and spacing elements are transmitted. In a similar manner, a no. 4 marking element and a no. 5 spacing element are transmitted. When the brush reaches the stop distributor disc segment, the distributor clutch is disengaged, and the line again becomes marking.

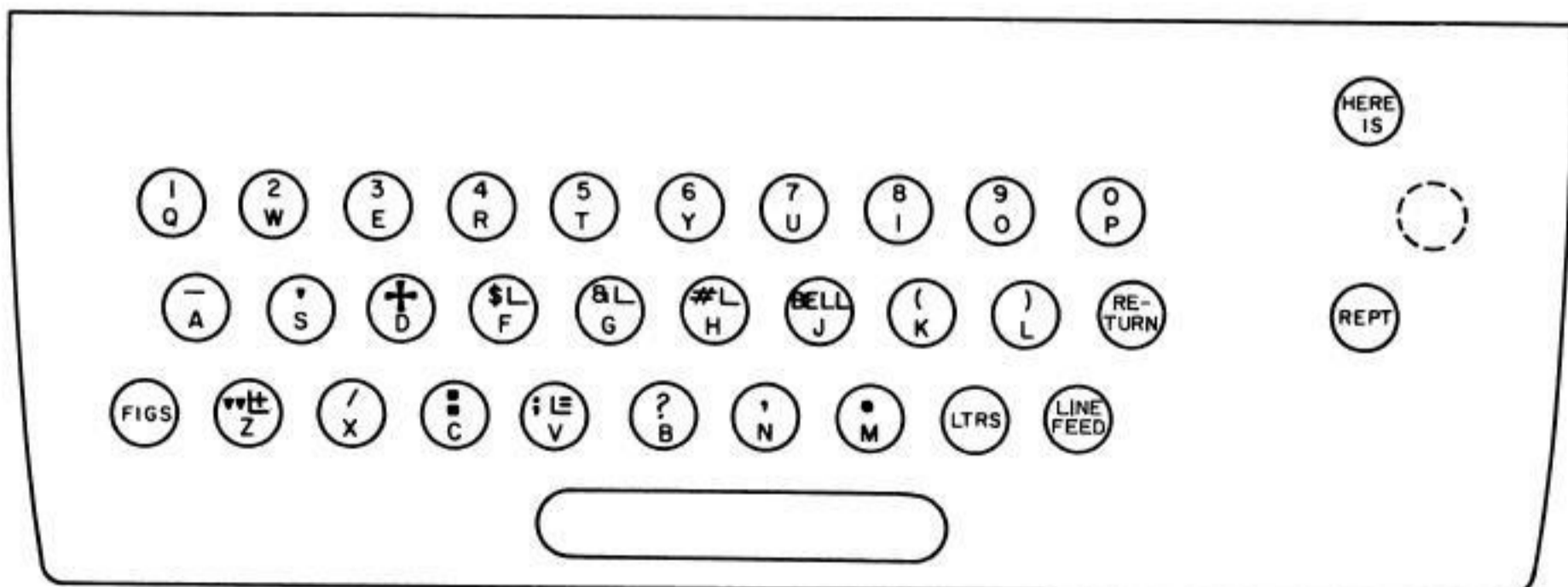
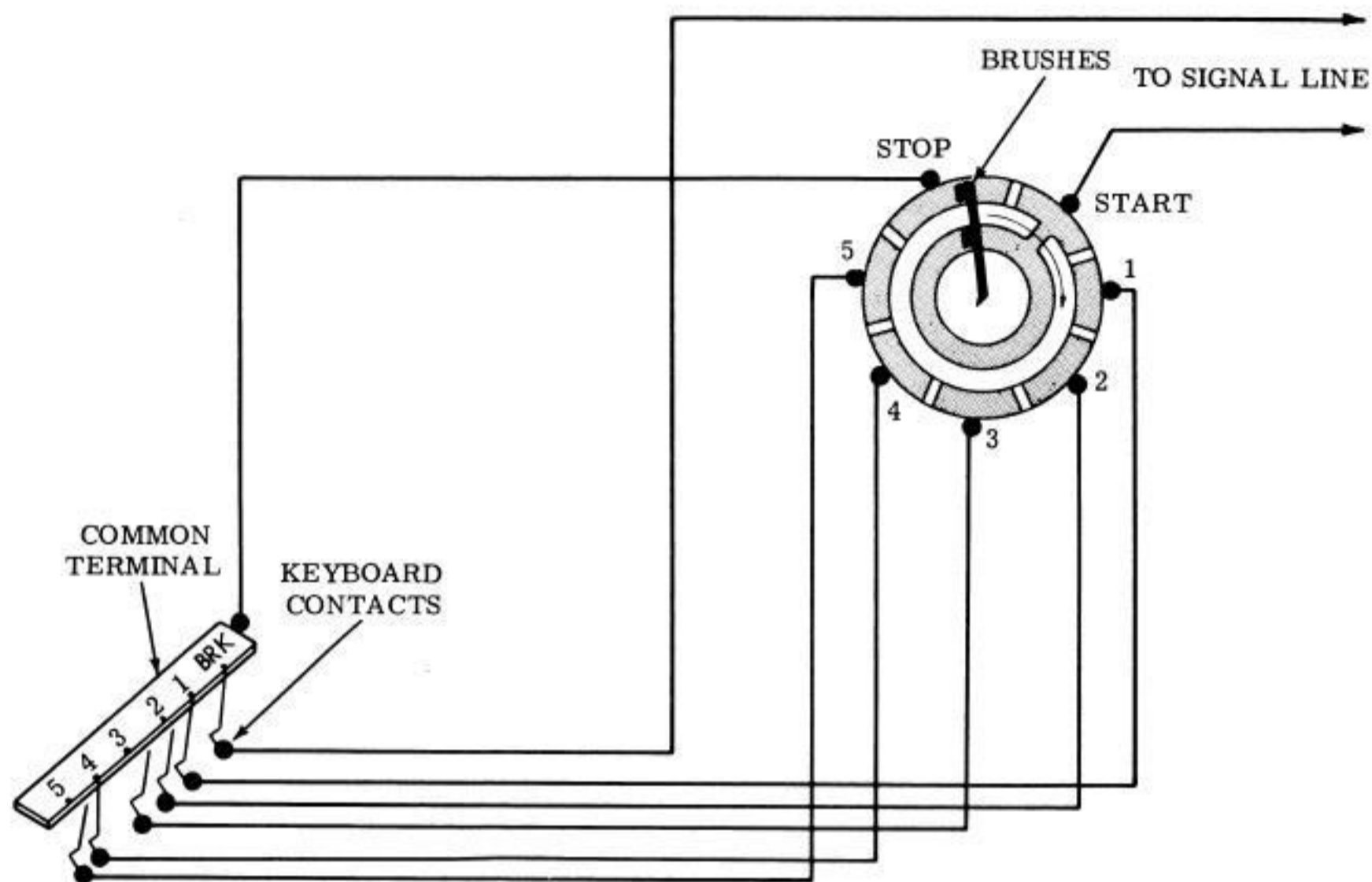


