

ENGINEERING SPECIFICATION FOR THE
FOUR ROW KEYBOARD REPERFORATOR TRANSMITTER
MODEL 29 AND 35 (SERIES 600 THRU 800)

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SECTION I

GENERAL DESCRIPTION AND ENGINEERING REQUIREMENTS

1. GENERAL DESCRIPTION

- a. The subject keyboard reperforator transmitter is a combination of two basic Model 28 mechanisms, the keyboard and tape reperforator. Tape reperforation and signal generation is provided in a single unit.
- b. In external appearance the keyboard reperforator is similar to the five level LAK. However, the mechanical linkage between the keyboard and perforator and the electrical control switch are deleted.
- c. The keyboard reperforator operates at 60, 75 and 100 WPM using the standard five level speed change gears and operates at intermediate speeds with special gears.
- d. The reperforator receives intelligence through a selector mechanism from the keyboard signal generator and can be controlled by stunt box contacts, manual switches or mechanically.
- e. The keyboard reperforator has provisions for a non-typing reperforator (LRPE) or a typing reperforator (LPR).
- f. In the Automatic Send-Receive Set, the keyboard reperforator operates in conjunction with an appropriate electrical service unit, transmitter, page printer and cabinet.
 - (1) Model 29 Sets have associated with them the Model 28 Cabinets and related furniture.
 - (2) Model 35 Sets employ re-styled cabinets. The keyboard, keytops and keytop guide, with redesigned mounting structure, conform to the Model 35 Cabinet design and colors.
- g. The six level equipment is noted as the 600 series, the seven level equipment is noted as the 700 series and the eight level equipment as the 800 series. The six level unit transmits an 8.5 unit code, the seven level a 9.5 unit code and the eight level transmits a 11.0 unit code.
- **h. Additional keys are included to provide a means for inverting code bits to obtain the additional code permutations normally associated with symbols or the controls designated on the upper half of the keytops.
 - (1) Various designations are applied to these keys, some of which are shift, control and auxiliary. Specific designations are indicated in the keyboard layout associated with the particular set.

- (2) The inversion feature involves changing one (or more) bits associated with a specific level (or levels) from mark to space or from space to mark.
- ** (3) On Model 35 Units equipped with parity, two code bars are present. One code bar provides the parity output and the second the inverse of parity. The normal parity bar operates on each code key depression. The parity inversion bar operates when the shift key is operated with a code key.
- ** (4) When more than one bit changing bars (inversion bars) is present a transition lock bar is used. This bar operates from the "shift" or "control" key to inhibit depression of the complimentary code keys when the shift or control key is partially depressed. This bar will ensure that one of the code bits will change if the parity bit changes or vice-versa.

2. FUNCTIONAL DESCRIPTION

- a. The function of the keyboard reperforator shall be:
 - (1) To provide an array of keys for typing.
 - (2) To provide mounting facilities for associated page printers and motor unit.
 - (3) To provide a signal generator for generating a start-stop code.
 - (4) To provide mounting facilities for a character counter.
- b. The keyboard reperforator consists of discrete subassemblies attached to a box sheet metal base similar to the LK6 base. It is capable of removal from the cabinet with a minimum of loose hardware.
- c. The design of the keyboard reperforator contains mechanical and/or control facilities for all accessories available for the LK keyboard, LP page printer, tape perforators, transmitters, and electrical service units as required.
- d. The non-typing reperforator LRPE is standard equipment on the keyboard reperforator.
- e. The tape punch with backspace is standard equipment on the keyboard reperforator.
- f. A 3600 RPM synchronous or governed motor is used to drive the keyboard perforator and provides power through a suitable coupling system for an associated transmitter.
- g. A tape supply container is provided on the keyboard perforator and provides facilities for mounting a low-tape switch assembly.
- h. "Local carriage return", "local line feed" and "repeat" are basic features on the keyboard reperforator.
- i. Lubrication; the minimum operational period between lubrications at specified places with oil and grease is 1500 hours.
- j. Contact Box - Standard
 - (1) The signal contacts and associated electrical components operate at a normal signal line voltage of 90 to 130 DC and a current of .06 amperes \pm 10% or .02 amperes \pm 10%.

- * (2) Electrical components used in the signal generation circuit are able to withstand surge voltages of 400 volts DC under all environmental conditions. Exceptions to this are filter components in LAK808 Contact Box.
- (3) The accuracy of signals generated are within the following tolerances of their ideal lengths relative to the end of the stop pulse.
 - (a) 6 level, 8.5 unit code $\pm 6.0\%$ - (6.0 Div.)
 - (b) 7 level, 9.5 unit code $\pm 7.0\%$ - (7.0 Div.)
 - (c) 8 level, 11.0 unit code $\pm 8.0\%$ - (8.0 Div.)

- k. Contact Box - WADS (Exceptions)
 - (1) The following requirements apply to LAK803 and LAK804. only.
 - (a) The accuracy of the signal generated with the timing contact feature shall be held within $\pm 12\%$ (± 12 Div.) for both marking and spacing pulses.

- l. For Units Employing Timing Contact
 - (1) Timing Circuit Requirement (WADS).
 - (a) The timing circuit operates at a signal line current of 20 to 40 ma at 40 V DC. The accuracy of the signal generated with the timing contact feature are held within $\pm 5\%$ (± 5 Div.) of their ideal lengths relative to the end of the stop pulse. (Strobed at the contact switch.)

- m. The engineering requirements included in the following specifications are applicable to the keyboard perforator transmitter except those which are incompatible with the above listed requirements:
 - (1) Model 28 Keyboard, Specification 6322S.
 - (2) Model 28 Reperforator, Specification 6934S.
 - (3) Model 28 Typing Reperforator, Specification 6158S.

SECTION II

DETAILED DESCRIPTION AND THEORY OF OPERATION

1. DETAILED DESCRIPTION

- a. The Model 28 Keyboard Reperforator is essentially a manually operated signal generator to which has been added a tape reperforation feature. It serves as a support for the page printer unit and the motor unit.
- b. The keyboard reperforator consists of the following mechanisms, and subassemblies:
 - (1) Base
 - (2) Motor Drive
 - (3) Keyboard Assembly
 - (4) Signal Generator
 - (5) Tape Reperforator, with a selector and tape printing feature (optional)
 - (6) Tape Reel Container
 - (7) Gearing and Shafting
 - (8) Answer Back (Optional)
 - (9) Character Counter (Optional)
 - (10) Keyboard Universal Contact (Optional)
 - (11) Keyboard Lock Switch (Optional)
 - (12) Timing Contacts (Optional)
- c. The base consists of a reinforced aluminum sheet box frame, the same as the five level LAK.
- d. The keyboard assembly is similar to that used in the LK6 with the following exceptions:
 - (1) The keylever guide assembly has been lengthened to accommodate 51 keylevers and six function levers.
 - (2) The clutch trip bar, code bars and universal bail assembly have been lengthened.
 - *(3) Code bars capable of changing the binary output of a code level from any particular key have been introduced on the Model 35 Units (called inversion bars). These bars are conditioned for operation by the "shift" key to provide a means of obtaining code permutations which are not available on the limited size keyboard.

