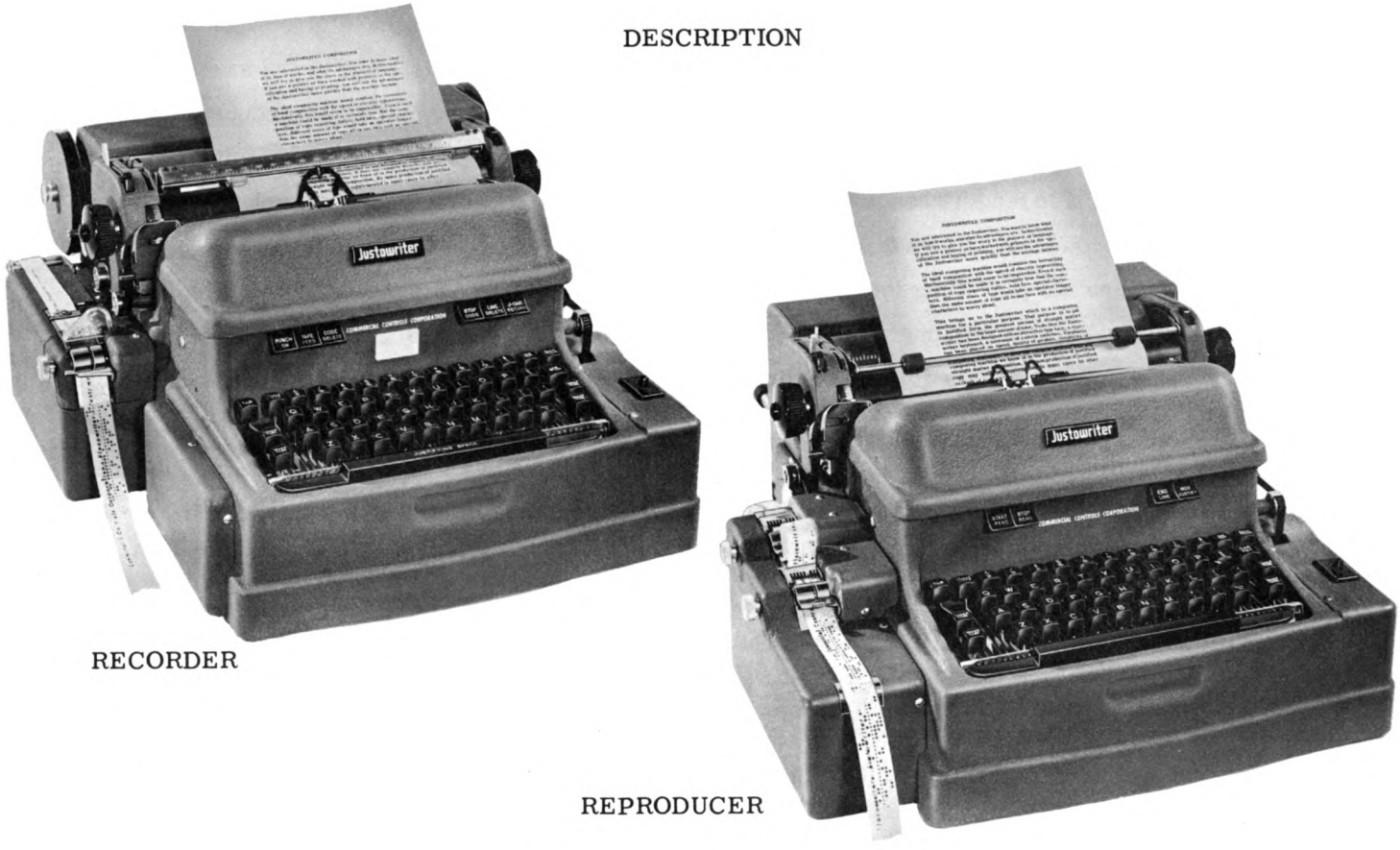
PART VII

JUSTOWRITER

DESCRIPTION



RECORDER

REPRODUCER

Figure 1-1 The Justowriter

GENERAL

The Justowriter is a proportional spacing, automatic justifying, typewriter composing machine which requires only one manual typing. The second, or justification typing, is accomplished by means of a perforated tape.

The Justowriter consists of two machines which are called: Recorder unit and Reproducer unit. Each is basically a proportional spacing, electrically powered typewriter with a standard keyboard. The Recorder unit is provided with a punch which records in a narrow tape the code for each letter and function. The Reproducer has a reader (double reader) which interprets the tape and automatically types and justifies in page or galley form.

The product is a clear, opaque justified page or galley in 12, 10 or 8 point type face of various styles especially suited to offset reproduction. The impression of each letter is obtained by using a one-time carbon ribbon. The characters are proportionally spaced to their natural widths from 2/32 inches to 5/32 inches in increments of 1/32 inches.

The Recorder unit is operated manually, in the same manner as any conventional typewriter, to print a trial copy to determine the normal length of a typed line. At the same time that a character is being printed or a function operated, a code is

perforated in a paper tape in the tape punch. When each line is completed, justifying information is also punched in the tape. This justifying information enables a line to be expanded or contracted to the desired length when it is retyped. This retyping is produced automatically on the Reproducer unit, and the justifying information in the tape automatically sets up apparatus to alter the spacing between words as required for justification of each line.

The word spacing in both the Recorder and Reproducer is accomplished by means of a variable escapement mechanism that is used for proportional letter spacing. The normal word spacing, as a result of operating the justifying space bar on the Recorder, is two units. When justifying in the Reproducer, the word spacing may be one, two, three, four or five units as required. (One unit is 1/32", 1/36" or 1/48".)

The expansion and contraction of word spacing in a line is accomplished in multiples of one unit spacing. Also, the maximum number of word spaces that can be expanded or contracted is eight. Thus, if a line has more than eight word spaces, the ninth, tenth, etc. word spaces will be a normal two units.

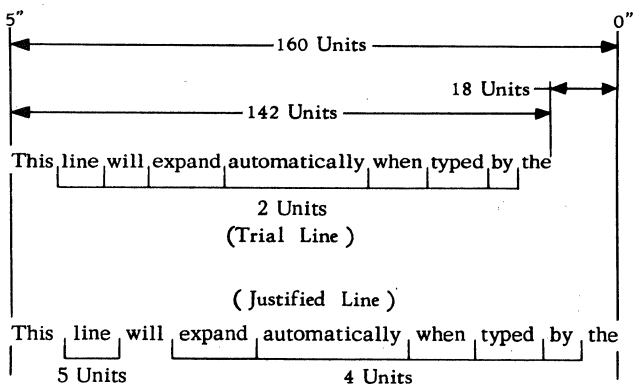


Figure 1-2 Trial and Justified Line

Figure 1-2 illustrates a line typed on the Recorder and the justification of the same line when automatically typed by the Reproducer. This line has eight word spaces and the trial line is 18 units short of zero for a five inch line (five inch line is 160 units - 32 units to the inch). The line is automatically expanded 18 units in the Reproducer by adding 3 units to the first two word spaces and 2 units to each of the remaining word spaces. Therefore, the total units in each word space is; five units in the first two, and four units in the remaining six word spaces.

All this is accomplished automatically by apparatus in the Recorder which selects a particular justification control code to be punched in the tape. Also, when the tape is read in the Reproducer, apparatus conditions this control code to automatically select the proper number of word spacing units at the start of the line and the point, if any, where this word spacing value decreases or steps down one unit.

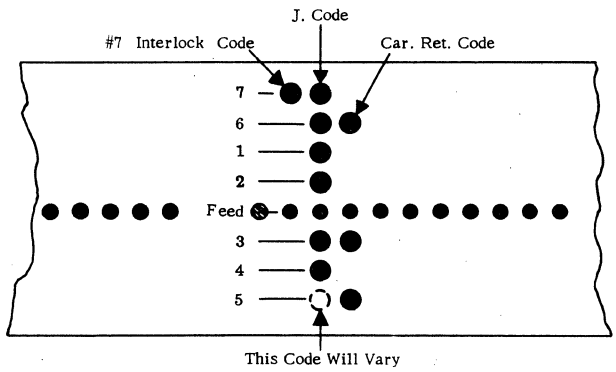


Figure 1-3 Justification Code In Tape

CODE SYSTEM

The same codes are used in the Justowriter tape for the characters and most of the functions

as are used in the Flexowriter tape explained in Part II Section 1 of this manual. In addition to the character and function codes, a justification code is used at the end of each line. This justification code actually consists of three distinct codes. (See Figure 1-3.) The first code will always be a number seven. The second code will always contain the 6-7 plus any combination (a maximum of 30 combinations) of 1 through 5. The last justification code will always contain a carriage return code which is 3-5-6.

