"DATASPEED®" PRINTER

RECORDER AND PAPER TRANSPORT

DESCRIPTION AND PRINCIPLES OF OPERATION

CONTENTS PAGE

1. GENERAL

1.01 This section provides description and principles of operation for the recorder and paper transport of the DATASPEED Printer. It is being reissued to change the title and to incorporate recent engineering changes. Since this is a general revision, marginal arrows ordinarily used to indicate changes and additions are omitted. This section was formerly designated 592-820-110, but this number is now cancelled. Since this issue of Section 578-500-110 is a revision of Section 592-820-110, Issue 2, it is designated Issue 3.

1.02 References to right or left, up or down, front or rear, apply to the unit as viewed from the front or tank side.

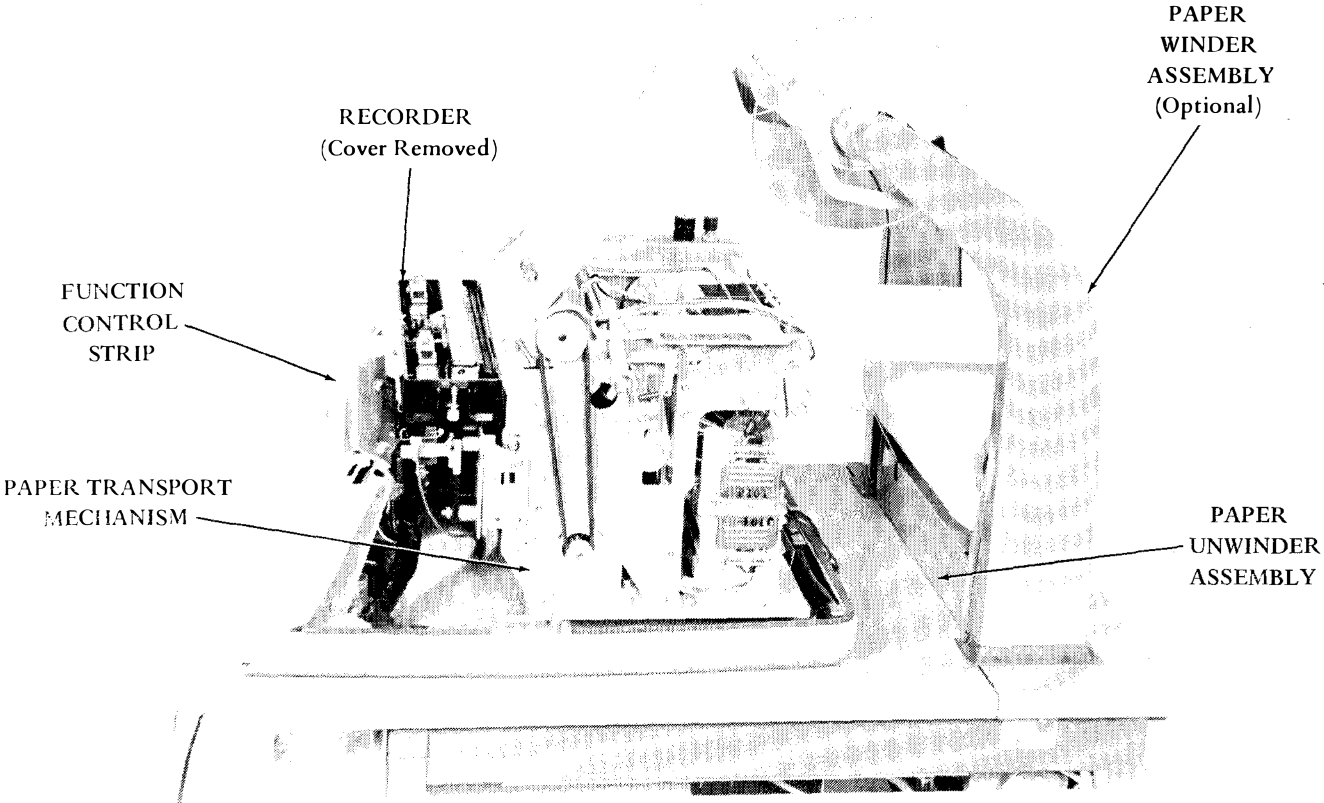
1.03 The DATASPEED system forms characters from a series of 40 nozzles (jets) located in a horizontal plane in front of the paper. A high potential charge on the platen, located directly behind the paper, attracts a stream of ink at high velocity from the selected nozzle. In transit, the stream breaks up into tiny droplets which are individually guided (electrostatically) in a vertical and a horizontal plane to form each character – one character every 8 milliseconds at 1200 words per minute. The nozzles are selected sequentially to print an 80-character line.

1.04 A cover protects the recorder and paper transport mechanism from damage. In addition, it shields the operator from the printer elements with the high potential charge. With the cover raised for inspection of the printer, the high voltage power supply is de-energized by the magnetic reed type interlock switches. Because of the high potential in these areas, only qualified personnel should service the set. Allow a 15 minute warm-up time before initiating the printing cycle. However, if the set is shut down only momentarily, a 30 second warm-up time is adequate.

> CAUTION: (a) REMOVE POWER FROM SET PRIOR TO SERVICING (b) AVOID SPILLING INK. THIS INK HAS POWERFUL STAINING CHARACTERISTICS; AVOID TOUCHING ELECTRODE AREA AND TRANSFERRING INK RESIDUE TO SKIN, CLOTHING, OR OTHER MATERIALS.

1.05 In the receive-only model, the cabinet supports the recording unit and its cover on an extendable panel (Figure 1). Facilities for supplying a large volume of teletypewriter paper to the recorder and transport at high speed, and a motor driven take-up reel or paper winder (optional) to retrieve the printed copy from the unit, are provided by the external paper handling devices at the rear of the cabinet. In the receive-only model, the paper supply reel moves forward with the cover and cabinet top panel to facilitate the installation of a new supply of paper. The paper winder is secured to the rear cabinet frame. It remains stationary as the recorder and transport, cover and paper

Prepared for American Telephone and Telegraph Company by Teletype Corporation



Note: Late design recorder units have a hinged access lid above the electrode assembly with a white character position scale stamped on it (not shown in illustration), and the metal strip down the center of the cover is omitted. Also, an auxiliary mask is added to the electrode assembly to help shield the electrodes from paper lint. The hinged lid simplifies maintenance by permitting the electrodes to be cleaned without removing the cover from the set. Circuit Cards in lower right hand corner have been modified – refer to the appropriate section and wiring diagrams for the changes. Paper-out sensing switch located on the paper bail is an added feature (not shown) which is arranged to remove the high voltage on a paper-out condition. The improved paper handling mechanisms located on the cabinet are tied in with the circuit logic.

Figure 1 - Recorder and Paper Transport Mechanism in Receive-Only (RO) Model

supply are moved forward. Refer to Section 578-500-112 for further information on the paper handling mechanism and enclosures.

2. DESCRIPTION

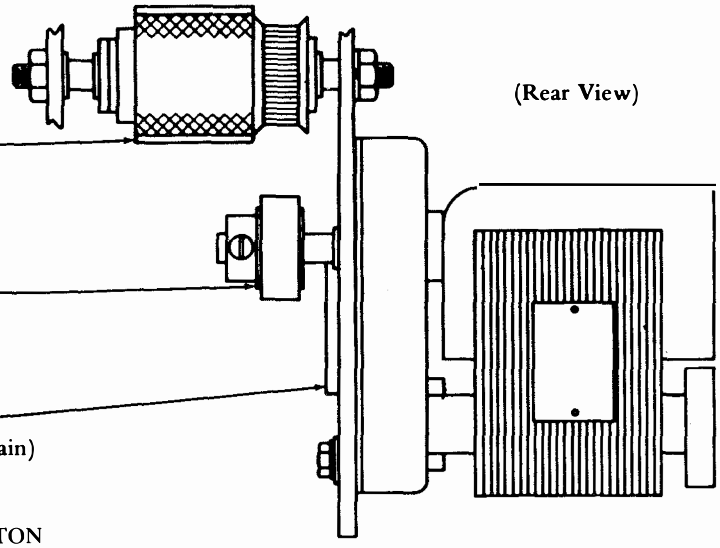
2.01 The DATASPEED printer is capable of printing copy at speeds up to 1200 words per minute. This unit utilizes high potential fields to transfer ink to the paper, and with the exception of paper feeding, line feeding, and ink circulating (pump) mechanisms, it has no moving parts.