Figure 4 - 32 Keyboard Arrangement



LETTER "D" SET UP
IN KEYBOARD CONTACTS

Figure 5 — Signal Wiring — 32 Keyboard Contacts

C. 33 Keyboard

2.24 Figure 6 illustrates a 33 keyboard arrangement. Figure 7 is a simplified schematic of the signal wiring for the 33 keyboard (without "even parity").

2.25 Transmission on 33 keyboards is similar to that on 32 keyboards, except that facilities are provided on the keyboard and distributor to generate the American Standard Code for Information Interchange (ASCII). The keyboard utilizes two SHIFT keys and one CTRL (control) key. The SHIFT key is used to generate the code combinations for printing characters appearing on the upper keytops (eg, "\$" that appears above "4" on the keytop in Figure 6). The CTRL key is used to generate the codes for the control characters appearing on the upper keytops (eg, "WRU"

that appears above "E" on the keytop in Figure 6). Simultaneous use of both CTRL and SHIFT keys allows access to special control functions, such as "S₅." In every case, the SHIFT and/or CTRL keys must be held down while the appropriate character key is depressed.

Note: Simultaneous depression of the CTRL and SHIFT keys accomplishes the following:

- (a) The no. 5 code element is inverted. If the code element is normally marking, it becomes spacing. If the code element is normally spacing, it becomes marking.
- (b) On 33 keyboards featuring "even parity," the no. 6 code element is converted from marking to spacing.
- (c) The no. 7 code element is converted from marking to spacing.