The above three codes are perforated in the tape automatically when the operator reaches the end of a line and depresses the J– Carriage Return switch.

The number seven code is used as an interlocking code for the two reading heads of the Reproducer double reader.

The front reader is called the print reader while the back reader is called the J-reader or justifying reader. Each line in a tape is always fed through the J-reader before feeding through the print reader. Therefore, the number seven code in each line insures that the justification code will always be read first, thus conditioning the Reproducer for proper justification before any codes in that line are read by the print reader. This interlock holds true no matter how the lines vary in length.

UNITS OF JUST.	CODE 1 W.S.	CODE 2 W.S.	CODE 3 W.S.	CODE 4 W.S.	CODE 5 W.S.	CODE 6 W.S.	CODE 7 W.S.	CODE 8 W.S.
– 7								367
– 6							367	3467
– 5						367	3467	467
– 4					367	3467	467	4567
– 3				367	3467	467	4567	567
– 2			367	3467	467	4567	567	3567
– 1		367	3467	467	4567	567	3567	34567
0	67	67	67	67	67	67	67	67
+ 1	1367	1367	1367	1367	1367	1367	1367	1367
+ 2	2367	13467	13467	13467	13467	13467	13467	13467
+ 3	12367	2367	1467	1467	1467	1467	1467	1467
+ 4		23467	2367	14567	14567	14567	14567	14567
+ 5		12367	23467	2367	1567	1567	1567	1567
+ 6		123467	2467	23467	2367	13567	13567	13567
+ 7			12367	2467	23467	2367	134567	134567
+ 8			123467	24567	2467	23467	2367	167
+ 9			12467	12367	24567	2467	23467	2367
+ 10				123467	2567	24567	2467	23467
+ 11				12467	12367	2567	24567	2467
+ 12				124567	123467	23567	2567	24567
+ 13					12467	12367	23567	2567
+ 14					124567	123467	234567	23567
+ 15					12567	12467	12367	234567
+ 16						124567	123467	267
+ 17						12567	12467	12367
+ 18						123567	124567	123467
+ 19							12567	12467
+ 20							123567	124567
+ 21								12567
+ 22								123567

Figure 1-4 Justification Code Chart

The second code contains the necessary justification information for conditioning the Reproducer to expand or contract a line the necessary number of units. As stated previously, the 6-7 code is always perforated in this position and is recognized by the J-reader only (the print reader will ignore this code). The 6-7 code, when read by the J-reader will start print reader operation, also, the 1 through 5 code units will condition the Reproducer to justify the line. There are thirty different binary code combinations that may be used from the 1 through 5 code units of justification code. These are shown in the chart in figure 1-4.

Code	Starting Word Space
1 2	5 Units
2	4 Units
1	3 Units
None	2 Units

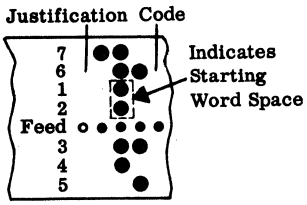


Figure 1-5 Starting W. S. Codes

This second position justification code can be broken down into two more groups (the 6-7 control code has already been explained). The 1 and 2 code units determine what the first or starting word space will be in a line. (See Figure 1-5.) Because there are two code units involved, there are four possible combinations of these code units. These four combinations correspond to the four possible units of escapement for a starting word space. They are as follows: if a 1-2 code is in the tape, the starting word space will be five units. With a 2 code in the tape, the starting word space will be four units. A 1 code in the tape will give a starting word space of three units. With neither the 1 or 2 code in the tape, a normal spacing of two units will be the starting word space.

The 3, 4, and 5 code units of this code position determine when the units of word spacing will decrease. (See Figure 1-6.) Or, in other words, these codes condition the Reproducer to automatically decrease the starting word space by one unit somewhere after the first word space and before the eighth word space.

These three units of code provide eight code combintions. The chart in figure 1-6 shows these eight combinations plus the results of each. For an example, if a 3-4 code was read in the J-reader, the Reproducer would be conditioned to decrease the starting word space by one unit after the second word space operation for that particular line.

Code	Word Space Decrease 1 Unit After:
3	First Word Space
3-4	Second Word Space
4	Third Word Space
4-5	Fourth Word Space
5	Fifth Word Space
3-5	Sixth Word Space
3-4-5	Seventh Word Space
None	Starting Word Space Not Reduced

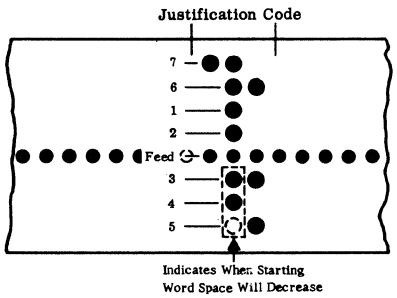


Figure 1-6 Word Space Reduction Codes

The third position of the justification code always contains a 3-5-6 carriage return code which, when read by the print reader in the Reproducer, will return the carriage and index the platen for the next line.

RECORDER

The Recorder consists of a writing machine (typing mechanism) which is basically similar to

a Flexowriter with a proportional spacing mechanism (explained in Part II, Section 2 of this manual). The tape punch in the Recorder is identical to the tape punch explained in Part II, Section 5. Also, the code selector is similiar in operation to the code selector explained in Part II, Section 3. It is apparent, then, that the same sequence of operation takes place when a keylever is depressed. That is, the operation of a keylever will trip its related cam. The cam operation causes a type bar to print a character plus operate a selector slide. The selector slide operation closes contacts which in turn causes a punch cycle of operation, thus perforating a code in a paper tape.

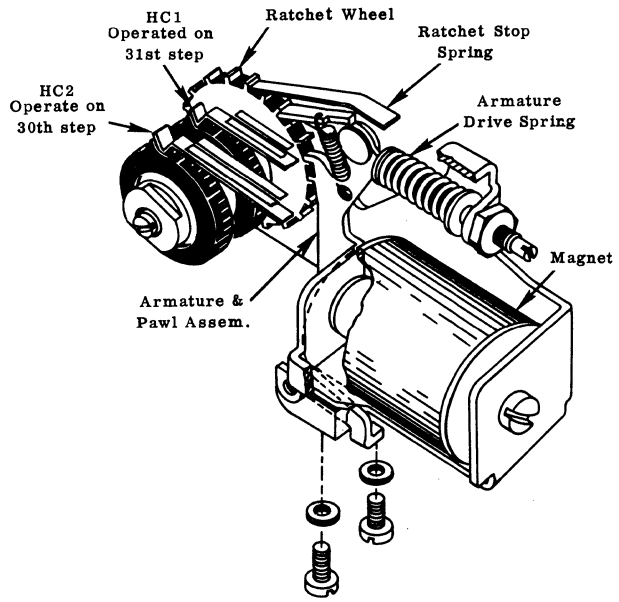


Figure 1-7 Hole Counter

Hole Counter (Figure 1-7) - As each line is typed on the Justowriter Recorder, the first 30 codes punched in the tape are counted by a mechanism called the tape hole counter. The tape hole counter is provided to insure that the distance between each justification code is at least three inches. This is necessary for proper operation of the J-reader and print reader in the Reproducer (the distance between the two reading stations is three inches). The hole counter is essentially a stepping switch mechanism using a magnet (HCM) to index a rotary shaft through a pawl and ratchet mechanism. The shaft is rotated one ratchet position when the magnet is de-energized. The ratchet wheel has 33 teeth and is fastened to the shaft. Also located on the shaft are two cams each having one lobe. The lobes are the distance of one ratchet tooth apart. The lobe on the right hand cam (viewed from armature end) operates its corresponding contacts on the 30th step of the ratchet and restores them on the 31st step. The lobe on the left hand cam operates its corresponding contacts on the 31st step of the ratchet and restores them on the 32nd step.

