35 KEYBOARD FOR AUTOMATIC SEND-RECEIVE SETS

GENERAL DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS

1. GENERAL DESCRIPTION

1.01 This section has been revised to include information on later design even parity. Changes and additions are indicated by arrows placed in the margin.

1.02 The 35 Keyboard for automatic send-receive sets provides a means for transmitting coded electrical impulses to a signal line and/or controlling the perforation of tape for use in a tape transmitter (Figure 1). It is designed to support a typing unit and a motor unit, and to utilize either a nontyping perforator, a typing perforator, a nontyping reperforator or a typing reperforator. In addition, the keyboard may be equipped with a number of variable features.

DESCRIPTION OF COMPONENTS

A. Base

1.03 The base is a reinforced aluminum sheet metal box frame on which all other assemblies are mounted.

B. Keyboard Assembly

1.04 The keyboard assembly consists of a keylever guide assembly, front frame, guide plate, keylevers, and ball lock assembly.

1.05 The keylever guide assembly accommodates all code and function levers.

C. Signal Generator

1.06 The signal generator consists of a frame assembly; front and rear plate assemblies; gear, shaft, clutch and cam assembly; and a contact box assembly (Figure 2).

1.07 The clutch stop and latchlevers are mounted on the frame.

1.08 The codebar assembly and nonrepeat lever with its guide are mounted on the rear plate.

1.09 The front plate acts as a mount for the detent plate assembly; transfer bail and stud; transfer levers with their guides, springs, and mounting studs; and the locking bail with its stud and spring.

© Teletype Corporation 1962 and 1964
Printed in U.S.A.

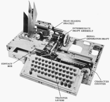

Figure 1 - Typical 35 Keyboard for Automatic Send-Receive Sets (Front View)

1.10 The cam, clutch, and shaft assembly is mounted between the front and rear plates. The cam is one piece of machined steel with ten lobes. The eight lobes which generate pulse signals, are equal in contour and are positioned at uniform angles with one another. The number four cam differs in contour, and is used to actuate the transfer lever locking bail.

1.11 The universal bail latchlever with its eccentric bushing is fastened to the right front of the frame. This latchlever extends to the rear over the codebar bail latch and the nonrepeat lever pawl.

1.12 The contact box assembly is mounted on the front plate. It is composed of a fibre insulating strip, a contact toggle assembly, phenolic base, and drive link.

Note: In the illustrative drawings, fixed pivot points are indicated as solid black circles. Movable pivot points are indicated as cross-hatched circles.

2. PRINCIPLES OF OPERATION

2.01 The following paragraphs cover the operating principles of the 35 Keyboard for Automatic Send-Receive Sets. This unit provides for manual, eight level, signal generation.

KEYBOARD MECHANISM

2.02 The keyboard mechanism and optional features are mounted on the base. These mechanisms include the intermediate gear, codebar mechanism with keylevers, signal generator mechanism, various function mechanisms and a character counter mechanism. Necessary circuitry is brought out to a connector mounted at the rear center of the base (Figure 2). The signal generator shaft, through a helical gear on the rear of the shaft, is operated by the main shaft of the typing unit which, in turn, derives its power from the motor unit.

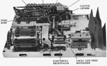

Figure 2 - Typical 35 Keyboard for Automatic Send-Receive Sets (Rear View)

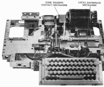

Figure 3 - Typical Keyboard for Automatic Send-Receive Sets (Front View)