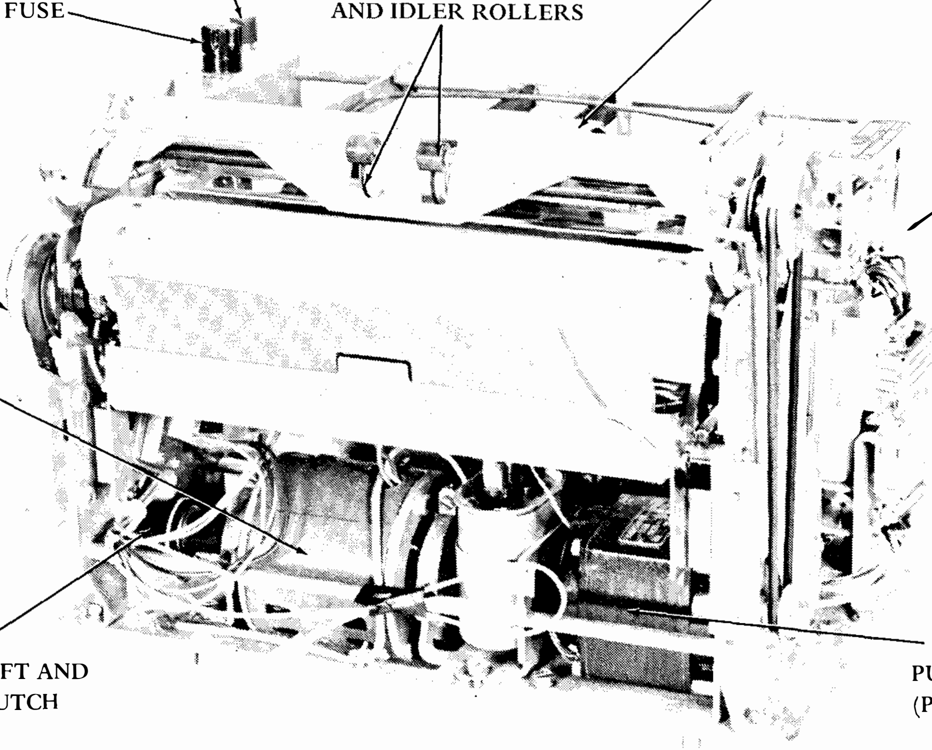
2.02 The printing function depends upon the initiation of a high velocity stream of ink from the selected nozzle, and deflection of this ink stream to form a character. The characters are formed on the paper at the platen. A series of 40 ink nozzles, located on a manifold in front of the platen, emit streams of small droplets of ink which are attracted by a highly positive charge on the platen. Printing takes place from left to right across the page under control of the recorder drive circuits. The recorder drive circuits energize the valving electrodes, which control the flow of ink from the nozzles, as well as the sets of horizontal and vertical deflection electrodes, which shift the positions of the ink streams to form the characters. The maximum length of line is 80 characters.

2.03 Paper is fed from the supply roll, through the paper transport mechanism to the line feed mechanism, which feeds the paper past the ink nozzles. The paper tensioner assembly pulls the printed paper from the platen and also keeps it tight against the platen during printing.

2.04 The recorder and paper transport mechanism is approximately 12 inches wide, 9-1/2 inches high, and 12 inches deep, and weighs approximately 33 pounds. The transport mechanism (Figure 2) includes three driving motors and the associated mechanical drive systems to step the paper across the platen at a prescribed rate. The recorder (Figure 3) includes an ink tank with an electrically driven pump, 40 nozzles and a set of electrodes aligned with each nozzle.

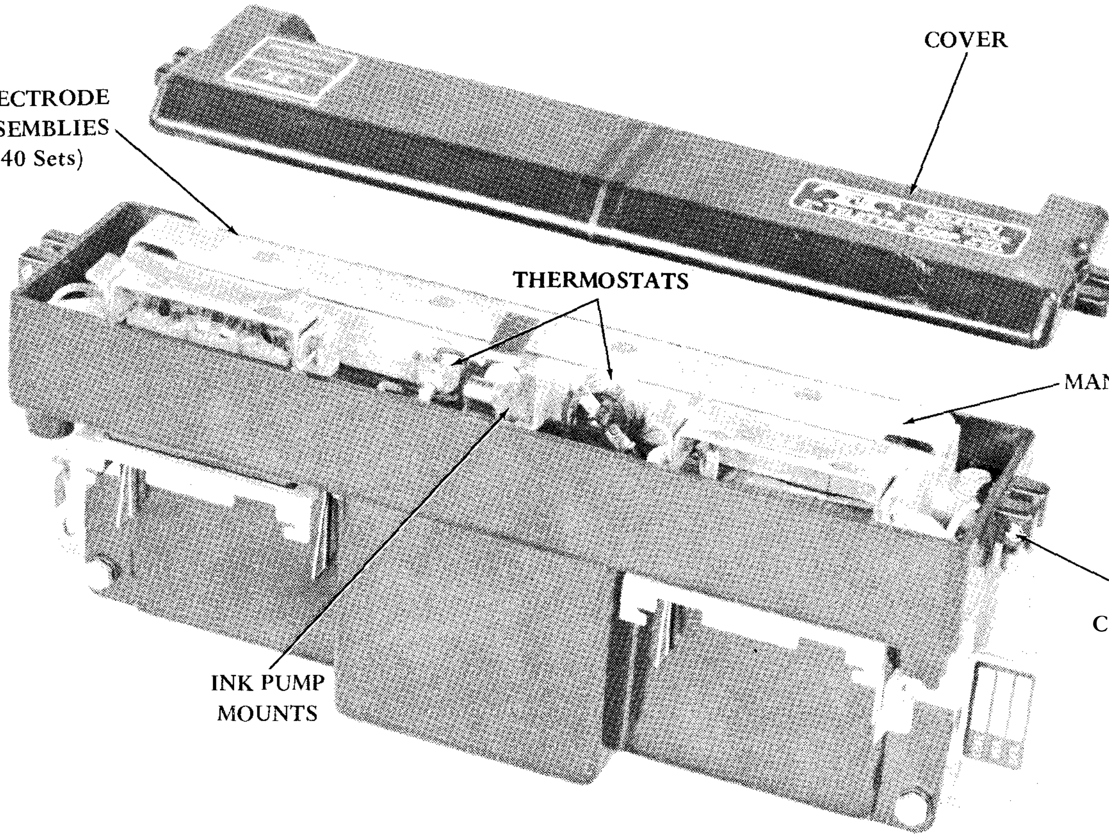
PRE-PAPER PULLER MOTOR ASSEMBLY





Note: The contour of the paper plate assembly has been serrated to reduce the surface contacting the paper (less paper lint generated). The detent arm located on the right side frame has been eliminated on the late design. A new lever is coupled to the pressure roller bail latch to guard against an accidental movement of the lever as the printer enclosure lid is closed. Note that the paper tensioner assembly becomes a single tire assembly in place of the double contact with the paper.

Figure 2 - Paper Transport Mechanism



Note: As pointed out previously the access lid (not shown) is arranged for the protection of the electrodes and to facilitate cleaning without removing the printer enclosure. Certain internal changes have been made in the tank such as the removal of the tank spring, modification of the pump, and double ink filters provided. Since this area requires factory adjustment no maintenance except keeping the ink supply and reservoir clean should be attempted.

Figure 3 - Recording Head

PAPER TRANSPORT (Pre-Paper Puller, Line Feed and Post Paper Puller)

2.05 As the paper is pulled from the supply roll, a controlled length or loop of paper is maintained within a recessed area of the transport mechanism. This loop is maintained in order to free the line feed mechanism of any drag on the paper as it is stepped through the printing station. Closing the pressure roller bail brings the loop forming mechanism into action. The loop forming switch forms the loop on initial threading of the paper over the recessed area. When the paper loop diminishes to a certain level, a sensing switch turns the pre-paper puller motor on to strip more paper from the roll. The switches operate in conjunction with the control circuit card located at the rear of the base.

2.06 A line feed motor and its associated control logic is used in conjunction with a magnetically-operated escapement to move a measured amount of paper (0.167 inch) over the platen in time for the next printing cycle. The line feed escapement magnets control the indexing of the escapement wheel, which allows the friction type feed roller to advance the paper. The line feed assembly includes a one-way (antiback-up) clutch with a torsion rod, a friction feed roller, interconnecting tie tube, and a timing belt drive arrangement. Some manual adjustment of the line feed motor torque is provided by the rheostat on the right side frame. The torque is stabilized by a regulator circuit on the middle card in the card mounting assembly at the rear of the transport.

2.07 A third motor, a post paper puller motor or paper tensioner motor, is coupled to the paper tensioner roller and idler shaft by a round drive belt. This assembly moves the paper out of the printing station to the paper take-up reel.