As stated previously, the first 30 holes perforated in the tape are counted by the hole counter. After the 30th step, the transferring of the right hand contacts prevent further stepping operation until the J-Carriage Return switch is depressed (see Circuit Description, Part VII, Section 3). When the J-Carriage Return switch is depressed, the 31st, 32nd and 33rd steps take place automatically. These last three steps perforate the 7, 6-7 (plus any combination of 1 through 5) and the 3-5-6 justification code in the tape.

Computer and Code Bar Assembly - The code computer mechanism is a device which operates to select one of 30 different justification control codes (Figure 1-4) which corresponds to the number of units a trial line is shorter or longer

than the desired justified length. This code selected also corresponds to the number of word spaces in the line.

The code computer is mounted as a unit to the left rear base frame at the rear of the carriage to work in conjunction with a computer code bar assembly which is mounted on the carriage (Figure 1-8).

The justification control information is in the form of a five unit code and accordingly there are five sets of contacts, JC1, JC2, JC3, JC4, and JC5, on the computer. Each set of contacts has an associated vertical contact arm (637) on which is pivoted a horizontal seeker (638). The tension of the movable contact springs of each set of contacts is formed in a direction which tends to close the contacts. The contacts are prevented from closing, however, by a contact arm bail (641) which extends across the five contact arms and normally holds the contacts open against the force of the springs. (See Figure 1-9.) A justifying code magnet (JCM) controls the operation of the contact arm bail. The magnet (JCM), however, does not become energized until the carriage has moved into the justifying zone. The maximum justification that can be obtained is plus 22 units to minus 7 units with at least eight word spaces in a line. This, then, would be the maximum limit for the justification zone. The minimum justification zone extends from plus 3 to plus 1 units from zero which results from a line with one word space only. Thus, the extent of the justification zone depends upon the number of word spaces in a line.

In view of the above, it is necessary to have the computer count and store the number of word spaces in each line. This is accomplished by a seeker bail (642) which is indexed from its normal or zero position upwardly to eight different positions by a justifying space magnet (JSM). (See Figure 1-10.) The justifying space magnet (JSM) is energized each time the justifying space bar is operated so that the seekers are elevated by the seeker bail, one position for each succeeding word

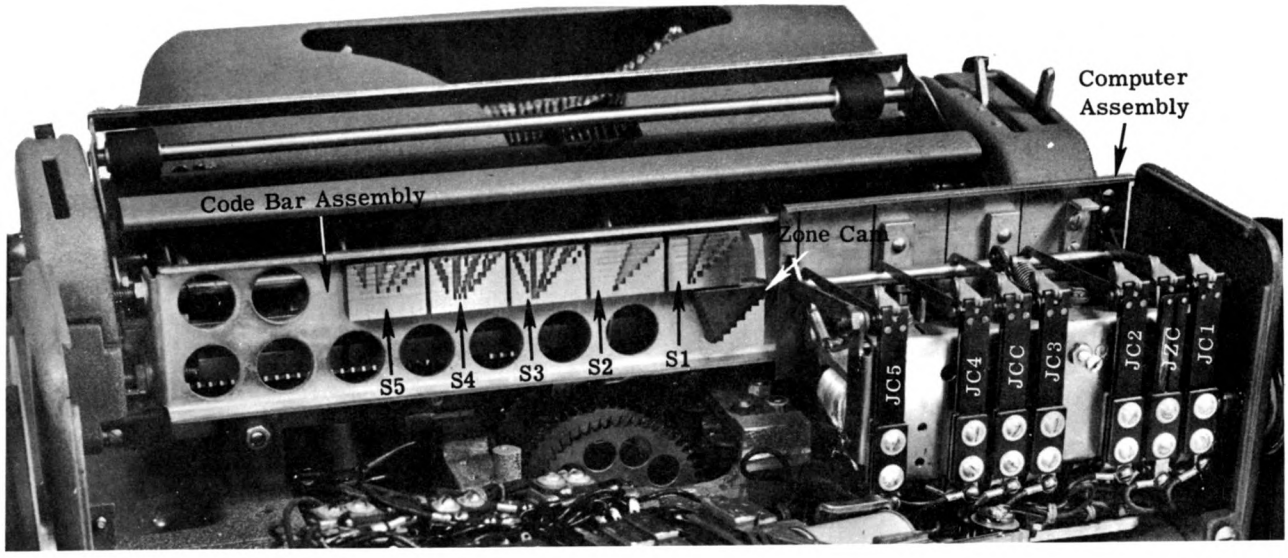


Figure 1-8 Computer and Code Bar Location

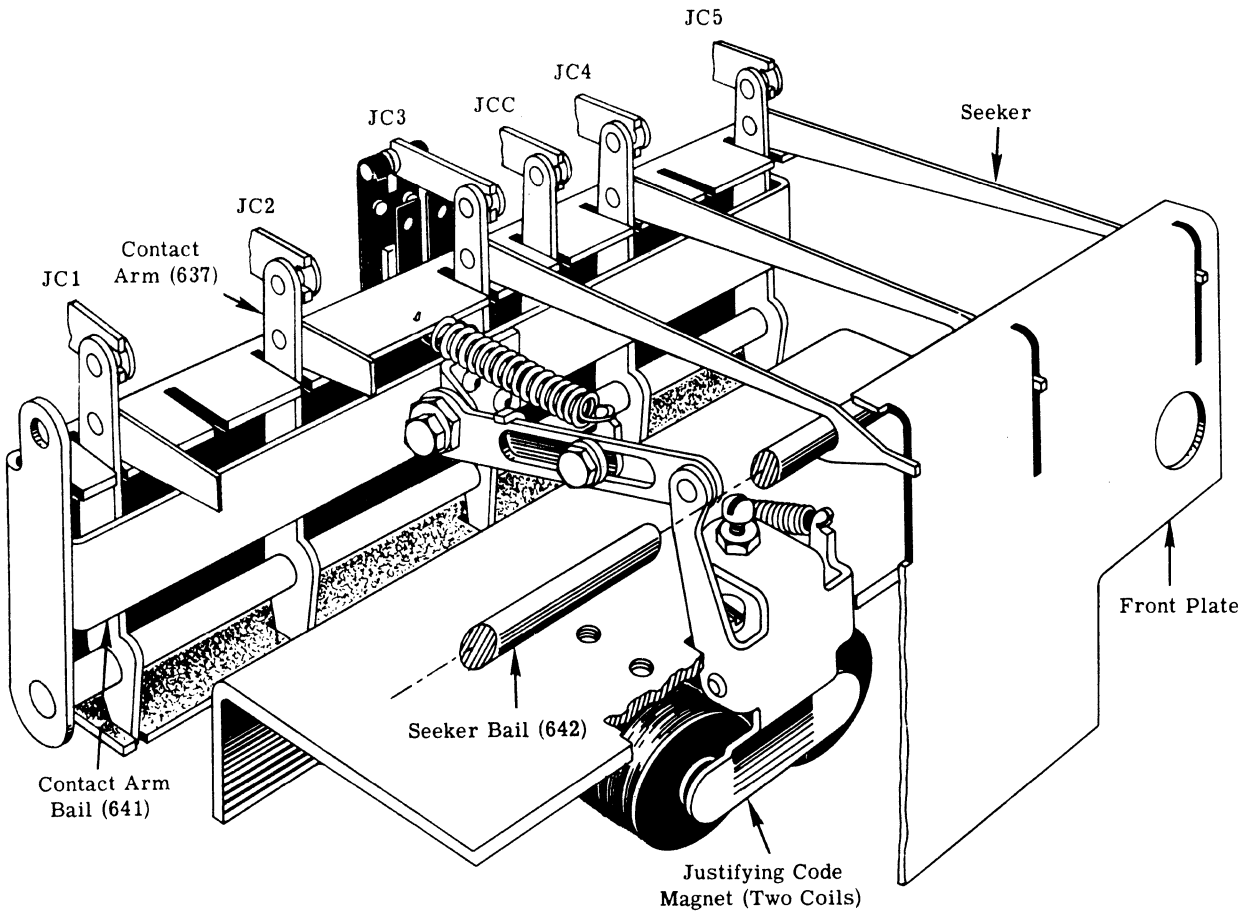


Figure 1-9 Seeker Operating Mechanism

space. The seeker bail not only determines the angular position of all five of the seekers with respect to their contact arms, but is designed to permit horizontal sliding movement of the seekers also.