CODE BAR MECHANISM

2.03 As a code selecting keytop is depressed, its corresponding codelever rotates about its pivot point (Figure 4). The rear end of the codelever comes up and rotates the universal bail. The extension arm on the top of the universal bail is moved out of engagement with the stop at the rear end of the universal bail latch. This occurs when the key and corresponding codelever are about two-thirds of the way toward full stroke. The universal bail latch then moves downward under spring force developed by the universal bail spring. As this latch descends, it strikes the codebar reset bail latchlever and carries it downward. When the corner of the reset bail latch descends beyond the center line of the needle bearing (mounted on the reset bail), the various spring forces acting on the reset bail cause it to swing to the right. This in turn permits the various codebars to move to the right in the direction of the spring forces acting on each codebar. As all this happens, the codelever is moved up to its full position by the manual input into the keytop. Hence, the codelever may stop some of the codebars from moving to their extreme right position. The codebars have vertical extensions that engage a curved part of the signal generator transfer levers. Those codebars that are permitted to move to the extreme right, move the corresponding transfer lever to the right also. However, those codebars that are stopped (because their teeth engage the activated codelever) do not quite touch or move their corresponding transfer levers. Therefore these transfer levers remain in their normal left hand position (Figure 5).

2.04 Simultaneously with the trip-off of the reset bail and the movement of the codebars to the right, the clutch trip bar (located in the rear slots of the codebar guides) moves to the right. This clutch tripbar engages the clutch stop latch and moves it out of its latched position with the clutch stop lug.

2.05 The motor unit that mounts on the rear right corner of the keyboard base supplies the mechanical power to drive the associated typing unit, and the signal generator shaft that is geared to the printer main shaft.

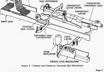

Figure 4 - Codebar and Codelever Universal Bail Mechanism

2.06 When the clutch is tripped, the spring loaded shoes in the clutch mechanism engage serrated teeth on the inside of the clutch drum. The clutch drum rotates continuously when the keyboard is turned on, because it is part of the shaft that mounts the signal generator gear (Figure 2). Since the clutch shoes are mounted on a plate that is part of the cam assembly, the cam rotates (clockwise as viewed from the front of the keyboard) when the clutch engages.

2.07 The arrangement of the cam assembly is such that the fourth cam from rear begins to push downward on its corresponding transfer lever (Figure 8). At almost the same time, the first cam from the front begins to move the transfer lever locking bail upward. The blade portion of this locking bail goes up beside a downward projection on each transfer lever. The locking projection is left or right of the locking bail, depending upon the position of the transfer lever as set up by the permutation action of the code bars. Thus, in the first few degrees of cam rotation, the permutated position of the transfer levers is locked into position and the codebars are free to be reset to their normal latched position.

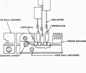

Figure 5 - Wedgelock Mechanism

2.08 The fourth cam engages its transfer lever first and moves it down (Figure 8). Since the start pulse is always spacing, no codebar is required to engage this lever. This lever is always held to the left by its spring. Then, as the fourth cam moves the lever down, the hook (at the upper right side of the transfer lever) engages the right hand side of the transfer (rocker) bail. This tips the transfer bail to the right, and pulls the contact drive link to the right. The resulting action of the toggle is such that the left hand set of contacts acts as a pivot, and the right hand contacts begin to open. When these contacts are open, the result is a spacing pulse (no current) in the signal circuit. The first (start) pulse of any character code is always a spacing pulse.

2.09 The number 1 cam and the transfer lever move downward next. In turn, the upper left hook of the associated transfer lever pulls down on the rocker bail, holding it to the right or tilting it back to the left. This pushes the drive link to the left (or right), resulting in closing the right (or left) hand contacts and allowing a marking (or spacing) pulse to be transmitted.

2.10 Similarly, the remaining transfer levers are pulled downward by their respective cams. The resulting pulse is marking if the transfer lever is to the right, or spacing if it is to the left. The last transfer lever is held to the right by a stop pin. Therefore the last pulse (stop pulse) is always marking (current on).

2.11 The locking bail is actuated by a cam lobe. This cam begins to move the locking bail up into its locking position almost as soon as the cam begins to rotate. Full lock position occurs approximately at the half-way point of the start pulse (48-1/2 degrees of rotation). The dwell on the first cam from the front holds the lock bail in its lock position until after the beginning of the last pulse. Then the cam pulls the bail down out of lock, and all transfer levers are free to return to their initial positions at a point half-way through the stop pulse.

