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MODEL 35 IDP AUTOMATIC SEND-RECEIVE TELETYPEWRITER SET (ASR) FOR BELL OF CANADA

NOTE

This specification, containing information pertaining to the Model 35 IDP Automatic Send-Receive Teletypewriter Set (ASR) for Bell of Canada, was prepared for use in a training program at Bell of Canada. This publication is to be used in conjunction with the Model 35 ASR Teletypewriter Set Bulletin 280B and other Bulletins as referred to herein.

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PART I

GENERAL DESCRIPTION AND OPERATION

MODEL 35 IDP AUTOMATIC SEND-RECEIVE TELETYPEWRITER SET (ASR) FOR BELL OF CANADA

1. GENERAL

1.01 This specific ASR set consists of the following basic units:

Cabinet	Reader Base
Keyboard	Reader
Typing Reperforator	Distributor
Typing Unit	Electrical Service Unit
Motor Unit	

1.02 The set can send and receive data using the American Standard Code for Information Interchange (ASCII). The flexibility is available to incorporate the switched service controls into the set to integrate the set and switched service into the same business system. As business machines employing the ASCII become available the set will be able to communicate with them by direct connection or with the buffering of punched paper tape.

1.03 The set can send and receive data in both parallel and serial signals. That is the bits comprising a character can be sent or received either simultaneously or sequentially. The character rate in either case is 100 words per minute. The bit rate of the serial signal is 110 baud.

1.04 The set can communicate with other business machines within a data processing center by direct connection using current-no current signals and either parallel or serial bit arrangements. The set can also communicate with remote senders and receivers to produce page copy or punched paper tape at the remote location, to accumulate data from the remote location or to communicate with a computer center. The basic set can conduct long range communication via a 20 milliampere neutral current telegraph circuit. Other arrangements can easily be accommodated.

1.05 The set is equipped with a versatile paper tape punch. A fully perforated paper tape can be prepared as a by-product while the operator is typing a form. It is thus a common language medium for an integrated data processing system. The punch is a receiving unit which can combine into one by-product tape data coming from the keyboard, the paper tape reader and the signal lines. Error correction and subsequent handling of the tape is facilitated by typing of all the graphic characters on the paper tape. The information recorded in tape can be edited by PUNCH ON and PUNCH OFF control code responses and by manual operation of pushbutton switches.

1.06 The page printer types single or multiple copies on continuous forms. The typing can originate from the keyboard, from the tape reader or from an external signal source. The page printer can print all the 64 graphic characters in the ASCII. These include the upper case alphabet, Arabic numerals, space (the invisible graphic) and 27 punctuation marks and special symbols.

1.07 Print suppression is provided as a means to pass data through the set without printing on the page. The punch can record data which is not printed.

1.08 The set is equipped with Two parallel signal tape reader. The reader can be used as a program tape reader to partly automate data preparation by supplying the controls and fixed information which are unchanging whenever a particular form is typed. The reader can also be used to reprocess a tape previously prepared on the set.

1.09 The set can be used off line to prepare a by-product tape and then on line to send data in that tape to a distant location. This procedure provides opportunity to assure that the tape is correct before transmission and it permits transmission to take place at the full speed of the 100 words per minute. The internal control codes in the program tape are not punched in the by-product tape so the set simply sends the data to the distant location with the page printer monitoring the traffic. SOME CONTROL CODES ARE PUNCHED

1.10 The set is equipped with a reader hold circuit that momentarily delays the reader after a control character is read. This eliminates the need for fill characters except to accommodate other equipment in a business system. For example, if the by-product tape is transmitted via a switched service set, timing fill characters must be inserted after TAB, FORM, XOFF, etc., conforming to switched service requirements.

1.11 The keyboard provides manual entry of data. The keyboard can send data to the page printer, the punch or to other receivers external to the set. The keyboard can generate the upper case alphabet, the Arabic numerals, space, 24 punctuation marks and special symbols and the control characters. The keyboard generates an even parity bit with every character.

1.12 The set features program control. In preparation of business forms repetitive operations are done automatically for the operator. This approach simplifies the preparation of complicated forms. It virtually eliminates the need for the operator to keyboard the control codes. Also, fixed information can be entered from the program tape. These operator aids result in faster production and better quality because there are fewer chances for human errors.

1.13 The internal control codes are suppressed so that these codes do not appear in the by-product tape nor in the outgoing serial signal.

1.14 The set is equipped with a local signal battery to permit off-line operation. The set is controlled by a three position rotary switch, the three positions being ON-LINE, OFF and LOCAL. The local signal battery is maintained during the OFF condition to prevent spurious characters from being typed when the set is turned on and off.

2. OPTIONAL FEATURES

2.01 Selective Character Suppression is available as an optional applique. This feature allows suppression of a preselected character whenever it occurs. The character can be suppressed at the punch only, at the printer only or throughout the set.

2.02 Input and output devices other than the basic components of the set are anticipated. Provisions have been made that facilitate connection to these devices and control of them. The auxiliary devices might be page printers, paper tape punches, card readers, codomats, pushbutton addressers, clocks, etc. Control circuitry is provided for two auxiliary input devices and one auxiliary output device.

3. STANDARD FEATURES

3.1 PRIVATE LINE COMMUNICATION

3.11 The set is arranged for direct application of a 20 milliampere current-no current private line telegraph circuit. The communication is by start-stop 11 bit telegraph signal at a 110 baud rate. The punch and page printer are both equipped with 500 milliampere output, maintenance free electronic selector magnet drivers to provide high receiving margins. The keyboard, tape reader and auxiliary parallel signal input devices gain access to the serial signal line via the distributor which converts the simultaneous bit arrangement to a sequential bit arrangement.

3.12 Data Set communication will provide access to switched service facilities. The proposed use of a data set coupler is discussed in paragraph 6.51 as an optional feature of this set.

3.13 A 60 milliampere current-no current signal can be accommodated by some minor modifications to the set. These consist of changing the selector magnet driver circuit card from Part Number 182630 (20 milliampere signal) to Part Number 182631 (60 milliampere signal) and moving three wires in the local signal circuit to increase the local circuits to 60 milliamperes.

3.2 PROGRAM CONTROL

3.21 The program control is accomplished primarily by responses to a set of internal control codes. This topic which concerns programming will be

discussed here. The related manual controls which concern the set operator will be duscussed under "CONTROLS". The internal control codes are identical in bit arrangement to the ASCII control codes but the responses are different so these internal control codes must be segregated from the ASCII code combinations and must not get outside the set. The segregation is accomplished by a precedence code condition. A code combination named DC_0 conditions the set to treat any subsequent control codes as internal codes. This condition is terminated by the code combination named NORMAL CODE. This returns the set to the normal condition wherein all code combinations are treated as ASCII. The suppression of internal control codes is accomplished at the point of conversion from parallel signal to serial signal. The internal control codes exist only in the parallel signal condition: they never get converted to serial signals. Because the communication facilities, the page printer and the punch are all in the serial signal signal circuit, the internal codes are well contained. The parallel signal receivers are supplied a disabling lead which identifies internal control codes.

3.22 The following 15 internal control codes have been assigned and are used in the set:

Keyboard Desig.	Internal Code Name	Set Response
CONTROL A	DATA INPUT 1	Enables an auxiliary input device and keyboard, disables other input devices and conditions the set to respond to control codes as ASCII.
CONTROL B	AUX. RECEIVER ON	Unblinds auxiliary receiver.
CONTROL C	AUX. RECEIVER OFF	Blinds auxiliary receiver.
CONTROL D	NORMAL CODE	Conditions the set to respond to the control codes as ASCII.
CONTROL E	DATA INPUT 2	Enables stepping switch input and keyboard, and disables other input devices and conditions the set to respond to control codes as ASCII. See paragraph 6.3.
CONTROL F	DATA INPUT 3	Enables auxiliary input device and keyboard, disables other input devices and conditions the set to respond to control codes as ASCII. See paragraph 6.3.

Keyboard Desig.	Internal Code Name	Set Response
CONTROL G	PRINT RESTORE	Ends automatic print suppress mode of operation (unblinds page printer and stops reader if preceded by a STOP code). Also PRINT RESTORE ends the with functions mode and the data by-pass mode.
CONTROL P	DC_0	Conditions set to respond to control codes as internal control codes. This code is always suppressed.
CONTROL Q	TAPE READER ON	Enables tape reader and keyboard and disables other input devices.
CONTROL R	PUNCH ON	Unblinds punch.
CONTROL S	STOP	Stops input device other than keyboard to permit keyboarding or other operator task. Also STOP ends the manual print suppress mode by unblinding the printer and stopping the reader.
CONTROL T	PUNCH OFF	Blinds punch.
CONTROL U	AUTOMATIC PRINT SUPPRESS	Blinds the printer and keeps the reader running until the next PRINT RESTORE code if there is an intervening STOP code.
CONTROL V	WITH FUNCTIONS	Modifies print suppress modes and data by-pass modes by allowing ASCII controls, CR, LF, TAB, V. T. and FORM to be received by printer (and the punch in the case of data by-pass). This allows the page printer to advance across and down a form when a section is not used.
CONTROL W	CARD EJECT	Commands a card reader to zip out the card being read. This appears as a lead on which an electrical pulse is provided to the card reader.

3.23 A block of 8 unassigned internal control codes is provided for special applications. These are the code combinations assigned in ASCII to data delimiters S_0 through S_7. The internal control code suppression feature includes these code combinations. The internal control code recognition circuit does not recognize these control codes but the associated relays have enough spare contacts to accommodate all these codes. Three of these codes can be generated directly by the keyboard. The others can be entered into a program tape by over punching two different characters. In terms of the corresponding data delimiters, the control codes can be punched by the following keyboard operations:

S_0	CONTROL X
S_1	CONTROL Y
S_2	CONTROL Z
S_3	CONTROL C, ~~backspace~~, ~~CONTROL X~~
S_4	CONTROL D, ~~backspace~~, ~~CONTROL X~~
S_5	CONTROL E, ~~backspace~~, ~~CONTROL X~~
S_6	CONTROL F, ~~backspace~~, ~~CONTROL X~~
S_7	CONTROL G, ~~backspace~~, ~~CONTROL X~~

3.24 Data inputs introduce both ASCII control codes and internal control codes. This requirement is often dictated by the source of the data. For example, by-product tapes from the set may be reprocessed later in the flow of a business process. Such tapes contain no internal control codes but might contain ASCII controls. Similarly, data tape or line data received from an ASCII communications system might include ASCII control codes functional in that system. The ASCII control codes in such situations are treated as if they were data: the internal code recognition is turned off as a data input device is called in. Access to internal controls from data input devices can be direct or indirect. Direct access is provided by enabling internal control code recognition with DC_0. This alternative is available if the data tape or other input media are not used in communication with any equipment other than the set. The curical control DC_0 will not appear in these cases by definition of the ASCII. The indirect access to internal controls is available without this restriction. The ASCII control code DC_1 will call in the program tape reader which can introduce the internal control code and return control to the data input device. DC_1 may be used by the switched service Data Interchange Code to call in a remote tape transmitter (XON) with the implication that the station sending the DC_1 will immediately stop sending. The use of DC_1 by the set is a consistent extension of this use. This compatibility will be demonstrated in the following paragraphs.

3.25 A remote input device can supply data directly to the set during data processing or with paper tape buffering. First consider the case of on-line processing. The remote transmitter is turned on by sending XON or a proper code sequence. Since this will normally be sent from a program tape, it must be followed by INTERNAL CODE DATA INPUT 2 (or 3) or INTERNAL CODE STOP to stop the tape reader. To return to the program tape reader either at the conclusion of the data or to introduce an internal control, the remote transmitter must send DC_1 (XON) which can be recognized in the stunt box by addition of appropriate function bar and contacts to the stunt box. The distant transmitter must stop after sending XON. This may be done by sending the sequence XON-XOFF-DELETE. The tape reader must be programmed with one internal control character to allow time for the DELETE character to clear the page printer following the sequence XON-XOFF-DELETE.

3.26 Transmission from the set during processing is perfectly compatible with the use of ASCII control codes in the communication facility. All internal control codes are suppressed and any required ASCII control codes can be generated by putting the set in the "normal mode." The same statements hold for subsequent transmission of by-product tapes. Since there is never DC_0 in the by-product tape the program control switch can be on or off.

3.27 The set will stop whenever DC_3 (XOFF) is read in the tape reader or in a parallel signal data input device.

3.3 KEYBOARD DESCRIPTION

3.31 The keyboard has four rows of keys. The alphabet, numerals and those symbols shown on bottom half of keytops are generated when the keytop is struck. The code combinations for the symbols shown on the upper half of the keytops and others not shown are generated by holding the SHIFT key down while the associated key is struck. The non-printing control code combinations not available as primary keys are generated by holding the CTRL key down while the associated keytop is struck.

3.32 The keyboard is equipped with a parallel electrical signal output feature. This keyboard is for systems where character recognition, hybrid control or output to foreign equipment is necessary.

3.33 The keyboard provides an array of keys for typist input and contacts on each code level for a simple parallel output.

3.34 The unit operates at 60, 75, or 100 WPM using standard Model 28 speed change gears.

3.35 This is an eight level keyboard generating the ASCII code. The eighth level is generated as an even parity bit.

3.36 In appearance, the unit is very similar to the Model 35 serial keyboard reperforator bases except that the serial signal generator contact mechanism is removed and code reading contacts are added.

3.37 The unit employs a "Shift" and "Control" key to provide access to needed code permutations beyond those provided by the primary keys.

3.38 Single pole, double throw code reading contacts are provided for the permutation output. They should not be used to make or break current; the auxiliary contact is provided for this purpose. The closure or operate time of the contacts varies depending on whether the key was depressed at the start of the keyboard cycle or depressed during the previous cycle. The operate time, therefore, is non-definable except that operation always occurs by the 0^{O} point of keyboard shaft rotation. The unoperate time occurs approximately 35 MS from the start of the keyboard cycle (or shaft rotation). The unoperate point will vary depending on adjustments and tolerances.

3.39 An auxiliary contact is provided (normally open) which operates after the operate point of the code reading contacts. The unoperate point occurs before the unoperate time of the code reading contacts. Closure time is theoretically between 6^{O} and 105^{O} of the keyboard cycle (27.5 MS). The use of 48 V DC below 100 MA with less and 200 volt transients will provide an acceptable life.

3.301 The keyboard consists of discrete sub-assemblies attached to an aluminum box frame similar to the Model 28 construction. Removal of the unit from the cabinet can be achieved by removal of four mounting studs and the loosening of the cabinet front panels.

3.302 A 3600 RPM synchronous motor is used to drive the keyboard for most applications. However other motors may be used.

3.303 A tape supply container for the reperforator is supplied.

3.304 In addition to normal code keys, the mechanical repeat, local carriage return, local line feed, local single line feed, local backspace and break release keys are provided. The local backspace key operates the printer mechanically and provides a contact output to operate the backspace magnet of a reperforator.

3.305 A contact assembly is provided which mechanically locks on receipt of a break output from the page printer. These contacts are brought out thru the keyboard connector and are used to stop the tape reader, blind the keyboard, etc. on receipt of break. The break release key unlatches the mechanical lock to reset the contacts to normal.

Sequence of Operations

Manual Input

3.306 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 up position by the manual input into the keytop. Hence, the code lever may stop some of the code bars, depending on the presence or absence of coded tines, from moving to their extreme right hand position. Those code bars that are permitted to fall to the extreme right move the corresponding latch levers in the code reading contact mechanism, unlatching the intermediate levers that are associated with the contacts. This allows a normally open contact to make contact on a "mark" pulse introduced in the code. Those code bars that are stopped because their teeth engage the activated code lever, remain in their normal left hand position, the "space" position.

3.307 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.

Mechanical Input

3.308 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 keyboard reset drive 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.

3.309 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 keyboard reset drive 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.

3.310 The arrangement of the cam assembly is such that it contains an eccentric on the front end of the cam assembly, which drives an eccentric follower arm and an auxiliary cam actuating an associated contact assembly in the area of the clutch. At approximately 6^{O} of cam rotation the auxiliary cam follower permits the auxiliary contacts to be closed for a period of 105^{O} of rotation, and opens up prior to the start of resetting the selected code bars to the rest position.

3.311 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.

3.312 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 $92\text{-}1/2^{O}$. At 145^{O} 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^{O} 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, 100 wpm.

3.313 Reset of the code reading contact mechanism is accomplished 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

code reading contact out bail drives the intermediate levers to their latched position.

3.314 "Shift" with even parity. Depression of this key and its related mechanism will invert the number five and eight 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 code lever prevents the No. 5 and No. 8 code bars 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 code lever engaging a diagonal camming surface on the underside of the shift lock bar and the transition bar, directing their motion to the left. The shift lock bar blocks out the selected group of keys as required by this specific unit while the 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 No. 5 inversion and No. 8 inversion code bars if coded marking, to fall only when the complimentary key is depressed. These inversion and associated code bars upon falling to the right unlatch their respective levers in the code reading contact mechanism permitting the proper combination of marking bits to be presented from the code reading contacts including even parity.

3.315 "Control" key with even parity. Depression of this key will cause the number seven bit to space and invert the number eight 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 Control key down while depressing a complimentary key. The control key code lever engages a diagonal camming surface on the underside of the "transition" code bar, directing its motion to the left, as it blocks the No. 7, No. 8 and No. 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 No. 8 inversion code bar, if coded marking, to fall only when the complimentary key is depressed. This operation deletes No. 7 and inverts No. 8 in the selection of the regular assigned code of the complimentary key code, developing a control code with even parity.

Electrical Input and Control

3.316 All electrical input both DC and AC comes into and out of the keyboard through the electrical connector at the left of the base. This keyboard accommodates a synchronous motor.

3.317 The signal circuitry when employed with the auxiliary contacts operates at a line current of 100 MA at 48 V DC.

Functions - Secondary Manual Operations

3.318 Local Line Feed - Refer to Bulletin 280B.

3.319 Local Carriage Return Mechanism - Refer to Bulletin 280B.

3.320 Local Backspace Mechanism - Refer to Bulletin 280B.

3.321 Repeat Key Operation - Refer to Bulletin 280B.

3.322 Local Single Line Feed

3.3221 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.

3.3222 Receive break switch. Operation of a double blank mechanism associated with the printer actuates the receive break 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 electrical lock mechanism are actuated to their operating positions completing their designated functions.

3.3223 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.

3.4 PAGE PRINTER (See Bulletin 280B for further information)

3.41 The page printer types all the graphic characters in the ASCII. Certain French accents and characters and special symbols have been substituted for the standard graphics.

3.42 The page printer will tabulate horizontally in response to the TAB code combination; tabulate vertically and the typebox will return to the left-hand margin in response to the VT code combination; feed out a form and the typebox will return to the left-hand margin in response to the FORM code combination.

3.43 The typebox will return to the left-hand margin and page will be fed one line (or two lines as preselected) in response to the RETURN code combination.

3.44 The page will feed one line (or two lines as preselected) in response to the LF code combination.

3.45 The printer can be backspaced one character at a time in step with the by-product tape by operating the LOC BS key.

3.46 Printer spacing is suppressed on trema (¨), circumflex (^), and grave (`) accents.

3.47 The page printer recognizes a line break signal. The set responds by blinding the keyboard, lighting the BREAK lamp and stopping the reader and turning off the special programming controls.

3.5 TAPE READER (Also refer to Bulletin 280B for information pertaining to the transmitter distributor that is also applicable to the reader.)

3.51 The tape reader reads the eight code level one-inch wide paper tape that is prepared by the tape punch. The reader has a parallel signal output which the distributor converts to a serial signal. The reader is primed to start first. Other input devices are turned on by internal control code selection. The reader is also used to transmit from by-product tapes which are prepared off line. The tape-out pin in the reader turns off the program controls when there is no program tape in the reader.

3.6 TYPING REPERFORATOR - Also refer to Bulletins 255B and 280B (Non-Typing Reperforator) and 282B (Typing Reperforator) for further applicable information.

3.61 The typing reperforator perforates a one-inch paper tape with eight code levels and a series of feed holes between the third and fourth code levels. The reperforator features typing between feed holes, print suppression on control codes, last character visibility of typing, magnet-controlled tape backspace and fully perforated code holes. The reperforator can receive serial signals from the communication line or from the parallel signal input devices via the distributor.

3.62 The typing reperforator uses a one-color ribbon. The unit is arranged for electrical input of information only. This information input consists of a 500 milliampere sequential signal in an 11 unit format consisting of start pulse, eight information pulses and a double unit stop pulse. The 64 character type wheel prints the 64 graphics of the ASCII code. Printing is suppressed on receipt of the 64 control permutations of the same code.

3.7 MULTIPLE WIRE DISTRIBUTOR - See Bulletin 234B.

3.8 ELECTRICAL SERVICE UNIT - See Bulletin 280B.

3.600 TRANSMITTER DISTRIBUTOR BASE

3.601 The transmitter distributor base consists of a base with motor and provision for mounting and driving a Model 35 single shaft transmitter and a multiple wire distributor.

3.602 The base mounts in the ASR set cabinet to the left of the perforator so that perforated tape feeds directly from the perforator into the transmitter. The tape chute is mounted to the cabinet in the space between the transmitter and perforator to allow slack tape to drop through an opening in the cabinet.

3.603 The base mounts a transmitter and multiple wire distributor in the IDP set. In this application it is used to read tape fully perforated with the eight-level code. The information leaves the transmitter in the form of an eight wire parallel output, on which operations can be performed. The information in eight wire parallel form is then put into the distributor. It leaves the distributor as a sequential signal in an 11 unit format consisting of a start pulse, eight information pulses and a double unit stop pulse.

3.7 CABINET

3.71 The external dimensions of the set are as follows:

Floor to top of plastic lid	38.5"
Floor to underside of keyboard	25.5"
Floor area required	40.0" wide 21.0" deep

3.72 The complete set is housed in one package. This provides for ease of operation with minimum floor space. The control package is mounted on a relay rack within the bottom part of the cabinet. Access is provided by a removable front panel. Space is available on the relay rack for optional packages.