2.08 The printing station is illuminated by a fluorescent lamp assembly on the underside of the cover. The plastic lens directs the light over the full width of the copy to be viewed.

PRINTING SYSTEM – RECORDING HEAD

2.09 The printing portion of the nonimpact page recorder consists of an ink tank with a means of maintaining consistent pressure on 40 ink nozzles, and a series of electrodes to initiate and control the ink stream. The platen, which attracts the ink from the respective nozzles, is located on the paper transport unit. Electrical connectors enable the recording head to be removed for service. Exercise extreme care in handling to avoid stains by the ink or its residue. The ink tank, enclosing the electrodes and ink handling components, extends across the front side of the paper transport mechanism.

2.10 The supply tank at the front of the unit has a liquid ink capacity of about one bottle of ink (TP301168 – 12 ounces per bottle). The manifold, with its 40 nozzles and attached character-forming electrodes, is located near the top of the tank and aligns with the platen. A continuous flow of ink is lifted into the manifold reservoir by the diaphragm-type pump. The pump is suspended from the manifold and submerged in the ink supply. The reservoir spillway maintains a certain ink level and enables the excess ink to be returned to the tank. Individual ducts connect the common reservoir with the respective nozzle. An electric heating element, embedded in the manifold below the nozzles, warms the liquid to facilitate an even flow of ink and the printing of legible copy.

2.11 Forty sets of electrodes (in a vertical plane across the back of the manifold) are aligned with the 40 ink nozzles. Each set consists of the following electrodes: (a) a valving element (next to the nozzle, with a hole for the ink stream); (b) vertical deflection elements (an upper and lower electrode); (c) horizontal deflection elements (a left and right electrode); and (d) a common mask (40 openings small enough to block undesired traces of the ink stream). The electrodes are electrically connected to the recorder drive module.

3. PRINCIPLES OF OPERATION

GENERAL

3.01 The paper is pulled from a supply roll by means of a motor driven pre-paper puller roller and formed into a loop for ready feeding over the platen. At the platen, printing takes place by means of electrostatic attraction of charged ink droplets from the nozzles on the manifold.

3.02 Since the recorder is capable of printing at speeds up to 1200 words per minute, a large amount of paper must be processed. Feeding paper accurately at this rate of speed requires a precise and efficient paper handling mechanism. For this reason, a separate motor (Figure 2) controlled by a sensitive switch (loop forming) is used to pull the paper from the roll and form it into a loop ready for instant response to the line feed mechanism. A second switch (loop sensing) is used to maintain the loop during operation.

PAPER SUPPLY AND PAPER UNWINDER ASSEMBLY

3.03 The 400-foot roll of paper that supplies the recorder and transport mechanism is held in its unwinder assembly on a nylon bearing spindle. This assembly is a part of the cabinet; therefore, refer to Section 578-500-112 (formerly Section 592-820-112) for further description.

PAPER HANDLING

3.04 The paper passes across a paper guide pan, between the pre-paper puller roller and its pressure roller, into the loop forming area, through the paper guide and line feed roller assembly, across the platen and between the paper tensioner drive roller and its idler rollers. Thus, the three drive rollers and their independent drive assemblies provide facilities for feeding the paper and controlling the paper tension as the paper is rapidly stepped through the printing station.

3.05 The components of the pre-paper puller mechanism consist of a shaded pole motor (117 v ac) with a gear train, pulley, and a timing belt to drive the pre-paper puller roller. An internal one-way clutch restricts any tendency for the feed roller to move backwards. A circuit card, mounted on the top connector of the three-tier card mounting assembly at the rear of the transport base, provides the ac input and the dynamic braking control of the motor.

3.06 The pre-paper puller motor circuit is activated by two switches: A loop forming switch and a loop sensing switch (Figure 4). The loop forming switch energizes the motor as the loop forming slide starts its downward travel. Assuming that little or no paper has been moved into the paper loop storage area, the loop forming slide will be elevated. Since the slide is linked to the loop forming switch, the normally open contacts of this switch will be closed to turn the motor on. With the motor on, paper is fed downward to form a loop. When the loop reaches a certain level, the loop sensing switch controls the operation. Further travel of the loop forming slide deactivates the ac connection to the card and activates the dc circuit. When the loop is formed below the lower switch arm, pressure on the arm is removed and the switch opens the alternate input to the circuit card. This loop is formed to provide a ready supply of paper for the line feed mechanism. When the loop diminishes due to line feeding, the lower switch arm closes the circuit to the drive motor. As a result of this operation, the paper is fed again. The loop is then pushed downward until the switch opens again. Should the lower switch fail to start the motor, the upper switch will. A pressure roller on top of the paper holds the paper tightly against the feed roller.

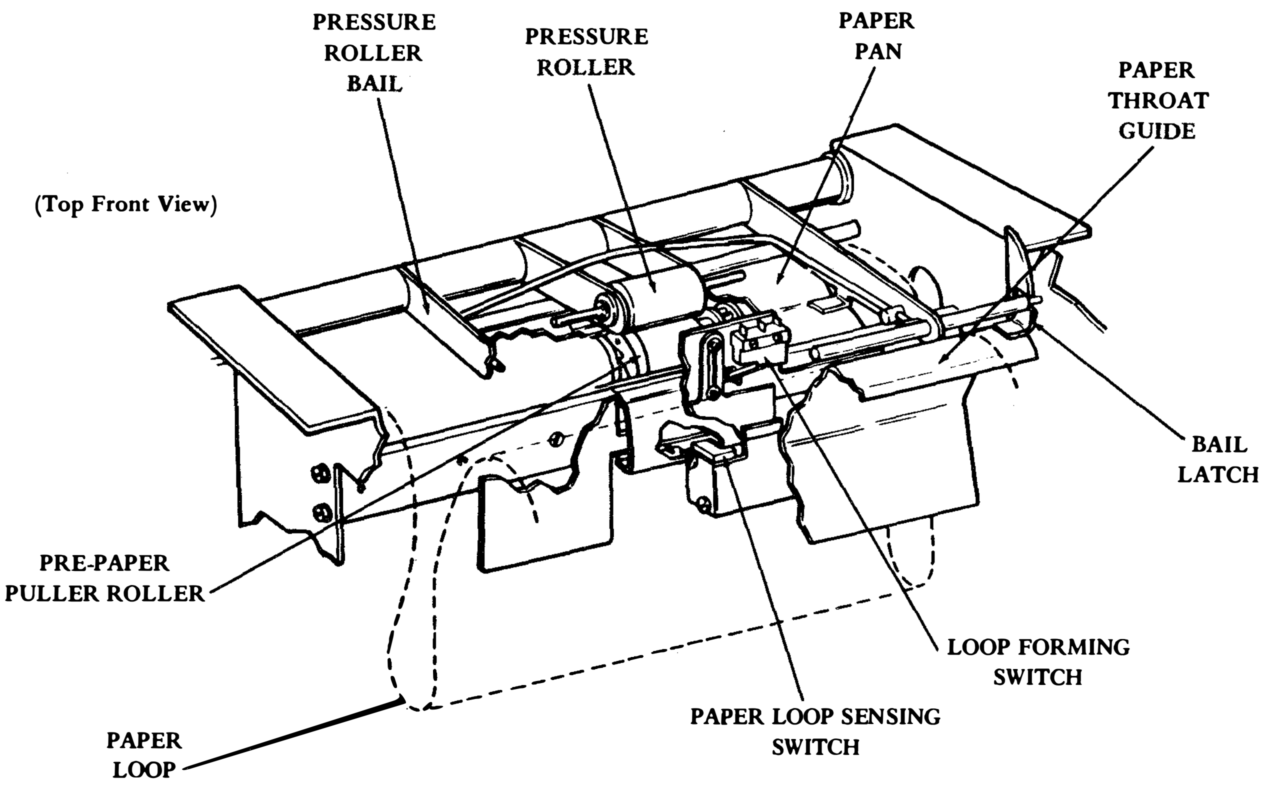


Figure 4 - Paper Loop Forming Mechanism

3.07 In a similar manner, the post paper puller motor, or paper tensioner motor, retrieves the paper that is stepped across the platen by the line feed mechanism. This arrangement provides a constant tension, as far as is possible, upon the paper leaving the platen, and assures that the paper is moved out of the printing area after printing.

LINE FEEDING

A. General

3.08 The line feed mechanism moves the paper across the platen on a line-by-line basis (six lines to the inch) with a maximum line feed rate of 120 operations per second. Line feeding is the most critical operation in the paper handling system. The ultimate goal is to perform a line feed operation in approximately 8.3 milliseconds. However, mechanical inertia of the line feed components may extend this interval, and the electronic system is designed to permit a 12 millisecond interval in which line feed occurs. The principal components of the line feed assembly are the torsion rod, the inertia disc, an escapement pawl, the feed roller assembly (which includes the feed roller, the tie tube, and escapement wheel), and the motor which provides the power necessary for operation (Figures 5 and 6). The combined forces of these components are placed in readiness by the torque derived from the motor through the one-way clutch and the regulating circuit.

