REPLACING PAGE ADDENDUM

Filing Instructions:

1. Remove from the section the pages numbered the same as those attached to this addendum.

2. Insert the attached pages into the section in their place.

3. Place this addendum ahead of Page 1 of the section.

32 AND 33 KEYBOARD

PRINCIPLES OF OPERATION

1. GENERAL

1.001 This addendum supplements section 574-121-100TC, Issue 1. The attached pages must be inserted in the section in accordance with the filing instructions above.

1.002 This addendum is issued to add information not included in Issue 1 of the section.

1.003 Make the following changes or additions:

(a) Page 1, Contents, add:

(b) Page 1, after 2.01, change "Note" to "Note 1" and add the following:

Note 2: On self-contained keyboards the parallel output of the set of keyboard contacts is transmitted to a 36-point connector, not to a distributor mechanism. At the 36-point connector the coded intelligence can be tapped for direct entry into electronic devices such as computers and associated business machines or other communications equipment.

Attached:
Page 1 dated September 1964, revised
Page 2 dated September 1964, reissued
Page 7 dated September 1964, reissued
Page 8 dated September 1964, revised
Page 9 dated September 1964, added
Page 10 dated September 1964, added

(c)   Page 1, following 2.02, add:

Note: Self-contained keyboards — described in Part 3 — do not have a distributor mechanism.

(d)   Page 3, following 2.11, add:

Note: There is no trip linkage or distributor clutch associated with the self-contained keyboard. Instead of being reset mechanically by a distributor clutch operating through a trip linkage, the universal lever is reset to its down position by a reset solenoid. The reset solenoid is actuated by a 115 volt ac pulse which is originated in associated external circuitry. When energized, the reset solenoid, through a pivoted linkage, moves a reset arm downward. As the reset arm, which engages the front end of the universal lever, moves downward, it moves the universal lever to its down position where it is latched by a latchlever.

(e)   Page 4, following 2.12, add:

Note: There is no distributor clutch on self-contained keyboards. However, the trip mechanism operates in the way described in 2.12 to prevent the universal lever from being released when a keylever is held down.

(f)   Page 4, following 2.15, add:

Note: In addition to other contact wires, the keyboard contact mechanism on self-contained keyboards has a universal contact which closes each time a keylever is depressed. The universal contact may be used to actuate the external circuitry which provides the 115 volt ac pulse to energize the reset solenoid and cause the universal lever to be moved to its down position.

(g)   Page 4, following 2.16 add:

Note: Self-contained keyboards do not have a distributor mechanism. See Note 2 of 2.01 and the Note following 2.11.

(h)   Page 4, following 2.18, add:

Note: Self-contained keyboards use a different technique to accomplish the repeat of the transmission of a character. But, just as in 2.18 above, the keylever of the character to be repeated must be held down simultaneously with the REPT keylever. The different technique now becomes apparent: Self-contained keyboards have an electrical switch which is operated by the REPT keylever. When the REPT keylever is depressed, the electrical switch is operated. One set of normally open contacts, whose function is determined by the customer, close and a set of normally closed contacts open. The action of the normally closed contacts cause the reset solenoid current path to be opened. At the same time the signal circuit from the keyboard contact mechanism remains closed and permits continuous parallel signal output of the character chosen. With the reset solenoid circuit opened, the reset solenoid cannot cause the universal lever to be reset and latched in the down position (2.11). Therefore,

the universal lever, having been allowed to move to its up position when the selected character keylever was depressed, will remain in its up position until the REPT keylever is released. When the REPT keylever is released, the normally closed contacts close and the normally open contacts open. Current can now flow in the reset solenoid circuit. When a 115 volt ac pulse is received by the reset solenoid, the universal lever will be reset to its down position, and the usual character selection can be continued in the normal manner (2.01).

(i)   Page 5, following 2.19, add:

Note: Paragraphs 2.19 and 2.20 are not applicable to self-contained keyboards.

(j)   Page 5, following 2.21, add:

Note: A self-contained keyboard does not have a distributor mechanism, therefore, when studying a self-contained keyboard, disregard so much of Figure 5 which illustrates a distributor and all of 2.22 and 2.23. See Note 2 of 2.01.