2.12 Reset of the codebars is accomplished by means of an eccentric on the front of the cam assembly, which drives an eccentric follower arm (Figure 8). This arm engages a stud on the side of the reset bail, and pulls the reset

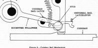

Figure 8 - Codebar Bail Mechanism

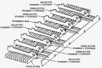

Figure 7 - Codebar Selection

bail to the left as the cam rotates. At the peak position of the reset eccentric, the codebar reset bail is clear of the needle-bearing stud. This permits the latch spring to pull the latch up into the locking position. The codebar reset bail is latched as the eccentric drives the follower arm back to its initial position. As the codebar reset bail is moved to the left into reset, it engages projections on the permutation codebars, clutch tripbar, and a step on the nonrepeat lever. This moves all these elements to the left into the latched reset position.

2.13 The reset eccentric is so positioned in angular relationship to the remainder of the cam that pickup of the codebars, and nonrepeat lever, begins at 92-1/2°. At 140° the codebars have moved to the left sufficiently to permit the codelever that determined the permutation to drop down out of the universal bail. This permits the universal bail to rotate forward and kick the nonrepeat lever down off the reset bail. At the same time, the extension on the universal bail moves in under its latchlever and holds this latchlever up. With the universal bail latch held up, the reset bail continues to move to the left. Full reset occurs at approximately 180° of cam rotation. As soon as the universal bail moves forward, a second keytop can be operated. However, from that point on, full time of cam rotation must expire before a third and successive keys may be operated.

REPEAT MECHANISM

2.14 Operation of the REPT keylever simultaneously with one of the keylevers in the three lower rows or the space bar disables the nonrepeat mechanism and causes the character or function selected to be repeated as long as the REPT keylever is held operated. The operated REPT keylever causes its function lever to raise the right end of the nonrepeat lever (Figure 5) and rotates it about its pivot point. In this position, the nonrepeat lever cannot be engaged and operated by the codebar bail, therefore, the nonrepeat lever crank will not reset the operated codebar bail latch. The codebar bail and universal bail latchlever are thus maintained in their operated positions and the codebar bail follows the eccentric arm movement back and forth until the REPT keylever is released.

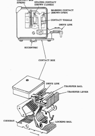

Figure 8 - Transfer Lever Mechanism and Contact Box Mechanism

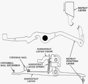

Figure 8 - Repeat Mechanism

CONTROL KEY MECHANISM

2.15 Operating the control key produces the upper case of a specific key by deleting the number 7 pulse. This is done by the control codelever blocking the number 7 codebar from falling to the right.

SHIFT KEY MECHANISM

2.16 To obtain a shift bit inversion case character, the enlarged shift key (at either side of the keyboard) is held down while depressing a complimentary key. The shift key preconditions the keyboard for the function of adding or deleting (as the case may be) the number 5 code bit, to obtain the complimentary key code. This is accomplished by means of a shift codelever engaging a diagonal camming surface, on the under side of the shift lockbar (outer slot of the codebar guide), and directing its motion to the left. The bail, riding the upper diagonal camming surface, is raised. This allows the inversion codebar (feed hole slot) to fall only when the complimentary key is depressed. This inversion bar, upon falling to the right, operates the transfer lever number 5 pulse by a mechanical connection. The code transmitted is then the addition or omission of the number 5 pulse, combined with the transfer levers selected by the complimentary key.

LOCAL LINE FEED MECHANISM

2.17 When the LOC LF keylever on the keyboard is depressed, paper is fed out of the associated typing unit when power is on. The mechanism operates as follows: Depressing the LOC LF keylever raises the forward end of the local line feed bail (Figure 10). This bail pivots and its upper end pushes the attached local line

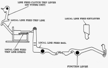

Figure 13 - Local Line Feed Mechanism

feed trip link toward the rear until the link engages the line feed clutch trip lever on the typing unit. Thus, the line feed mechanism on the local typing unit is made to operate without a signal and other typing units on the same line circuit are not disturbed.