The indexing mechanism functions through the movement of the JSM armature which, in turn, pivots the pawl operating arm (650) counter-clockwise. The indexing pawl (656), being pivotally connected to the pawl operating arm, is therefore rocked into contact with a tooth on the seeker bail operating arm segment. This movement, therefore, elevates the seekers the distance of one segment tooth each time the JSM is energized.

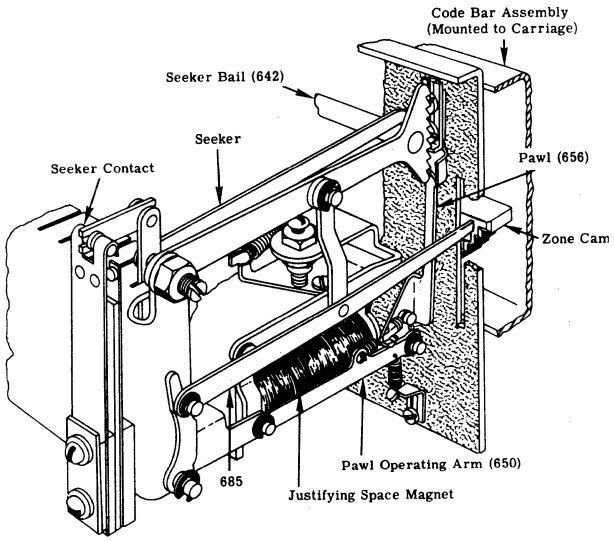


Figure 1-10 Indexing Mechanism

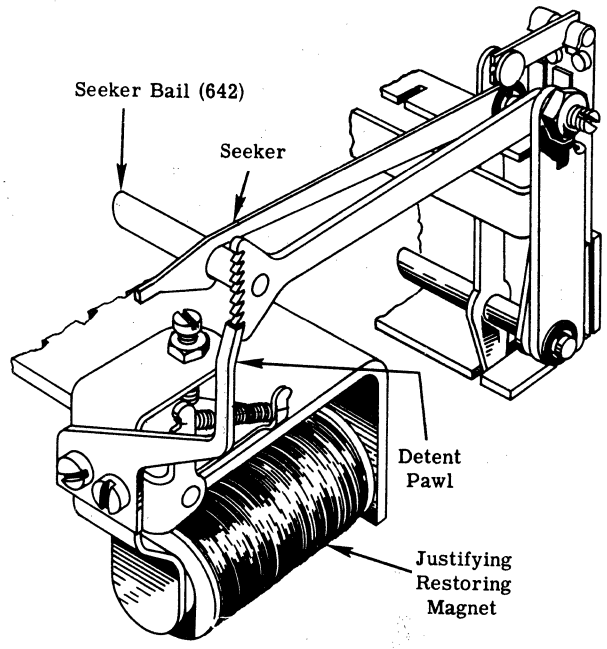


Figure 1-11 Detent Mechanism

A detent pawl engages a tooth of the right hand segment and holds the seekers in each elevated position. The detent pawl is disengaged from the segment each time the justifying restoring magnet (JRM) is energized, thus allowing the seekers to drop down to their normal position. (See Figure 1-11.)

A zone contact operating arm (685) follows the upward indexing movement of the seekers through a link (687) which is connected to the seeker bail operating arm. The front end or nose of the zone contact operating arm extends through a vertical slot in the front plate. The rear end of the operating arm is linked to the justifying zone contact (JZC). (See Figure 1-12.)

A justifying zone cam is mounted on the code bar assembly to move with the carriage. This cam works in conjunction with the nose of JZC operating arm to close the justifying zone contact during certain zones of movement of the carriage

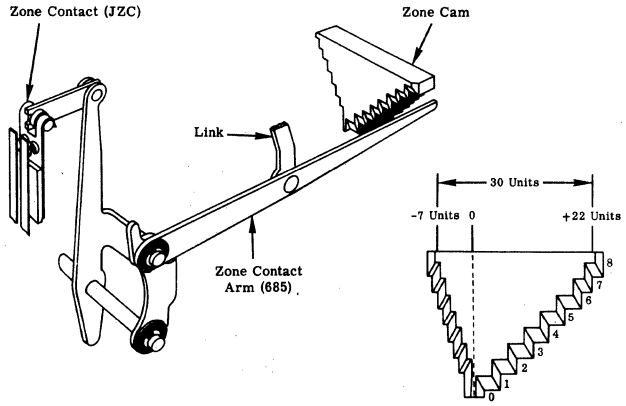
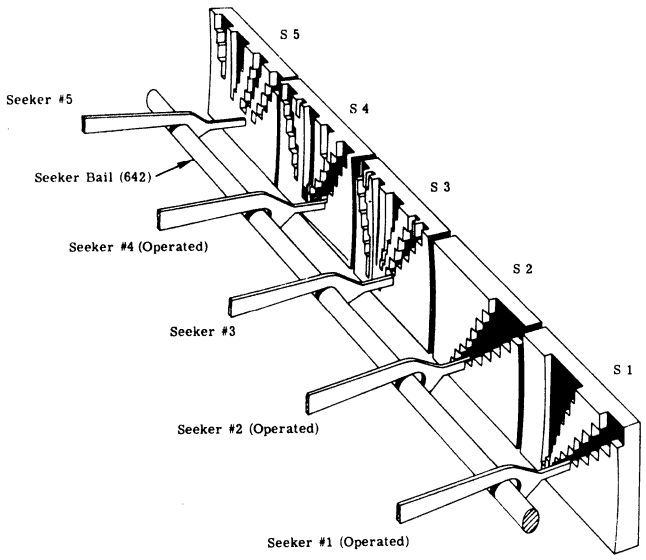


Figure 1-12 Zone Contact Linkage and Cam

depending on the number of word spaces in the line. As explained previously, the maximum justification that can be obtained is plus 22 units to minus 7 units with at least eight word spaces in a line. Therefore, the zone cam is arranged to hold the contact JZC closed through a maximum of 30 units of travel of the carriage when there are eight or more word spaces (seekers elevated to highest level). When there is only one word space in a line, the zone cam will hold the contact JZC closed through a maximum of four units of travel of the carriage. In other words, the greater the number of word spaces, the greater will be the range of positions of the carriage in which justification can be accomplished. The face surface of the zone cam presents an angular area which increases in width from bottom to top. Consequently, as the seeker operating arm is indexed upwardly as word spaces are put into the line being written, a wider surface of the cam will be presented to the nose of the zone contact operating arm. The closing of contact JZC energizes a lamp JZL and the contact remains closed during the time that the nose of the operating arm travels across the face of the cam. In



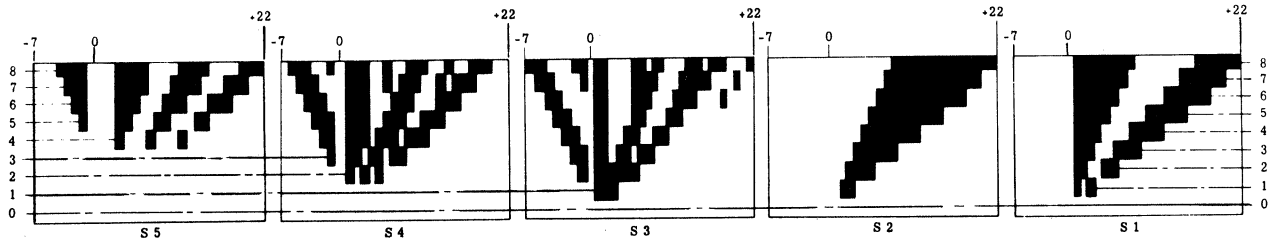


Figure 1-13 Code Bar Assembly

studying the code chart in Figure 1-4, it will be obvious the manner in which the zone cam derives its shape.

