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# 1132 Printer

## PREFACE

This manual describes the manual controls and program control of printing and carriage operations of the IBM 1132 Printer. It also describes the mechanical and electrical principles involved in performing these operations.

It is assumed that the user has a basic knowledge of the stored programming concept, and of the instruction set and theory of operation of the using system.

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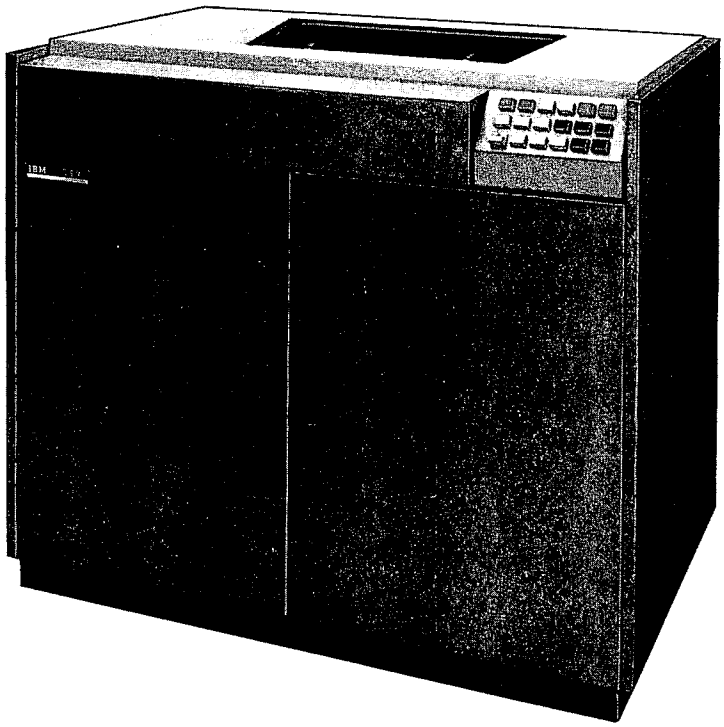



IBM 1132 Printer

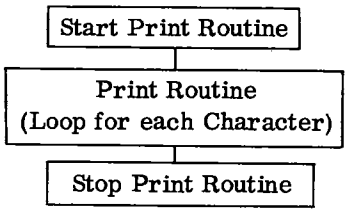
## DESCRIPTION

- The 1132 printer provides output printing of up to 120 characters per print line.
- A tape-controlled automatic carriage provides spacing or skipping for continuous forms.
- Printing and carriage operations are controlled by using system programs.
- Ribbon feeding and reversing is automatic.

### Printing

The IBM 1132 printer uses print wheels to provide output printing for a computing system. Printing is controlled by instructions in the program of the using system. Printing speed varies depending on the output format of the system program. Numeric printing and line spacing is accomplished at up to 110 lines per minute and alphameric printing up to 80 lines per minute. Special programs and/or special print wheels can increase these speeds. Horizontal spacing is 10 characters per inch, and there are 120 print positions per line.

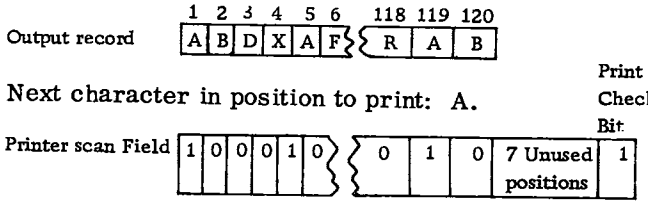
### Program Control




All print operations are accomplished under control of programs stored in the system Central Processing Unit (CPU). Before a print operation is started, usual programming procedures establish an output record area in storage. Another area of storage in fixed locations or addresses is set aside as a printer scan field for use in print magnet selection.

Start Print Routine. The start print routine in the CPU program prepares the system to start printing the information in the output record.

Print Routine. The print wheels are continuously running, and the 1132 continuously makes available to the CPU the code for the print wheel character in position to print next. An instruction of the print routine causes this code to be sent to the CPU. The routine compares this code with each character in the output record. Each time an equal is encountered, a bit is stored in the printer scan field. For example, if the first character of the output record equals the comparison character, a bit is stored in the first position of the printer scan field. The second position of the output record is next compared and a bit is stored or not stored, depending on the result of the comparison. The program continues the comparison procedure until the printer scan field contains a bit in each position which gave an equal comparison.




Each of the first 120 positions of the printer scan field corresponds to a print wheel position of the 1132. A bit is placed in position 128 of the printer scan field for checking scan completion.

The 1132 continuously emits CB signals for each character of the print wheel. When the next CB signal is received by the CPU, the printer scan field is immediately transferred to the 1132, sixteen positions at a time. The print magnets corresponding to bits in the printer scan field are energized and remain energized for the duration of the CB signal. When the last or eighth group of the scan field is transferred, position 128 is checked for the presence of a bit. If there is no bit, it is an indication that the scan was not completed in the allowable time, and the print scan check indicator is turned on.

After the scan is completed, the print routine is entered again. The printer again sends the CPU the coding for the next available print wheel character. Note that while the print magnets are still energized for the printing of one character, the program starts setting up the printer scan field for the next character of the print wheel.

Stop Print Routine. When the program determines that the print magnets have been energized to start printing of the last character of the line, the print operation is complete. The program must allow time for the mechanical action of printing to be completed before starting a carriage space operation. After carriage spacing or skipping, the printer can start another print operation.

Print Operation Instructions

Printing is controlled by the using system. A brief description of typical system instructions follows.

Sense Device. Before the 1132 printer is instructed to print, usual programming includes a sense device instruction to check the printer status to insure that the printer is ready, not busy, and that all previous print scans have been completed.

Read Emitter. This instruction requests the printer to transmit, back to the system, the bit structure of the character in position to print next.

Start Printer. This instruction is given to start a print operation when the output record is ready.

Stop Printer. This instruction directs the printer to stop printing and returns it to a non-busy state.

Print Operation Timings

The print wheels are continuously running, and have no definite timing relationship to the instructions in the CPU program. However, following a start printer instruction, printer CB pulses are being presented to the CPU, one for each character position of a print wheel. Because each CB pulse is causing an automatic print scan and branch to a print subroutine, the program can be written to keep track of print wheel movement by counting the number of scan cycles taken.

If a scan cycle is taken when the printer scan field has only a bit in position 128, no print magnets are energized, and the scan cycle is an idle scan cycle. (Bit 128 must be present to prevent a print scan check.) Programming a certain known number of idle scans allows the time required for the completion of printer mechanical action. For example, during the time between print magnet energization and actual printing, the print wheel always moves the same distance, and a certain number of print scan cycles can be taken. After the final print scan cycle for a line of print, 16 idle scan cycles must be taken before spacing or skipping can be started. This programmed delay allows actual printing of the last character of a line before paper movement starts.

If a single or double space is required, the next print line can be started two scan cycles after the space operation is initiated. This programmed delay allows time for paper to be moved and stopped before any character of the next line is printed. Additional time must be allowed for spacing more than two line spaces.

Numeric Printing. Printing entirely numeric records on successive lines can be accomplished at a higher speed than printing of alphameric records. The total delay necessary in any alternate print and space program is equal to 18 print scan cycles as previously described. Numeric characters are grouped together on the circumference of the print wheel, Figure 1-1. The delays can be programmed to occur during the time unused characters are passing the print position. Thus, the numeric characters are utilized each revolution of the print wheels, and the number of lines printed per minute equals the print wheel revolutions per minute.

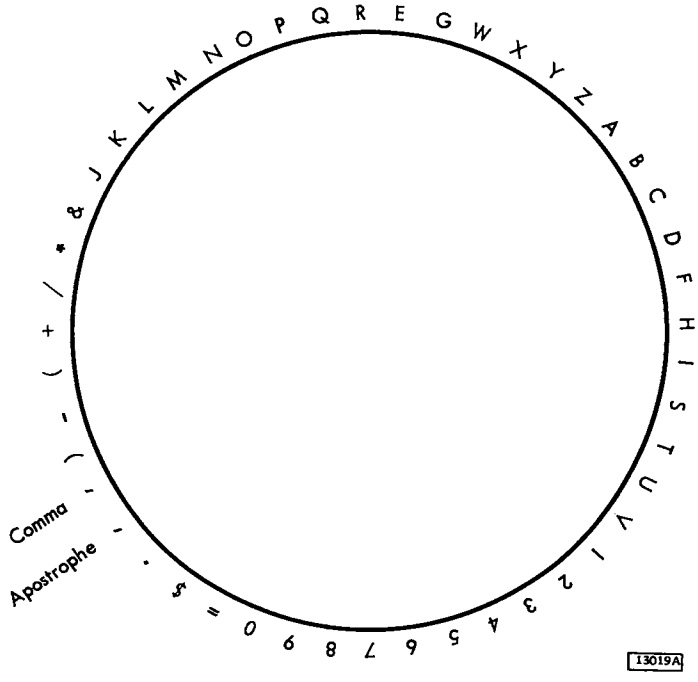



Figure 1-1. Print Wheel Character Arrangement

Alphameric printing. When the program calls for the capability of printing any of the 48 characters, printing speed is lessened. Print scan cycles must be taken for each character of the entire print wheel. Then the delay required for completing mechanical printing action and the carriage space must be programmed. The next print operation can not be started until the print wheel has moved approximately 1/3 revolution further. (Figure 1-2.) Further extension of the timing chart would show that approximately three print instructions can be completed during four revolutions of the print wheels.

These considerations are the basis for calculating maximum printer speeds. Output format and programming can be seen to have a definite effect on printing speeds.

## Forms Control

Forms feeding is provided by a tape-controlled carriage and forms tractor. A manual control lever on the feed tractor allows selection of 6 or 8 lines per inch spacing. The carriage can be controlled to move the forms a single line space or a distance determined by the punching in a control tape. Operator control keys for the carriage are Carriage Space, Carriage Restore, and Carriage Stop.

### Forms Control Instructions

On-line forms feeding is under control of the using system program instructions. A brief description of typical instructions follows.

Sense Device. This instruction senses the operating status of the carriage:

1. Is the carriage busy?
2. Is there a skip or space response condition?
3. Which control tape channel punch was read?

Space. This instruction signals the carriage to advance the forms one line space.

Start Carriage. This instruction starts a carriage skip and forms are fed until a Stop Carriage instruction is given.

Stop Carriage. When the using system determines that the desired control tape punching has been sensed, the Stop Carriage instruction is given. This stops paper movement and the printer can respond to further instructions.

## Ribbon Control

Ribbon feeding is continuous when the 1132 printer motor is running. A reversing device operates when all the ribbon has been fed onto either ribbon spool.