B. Components

3.09 A one-way clutch and a drive pulley are attached to the line feed motor, which is located in the left front corner of the recorder base plate. A rheostat on the right side frame permits manual adjustments of motor torque. This control is in series with one winding of the motor, a current limiting resistor, and the line feed control logic at the rear of the transport. The drive pulley is connected to a driven pulley on the line feed torsion rod through a spring and a timing belt. The torsion rod is attached to the line feed roller and the tie tube at the right end with a setscrew. An escapement wheel is attached to the left end of the tie tube (Figure 5) and is held in a blocked position by an escapement pawl of the escapement magnet assembly (Figure 7).

3.10 When the recorder is initially turned on, the line feed motor winds up the spiral spring in the line feed assembly. The torsion rod, as well as the motor shaft assembly, contains a one-way clutch (Figures 5 and 6) which prevents the spiral spring in the line feed assembly from turning backward.

3.11 Note that the torque is applied to the spiral spring in the line feed assembly, and the spiral spring transfers the torque to the torsion rod. The torque is then

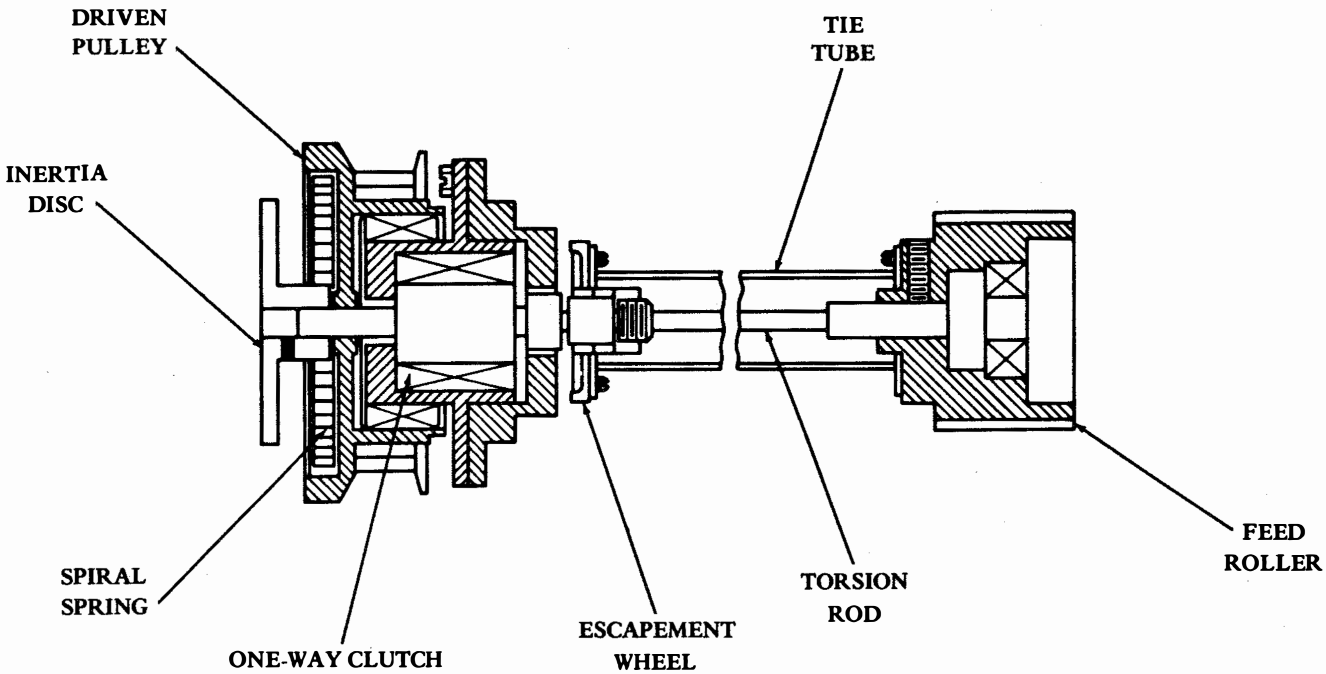


Figure 5 - Line Feed Assembly

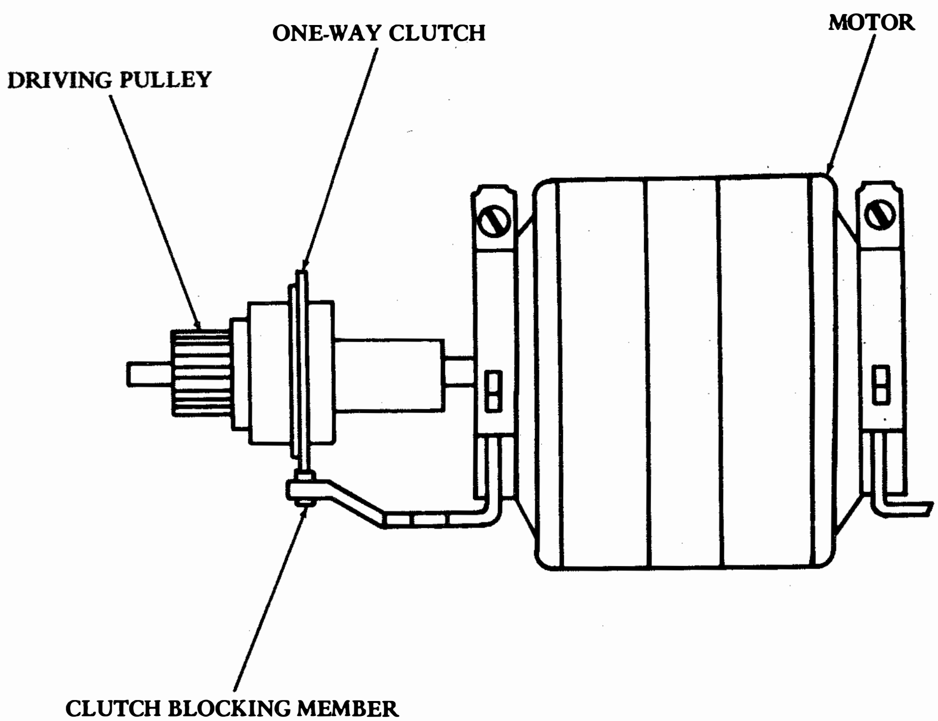


Figure 6 - Line Feed Torque Motor

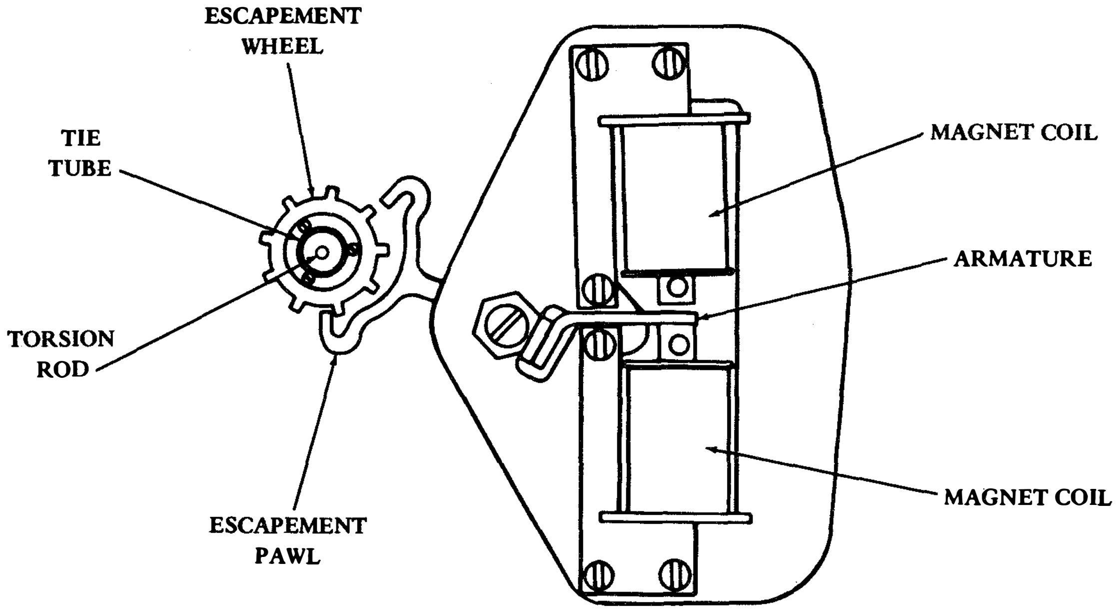


Figure 7 - Escapement Magnet Assembly

passed on to the escapement wheel through the paper feed roller and the tie tube (Figures 5 and 7).