There are five individual sections mounted to the code bar assembly which are identified as S1, S2, S3, S4, and S5. Each section is approximately one inch in length and is associated with one of the five seekers. The seekers are horizontally spaced one inch apart also. The five sections of the code bar assembly have nine vertically spaced fields at levels corresponding to zero and the eight stepped positions of the seekers. Each level (except zero) of a section is notched at certain horizontal unit spaces to allow forward movement of the seekers which are under tension of their individual contact springs. If a seeker does move into a notch in its related code bar section, the seeker movement will allow its contact to close. The remaining portions of the code bar sections which are not notched restrain forward movement of the seekers to prevent closing of the contact points. Thus each horizontal unit space of each section and level of the code bar is either notched or not, to control the operation of all five contacts (JC1 through JC5), according to the horizontal position of the carriage and the vertical position of the seekers. (See Figure 1-13.)

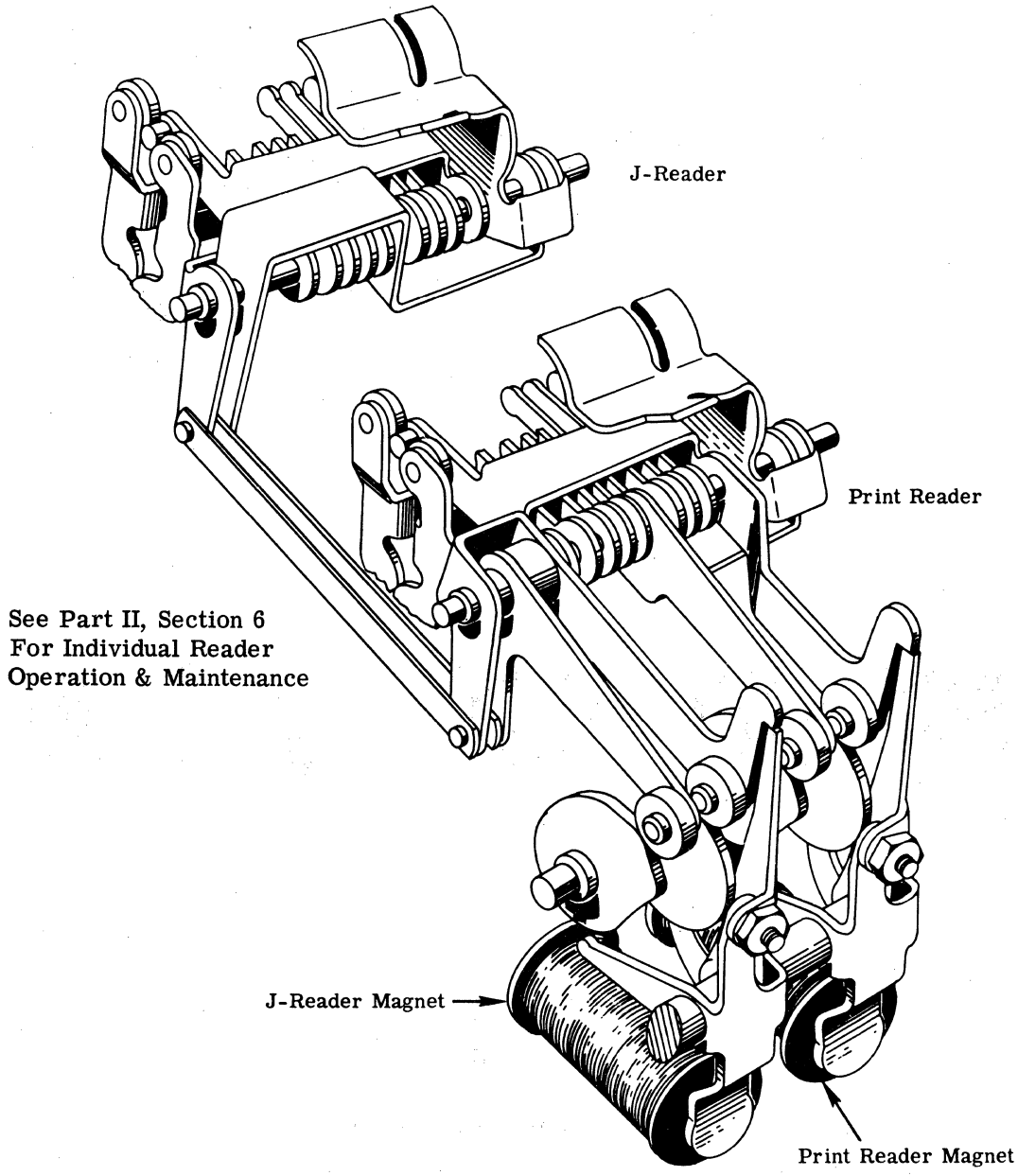


Figure 1-14 Double Reader

When a trial line is being typed, the seekers do not contact the code bar section and consequently do not interfere in any way with the carriage movement. This is because the previously mentioned contact arm bail normally holds the contacts open and the seekers out of the path of the code bar assembly. The bail is moved at the end of a trial line due to the energization of the magnet JCM (the JCM is energized when the J-Carriage Return switch is depressed). Thus, the noses of the seekers are all allowed to move through their respective slots in the computer front plate and into contact with their related code bar sections, whereby, some seekers are

stopped and others move into notches allowing their contacts to close.

The code contacts (JC1 through JC5) are individually connected to punch magnets in the tape punch. Thus, when a contact closes, its respective punch magnet becomes energized, resulting in the code position being perforated in the tape.

From the above functional description, it can be seen that a code can be set up and perforated in a tape which represents the information necessary to condition the Reproducer to add or subtract units of word spacing in a line.

Line Delete - A line delete switch is provided on the Recorder, which, when depressed (with the J-Carriage switch), will perforate all seven code units in the justification code. This code, when read in the Reproducer, will condition the Reproducer to ignore all the codes in the preceeding line, thus the line will be deleted. This is a very useful function in the event an operator makes a mistake.

Note: A complete Recorder Circuit Description is explained in Part VII, Section 3 of this manual.

REPRODUCER

The Reproducer consists of a writing machine (typing mechanism), a double reader, code selector and code translator. All of these mechanisms are similar in design and operation to those explained in Part II of this manual. The double reader, however, has two sets of single reader component parts resulting in two separate readers mounted on one base. (See Figure 1-14.)

Therefore, the double tape reader has two reading stations, rear and front which have identical structure insofar as the number and control of reading pins are concerned. The rear reader is affected only by codes having a 7 hole and is referred to as the justification reader. The front reader is affected by the printing codes consisting of combinations of holes from 1 to 6 and is referred to as the print reader.

The tape prepared on the Recorder is placed into both reading stations of the double reader, and in order to start the reading operation, the tape hold-down arms of both reading stations must be against the pin wheels to allow the two tape contacts JRTC and PRTC to close. The tape is placed edgewise into both stations and it is not necessary to form a loop between the two stations. It is only necessary that the first printing code holes at the beginning of the line be back of the reader pins in the print reader. Also, the first line justification code should be in back of the reader pins in the J-reader.

In order to start automatic operation of the Reproducer, it is only required to press and release the start read switch. This starts operation of the justification reader only, and as this reader reads the printing codes in the tape, no controls are set up because the number 6 and 7 codes must be read simultaneously in order to complete circuits through the other contacts of the justification reader.

From the description of the Recorder operation it will be remembered that at the end of each line a number 7 code hole alone is first punched followed by a code including the number 7 and number 6 holes, plus a five unit code representing the justification control. Accordingly, as the justification section of the double reader reaches the end of the first line, it will first read a number 7 code

hole alone. When the print reader is not operating, as is the case being explained, the reading of the number 7 code hole in the J-reader will not stop operation of the J-reader. It will stop operation of the J-reader, however, if the print reader is operating.