LOCAL CARRIAGE RETURN MECHANISM

2.18 The local carriage return mechanism enables the operator to trip the carriage return mechanism on the associated typing unit, thereby causing the type box carriage to be fully returned to its normal position at the beginning of a line of copy. This mechanism operates as follows: When the LOC CR keylever (Figure 11) is depressed, its function lever rises and, in turn, raises the forward end of the local carriage return bail. This bail rotates about its pivot point until the upper end engages the carriage return lever on the typing unit. The carriage return mechanism operates in this manner without a signal that would cause other units in the line circuit to function.

3. VARIABLE FEATURES

CODE READING CONTACT MECHANISM (See Figure 2)

3.01 Used in place of the signal contact box, the code reading contact mechanism enables a keyboard to transmit its output in parallel-wire form. The mechanism contains a bank of contacts which assume spacing (open) and marking (closed) positions, as determined by codebar selection. Each contact has an intermediate lever and latchlever for actuation. The contacts are reset by a drive arm associated with the eccentric follower (2.12). Operation is as follows:

3.02 Following the depression of a keytop, selected codebars are moved to the extreme right position (2.03). Their corresponding latchlevers are engaged and moved to the right, selecting the associated intermediate lever. This results in contact closure and the transmission of a marking pulse from the actuated contacts. Contacts associated with unselected codebars remain open, or spacing.

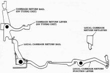

Figure 11 - Local Carriage Return Mechanism

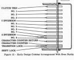

Figure 12 - Early Design Codebar Arrangement With Even Parity

3.03 The contacts are reset by means of an extension drive arm between the eccentric follower drive arm and the code reading contact reset bail. As the eccentric rotates to the reset position, the bail drives the intermediate levers to their latched position.

EVEN PARITY

3.04 In keyboards equipped to provide an even parity output, the eight bit of the signal code may be either marking or spacing, in order to always supply an even number of marking pulses for each code combination transmitted.

A. Early Design (See Figure 12)

Shift With Even Parity

3.05 Depression of this key and its related mechanism will invert the number 5 and 8 marking bit to spacing or a spacing bit to a marking bit, as the case may be. This is another means of obtaining an upper case or symbol associated with a particular keytop and is accomplished by holding down the enlarged SHIFT key (at either side of the keyboard) while depressing a complimentary key. The shift codelever prevents the number 5 and number 8 codebars from falling and at the same time preconditions the keyboard for the function of inverting the space-to-mark bit or the mark-to-space bit, as required to obtain its complimentary key code with parity. This is accomplished by means of a shift codelever engaging a diagonal camming surface on the underside of the shift lockbar and the transition bar, directing their motion to the left. The shift lockbar blocks out the selected group of keys while the transition bar prohibits the complimentary keys from being actuated prematurely through its "saw tooth" design. As the motion to the left develops, the upper bail with its two blocking tines riding the upper diagonal camming surface is raised permitting the number 5 inversion and number 8 inversion codebars, if coded marking, to fall only when the complimentary key is depressed. These inversion and associated codebars, upon falling to the right, permit the proper combination of marking bits to be presented with even parity.

Control Key With Even Parity

3.06 Depression of the CTRL (control) key will cause the number 7 bit to space and invert the number 8 bit. This is another means of obtaining an upper case function, with even parity, associated with a particular keytop. This is accomplished by holding the CTRL key down while depressing a complimentary key. The CTRL key codelever engages a diagonal camming surface on the underside of the transition codebar, directing its motion to the left, as it blocks the number 7, number 8, and number 5 inversion bars from falling to the right (mark). As the motion to the left develops, the upper bail again rides the upper diagonal camming surface, permitting the number 8 inversion codebar, if coded marking, to fall only when the complimentary key is depressed. This operation deletes number 7 and inverts number 8 in the selection of the regular assigned code of the complimentary key code, developing a control code with even parity.