- * (4) On units equipped with parity, a parity inversion bar is provided which is operated by the "shift" key or "control" key. This bar changes the parity bit so that a reputable parity count is obtained when the shift or control permutations are generated. A transition lock bar is provided when more than one bit may be inverted from the shift or control keys as a safety device as described in Paragraph 1.h.(3), Page I-2.
- (5) A panel to the left and right of the keyboard field is provided for mounting switches, indicator lights, etc., according to customer requirements. Connections to the switches, etc., are brought out via a cable to a multi-point connector for connection to complimentary equipment. This cable is completely independent of the keyboard cable. Keyboards used with Model 28 furniture only, provide the use of these panels.
- (6) A keyboard universal contact is provided on some units which operates from the left side of the clutch trip bar. The contact provides a closure on each keyboard cycle.
- (7) A keyboard lock bar switch is provided on some units to furnish an electrical output on line break.
- (8) Means are provided to lock out those keys, when required, not having a symbol or other specific shift character associated with the key.
- (9) The shift lock bar locks out the following keytops for the Model 35 Units: Alt Mode Q, A, Z, W, X, E, D, C, R, F, V, T, G, B, Y, H, U, J, I, O, LINE FEED, RUBOUT, RETURN and SPACE BAR.
- e. The signal generator used on the keyboard perforator is a modified IK6 signal generator. The modification consists of a new cam, transfer levers, guides, etc., to accommodate the upper level requirements.
- f. Provisions are made for mounting a signal generator timing contact to reshape the signal for both marking and spacing pulses through an associated regenerator circuit.
- g. The tape reperforator is similar to the Model 28 reperforator or typing reperforator. It differs primarily in its base casting which requires additional machining, and in the method of driving the punch and selector. Two drive shafts are used, the main shaft which carries the function clutch and cam sleeve assembly, and drives the selector, and a lower shaft, the jack shaft, which is geared directly to the mainshaft. A backspace is provided on the punch which may be manually or electrically, control is obtained from the keyboard.
- h. The tape reel container used on the keyboard perforator is similar in appearance to other Model 28 type tape reel containers. It is a welded structure fastened to the left side of the keyboard base. A low-tape switch assembly is available for the tape reel container.

1. Power is supplied to the various units and mechanisms on the keyboard perforator and to the associated transmitter distributor by means of suitable shafting, flexible rubber couplings and gearing. The power take-off for the page printer and signal generator are identical with the system used in the LK6. Power take-off for the reperforator is through a right angle gear assembly (rear bracket assembly).
- **j. A reperforator backspace switch is provided on the left side of the keyboard for the purpose of associating the backspace function with the reperforator.
- **k. A backspace key is provided on the right side of the keyboard for the purpose of backspacing the reperforator and the printer simultaneously.
1. All electrical wiring is brought into the keyboard through an appropriate receptacle mounted at the rear center of the keyboard base. A main cable interconnects the various electrical components with this receptacle.

2. THEORY OF OPERATION

a. Sequency of Operations

(1) Manual Input

- (a) As the operator's finger depresses a code selecting keytop, the corresponding code lever, to which the keytop is attached, is rotated about its pivot point. The rear end of the code lever comes up and rotates the universal bail. The extension arm on the top of the universal bail is moved out of engagement with the step at the rear end of the universal bail latch. This occurs when the key and corresponding code lever are about two thirds of the way toward full stroke. It is referred to as "tripping off the latches" or "trip off point". The universal bail latch then moves downward under spring force developed by the universal bail latch spring. As this latch descends it strikes the code bar reset bail latch lever 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 allows the various code bars to move to the right in the direction of the spring forces acting on each code bar. As all this happens the code lever has been moved up to its full position by the manual input into the keytop. Hence, the code lever may stop some of the code bars from moving to their extreme right hand position. The code bars have vertical extensions that engage a curved part of the signal generator transfer levers. Those code bars that are permitted to move to the extreme right move the corresponding transfer lever to the right also. However, those code bars that are stopped because their teeth engage the activated code lever do not quite touch or move their corresponding transfer levers, hence these transfer levers remain in their normal left hand position.

- (b) Simultaneously with the trip off of the reset bail and the movement of the code bars to the right, the clutch trip bar, located in the rear slots of the code bar guides, moves to the right. This clutch trip bar engages the clutch stop latch and moves it out of latched with the clutch stop lug. Up to this point all the action has been due to the manual operation of the keytop and its associated code lever resulting in trip off of latches and movement of parts under spring tension.

(2) Mechanical Input

- (a) The motor unit that mounts on the rear right corner of the keyboard base supplies the mechanical power to drive the associated page printer and the signal generator shaft that is geared to the printer main shaft. The intermediate gear assembly transfers the motor torque to the printer mainshaft. The gear ratio, between the pinion mounted on the motor and gear assembly, determines the speed of operation or the speed of signal generation. Various speeds, such as 60 WPM (368 OPM), 75 WPM (460 OPM), 100 WPM (600 OPM), can be obtained by removing the motor pinion and mating gear and mounting other matched pinions and gears of the wanted ratio. The gear ratio from the intermediate gear assembly to the printer mainshaft, and the gear ratio from the printer shaft to the signal generator shaft are fixed ratios. Hence, the only variable combination is at the motor. Special speeds can be obtained by using a governor controlled motor in place of the synchronous type motor usually used that operates at 3600 RPM.
- (b) Upon the trip-off of the clutch, 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 in the "power on" condition, because it is part of the shaft that mounts the signal generator gear. Since the clutch shoes are mounted on a plate that is part of the cam assembly, the cam begins to rotate (clockwise when viewed from the front of the keyboard) upon engagement of the clutch.
- (c) The arrangement of the cam assembly is such that the fourth cam from the rear begins to push downward on its corresponding transfer lever. Almost at 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 will go up beside a downward projection on each transfer lever. The "locking" projection will be 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 permuted position of the transfer levers is locked into position and the code bars are free to be reset to their normal latched position.

- (d) The cams and their corresponding transfer levers are numbered from rear to front. The number of cams always exceed the level by two (i.e. 8 level has 10 cams). Number 4 cam engages its transfer lever first and moves it down. Since the start pulse is always spacing, no code bar is required to engage this lever, hence it is always held to the left by its spring. Thus, 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 contact toggle is such that the left hand set of contacts acts as a pivot and the right hand contacts begin to open. The right hand contacts are the ones that control the signal current in single contact type operation. Hence when these contacts are open, the result is "no current" in the signal circuit. This is known as a spacing pulse. Thus, the first pulse, the start pulse, of any character code is a spacing (no current) pulse.
- (e) 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.
- (f) Similarly, the remaining transfer levers are pulled downward by their respective cams. The resulting pulse will be 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, hence the resulting pulse, the stop pulse, is always marking (current on).
- (g) As noted, the primary purpose of the cam is to operate the contacts so that uniform length pulses are generated. The secondary purposes of the cam are to lock and unlock the transfer levers in their permutated positions and to reset the code bars.
- (h) As already indicated, 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 starts to rotate. Full lock position occurs approximately at the half-way point of the start pulse ($48\frac{1}{2}$ 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 about half-way through the stop pulse.

- (i) Reset of the code bars is accomplished by means of an eccentric on the front of the cam assembly, which drives an eccentric follower arm. This arm engages a stud on the side of the reset bail and pulls the reset bail to the left as the cam rotates. At the peak position of the reset eccentric, the code bar reset bail latch is clear of the needle bearing stud by about some to .010 inches. This permits the latch spring to pull the latch up into locking position and the code bar reset bail is latched as the eccentric drives the follower arm back to its initial position. As the code bar reset bail is moved to the left into "reset", it engages projections on the permutation code bars, clutch trip bar, and a step on the non-repeat lever, thus moving all these elements to the left into latched reset position.
- (j) The reset eccentric is so positioned in angular relationship to the remainder of the cam that pick up of the code bars and non-repeat lever begins at $92\frac{1}{2}^{\circ}$. At 145° the code bars have been moved to the left a sufficient distance to permit the code lever, that determined the permutation, to drop down out of the universal bail. This permits the universal bail to rotate forward and kick the non-repeat lever down off the reset bail. At the same time the extension on the universal bail moves in under its latch lever and holds this latch lever up almost in the same position that the pawl on the non-repeat lever had held it in the early reset movement. With the universal bail latch held up, the reset bail continues to move to the left and full reset occurs at approximately 180° of cam rotation. As soon as the universal bail is permitted to move forward, a second key can be struck, thus moving its code lever into a permutation position. However, from that point on, full time of cam rotation must expire before a third and successive keys may be struck, assuming the operator is capable of maintaining the speed of the keyboard depending on the gearing, such as 60 WPM, 75 WPM or 100 WPM.
- (k) To repeat a character, the repeat key is held down. Its associated levers hold up the right hand end of the non-repeat lever so that the reset bail cannot engage the step. The result is that the universal bail latch lever remains down, hence preventing the code bar reset bail latch from coming up into full latch position. This permits the reset bail to follow the eccentric arm movement back and forth. Therefore, the code bars and their transfer levers are in permutation position at the beginning of each repetitive cycle and the same pulse pattern is sent out over the signal line.
- *(l) Operation of Shift of Control Key may result in having a specific bit or bits always marking, always spacing or inverted from its normal condition. Keyboards are not limited to a single arrangement.