## Operator Controls (Figure 1-3)

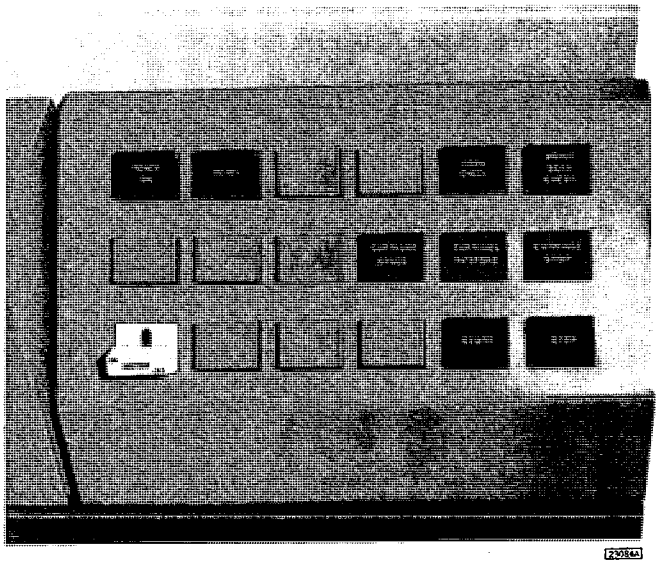


Figure 1-3. Operator Control Keys and Lights

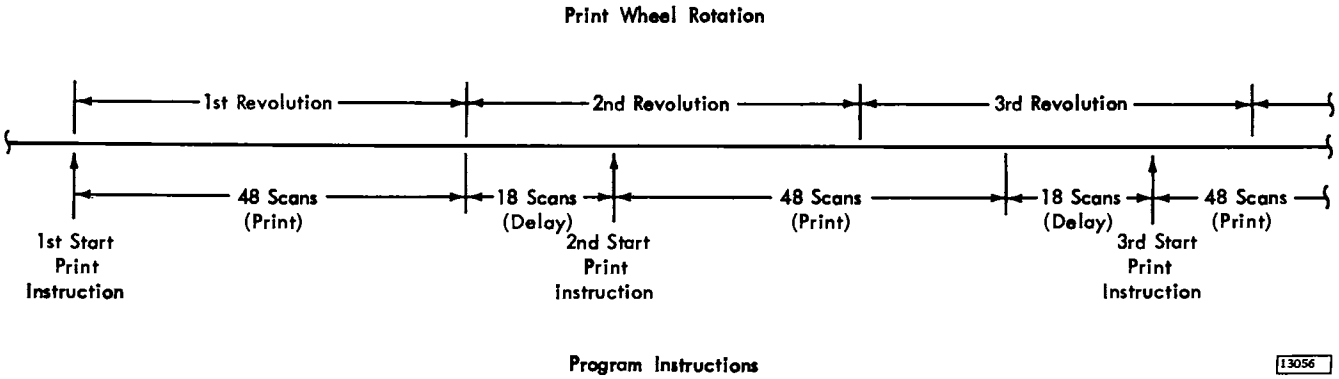



Figure 1-2. Alphameric Printing

Lights

Power On. This light indicates that power is being supplied to the 1132 and that the 1132 motor switch is on.

Ready. This light indicates that the 1132 printer is ready to accept instructions from the system. Conditions to place the machine in a ready status are:

1. Forms are in printing position.
2. Power is on.
3. The start key is pressed after items 1 and 2 are satisfied.

Print Scan Check. This light indicates that a print scan for a particular character has not been completed while that character is in position to print. The light is automatically turned off when a sense device instruction senses the condition.

Form Check. This light indicates that about 14 inches of paper or less remain in the machine. When the form check light turns on, the ready light is turned off.

Keys

Start. When this key is pressed, the printer is placed in a ready status if:

1. Forms are in the machine.
2. Power is on.

Stop. Pressing this key takes the printer out of the ready status.

Carriage Restore. Pressing this key starts a carriage skip. This skip is automatically terminated when a hole in control tape channel 1 is sensed. The key is not effective when the machine is in a run status. A manual control determines whether or not the forms are moved.

Carriage Space. Pressing this key advances the forms one space. The key is not effective when the machine is in a run status.

Carriage Stop. Pressing this key stops a carriage operation that is in progress.

Switches

Motor Switch. When on, this switch enables the circuit to cause the drive motor to run. It should be turned off during ribbon replacement or when the machine is not in use.

Carriage Manual Controls

Platen Clutch Knob. This knob disconnects the platen from the drive motor so that the platen may be positioned independently of the carriage tape mechanism (Figure 1-4).

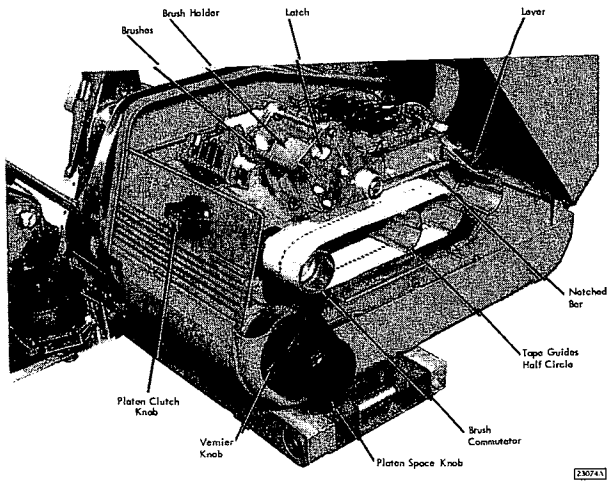



Figure 1-4. Right Side of Carriage

Platen Space Knob. Rotating this knob moves the form vertically line by line. The platen clutch must be disengaged so the form can move (Figure 1-4).

Platen Space Knob Vernier. Rotating the vernier moves the form vertically less than one line space. Turning the knob in a clockwise direction causes the printing to occur higher on the form. Counterclockwise movement of the knob advances the platen and lowers the printing on the form. In either case, the carriage tape is not affected and adjustments can be made while the platen is engaged and while the machine is in operation (Figure 1-4).

Forms Thickness Adjustment Device. This device moves the entire carriage and platen away from its normal position in relation to the printwheels. This

provides additional clearance between the platen and the printwheels when forms of increased thickness are used (Figure 1-5).

Pressure Roller Release Lever. Operating this lever toward the rear of the carriage releases the pressure holding a form to the platen. It is used when inserting new forms or when repositioning a form. The pressure release lever should always be in the released position when the forms tractor is being used (Figure 1-5).

Platen Shift Wheel. Turning this handwheel moves the carriage horizontally (Figure 1-5).

Lines Per Inch Adjustment. This mechanism, located on the right side of the forms tractor, allows the operator to select vertical spacing of 6 or 8 lines to the inch (Figure 1-5).

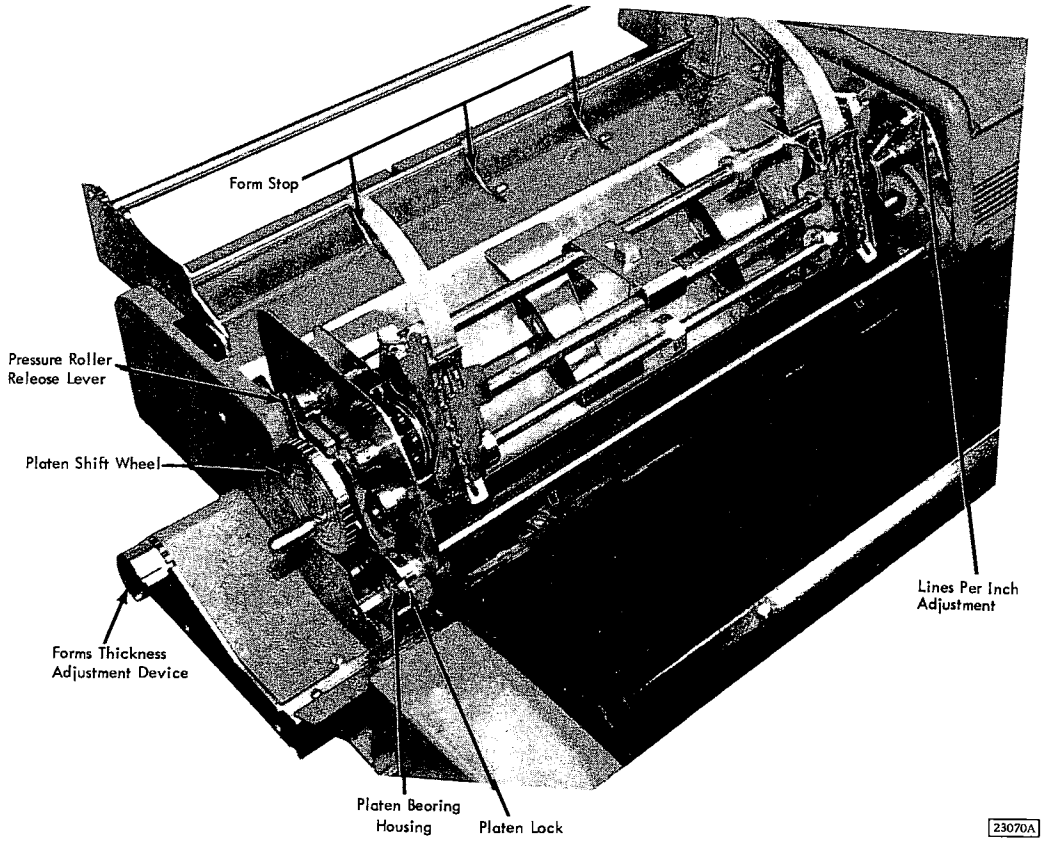



Figure 1-5. Left Side of Carriage

Carriage Control Tape

The control tape (Figure 1-6) has 12 columnar positions indicated by vertical lines. These positions are called channels. As viewed from the front of the machine, they are numbered 1 through 12 from left to right. Brush 1 rests on channel 1, brush 2 on channel 2, and so on. A maximum of 132 lines can be used for control of a form, although for convenience the tape blanks are slightly longer. Horizontal lines are spaced 6 to the inch for the entire length of the tape. Round holes in the center of the tape are pre-punched for the pin feed drive in the tape sensing mechanism.

Tape Channels. Tape channels are punched to control various functions:

1. Channels 1 through 6 are used to stop the form (skip to) as designated by the program. Channel 1 is normally punched for the first printing line of a form. When the Carriage Restore key is operated, the carriage will automatically seek channel 1 as a home position.
2. Channels 9 and 12 are normally used to sense the location of the form for the purpose of overflow. These two channels may be used for the same purpose as channels 1 through 6.
3. Channels 7, 8, 10, and 11 are not used.