After reading the number 7 code hole, the next code to be read by the J-reader is the 7 and 6 code holes along with the five unit justification code. When the 7 and 6 code holes are read, the print reader will automatically start operation. At the same time, the five unit justification code is read along with the 6 and 7 code holes which will energize storage relays related to the holes in the justification code.

The operation of the print reader will read the six unit codes and accordingly control the translator and affect automatic operation of the Reproducer to print the line. The print reader, however, does not cause printing operation in response to any code employing the number 7 code hole because the circuits from the PRC contacts to the translator code magnets are controlled by a normally closed PRC7 contact.

The control circuits for the two readers are so interlocked that if the justifying reader reaches a number 7 code hole in the tape while the print reader is still operating, the justification section will be stopped until the printing section reaches a number 7 code hole. On the other hand, if the print reader finishes the line and reaches the number 7 code hole while the justifying reader is still operating, the print reader will be stopped until the justifying reader reaches the next number 7 code hole.

Non-Justify - Provision is made on the Reproducer for operating the machine to produce unjustified lines. For this purpose, a non-justify switch is provided on the machine which, when pressed, is retained in its depressed position. When the non-justify switch is depressed and the tape in the print reader, only the print reader operates, reading and producing a non-justified line.

Line Delete - In the Recorder, it will be remembered that a line delete code 1-2-3-4-5-6-7 may be punched in the tape in place of the justification code to delete the entire line preceding this delete code. When this code is read by the J-reader, a relay (COR) is energized. When relay COR is energized, a normally closed contact on this relay opens, breaking the circuit which energizes the translator magnets through the PRC contacts. Thus, while the print reader is reading a line following the sensing of the line delete code by the J-reader, the translator code magnets do not become energized and, accordingly, that line is not printed.

End Line - In operating the Reproducer, it may sometimes be desirable to stop the machine for a long period of time and turn off the main power switch when a length of tape still remains in the readers. For example, this would occur when a length of tape still remained in the machine at the end of the day so that the power must be turned off before finishing the entire tape. As will be explained later, the justification controls set up by energization of the storage relays may be lost in the event the power switch is turned off while the print reader is operating to automatically type a line. For this reason, an end line switch is provided on the machine. The end line switch, when held depressed during the typing of the entire line, will stop the machine operation,

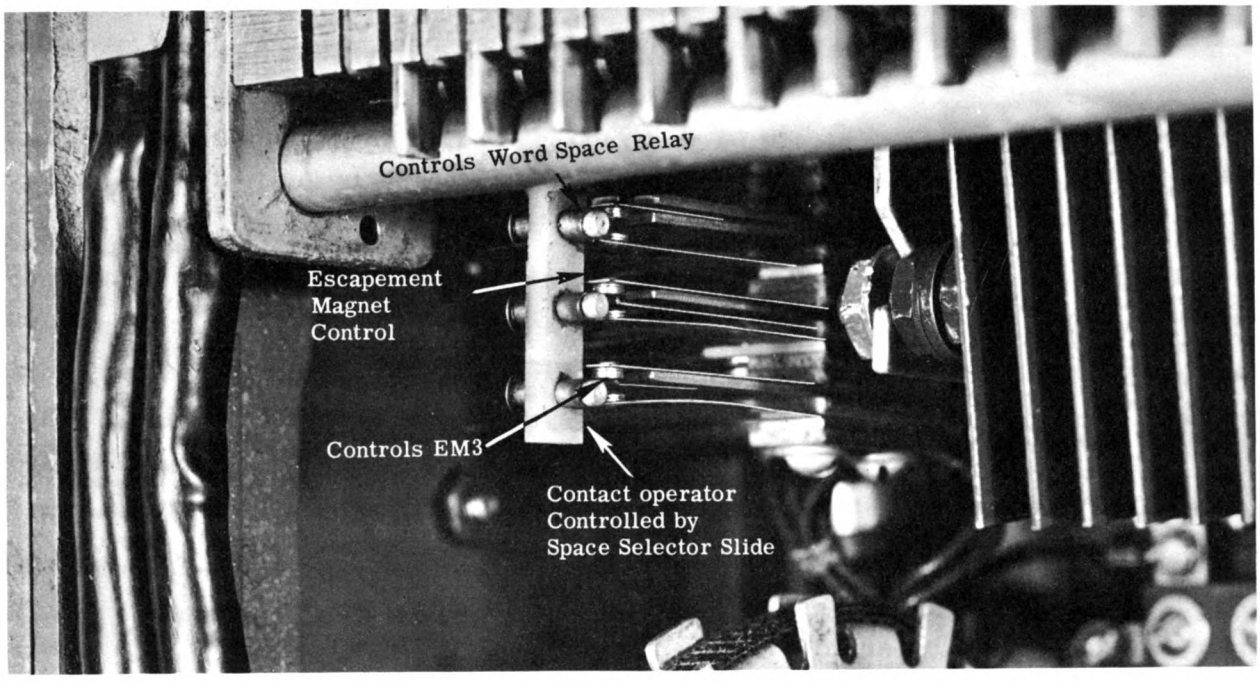


Figure 1-15 Word Space Contacts

whereupon the power switch may be turned off without danger of losing any justification controls set up in the machine.

The function of this end line switch is merely to open the circuit to the JRR relay so that when the printing section finishes a line, relay JRR will not become energized to start operation of the J-reader, and accordingly both readers will stop with no justification controls stored in the relays. Thus, the operator merely presses the end line switch and when both readers stop operations, the power switch may be turned off. Later, when it is desired to resume operation from the same tape, the power switch is merely turned on and the start read switch operated.

Word Space Control - When a number 3 code hole is read by the print reader in the Reproducer, the space bar key lever is automatically operated. The resultant selector slide operation does not directly select the operation of the escapement magnets EM1, EM2, and EM3, but instead, controls three normally open contacts called word space contacts (WSC). (See Figure 1-15.) Two of the three contacts (WSC) control the circuits for energizing the escapement magnets, and the other controls a word space relay WSR. Therefore, the extent of spacing between words can be varied between one unit and five units to affect justification and is under the joint control of the two storage relays JR1 and JR2 and the stepdown relay SDR.

The chart in Figure 1-16 shows the different word space values (in units) which are affected upon operation of contacts WSC according to the different combinations set up by relays JR1, JR2 and SDR. As explained previously, the 1 and 2 justification code holes, when read by the J-reader, control the energizing of the JR1 and

JR2 relays. Also, these two code positions determine the starting word space in a line. For example (refer to Figure 1-16), if a 1 and 2 justification code was read in the J-reader, the JR1 and JR2 relays would be operated. With these relays held energized, when the first number 3 word space code is read in the print reader, a circuit would be complete to the EM2 and EM3 escapement magnets, escaping the carriage 5 units for the first word space. If the relay SDR were to become energized along with relays JR1 and JR2 (this would happen only after the first word space and before the eighth word space), then the starting word space escapement would be decreased from five units to four units.

Code		Relays Operated			Escapement Magnets			Word Space
		JR1	JR2	SDR	EM1	EM2	EM3	In Units
1	2	X	X			X	X	5
1	2	X	X	X	X		X	4
	2		X		X		X	4
	2		X	X			X	3
1		X					X	3
1		X		X		X		2
						X		2
				X	X			1

X-Denotes Operated

Figure 1-16 Starting Word Space Chart

By studying the chart in Figure 1-16 it would be noted that when the stepdown relay SDR is energized, the word spacing is reduced by one unit for each of the four values of word spacing selected by the relays JR1 and JR2. Therefore, with relay SDR de-energized, the initial or starting word spacing in a line is always determined by relays JR1 and JR2, and the point at which the word spacing is reduced during typing of the line is determined by the energization of the step-down relay SDR.