3.8 OFF-LINE OPERATION

3.81 The set can be operated off line so that the serial signals are contained within the set. This mode of operation is useful for preparing by-product tapes since it allows the transmission to take place later at maximum operating speed of 100 words per minute and it permits correction to be made in the by-product tapes off line before transmission. Other uses for the Local mode are for preparation of program tapes and for operator training and practice. The Local mode is provided by turning the rotary power switch to the LOC position.

4. CONTROLS

4.1 Private Line Communication

4.11 In the simplest applications of the set, communication is achieved by turning the rotary power switch to the ON LINE position and operating the set, that is operating keyboard or starting the tape reader or turning on the punch. An interlock is provided between the tape reader and the page printer blinding circuit such that the page printer can only be blinded when the tape reader is running. Thus messages sent from the outlying points cannot be lost because of a print suppress condition.

4.12 The BREAK pushbutton switch can break the signal line to interrupt transmission from another location in emergencies. The local printer detects the break signal and lights the lamp inside the BREAK switch.

4.2 Program Control

4.21 The PROGRAM CONTROL twist switch turns the program control features on and off. PROGRAM CONTROL switch on turns on an indicator lamp housed within the switch and enables all the internal controls. The switch should be turned off during the preparation of program tapes so that the internal control codes can be punched. (Normally they are suppressed.)

4.22 The PRINT SUPPRESS pushbutton switch starts a mode of operation in which the reader runs with page printer blinded. The other controls are unaffected. This mode of operation continues until the STOP code is read or until the operator pushes the STOP switch. After the reader stops, the blind is maintained until the last character cycle is finished. While the manual or automatic print suppress operation is in process, an indicator lamp housed in the PRINT SUPPRESS switch is lighted.

4.23 The DATA BYPASS pushbutton switch starts a mode of operation in which the reader runs with the entire serial circuit blinded. This mode allows skipping over fixed information in the program tape up to the end of the section as marked by the PRINT RESTORE code. The PRINT RESTORE code terminates this mode. The operator can bypass two contiguous sections of the tapes by reoperating the DATA BYPASS button or by simply holding it down until after the first PRINT RESTORE code is passed. The operator can manually terminate the operation by depressing the STOP button. The blind is then maintained long enough after the reader stops for the last character cycle to be finished. While data bypass is in progress, an indicator lamp housed within the switch is lighted.

4.3 Keyboard

4.31 The keyboard BRK RLS key works in conjunction with the break signal

recognition page printer feature. The BRK RLS key unlatches the contacts and restores the set to normal. (After a break is recognized the keyboard is blinded and the program controls are disabled.)

4.32 The LOC LF key is a non-transmitting key that causes the page printer to feed out paper as long as the key is depressed. The LOC S LF key is a non-transmitting key that causes the paper to feed one line each time the key is depressed. These keys are used together to rapidly advance a form to near the desired line and then step to the exact line one line at a time.

4.33 The LOC CR key is a non-transmitting key that allows the type box to return to the left margin when the key is depressed.

4.34 The LOC B SP key is a non-transmitting key that causes the page printer to back up the type box one character and causes the punch to backspace the tape one character every time the key is depressed. If the perforator is not turned on, the tape is not backspaced. If an auxiliary perforator is connected to the set, the tape there is backspaced if that perforator is turned on when the LOC B SP key is depressed.

4.35 The REPT key will cause a code combination selected on the keyboard to be repeated as long as the REPT key is held down.

4.4 Printer

4.41 The printer is normally on and will receive any serial signals that pass through the set except during the print suppression modes.

4.42 Printer backspace (one character at a time) is provided by the LOC B SP key. This keeps the printer in step with the by-product tape in the event corrections are made.

4.43 Print suppression is provided in the manual print suppress mode and in the data bypass mode by depressing the appropriate pushbutton switches.

4.44 The printer operates a margin indicator switch and lights the EOL lamp when the type box approaches the right hand margin. Return of the type box to the left extinguishes the lamp.

4.5 Tape Reader

4.51 The tape reader is started and stopped manually by depression of the START pushbutton switch and the STOP pushbutton switch. The reader on condition is signified by an indicator lamp housed within the START switch.

4.52 The tape-out switches in the reader have significant control functions. The tape reader must have tape in it for the program controls to be effective.

When tape is removed from the tape reader, the set reverts to the normal condition by turning off all the special controls. Punch control is an exception: the punch can be used when there is no tape in the program tape reader. If tape runs out of the tape reader, this turns the reader off and it is necessary to depress the START pushbutton switch after putting another tape in the reader to get it to start.

4.53 The READER STEP pushbutton switch causes the reader to step exactly one character, transmitting what it reads.

4.54 The control lever on the reader is spring biased to the run position. The control lever can be held in the free wheel position where it frees the feed wheel from the detent so that the tape can be positioned by hand to read particular character. The tight tape switch and the control lever can both stop the reader temporarily until released.

4.55 The reader is turned on in the print suppress modes and in the data bypass mode.

4.6 Typing Reperforator

4.61 The typing reperforator can be turned on and off by control codes or by hand. The manual controls are the PUNCH ON pushbutton switch and the PUNCH OFF pushbutton switch. In either case the lamp in the PUNCH ON switch is lighted when the typing reperforator is on. The typing reperforator can be on whether program control is used or not. Normal usage calls for the typing reperforator to be code controlled from the program tape. The versatile controls are valuable for special uses such as preparing program tapes, copying tapes and general communication.

5. TYPICAL OPERATING PROCEDURES

5.1 Order Writing and By-Product Tape Preparation

5.11 The following steps comprise a very simple demonstration of order writing with the communications set. The sequence applies to the order format shown on Figure 1.

5.12 Turn rotary switch to LOC position.

5.13 Insert program tape in tape reader.

5.14 Depress START pushbutton switch. This starts the tape reader which advances the form and the type box to the date zone and turns on the punch. Then the reader stops.

5.15 Enter the date from the keyboard. This could also be entered by a

fully automatic date generator as an optional auxiliary input device.

5.16 Depress START pushbutton switch. The program tape positions the typebox at the customer order number zone and stops.

5.17 Type the customer order number.

5.18 Steps 5.19 through 5.105 demonstrate use of an optional edge punched card reader. The same information could be entered at the keyboard on the basic set.

5.19 Push the START pushbutton switch. The program tape then calls in the customer information edge punched card which supplies the customer's name and address and returns control to the program tape. The tape reader stops.

5.101 Insert first item card in edge punched card reader.

5.102 Depress start pushbutton switch. The edge punched card reader is called in. It supplies the part number and then suppresses printing to enter price and discount schedule in the punched paper tape. Then the punch is turned off while the description is read in the edge punched card and typed on the form. The punch is turned back on and the control is returned to the tape reader which inserts the item number and stops.

5.103 Enter the quantity from the keyboard.

5.104 Repeat steps 5.101 through 5.103 for each item.

5.105 After last item, depress DATA BYPASS pushbutton switch. The program tape takes the set past the remainder of the item information zone. The reader stops at the delivery requirements zone.

5.106 Enter delivery requirements from keyboard.

5.107 Operate START pushbutton switch. The tape reader then advances the set to the shipping instructions zone and stops.

5.108 Keyboard the shipping instructions.

5.109 Depress START pushbutton switch. Under program tape control, the page printer will carriage return and form feed, the typing reperforator will feed out a short trailer of tape and turn off and the reader will stop. The form is done.

5.2 Data Transmission

5.21 The tapes can be accumulated or sent individually. The first step is to put the by-product tape in the tape reader.

5.22 Turn the rotary power switch to the ON LINE position.

5.23 Push the START pushbutton switch. The tape reader reads the tape and sends on line with the page printer monitoring. When the tape runs out the reader stops.

5.24 More sophisticated communication systems will require additional controls peculiar to the system.

5.3 Preparation of Program Tape

5.31 Analyze the form to be prepared to determine controls required. Then write the program as a sequence of controls and fixed information.

5.32 Turn the set on in the LOC mode and turn off the PROGRAM CONTROL twist switch.

5.33 Turn on the typing reperforator manually.

5.34 Keyboard all characters in the tape allowing suitable leaders and trailers for tape handling.

5.35 The program control tape can be spliced into a loop if desired.

6. OPTIONAL FEATURES

6.1 Edge Punched Card Reader

6.11 An edge punched card reader will be available at a later date which can be cable connected to the set as an auxiliary input device. Functionally it will serve the same basic purpose as a data tape reader with the added feature of card zip-out.

6.2 Selective Character Suppression

6.21 An optional applique to the control package will provide suppression of any preselected character effective at the typing reperforator, at the printer or on all serial signal output.

6.3 Data Input Devices

6.31 DATA INPUT 1 calls in an auxiliary input device. The control consists of a dc power circuit to turn the device on and off in response to (a) code selection of input device (b) reader start-stop control (c) reader hold on controls (d) reader hold on tabulation and form feed (e) READER STEP (f) PRINT SUPPRESS modes (g) DATA BYPASS mode and (h) release analogous to release by tape out contacts on data tape reader.

6.32 DATA INPUT 2 can call in an auxiliary input device. Besides having the control capability described in Paragraph 6.32, there is a special circuit for control of a stepping switch type of input device or electronic input device. This circuit turns on the distributor which drives the input device character by character. Another circuit connects the input device to the parallel signal input.

6.33 DATA INPUT 3 can also call in an auxiliary input device. The control features are identical to those described in Paragraph 6.31. In addition a spare make contact is provided which has been found useful for controlling an edge punched card reader.

6.34 The parallel signal input devices can generate ASCII code combinations and internal controls.

6.35 Serial input devices are restricted to ASCII codes. For them to gain access to the internal codes, the program tape must be called in. Control can be reverted to the tape reader from a serial input device by opening the release leads when the input device is finished. If the means is not available, DC1 recognition contacts can be added in the stunt box to open these leads.

6.36 Serial input devices require fill characters after certain ASCII control codes because the HOLD feature functions only on parallel input devices.

6.4 Auxiliary Receiver

6.41 One auxiliary receiver can be controlled by the set. This can be a parallel or serial signal receiving device. More than one auxiliary receiver can be driven but only one of them can be turned on and off by the basic control package.

6.5 Communication Via Data Set

6.51 The set can communicate via data sets. Many of these data sets require EIA business machine interface. For this purpose and for any other application where the set will be required to present an EIA interface, a separate Teletype data set coupler (TP198420) is available.

6.52 The by-product tapes and the serial signal, being purged of internal control codes, are fully compatible with transmission over switched service equipment.

6.6 Auxiliary Programmer

6.61 The control package can operate in conjunction with an external programming device. This can generate control codes or be integrally wired with the set control circuits.

NUTS AND BOLTS CORP.

ORDER FORM

ORDER NUMBER
12340

DATE: 11-30-63

CUSTOMER ORDER NO: 999

CUSTOMER:
John Doe Mfg. Co.
123 XYZ Street
Anywhere, U.S.A.

Part Number	Price	Discount Schedule	Description	Quantity	Item Number
19720	.10	A	Bolt	100,000	1
27968	.05	A	Nut	100,000	2

In By-Product Tape Only

Not in By-Product Tape

DELIVERY: ASAP

SHIPPING INSTRUCTIONS: Motor Freight

FIGURE 1

PART II

DETAILED DESCRIPTION

MODEL 35 IDP AUTOMATIC SEND-RECEIVE TELE-TYPEWRITER SET (ASR) FOR BELL OF CANADA

1. APPLICABLE WIRING DIAGRAMS (Furnished with the equipment).

UNIT	WIRING DIAGRAM
Keyboard	6454WD
Typing Reperforator	5984WD
Typing Unit	6396WD
Motor Unit	2900WD
Tape Reader	6391WD
Tape Reader Base	4348WD
Distributor	4790WD
Electrical Service Unit	6901WD
Panel W/Cable (Keys, Buttons, etc.)	6902WD
Panel W/Cable (Switches, etc.)	6380WD
Relay Panel Assembly	6909WD

NOTE

Detached contact schematic wiring diagram for the set is 6953WD and included as part of this specification.

2. DETAILED DESCRIPTION

2.1 Serial Signalling

2.11 The Serial Signal Characteristics - The serial signal is a 20 milliampere current-no current, 11 unit signal with a one unit start pulse, eight intelligence bits and a two unit stop pulse. The code is the American Standard Code for Information Interchange (ASCII). Basic operating speed is 100 words per minute. Slower speeds can be obtained by speed change gears. The set can be adapted to a 60 milliampere signal by making the changes.

2.12 Signal Line Circuit - Remote communication is accomplished by the serial signal. The external signal line is connected to screw terminals in the electrical service unit basic facilities package. The plus side of the line is connected to Terminal T-3. The circuit when operating passes through the line-local relay make contacts and the BREAK Switch to the stop pulse contacts on the distributor and to make Contacts 6-8 on Relays B1 through B8. These relays store the bit coding for the character being distributed. The contacts are wired to the corresponding levels of the parallel to serial distributor.

The common side of the distributor contacts is connected to the page printer selector magnet driver input which is in series with the punch selector magnet driver. The punch selector magnet driver is connected to the other make contacts on the line-local relay which in turn is connected to Terminal T-4 where the minus side of the signal line is connected.

2.13 Selector Magnet Driver - The two Selector Magnet Driver Assemblies 193485 couple the signal line to the selector magnets on the page printer and punch. The signal input is a 20 milliampere neutral signal. (For 60 milliampere signal applications the 182630 Circuit Card should be replaced by the 182631 Circuit Card.) The selector magnet driver has a 500 milliampere output to the selector magnets. The output current is held constant when the AC power input voltage fluctuates.

2.14 Local Signal

(a) The set can be operated with local battery for the signal. This provides a signal for off line operation of the set. Also, it prevents spurious characters from being punched or typed when the set is turned off and the external signal line is shunted past the set.

(b) Control is provided by the rotary switch which turns off the Line-Local relay whenever the switch is turned to LOC or OFF. When the switch is in the ON LINE position, the Line-Local Relay is energized from hot AC power on Terminal T-2 via fuse to Power Switch points 2 to 1 and through the coil of the relay to AC return (on Terminal T-1).

(c) The Line-Local Relay contacts switch the components from the external signal line to a local signal battery. When the Line-Local Relay is released (that is, when the rotary switch is in OFF or LOC position) one pair of break contacts on the Line-Local Relay shunts the external signal line past the set and another pair of break contacts completes the local battery signal circuit.

(d) The local battery is derived from the punch selector magnet driver power transformer. Two wires from the transformer are brought to a full wave rectifier on circuit card K. The positive 20 volts is connected to resistor M-R12 which limits the current to 20 milliamperes. This local signal circuit passes through the Line-Local Relay break contacts and then through the set components starting with the BREAK Switch, then the B-1 through B-8 Relay Contacts and the distributor, to the page printer selector magnet driver, the punch selector magnet driver to the return side of the battery.

2.2 Parallel Signalling

2.21 Basic Approach

(a) The tape reader and keyboard are parallel signal devices. The parallel

signal is repeated by a set of relays (B1 through B8). Contacts of these relays are connected to the distributor to send to the page printer, the punch and to remote receivers.

2.22 Character Generation from Keyboard

(a) When the keyboard is operated, circuits respond in the following order. Keyboard code reading contacts are set up with the code combination of the particular character. The keyboard auxiliary contacts close to cause the set to read the character from the code reading contacts. More specifically, the auxiliary contacts operate the Timing relay and the make contacts 1-3 on the Timing relay connect ground to the code reading contacts via the closed break contacts Run -2. The code reading contacts which are closed (marking) for the particular character connect ground to one side of the coil (Terminal 14) of associated B1 through B8 Relays. Since the other side of each coil (Terminal 1) is connected to the -48 Battery via current limiting resistor M-R3 through M-R10, the selected relays will operate.

(b) After the code reading contacts have been read, the B Relays must be locked for a long enough time to distribute the character as a serial signal. The Timing relay releases when the keyboard auxiliary contacts open. At this instant the locking circuits close through the Timing relay break contacts, diodes M-CR2 through M-CR10 and B Relay Make Contacts 11-13 to the corresponding B Relay Coils. Contacts on the B Relays have suitable timing for coding the distribution of the serial signal.

(c) The subsequent characters are processed in the same way. Notice the interlock provided by the distributor auxiliary contacts. These contacts are closed while the bits are being distributed. The function of the contacts in this circuit is to suppress operation of the Timing relay while a character is being distributed. This suppression is accomplished by shunting the coil of the Timing relay via Diode M-CR12.

2.23 Character Generation from Tape Reader

(a) The same circuits are used for keyboard character generation and tape reader character generation. The code reading contacts and auxiliary contacts involved are of course those associated with the particular input device.

2.3 Control Code Recognition

2.31 The special control codes are recognized in a relay contact tree. (The traditional page controls including CR, LF, FORM, TAB and V. TAB are recognized mechanically within the page printer and are not a part of this immediate discussion.) These special control codes are recognized both individually and as a group. The tree is only functional when a character has been found to be in the special control group. First consider the recognition

of this group of code combinations. The group is defined as all codes either having Bits 4, 6, and 7 spacing or having Bits 6 and 7 spacing and Bits 4 and 5 marking. The Control Code Recognition Relay operates when either of these conditions is met. The $\overline{M4}$ Relay is used to help control the Control Code Recognition Relay. Since $\overline{M4}$ coil is shunted by B4 make contacts 3-5 through Diode M-CR10, the $\overline{M4}$ Relay is operated with Bit 4 is spacing (B4 Relay released). The Control Code Recognition Relay is connected to ground whenever Bit 4 or Bit 5 is spacing by $\overline{M4}$ Make Contacts or by Diode N-CR6 and B5 Make Contacts 5-3. However, the Control Code Recognition Relay is prevented from operating when either Bit 6 or Bit 7 is marking by a shunting circuits from ground through B7 Make Contacts 3-5 and Diode N-CR2 and from ground through B6 Make Contacts 3-5 and Diode N-CR1 past the Control Code Recognition Coil to Resistor M-R2.

2.32 Having recognized the block of control codes we can progress to the individual control code recognition. The four Relays M1, M2, M3 and M5 provide the necessary contacts for control code recognition . Except that they can only operate when a character is a control code (this restriction is imposed by the Control Code Recognition Make Contacts 2-4 which are in series with the M1, M2, M3 and M5 Coils), Relays M1, M2, M3 and M5 are operated by Make Contacts 7-9 on Relays B1, B2, B3 and B5 respectively. Contacts of the relays are arranged in a tree configuration. Control pulses from ground through the tree act on the control circuits. In more detail, ground is connected to the tree through the distributor auxiliary contacts, Diode N-CR5, and the PROGRAM CONTROL Switch. The tree begins with $\overline{M4}$ Make Contacts 3-5 which connect to M5 Transfer Contacts 1 which branch successively through transfer contacts of Relays M3, M2 and M1. The outputs of the tree are labeled CA, CB, . . . , CW, on the detached contact schematic wiring diagram 6953WD.

2.4 Reader Control

2.41 Run-Stop

(a) The reader can be controlled both manually and automatically. The on-off control will be discussed here and the input device selection will be taken up after the idea of internal control codes has been introduced. The run relay controls the reader by completing the reader clutch trip magnet circuit when otherwise conditioned to go. The circuit to operate the tape reader runs from -48 volts through M-R-16, the clutch trip magnet coils, the tight tape switch, Data Tape Reader Control break contacts 3, Stepping Switch Control break contacts 3, Auxiliary Input Control break contacts 6, Run make contacts 6, Hold break contacts 2, Stop 2 break contacts 2, form feed switch and the tab switch to dc ground. The functions of most of these contacts are covered elsewhere.

(b) The Run relay is operated by the manual switch START which connects the Run relay to ground through the program tape reader tape out contacts and

the keyboard break switch. Run make contacts 3 lock up the Run relay through Stop 2 break contacts 5.

(c) The manual stop of the reader is accomplished by operation of Stop 1 and Stop 2 relays. The sophicated stop circuit is required to stop stepping switch tape input devices and terminate print suppress and data bypass operation. The STOP pushbutton switch connects -48 to the Stop 1 relay via N-R4. The relay coil is shunted by the distributor auxiliary contacts which connect ground through the diode N-CR6 and Stop 1 break contacts 5 past the Stop 1 coil to resistor N-R4. This shunt prevents operation of Stop 1 relay in the middle of a character. The Stop 1 make contacts 2 connect ground to the Stop 2 coil to operate Stop 2 relay. The Stop 2 break contact 2 in turn open the circuit to the tape reader clutch trip magnet stopping the reader. The Stop 1 relay locks up momentarily through the distributor auxiliary contacts if another character was read during the stop sequence. The Stop 2 relay locks up through Stop 2 make contacts 1, diode N-CR2, the STOP pushbutton switch, Stop 1 break contacts 5, and Stop 2 make contacts to ground. The significance of this timing is discussed in subsequent paragraphs.

(d) The automatic stop of the reader is accomplished by a character recognition circuit independent of the tree. This separate circuit is provided because the stop feature is wanted when the PROGRAM CONTROL switch is off. Recall that the PROGRAM CONTROL switch must be on for the tree to be functional so the tree is unsatisfactory for reader stop. When the STOP Code (Control S) is recognized the Run Coil is shunted by the following circuit. Ground is connected through the distributor auxiliary contacts through Diode N-CR5, M5 Make Contacts 9, M1 Make Contacts 9, M3 Break Contacts 9, M2 Make Contacts 9, $\overline{M4}$ Make Contacts 4-6, Control Code Recognition Make Contacts 3-5 past the Run Coil and through Resistor N-R2 to -48.

2.42 Reader Hold

(a) Many of the controls require that the reader pause momentarily before reading the next character. For example, carriage return operation requires the time usually assigned to two characters. This set will both carriage return and line feed on a single LF Character. The need for an extra timing character in the tape is obviated by the reader hold circuit. Similarly a timing character is not required after TAB, V. T., and FORM Control Codes because the reader hold circuit makes the reader pause until the reader control contacts on the page printer open to inhibit the reader. Another example is the automatic switching from one input device to another. Here for example the tape reader might call in a data input device. Since the command comes in the middle of the switching control character, the reader hold circuit is necessary to assure that the data input device cannot start in the middle of the switching control character.