- *1. Model 29 Binary Coded Decimal Coded Keyboards - Depressing the shift key on these keyboards causes Bits 2 & 3 to always mark when a complimentary key is depressed. (This is a means for obtaining an "upper case" or symbol associated with a particular keytop.) This is accomplished by holding down the single enlarged shift key while depressing a complimentary key. The shift key is associated with a code bar in the No. 4 Cam position and is held by a spring loaded latch. When the "shift" key is depressed, the latch is operated allowing the code bar to fall to the right when a complimentary key is depressed. This code bar operates two transfer levers by a mechanical connection. The code transmitted is then the summation of the transfer levers operated by the "shift" code bar and the transfer levers operated by the complimentary key.
- *2. Model 35 Data Interchange Coded Keyboards - Depressing the shift key on these keyboards causes Bit 5 to invert when a complimentary key is depressed. 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 code lever prevents the No. 5 Code Bar 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, not available on any of the regular keys. This is accomplished by means of a shift code lever engaging a diagonal camming surface on the underside of the shift lock bar (outboard slot of the code bar guide) and directing its motion to the left. The shift lock bar blocks out any selected group of keys as required by the specific unit. As this motion develops the bail riding the upper diagonal camming surface is raised permitting the inversion code bar (feed hole slot), if coded marking, to fall only when the complimentary key is depressed. This inversion bar upon falling to the right operates transfer lever No. 5 by a mechanical connection. The code transmitted is then the addition or omission of the No. 5 pulse combined with the transfer levers selected by the complimentary key.
- *3. Model 35 Data Interchange Coded Keyboards - Depressing the control key on these units causes Bit 7 to be deleted when a complimentary key is depressed. This key provides access to the control permutations when used with the alpha keys. This is accomplished by holding the control key down while depressing a complimentary key. The control key code lever blocks the No. 7 code bar from falling to the right (mark), deleting the No. 7 marking pulse from the selection of the regular assigned code of the complimentary key code.

4. Model 35 Data Interchange Code Keyboards equipped with Even Parity - Units so equipped contain an additional parity and parity inversion bar (No. 8). The parity bar normally operates. When the shift or control keys operate the parity bar is blocked and the parity inversion bar is allowed to operate. The parity inversion bar is allowed to operate by the same bail that allows operation of the No. 5 inversion bar. Therefore, since both the 5 & 8 Bits change, parity is perpetuated during the shift. The control key blocks the 7, 8, and 5 inversion bars so that only the 7 and 8 Bits change which also perpetuates parity.

Since two bit changes occur with either shift or control, a means to inhibit an improper parity permutation on partial depression of these keys is provided by the transition bar. This is required since two bits cannot be changed simultaneously due to part looseness and tolerances. The transition bar is located adjacent to the shift lock bar and is operated during the depression of the shift or control keys. As either of these begin to operate all code keys are blocked. Thereafter, the 5 or 7 and 8 Code Bars are conditioned for the shift or control function. As the shift or control key is further depressed, the code keys are unblocked. The complimentary key can then be operated to obtain the shift or control permutation.

- (m) In summary, it is noted that the permutation pattern is set up as a result of the manual operation of a key but the actual signal generation is done mechanically by the power driven parts of the machine. Thus, similar to an electric typewriter, the operator supplies only the energy to operate the keys, the keyboard generates the signal, and the printer receives the signal and prints accordingly.

(3) Electrical Input and Control

- (a) All electrical input, both DC and AC comes into and out of the keyboard through the electrical connector at the left of the base. The keyboard will accommodate a synchronous or series motor as the customer requirements dictate.
- *(b) The signal circuitry is similar to previous models and the DC signal supply is usually 110 V to 130 V for single contact uses. The signal circuit will be .06 amp. (60 milliamp.) or .02 amp. (20 milliamp.) depending on the exterior signal circuit. LAK808 is used in conjunction with low level keyer 192740. The contact box contains 179643 Filter. Standard signals or voltages should not be applied to this contact box.
- (c) The signal circuitry when employed with the timing contact feature (Model 35) operates at a line current of 13 ma to 40 ma at 40V DC. Refer to Specification 60,491S for detailed description of the timing contact feature associated with the signal regenerator circuit.
- *(d) The main electrical components in the keyboard section of the signal circuit are the connector with gold plated pins, the wiring cable which is composed of #22 AWG stranded wire coated with a polyvinyl coating and jacketed with nylon and enclosed

in a polyvinyl tubing and tungsten contacts. It will be noted that screw type terminals have been supplied inside of the contact box to permit ready disconnect of the leads for testing purposes. Gold plated contacts are used in the LAK808 Contact Box.

- (e) The ideal signal generated by the keyboard is a square wave type DC telegraphic signal.
 - (f) The spacings, insulation material, and components used in the electrical circuitry of the keyboard meet military and Underwriter Laboratory requirements. A.U.L. plate attached to the keyboard base indicates the keyboard and its electrical circuitry only are approved. Separate U.L. plates are required on the printer, motor, etc., to indicate they are approved also.
 - (g) The margin indicator switch and its wiring is considered standard on the keyboard. Its operation is the same for previous models. Accessory electrical devices such as Electrical Line Break, are covered in separate specifications.
- (4) Functions - Secondary Manual Operations

(a) Local Line Feed

- 1. Depression of the red key marked LOC. LF at the left side of the bottom row of keys results in paper being fed out of the associated typing unit when power is on. The sequence is such that the key causes its function lever to raise the forward end of the local line feed bail. This bail rotates about its pivot point and the upper end pushes the attached 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 will not be disturbed.

(b) Local Carriage Return Mechanism

- 1. Depression of the local carriage return key causes its function lever to raise 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. Thus the carriage return mechanism on the local typing unit is made to operate without a signal that would cause other units in the line circuit to function.

(c) Keyboard Unlock Mechanism (Where Applicable)

- 1. Operation of the keyboard unlock keylever causes its function lever to rise against a diagonal camming surface on the lock bar. This causes the lock bar to move to the left until the lock bar pawl falls into a notch in the

top of the lock bar. In this position, the teeth on the bottom of the lock bar are between the code selection levers and offer no restrictions to their operation. The unlock key is normally in the depressed position for operation of the keyboard and in the upward position for the lock condition.

(5) Accessory Functions

(a) Local Backspace Mechanism (Where Applicable)

1. 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. As the forward (right) end of the backspace bail moves down it engages the intermediate arm located on the front plate and rotates the arm to its operated position. Attached to the intermediate arm is an adjusting plate. The plate, which rotates with the intermediate arm, engages the backspace camming bail and rotates the bail to its operated position. In its operated position the camming bail is in contact with the spacing feed pawl at the camming surface near the center of the feed pawl. With the camming bail operated, a backspace operation will occur when the spacing clutch trip lever is tripped.
2. When the backspace operating bail is operated a trip link attached to the upper end of the bail is moved to the rear, engaging the tripping the spacing clutch trip lever, allowing the spacing clutch to rotate. It is noted that positioning of the backspace camming bail is completed before the spacing clutch is tripped. As the eccentric assembly rotates, the feed pawl that is moving up is prevented from engaging the teeth on the spacing drum by the action of the eccentric and the pivoting of the feed pawl on the backspace cam bail. The spacing drum rotates backward under spring tension following the feed pawl that is moving down. As the spacing clutch rotates the trip link stripper lever riding on the clutch cam disk disengages the trip link from the clutch trip lever to block further rotation of the clutch.