(k)   Page 6, following 2.24, add:

Note: A self-contained keyboard does not have a distributor mechanism, therefore, when studying a self-contained keyboard, disregard so much of Figure 7 which illustrates a distributor and so much of 2.25, 2.26, and 2.29 which is written about a distributor. See Note 2 of 2.01.

32 AND 33 KEYBOARD

PRINCIPLES OF OPERATION

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

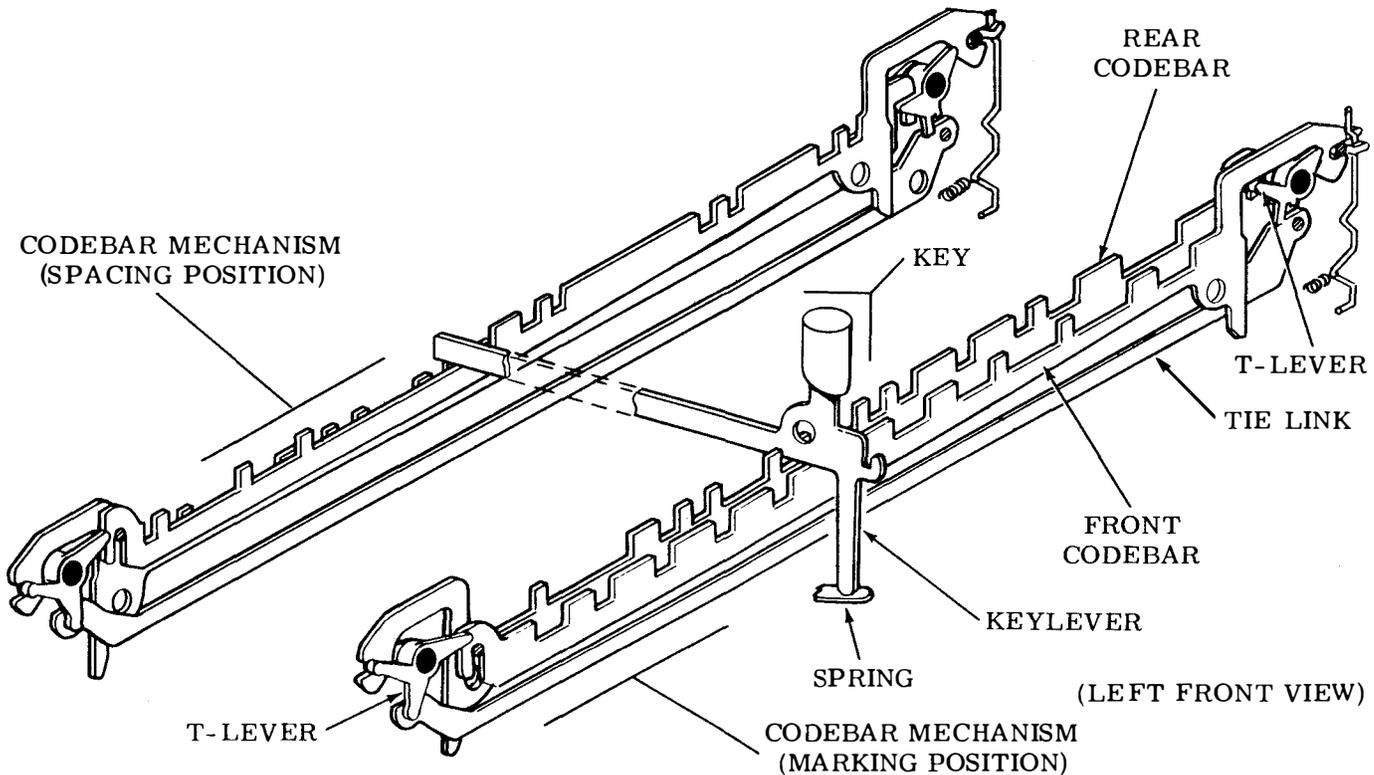2.03 The codebar mechanism is illustrated in Figure 1.