3.12 The line feed cycle is initiated by a current pulse, from the line feed driver of an associated unit, which energizes the unoperated magnet coil and de-energizes the other (Figure 7). This switches the armature escapement pawl to its alternate position. As the escapement pawl reaches its alternate position, it unblocks the escapement wheel. To avoid excess wear on the escapement wheel, this assembly is designed so that the additions and subtractions of torques developed within the assembly start the escapement wheel rotation with an accelerated velocity, but end its travel with a retarded velocity.

PRINTING

3.13 Forty equally spaced ink nozzles and forty corresponding sets of electrodes are in horizontal alignment with the platen. When the proper printing conditions exist, a maximum 80-character line of copy at 1200 words per minute is available. A manifold assembly supports the nozzles and contains the ducts that link each nozzle with the common ink reservoir. A continuous flow of ink (in excess of printing needs) is pumped from the supply tank into the reservoir. When the reservoir is filled to its operational level, the surplus ink drains back into the tank. By maintaining a constant ink level, a uniform hydrostatic pressure exists at each nozzle to assure good droplet formation. Also, a heating element located under the ink nozzles maintains the temperature of the ink above room temperature so that good density of the copy is assured. With this preparation, the ink is extracted from the nozzles in the form of negatively charged droplets which are electrostatically deflected to form the characters on the page.

3.14 The recorder assembly consists of forty sets of printing units. Each printing unit consists of a nozzle, a valving electrode, a pair of vertical deflection electrodes, and a pair of horizontal deflection electrodes. Across the front of the printing head assembly is the mask. There is a rectangular hole in the mask in front of each printing unit. Each printing unit prints two characters, one in a left matrix and one in a right matrix. A maximum of 32 points in the matrix are available for forming one character.

3.15 The manifold supports the nozzles and provides a supply of ink to each of the forty nozzles. The manifold and nozzles are held at a constant negative voltage of -1900 v.

3.16 The valving electrode in front of each nozzle controls the flow of ink from that nozzle. The valving electrode derives its potential of +550 v (Figure 8) from the spacing drive power supply in the cabinet. The spacing drive power supply uses signals from the character generator to select the valving electrodes which will turn on the appropriate nozzles for printing. When the valving electrode is at the off voltage (0 v), no ink issues from the nozzle. When it is at the on voltage (+550 v), ink is extracted from the nozzle in the form of a droplet stream. The droplets, approximately 0.001 inch in diameter, pass through the hole in the valving electrode and proceed with increasing velocity to the region of the deflection electrodes.

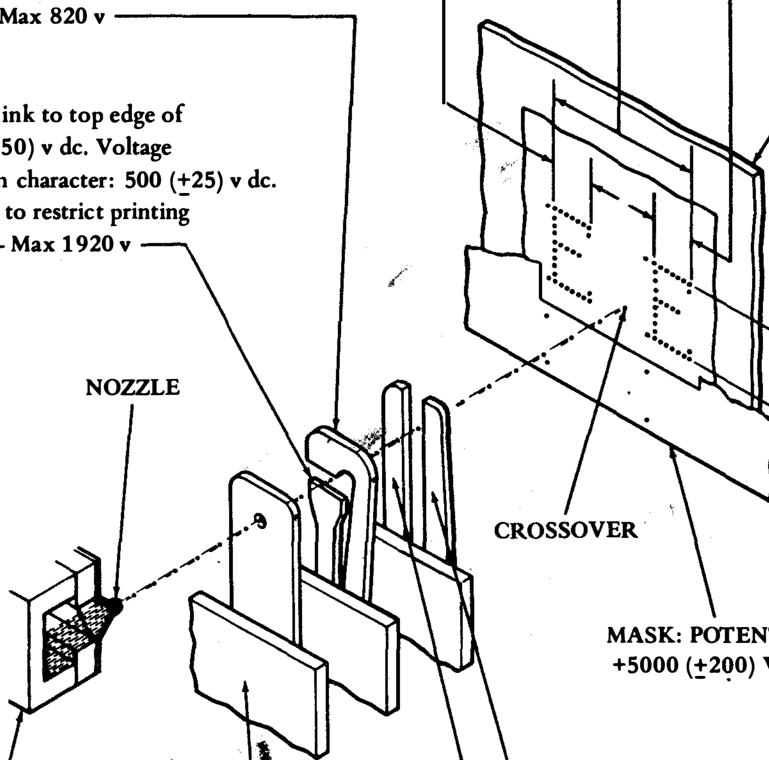


Figure 8 - Nominal Electrode Voltages

3.17 The first pair of deflection electrodes which influence the ink droplets are the vertical deflection electrodes. These electrodes are supplied with their deflection voltage (Figure 8) by the high voltage power supply, which is modulated by the digital-to-analog converter for vertical printing contained in the cabinet. The vertical deflection electrodes, one above and one below the jet, are arranged to form a horizontal slot. If the upper electrode is at a higher voltage than the lower, the ink droplets will be deflected upward; or conversely, if the lower electrode is at a higher voltage than the upper, the droplets will be deflected downward. The average voltage of these two electrodes is higher than that of the valving electrode; therefore, the droplets are accelerated.

3.18 The next set of electrodes, the horizontal deflection electrodes, are arranged to form a vertical slot. These electrodes are supplied with their deflection voltage (Figure 8) by the high voltage power supply, which is modulated by the digital-to-analog converter for horizontal printing contained in the cabinet. As in the case of the vertical deflection system, the droplets are deflected horizontally by varying the electrode voltage. The average voltage of this electrode set is higher than that of the previous set; so, again the ink droplets are accelerated.

3.19 In their flight toward the paper, the ink droplets encounter one more electrode, the mask. The mask derives its constant +5000 v (Figures 8 and 14) from the