(b) Local Reverse Line Feed Mechanism (Where Applicable)

1. Manual depression of the LOC R LF keylever causes its associated function lever to rotate the bail toward the rear. This pushes the trip link, causing the transfer bail to ride up the cam slope of the trip link.
2. As the transfer bail is pivoted by this camming action its other arm engages the slide link in the typing unit.
3. As the trip link continues to move to the rear, it engages and trips the line feed clutch. Subsequent operations in the typing unit result in reverse line feed of the paper. See Specification 6933S for a detailed description and operation of the typing unit parts.
- **4. It should be noted that this feature is restricted for use with typing units containing a line feed mechanism that operates at 30 lines per second or less. It is not compatible with Model 35 Typing Units operating at the new 60 lines per second speed.

(c) Signal Line Break Switch (Where Applicable)

1. Depressing the signal line break switch causes the normally closed contacts to open, providing a discontinuity in the signal line circuit.

(d) Here Is Switch (Where Applicable)

1. Depressing the Here Is Switch causes the normally open contacts to close, allowing the answer back magnet to operate the answer back mechanism.

**(e) Local Single Line Feed (Where Applicable)

1. Manual depression of the (Loc. S. LF) keylever causes its associated function lever to rotate toward the rear allowing the trip link to trip off the line feed clutch. As the clutch rotates, a camming surface on the clutch disc rotates the trip lever, disengaging the trip link from the line feed clutch extension and restoring the mechanism to its normal position. This provides a non-repeat local line feed.

**(f) Receive Break Switch (Optional on Model 35)

1. Operation of a double blank mechanism associated with the printer actuates the keyboard lock plunger in its downward travel. As this motion develops, a keyboard function lever is driven to its latched position through a yield spring. Simultaneously the contacts associated with the receive break mechanism are actuated to their operating positions completing their designated functions.

Depression of the "break release" keytop causes the specific code lever to rotate at its operating end in an upward motion. As this motion develops, the end of the code lever engages a diagonal camming surface on the lower side of the latch moving it to the unlatched position. At this time the function lever is unlatched and the contacts and associated parts are restored to their normal position.

b. Accessory Components Mounted to the Left and Right of the Keyboard Field

- (1) The accessory components mounted to the left and right of the keyboard field bear no significance to the operation of the keyboard as a unit. However, they are connected to complimentary equipment within a set and may indirectly control the keyboard. The theory of operation for these components appears in the Automatic Send-Receive Set Specification associated with the particular keyboard.

SECTION III

ADJUSTMENTS, SPECIAL REQUIREMENTS AND LUBRICATION

1. ADJUSTMENTS

- a. Refer to Specification 60,131S for all adjustments of the keyboard mechanism.
- b. Refer to Specification 6261S for adjustment of the character counter.
- c. Refer to Specification 6924S for adjustment of the Model 29 Answer Back Mechanism.
- d. Refer to Specification 60,412S for adjustment of the reperforator.

e. Reperforator Unit to Keyboard Unit

- (1) The reperforator must be mounted so that the jack shaft is in alignment with the rear bearing bracket shaft end and is perpendicular to the rear motor shaft.
- (2) Loosen set screws and slide the flexible coupling out of engagement with the rear bearing bracket shaft. Loosen two screws on alignment bracket. Loosen four reperforator mounting screws. Align the reperforator jack shaft with the rear bearing bracket shaft and tighten the reperforator mounting screws. Snub the alignment bracket against the reperforator casting and tighten down. If the shafts are not in alignment at this point, adjust the rear bearing bracket to the left or right until the shafts are in alignment. Position and fasten the flexible coupling.

f. Reperforator Backspace Actuating Switch - Figure 1

- (1) Depressing the LOC. B. Sp. keytop shall close the normally open reperforator backspace actuating switch.
- (2) This adjustment may be checked by means of an ohmeter.
- (3) To adjust, shift the switch assembly on its mounting holes.

NOTE: An ideal condition exists when both the printer and reperforator backspace simultaneously. To achieve this, the adjustment must be made by trial and error, with the reperforator and page printer mounted. If the reperforator backspace before the page printer, increase the gap between the contact operating pad and the backspace operating bail. If the page printer backspaces first, decrease the gap.

g. Lubrication

- (1) Rear Bearing Bracket
 - (a) Grease
 1. Both - Light coat

** (2) Place one drop of oil at the tape lever pivot point.

* (3) Refer to Specification 60,131S for further lubrication information.

** h. Tape Alarm Switch

- (1) Requirement: The switch shall operate when a roll of tape is reduced to between 2-3/8 and 2-1/2 inches in diameter.
- (2) To Adjust: Loosen the switch assembly mounting screws and position the assembly in the tape container. Bend tape arm if necessary.

** 1. Tape Arm Spring Tension

- (1) Requirement: It shall require 6 to 10 ozs. to release the switch.
- (2) To Check: Hook the end of a 32 oz. spring scale over the tape lever at the spring and pull in line with the spring.