(b) The Reader hold circuit consists of a slow release Hold relay which operates whenever Bits 6 and 7 are both spacing. Break Contacts 2 on this

relay open the reader clutch trip magnet circuits whenever the relay is operated. The test for Bits 6 and 7 is made by Transistor T-Q1. Ground is connected to the emitter by the keyboard or reader auxiliary contacts via diode T-CR1 or by distributor auxiliary contacts, the Run make contacts 5, Stepping Switch Control make contacts 6 and diodes T-CR7 and T-CR6. When bits 6 and 7 are both spacing, current goes through the transister base, Zener Diode T-ZD1 and Resistor T-R4 to -48. This base current turns on the transistor so that current can continue through the transistor collector to the primary winding of the Hold relay to -48. The Hold relay then operates the Hold Break Contacts 2 open the reader clutch trip magnet circuit. After the distributor auxiliary contacts close they complete a holding circuit from ground through the distributor auxiliary contacts, the Hold Make Contacts 4, Diode T-CR5 to the Hold primary winding. When the distributor auxiliary contacts open the Hold relay begins its slow release. The energy in the coil induces current in the secondary winding through Hold Make Contacts 8, Resistor Z-R1 and ~~M4~~ B4 make contacts 10-12. The current gradually decays until the relay armature falls away from the core. Purpose of the ~~M4~~ B4 contacts is to restrict the slow release to format effector code combinations.

(c) When a character is not a control character, Bit 6 or 7 is marking and the Transistor T-Q1 is biased off. This bias is provided through code reading contacts which connect ground via T-CR8 or T-CR9 to Resistor T-R4. Ground is supplied to the code reading contacts directly through Timing relay Make Contacts 1-3.

2.43 Reader Step - A circuit is provided for stepping the reader one character at a time. The READER STEP Push Button Switch can be depressed any length of time and the reader will read only one character. Another character can be read by releasing and again depressing the push button. The circuit performing this function contains a Limit relay which operates as soon as a character is read and inhibitsreading of another character. The READER STEP Make Switch in series with the Limit break switch delivers this pulse to the reader clutch trip magnets. The Limit relay operates when the reader auxiliary contacts close. Ground through the reader auxiliary contacts is connected through Diode T-CR1 and the READER STEP make switch very soon after the reader clutch is tripped. The Limit relay then locks up through its own Make Contacts 1 until the make switch under the READER STEP push button opens.

2.5 Punch Control

2.51 The paper tape perforator can be turned on and off by push button switches or by control codes. The control is achieved by blinding and unblinding the punch selector magnet driver by Contacts 6 or the Punch Control relay. The selector magnet driver is blinded by delivering current to the input independent of the condition of the signal line. The source of this current is a supplementary rectifier attached to the power transformer of the punch selector magnet driver.

This produces a +20 volts which causes current through Resistor K-R2 whenever Punch Control Break Contacts 6 are closed. The connection to the (+) input of the selector magnet driver keeps the selector magnet driver in the marking condition. Thus the Punch Control relay must be released to blind the punch ("off" condition) and the Punch Control relay must be operated to unblind the punch ("on" condition).

2.52 The Punch Control relay can be operated manually by depression of the PUNCH ON push button. This connects ground to Punch Control relay coil. The relay operates and locks up through Punch Control Make Contacts 2 and the PUNCH OFF normally closed push button switch. By operating the PUNCH OFF Push Button, the Punch Control relay can be dumped. Code control is available through the character recognition relay contact tree. The internal code combinations PUNCH ON will operate the relay and PUNCH OFF will dump it. On PUNCH ON ground is connected to the coil of the Punch Control relay from M1 Break Contacts 6 in the Tree via lead CR. On PUNCH OFF the Punch Control relay coil is shunted when ground is connected from M1 Break Contacts 7 on Lead CT past the relay coil to Resistor N-R1.

2.6 Internal Control Codes

2.61 Definitions

(a) The control codes can be used internally for the assigned special purposes and suppressed from the page printer, tape punch and signal line. This not only purifies the by-product tape and outgoing signal of controls not useful anywhere else in the system but also allows redefinition of the meaning of certain control codes combinations without conflicting with established definitions of ASCII. The code combinations as identified on the keyboard have been assigned the following special meanings when preceded by DC_0. (DC_0 always has this meaning.)

INTERNAL CONTROL CODES

CONTROL A	DATA INPUT 1
CONTROL B	AUXILIARY RECEIVER ON
CONTROL C	AUXILIARY RECEIVER OFF
CONTROL D	NORMAL CODE
CONTROL E	DATA INPUT 2
CONTROL F	DATA INPUT 3
CONTROL G	PRINT RESTORE
CONTROL P	DC_0
CONTROL Q	TAPE READER ON
CONTROL R	PUNCH ON
CONTROL S	STOP
CONTROL T	PUNCH OFF
CONTROL U	AUTOMATIC PRINT SUPPRESS
CONTROL V	WITH FUNCTIONS
CONTROL W	CARD EJECT

(b) For these codes to be treated as internal control codes they must be preceded by CONTROL P (DC_0). The precedence can be immediate or there can be intervening characters. The only restriction is that CONTROL D (NORMAL CODE) reverts the set to the normal mode in which the control codes are not suppressed. CONTROL P (DC_0) because it introduces this special mode is always suppressed whenever it occurs.

2.62 Internal Code or Normal Control Selection

(a) The DC_0 character must be recognized and stored to determine meaning of subsequent controls. The recognition of CONTROL P (DC_0) is done by the relay contact tree. Relays L-Internal Code Control and P-Internal Code Control are operated by a ground pulse from M1 Break Contacts 5 along Lead CP. The relays lock up through L-Internal Code Control Make Contacts 1, Diode P-CR1, PROGRAM CONTROL Switch, tape reader tape out switch and the keyboard break switch to ground. Contacts of these relays enable control responses when the internal control codes are recognized. The relays are released when CONTROL D (NORMAL CODE) is recognized by the relay contact tree. This shunts the coil of L-Internal Code Control by connecting ground from M1 Break Contacts 3 along Lead CD past L-Internal Code Control Coil to resistor L-R2. The P-Internal Code Control relay releases immediately because the locking path through L-Internal Code Control Make Contacts 1 opens.

2.63 Suppression of Internal Codes

(a) The internal codes are suppressed by blinding the distributor. This blind is a relay contact shunt of the distributor contacts. The Internal Code Blind make contacts 3-5 are in series with the Control Code Recognition make contacts 7-9. The Control Code Recognition relay was introduced earlier. The Internal Code Blind relay operates at the start of the DC_0 character and releases at the end of NORMAL CODE DATA INPUT 1, DATA INPUT 2, or DATA INPUT 3. Together these two relays blind all the internal control codes including those just mentioned.

(b) The Internal Code Blind relay is operated by an early recognition circuit. The DC_0 character causes ground to be applied through the keyboard break switch, program tape reader tape out switch, PROGRAM CONTROL switch, diode P-CR1, M4 make contacts 7-9, and B5 make contacts 10-12 and Internal Code Control break contacts 12 to the Internal Code Blind coil. On other characters which also have bit 4 spacing and bit 5 marking, operation of the relay is blocked by shunting from ground through either B6 make contacts 3-5 and diode N-CR4, B7 make contacts 3-5 and diode N-CR3, B1 make contacts 10-12, B2 make contacts 10-12 or B3 make contacts 10-12. M4 Make Contacts 7-9 and then through L-Internal Code Control Break Contacts 6. After Internal Code Blind relay operates it locks up through P-Internal Code Control Make Contacts 1 and Diode P-CR1. Meanwhile the shunt circuit is disabled by P Internal Code Control Break Contacts 6. When the NORMAL CODE Character

occurs the P-Internal Code Control relay releases early but the Internal Code Blind relay remains operated until the end of the character. The locking path during this interval is from ground through $\overline{M4}$ Make Contacts 7-9. M3 Make Contacts 11 and Internal Code Blind Make Contacts 2-4. The shunt is not effective on the particular code combination assigned to the NORMAL CODE character.

2.7 Choice of Input Devices

2.71 Four input devices other than the keyboard can be controlled by the control circuits. The basic input device is the tape reader. Three other input devices can be controlled. While they might be one of many types, the possibilities of stepping switches and edge punched card readers will be discussed as examples.

2.72 The control referred to is the selection by code of a particular input device. The primary input device is the Tape Reader. DATA INPUT 1 will turn on a second Tape Reader. DATA INPUT 2 will turn on a stepping switch (on some other device) and DATA INPUT **3** can be used to turn on an edge-punched-card reader. The TAPE READER ON character returns control to the tape reader. These input devices can be switched on and off in any order. A safety feature is built into the circuit so that only one input device can be on at a time.

2.73 The circuitry for selection of input devices consists of three relays. The released condition of all three relays gives control to the tape reader. Lead CA from the tree delivers ground to the Data Tape Reader Control relay via L-Internal Code Control Make Contacts 5 and the data tape reader tape out switch when DATA INPUT 1 is recognized. Data Tape Reader Control Make Contacts 1 lock up the relay while Break Contacts 1 dump the other two input device control relays. Similarly a pulse on lead CE from the TREE turns on the Stepping Switch Control relay when the DATA INPUT 2 Character occurs and a pulse on Lead CF turns on the Auxiliary Input Control relay when the DATA INPUT 3 Character is recognized. A pulse on lead CQ from the Tree past the relay coils to Resistor L-R1 will shunt down any of the three input device control relays when TAPE READER ON is recognized.

2.8 Control of Auxiliary Receivers

2.81 The basic set contains a page printer and a paper tape punch. Code control of an auxiliary receiver is provided in the basic set. This can be turned on and off by code. The control is provided by the Auxiliary Receiver Control relay which is turned on by a ground pulse on lead CB from the Tree through P-Internal Code Control Make Contacts 2. The relay will lock up through Auxiliary Receiver Control Make Contacts 2 until a ground pulse on lead CC from the Tree through P-Internal Code Control Make Contacts 1 past the relay coil to Resistor T-R3 shunts down the Auxiliary Receiver Control relay. The

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same kind of blinding circuit used on the basic punch is provided for controlling a punch or page printer using the selector magnet driver. Recall that the power transformer is used to develop +20 volts which through the current limiting resistor, T-R1 and the Auxiliary Receiver Control Break Contacts 6 deliver blinding current to the plus signal input of the selector magnet driver.

2.9 Manual Print Suppress

2.91 The PRINT SUPPRESS push button switch provides a way to read tape without printing. The punch control is not affected. This is useful for information to be transfered from the data tape or program tape to the by-product tape without typing on the local page printer. The blind is accomplished by putting current into the page printer selector magnet driver. The blinding circuit includes a rectifier attached to the page printer selector magnet driver, a current limiting Resistor K-R1 and a connecting path through the With Functions Break Contacts 6 and the Manual Print Suppress Make Contacts 3 to the plus signal input on the page printer selector magnet driver.

2.92 The blinding circuit is controlled by the Manual Print Suppress relay. The relay is operated by connecting ground through the PRINT SUPPRESS push button switch to the relay coil. The relay then locks up through the Manual Print Suppress Make Contacts 5 and Stop 2 break contacts 5. Then the manual print suppress operation can be terminated by depression of the STOP push button. Notice the use of Stop 1 make contacts 3 to delay the release of the Manual Print Suppress relay. This sustains the blinding condition long enough to complete the last character. The operation can also be terminated by recognition of the STOP Code. Then the relay is shunted down by a ground pulse through the distributor auxiliary contacts, Diode N-CR5, M5 Make Contacts 9, M1 Make Contacts 9, M3 Break Contacts 9, M2 Make Contacts 9, $\overline{M4}$ Make Contacts 6-8 and Control Code Recognition Make Contacts 3-5 past the Manual Print Suppress coil to Resistor N-R2.

2.01 Automatic Print Suppress

2.011 The print suppress mode of operation can also be introduced automatically by code. The termination of this mode differs from the manual print suppression in that automatic print suppression is terminated by the occurrence of the PRINT RESTORE Character.

2.012 The Automatic Print Suppress Make Contacts 6 are in parallel with the Manual Print Suppress Make Contacts 3 in the page printer blinding circuit. The automatic Print Suppress relay is operated by a ground pulse on lead CV from the Tree through P-Internal Code Control Make Contacts 3 to the relay coil. The relay locks up through Automatic Print Suppress Make Contacts 4 and Stop 2 break contacts 5. Manual termination of this mode also features the slow release of the relay by the holding current through Automatic Print Suppress make contacts 4 and Stop 1 make contacts 3 to ground. The operation

can be terminated by recognition of PRINT RESTORE. The lead CG from the Tree applies ground through P-Internal Code Control Make Contacts 5 past the relay coil to Resistor P-R1 shunting down the relay.

2.02 Data Bypass

2.021 The data bypass operation gives the operator flexibility of shipping sections of a tape that are not always required. This mode is initiated by depression of the DATA BYPASS Push Button Switch and is terminated by recognition of the PRINT RESTORE Character. The distributor output is suppressed in this mode so that neither tape punch, page printer nor the signal line receives any of the bypassed data.

2.022 The distributor contacts are shunted during this operation by the With Functions Break Contacts 2 and the Data Bypass Make Contacts 3. The Data Bypass relay is operated by a ground pulse through the Data Bypass Push Button Switch, the PROGRAM CONTROL Switch, the program tape reader tape out switch and the keyboard break normally closed switch. The relay locks up through the Data Bypass Make Contacts 2 and Stop 1 make contacts 3 to ground. The same slow release circuit (through Stop 1 make contacts) used for the manual and automatic print suppress modes is available when the data bypass mode is terminated by the STOP Push Button Switch. The termination of this mode by recognition of the PRINT RESTORE Code is accomplished by shunting down the relay by way of a ground pulse on lead CG from the Tree through P-Internal Code Control Make Contacts 5 past the relay coil to Resistor P-R1.

2.03 With Functions

2.031 The print suppress and data bypass modes can be modified so that all characters except the format effectors are suppressed. The purpose of this feature is to advance across and down a form even when blocks of information are print suppressed or bypassed. A With Functions relay controls this feature. The relay is code controlled, operating on the WITH FUNCTIONS Character and releasing on the PRINT RESTORE Character.

2.032 The With Functions relay operates on a ground pulse from the Tree on lead CV through P-Internal Code Control Make Contacts 4 to the relay coil. The relay locks up through the With Functions Make Contacts 4, Diode P-CR1, the PROGRAM CONTROL Switch, the program tape reader tape out switch and the keyboard break normally closed switch to ground. The relay is released by shunting down the coil with a ground pulse from the Tree on lead CG through P-Internal Code Control Make Contacts 5 past the coil to Resistor P-R1.

2.033 The manual and automatic print suppression modes are controlled by contacts in the page printer selector magnet driver blind circuit. The With

Function Break Contacts 6 open leaving the blinding circuit controlled by the parallel combination of Control Code Recognition Make Contacts 6-8, B6 make Contacts 7-9 and B7 Make Contacts 7-9. The B6 and B7 Contacts blind all the graphics and the Control Code Recognition contacts blind all control codes except the format effectors.

2.034 The data bypass mode is modified by the With Functions relay contacts in the distributor blinding circuit. The With Functions Break Contacts 2 open during this operation so that graphics are blinded by B6 Make Contacts 10-12 or B7 Make Contacts 10-12 in series with the Data Bypass Make Contacts 3. The control codes other than format effectors are blinded by Control Code Recognition Make Contacts 7-9 and Data Bypass Make Contacts 1.

DRAWINGS INCLUDED IN THIS SPECIFICATION

PART NO.	NAME
182630	Circuit Card Assembly (Selector Magnet Driver)
198248	Circuit Board
198260	Circuit Board
198273	Circuit Board
198275	Circuit Board
198277	Circuit Board
198279	Circuit Board
198296	Circuit Board

50239S

REVISIONS		
ISSUE	DATE	AUTH. NO

193485-SELECTOR MAGNET DRIVER ASSEMBLY 1 20MA

193485-SELECTOR MAGNET DRIVER ASSEMBLY 2 20MA

PAGE PRINTER SELECTOR MAGNETS

PUNCH SELECTOR MAGNETS

WIRING DIAGRAM 5983WD

WIRING DIAGRAM 5983WD

REFER TO SHEET 5 FOR NOTES

T-CR3 330 T-R2 910 T-R1 T-C2 T-C1 150

60MA 20MA

AUX RECEIVER CONTROL

KYBD BREAK SWITCH

BREAK SWITCH

MANUAL PRINT SUPPRESS

AUTO PRINT SUPP.

WITH FUNCTIONS

CONTROL CODE RECOG

DATA BY-PASS

INT CODE BLIND

SELECTOR SUPPRESS

PUNCH CONTROL

K-R3 330 K-CR1 K-R1 910 K-CR3 K-C2 150 K-R4 330 K-CR2 K-R2 910 K-CR4 K-C1 150

M-RI3 330 M-RI2 910

LINE LOCAL RELAY

(+) SIGNAL LINE

(−)

SCHEMATIC WIRING DIAGRAM FOR VCL 320 + LP 816 DATA COMMUNICATIONS SET

APPROVALS	
D AND R	E OF M

E-NUMBER	
PROD. NO.	6953 WD-1
DATE	
P.D. FILE NO.	3-A151/116.219A
DRAWN L.A.	CHKD.
ENGD. R.D.S.	APPD.

TELETYPE CORPORATION

#1

502395

REVISIONS		
ISSUE	DATE	AUTH. NO.

M-R14 2.2 K
M-CR12
M-CR11
TIMING RELAY
HOLD
STEPPING SWITCH CONTROL
LD CLUTCH TRIP MAGNET
T-CR5
T-Q1 2N398A
T-R4 3.9K
T-CR6
T-R5 3.9K
T-CR7
T-CR4
T-CR1
DIST AUX
PROGRAM TAPE READER AUX CONTACTS
LAK AUX CONTACTS
STEPPING SWITCH CONTROL
RUN
HOLD
Z-R1 51
T-CR12
3A8 P (-48V)
PARALLEL OUTPUT
M-R9 400
M-R10 400
M-R8 400
M-R7 400
M-R6 400
M-R5 400
M-R4 400
M-R3 400
M-CR1
M-CR2
M-CR3
M-CR4
M-CR5
M-CR6
M-CR7
M-CR9
M-CR8
T-CR8
T-CR9
T-CR10
T-CR11
Z-CR1
Z-CR2
Z-CR3
Z-CR4
Z-CR5
Z-CR6
PARALLEL INPUT
TIMING RELAY
STEPPING SWITCH CONTROL
RUN
N-CR7
SPARE
INT CODE BLIND
CONTROL CODE RECOG
KEYBOARD MULT. WIRE OUTPUT CONTACTS
PROGRAM TAPE READER MULT. WIRE OUTPUT CONTACTS

REFER TO SHEET 5 FOR NOTES

SCHEMATIC WIRING DIAGRAM FOR VCL 320 + LP816 DATA COMMUNICATIONS SET

APPROVALS	
D AND R	E OF M

E-NUMBER

PROD. NO. 6953 WD – 2

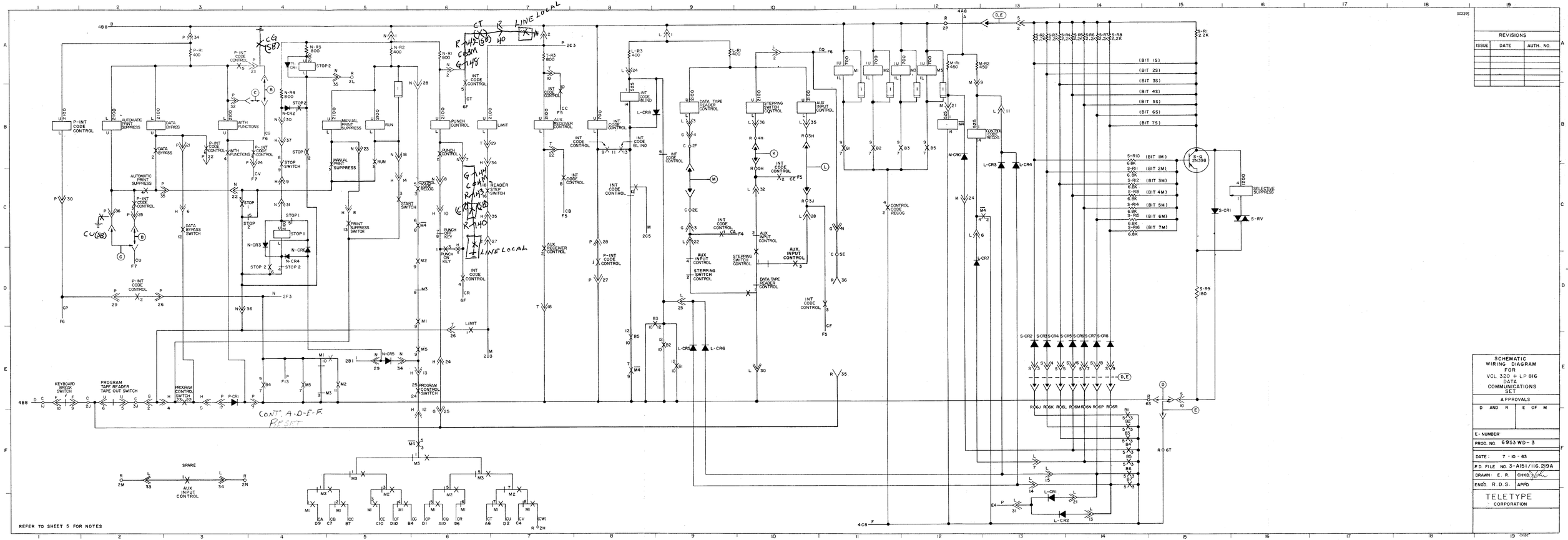
DATE 7-8-63

P.D. FILE NO. 3-A151/116, 219A

DRAWN R.D.L.	CHKD.
ENGD. R.D.S.	APPD.