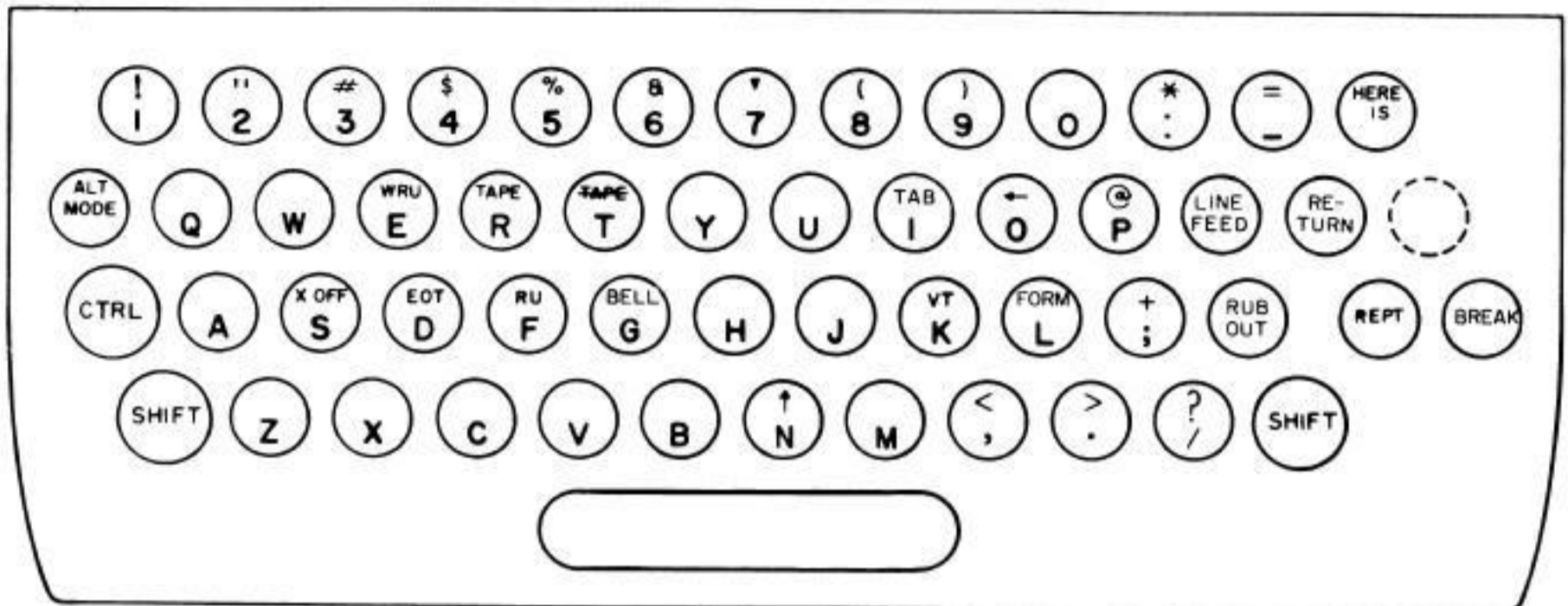


Figure 6 - 33 Keyboard Arrangement

(d) On 33 keyboards featuring "even parity," the no. 8 code element is inverted and reinverted, giving a "normal" no. 8 code element.

2.26 The SHIFT key inverts the no. 5 code element on all 33 keyboards. If the element is normally marking, it makes it spacing; if the element is normally spacing, it makes it marking. It does this by two 2-headed T-levers, one at the shift position, and one at the no. 5 position, each of which operates two contact wires, alternately opening one and closing the other. As shown in Figure 7, in the spacing condition, the "c" contact associated with the no. 5 T-lever is open, and the "d" contact is closed. In its unoperated position, the "a" contact associated with the SHIFT T-lever is closed, and the "b" contact is open. For example, if the "4" key alone is pressed, the code combination for "4" (--3-56-8) is set up in the keyboard contacts and subsequently transmitted. In this case, the 2-headed no. 5 T-lever holds the "c" contact closed and the "d" contact open, resulting in a marking no. 5 code element. (The signal path is through the stop distributor disc segment, the common terminal, the closed "c" contact, the closed "a" contact, the no. 5 distributor disc segment, the brushes, the inner distributor disc, and the start distributor disc segment, as shown in Figure 7.)

2.27 If the "4" key is depressed with the SHIFT key, the same condition is set up in the keyboard contacts, except that the 2-headed shift T-lever holds the "a" contact open and the "b" contact closed and thus opens the signal circuit. This results in the no. 5 code element being spacing rather than marking, and the code combination for "\$" (--3--6-8) being transmitted.

2.28 If the "N" key alone is depressed, the code combination for "N" (-234--78) is set by the codebars and subsequently transmitted to the line. In this case, the 2-headed no. 5 T-lever holds the "c" contact open and the "d" contact closed. On the other hand, if the "N" key is depressed with the SHIFT key, the same condition is set up in the keyboard contacts as before, except that the SHIFT key opens the "a" contact and closes the "b" contact and thus closes the signal circuit. This results in the no. 5 code element being marking rather than spacing and the code combination for (-2345-78) being transmitted.

Note: On keyboards featuring "even parity," the no. 8 code element is also inverted in a manner similar to that described above for the no. 5 code element.