B. Later Design (See Figure 13)

Shift With Even Parity

3.07 Depression of the shift key and its related mechanism inverts the number 5 and number 8 marking bits to spacing or spacing bits to marking as the case may be. This is a means of obtaining an upper case or symbol associated with a particular keytop and is accomplished by holding down the enlarged SHIFT key (at either side of the keyboard) while depressing a complimentary key. The shift codelever prevents the No. 5 codebar from falling and at the same time conditions the keyboard for the function of inverting the space-to-mark bit or the mark-to-space bit as required to obtain its complimentary key code with parity. This is accomplished by means of a shift codelever engaging a diagonal camming surface on the underside of the shift lockbar directing its motion to the left. The shift lockbar serves a dual purpose; it blocks out the selected group of keys and inhibits the complimentary keys from being actuated prematurely. As the motion to the left develops, the upper bail riding the upper diagonal camming surface on the shift lockbar, is raised. This raises the blocking tine and permits the No. 5 inversion codebar, if coded marking, to fall. At the same time a pivoted follower attached to the shift lockbar, rides up a "V" shaped camming surface on the control lockbar. This raises the blocking surface of the lower blocking bail allowing the No. 8 inversion codebar to fall, if coded marking, and blocks the No. 8 codebar. Upon falling to the right, the codebars unlatch their respective transfer levers causing the proper permutation to be generated.

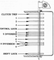

Figure 13 - Later Design Codebar Arrangement With Even Parity

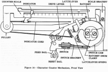

Figure 14 - Character Counter Mechanism, Front View

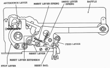

Figure 15 - Character Counter Mechanism, Rear View

Control Key With Even Parity

3.08 Depression of the CTRL (control) key will cause the seventh bit to space and the eighth bit to invert. This is a means of obtaining a control function with an even parity bit. It is accomplished by holding the control key down while depressing a complimentary key. The control key operates a control lockbar, which serves the purpose of both blocking out those keys to which a control is not associated and preventing a complimentary key from being actuated prematurely, by means of its saw tooth design. The control key codelever engages a diagonal camming surface on the underside of the control lockbar directing its motion to the left, as it blocks the No. 7 codebar from falling to the right (mark position). As motion develops, the follower engages the "V" shaped camming surface of the control lockbar, and moves up, raising the lower blocking bail. The lower bail, in its upward travel, unblocks the No. 6 inversion codebar and permits it to fall to the right (8 coded marking). As the codebars fall to the right they operate their respective transfer levers causing the proper permutation to be generated.

3.09 The design of the keyboard allows the depression of the shift and control keys simultaneously. Holding the shift and control key down while depressing the proper complimentary key will generate SO through ST and NULL. As the shift and control keys are depressed their key codelevers engage a diagonal camming surface on the underside of their respective lockbars directing them to move to the left. As the shift lockbar moves, its upper diagonal camming surface causes the upper blocking bail to rise, unblocking the No. 5 inversion codebar so that it may fall to the right if marking. The shift key codelever blocks the No. 6 codebar. As the control lockbar moves, the follower attached to the shift lockbar rides in the "V" shaped camming surface on the control lockbar. Since the total travel of the two lockbars, is the same the follower will not ride up on either of the camming surfaces and the lower blocking bail remains in its normal position. This causes the No. 8 inversion codebar to remain blocked and allows the No. 5 codebar to fall to the right when marking. The codebars, upon falling to the right, permit the proper combination of marking bit 1 through 6 to be generated.

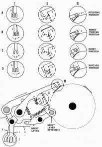

Figure 16 - Operation of Character Counter Mechanism

CHARACTER COUNTER MECHANISM

A. General (See Figures 14, 15, and 16)

3.10 The character counter is driven mechanically from the perforator transmitter by the action of the counter and carriage return codebars located in the second and third slots of the codebar basket. These bars provide drive projections which engage the forks of the feed and reset bails of the counter. As the codebars fall to the right when a key on the keyboard is struck, the counter mechanism is tripped. As the keyboard is reset under power, the counter performs its required functions. These functions may be divided into three distinct phases of operation. Figure 16 illustrates these three phases of operation and also the normal position of the counter mechanism.