TELETYPE CORPORATION

E TC 439 2-63


REVISIONS
ISSUE | DATE | AUTH. NO.
SCHEMATIC WIRING DIAGRAM FOR VCL 320 + LP 816 DATA COMMUNICATIONS SET
APPROVALS
D AND R | E OF M
E-NUMBER
PROD. NO. 6953 WD-3
DATE: 7-10-63
P.O. FILE NO. 3-A151/116.219A
DRAWN: E. R. CHKD.
ENGD. R.D.S. APPD.
TELETYPE CORPORATION
502395
REFER TO SHEET 5 FOR NOTES
CONT. A-D-E-F
SPARE
AUX INPUT CONTROL
P-INT CODE CONTROL
AUTOMATIC PRINT SUPPRESS
DATA BYPASS
WITH FUNCTIONS
MANUAL PRINT SUPPRESS
RUN
PUNCH CONTROL
LIMIT
INT CODE CONTROL
INT CODE BLIND
DATA TAPE READER CONTROL
STEPPING SWITCH CONTROL
AUX INPUT CONTROL
AUX RECEIVER CONTROL
CONTROL CODE RECOG
SELECTIVE SUPPRESS
KEYBOARD BREAK SWITCH
PROGRAM TAPE READER TAPE OUT SWITCH
PROGRAM CONTROL SWITCH
START SWITCH
STOP SWITCH
PRINT SUPPRESS SWITCH
DATA BYPASS SWITCH
READER STEP SWITCH
PUNCH ON KEY
PUNCH OFF KEY
CU(5B)
CG(5B)
CT R LINE LOCAL
LINE LOCAL
(BIT 1S)
(BIT 2S)
(BIT 3S)
(BIT 4S)
(BIT 5S)
(BIT 6S)
(BIT 7S)
(BIT 1M)
(BIT 2M)
(BIT 3M)
(BIT 4M)
(BIT 5M)
(BIT 6M)
(BIT 7M)
S-Q 2N398
S-CR1
S-RV
S-R9 180
L-CR1
L-CR2
L-CR3
L-CR4
L-CR5
L-CR6
L-CR7
M-CR6
S-CR2
S-CR3
S-CR4
S-CR5
S-CR6
S-CR7
S-CR8
ROOJ ROOK ROOL ROOM ROON ROOP ROOR
ROOT

502395

REVISIONS		
ISSUE	DATE	AUTH. NO.

COPY LIGHT TRANSFORMER
COPY LIGHT RECEPTACLE
COPY LIGHT
COPY LIGHT
PUNCH LIGHT
COPY LIGHT RECEPTACLE
PUNCH ON
PUNCH CONTROL
RUN
START
PRINT SUPPRESS
MANUAL PRINT SUPPRESS
DATA BYPASS
DATA BYPASS
PROGRAM CONTROL
PROGRAM CONTROL SWITCH
BREAK LAMP
E.O.L. INDIC. LAMP
KBD BREAK SWITCH
MARGIN INDICATING SWITCH
48 V.D.C. POWER SUPPLY TRANSFORMER
FUSE 1.5 AMP.
M-CR16
M-CR15
M-CR14
M-CR13
M-R11
M-R15
C1 900
M-R16 400
VERT. TAB CONTACT
HORIZ. TAB CONTACT
RETURN
POWER CORD AND PLUG
CONV. RECPT.
10 AMP FUSE
HOT SIDE
EOT (SB)
LINE LOCAL RELAY
SIGNAL BELL CONTACT (S.B.)
READER BASE MOTOR 19580
MOTOR START CAPACITOR
MOTOR START RELAY
MOTOR START RELAY
.8 AMP FUSE
AC
POWER SWITCH (LOCAL)
POWER SWITCH
POWER SWITCH (ON LINE)
PRINT SUPPRESS CONTACTS
LPR PRINT SUPPRESS MAGNET
LAK MOTOR UNIT
BACK SPACE CONTACT
AUX. RECEIVER CONTROL
PUNCH CONTROL
PUNCH BACK SPACE MAGNET
DATA TAPE READER CONTROL
STEPPING SWITCH CONTROL
AUX. INPUT CONTROL
TIGHT TAPE SWITCH
PROGRAM TAPE READER CLUTCH TRIP MAGNETS
READER STEP SWITCH
MANUAL PRINT SUPPRESS
RUN
AUTOMATIC PRINT SUPPRESS
DATA BYPASS
LIMIT
STOP 2
HOLD
DATA TAPE READER CONTROL
STEPPING SWITCH CONTROL
V.R.C. TT SW
DATA TAPE READER CL. TRIP

REFER TO SHEET 5 FOR NOTES

SCHEMATIC WIRING DIAGRAM FOR VCL 320 + LP 816 DATA COMMUNICATIONS SET

APPROVALS	
D AND R	E OF M

E-NUMBER	
PROD. NO.	6953WD-4
DATE	8-7-63
P.D. FILE NO.	3-A151/116 219A
DRAWN R.E.L.	CHKD.
ENGD. R.D.S.	APPD.

TELETYPE CORPORATION

NO. NOTES

1.

2. FOR ACTUAL WIRING DIAGRAMS OF INDIVIDUAL UNITS AND ASSEMBLIES SEE:

WD NUMBER	UNIT
6397WD	PAGE PRINTER - LP316
6454WD	KEYBOARD - LKX905
2900WD	MOTOR - LYM3
6901WD	ELECTRICAL SERVICE UNIT - LESU312
6900WD	RELAY PANEL ASSEMBLY - 199200
6902WD	PANEL - 197089
6389WD	PANEL - 199242
6938WD	TYPING REPERFORATOR - LPP905
6348WD	TRANSMITTER BASE - LCXB806
6391WD	TRANSMITTER - LXB02
6790WD	DISTRIBUTOR - LTB03

3. LEGEND:

- o S MOTOR TERMINAL BLOCK (ON KEYBOARD)
- o T POWER & SIGNAL LINE TERMINAL BLOCK (ON LESU)
- o C WIRING FIELD (ON LESU)
- o R WIRING FIELD (ON RELAY PANEL)
- o M MOTOR TERMINAL BLOCK (ON LCXB)
- >> F KEYBOARD CONNECTOR
- >> P PAGE PRINTER CONNECTOR
- >> E POWER PANEL CONNECTOR
- >> U PROGRAM TAPE READER CONNECTOR
- >> V DATA TAPE READER CONNECTOR **(NOT USED)**
- >> G RELAY PANEL CONNECTOR
- >> H SWITCH PANEL CONNECTOR
- >> J DISTRIBUTOR CONNECTOR
- >> K CIRCUIT CARD RECEPTACLE
- >> L " " "
- >> M " " "
- >> N " " "
- >> S " " "
- >> T " " "
- >> P " " "
- >> Z " " "

4. USE ON 60 CYCLE 117V AC POWER ONLY.

5. ALL APPARATUS SHOWN IN DE-ENERGIZED OR UNOPERATED POSITION.

NO. NOTES

6. 20-60 MA SIGNAL OPTION:

(20 MA) INDICATES WIRING FOR 20 MA SIGNAL

(60 MA) INDICATES WIRING FOR 60 MA SIGNAL.

THE 198200 PANEL IS NORMALLY WIRED FOR 20 MA OPERATION; THEREFORE, FOR OPERATING ON A 60 MA LINE, THE FOLLOWING CHANGES ARE NECESSARY:

MOVE WIRE ON M-17 TO M-18

MOVE WIRE ON K-E TO K-H

MOVE WIRE ON K-M TO K-K.

MOVE WIRE ON T-7 TO T-9.

THE 193485 SELECTOR MAGNET DRIVERS ARE INTENDED FOR USE WITH 20 MA SIGNAL. FOR 60 MA OPERATION THE 182630 CIRCUIT CARD MUST BE REPLACED BY THE 182631 CARD.

7. AUXILIARY RECEIVER OPTION:

(A) INDICATES WIRING WHEN AUXILIARY RECEIVER IS NOT USED. TO ADD A SERIAL SIGNAL AUXILIARY RECEIVER, REMOVE STRAP (A) AND CONNECT THE AUXILIARY RECEIVER SIGNAL INPUT TO R-3S (+) AND R-1P (-).

8. CONTROL CODE OPTIONS:

(B) INDICATES THE NORMAL WIRING WITH CONTROL RELAYS ONLY RESPONDING TO INTERNAL CONTROL CODES.

(C) INDICATES A WIRING MODIFICATION USED TO ALLOW CONTROL RESPONSES TO ASCII CONTROL CODES NOT NORMALLY ALLOWED

9. SELECTIVE CHARACTER SUPPRESSION OPTION.

(D) INDICATES THE ADDITION OF THE SELECTIVE CHARACTER SUPPRESSION CIRCUIT TO OPERATE ONLY DURING PROGRAM CONTROL MODE.

(E) INDICATES THE ADDITION OF THE CHARACTER SUPPRESSION CIRCUIT TO OPERATE AT ALL TIMES

10. MOTOR CONTROL RELAY OPTION:

(F) INDICATES A STRAP BETWEEN TERMINALS C-1H AND C-2H THAT CAN BE REMOVED AND REPLACED BY CONTACTS OF A MOTOR CONTROL RELAY WHEN REQUIRED

11. COPYLIGHT OPTION:

(G) INDICATES CONNECTION OF COPYLIGHT TRANSFORMER TO TERMINAL C-2G TO MAINTAIN COPYLIGHTS ON AT ALL TIMES.

(H) INDICATES CONNECTION OF COPYLIGHT TRANSFORMER TO TERMINAL C-3H TO TURN COPYLIGHTS ON ONLY WHEN THE SET IS TURNED ON.

NO. NOTES

12. NETWORK SYMBOLS:

1 INDICATES 195A NETWORK.

2 INDICATES 186A NETWORK.

13. STEPPING SWITCH OPTION:

(J) INDICATES A STRAP BETWEEN TERMINALS R-3M AND R-1J, ADDED WHEN A STEPPING SWITCH IS USED AS AN INPUT DEVICE. MORE GENERALLY, THIS IS USED WITH ANY INPUT DEVICE WHICH IS DRIVEN BY THE DISTRIBUTOR AUXILIARY CONTACTS

14. STEPPING SWITCH INPUT RELEASE OPTION:

(K) INDICATES A STRAP THAT CAN BE REPLACED BY A RELEASE CONTACT ON THE ASSOCIATED INPUT DEVICE.

15. AUXILIARY INPUT RELEASE OPTION:

(L) INDICATES A STRAP WHICH CAN BE ADDED WHEN AN AUXILIARY INPUT DEVICE IS USED WITH THIS CONTROL CIRCUIT. IF A RELEASE CONTACT IS REQUIRED ON THE INPUT DEVICE, IT SHOULD BE WIRED IN THIS LOCATION.

16. DATA TAPE READER CONTROL OPTION:

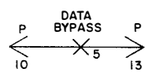
(M) INDICATES A STRAP WHICH CAN BE ADDED WHEN AN AUXILIARY INPUT DEVICE IS USED WITH THIS CONTROL CIRCUIT. IF A TAPE READER IS CONTROLLED BY THIS CIRCUIT, THE TAPE OUT SWITCH SHOULD BE WIRED IN THIS LOCATION.

17. ALL RESISTORS 1/2 WATT AND RESISTANCE VALUES IN OHMS, UNLESS OTHERWISE SPECIFIED.

18. ALL CAPACITANCE VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

19. CROSS REFERENCE BETWEEN SCHEMATIC WD AND ACTUAL WD ON CODE READING CONTACT TERMINALS MUST BE MADE THROUGH THE ASSOCIATED CONNECTOR TERMINAL DESIGNATION WHICH ARE SHOWN ON BOTH.

20. SPARE CIRCUIT



21. 6953WD CONSISTS OF:

6953WD-1
6953WD-2
6953WD-3
6953WD-4
6953WD-5 (NOTES)

502395

REVISIONS		
ISSUE	DATE	AUTH. NO.

SCHEMATIC WIRING DIAGRAM FOR VCL 320 + LP 816 DATA COMMUNICATIONS SET

APPROVALS	
D AND R	E OF M

E-NUMBER

PROD. NO. 6953WD-5

DATE 9-13-63

P.D. FILE NO. 3-A151/116.219A

DRAWN R.W.D. | CHKD.

ENGD. R.D.S. | APPD.

TELETYPE CORPORATION

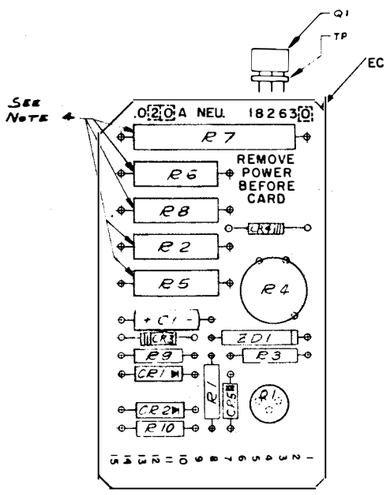
B TC 434/2-63

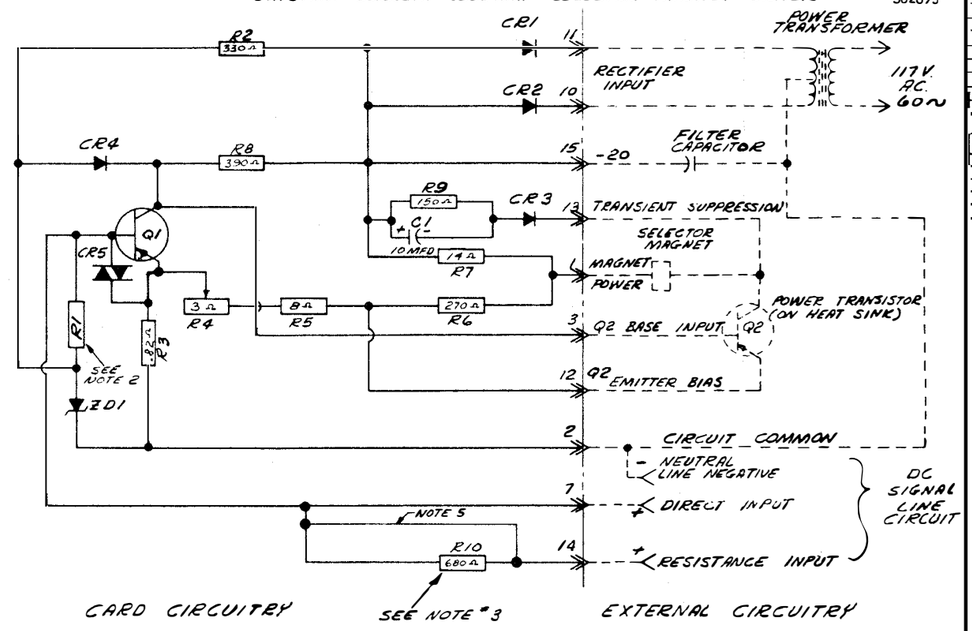
CIRCUIT CARD ASSEMBLY

182630-35

CONSTANT CURRENT .500 AMP SELECTOR MAGNET DRIVER 50239S

NO.	NOTES
1.	
2.	THE SELECTION OF THIS RESISTOR DEPENDS ON THE APPLICATION IN WHICH THE DRIVER IS TO BE USED.
3.	R10 IS USED ON 182630 ASSEMBLY ONLY.
4.	RAISE K2, 5, 6, 7, 8 1/32 TO 1/16 ABOVE CIRCUIT CARD
5.	THE 39603RM STRAP IS USED ON THE 182631 ASSEMBLY ONLY.





REF. DESIG.	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESIGNATION	LOCATING FUNCTION	USED ON	FOR
R1	182779	SELECT ONE SEE NOTE 2	RESISTOR 420 OHMS 1/2W	.010 AMP. SWITCHING	182630	.020A NEUTRAL LINE
"	182797		RESISTOR 135 OHMS 1/2W	.030 AMP. SWITCHING	182631	.060A " "
R10	182777	1	RESISTOR 680 OHMS 1/2W	INPUT CURRENT LIMITING	182630	DATA SET OPERATION
R10	39603RM	1	STRAP	.030 AMP SWITCHING	182631	.060A NEUTRAL LINE
R2	181669	1	RESISTOR 330 OHMS 2.5W	ZENER CURRENT LIMITING		
R3	182778	1	RESISTOR 0.82 OHM 1/2W	COMMON EMITTER BIAS		
R4	182773	1	RHEOSTAT 3 OHMS 2.5W	OUTPUT CURRENT ADJUST		
R5	181717	1	RESISTOR 8 OHMS 5W	Q2 EMITTER BIAS		
R6	182770	1	RESISTOR 270 OHMS 4W	Q2 EMITTER BIAS		
R7	182772	1	RESISTOR 14 OHMS 10W	Q2 COLLECTOR LOAD		
R8	182627	1	RESISTOR 390 OHMS 4W	Q1 COLLECTOR LOAD		
R9	182776	1	RESISTOR 150 OHMS 1/2W	Q2 COLLECTOR TRANSIENT LIMITING		
CR1	182520	2	DIODE 1N3193	POWER RECTIFIER		
CR2	182520		SAME AS CR1	" "		
CR3	181619	2	DIODE 1N482	COLLECTOR TRANSIENT LIMITING		
CR4	181619		SAME AS CR3	VOLTAGE CLAMPING		
CR5	178844	1	VARISTOR 100A	INPUT PROTECTION		
ZD1	182774	1	DIODE, ZENER 4.7V 5% 3/4W	REFERENCE		
C1	182628	1	CAPACITOR, 10 MFD, 25W VDC	COLLECTOR TRANSIENT LIMITING		
Q1	181671	1	TRANSISTOR, HIGH GAIN	INPUT SWITCH		
TP	144495	1	PAD, TRANSISTOR MOUNTING			
EC	182775	1	CIRCUIT BOARD, ETCHED			

CIRCUIT DESCRIPTION

THE SELECTOR MAGNET DRIVER CIRCUIT IS POWERED FROM A SOURCE OF 117 VOLT ALTERNATING CURRENT THROUGH A STEP DOWN ISOLATION TRANSFORMER. DIODES CR1 AND CR2 PROVIDE FULL WAVE RECTIFICATION OF THE REDUCED VOLTAGE TO -20 VOLTS DC AT TERMINAL 15. THE CIRCUIT COMMON IS CONNECTED TO TERMINAL 2 AND A POWER SUPPLY FILTER CAPACITOR IS CONNECTED BETWEEN TERMINALS 2 AND 15.

THE DIRECT CURRENT SIGNAL LINE CIRCUIT IS CONNECTED THROUGH TERMINALS 7 AND 2 . WITH AN ALTERNATE CONNECTION THROUGH R10 AT TERMINAL 14 PROVIDING A CURRENT LIMITING FUNCTION.

IN THE MARKING CONDITION, Q1 IS OFF-BIASED. WITH Q1 OFF, THE BASE OF Q2 WILL BE CLAMPED AT THE ZENER REFERENCE VOLTAGE BY DIODE CR4. THIS VOLTAGE CLAMP IS THEN TRANSLATED TO CURRENT REGULATION BY THE TRANSISTOR ACTION OF Q2. THE REGULATED MAGNET CURRENT IS ADJUSTED TO .500 AMPERES BY RHEOSTAT R4.

WITH THE SIGNAL LINE IN THE OPEN OR SPACING CONDITION, Q1 IS TURNED ON BY BASE CURRENT SUPPLIED THROUGH RESISTOR R1. THE POTENTIAL AT THE COLLECTOR OF Q1 WILL BE NEAR ZERO , OFF-BIASING Q2. WITH Q2 OFF, NO SELECTOR MAGNET CURRENT FLOWS, ALLOWING THE MAGNET TO RELEASE. DURING THE TURN OFF OF Q2 THE INDUCTIVE TRANSIENT DEVELOPED AT THE COLLECTOR IS SUPPRESSED BY THE NETWORK CONSISTING OF CR3, R9 AND C1.

"SNAP-ACTION" IS SUPPLIED TO THE CIRCUIT TRANSITIONS BY FEEDBACK IN THE EMITTER CIRCUITS OF TRANSISTORS Q1 AND Q2.

PARTS REQ.	NO. REQ.	USED ON	NO. REQ.

REVISIONS

ISSUE NO.	DATE	AUTHOR NO.
2		30-1260
1		30-5488
1		30-5495
3		30-5504

APPROVALS	
D AND R.	E OF M

E. NUMBER

PROD NO 182630-95

TELETYPE CORPORATION

182630-35

SCALE: 1/2

STOCK SPECIFICATION

DRAWN	PD FILE NO	DATE	SIZE	KIND	SHAPE	TEMPER
E.R.	30-158AAA					
DESIGNED	ENGINEER	CHECKED	APPROVED			
R.J.M.	R.J.M.					