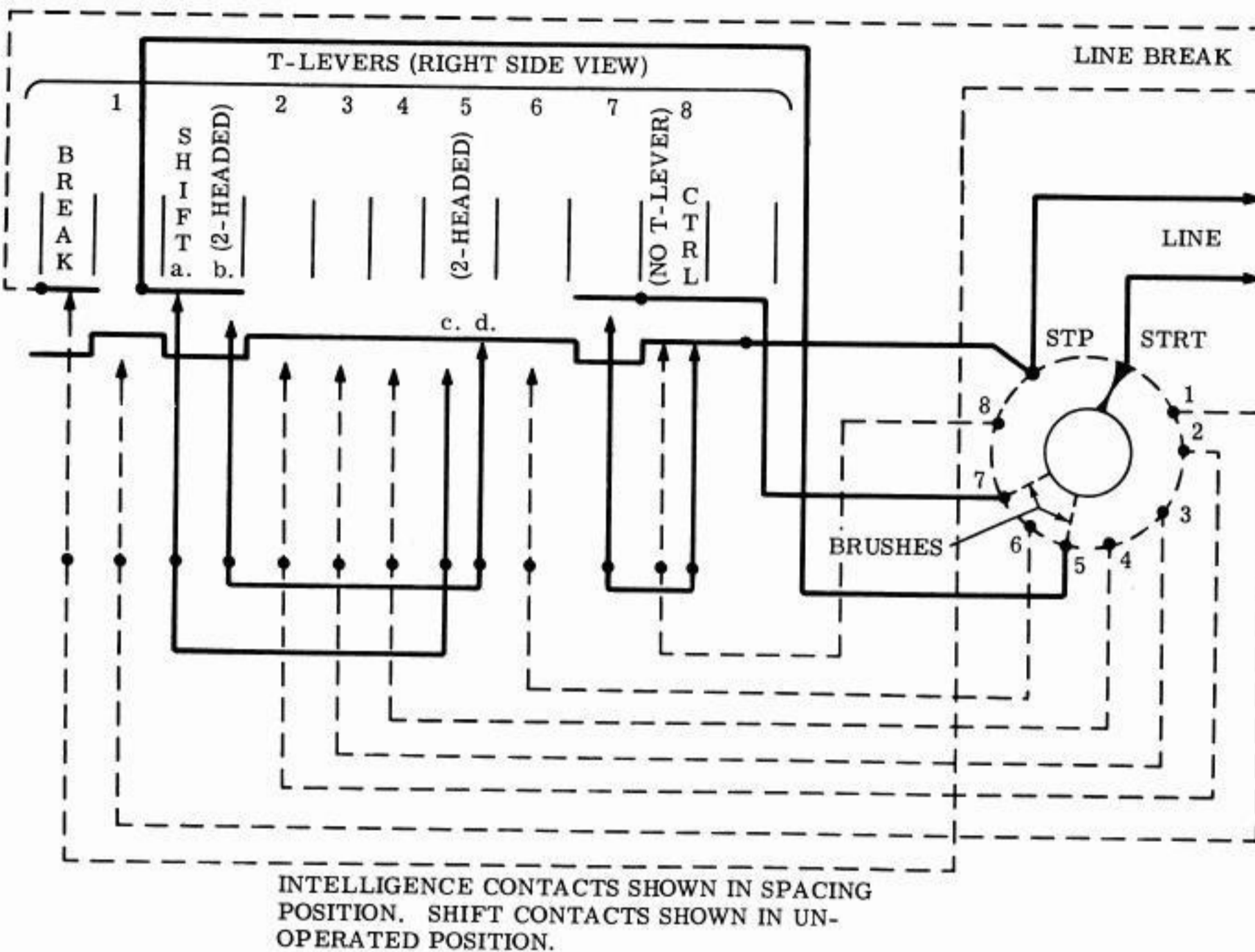


Figure 7 - Signal Wiring - 33 Keyboard (Without "Even Parity")

2.29 The CTRL key converts the no. 7 code element from marking to spacing on all 33 keyboards. For example, if the "E" key alone is depressed, the "E" code combination (1-3---78) is set up in the keyboard contacts and subsequently transmitted. (The path of the current for the marking no. 7 code element is through the stop distributor disc segment, the common terminal, the closed control contact, the closed no. 7 contact, the no. 7 distributor disc segment, the brushes, the inner distributor disc, and the start distributor disc segment.) If the "E" key is held down with the CTRL key, the same condition as before is set up in the contacts, except that

the control T-lever opens the control contact and thus breaks the signal circuit. This results in the no. 7 code element being spacing and the code combination for "WRU" (1-3----8) being transmitted.

Note: On keyboards featuring "even parity," the CTRL key inverts no. 8 code element and converts no. 6 code element from marking to spacing, in addition to converting no. 7 code element from marking to spacing. If no. 8 code element is normally marking, the CTRL key makes it spacing. If no. 8 code element is normally spacing, the CTRL key makes it marking.