It has been mentioned previously that the point at which the word spacing is reduced one unit by the energization of relay SDR is perforated in the tape in the form of a three unit code (justification code holes 3, 4 and 5). This code conditions the storage relays JR3, JR4 and JR5. This information stored in relays JR3, JR4 and JR5 together with three word space counting relays CR3, CR4, and CR5, determine after which word space in a line the SDR will be energized. The counting relays CR3, CR4, and CR5 operate in definite sequence for each line as follows:

1st word space operation - CR3 energized
2nd word space operation - CR3 and CR4 energized
3rd word space operation - CR4 energized
4th word space operation - CR4 and CR5 energized
5th word space operation - CR5 energized
6th word space operation - CR3 and CR5 energized
7th word space operation - CR3, CR4 and CR5 energized
8th word space operation - CR3, CR4 and CR5 energized

From the above information it can be seen that, when the condition of the counting relays CR3, CR4 and CR5 match or correspond respectively to the stored condition of relays JR3, JR4 and JR5, relay SDR becomes energized to reduce the value of the remaining word spaces in a line. For example, if the J-reader reads the justification code units 3 and 4, the JR3 and JR4 relays would become energized. During the second word space operation, the relays CR3 and CR4 are energized. After the second word space operation,

the SDR is energized due to the matching of CR3 and CR4 with JR3 and JR4.

The contacts of the word space relay WSR and contacts of a half-step relay CRP are used to set up conditions of relays CR3, CR4 and CR5 which correspond to the accumulated number of word spaces in typing a line. In addition, a final count relay CR8 is provided to de-energize relays JR1, JR2 and SDR after the eighth word space so that any additional word spaces will result in a normal two unit escapement of the carriage.

For a summary of manner in which justification is controlled in the Reproducer, the following example will be helpful (Figure 1-17): Suppose a line having six word spaces is eight units short of the desired length. It will, therefore, be necessary to add eight units between the words of this line in order to achieve complete justification of the line. By referring to the code chart in Figure 1-4, it will be noted that the code for the above condition consists of the 2, 3 and 4 codes. The 2 code will control the number of units by which the words will be spaced during the reproduction of the initial part of the line. The 2 code, according to the chart in Figure 1-16, will cause the magnets EM1 and EM3 to be energized during the first word space operation, thus causing four units escapement of the carriage. The 3 and 4 codes indicate after which word space the reduction in spacing units will take place. Therefore, according to the chart in Figure 1-6, the word spacing will reduce one unit (from four units to three units) after the second word space operation.

In the example, there are six word spaces having a total of twelve normal units of spacing between words. Since the first two word spaces will be four units or a total of eight units, and the

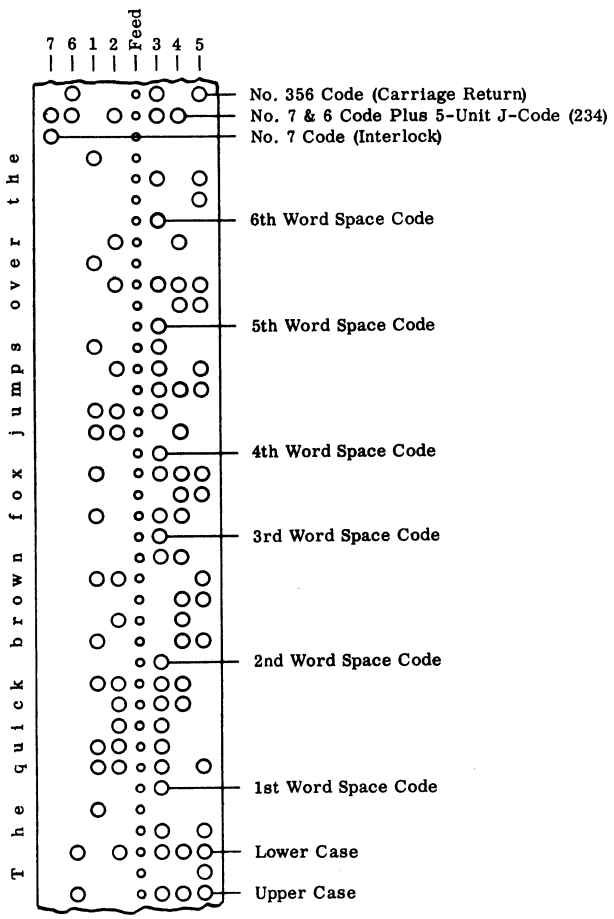


Figure 1-17 Example J-Code In Tape

next four word spaces will be three units or a total of twelve units, it follows that a total of twenty units will be provided in the six word spaces. The normal number of space units in the six word space line is twelve units, as noted above, therefore, the eight additional units have been provided to achieve complete justification of the line.

For a complete Reproducer Circuit Description, see Part VII, Section 4.

SPECIFICATIONS

Power Supply - The Justowriter Recorder and Reproducer may be specified with one of the following power supplies:

Volts	Cycles	Phase	Amperes
115	DC	-	2.3
115	60	1	2.3
115	50	1	2.3
115	25	1	2.3
230	60	1	1.5
230	50	1	1.5

Weight and Dimensions - The width of the Justowriter Recorder and Reproducer is 18", the depth is 21" and the height is 10". The shipping weight of each is approximately 115 pounds while the unpacked weight of each is approximately 85 pounds.

Type Style - The Justowriter Recorder may be equipped with any of the type styles illustrated below except the Booktype and Newstype. The Reproducer may be equipped with any one of the 8, 10, 11 or 12 point type styles.

When a different type style is used on each unit, the Recorder should be equipped with a Carbon Ribbon Mechanism.

The following type illustrations are set in actual size as listed:

This entire manual is set in BOLD FACE TYPE and reduced to approximately 10 point.

12 point

BOLD FACE ITALIC TYPE is especially useful on a Recorder in combination with a Bold Face Reproducer. For headings, word emphasis and footnotes, Italic copy is stripped in.

12 point

GALVIN TYPE is the result of a complete study of the Justowriter method of printing. The designer sought to produce a type which would print well and be attractive. Not an adaptation of any existing type face.

12 point

SECRETARIAL TYPE is a fine-line, feminine style type which is compact, legible and attractive. Excellent for making stencils.

12 point

ROGERS TYPE was specifically designed for the Justowriter by Bruce Rogers. Especially suited to actual size use in books and other reading matter.

11 point

DOCUMENTARY TYPE is distinctively styled for easy readability. Well suited for all offset or duplicator reproduction in actual or reduced size.

11 point

MODERN TYPE is a smart looking, well-rounded type face. Well suited to actual size reproduction for books, manuals, house organs and sales literature.

10 point

BOOKTYPE is a true 10 point face and because of this fact it is ideally suited for the composition of books, manuals and pamphlets without the necessity of photographic reduction.

10 point

NEWSTYPE is a condensed, 8 point type perfect for newspapers and house organs. Can be used on the Reproducer only, with any of the above type faces on the Recorder.

8 point

Each of the type styles are based on 1/32" spacing with the exception of the 8 point Newstype which has 1/48" spacing, and 10 point Booktype which has 1/36" spacing. The 1/36" and 1/48" escapement can be used on the Reproducer only.

Keyboard - The Justowriter keyboard is shown in Figure 1-18.

Carriage - The Justowriter Reproducer may be equipped with either a 12" or 16" carriage. The Recorder, however, can have only a 12" carriage.

Platens and Ratchets - The No. 2 platen is used with fabric ribbon, while the No. 8 platen is used when carbon ribbon, or both carbon and fabric ribbon is used.