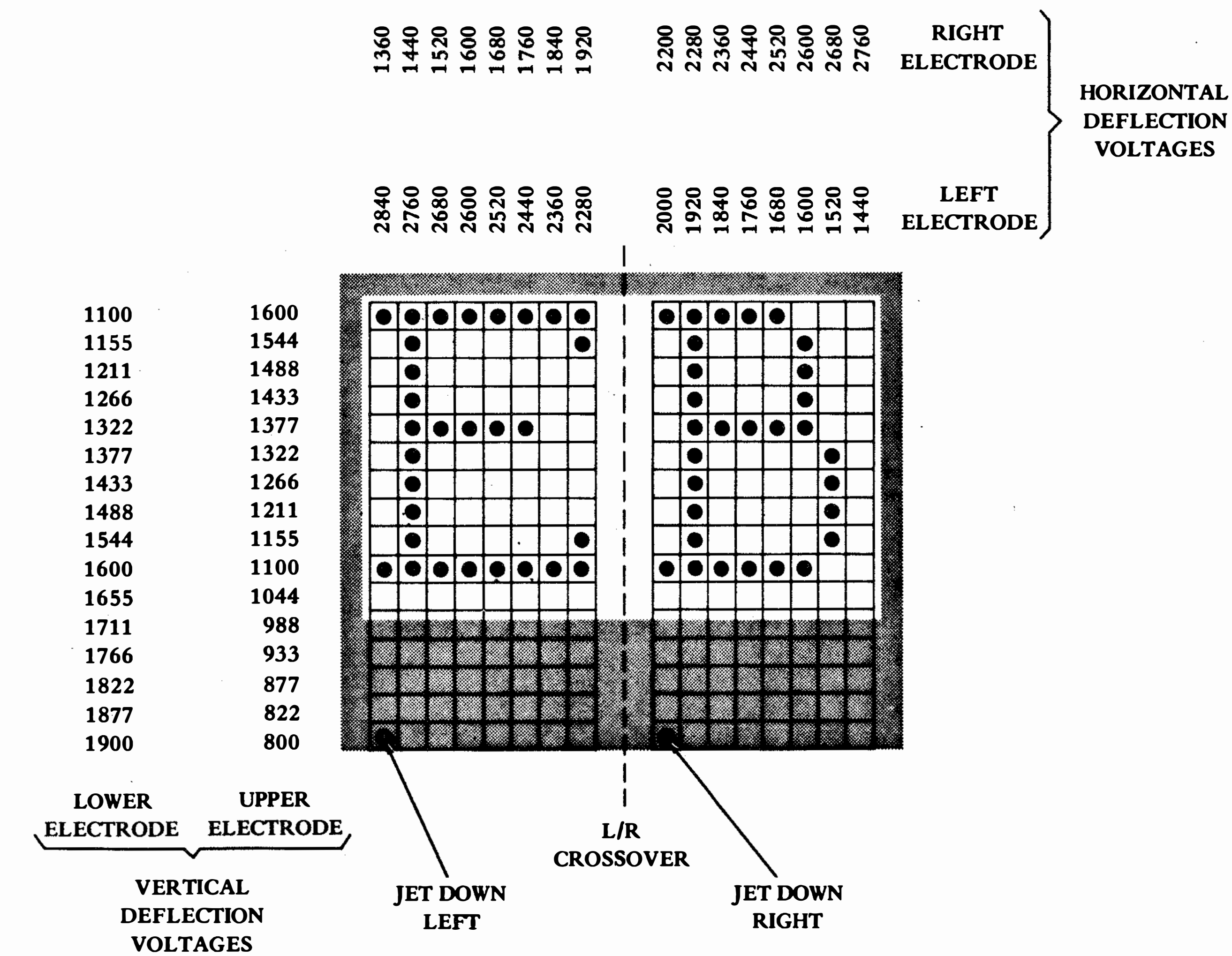


Figure 9 - Character Matrices and Deflection Voltages

power supply at the rear of the paper transport. When a nonprinting condition exists, the mask acts as a shield. That is, the voltage at the deflection electrodes is such that the ink droplets are deflected downward so they strike the lower portion of the mask. The ink droplets are therefore prevented from reaching the paper, and they drain down the mask to be returned to the ink supply in the manifold. When a printing condition exists, the mask voltage is the same as the average voltage established by the electric field between the horizontal deflection electrode set and the platen. As far as the ink droplets are concerned, the mask is invisible. In addition to its electrical function, the mask provides some protection for the deflection electrodes.

3.20 Summarizing the function of each electrode, the sequence of events that form a character can be explained as follows:

(a) The valving voltage is raised at the selected position until the ink begins to flow from the nozzle. At the same time the vertical deflection voltages are such that the ink is directed toward the lower edge of the mask until it is desired to start forming the character.

(b) The deflection voltages applied to the vertical and horizontal electrode sets cause the droplets to strike the starting position in the given character.

(c) Continued stepping of the deflection voltages traces the complete character.

(d) Once a given character is formed, vertical deflection is such that the droplets strike the lower part of the mask. This blocks the ink flow to the paper.

(e) Valving voltage is reduced until the jet is turned off.

3.21 Since there are only half as many nozzles as possible characters in a line, each nozzle must print two characters. This is accomplished by a bistable condition in the horizontal deflection electrode set. In effect, this results in two home positions for the droplets (Figure 9).

3.22 The stepping, or turning on, of the appropriate nozzle is accomplished electronically as described in Section 578-500-111 (formerly Section 592-820-111). For the schematic of the valving and deflection electrodes, refer to wiring diagram 8344WD. Note that the 20 upper vertical deflection electrodes receive the same stepping voltage. The 20 lower vertical deflection electrodes simultaneously receive a different value of the stepping voltage. A second signal path supplies the upper and lower elements of the remaining 20 vertical electrodes. In a similar manner, all the horizontal electrodes are charged simultaneously. However, the ink nozzles are conditioned separately and only the selected nozzle will initiate the printing, with the adjacent nozzle made ready for the next two characters. The valving electrode that is brought up to +550 v will cause the ink, which is negatively charged at -1900 v, to flow from its nozzle. The platen on the transport assembly, supported by the positive charge on the various electrodes, attracts the droplets toward the paper.

3.23 A basic dot matrix pattern is used to form all printed characters. Figure 10 shows how this dot pattern is used to form the letter E using a dot pattern eight dots wide and 10 dots high. In printing, the ink jet is directed to a given dot position, remains there for a specific time interval (250 microseconds), and is then directed to each succeeding dot position for a similar length of time until the complete letter has been printed. The total time required to print a character is, therefore, 250 microseconds times the number of dots needed to make up the letter.

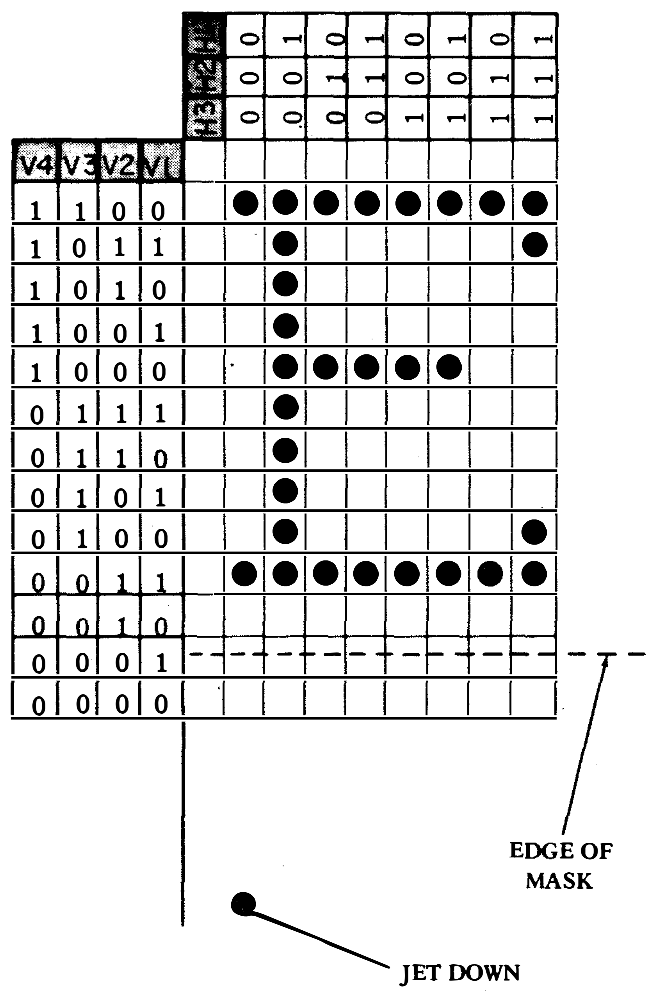


Figure 10 - Matrix Pattern

3.24 If each nozzle and set of electrode assemblies were to print one character, a total of 80 nozzles and electrode assemblies would be required to print a line of 80 characters across the page. However, each nozzle and set of electrode assemblies prints two adjacent characters so that only 40 sets are necessary to print a single line. Figure 11 shows two adjacent characters and the spacing relationship between them.

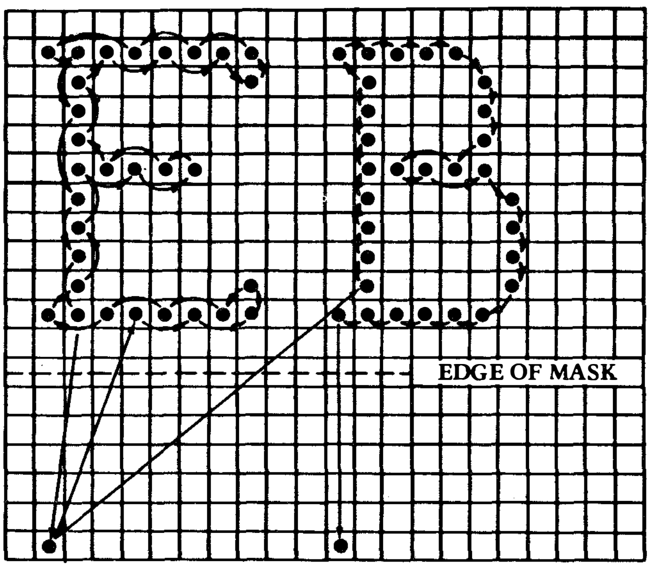


Figure 11 - Basic Tracing Pattern of Typical Electrode Assembly

3.25 A fixed amount of time is available for printing each character. At 1200 words per minute this is 8 milliseconds (250 microseconds by the 32 maximum dot positions per character = 8 milliseconds). However, characters built up from relatively few dots in the matrix pattern (such as the letter I) are completed early, and a wait period occurs when, even though the ink jet is turned on, it must not print. This is accomplished by deflecting the ink jet downward to a considerable distance below the printing area where it strikes the mask shown in Figures 8, 10, and 11. Ink that hits the mask cannot reach the paper, so deflecting the ink downward is equivalent to turning off the ink jet. This down position is referred to as jet-down or on-the-mask. Whenever a jet is turned on by the valving electrode (ink flowing) but is not printing, the ink is directed toward the mask. This situation occurs at three different times in the printing process: First, during the time allowed for ink to start flowing, but before printing has begun; second, after a left character has been printed but before a right character has started; and third, after printing has been completed and during the time allowed to turn off the ink jet.