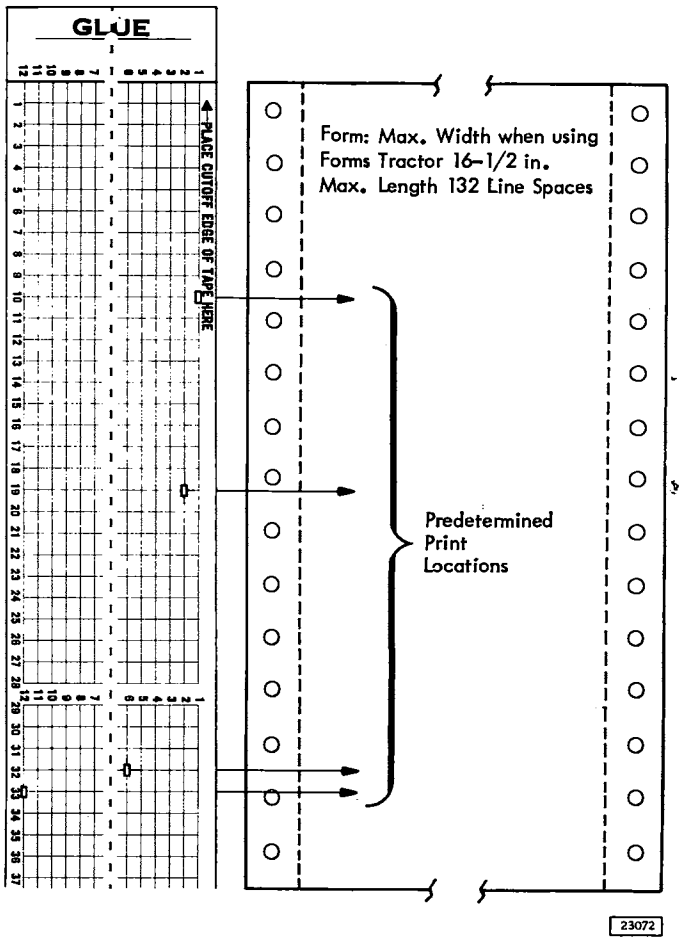



Figure 1-6. Control Tape Punching for Predetermined Printing Locations

## MOTOR AND DRIVE

Figure 2-1 is a left side view showing the mechanical drive system of the 1132. These parts run continuously when the motor is running.

Adjustable Pulley. The smaller of the two intermediate pulleys is adjustable to drive the print clutch shaft at 300 rpm. The bracket which supports the intermediate pulley pivot is movable to maintain proper belt tension.

Print Wheel Drive Gear. This gear is driven through intermediate gears at 112.5 rpm. The print wheel drive gear spans the width of the print wheel unit and drives all the print wheels.

Ribbon Feed Eccentric Sleeve. This sleeve (not shown in Figure 2-1) is attached to the right hand end of the print wheel drive gear shaft. The sleeve operates the ribbon feed rocker arm through a link. The ribbon feeds continuously when power is on.

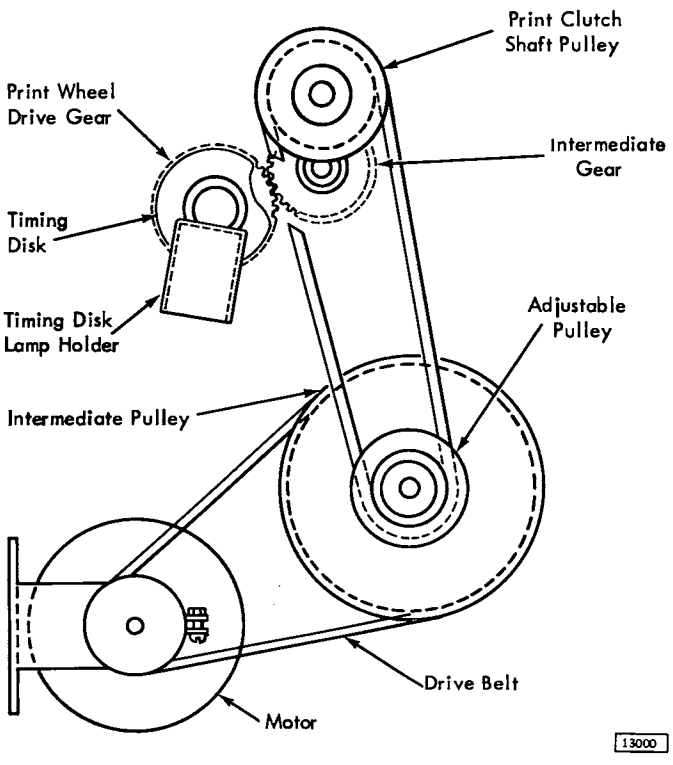



Figure 2-1. Motor and Drive (Left end view)

## PRINT MECHANISM

The print mechanism consists of a print magnet unit, a print cam mechanism, and a print wheel unit. Description of the overall operation of the mechanism is followed by a detailed description of each unit.

### Print Operation

The print mechanism involved in printing one position is shown in Figure 2-2. All parts are shown latched. With the drive motor running, the print clutch shaft turns within the print cams in the direction shown. Also, the print wheels and print wheel drive gear turn continuously.

When the print magnet is energized, the print clutch dog is released and engages a flute of the print clutch shaft. The print cam turns, and the high lobe of the cam strikes the tail of the print wheel hanger, camming the hanger and print wheel toward the platen. The print wheel is not driven fully against the platen but momentum continues the motion. The character that is printed is determined by the timing of the inpulse that starts the print cam motion.

The flutes in the print clutch shaft have a 7° twist, end-to-end. This twist results in slightly different print times for the same character between the left and right ends of the unit.

Print cam motion continues until the print clutch latch stops the print clutch dog and disengages it from the print clutch shaft flute. The print cam detent positions the print cam between print operations.

### Print Magnet Unit

The print magnet unit (Figure 2-3) contains a print magnet, link, and knockoff lever for each of the 120 printing positions. The function of the unit is to control the unlatching of the print clutch latches in the print cam mechanism.

When the print magnet is energized and attracts its armature, the tip of the armature moves the link in the direction shown by the large arrow in Figure 2-3. The turned-up tip of the link pivots the magnet armature knockoff lever clockwise, allowing the print clutch latch to move into the cut-out portion of the upper tip of the knockoff lever. When the print magnet is de-energized, the knockoff lever compression spring and the armature knockoff spring

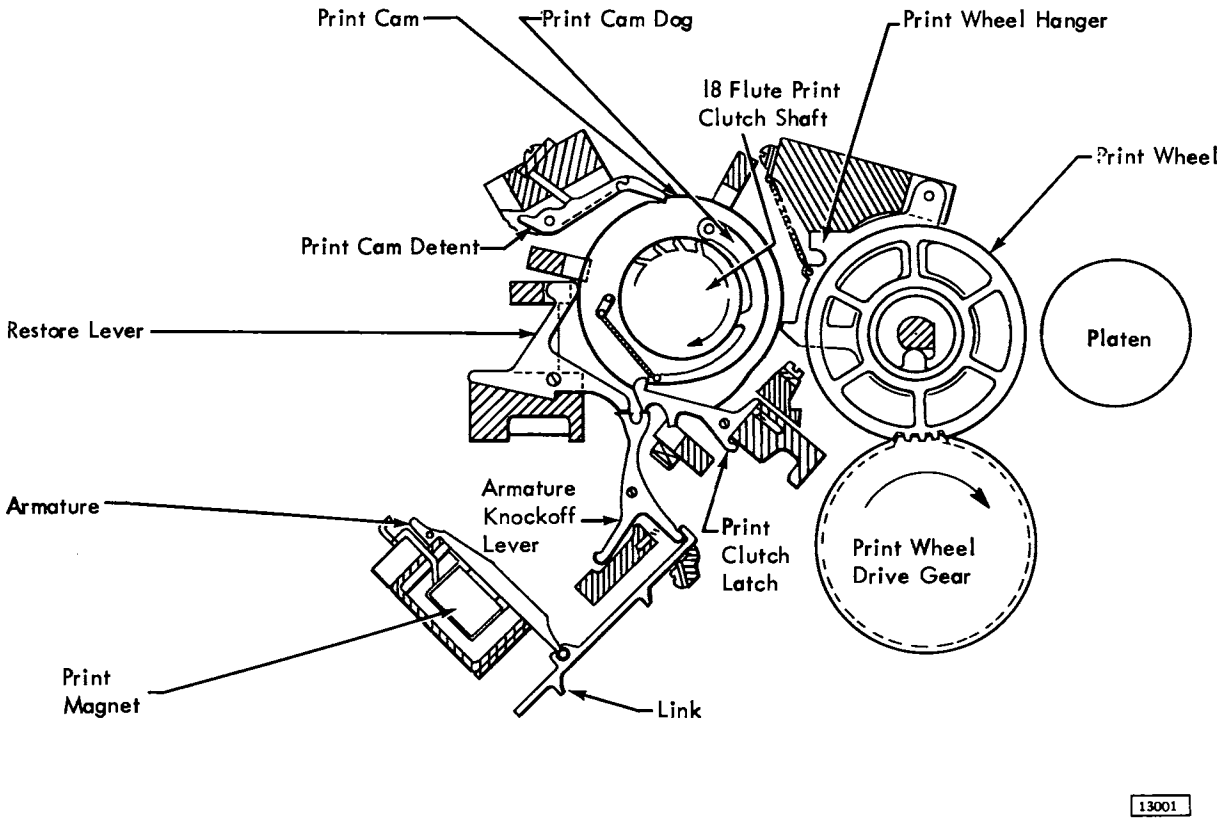



Figure 2-2. Printing Mechanism

return the linkage to its normal position. The restoration of the print clutch latch is described under Print Cam Mechanism.

## Print Cam Mechanism

The print cam mechanism is not a self-contained unit which can be removed as an assembly. The components operate in separately removable support and guide bars. The function of each print cam is to cam its associated print wheel toward the platen.

The mechanism for a single print position is shown in its latched-up position (Figure 2-4), with the print clutch latch resting on the armature knockoff lever. When the knockoff lever pivots clockwise, the print clutch latch is moved into the cut-out in the knockoff lever by the latch compression spring (Figure 2-3).

As the latch releases the tip of the print cam dog, the dog spring pulls the dog into a flute of the continuously running print clutch shaft. The dog starts driving the print cam, and after the cam has turned approximately 3/4 of a revolution, the high lobe drives the print wheel hanger toward the platen (Figure 2-6).

The print clutch latch is relatched on the tip of the armature knockoff lever by the restore lever which follows the print cam (Figure 2-5). This places the latch in the path of the print cam dog, and disengages it from the print clutch shaft flute. Print cam motion stops, and the cam is held by the inter-action of the detent and the print clutch dog spring tension.

## Print Wheel Unit

Each print wheel has 48 characters around its periphery and is driven continuously by the 48 tooth print wheel drive gear. The print wheel pivots on a hub which is part of the print wheel hanger.

When the print cam cams the print wheel hanger toward the platen, the hanger pivots at the top against hanger spring tension (Figure 2-6). The print wheel is not cammed all the way against the platen, but momentum continues the motion and a character prints.