LOCAL BACKSPACE SWITCH

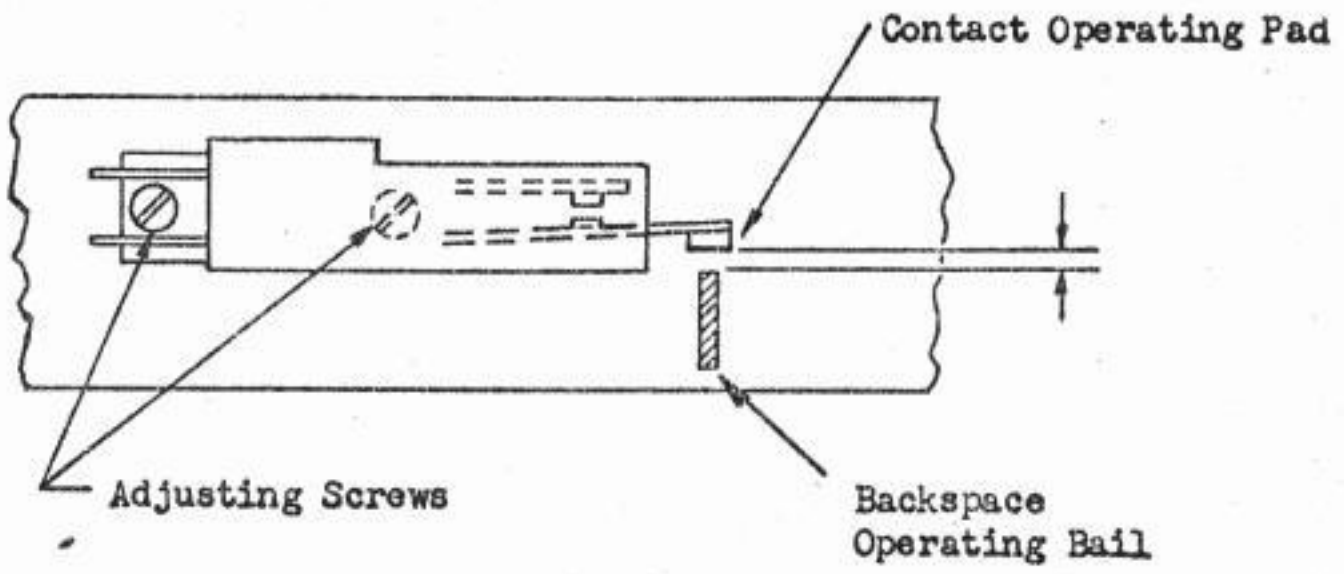
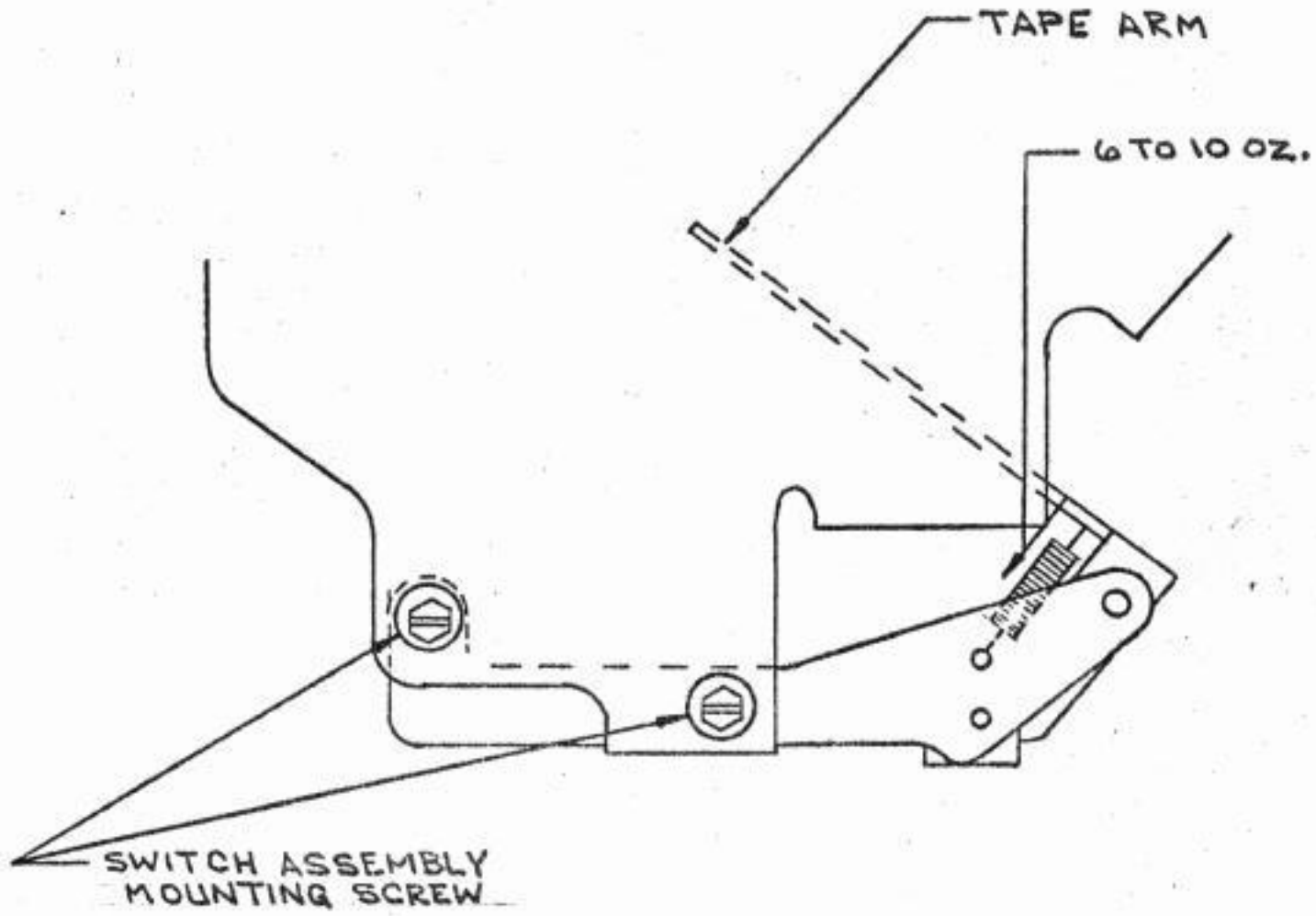


Figure 2



TAPE CONTAINER

FIGURE 2

SECTION IV

MANUFACTURING INFORMATION

1. GENERAL

- a. The keyboard base units, subassemblies, and parts shall be manufactured in accordance with released prints, wiring diagrams, bills of material, engineering specifications and Teletype manufacturing standards.

2. TESTS

a. Mechanical - Compatible with Customer Requirements

(1) 600 OPM - 100 WPM (Standard Test)

- (a) With the keyboard shaft operating at 600 OPM in conjunction with a properly adjusted and functioning printer, the keys shall be exercised at a rate of 588 OPM (98 WPM) for two hours. No errors in copy shall be permitted that are a result of mal-functioning of the keyboard.

- (b) Manual operation of any or all (in sequence) code selecting keys in conjunction with the repeat key shall result in error free copy of 1000 characters.

- (2) Other mechanical tests shall be conducted, as deemed essential by the manufacturing organizations, to maintain a quality product.

b. Electrical Tests

(1) Dielectrical Test

- (a) Dielectric and other electrical tests shall be conducted as deemed essential by the manufacturing organizations to assure compliance with electrical requirements.

3. CABLE ROUTING

a. Keyboard Main Cable (See Figure 24)

- (1) Route the keyboard cable as shown in Figure 24. The cable is to be kept clear of moving parts such as gears, levers, etc.

b. Keyboard Switch Cable (See Figure 25)

- (1) When this cable is used, route as shown in the figure. The cable is to be kept clear of moving parts. Within the hood, the cable must be tied.

4. SUPPLEMENTS FOR FACTORY USE ONLY

a. Clutch Shoe Lever Adjustment - Page III-2, Paragraph c. (1)

(1) Requirement: Unchanged

(2) Clutch Shoe Lever Adjustment

(a) To Adjust or Check: With the clutch engaged, apply the pull end of a 64 ounce scale over the clutch shoe release lever and pull opposite the stop lug on the disc with a force of 32 ounces. Release the pressure slowly and check the requirement.