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.
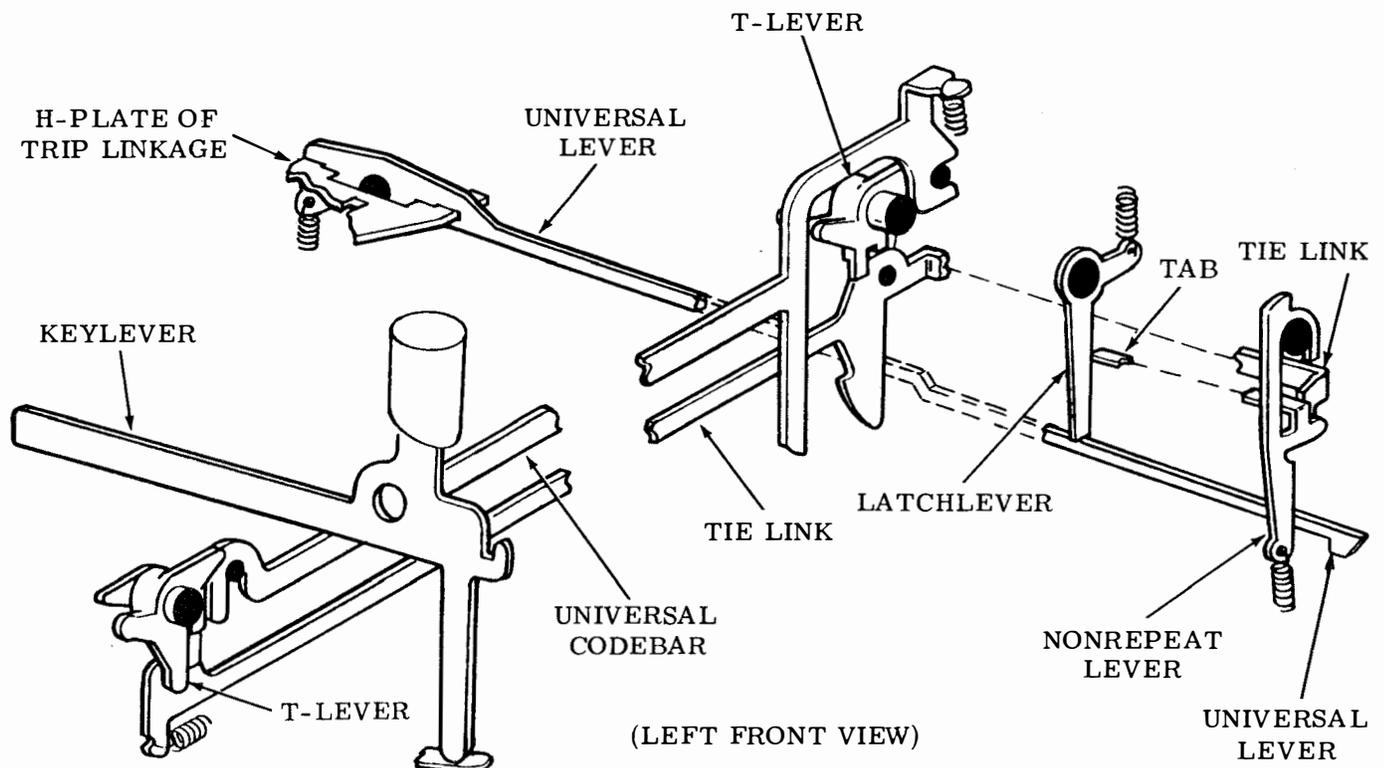
H-PLATE OF TRIP LINKAGE

UNIVERSAL LEVER

T-LEVER

KEYLEVER

TIE LINK

TAB

LATCHLEVER

TIE LINK

UNIVERSAL CODEBAR

T-LEVER

NONREPEAT LEVER

UNIVERSAL LEVER

(LEFT FRONT VIEW)