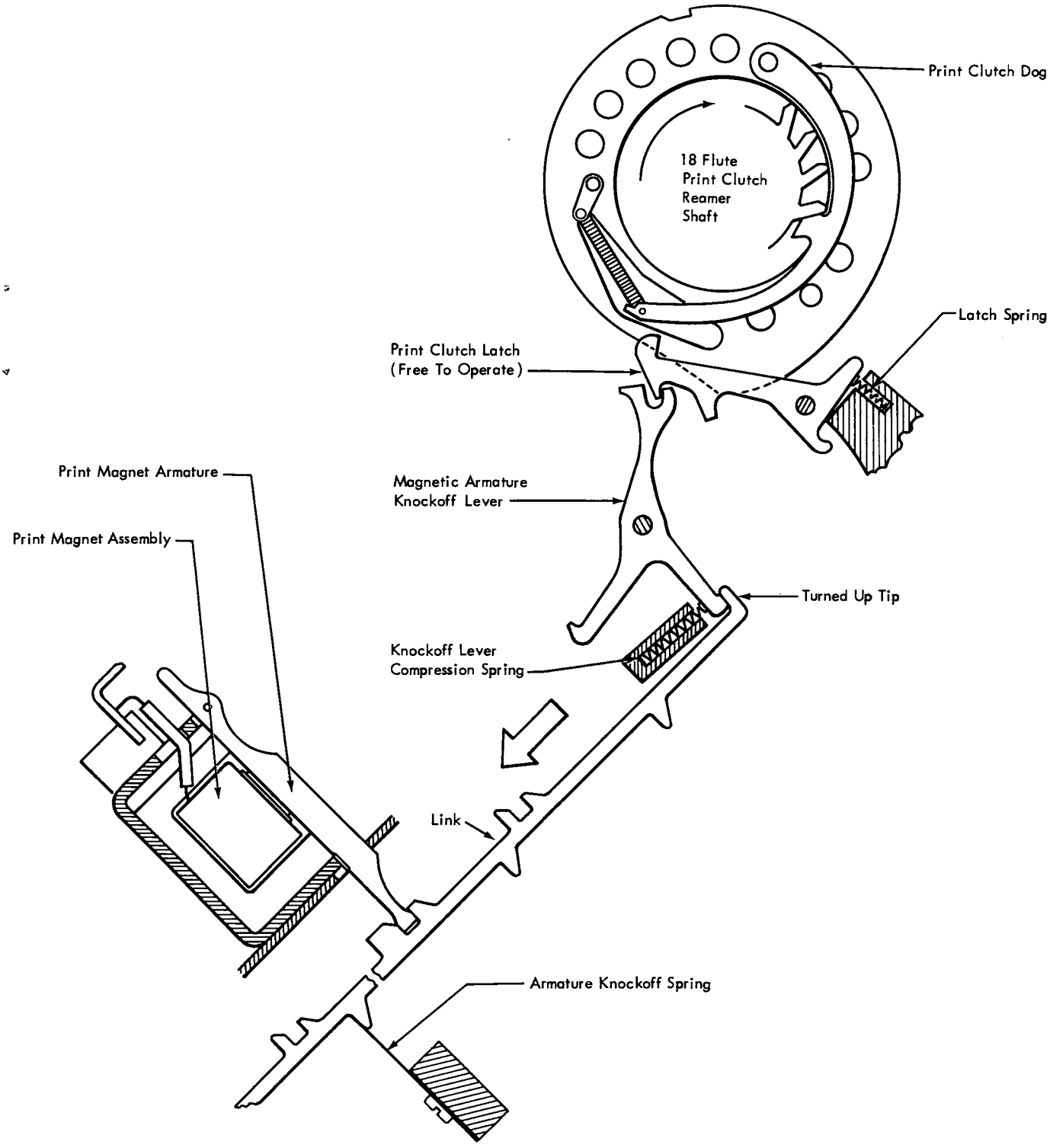



Figure 2-3. Print Magnet (Energized)

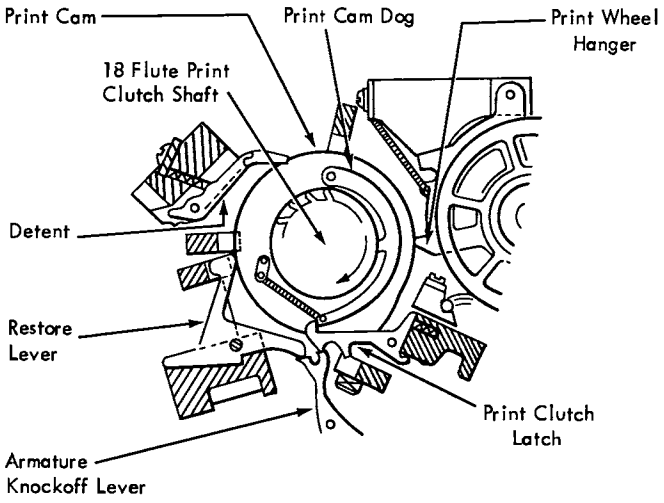



Figure 2-4. Print Cam Mechanism

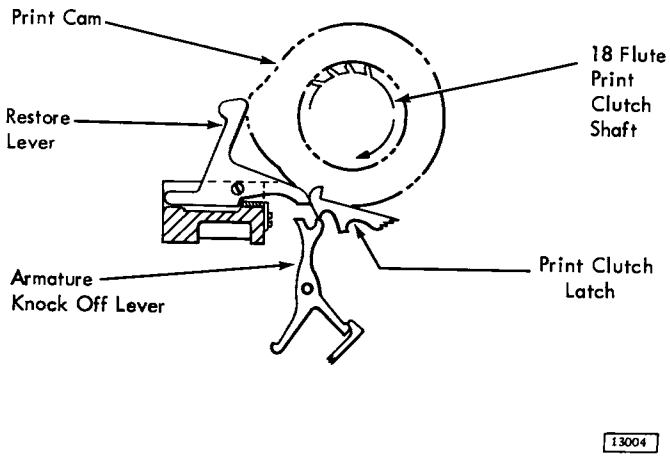



Figure 2-5. Clutch Latch Restore Lever

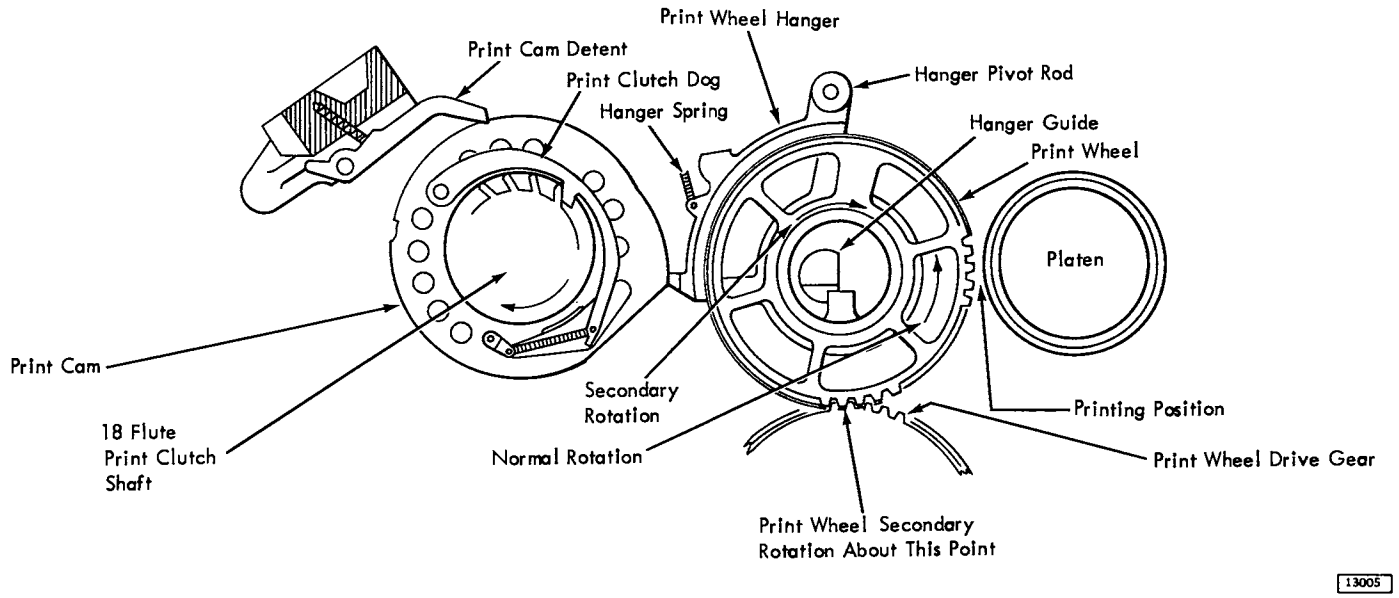



Figure 2-6. Print Wheel Operation

As the hanger and print wheel move toward the platen, a lug on the hanger is guided by a slot in the hanger guide. During this time, the print wheel tends to pivot about its point of contact with the print wheel drive gear (Figure 2-6). This causes a secondary rotation in the opposite direction to the normal rotation. The result is that the print wheel rotation is almost stopped at print time.

## PRINT EMITTER

### Timing Disk

Clamped to the left end of the print wheel drive gear is the timing disk which has slots used to generate timing pulses. There are nine rows of slots, and the outer row has 48 slots, equally spaced.

This row provides the print disk clock pulses, one for each possible character. Slots in the other rows represent the character coding. (Figure 2-7.)

## Solar Cells

The solar cells and their light source are mounted on a bracket on the print mechanism left side frame. (Figure 2-8.) When a slot of the timing disk is between the lamp and the solar cell, a pulse is generated. This pulse is fed into an amplifier circuit, and the amplifier output signal is sent to the using system. This signal may be used in the system circuits. Both lamp and solar cell supports can be pivoted on the shaft for alignment.

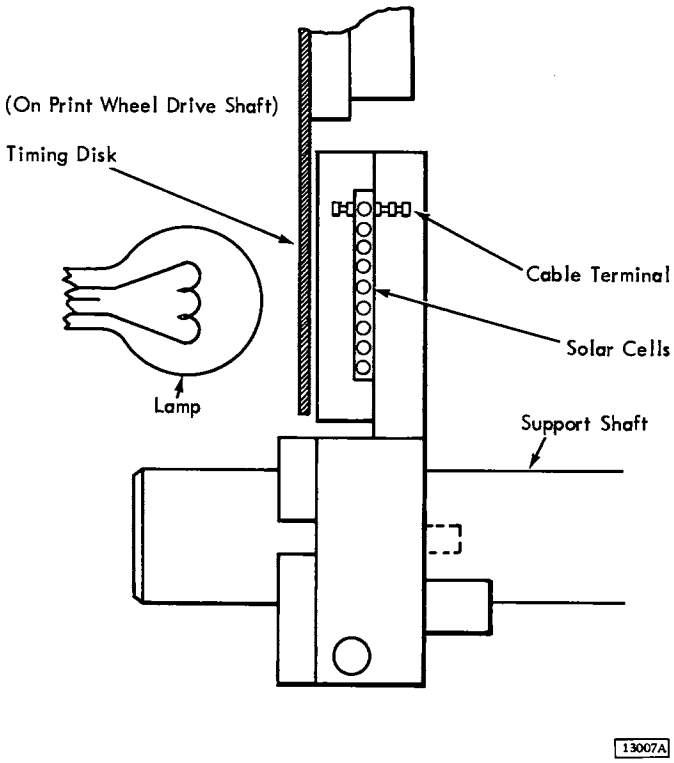



Figure 2-8. Solar Cells and Lamp

# RIBBON FEED AND REVERSE

## Ribbon Feed

An eccentric sleeve secured to the right end of the print wheel drive gear shaft imparts reciprocal motion to the adjustable rocker arm. (Figure 2-9). The rocker arm operates the ribbon feed link. The