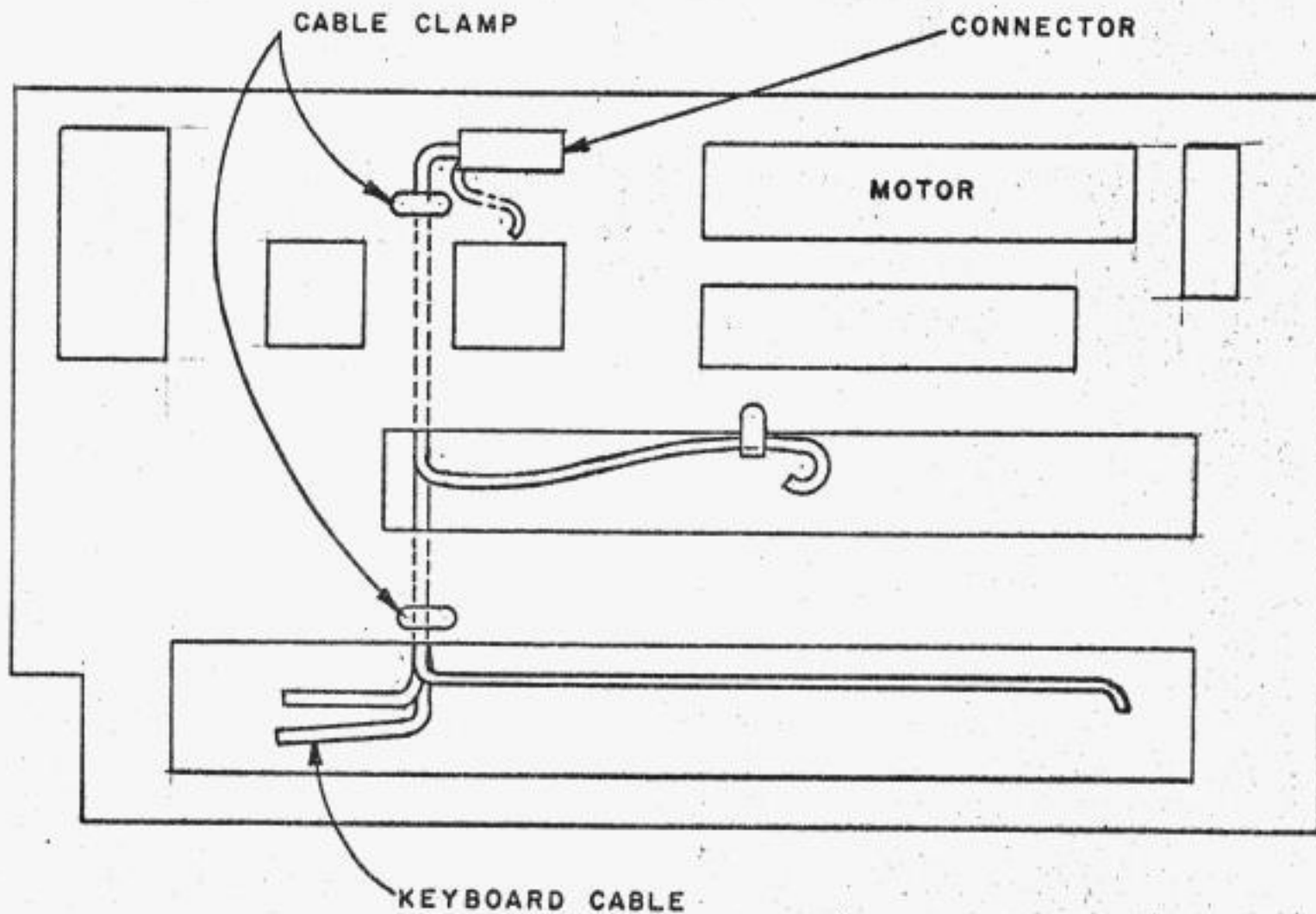
b. Signal Generator Contacts

(1) Care should be taken with all units so that the signal generator contacts are not pitted during test exercise of adjustment. Pitted contacts tend to procure signal "breaks" and unacceptable operation in low level circuit applications.

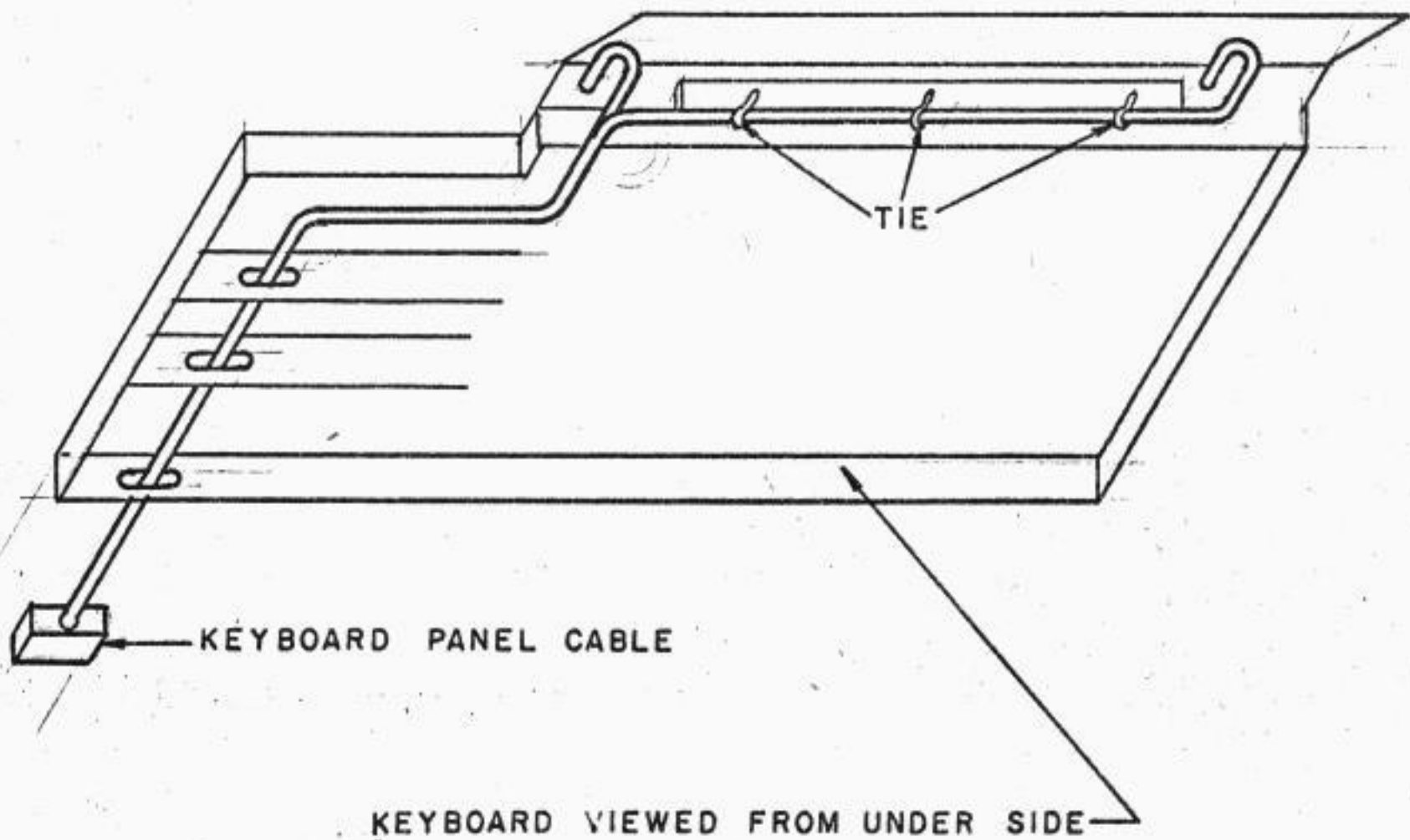
All test equipment used should operate on 20 ma, 40V DC non-inductive, or less, by the use of the new line of selector drivers. Higher voltages (for strobe etc.) can be used with a related drop in the current so as to keep the energy across the contacts in the same order of magnitude. The use of low level non-inductive test equipment is especially necessary in working with units which are not equipped with arc suppressors.

Pitted or chipped (in the case of gold plating) contacts should not be considered as an acceptable product to be shipped to a customer.

** (2) The contacts and contact box of LAK808 shall only be operated in conjunction with the 192740 Low Level Keyer.



KEYBOARD VIEWED FROM TOP



SECTION V

INSTALLATION AND SERVICING INSTRUCTIONS

*1. INSTALLATION (MODEL 29)

a. General

(1) Unpacking

- *(a) The Model 29 Keyboard is packaged in individual cardboard cartons. To unpack, cut the sealed edges of the carton carefully so as not to damage the unit. The small parts contained in the cloth bag are to be kept with the unit until used in the installation.

(2) Tools

- (a) Set of Tools 113778 contain the necessary tools for installing or servicing the Keyboard.

b. Mounting

(1) Initial Assembly and Adjustment

- (a) Refer to Field Specification 5759S for instructions on mounting and connecting the motor, gearing installation and typing unit installation. For such initial adjustments as intermediate gear assembly adjustment to motor pinion and typing unit main shaft and typing unit to signal generator gears. See Section III of this specification.

(2) Installation into a Cabinet (LAAC)

- *(a) The Model 29 Keyboard, will come with Modification Kit S.O.P. 170328 (Hood and Seal) assembled to the keyboard and installation into a cabinet can follow instructions as given in Field Specification 5759S.

(3) Electrical Connection

- (a) The electrical service to the keyboard comes through the cable from the left end of the Electrical Service Unit. Insert the plug that terminates this cable into the connector at the left rear of the keyboard. Push down until the plug is latched into position in the receptacle. Check for proper operation according to Specification 5759S.

**2. INSTALLATION AND SERVICING INSTRUCTIONS FOR MODEL 35

- a. Refer to Specification 60,404S.

*3. SERVICING INSTRUCTIONS

a. Removal of Major Subassemblies

(1) Signal Generator Assembly

- (a) Unlatch and disconnect the electrical plug at the rear of the keyboard. Remove the contact box cover and disconnect the signal line leads at the contact terminals. Pull up on the line cable with its strain relief and grommet intact and push it aside out of the way. Remove the typing unit if it is present. Unscrew two hold down screws at the front of the signal generator and one at the right rear (near the gear). Lift the signal generator carefully, holding the universal bail back so that the non-repeat lever clears OK and its spring will not be unduly stretched. When setting the assembly down on the bench, check to see that the non-repeat lever is up in its guide slot. This guide will act as a leg and protect the non-repeat lever.