3.26 To print a line of characters from left to right, the 40 ink jets are turned on in successive order. Thus, the first jet prints two characters, followed by the second jet, which prints the next two characters, and so forth. Each individual jet prints first a left and then a right character until the entire line is printed. The return to starting position for a new line is called reset and is initiated by a CARRIAGE RETURN (reset) signal.

3.27 To understand the character signals which must be supplied as input signals to the printer drive for providing the required vertical and horizontal deflection at the electrodes, refer again to Figure 10. This basic matrix pattern shows 12 possible positions above the zero position. These 12 vertical positions are represented by a four-bit binary code, as shown to the left of the matrix pattern. The horizontal positions are represented by a three-bit binary code, as shown above the matrix pattern. Any position in the matrix pattern may be located by specifying four vertical bits and three horizontal bits.

3.28 A separate signal is provided to control printing the left or the right character from a single jet. This signal is called the LEFT/RIGHT SHIFT signal. A separate signal must also be provided to control the jet-down (on-the-mask) or the jet-up (printing) positions. Refer to Section 578-500-111 (formerly Section 592-820-111) for the circuits and timing requirements for the recorder drive signals.

3.29 The paper, which is held taut against the platen by the paper tensioner mechanism, represents the ultimate goal for the negatively charged ink droplets. The platen derives its +10,000 v from the power supply at the rear of the paper transport mechanism.

3.30 The recorder enclosure (Figure 4) houses the ink supply, the (vibrating-diaphragm) pump, and the ink manifold. The pump, operating in the ink reservoir, raises the ink to the manifold, where it is drawn through a nozzle when valving potential appears at a valving electrode. Correct viscosity of the ink is maintained by a thermostatically controlled heater located in the ink container. This heater-thermostat arrangement maintains the temperature of the ink at a constant 130° F.

3.31 The ink pump is a magnetically actuated, vibrating diaphragm type which operates at a rate of 60 pulsations per second. This rate is achieved by half-wave rectification of the 26 v, 60 Hz ac input to the pump magnet. The self-contained pump assembly consists of a housing, a coil, a moving plunger (armature), and a vibrating diaphragm. The housing is the enclosure for the assembly and support for the core. The coil is connected in series with the half-wave rectified 26 v ac input to provide the pulsating electromagnetic field. This field actuates the armature, which is coupled to the diaphragm to provide the pump action. The schematic diagram of the ink pump circuit is shown in wiring diagram 8344WD.

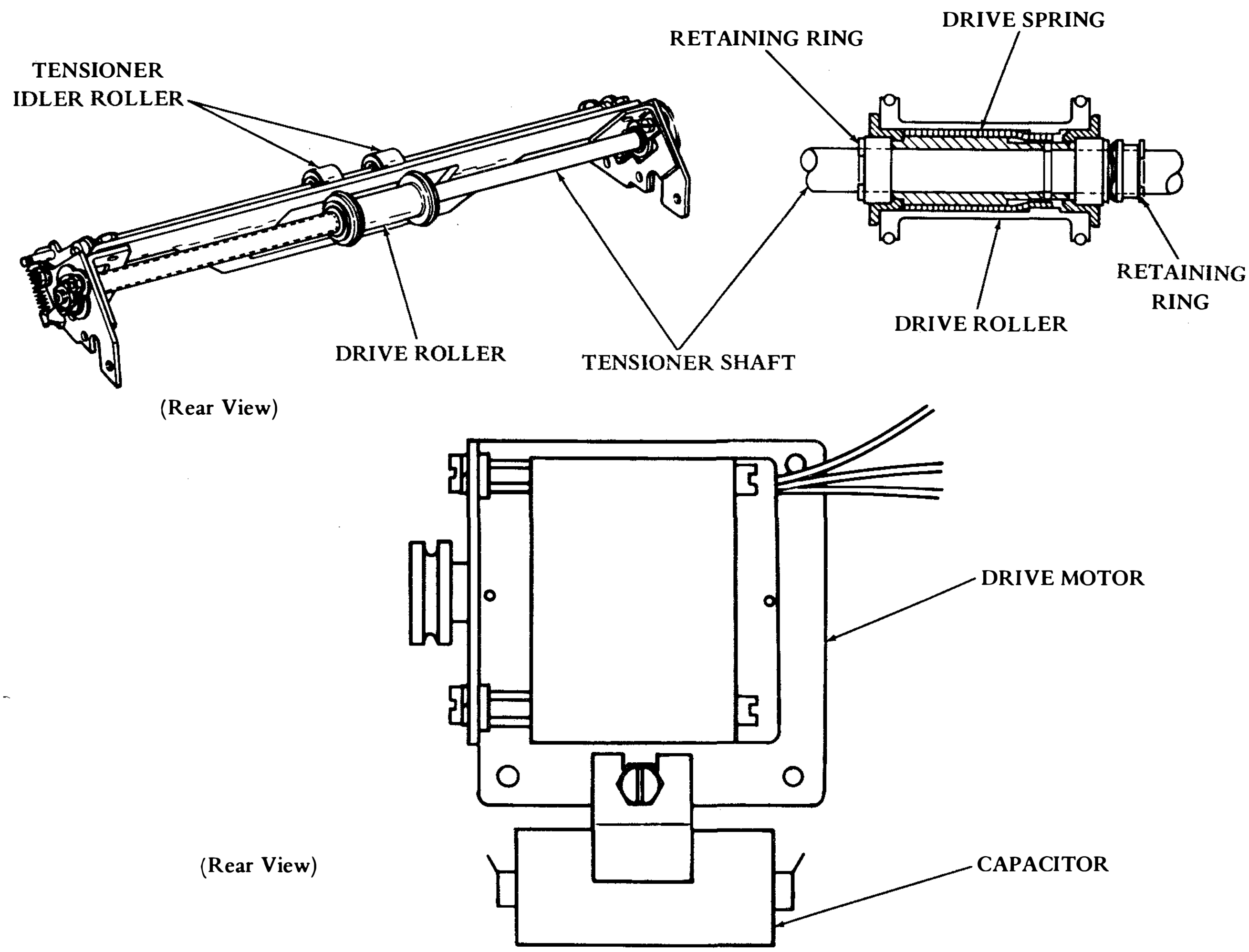
3.32 For filtering purposes, the ink inlet to the pump is covered with a screen which is secured by the filter retainer. The capacity of the tank is one bottle of ink – do not replenish the ink supply with more than 1/2 bottle unless the tank is drained, cleaned, and refilled.

3.33 When the manifold temperature falls below 130°F, the contacts of a thermostat close to forward bias the gate circuit of a triac (see wiring diagram 8344WD). With the triac turned on, 26 v ac is directed to the ink heating element until the ink temperature reaches 130°F. Then the thermostat contacts are opened and the triac becomes nonconductive. A second thermostat, with a manual reset button, is placed in one leg of the 26 v ac input to the heater and the pump. Should a malfunction occur in the ink heater thermostat which might cause the ink temperature to reach 160°F, the second thermostat opens to break the heater circuit.

3.34 The ink contains a violet toner and organic liquids. Exercise extreme care in handling to avoid any possibility of the ink or its residue coming in contact with clothing, skin, or most plastics. The violet toner has powerful staining characteristics. Therefore, the ink tank cover and the doors of the cover over the unit should be well seated in the recessed area provided to seal the components.

PAPER TENSIONER MECHANISM

3.35 The paper tensioner mechanism (Figure 12) consists of a drive roller and a pressure roller. The drive roller derives a constant torque through an internal overrunning spring clutch. The spring clutch is secured to a continuously rotating shaft. The tensioner provides for the instant take-up of the printed copy. In addition, it provides a positive drive to move the paper outward through the slot in the cover. The rapid take-up feature of the tensioner tends to



Note: The latest design mechanism becomes a single tire drive roller arrangement. Note that the clutch assembly is now permanently lubricated.