ET 108206
TG 201 15-041

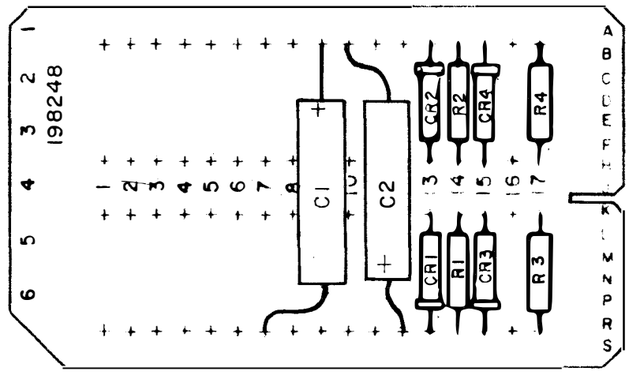
CIRCUIT BOARD

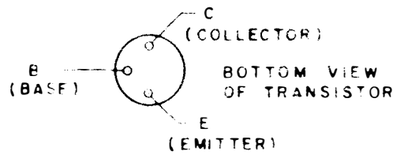
50239S

198248

REVISIONS

LTR	APP	AUTH NO
2	9-18-63	77527





REF DESIGN	TELETYPE PART NO.	TOTAL QTY	NAME AND DESCRIPTION	LOCATING FUNCTION
R 1	198264	2	910Ω RESISTOR	
R 2			SAME AS R1	
R 3	181669	2	330Ω RESISTOR 2 1/2 W	
R 4			SAME AS R3	
C 1	198266	2	150 MFD CAPACITOR 50 WVDC	
C 2			SAME AS C1	
CR1	182520	4	IN 2611 DIODE OR IN 3193	
CR2			SAME AS CR1	
CR 3			" " "	
CR4			" " "	
	177499	1	ETCHED CARD	

NOTE
CARD CONNECTIONS ARE REPRESENTED BY LETTERS
TEST POINTS ARE REPRESENTED BY NUMBERS

APPROVALS

D AND R	E OF M

E NUMBER

PROD NO 198248

DATE 6-29-63

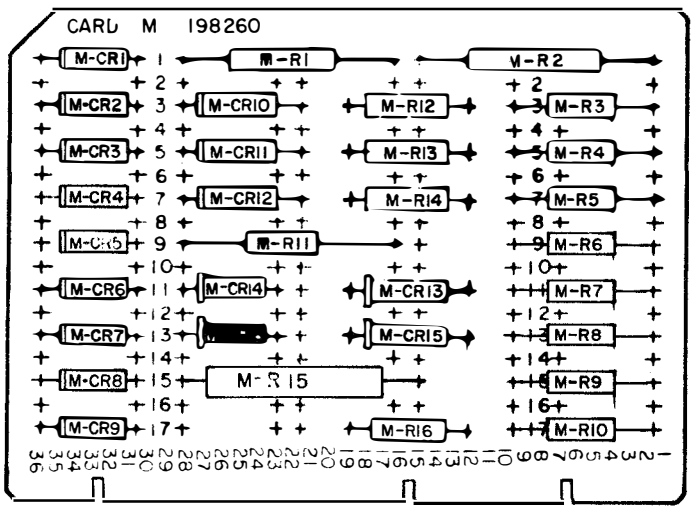
PD FILE NO. 3-A15/116.219A

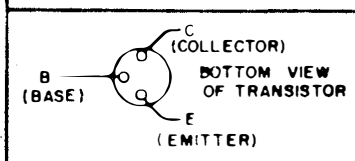
DRAWN RGK CHKD

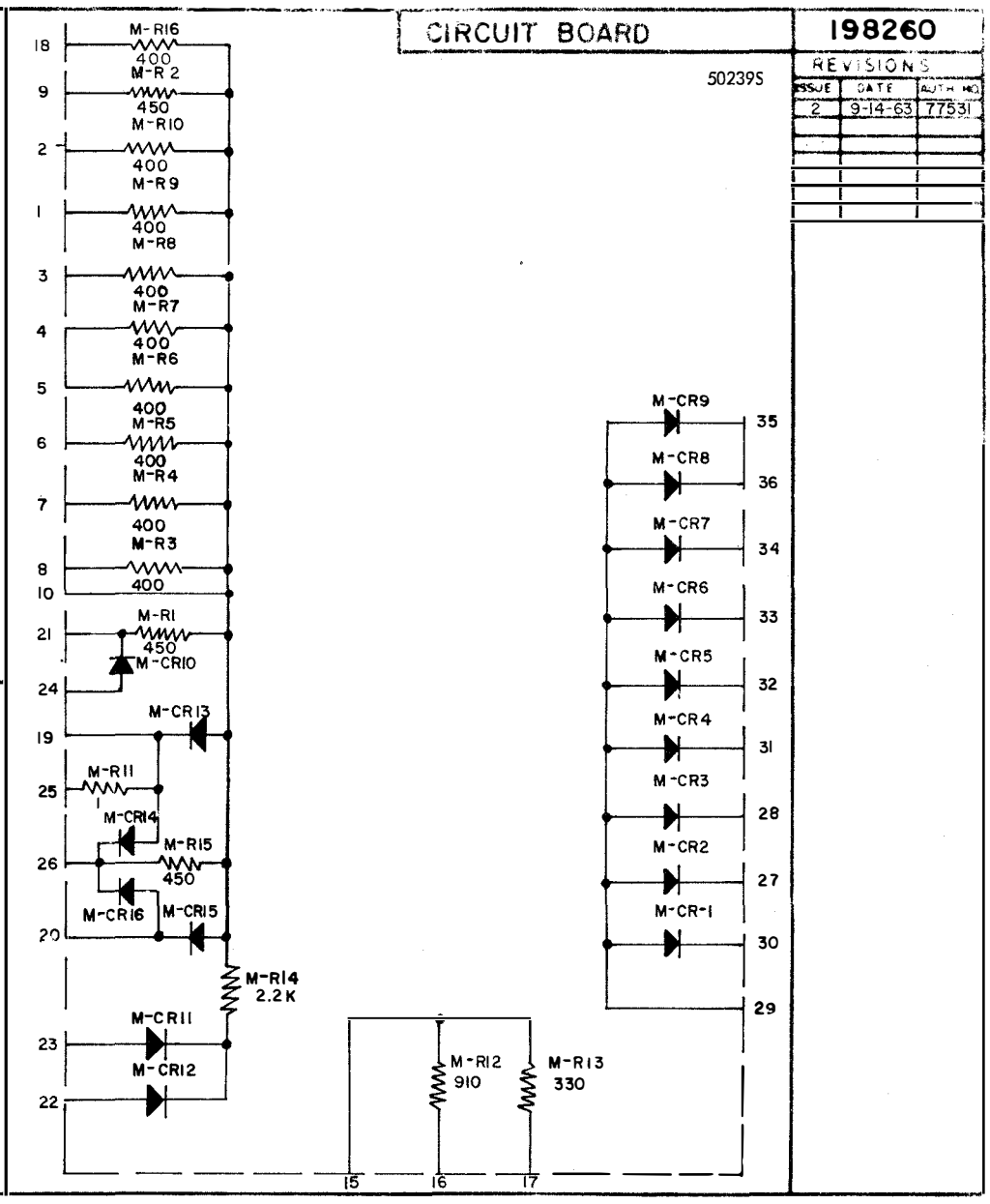
ENG. RDS APP.

TELETYPE CORPORATION

198248







CIRCUIT BOARD

50239S

198260

REVISIONS

ISSUE	DATE	AUTH NO
2	9-14-63	77531

REF DESIGN	TELETYPE PART NO	TOTAL QTY	NAME AND DESCRIPTION	LOCATING FUNCTION
M-R1	171462	3	450 Ω RESISTOR – 10 W	
M-R2			SAME AS R1	
M-R3	171522	9	400 Ω RESISTOR – 5 W	
M-R4			SAME AS R3	
M-R5			" "	
M-R6			" "	
M-R7			" "	
M-R8			" "	
M-R9			" "	
M-R10			" "	
M-R11	171463	1	1 Ω RESISTOR – 10 W	
M-R12	198264	1	910 Ω RESISTOR	
M-R13	181669	1	330 Ω RESISTOR – 2½ W	
M-R14	118213	1	2.2K Ω RESISTOR – 2 W	
M-CR1	181653	12	IN 645 DIODE	
M-CR2			SAME AS CR1	
M-CR3			" "	
M-CR4			" "	
M-CR5			" "	
M-CR6			" "	
M-CR7			" "	
M-CR8			" "	
M-CR9			" "	
M-CR10			" "	
M-CR11			" "	
M-CR12			" "	
M-CR13	171609	4	IN 3193 DIODE	
M-CR14			SAME AS CR13	
M-CR15			" "	
M-CR16			" "	
M-R15	171462		SAME AS R-1	
M-R16			SAME AS M-R3	
	198261	1	ETCHED CARD	

APPROVALS

D AND R | E OF M

E-NUMBER

PROD NO 198260

DATE 6-29-63

PD FILE NO 3-A151/116.219A

DRAWN J.W.P. | CHKD

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TELETYPE CORPORATION

198260

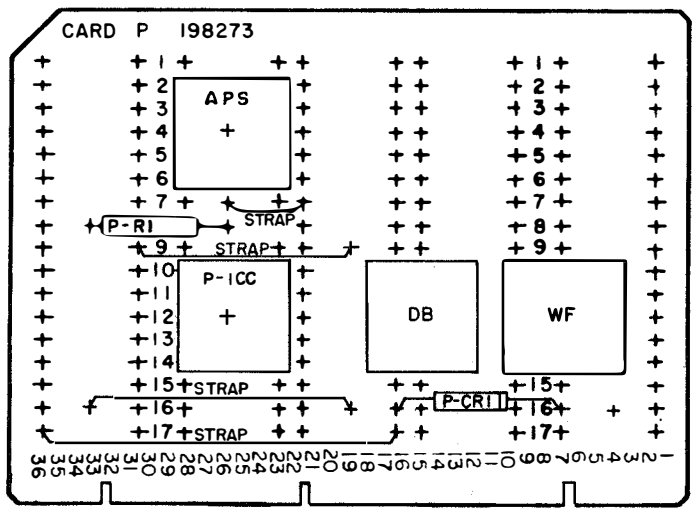
CIRCUIT BOARD

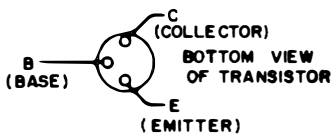
198273

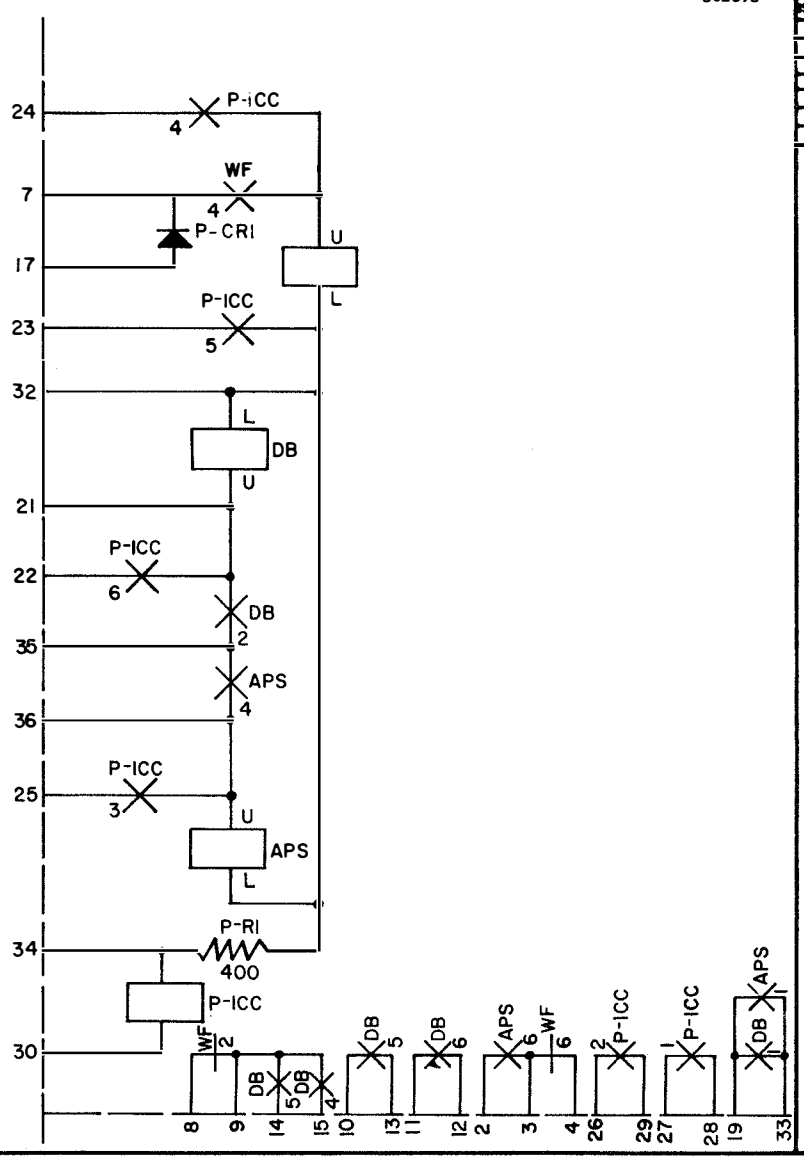
50239S

REVISIONS

ISSUE	DATE	AUTH NO.







REF. DESIGN.	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION
P-RI	171522	1	400 Ω RESISTOR - 5W	
P-CRI	181653	1	IN645 DIODE	
APS	198268	4	MB RELAY	AUTOMATIC PRINT SUPPRESS.
P-ICC			SAME AS APS	INTERNAL CODE CONTROL
DB			" "	DATA BYPASS
WF			" "	WITH FUNCTIONS
		4	STRAPS	
	198274	1	ETCHED CARD	

REF. DESIGN.	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION

APPROVALS

D AND R	E OF M
9/30/63	

E-NUMBER

PROD NO. 198273

DATE 6-29-63

PO FILE NO. 3-A151/116.219A

DRAWN J.W.P.	CHKD.
ENGG R.D.S.	APPD.

TELETYPE CORPORATION

198273

CIRCUIT BOARD

198275

REVISIONS

ISSUE	DATE	AUTH NO.
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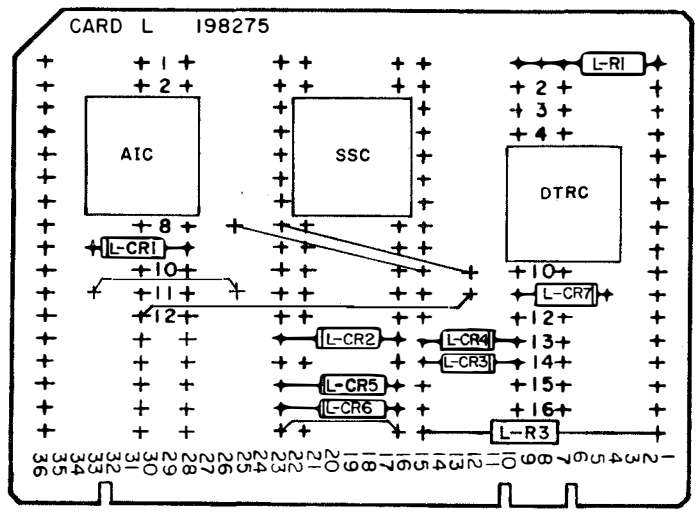
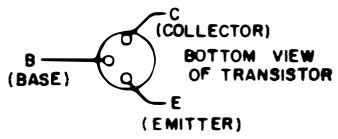
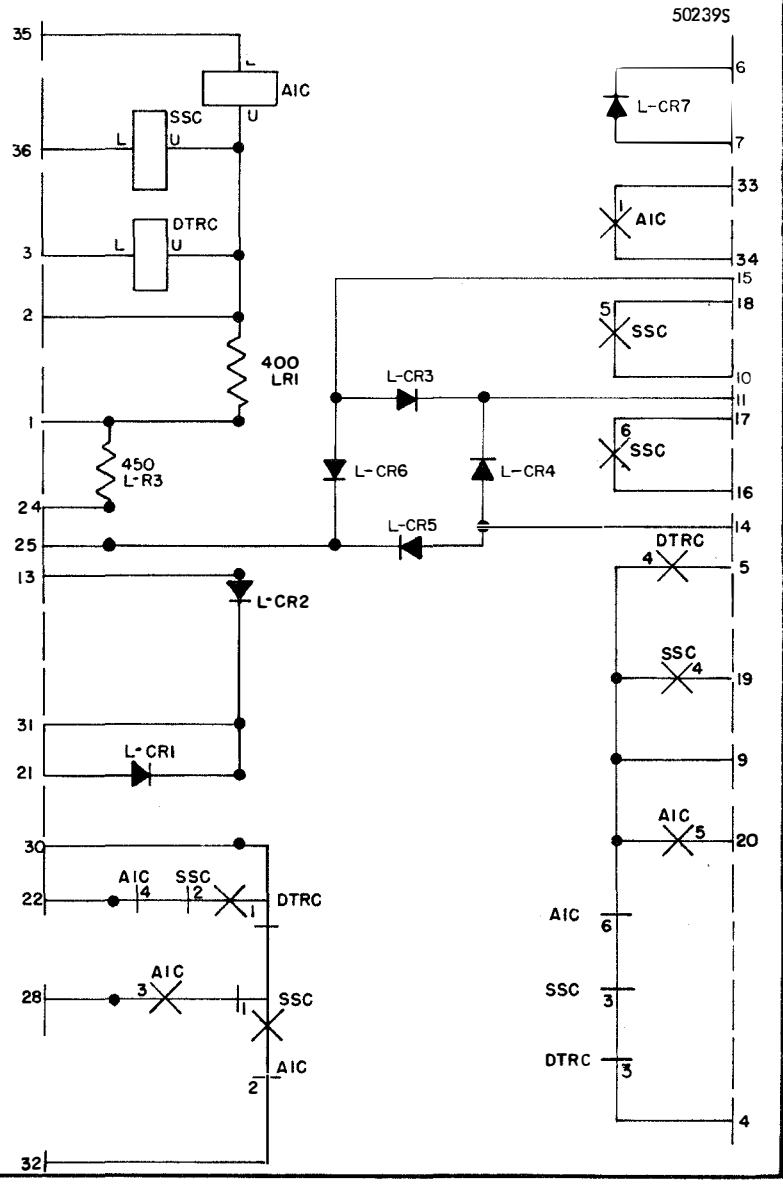
3	11-21-63	78124







REF. DESIGN	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION
L-RI	171522	1	400 Ω RESISTOR – 5W	
L-R3	171462	1	450 Ω RESISTOR – 10W	
L-CR1	181653	7	IN 645 DIODE	
L-CR2			SAME AS L-CR1	
AIC	198268	3	MB RELAY	AUX. INPUT CONTROL
SSC			SAME AS AIC	STEPPING SWITCH CONTROL
DTRC			" "	DATA TAPE READER CONTROL
		4	STRAPS	
	198276	1	ETCHED CARD	
L-CR3			SAME AS L-CR1	
L-CR4			" "	
L-CR5			" "	
L-CR6			" "	
L-CR7			" "	

REF. DESIGN	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION

APPROVALS

D AND R	E OF M

E-NUMBER

PROD NO 198275

DATE 6-29-63

PD FILE NO 3-A151/116.219A

DRAWN J.W.P.	CHKD.
ENGD R.D.S.	APPD

TELETYPE CORPORATION

198275

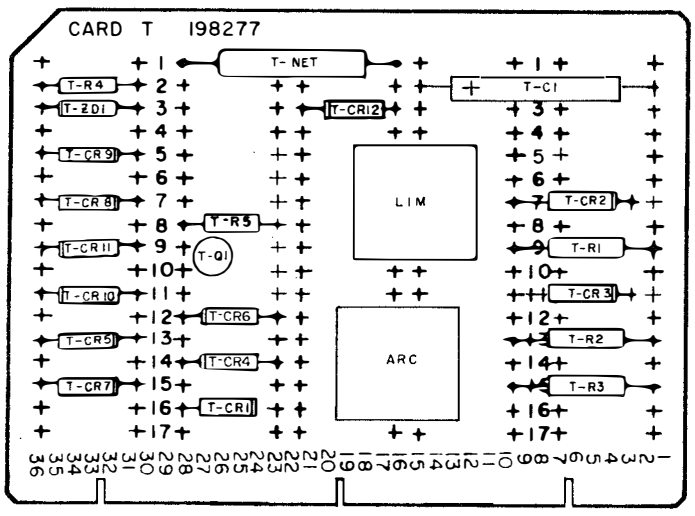
CIRCUIT BOARD

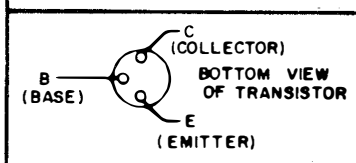
198277

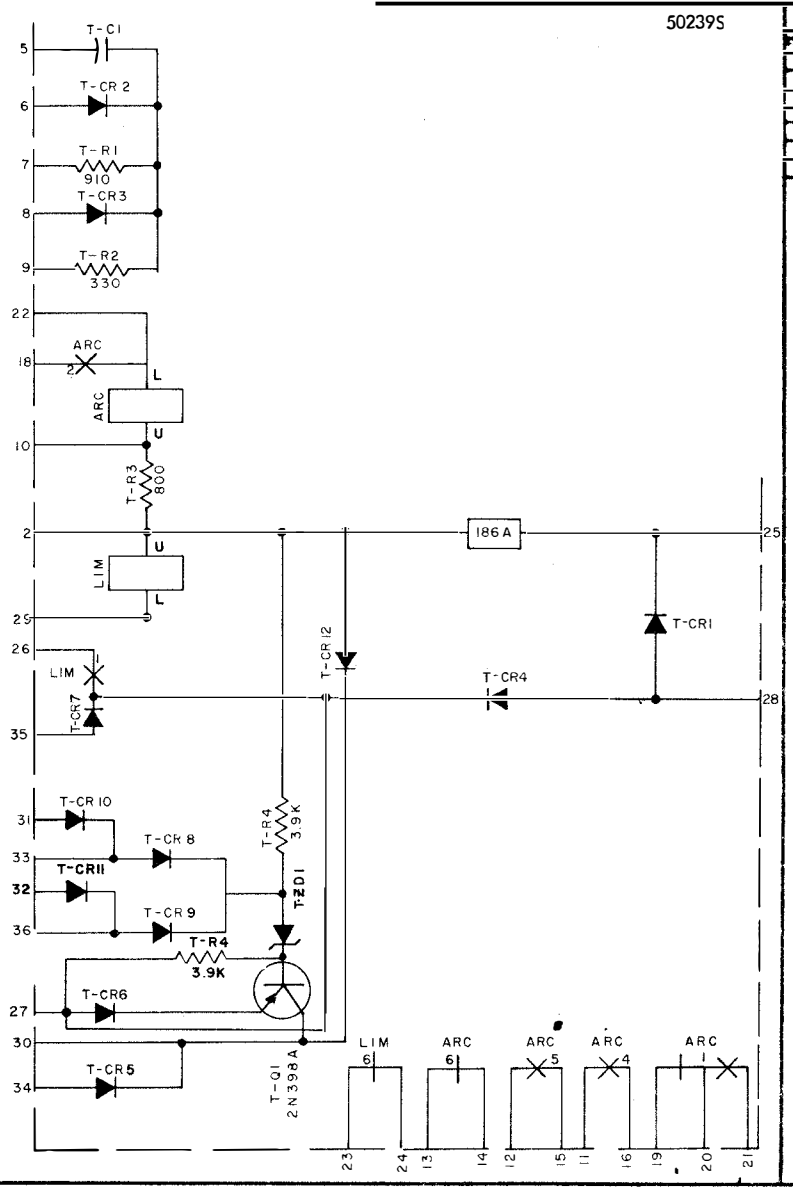
50239S

REVISIONS

ISSUE	DATE	AUTH NO
2	10-24-63	77544
3	11-22-63	79272







REF DESIGN	TELETYPE PART NO	TOTAL QTY	NAME AND DESCRIPTION	LOCATING FUNCTION	REF DESIGN	TELETYPE PART NO	TOTAL QTY	NAME AND DESCRIPTION	LOCATING FUNCTION
T-R1	198264	1	910 Ω RESISTOR 1-W						
T-R2	181669	1	330 Ω RESISTOR - 2 1/2 W						
T-R3	198265	1	800 Ω RESISTOR - 5 W						
T-R4	143667	2	3.9K Ω RESISTOR - 1/2 W						
T-R5			SAME AS T-R4						
T-CR1	181653	12	IN645 DIODE						
T-CR2			SAME AS T-CR1						
T-CR3			" "						
T-CR12			" "						
T-CR5			" "						
T-CR6			" "						
T-CR7			" "						
T-CR8			" "						
T-CR9			" "						
T-CRIC			" "						
T-CR11			" "						
T-NET 1	165027	1	186A NETWORK						
LIM	198268	2	MB RELAY	LIMIT					
ARC			SAME AS LIM	AUX. RECEIVER CONTROL					
T-CI	198266	1	150 MFD CAPACITOR 50W VDC						
T-ZD1	195247	1	IN757 ZENER DIODE						
T-Q1	177224	1	2N398A TRANSISTOR						
	144495	1	TRANSISTOR PAD						
T-CR4			SAME AS T-CR1						
	198278	1	ETCHED CARD						