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

Page 3

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.
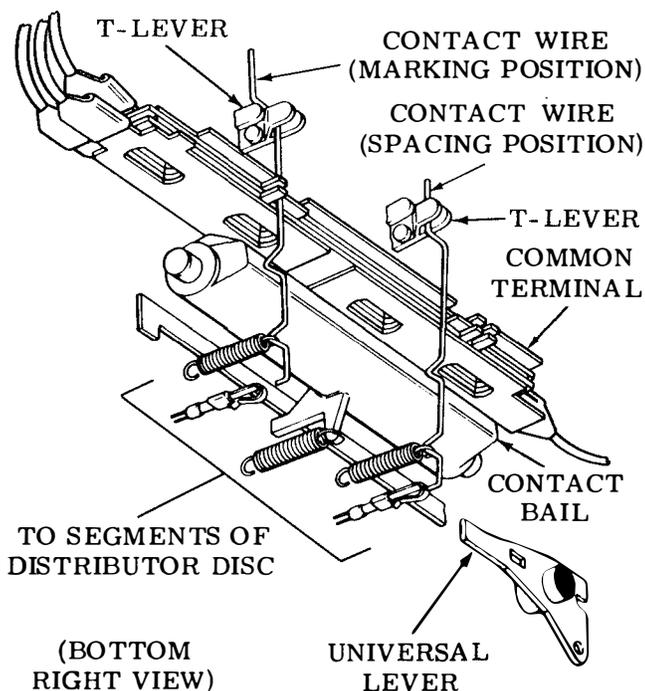

Figure 3 — Keyboard Contact Mechanism