Figure 12 - Paper Tensioner Mechanism

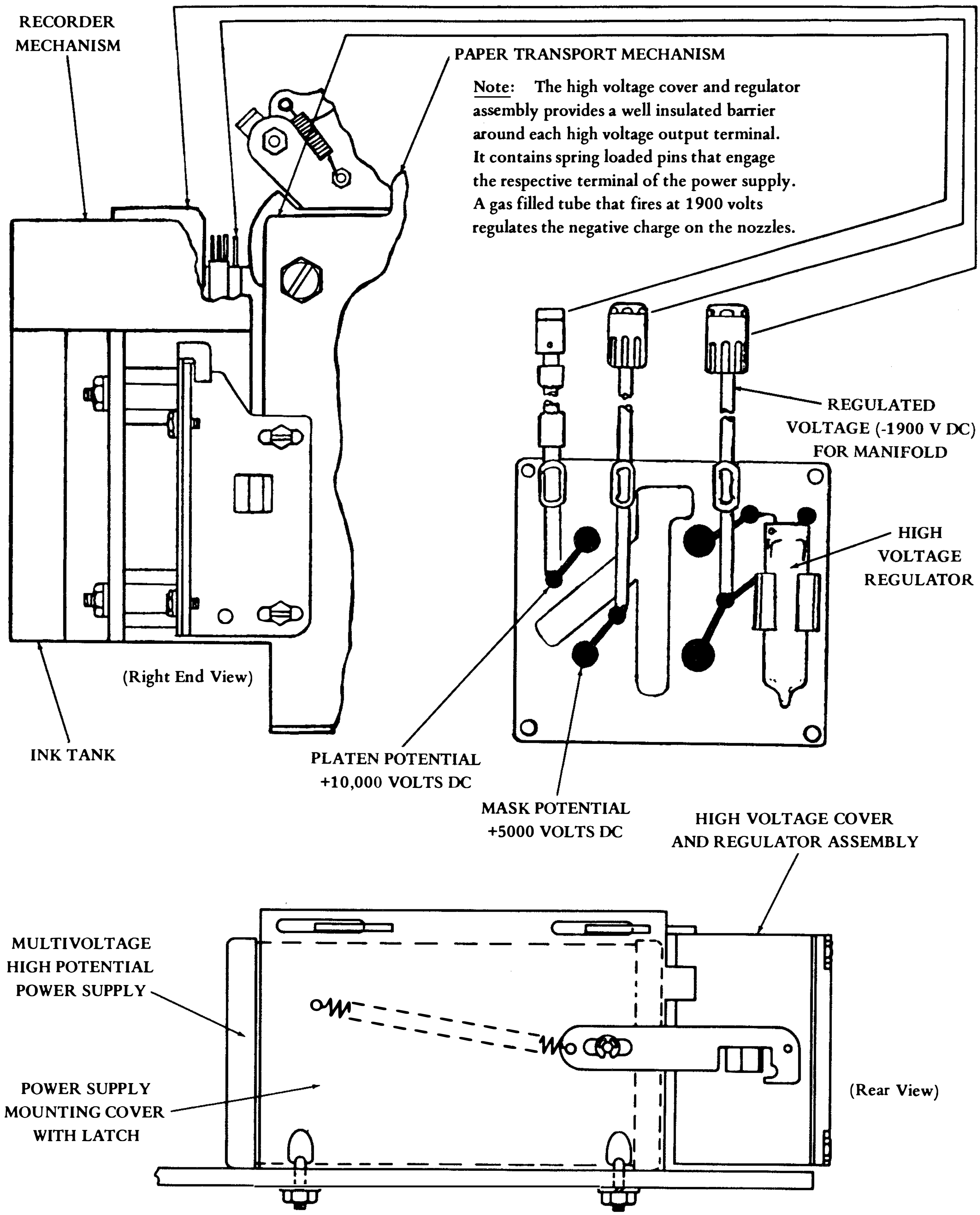
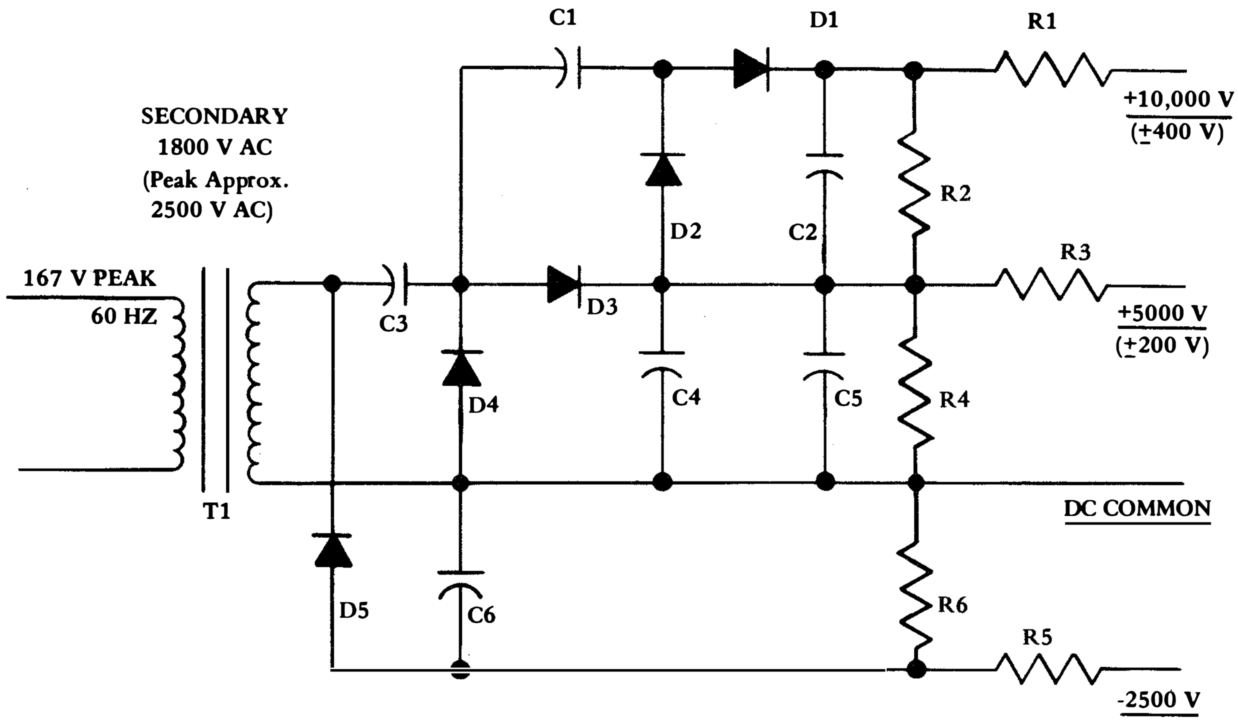
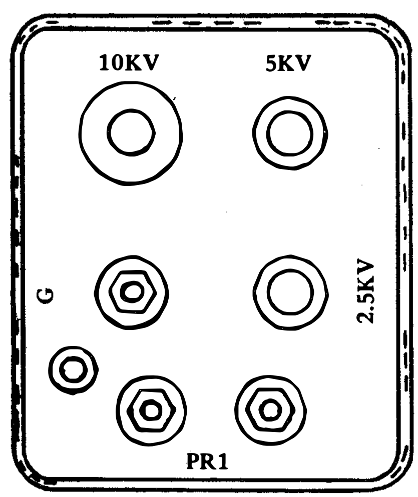


Figure 13 - Distribution of Electrostatic Charges to the Platen, Mask, and Nozzles





(Left End View)

Figure 14 - Platen, Mask, and Ink Nozzle Multivoltage High Potential Power Supply

maintain a taut paper condition in the printing area during most of the feeding cycle. The drive roller is confined to the center of the tensioner shaft by two retaining rings, one at either end of the drive roller. Because the drive roller is not directly fastened to the shaft, which continually rotates, it is allowed to slip around its drive spring and thus keep the paper taut during the printing cycle. During the line feed cycle, the torque in the drive spring rotates the roller with a power take-off effect. This power take-off keeps the paper taut throughout most of the line feed cycle.

3.36 Continuous rotation of the tensioner shaft is maintained by the driving belt from the drive pulley to the driven pulley. The torque for the paper tensioner is derived from the separately excited motor (Figure 12) located at the front right corner of the transport base. This motor is independent and not regulated by separate or accumulated line feed drive pulses.

3.37 A paper damper, consisting of two rollers (near each edge) engages the paper after it leaves the printing area. The damper integrates the stepping motion of the line feed mechanism into a smooth, continuous motion, thereby restricting the noise to the area within the cabinet.

HIGH VOLTAGE POWER SUPPLY

3.38 The high voltages required on three elements of the manifold assembly are obtained from the self-contained power supply at the left rear corner of the transport base. The "snap on" high voltage regulator assembly distributes the proper output by means of a well insulated divider and current limiter. The power supply consists of a transformer (167 peak v ac primary/2500 peak v ac secondary), rectifier, and filter circuits. With respect to the common terminal, a half-wave rectifier and associated filter provides a -2500 v output for connection to the high voltage regulator assembly linked to the manifold nozzles (Figure 13). A voltage doubler and filter provides a +5000 v output for the mask element. A second voltage doubler configuration draws upon the 5000 v potential of the previous doubler to produce the +10,000 v output to the platen (Figure 14).