APPROVALS

D AND P	E OF M

E NUMBER

PROD NO 198277

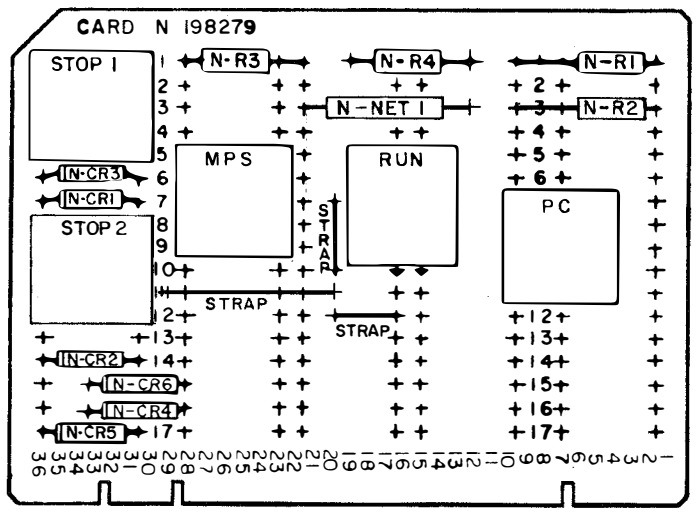
DATE 6-29-63

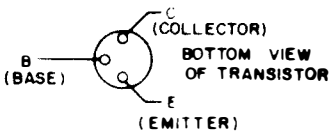
PD FILE NO 3-A151/116.219A

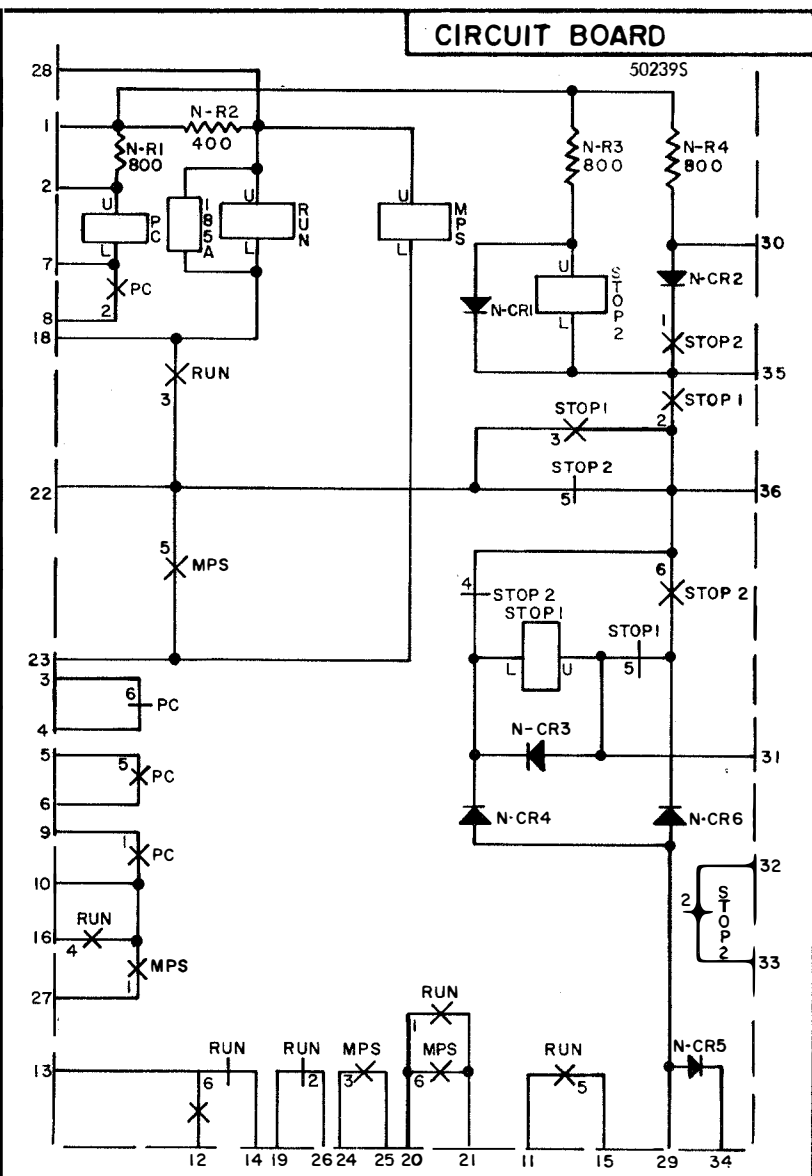
DRAWN J.W.P.	CHKD
ENGD R.D.S.	APPD

TELETYPE CORPORATION

198277







198279

REVISIONS

ISS'D	DATE	AUTH NO
2	9-14-63	77531

REF DESIGN	TELETYPE PART NO	TOTAL QTY	NAME AND DESCRIPTION	LOCATING FUNCTION
N-R1	198265	3	800Ω RESISTOR-5W	
N-R2	171522	1	400Ω RESISTOR-5W	
N-R3			SAME AS N-R1	
N-R4			" " "	
N-CR1	181653	6	1N645 DIODE	
N-CR2			SAME AS N-CR1	
N-CR3			" " "	
N-CR4			" " "	
N-CR5			" " "	
N-CR6			" " "	
N-NET 1	153631	1	185A NETWORK	
		3	WIRE STRAPS	
MPS	198268	5	MBIO RELAY	MANUAL PRINT SUPPRESS
RUN			SAME AS MPS	RUN
PC			" " "	PUNCH CONTROL
STOP 1			" " "	STOP 1
STOP 2			" " "	STOP 2
	198280	1	ETCHED CARD	

REF DESIGN	TELETYPE PART NO	TOTAL QTY	NAME AND DESCRIPTION	LOCATING FUNCTION

APPROVALS

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E NUMBER
PROJ NO 198279
DATE 6-29-63
PD FILE NO 3-A151/116.219A
DRAWN R.W.D CHKD
ENGR R.D-S APPD

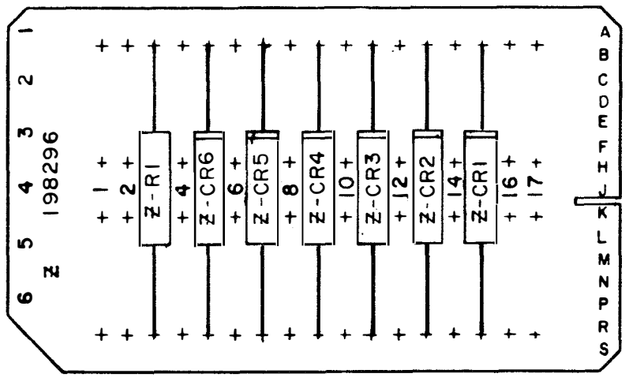
TELETYPE CORPORATION

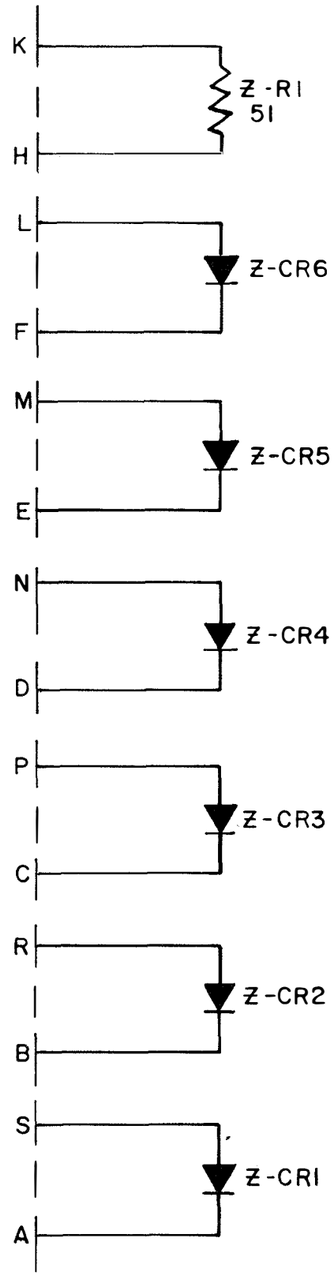
198279

CIRCUIT BOARD

198296

50239S





REF. DESIGN	TELETYPE PART NO.	TOTAL QTY.	NAME AND DESCRIPTION	LOCATING FUNCTION
Z-R1	143656	1	51Ω RESISTOR	
Z-CR1	181653	6	1N645 DIODE	
Z-CR2			SAME AS Z-CR1	
Z-CR3			" " "	
Z-CR4			" " "	
Z-CR5			" " "	
Z-CR6			" " "	
	172070	1	ETCHED CARD	

NOTE:
CARD CONNECTIONS ARE REPRESENTED BY LETTERS
TEST POINTS ARE REPRESENTED BY NUMBERS

ISSUE	DATE	AUTH NO

APPROVALS

D AND R	E OF M

E-NUMBER

PROD. NO. 198296

DATE 10-7-63

P.D. FILE NO 3-A151/116.219A

DRAWN RWD | CHKD

ENGD RDS | APPD

TELETYPE CORPORATION

198296

PART III

ADJUSTMENTS

MODEL 35 IDP AUTOMATIC SEND-RECEIVE TELETYPEWRITER SET (ASR) FOR BELL OF CANADA

1. KEYBOARD (Refer to Bulletin 280B for other applicable adjustments and spring tension requirements.)

1.1 Auxiliary Contact Adjustment (Figure 1) - With the keyboard drive mechanism in the reset position (clutch latched) the cam follower in its guide and on the high part of the cam, the contact gap shall be .005 to .015. To adjust, loosen the stud and spring post holding the timing contact bracket to friction tightness. By use of a screwdriver between the bracket upright and rear plate, adjust the bracket such that the contact has .005 to .015 gap. Tighten the nuts and recheck the clearance.

1.2 Code Reading Contact Adjustments - The following adjustments are to be made before the code reading contact assembly is installed. Each adjustment should start with the contact pile-up farthest from the handle of the bending tool:

a. Backstop - Normally closed contact (Figure 2) - The eight level normally closed contact designated Number 1 in Figure 2 shall be parallel to the mounting plate and in line with each other by .010". Bend the backstop to meet this requirement.

b. Spring Tension - Normally closed contact against backstop (Figure 3) - With the swinger held away from the normally closed contact, it shall require 2 to 6 ounces (applied perpendicularly at the contact point) to move the stationary leaf of the normally closed contact away from its backstop using an 8 ounce spring scale. Bend the stationary leaf of the normally closed contact to meet this requirement. To increase the tension of the leaf against the backstop, it may be necessary to bend the backstop away from the contact leaf to increase the tension, and reposition the backstop to meet the requirement of Paragraph 1.2a.

c. Normally Closed Contact Spring Tension (Figure 4) -It shall require 30 to 40 grams applied just below the contact point of the swinger to open the normally closed contact. Bend the swinger to meet this requirement.

d. Normally Open Contact Gap (Figure 5) - The normally open contact gap shall be .005" to .012" when removed from unit. Bend the normally open contact backstop to meet this requirement.

e. Normally Open Contact Spring Tension (Figure 6) - It shall require 35 to 50 grams applied just below the contact point to move the normally open contact spring away from its backstop. Bend the normally open contact spring to meet this requirement. To increase the tension of the leaf against the backstop, it may be necessary to bend the backstop away from the contact leaf, form the contact leaf to increase the tension, and reposition the backstop to meet the requirement of Paragraph 1.2b.

NOTE

The following adjustment is to be made after the code reading contact assembly is installed.

f. Marking Contact Gap (Figure 8) - With the keyboard drive mechanism in the rest position, (clutch latched) the contact gap shall be .015" to .025" (check outside levels only). To adjust, loosen the four screws securing the contact mounting bracket to the front and rear side mounting brackets, to friction tightness. Position the contact adjustment mounting bracket in the direction necessary to obtain the required contact gap. (CAUTION: Do not apply force to the contact pile-up.) Tighten the screws and recheck the gap.

g. Code Reading Reset Bail Adjustment (Figure 9) - With the keyboard eccentric drive arm extension (clutch disengaged) to the extreme left hand position, the bap between any one latch and its intermediate lever shall be .010 to .030. To Adjust, loosen the four mounting screws associated with the mounting plate to friction tightness. Position the code reading contact assembly to meet the requirement and tighten the screws and recheck the gap.

1.21 Special Requirements

NOTE

The following tests are to be made after the installation and contact adjustments have been made. The minimum signal lengths shall apply to the time between the latest start and earliest end of all contact traces.

(1) "Zero" the DXD Test Set as follows:

(a) With the unit in operation receiving "rubout" combination, connect the neon trace to code reading contact No. 1, and observe and note the point at which the trace begins. This point will "jump" so note only the latest reading.

(b) Repeat (a) for all code reading contacts.

(c) Choose the contact trace which starts the latest and set the "Start-Zero" mark of the DXD scale to this point on the trace.

(d) Record the earliest end of the neon traces for future adjustment references.

(2) Code Reading Contacts

(a) Zero the DXD

(b) Connect the neon trace lamp to the spacing or the normally closed contact (when the unit is in the idle position) of the code reading contact assembly. With the unit receiving "Space" characters the neon trace should be on continuously and free of breaks.

(c) Repeat (a) for each code reading contact except the 6th and 8th levels. Check these levels while the unit is receiving the character P.

(d) If the requirements cannot be met, refine adjustment 1.1.2.f.

(e) Connect the neon lamp to the normally open contact (when the unit is in the idle position) of the code reading contact assembly. With the unit receiving Letters, the combined code reading contact traces shall have a minimum signal length of 500 divisions (length between latest start and earliest end). All bounce must end within 20 divisions of the latest start of a contact trace. (Refer to Figure 7.)

(f) Repeat (b) for each code reading contact.

(g) If the requirement in (b) cannot be met, refine adjustment 1.1.2.f. attempting to adjust towards the maximum signal length or 1.1.2.a. for those contacts that do not meet requirements.

(h) If there is excessive bounce refine spring tensions 1.1.2.b. and 1.1.2.c.

(3) Auxiliary Contacts

(a) Zero the DXD as explained in Paragraph 1.1.21(1).

(b) Connect the neon trace to the normally open contacts (when the unit is running) of the auxiliary contact assembly.

(c) With the machine receiving letters the end of the neon trace should end at a minimum of 22 divisions before the earliest end of the code read contact traces. (Refer to Figure 7.) This includes any bounce.

(d) The start of the trace should begin at a minimum of 143 divisions after the DXD Start-Zero Mark. The minimum length of contact closure is 250 divisions. (Refer to Figure 7.)

(e) If the requirements cannot be met refine adjustment 1.1.1.

1.3 Receive Break Switch Adjustment (Figure 11)

1.31 Requirement: With the keyboard lock plunger in its downward position, and the function bail latched, the bail shall operate the contact pile-up with some overtravel to ensure continuity of the contacts. To Adjust, loosen the lock nut associated with the adjustment screw and adjust to meet the requirements. Tighten the lock nut and recheck for the overtravel or continuity.

1.4 Spring Tension Requirements

1.41 No. "8" Inversion Bar (Figure 13) - 3-1/2 to 4-1/2 ozs. (Unit in latched position). Unhook the spring at the code bar guide and pull it to the installed length with an 8 oz. scale.

1.42 Transition Code Bar (Figure 13) - 1/2 - 1-1/2 ozs. Unhook the spring at the code bar guide and pull it to the installed length with an 8 oz. scale.

1.43 Code Reading Contact Intermediate Lever (Figure 8) - 1 to 2 ozs. (Unit in latched position). Unhook the spring at the post and pull it to the installed length with an 8 oz. scale.

1.44 Code Reading Contact Drive Arm Extension (Figure 10) - 4 to 5 ozs. (Unit in latched position). Unhook the spring at the post and pull it to the installed length with an 8 oz. scale.

1.45 Code Reading Contact Reset Bail (Figure 10) - 1/2 to 1-1/2 ozs. (Unit in latched position). Unhook the spring at the post and pull it to the installed length with an 8 oz. scale.

1.46 Code Reading Contact Latch Lever (Figure 8) - 2 - 4 ozs. (Unit in latched position). Unhook the spring at the post and pull it to the installed length with an 8 oz. scale.

1.47 Receive Break Switch (Figure 11) - The requirements are met when the normally open contacts close and the normally closed contact opens between 10 to 16 ozs. With a 32 oz. scale placed in the center of the nylon pad, push down vertically. Adjust by using a spring bender until the requirement is met.

1.48 Local Single Line Feed Trip Link Vertical Spring (Figure 12) - 1-1/2 - 2-1/2 ozs. With typing unit removed, pull spring to installed length.

1.49 Local Single Line Feed Trip Link Horizontal Spring (Figure 12) - 1-1/2 - 3-1/2 ozs. With the typing unit removed, pull spring to installed length.

1.491 Local Line Feed Trip Link - 1-1/2 to 2-1/2 ozs. With typing unit removed, pull spring to installed length with an 8 oz. scale.

2. TYPING REPERFORATOR (Refer to Bulletin 282B for other applicable adjustments and spring tension requirements.)

2.1 Armature Air Gap and Downstop Adjustment (Figure 14) - With the armature resting on the downstop screw there should be .015 to .020 inch clearance between the magnet core and the armature at the closest point, and some to 1/32 inch clearance between the rear of the armature slot and the blocking link, as gauged by eye. To adjust, position magnet bracket with the screws loosened. Position the magnet armature downstop screw with the lock nut loosened.

2.2 Armature Upstop Adjustment (Figure 14A) - With the armature held against the upstop screw (magnet is not to be energized) and the ribbon carrier biased in an upward direction, there should be some to .005 inch clearance between the lower surface of the blocking link and the top surface of the ribbon carrier, and .004 - .007 inch clearance between the magnet core and the armature at the closest point. To Adjust, position the magnet armature upstop screw with the locknut loosened.

3. SIX-BUTTON KEYSET (Used in mode switch panel) Figure 15 - The contact gap indicated on Figure 15 must be .010 inch to .020 inch. To adjust, bend the break contact leaf to meet the requirement.