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 simplied 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.
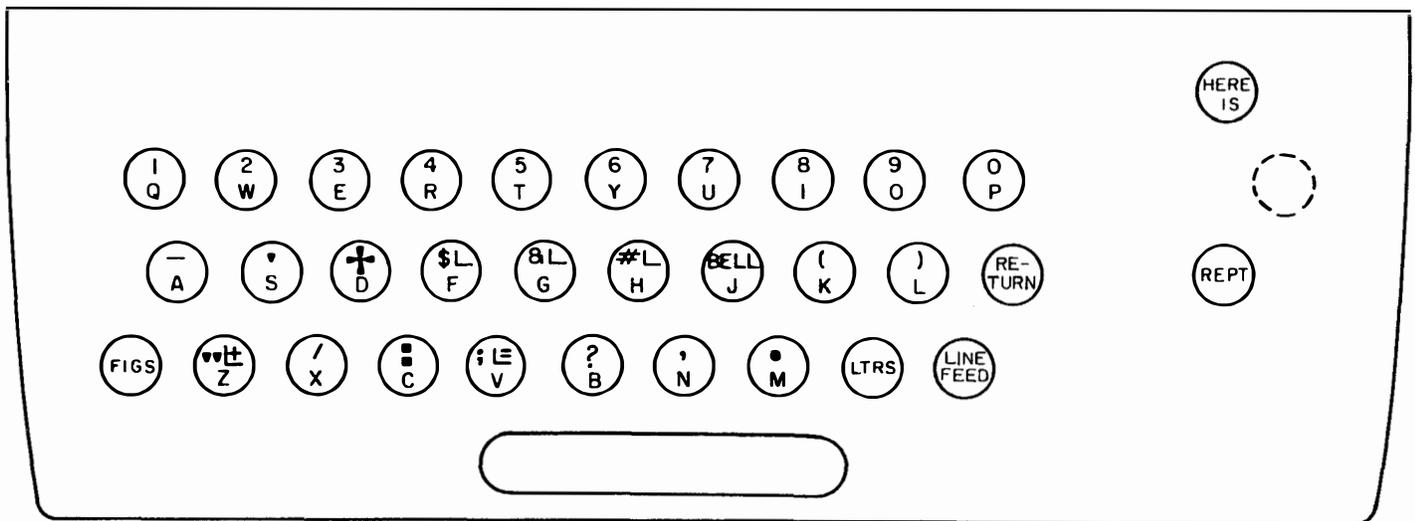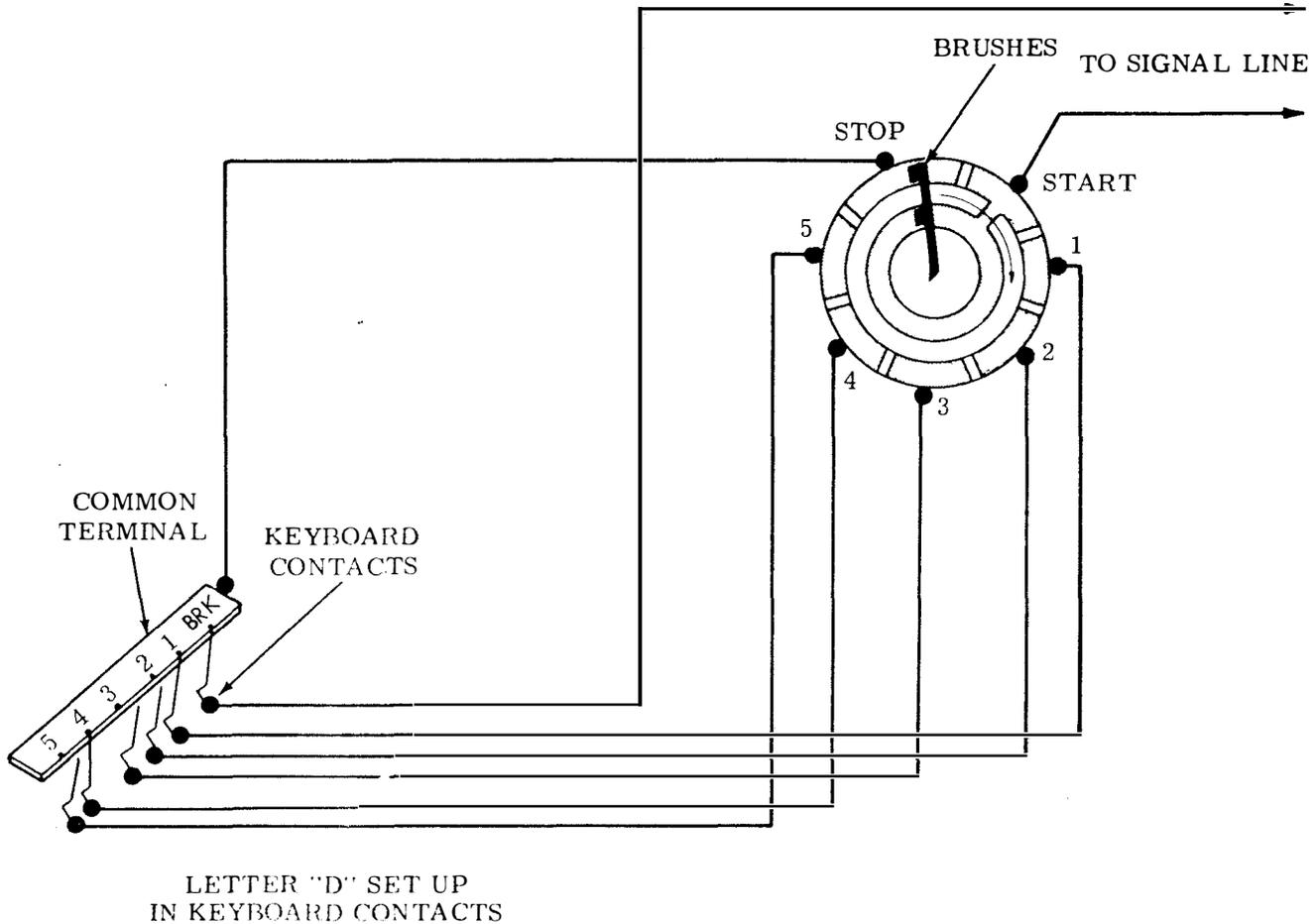