CAUTION: If the non-repeat lever gets pulled down almost 90° to its normal position, its spring may be stressed beyond elastic limits which will result in malfunctioning upon reassembly of the signal generator to the keyboard.

(2) Keyboard Assembly

- (a) Remove the typing unit, reperforator and signal generator.
- * (b) Remove the plastic plates, hood seal and seal plates (Model 29).
- (c) Remove four screws that hold the front frame to the front of the base.
- (d) Remove from the top the two hold down screws with flat washers at the right and left rear of the code bar assembly brackets and two screws at the extreme left and right ends of the right-angle bracket at the front of the code bar assembly. Remove the screw and cable clamp at the left on this bracket.
- (e) When these eight screws (four in front and four on top) have been removed, the keyboard assembly can be removed from the base by tipping it up slightly at the front and pulling forward so as to disengage the function levers. Note that all the function levers are under their corresponding function bails. When reassembling, take care that the function levers go back under their bails as required.

b. Signal Maintenance - Parts or Subassembly Replacements

(1) Signal Generator - Mounted on Keyboard

* (a) Arc Suppressor and Filter

1. To remove the arc suppressor, remove the contact box cover and disconnect the suppressor leads at the contact terminals. Be sure leads are tight at the contact terminals when replacing the arc suppressor and before fastening on the contact box cover.
- **2. To remove the 179643 Filter, remove the contact box cover and disconnect the leads from the cable. Loosen the three captive screws holding the filter to the contact assembly.

(b) Contact Assembly

1. In the event the contacts need replacement the most economical method of renewing them is to replace the entire contact assembly. To remove this assembly, take off the contact box cover and disconnect the signal line leads. Next, unhook the drive link spring, then remove the entire contact box assembly by unscrewing the two mount screws in the front plate of the signal generator. Disengage the drive link from the transfer bail and lift off the contact box assembly. Note that the adjustment eccentric has its high portion up.
2. Remove the lock nut on the top of the phenolic block and then turn the assembly over and remove the two 4-40 screws holding the contact unit in place. Slip the drive link out through the slot in the contact box and disconnect the link from the contact toggle by removing the 2-56 screw, washers and insulated bushing. Reverse the procedure for installation of the new contacts then adjust the contacts as outlined in Section III of this specification.

(c) Clutch Stop Arm

1. To remove this part, unhook the spring and unscrew the adjustment screw. After replacement, adjust to the clutch stop lug as outlined in this specification.

(d) Non-Repeat Lever Mechanism

1. Remove the lock nut and shoulder screw that mounts this mechanism through the non-repeat pawl. When replacing, be sure the non-repeat pawl (spring arm) is on top of the stop pin but under the universal bail latch lever. Adjust as given in this specification.

(e) Transfer Bail

1. Unhook the drive link spring and remove the lock nut at the end of the transfer bail shaft on the front plate of the signal generator. Disengage the drive link from the transfer bail and pull the bail and shaft toward the rear.

(f) Detent Plate Assembly

1. Remove the transfer bail and shaft. Take out the two detent plate mounting screws on the front plate of the signal generator and the detent plate assembly can be lifted up and out of place. The detent latches can then be taken off by removing the tru-arc retainers off the studs.

(g) Reset Bail Latch

1. Remove the tru-arc retainer from off the end of the reset bail latch stud and unhook the spring from the latch. Strip off the latch to allow the code bar reset bail to move to its extreme right hand position then work the latch to the front until it is free of its mounting stud and the needle bearing on the code bar reset bail. Lift the latch out of the assembly and remove the oil wick on the hub.

(h) Latch, Universal Bail

1. Remove the non-repeat lever mechanism first (see paragraph b.(1)(d)). Unhook the universal bail latch lever spring and remove the mounting screw and eccentric bushing. Move the latch lever toward the rear to extract it out of the guide slot in the rear plate of the signal generator. Reverse the procedure for assembly and adjust the universal bail clearance per Section III.

(2) Signal Generator Assembly - Removed from Keyboard

- (a) The following disassembly procedures can be conducted only after the Signal Generator Assembly has been removed from the Keyboard Base.

(b) Transfer Lever Replacement

1. Remove the contact box assembly. Remove the locking bail spring and then extract the locking bail by first unlatching the clutch and rotating the shaft approximately 270° . This positions the cams so the locking bail can be dropped down and unhooked from the guide post under the cam. Hold the signal generator gear in the left hand and tip the assembly up at an angle toward you, reach around with the right hand underneath the assembly and grasp the locking bail at its bottom

1. Unhook the drive link spring and remove the lock nut at the end of the transfer bail shaft on the front plate of the signal generator. Disengage the drive link from the transfer bail and pull the bail and shaft toward the rear.

(f) Detent Plate Assembly

1. Remove the transfer bail and shaft. Take out the two detent plate mounting screws on the front plate of the signal generator and the detent plate assembly can be lifted up and out of place. The detent latches can then be taken off by removing the tru-arc retainers off the studs.

(g) Reset Bail Latch

1. Remove the tru-arc retainer from off the end of the reset bail latch stud and unhook the spring from the latch. Strip off the latch to allow the code bar reset bail to move to its extreme right hand position then work the latch to the front until it is free of its mounting stud and the needle bearing on the code bar reset bail. Lift the latch out of the assembly and remove the oil wick on the hub.

(h) Latch, Universal Bail

1. Remove the non-repeat lever mechanism first (see paragraph b.(1)(d)). Unhook the universal bail latch lever spring and remove the mounting screw and eccentric bushing. Move the latch lever toward the rear to extract it out of the guide slot in the rear plate of the signal generator. Reverse the procedure for assembly and adjust the universal bail clearance per Section III.

(2) Signal Generator Assembly - Removed from Keyboard

- (a) The following disassembly procedures can be conducted only after the Signal Generator Assembly has been removed from the Keyboard Base.

(b) Transfer Lever Replacement

1. Remove the contact box assembly. Remove the locking bail spring and then extract the locking bail by first unlatching the clutch and rotating the shaft approximately 270° . This positions the cams so the locking bail can be dropped down and unhooked from the guide post under the cam. Hold the signal generator gear in the left hand and tip the assembly up at an angle toward you, reach around with the right hand underneath the assembly and grasp the locking bail at its bottom

portion and turn it clockwise after disengaging it from the upper guide post. It may be necessary to move the gear (cam) back and forth slightly to get clearance to drop the locking bail out of the upper guide post. Continue to turn the locking bail clockwise to about a right angle position to normal and extract it out through the bottom opening in the frame.

2. Remove the transfer bail and shaft. Remove the screw in the upper right hand transfer lever guide and rotate this guide about the (loosened) locking bail spring post so that the guide will not interfere with the transfer lever removal.
3. Remove the transfer lever springs. Remove the transfer lever stop pin at the left of the levers by taking off the lock nut on the front plate.
4. Drop the transfer levers down and reach in under the cam with a set of tweezers to take off the oil wicks that are on the transfer levers.
5. Unhook the transfer levers from the lower guide post and pull them up out of the assembly one at a time from rear to front. If the same set of layers is to go back into the assembly, be sure to number them some way as to get them back in the right sequence. Reverse the entire procedure for reassembly.

(c) Cam and Shaft Assembly Removal

1. Remove the locking bail as outlined in the preceding paragraphs.
2. Remove two mounting screws in the rear (gear) plate and remove the 10-32 lock nut at the front end of the shaft.
3. Hold the clutch stop and latch levers out of the way and pull back on the rear plate so as to disengage the shaft from the front plate. Now the entire cam, clutch, and shaft assembly can be removed toward the rear and upward by gently rotating so as to clear the various transfer levers. The eccentric follower arm and spacer washer will fall free and must be carefully positioned when reassembly begins.
4. To take the cam (with clutch assembly) off the shaft, disengage the clutch by holding the clutch shoe lever against the stop lug and slide the cam off the shaft.