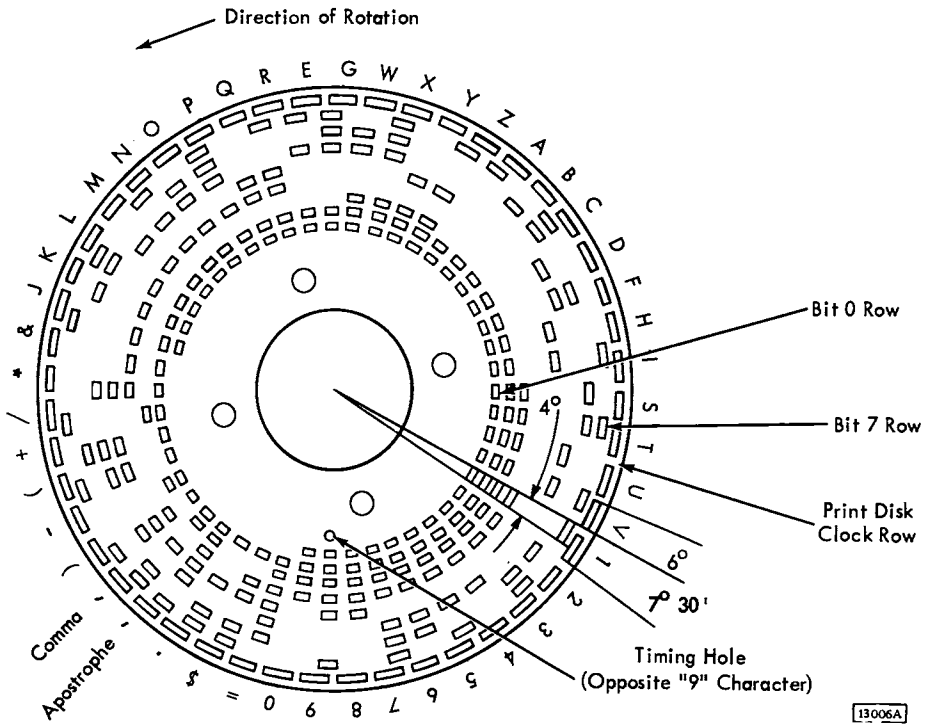



Figure 2-7. Timing Disk

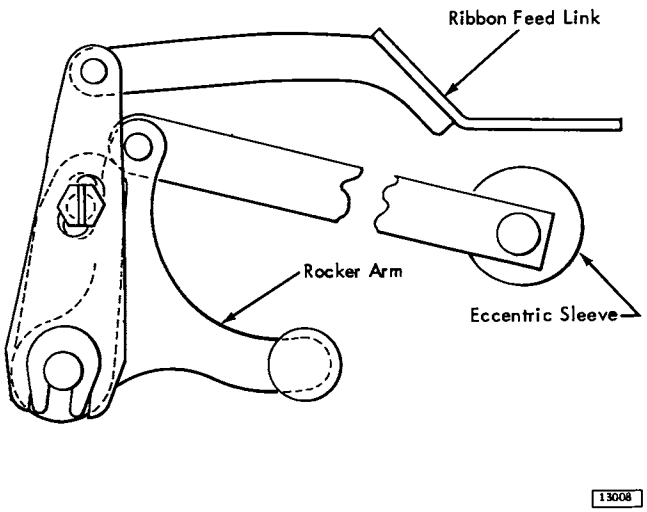



Figure 2-9. Ribbon Feed Drive

ribbon feed link in turn drives the ribbon feed operating arm (Figure 2-10). Attached to this ribbon feed operating arm is the ribbon feed pawl which engages in the teeth of the ribbon feed ratchet wheel and causes the ribbon spool to rotate. The ribbon feed check pawl holds the ribbon feed ratchet wheel in its advanced position and prevents it from turning backwards when the feed pawl is moved to the rear to engage the next tooth of the ratchet wheel.

With the ribbon reverse detent positioned as shown in Figure 2-10, the ribbon feed pawl is free to engage with the teeth of the ribbon feed ratchet wheel when the ribbon feed operating arm is moved in a clockwise direction. The tail of the ribbon feed pawl of the right-hand unit does not operate against the pawl controlling stud while the unit is positioned as shown in Figure 2-10. Consequently, any movement of the ribbon feed pawl is transmitted to the ribbon feed ratchet wheel, causing the ribbon spool to turn clockwise and wind the ribbon on the spool.

While this action is taking place at the right spool, the left spool is unwinding; the right and left units are positioned as shown in Figure 2-10. It should be noted that the left ribbon feed operating arm assembly is held in such a position that the ribbon feed pawl is held clear of the ribbon feed ratchet teeth by the pawl controlling stud because of the position of the left ribbon feed operating arm assembly.

## Ribbon Reverse

When the ribbon has reached the rivet indicating the end of the ribbon, the mechanism must be reversed to feed the ribbon in the opposite direction. As the rivet in the ribbon feeds around the ribbon guide spool, the ribbon feed reverse arm is operated, and, in turn, causes the ribbon feed reverse pawl to move into the path of the feed pawl stud as shown in Figure 2-11. As the ribbon feed operating arm operates, the feed pawl stud strikes the ribbon feed reverse pawl and limits the movement of the operating arm. This action causes the ribbon reverse detent roller of the right ribbon feed operating arm to change its

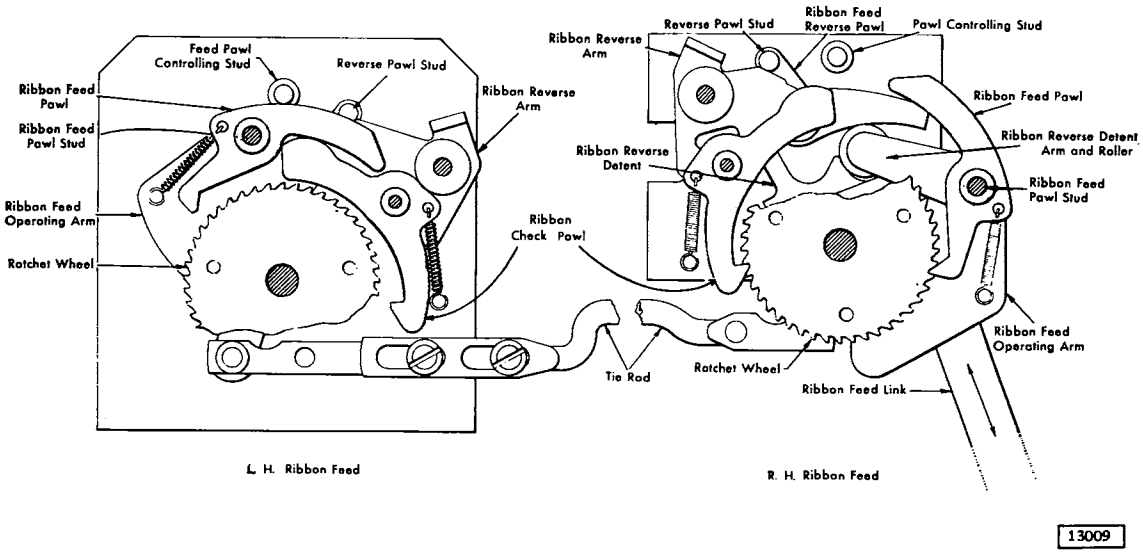



Figure 2-10. Ribbon Feed Mechanism (Feeding to Right)

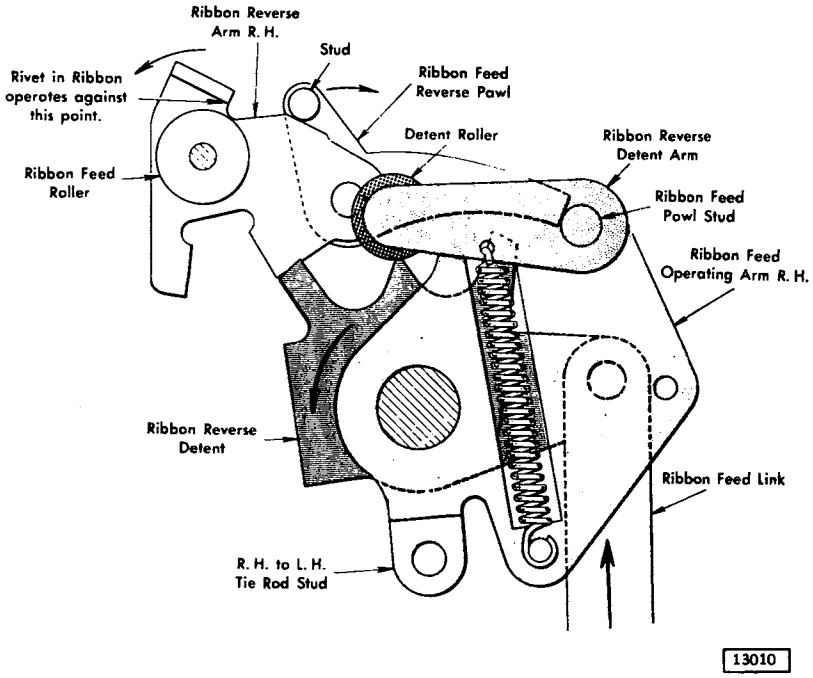



Figure 2-11. Ribbon Reversing Mechanism

position in the ribbon reverse detent. When this takes place, the positions in the left and right units are reversed and the ribbon begins to feed in the opposite direction (Figure 2-12). These conditions remain as shown until the other end of the ribbon is reached, at which time the ribbon reverse pawl will force the ribbon reverse detent roller of the right ribbon feed operating arm back to the original position of the operating arm. This causes the ribbon to reverse and travel in its original direction.

## CARRIAGE DRIVE UNIT

The carriage drive unit is mounted at the right end of the carriage frame and supplies all power to the platen for spacing or skipping operations.

### Continuously Running Mechanism

By turning the drive shaft counterclockwise, the power supply may be traced to the two clutches (Figure 2-13).