4. TAPE READER - See Bulletin 235B and applicable Transmitter Distributor Adjustments in Bulletin 280B.

5. MULTIPLE WIRE DISTRIBUTOR - See Bulletin 234B.

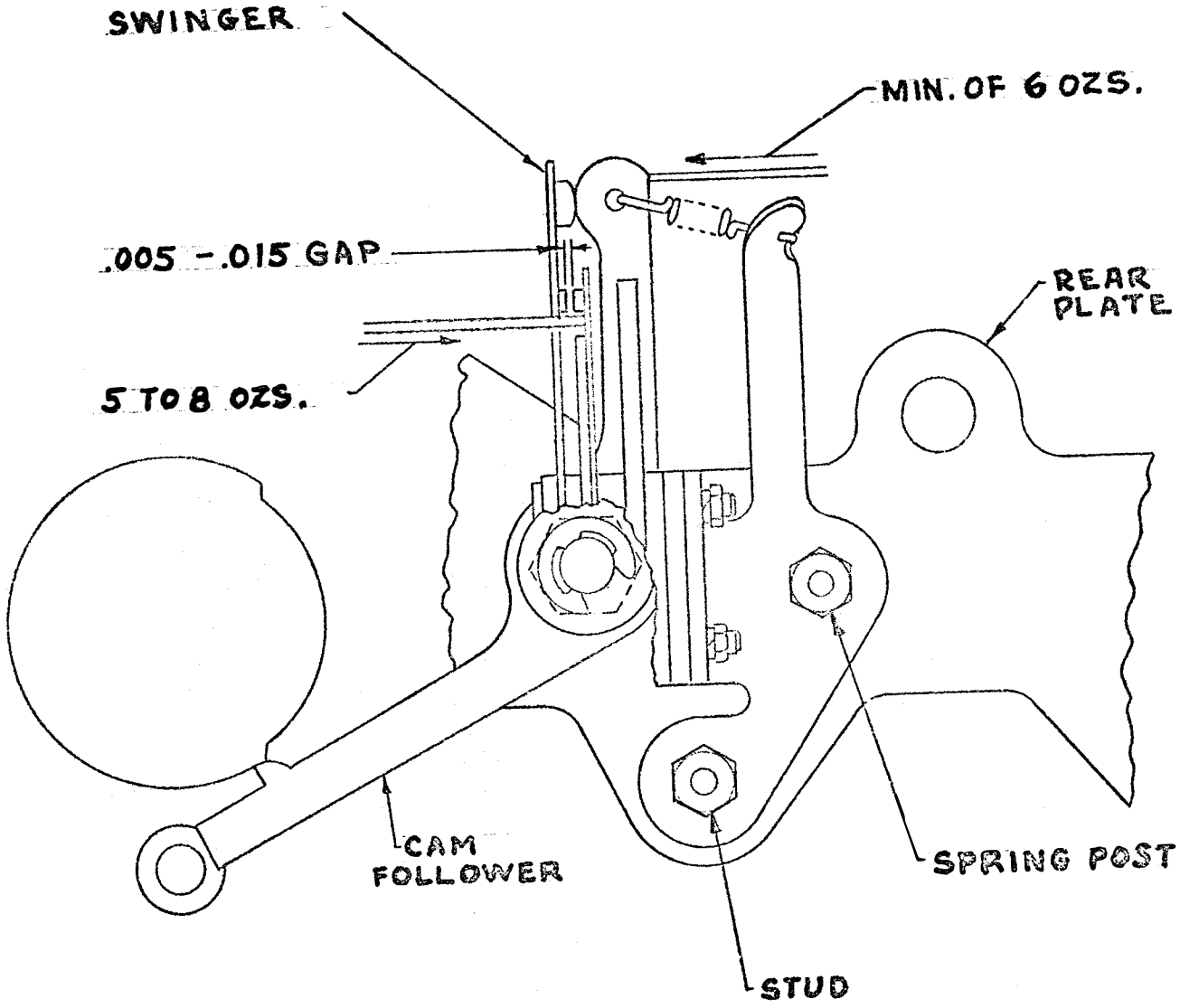


FIGURE 1

AUXILARY CONTACT

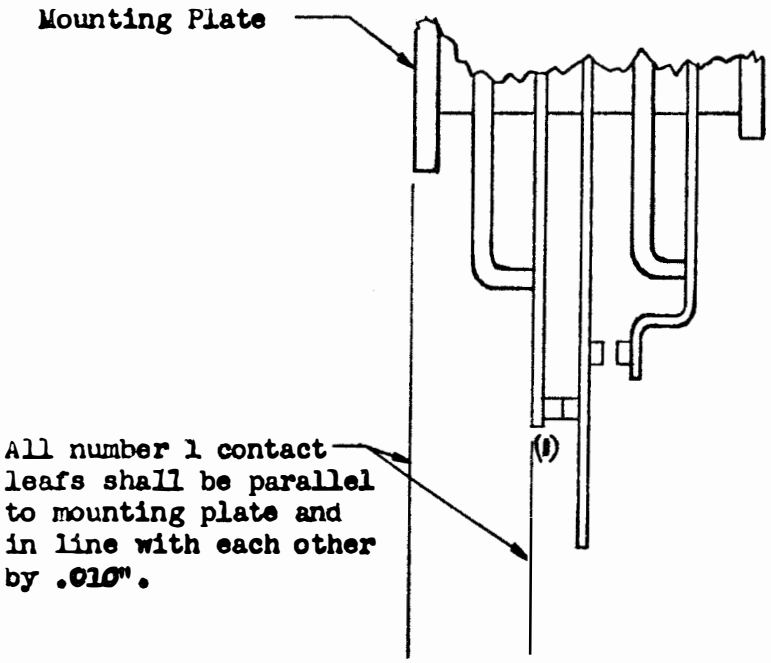


FIGURE 2

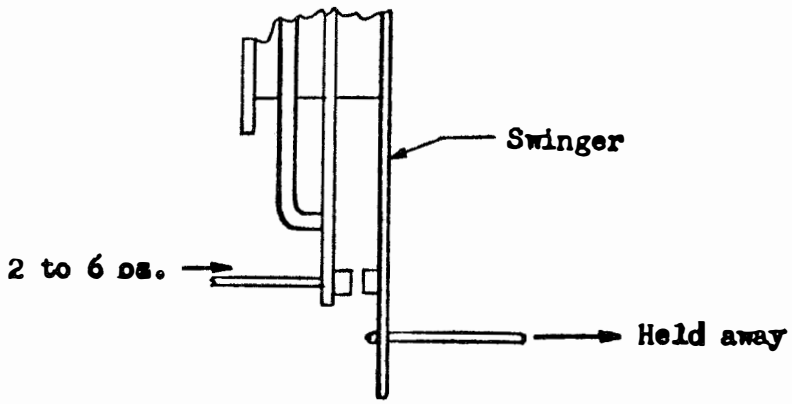


FIGURE 3

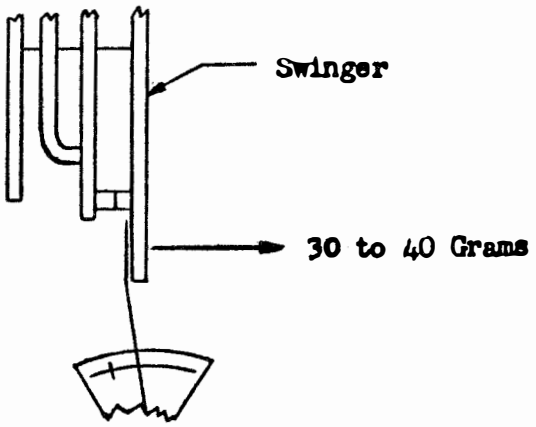


FIGURE 4

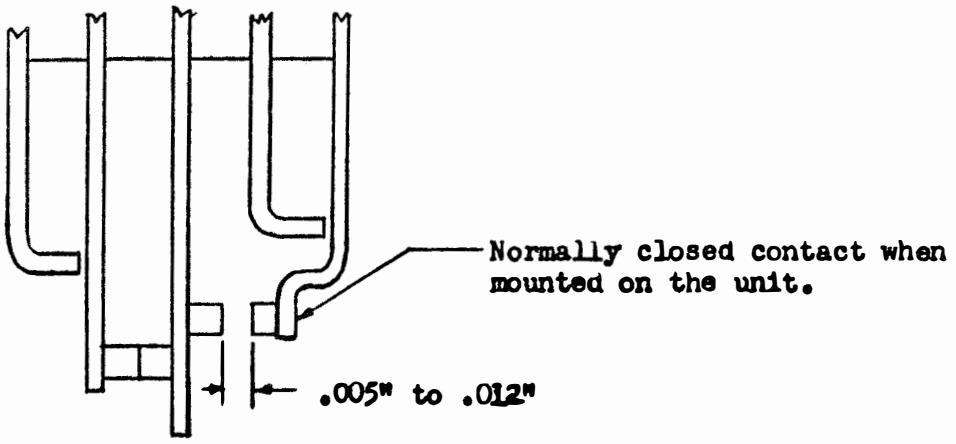


FIGURE 5

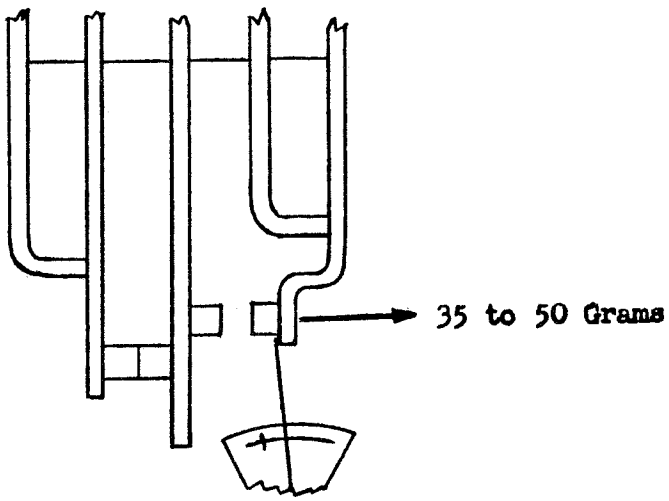


FIGURE 6

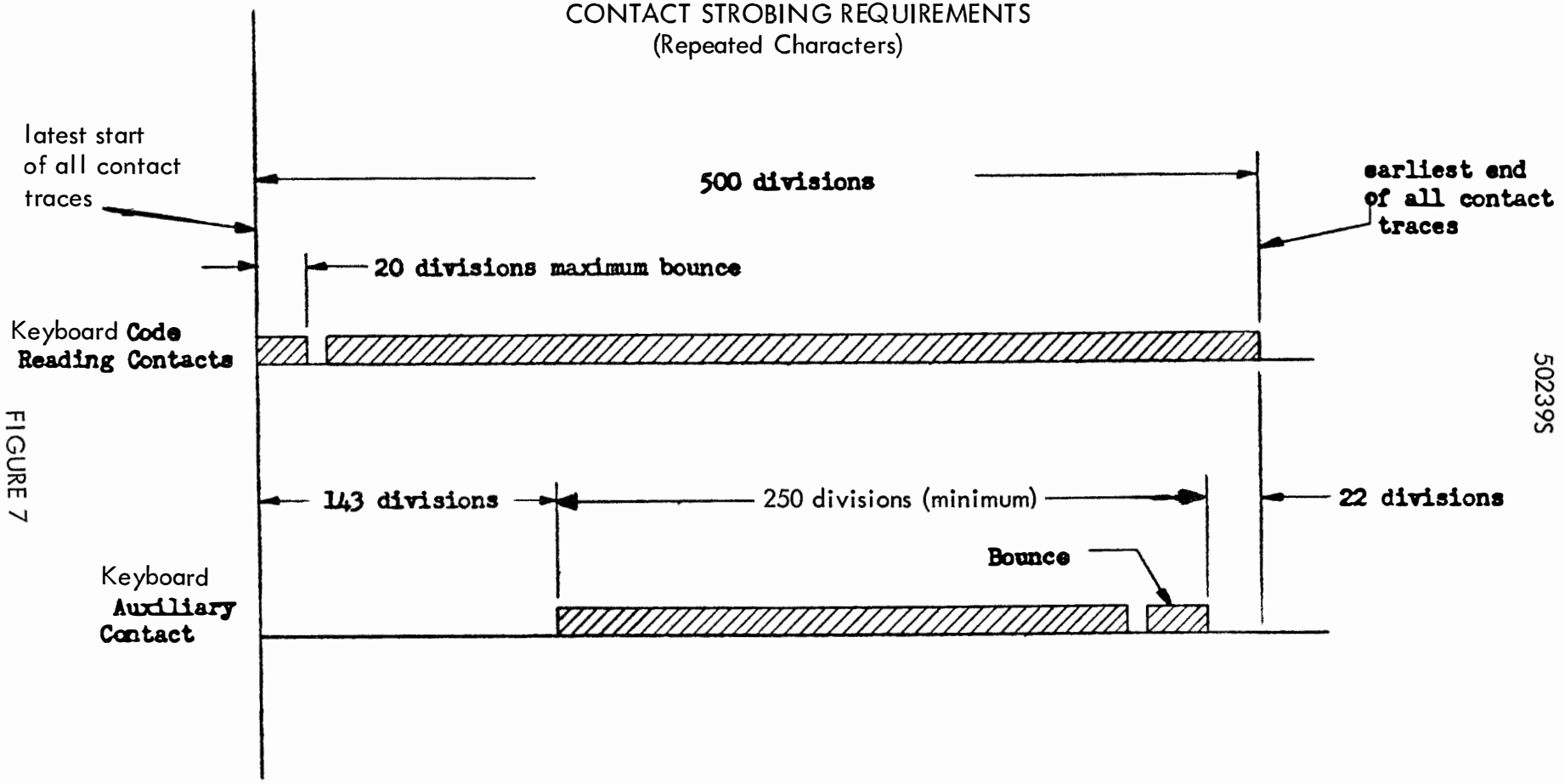

CONTACT STROBING REQUIREMENTS
(Repeated Characters)
latest start of all contact traces
500 divisions
earliest end of all contact traces
20 divisions maximum bounce
Keyboard Code Reading Contacts
143 divisions
250 divisions (minimum)
22 divisions
Bounce
Keyboard Auxiliary Contact

FIGURE 7

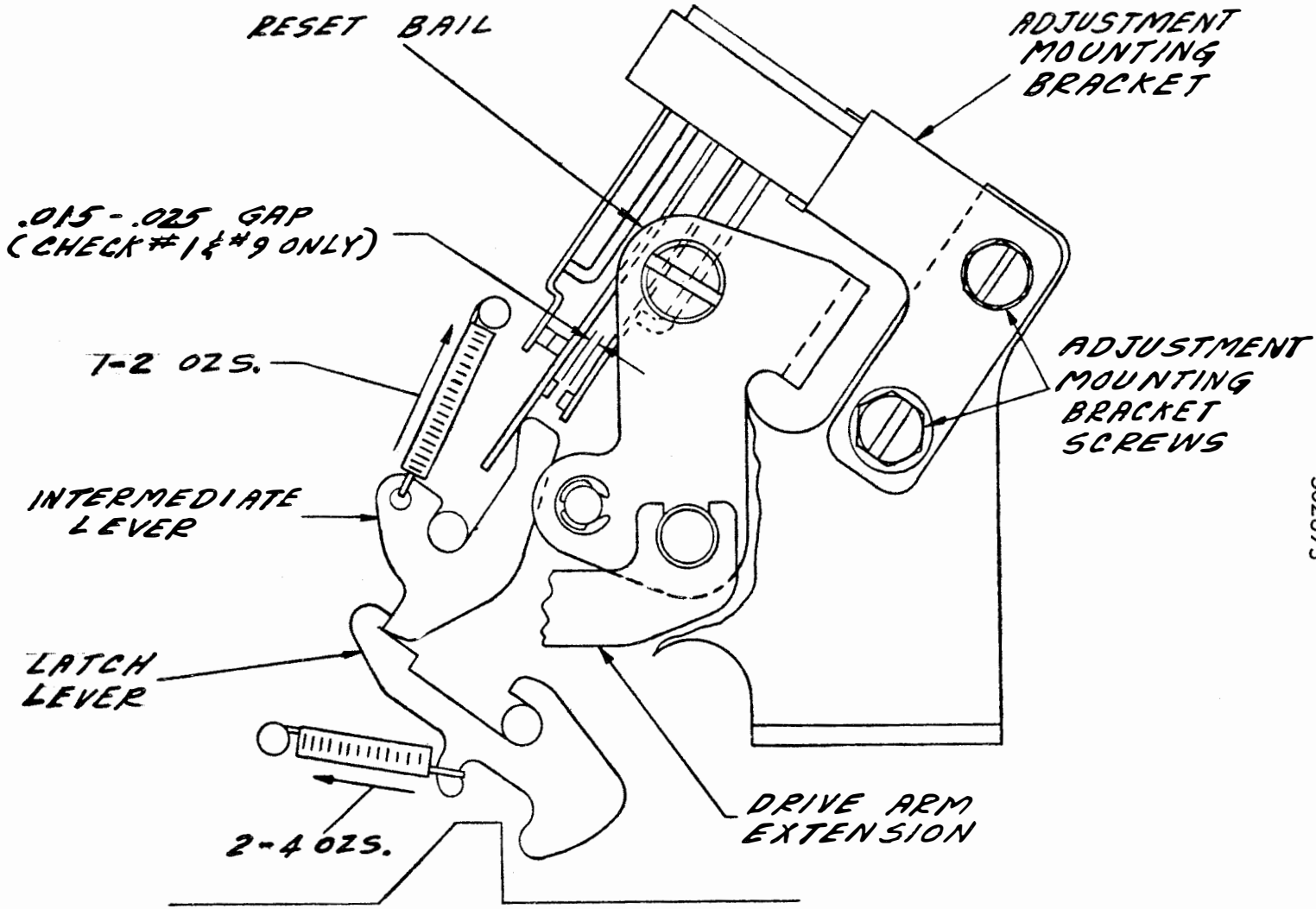


FIGURE 8

CODE READING CONTACT MECHANISM

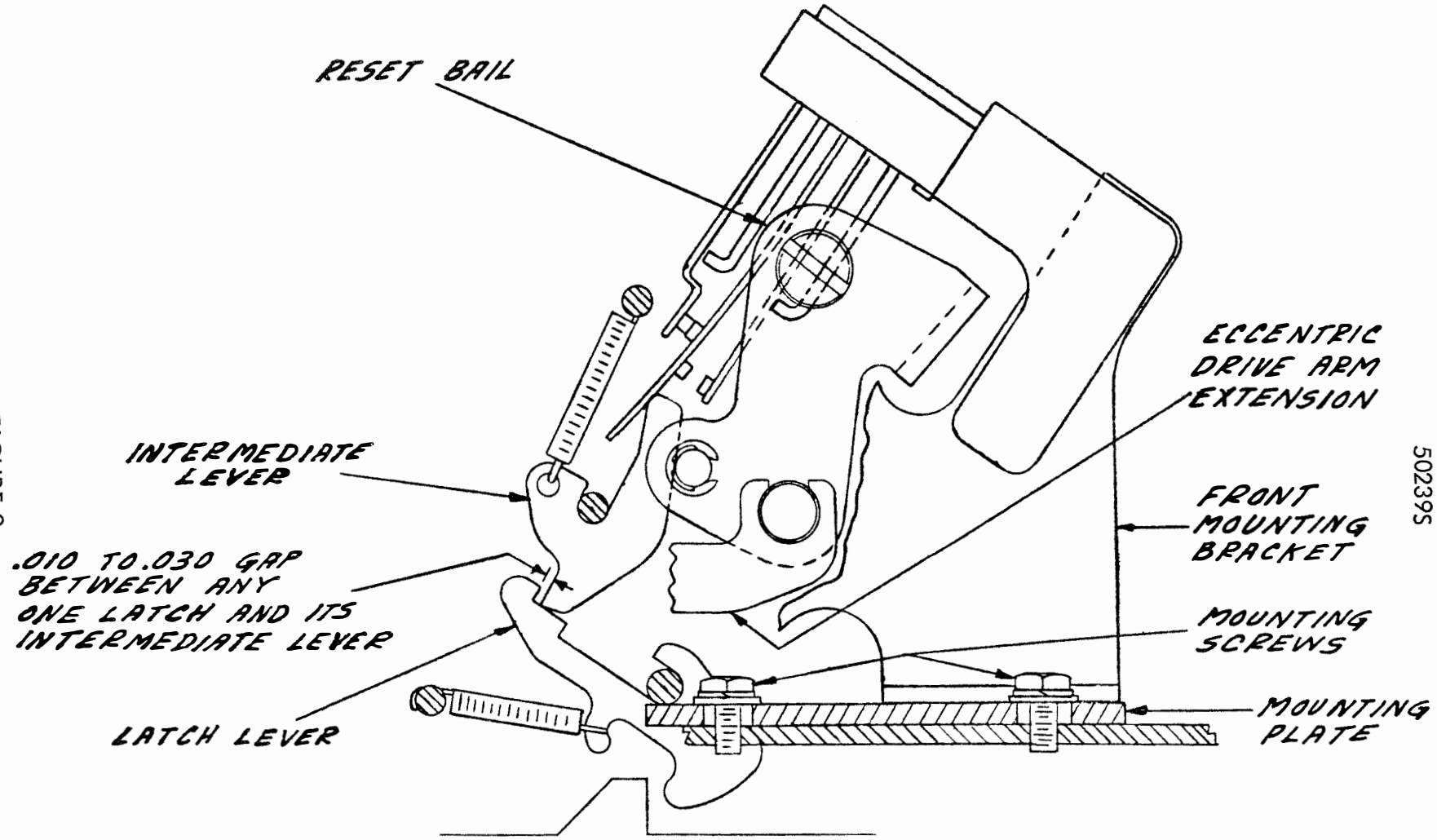
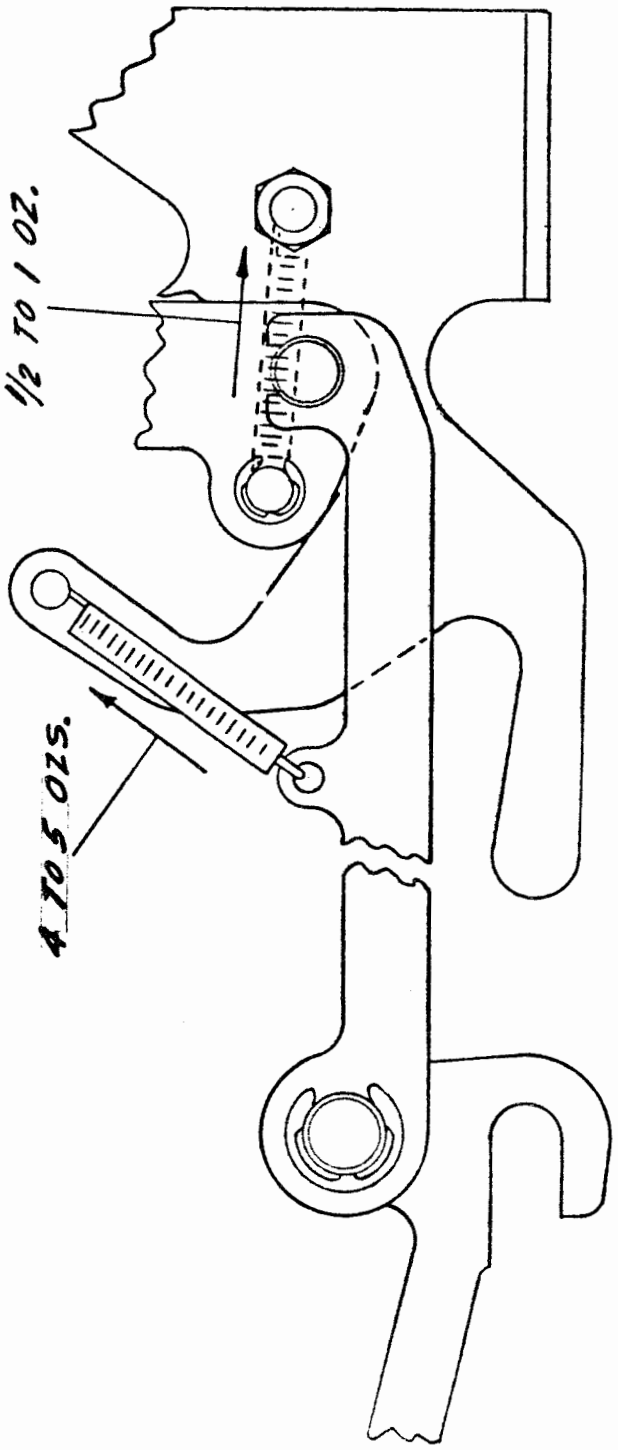