In reassembly it is advisable to wire the shoe lever lug and stop lug together so that it will be easier to manipulate and guide the clutch shoes into the clutch drum. It is best to have the shaft in place first and slide the cam and clutch onto the shaft and into the clutch drum.

(d) Clutch Assembly

1. After removing the cam and clutch assembly as indicated in the preceding paragraphs, the clutch itself may be removed from the cam (or vice-versa). First, carefully remove the springs in the clutch assembly then remove the clutch shoes. Next, remove the two clamp screws in the clutch disk and remove the adjusting disk. The clutch disk can then be removed from the cam by taking out the two screws securing it to the cam.
2. If a new cam is being installed, try the clutch shoes and adjusting disk in their respective grooves to see that these pieces can move freely before beginning assembly. Assembly procedure should follow in reverse order of disassembly.

(e) Code Bar Reset Bail Removal

1. Unhook the reset bail spring from off the bail.
2. Remove the lock nuts at the front and rear ends of the reset bail pivot shaft.
3. Remove the lock nut from the rear end of the transfer lever guide post (under the cam) and from the rear end of the upper locking bail guide post. Pull the rear plate of the signal generator to the rear so that the reset bail and its pivot post come clear. Disengage the hook at the end of the eccentric follower arm and lift the reset bail assembly up and out into the open.

(3) Keyboard Assembly - Mounted on the Keyboard Base

(a) Keytop Assemblies

- *1. Remove the plastic plates and keyboard hood (Model 29).
2. To remove any or all of the keytop assemblies, hook one lug of the keytop removal tool over the top of the associated key code lever and insert the other lug in the slot of the keytop blade member. A pull forward on the removal tool will snap the keytop assembly free of its pivot stud at the end of the key code lever, then the keytop assembly can be lifted out from the top of the keytop guide plate.

3. When installing keytop assemblies, carefully position the blade member over its corresponding pivot stud then push down on the keytop until the blade snaps into position. After assembly, check the operation of the keytop assembly and its code lever because the pivotal action should be free. Binding at this pivot will result in sluggish action of the keylever linkage and be annoying to the operator.

(b) Ball Lock Assembly

- *1. Remove the plastic plates and keyboard hood (Model 29).
2. Remove the 4-40 screws at each end of the wedge retainer plate and loosen the clamp at the center. As the wedge retainer is removed, note the spacer washers at each end. Remove the lock wedges (52). Remove the mounting screws at each end of the Ball Lock Bar Assembly and it will come free of the keyboard. Reassembly is the reverse of this procedure.
3. A short cut method of removing the Ball Lock Assembly is to take the two mounting screws out that fasten the assembly to the front frame. Then the assembly can be dropped down, leaving the wedges hanging on the various key code levers from which they can be readily picked off. However, it is best to follow the preceding paragraph for reassembly.
4. The lock balls can be removed by taking out the adjustment screw and rolling the balls out of the channel. There are 53 balls in this assembly, and proper keylever locking action cannot be obtained with more or less than this number of balls.

(c) Keytop Guide Plate

- *1. Remove the plastic plates and keyboard hood (Model 29).
2. Remove the space bar assembly by taking out the pivot screws that fasten it to the space bail. Remove the guide plate hold down screw located under the space bar and the screws at the upper left and right corners. Gently work the guide plate up off of the keytops and permit the keytops to fall free. To reinstall the guide plate with the keytops attached to their levers, flop them all toward the rear, put the front edge of the guide plate down on the frame first and push the keytops into their respective holes, taking the bottom row first, then the second row, etc., all the while steadily lowering the guide plate into place. Refasten the plate and restore the space bar to its position.

(d) Universal Bail Assembly

1. If for some reason the Universal Bail Assembly only needs removal, the keyboard must be removed from its cabinet and typing unit and set up vertically on its rear side, using the motor as a "foot". A wrench can then be applied from the bottom side of the keyboard to the pivot studs at each end of the Universal Bail Assembly. Disconnect the universal bail spring before removing this assembly entirely.
2. In the event the Keyboard Assembly has been removed it becomes an easy matter to remove the universal bail spring, the pivot studs, and then the universal bail itself.

(4) Keyboard Assembly - Removed from Keyboard Base

(a) Front Frame Assembly

1. Remove the bail lock assembly, all keytop assemblies, space bar assembly and then the keytop guide plate as directed in previous paragraphs. Disconnect the space bail link at the stud on its code lever by removing the tru-arc retainer. Remove the screw at each end of the right angle bracket by which the front frame assembly is fastened to the remainder of the assembly. The assembly left after removal of the front frame is known as the Keylever Guide Assembly.

(b) Code Bars - Removal or Replacement

1. The following procedure can be followed with the Keyboard Assembly mounted in the base (signal generator removed), Keyboard Assembly demounted, or in the Keylever Guide Assembly stage.
2. Unhook the various code bar springs from the spring bracket at the right hand end of the assembly so the springs will remain with their respective bars. Note that the clutch bar spring is larger and stronger than the code bar springs. Loosen the adjustment screws at the right and left end brackets and lift the code bar guides to the top limit of their adjustment slots. Move the code bar to the right so as to clear the left hand guide, then lift the code bar slightly and remove it to the left until it is free of the right hand guide. Reverse the procedure to assemble and refer to Section III for the adjustment procedure.

(c) Key Code Lever - Removal and Replacement

1. In case it is necessary to replace a function lever or key code lever, the keyboard assembly should be dismantled down to the keylever guide assembly stage. Remove the code bars, and clutch bar as instructed in the preceding paragraphs.
2. Turn the assembly upside down and remove all the keylever springs. Remove the inner tru-arc from off the common pivot shaft and pull this shaft out until the lever needing replacement is free. Extract the lever from out the guide "basket" toward the front (pivot side). Replace with a new lever and reverse the procedure to build the assembly.

(5) Miscellaneous Assemblies

(a) Margin Switch Mechanism

1. This mechanism is to the left of the signal generator and on top of the base, hence its parts are readily accessible for removal or replacement or maintenance. If it is necessary to replace the switch, remove the two mounting screws holding the switch to the mount bracket and pull out the slack lead wire. Unsolder the leads then install a new switch by reversing the procedure.

(b) Function Lever Bails

1. Remove the keyboard from its cabinet and typing unit. To remove and replace a function lever bail or add an accessory function lever bail, remove the inner tru-arc retainer from off the common pivot shaft and pull this shaft aside through the opening provided in the side of the base until the function bail in question is clear. Reverse this procedure for installation of bails.

(c) Installation or Servicing of Accessories

1. Refer to the specification describing the accessory for information concerning its installation and servicing.

c. Periodic Maintenance

(1) Lubrication

- (a) Lubricate the keyboard before placing it in service. After a few weeks in service, relubricate to make certain that all points receive lubrication. The following lubrication schedule should be followed thereafter:

<u>Operating Speed</u>	<u>Lubrication Hours</u>	<u>Interval or Months</u>
100 WPM	1500	6

- (b) Lubricate all locations as indicated in Section III of this specification.

NOTE: It is necessary to remove the keyboard hood to properly lubricate pivot points, wicks, and the ball lock assembly of this portion of the keyboard.

(2) Preventive Maintenance

- (a) A thorough visual examination of the equipment during periodic checks may uncover conditions that could possibly cause trouble later. The appearance of oxidized (red) metal dust adjacent to any bearing surface may indicate insufficient lubrication. The adjustment clearance of working parts should be observed.
- (b) Manual operation check-up should accompany visual inspection. Connections at the connector receptacle and at the terminal block should be checked for tightness. Nuts and screws that lock adjustment features should be carefully checked and tightened if found loose. While clearing the unit, care should be taken to avoid damage or distortion of delicate springs that might weaken their tension.
- ** (c) When servicing signal generators equipped with gold contacts care must be exercised so that the thin gold film is not removed by burnishing, etc. Passing of a strip of bond paper between the contacts is the recommended cleaning procedure.