Figure 4 — 32 Keyboard Arrangement

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 ar-
rangement. Figure 7 is a simplified
schematic of the signal wiring for the 33 key-
board (without "even parity").

2.25   Transmission on 33 keyboards is simi-
lar 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 print-
ing characters appearing on the upper key-
tops (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 ap-
propriate 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.

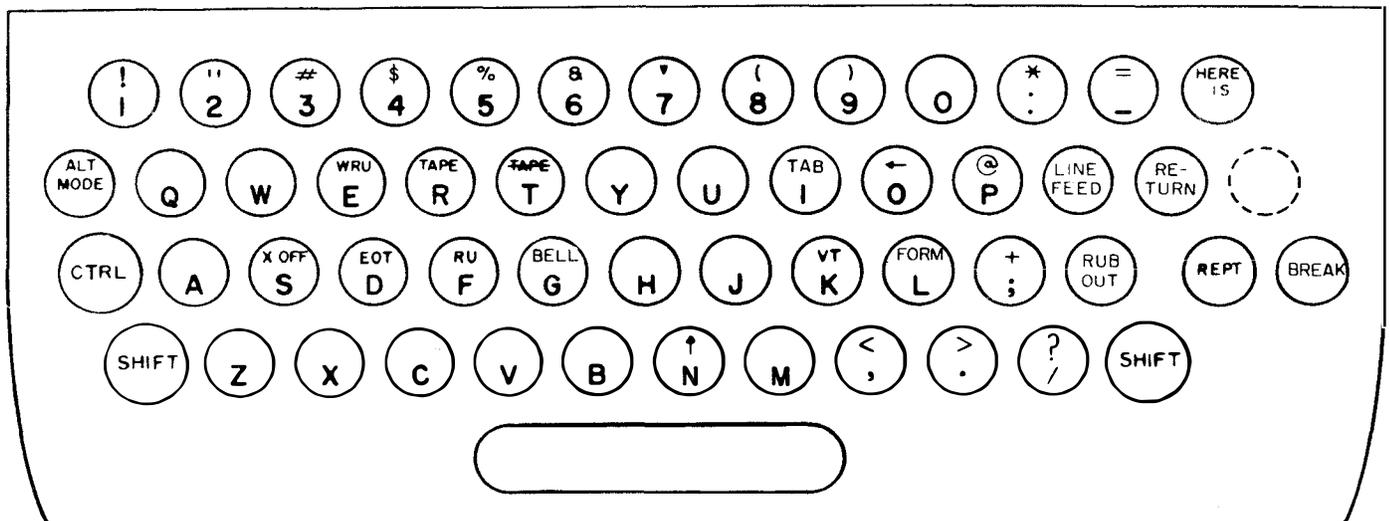(c) The no. 7 code element is converted
from marking to spacing.

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.

INTELLIGENCE CONTACTS SHOWN IN SPACING
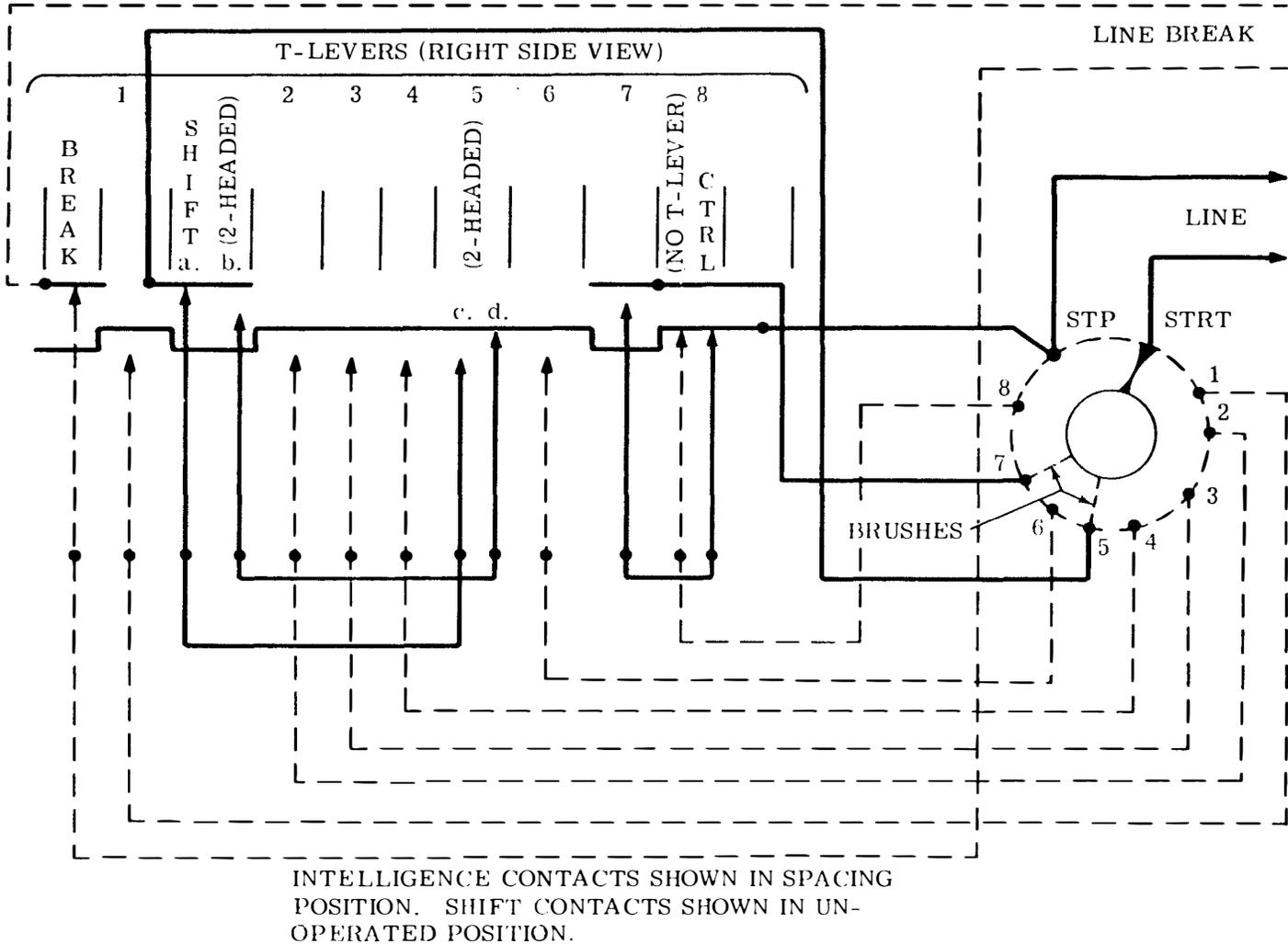POSITION. SHIFT CONTACTS SHOWN IN UN-
OPERATED POSITION.