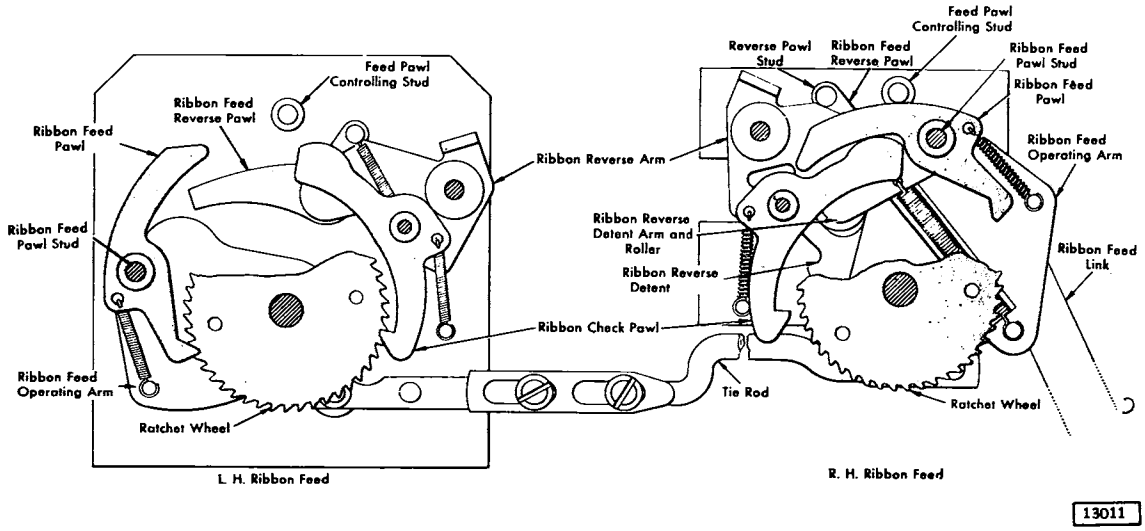



Figure 2-12. Ribbon Feed Mechanism (Feeding to Left)

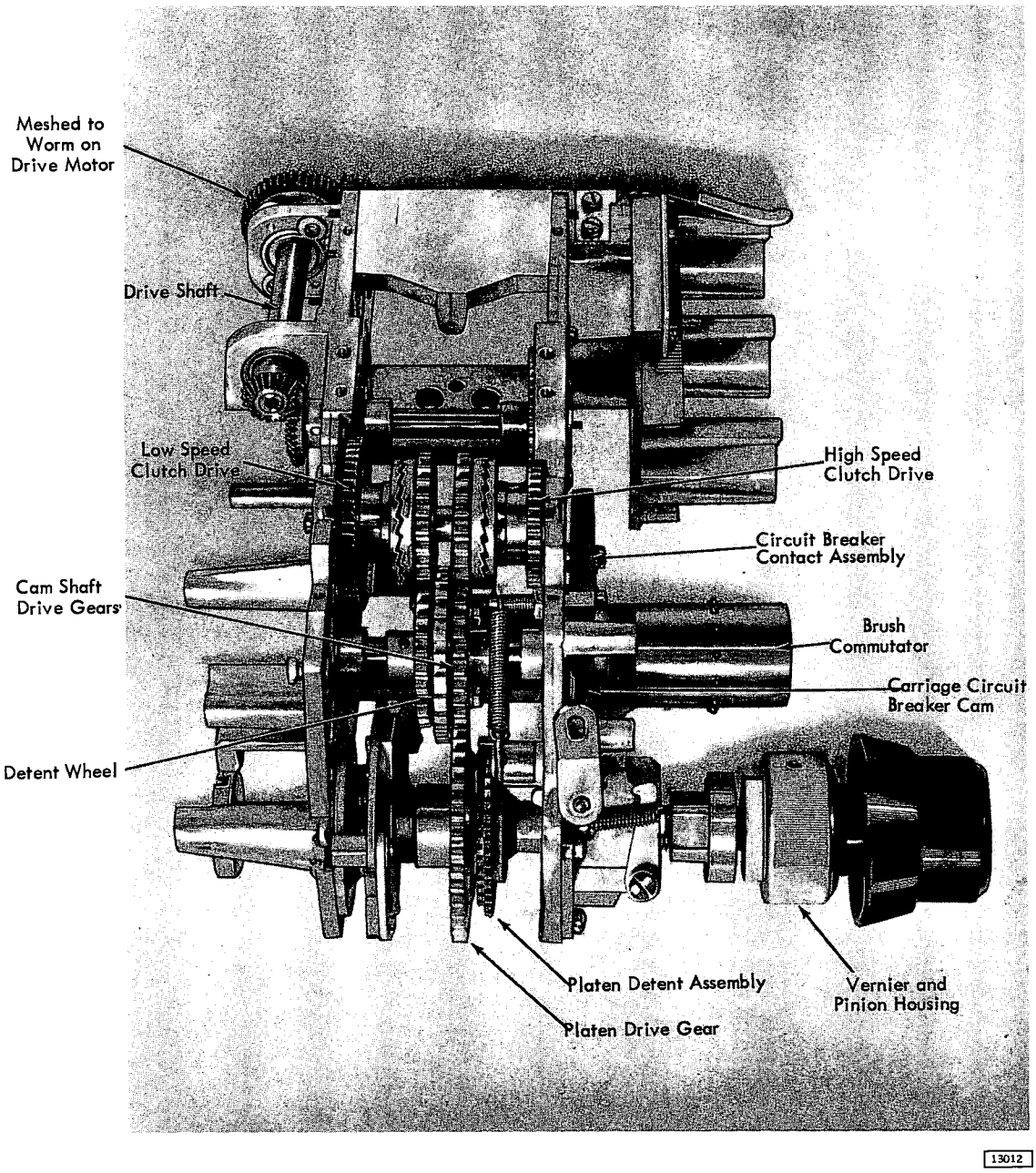



Figure 2-13. Carriage Drive Unit (Removed from Carriage)

A beveled gear transmits power to a second shaft which has a low speed gear with 28 teeth and a high speed gear of 43 teeth. These two gears supply power to the drive section of the high and low speed clutches. With power turned on, the gears up to this point are continuously running.

## Clutches

Each of the clutches has two faces, the drive gear and the driven gear, which have interlocking teeth. Clutch engaging cams operate against the movable drive face of either clutch, force the clutch teeth together, and drive the carriage mechanism at the proper speed. An interposer interlock prevents both drive clutches from engaging at the same time.

The clutch magnet must be energized whether the carriage is to space or skip. Spacing is normal advancement of the platen by a single space. Skipping is moving the platen more than one space. The low speed clutch is used for all spacing operations. The high speed clutch is used for all skipping operations.

## Interposers

Figure 2-14 shows the method used in selecting mechanically the correct clutch for either spacing or skipping. To operate a clutch engaging arm, an interposer must be positioned between the T lever and the clutch engaging arm. The selection of the low and high speed interposers is determined by the electrical circuits which cause the interposer magnet to be energized. When the interposer armature is in the normal position, the low speed interposer will be operated by the T lever, and the low speed clutch will supply power to the platen. When the interposer armature is attracted, the low speed interposer will be moved to a position where the interlock plate will support it but the T lever will move in the cut away portion of the low speed interposer. At the same time, however, the high speed interposer has been moved into position so that the T lever will cause the high speed clutch engaging arm to operate (Figure 2-14).

For normal spacing, only the clutch magnet is energized. For all skipping operations, the normal circuit to the clutch will be open and the interposer magnet will be energized first. To ensure that the interposers are correctly positioned, the circuit to the clutch magnet cannot be completed except through

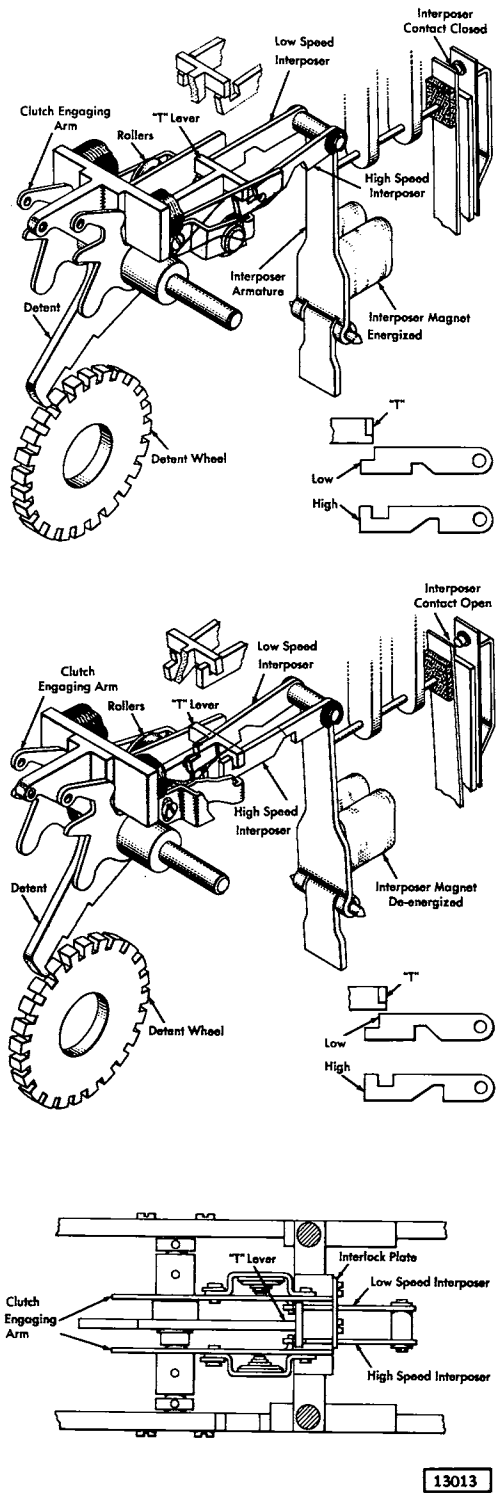



Figure 2-14. Carriage Interposer Operation

the interposer contact which will not close until the armature has traveled its full distance. This prevents the T lever from operating either clutch until the high speed interposer is fully positioned.

Figure 2-15 shows that, with either clutch engaged, power through the cam shaft drive gear, platen drive gear and platen detent assembly, when engaged, will cause the platen to advance. At the correct time, the carriage circuit breaker will cause the clutch magnet to de-energize, thus allowing the detent to latch the detent wheel and in turn hold the platen in a fixed position.

Platen Clutch Knob

Figure 2-15 shows the two clutches, the cam shaft drive gear, and, the detent wheel being held by the detent latch. Also, at the right end of the shaft part of the carriage circuit breaker and the brush commutator may be seen. The platen clutch lever which is operated by the platen clutch knob has been pivoted to the left; this causes the platen detent assembly to move to the right and unmesh the platen detent assembly from teeth on the side of the platen drive gear which drives the platen shaft. This permits the operator to disconnect the platen from the drive unit and the latched detent wheel so that the platen may be positioned independently of the carriage tape mechanism.