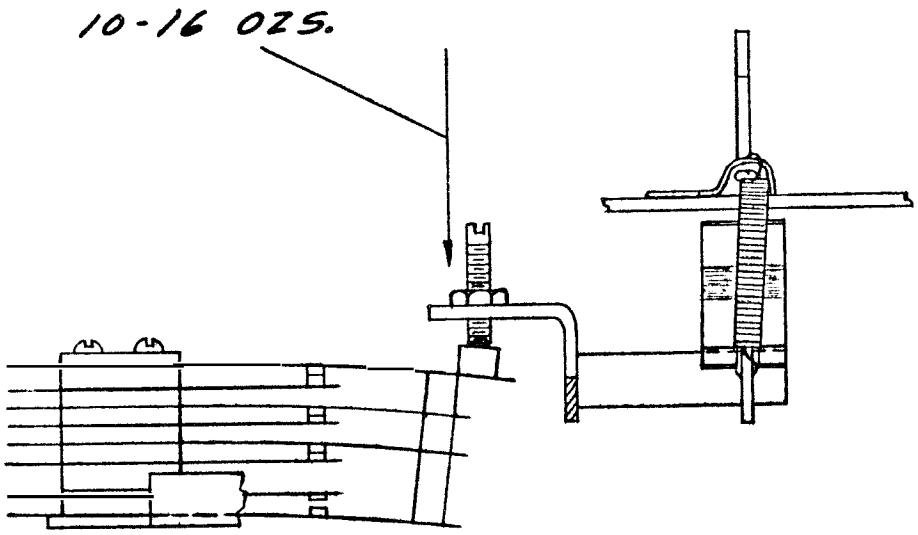
FIGURE 9

CODE READING CONTACT
RESET BAIL ADJUSTMENT



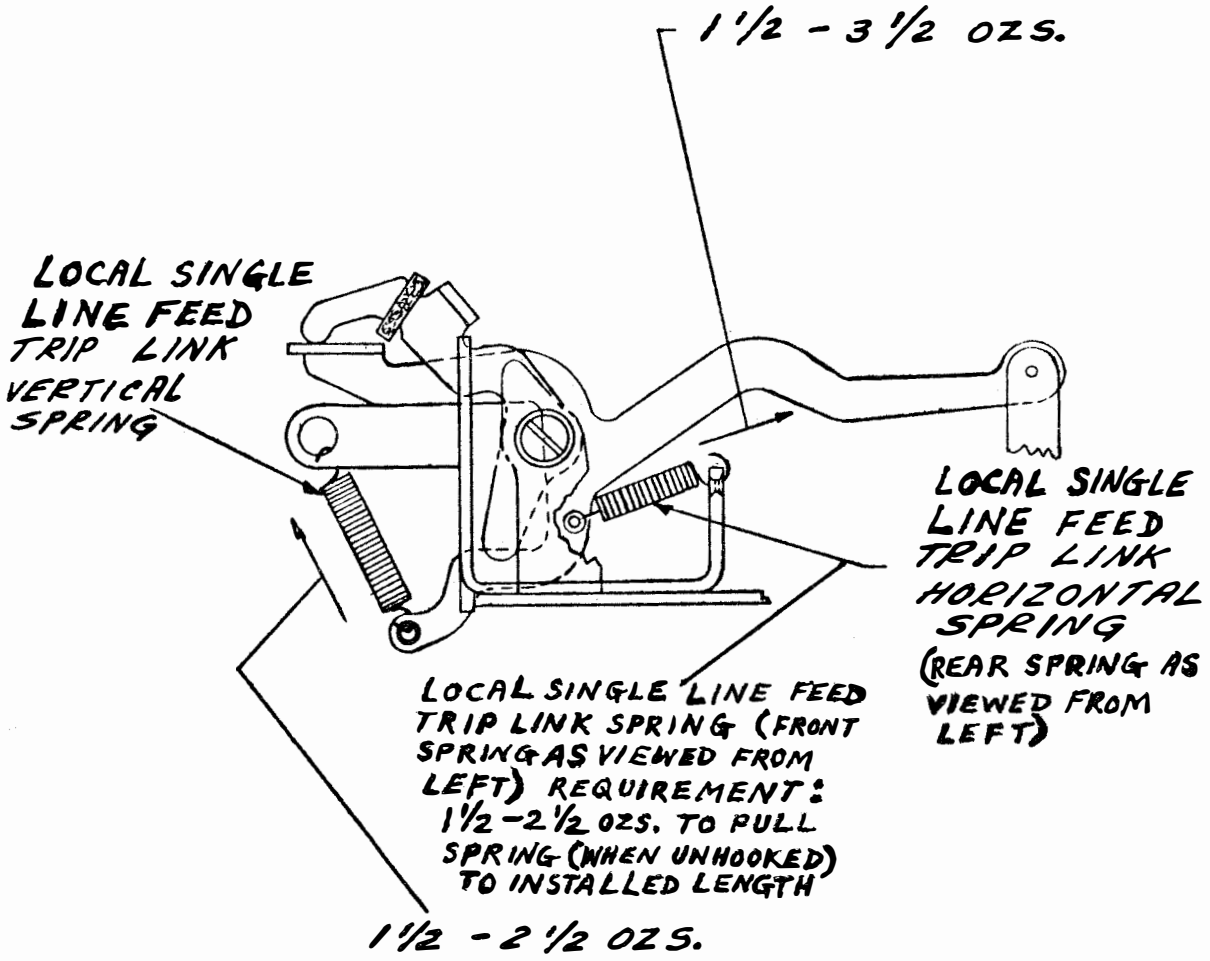
CODE READING CONTACT
DRIVE LINKAGE

FIGURE 10



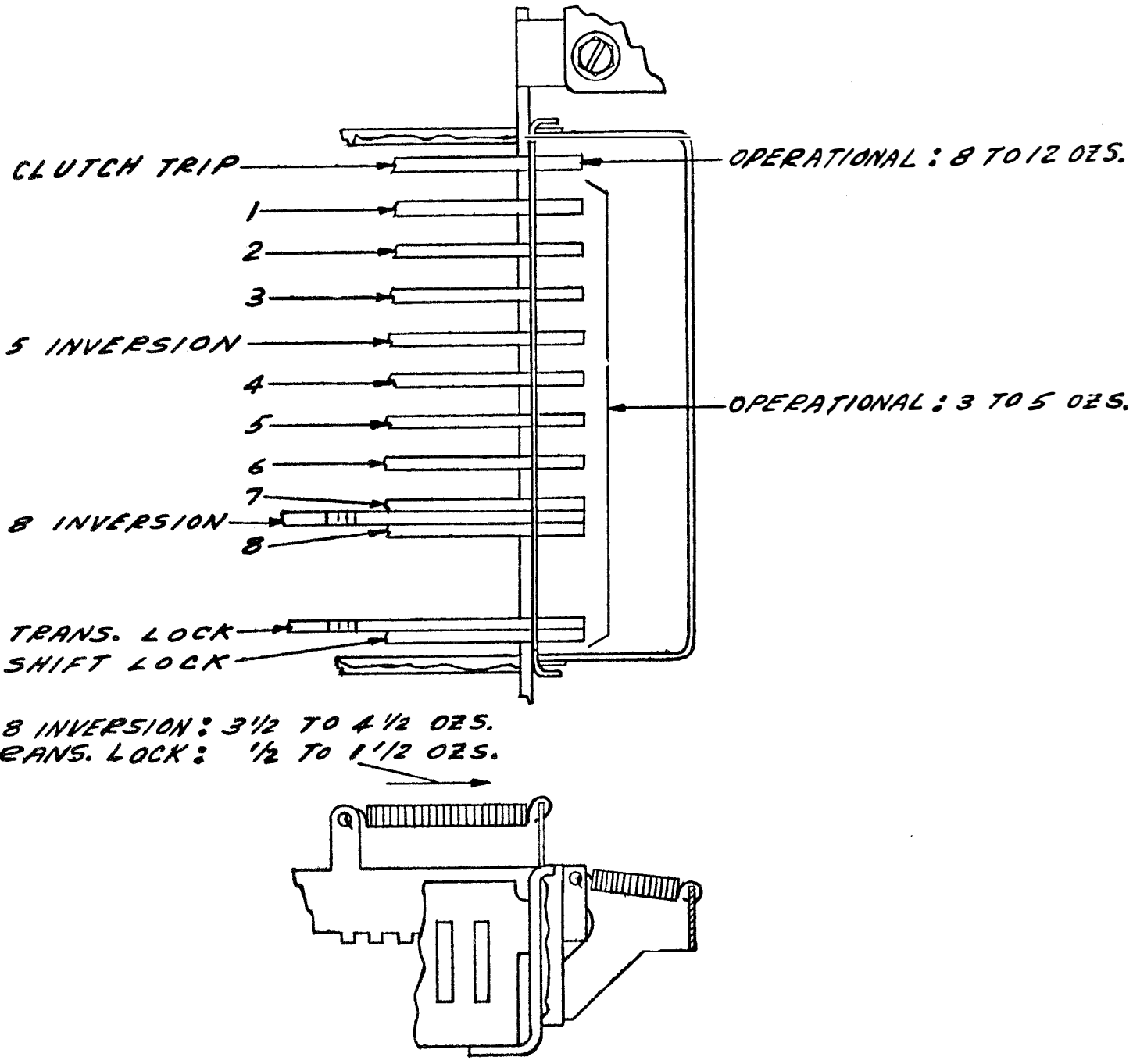
RECEIVE BREAK SWITCH

FIGURE 11



LOCAL SINGLE LINE FEED

FIGURE 12



CODE BAR ARRANGEMENT
& SPRING TENSIONS

FIGURE 13

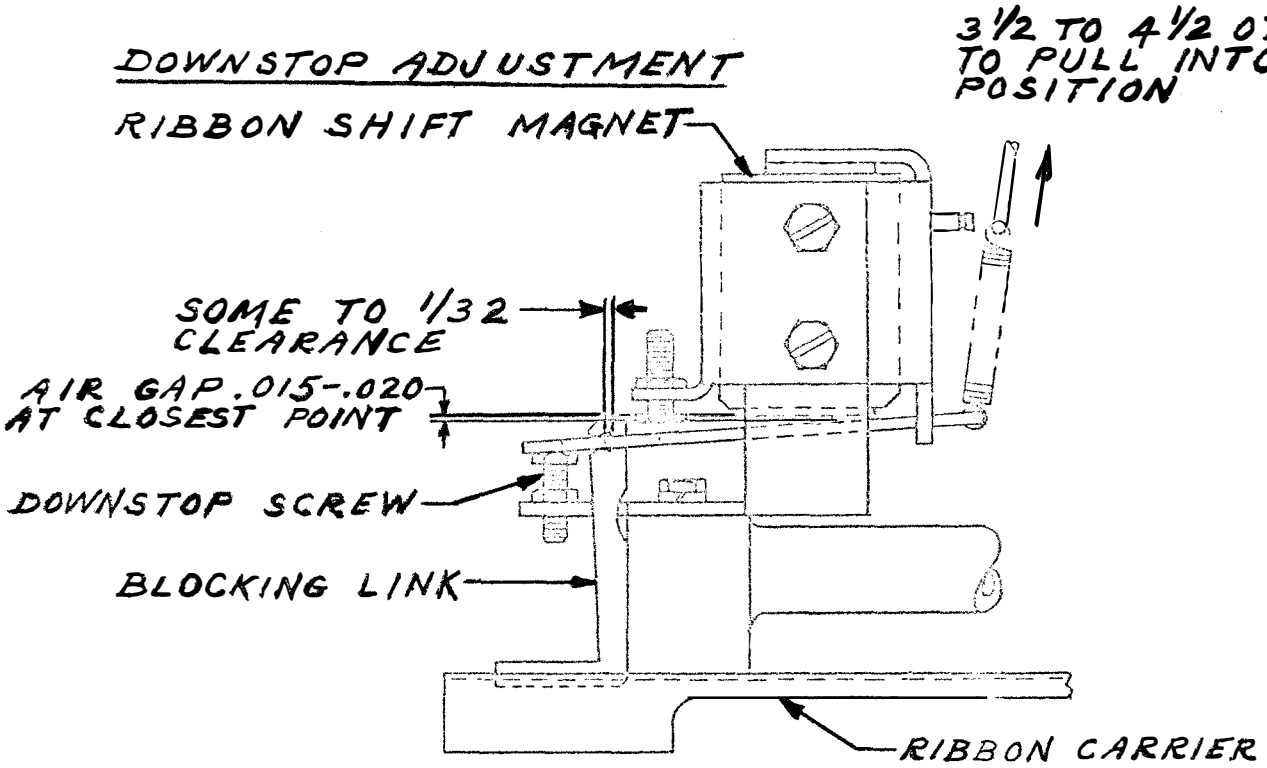
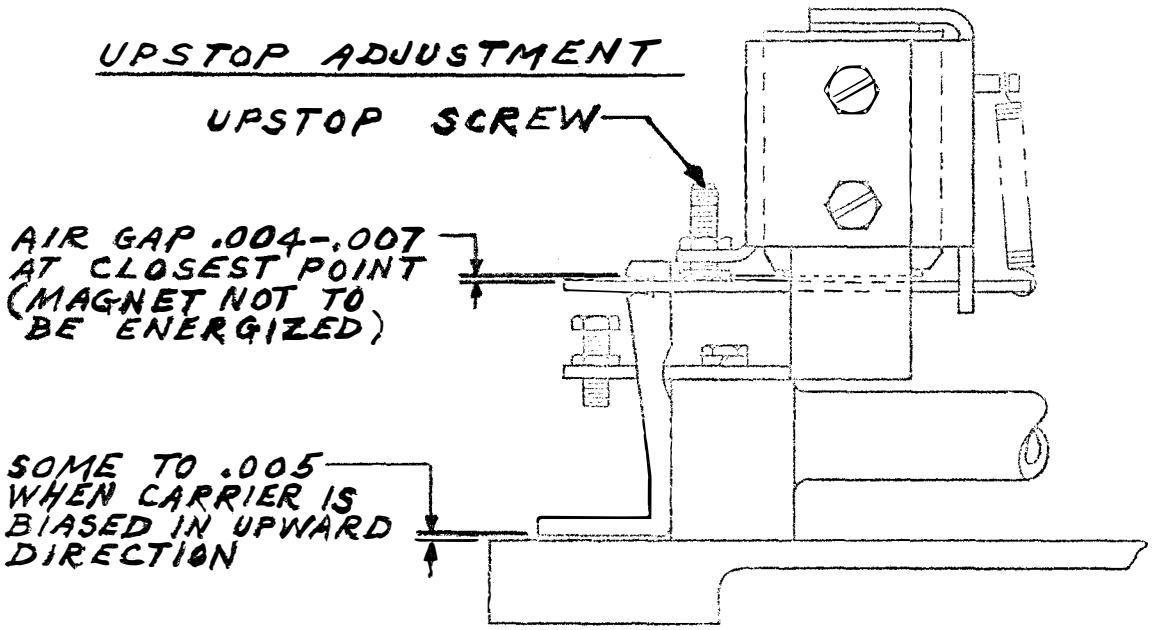
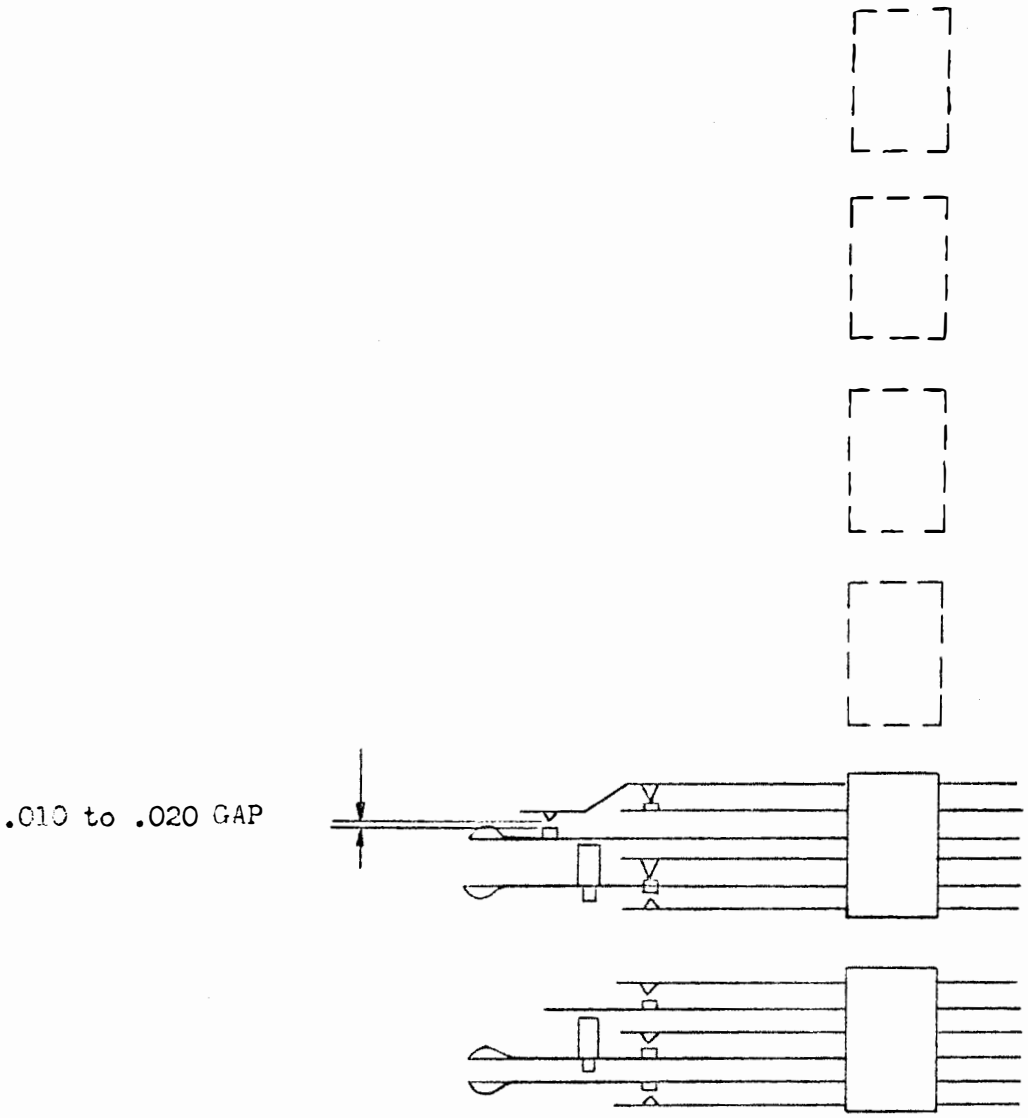


FIGURE 14



RIBBON SHIFT ADJUSTMENTS

FIGURE 14A



SIX BUTTON KEYSET ADJUSTMENT

(As viewed from above looking through switch mounting plate)

FIGURE 15

PART IV

DISASSEMBLY, REASSEMBLY, AND INSTALLATION

MODEL 35 IDP AUTOMATIC SEND-RECEIVE TELETYPEWRITER SET (ASR) FOR BELL OF CANADA

NOTE

Refer to Bulletin 280B for further applicable disassembly and reassembly information.

1. DISASSEMBLY AND REASSEMBLY

1.1 KEYBOARD

1.11 Keyboard drive mechanism - Unlatch and disconnect the electrical plug at the rear of the keyboard. Remove the code reading contact pile-up assembly and cable assembly from the unit. Be extremely careful in handling these contacts. Disconnect the leads to the auxiliary contact assembly. Remove the typing unit if it is present. Unscrew two hold down screws at the front of the keyboard drive mechanism and one at the right rear (near the gear). Lift the assembly carefully, holding the universal bail back so that the non-repeat lever clears 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. To reassemble, reverse the disassembly procedure.

CAUTION: If the non-repeat lever gets pulled down almost 90^{o} to its normal position, its spring may be stressed beyond elastic limits which will result in mal-functioning upon reassembly of the keyboard drive mechanism to the keyboard.

1.12 Code reading contact assembly - Remove the ring retainer from the eccentric drive extension post, then unhook the extension drive arm spring and slide the extension arm from the post. Remove the four screws securing the code reading contact mounting plate to the keyboard. Lift the unit carefully, not to damage any of its springs or levers. To reassemble, reverse the disassembly procedure.

1.13 Keyboard assembly - Remove the typing unit, typing reperforator, keyboard drive mechanism and code reading contact assembly. Proceed per Bulletin 280B. To reassemble, reverse the disassembly procedure.

1.2 CABINET COVER ASSEMBLY - Unfasten the lower cover lock screws in each front corner. Open the upper cover to its vertical lock position, push on the lower cover latch (under right front corner of upper cover) and lift the front of the lower cover using the grips provided. Raise the lower cover to its

vertical lock position. Replace the cover assembly by reversing the preceding steps.

2. INSTALLATION

2.1 CONNECTION OF SIGNAL LINE

CAUTION: Make sure the set power cord is not connected to the 115 volt ac power source.

Remove the cover assembly. At the right end of the electrical service unit is a four-position terminal strip. Remove the insulating cover and connect the positive side of the signal line to terminal 3 and the negative side to terminal 4. Replace the insulating cover and the cover assembly.

2.2 CONNECTION OF POWER - Connect the set power cord to the 115 volt ac power source.

CAUTION: The round pin on the plug must be connected to ground.