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 ele-
ment is through the stop distributor disc seg-
ment, 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 distrib-
utor 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 re-
sults 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
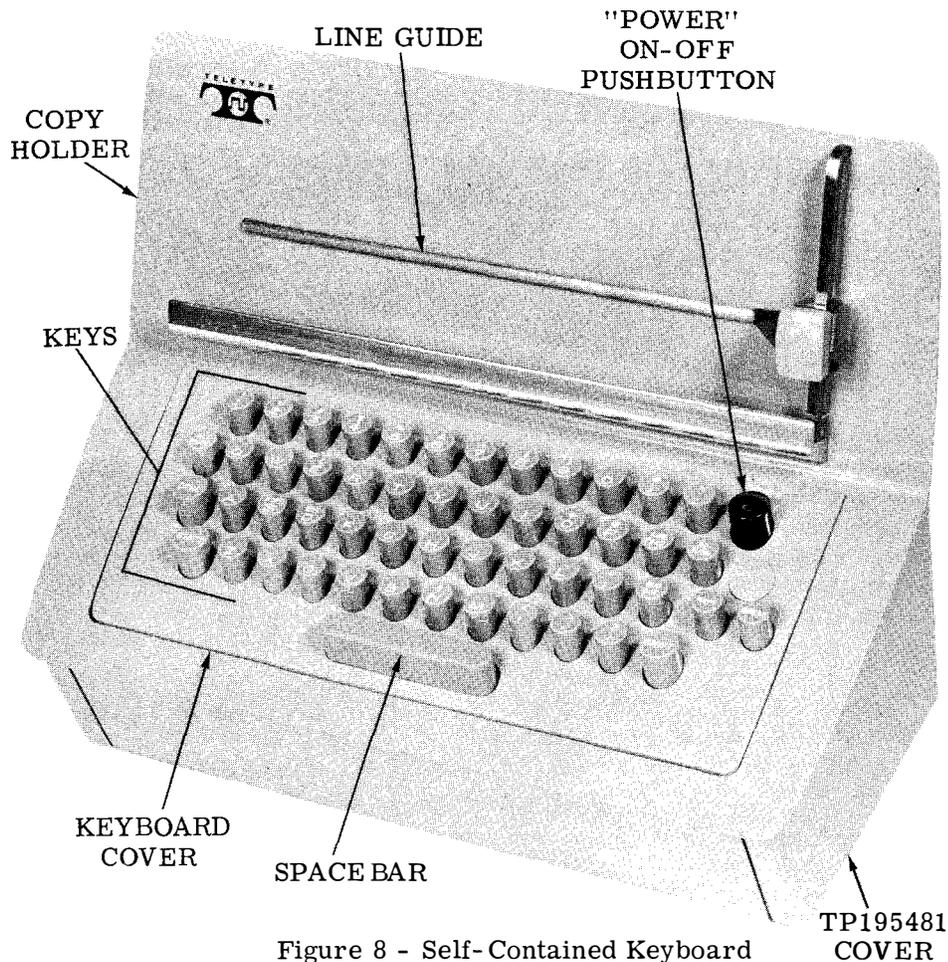normally spacing, the CTRL key makes it
marking.