Once the paper or form is located for the first printing line, the operator can restore the tape to the first line position by pressing the restore key. The tape mechanism will move the tape until a punch is read by the number one carriage brush but will not

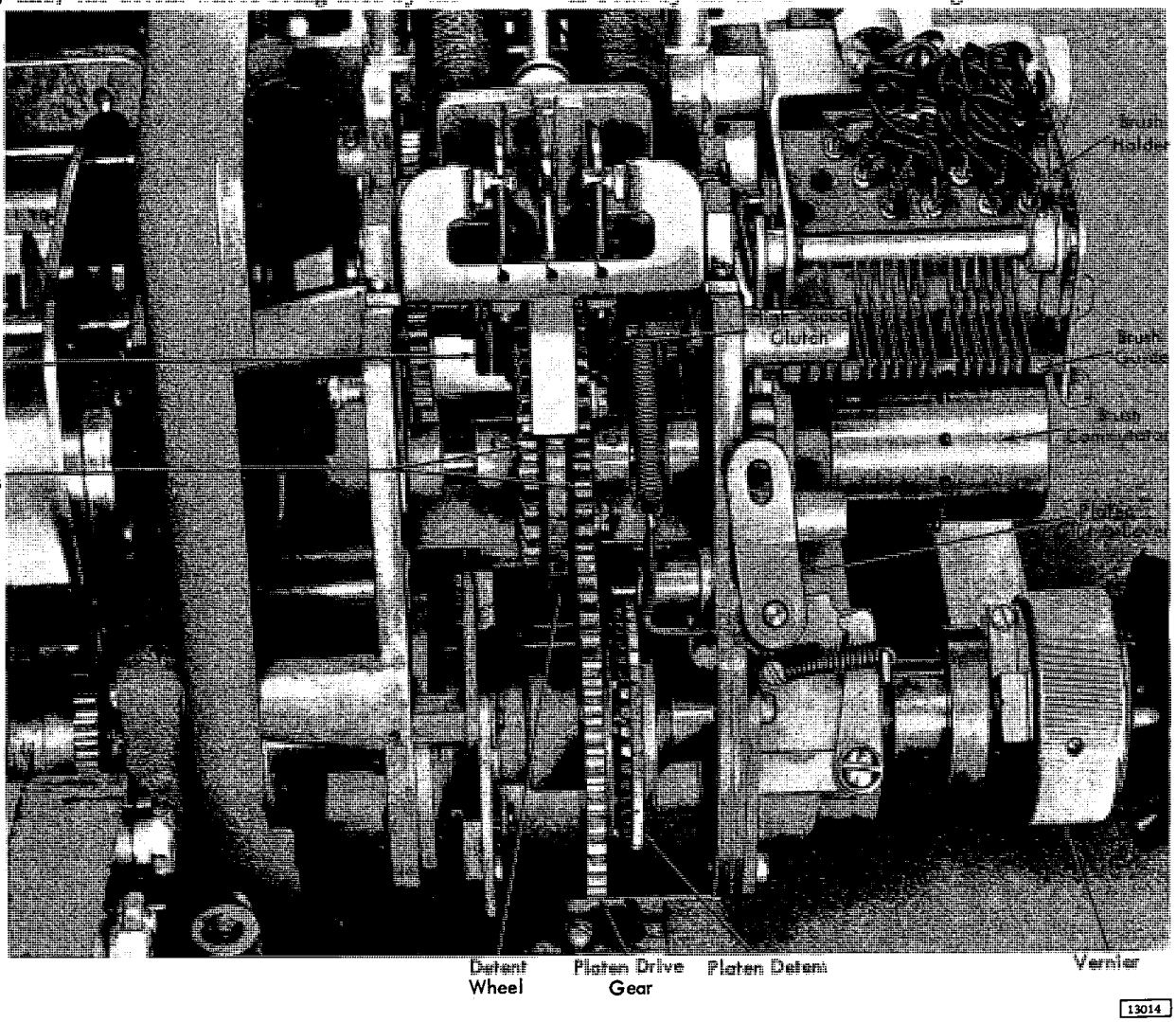



Figure 2-15. Carriage Drive Unit

move the platen. The operator can then connect the carriage drive mechanism to the platen by turning the platen clutch knob to the left. This remeshes the platen detent assembly with the teeth on the platen drive gear.

The platen detent assembly is similar to a tube through the center of which passes the platen shaft; however, the platen detent assembly is connected to the original vernier platen knob. The beveled gears in the vernier housing provide a connection between the vernier platen knob and the platen shaft. Thus, it may be correctly stated that, when the platen drive gear is meshed with the platen detent assembly, power from the drive unit is transmitted to the platen shaft through the vernier. Whenever the platen clutch knob is turned to the right, a detent pin is lowered into the teeth on the platen detent and holds the detent teeth in alignment with the three teeth on the platen drive gear. Turning the platen clutch knob to the left allows the teeth to remesh and also raises the detent pin, which is under spring tension, clear of the teeth on the platen detent assembly.

Figure 2-16 shows the location of the interposer contact which closes when the interposer magnet is fully energized. Attached at the top of the interposer magnet armature are the low speed and high speed interposers which control the selection of the correct clutch.

## Carriage Reading Brushes

The carriage reading brushes are mounted in a frame and held in a brush block similar to other machines. The brush commutator is insulated from the rest of the machine, therefore, the inner brush serves as the common for the circuits established by the brushes 1 through 12 (Figure 2-15).

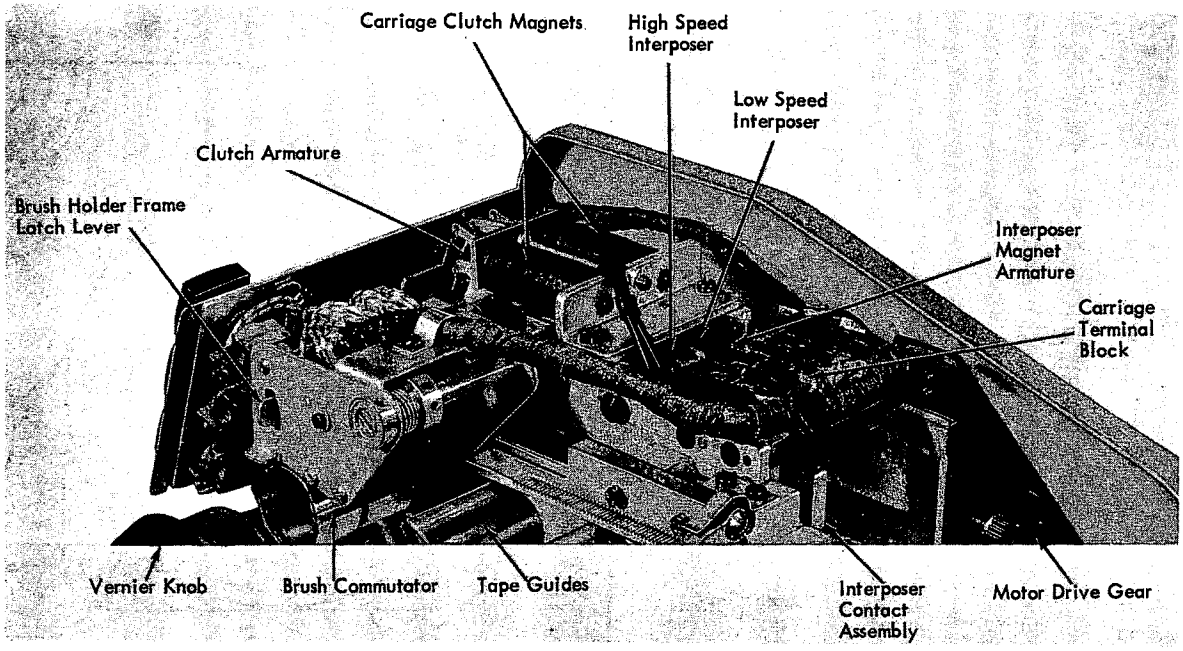
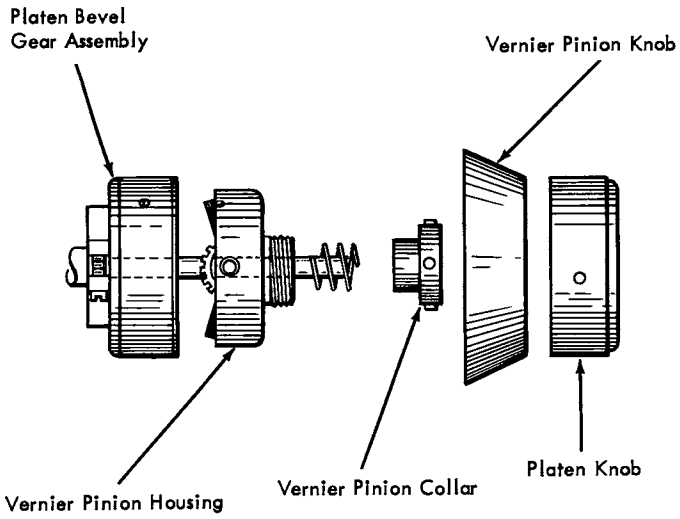



Figure 2-16. Carriage Interposer Mechanism

## Vernier

A platen knob is attached to the right end of the platen shaft by means of a socket setscrew which may be removed. Next is a bakelite vernier knob which is screwed to the original vernier pinion housing. Revolve the vernier knob until the hole in the platen beveled gear assembly is in line with the hole in the vernier pinion housing. A small rod placed through the two pieces serves as a lock and the vernier pinion knob may be removed by turning it counterclockwise (Figure 2-17).

The vernier pinion housing is positioned on the platen shaft and held under spring tension by means of the vernier pinion collar and three socket setscrews. Remove the screws and the vernier pinion housing will slide off its shaft. A study may now be made of the gear teeth cut in the platen bevel gear assembly and the teeth of the platen drive shaft gear. Note that there are three bevel gears in the vernier pinion housing placed 120° apart. Each of the gears will align with one tooth of the platen bevel gear assembly and a tooth of the platen drive shaft gear. Only one position in each 120° arc will be aligned, as all other gear teeth in each 120° arc are slightly offset in relation to each other and there are 45 teeth on the platen beveled gear assembly and 42 teeth on the platen drive shaft gear. Thus, as the vernier pinion housing is advanced, the teeth of the bevel gear force the platen drive shaft gear slightly ahead so that the next tooth may be brought into alignment with the platen bevel gear. This action of the bevel gear moving ahead forces the offset teeth of the platen drive shaft gear to move ahead also, thus causing the platen to advance a short distance for each tooth of the bevel gear.



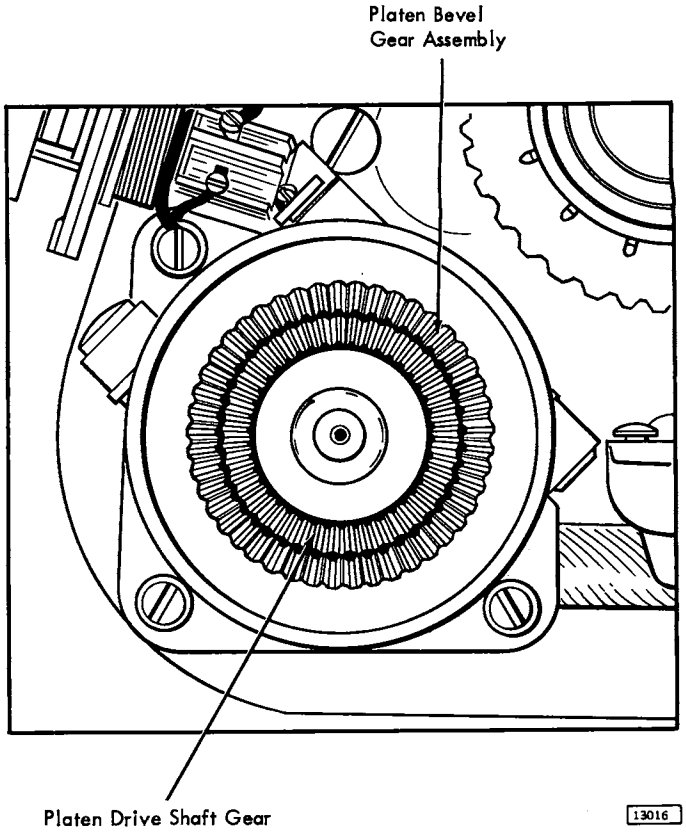




Figure 2-17. Platen Vernier

## INTER-MACHINE COMMUNICATION

- The 1132 printer receives most of its operating voltages from the using system.
- Signals from the using system to the 1132 printer control carriage and print operations.
- Response signals sent to the using system from the 1132 printer indicate conditions in the printer.