B. Stepping

3.11 Referring to sequence A, Figure 16, as a key is struck the codebars fall to the right, carrying with it feed bail 1. The drive lever, which is linked to the feed bail, moves to the left slightly more than one tooth. As the codebars are reset under power, stepping bail 1 moves clockwise, causing the drive lever to advance the ratchet drum one tooth. The drive pawl prevents the ratchet drum from rotating counterclockwise until it is again tripped for the following character. When this occurs the ratchet drum rotates slightly counterclockwise, coming to rest against the latchlever.

C. Counter Reset

3.12 Sequence B, Figure 16, illustrates the tripped position of the counter mechanism for a reset function. Reset bail 2 moves counterclockwise as its codebar falls to the right, causing the reset lever in turn to rotate clockwise. As the reset lever rotates clockwise the reset lever extension moves downward until it falls under the shoulder of the projection on the drive and latchlevers under the action of its spring. When the counter bars are reset as in C, Figure 16 the reset bail is rotated clockwise to its original position, causing the reset lever to rotate counterclockwise, carrying the reset lever extension upward, and moving both the drive and latchlevers out of engagement with the ratchet teeth. The mechanism remains in this condition and the ratchet drum assembly rotates rapidly counterclockwise (under the action of its return spring) until it reaches its zero position.

3.13 As the ratchet drum reaches its zero position, a stop on the ratchet strikes a stop lever fastened to the frame. The elastic impact is transmitted through the stop lever to the antibounce lever whose lower end is normally in contact with the stop lever. The antibounce lever rotates counterclockwise, dropping in behind the ratchet stop. As the ratchet drum rebounds from the stop lever, its stop strikes the antibounce lever, preventing further motion and maintaining the antibounce lever in its actuated position. The ratchet continues to operate between the stop lever and antibounce lever until the energy in the system has been largely dissipated. The ratchet stop then remains in contact with the stop lever, permitting the antibounce lever to return to its normal position.

D. Restart

3.14 Sequence D, Figure 16, illustrates the restarting action of the counter mechanism for the character following carriage return. As a key on the keyboard is depressed, the counter codebar falls to the right, the feed bail moves counterclockwise and the drive lever moves to the left. As the drive lever moves to the left it is disengaged from the reset lever extension and falls into engagement with the ratchet tooth. As the codebars are reset under power, the feed bail rotates clockwise and the feed lever begins to move to the right. As it does, its projection pushes the reset lever extension to the right and out of engagement with the latch lever, which falls into engagement with the ratchet drum. As the drive lever completes its stroke, it steps the ratchet one tooth as in the normal stepping operation.

E. End Of Line Switch

3.15 The end-of-line switch operates the end-of-line indicator light located in the cabinet to signal the end of a typed page printer line.

3.16 Operation of the character counter end-of line indicator switch is controlled by a switch cam (Figure 14). The switch cam rotates with the ratchet drum and can be adjusted to close the switch at any typed line length of from 15 to 80 characters.

LOCAL BACKSPACE MECHANISM (See Figure 17.)

3.17 Two types of local backspace mechanisms are used. Earlier designed keyboards used a combination mechanical and power back space. The mechanical linkage operated the

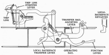

Figure 17 - Local Backspace Mechanism

typing unit backspace and the switch (power) operated the reperforator backspace. The later design keyboards use only the power operated backspace. The main difference being the location of the backspace key on the keyboard. The earlier design located the backspace key on the right side of the keyboard and the later design locates the backspace key on the left side of the keyboard.

(a) Mechanical Linkage. Depressing the local backspace keylever causes its function lever to raise the forward end of the local backspace operating bail, rotating the bail about its mounting shaft. A pin in the rear (left) arm of the bail engages the cam surface on the lower end of the backspace transfer bail. When the operating bail is rotated, the downward motion of the pin causes the upper end of the transfer bail to engage the backspace bail on the typing unit and rotate the backspace bail about its shaft.

(b) Power Drive Backspace Mechanism. The power drive backspace mechanism is used to backspace perforated tape to delete errors in character information. Backspacing is accomplished automatically by pressing the B SP, keylever on the keyboard. When the keylever is depressed, the switch associated with the tape backspace button assembly is closed. The circuit to the magnet assembly of the power drive backspace mechanism is then energized, causing the armature bail to fall.