COPY HOLDER

LINE GUIDE

"POWER" ON-OFF PUSHBUTTON

KEYS

KEYBOARD COVER

SPACE BAR

TP195481 COVER

Figure 8 - Self-Contained Keyboard

3. SELF-CONTAINED KEYBOARD

DESCRIPTION

3.01   A self-contained keyboard is illustrated in Figure 8.

3.02   The self-contained keyboard is an individual piece of communications equipment which is capable of transmitting intelligence, when used in conjunction with other supplementry equipment, by the manual operation of a group of keys. It has a parallel signal output and is designed for use in applications which require a means for direct entry into electronic devices such as computers and associated business machines or other communications equipment. The self-contained keyboard includes the following components:

(a)   A spacebar and keys similar to those on a typewriter.

(b)   A codebar mechanism which converts the manual depression of the keys to mechanical positions corresponding to the proper code combinations.

(c)   A contact mechanism in which the codebar mechanism sets up the code combination.

(d)   A frame and two side brackets which support the mechanisms and a keyboard cover which serves as a guide for the keys.

(e)   A reset solenoid which, through a pivoted linkage and a reset arm, resets the universal lever.

(f)   A POWER on-off pushbutton switch which closes and opens the power input circuit, and a 6-volt lamp which lights up the POWER pushbutton when it is in the POWER-on position.

(g)   A TP195481 cover with a copyholder and line guide to provide a protective-decorative enclosure for the keyboard while adding an operating convenience to it.

(h)   A fuse which is accessible from the bottom of the keyboard and a 36-point connector are also provided.

3.03   The self-contained keyboard closely re-
        sembles a typewriter keyboard. It has
four rows of keys and generates an 8-level ASCII
signalling code.

(a)   The characters on the lower part of the
       keytops, including the numerals in the
upper row, can be transmitted without the use
of a shift operation. A SHIFT key is used to
transmit the printing characters (such as &,
%, and #) appearing on the upper part of the
keytops.

Note: When the SHIFT key is held down,
all the keys which do not print characters
appearing on the upper part of the key-
tops are mechanically locked and cannot be
operated. This prevents transmission of
false characters for those keys blocked.

(b)   A control (CTRL) key is used to transmit
       the control functions (such as XOFF or
EOT) which appear on the upper part of the
keytops.

(c)   Simultaneous use of both the CTRL and
       SHIFT keys allows access to special
functions which may be provided by the key-
board. In every case, the SHIFT and/or
CTRL keys must be held down while the ap-
propriate character is depressed.

(d)   Because of the frequency of use in certain
       applications, separate keys for certain
functions, such as RE-TURN (carriage re-
turn) and LINE FEED are provided, and the
CTRL key is not necessary to generate their
code combinations. In the case of RE-TURN
and LINE FEED, the CTRL key can be used
in conjunction with either the RE-TURN or
LINE FEED keys, but it is not necessary.

Note: In addition to the separate key pro-
vided, the "line feed" code combination
can be generated by the simultaneous use
of CTRL and J keys. Likewise, the "car-
riage return" code combination can be
generated by the simultaneous use of the
CTRL and M keys.

3.04   Technical Data:

(a)   Dimensions and Weight (Approximate):

Width . . . . 16-1/4 inches

Depth . . . . 6-1/2 inches

Height . . . . 10-1/8 inches

Weight . . . . 13 pounds

(b)   Electrical:

Note 1: Refer to 7012WD and 7013WD for
information on making input connections.

Reset Solenoid:

Input	115 volts ac 60 cps
Resistance	220 ohms
Reset pulse length	12 to 16 milliseconds

Code Reading Contacts:

Signal line current	max 0.070 ampere

Note 2: Allow 7 milliseconds between the
first closure of the universal contact and
the reading of the code reading contacts.