### Voltage Lines to the 1132 Printer

AC Voltage. Line voltage from the using system is supplied to the 1132 blower and convenience outlets. When the C.E. switch is on and the 1132 sequencing relays are picked, line voltage is supplied to the drive motor and a power transformer. One output of this transformer provides voltage for the timing disk lamp. The other transformer output is rectified and filtered to provide 48 vdc used in carriage motor and magnet circuits and in 1132 print magnet circuits.

Sequenced AC Voltage. When the sequencing relay in in the using system is picked, sequenced voltage from the system picks printer sequencing relays.

DC Voltages. The using system supplies +12 vdc, +6 vdc, +3 vdc, and -3 vdc for circuits in the 1132.

### Signal Lines to the 1132 Printer

These lines from the using system are called Printer Entry Lines.

Forms Indicator. This line activates a lamp driver which lights the Form Check light.

Ready Indicator. This line conditions a lamp driver which lights the Ready light.

Motor On Indicator. This line conditions a lamp driver which lights the Power On light.

Print Scan Error. This line conditions a light driver, which lights the Print Scan Check light.

Interposer Magnet Select. This line conditions a magnet driver which energizes the interposer magnet.

Carriage Magnet Select. This line conditions a magnet driver which energizes the carriage magnet.

Use Meter Select. This line causes current flow in the use meter coil.

Print Buffer 0 through 15. When active, each of these lines indicates a character in the using system print buffer. Each line is an input to one of a group of 16 AND circuits in the 1132.

Print Gate. This line is active as a result of a using system print instruction. It is common to all of the 16 AND circuits previously mentioned. The outputs of the AND circuits which have both inputs active are print bit 0 through 15 lines.

Print Select Group 0 through 7. These lines are made active sequentially by the using system group counter circuits. Lines 0 through 6, when active, each condition a group of 16 AND circuits in the 1132. Line 7 conditions a group of 8 AND circuits.

### Signal Lines from the 1132 Printer

These lines, supplying responses to the using system, are called Printer Exit Lines.

Forms Contact. This line is controlled by the n/o forms contact points. Because it is considered normal to have forms in position to print, the n/o contact is open under this condition. The line now allows development of a ready condition in the using system. Without forms in position, the normally open contact closes, and the line blocks the ready condition. The line returns to the 1132 and activates the forms indicator line.

Start Key. A capacitor is charged through the Start key's normally closed contact. When the key is pressed, the capacitor discharges through a voltage divider network via the normally open contact. Because the capacitor can recharge only through the normally closed contact, the line is activated once

each time the key is pressed. The 1132 Stop, Carriage Space, Carriage Restore, and Carriage Stop keys operate in a similar manner.

Stop Key. This line is active once for each time the stop key is pressed. See Start Key.

Carriage Space Switch. This line is active once for each time the carriage stop key is pressed. See Start Key.

Carriage Restore Switch. This line is active once for each time the carriage restore key is pressed. See Start Key.

Carriage Stop Switch. This line is active once for each time the carriage stop key is pressed. See Start Key.

Motor on Switch. This line is active continuously when the 1132 motor switch is turned on.

Carriage CB. This line is activated for approximately 10$\mu$sec when the carriage CB contact closes.

Interposer Contact. This line is active when the interposer contact is closed.

Carriage Brush 1 through 6, 9, and 12. Any of these lines is activated when its carriage brush makes contact on the brush commutator. The line signals the using system circuits when a carriage control tape hole is sensed and tells which tape channel the hole is in.

CB Clock. This line is active when the Print Disk Clock solar cell senses a slot in the outer circle of slots of the timing disk. Light through the slot striking the solar cell affects the input to an amplifier circuit. The output of the amplifier, by the use of a diode clamping circuit, develops the CB Clock line.

Print Disk Bit 0 through 7. Any of these lines is activated by a solar cell sensing a slot in its corresponding row of the timing disk. There are eight similar circuits in the 1132 printer which activate the eight lines. Light through a slot in the timing disk strikes a solar cell. The solar cell output is the input to an amplifier circuit, and the amplifier output is a Print Disk Bit line.

## CIRCUIT DESCRIPTION

### Carriage Operations

#### Carriage Space

Any carriage operation is started by energizing one of the carriage magnets. A single space uses the clutch magnet only, and it is energized by activating the carriage magnet select line to the 1132. This line may be activated from an instruction or by receiving a carriage space switch signal when the carriage space key is pressed. Platen motion starts and when the carriage CB closes, its signal blocks the carriage magnet select line. The clutch magnet is deenergized, and the platen stops in a detented position.

#### Carriage Skip

In a carriage skip operation the interposer magnet is energized first. The interposer magnet select line may be activated from an instruction or by receiving a carriage restore switch signal when the carriage restore key is pressed. When the interposer magnet armature is attracted, the interposer contact closes, and its signal conditions the circuit to activate the carriage magnet select line. This line energizes the clutch magnet, and platen motion starts.

If the skip was started by pressing the carriage restore key, sensing a control tape channel 1 hole signals a skip stop. The next carriage CB impulse blocks the circuits which are energizing the interposer and clutch magnets. The carriage clutch latches up, and platen motion stops.

A programmed skip is terminated by a stop carriage instruction. The using system program determines when the instruction is given. The next carriage CB impulse blocks the circuits which are energizing the interposer and clutch magnets. The clutch disengages and platen motion stops.

### Printing Operations

Pressing the carriage stop key on the printer while any skip is in progress sets up a skip stop condition in the CPU circuits. The following carriage CB impulse stops platen motion as previously described.

Print Emitter

Print emitter circuits are described under "Signal lines from the 1132 printer." They are the CB clock and print disk bit 0 through 7 lines.

Print Magnet Control Circuits

Printing from any print wheel is started by energizing the print magnet for that position. Figure 3-1 illustrates the logic of print magnet driver selection circuits. The using system loads information from the print scan field into the system print buffer, sixteen positions at a time. Each group of 16 bits of information is in the buffer for a number of microseconds which is controlled by the CPU. The print gate line to all 16 of the printer input AND circuits is active throughout the time required to select the print magnet drivers. When any one of the input AND circuits is satisfied, its output provides a corresponding print bit pulse. Print buffer position 0 provides print bit 0, etc.

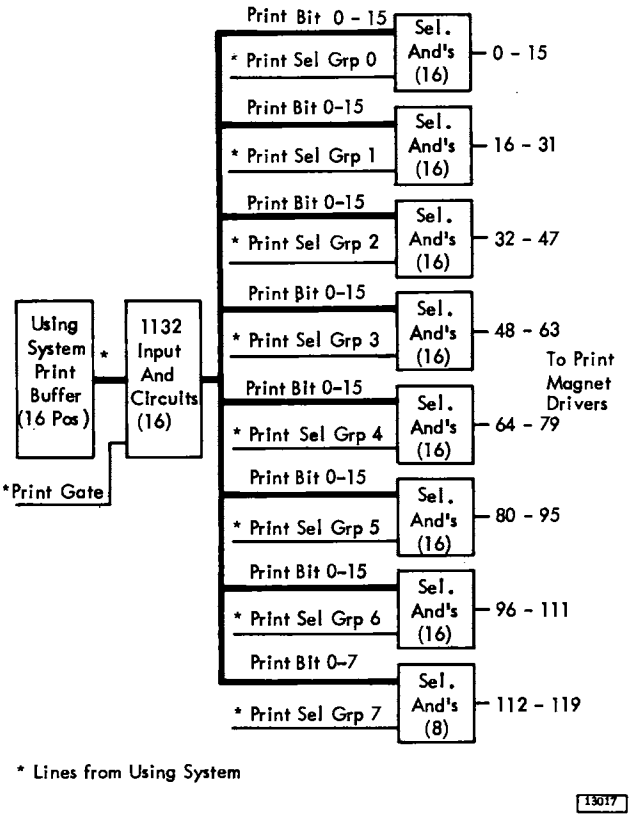



Figure 3-1. Print Magnet Driver Selection

NOTE: CPU circuits delay the start of the transfer scan until approximately 1.78 ms after the start of the CB Clock pulse.

The print magnet driver circuit is similar in operation to a gaseous grid controlled tube circuit (thyratron). When a pulse is applied to the input, it starts conduction in the output line through the magnet to the magnet common and +48 vdc Figure 3-2. After the input pulse stops, the driver continues to provide output current through the magnet until the +48 volts is removed from the magnet common. The +48 volts is supplied by a CB amplifier circuit when the print disc clock solar cell senses a slot in the outer row of the timing disk. In the time between CB pulses the print magnet driver circuit stops conducting and the print magnet is de-energized. The driver circuit does not energize the magnet again until another input pulse is received.

The using system circuits contain a counter which provides a print select group line each time the print buffer is loaded. Line 0 is active when the buffer is loaded the first time, and lines 1 through 7 are activated successively as the buffer is reloaded with succeeding portions of the print scan field. Only one print select group line is active at any time, and each line when active gates one input to each of a group of selection AND circuits. When an AND in this group also has a print bit pulse on the other input, an output pulse becomes the input to a print magnet driver.

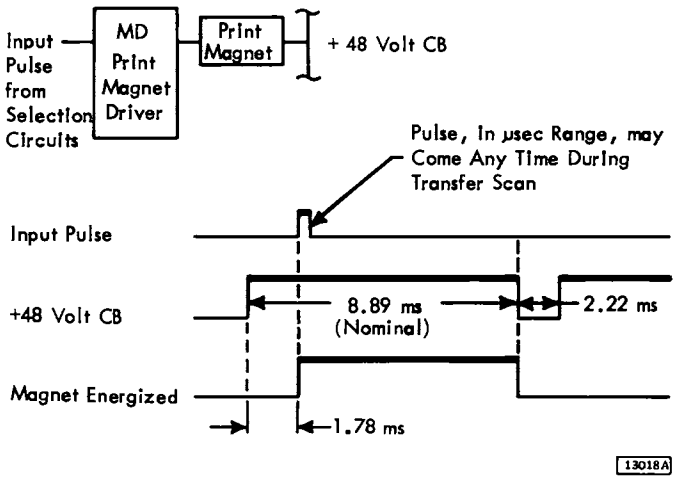



Figure 3-2. Print Magnet Driver Operation

- Voltages of +12 vdc, +6 vdc, +3 vdc, and -3 vdc are supplied by the using system.
- Power sequencing is under control of the using system power sequencing.
- A multi-output transformer in the 1132 printer supplies nominal 48 vac and 20 vac.

## SEQUENCING

When +6 vdc and -3 vdc in the using system are at operating levels, a 24 volt sequencing ac is supplied by the using system, and contactor K1 and relay K2 are picked in the printer. When K1 picks, the purpose of the normally open K1-1 and K1-2 points is to supply ac to the 1132 drive motor and the input to the multi-output transformer. K1-3 n/o points close the circuit to +48 vdc lines when K-1 picks. The purpose of the K2 relay normally closed points is to discharge the capacitors in the 48 vdc supply when power is turned off.

## POWER SUPPLY

The multi-output transformer supplies 48 vac and 20 vac outputs. The 20 volt circuit contains a variable resistor for varying the light intensity of the emitter disk light. The 48 vac is rectified and filtered to supply 48 vdc to the carriage motor and magnets and the 1132 print magnets.

# INDEX

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