Ratchets: For 10-, 11-, 12-point type

44 - 4.0 lines per inch
50 - 4.55 lines per inch
55 - 5.0 lines per inch (standard)
62 - 5.64 lines per inch
66 - 6.0 lines per inch

For 8-point type

36 - 6.55 lines per inch
38 - 6.91 lines per inch
39 - 7.09 lines per inch
40 - 7.28 lines per inch
44 - 8.0 lines per inch

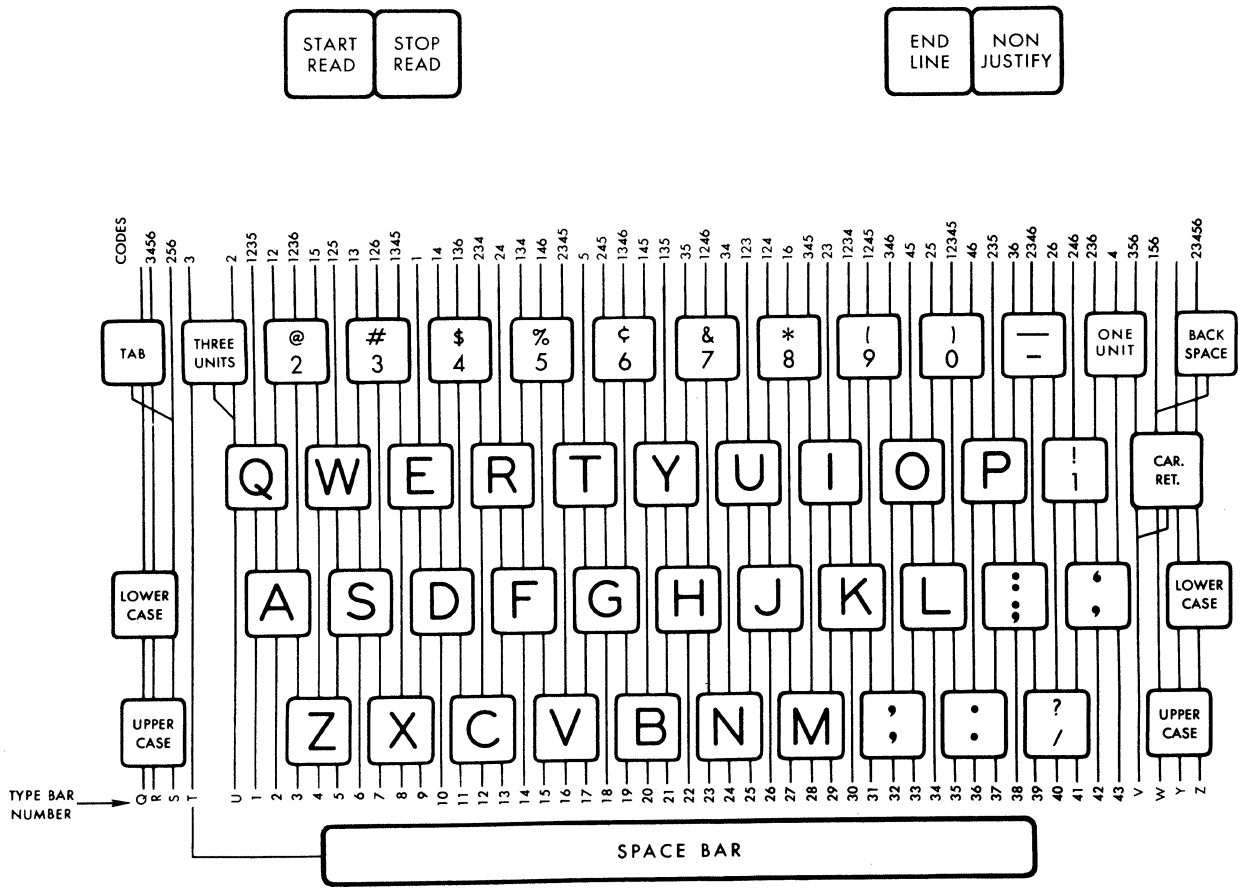


Figure 1-18 Keyboard

MAINTENANCE

RECORDER

Writing Machine - The writing machine in the Justowriter Recorder is basically the same as the unit described in Part II, Section 2 (President Model). There are, however, a few differences in parts and adjustments as follows:

A unit scale is provided in place of the paper bail. This scale is graduated for 8 point (top scale), 10 point (middle-in red), and 12 point (bottom scale). This unit scale may be used to convert from 12 point (Recorders have 1/32 inch escapement only - for 12 point) to 8 point or 10 point easily. The 8 point Reproducers have 1/48 inch escapement, while the 10 point Reproducers have 1/36 inch escapement. Therefore, if an 8 point 2 inch line is required, the Recorder margin stop would be set at 3 inches.

When setting for an 8 point line, the margin stop on the Recorder can be set on all graduation lines (on unit scale). The tab stops can be set on the long graduation lines only (on the unit scale). Referring to the margin rack, the margin stop can be set on all lines and dots. On the tab rack, however, the tab stops can be set in slots with horizontal lines only.

When setting for a 10 point line, the margin stop and tab stop on the Recorder can be set on all graduation lines of the unit scale. On the margin rack, the margin stop can be set on the dots only. On the tab rack, the tab stops can be set in slots having vertical lines only.

The tabular rack is numbered from right to left in inches. The tab stop slots are an eighth of an inch apart (4 units). The margin rack is also numbered from right to left in inches, with the notches spaced an eighth of an inch. The front scale on the Recorder is not used.

Margin and Tab rack adjustments:

1. Adjust the unit scale midway in the screw slots.
2. Adjust the card holder as follows:
   Move the carriage to the extreme left hand margin.
   Type approximately ten lower case "n's" (three units of escapement). Space the carriage approximately fifteen spaces and type ten more "n's". Move the carriage back and type one "n" in about the mid-position of the two rows of "n's". Back space twelve times and adjust the vertical edge of the card holder to the right hand edge of the character "n". Adjust the top edge of the card holder to the bottom edge of the two typed rows of "n's". Tighten the card holder screws.
3. Move the carriage until the pointer on the card holder aligns with the "0" position on the unit scale. Adjust the unit scale if necessary to obtain exact alignment.
   Note: The pointer should be the same distance from the bottom edge of the scale for the entire movement of the carriage.
4. With the carriage at the "0" position, escape the carriage one unit at a time and check to see that the carriage moves a least thirteen units past "0" before reaching the right hand final carriage stop.
5. Check the tab rebound check adjustments as

follows: lock up the tab lever and move the carriage to engage the tab lever with a tab stop. Adjust the horizontal eccentric to position the rebound check lever from .000" to .003" away from the tab stop. Adjust the vertical eccentric so the tip of the rebound check lever will be level to .010" below the tip of the tab lever. Check these adjustments in various positions. (Also, with the tab operated, check to see that the rebound check lever does not strike a tab stop on carriage return.)

6. Operate the escapement until the carriage return pawl (150) can be seen from the top. With the power off, depress the tab operating lever and allow the carriage to be held by the tab stop in the "0" position. Then, watching the carriage return pawl, trip the tabular latch and notice what part of the tooth (on pinion 137) the pawl engages. Adjust the rack so the operating end of the carriage return pawl will engage the tooth far enough back (approximately $\frac{1}{2}$ tooth maximum distance) to always drop safely into the same tooth.

   Note: If a tab rack adjustment is made, it may be necessary to readjust the computer and code bar assembly. (See page 2-3 of this section.)

7. Loosen margin rack brace. Adjust the margin rack roughly so the threads on the right hand end extend flush to two threads outside the nut on the carriage end plate. Operate the escapement by hand until the carriage return pawl (150) can be seen from the top of the machine. Set the margin stop at No. 1 position on the margin rack. Move the carriage to engage the margin stop. Move the carriage manually to the right causing the margin stop to move the margin release lever in its elongated slot. This movement or margin overthrow should be from "0" to 1/32" travel of the margin release lever. Move the margin rack to obtain this adjustment. (The above adjustment may also be checked by watching the carriage return pawl from the top of the machine. The pinion (137) should move to the right toward next tooth from 0 to $\frac{1}{4}$ tooth space.)

   Note: Adjustments for 8 point machines should be $\frac{1}{2}$ tolerances given above.

8. Check to see that the margin release lever clears the bottom of the margin stop by approximately 1/32".
9. Fasten the margin rack brace to the margin rack and check above adjustments by moving margin stop along rack in several positions. The adjustments should not vary over .005"
10. Check the setting between the tab and margin racks as follows:

    Set the margin stop at No. 1 position, return the carriage to the margin stop and type the lower case "n".

    Move the margin stop to the left hand end of the margin rack. Insert a tab stop in the No. 1 position. Move the carriage manually to the left hand margin.

    Tab to the No. 1 position and type the lower case "n". The last "n" character typed should print over the first character typed. If an adjustment is necessary, move the tab rack

and repeat the above adjustment procedure. Check the margin and tab rack relationship at several positions across the racks.

11. Check the final tab stop to be sure that it will unlatch the tab lever 1/8" to $\frac{1}{4}$" before the carriage reaches the right hand carriage stop.

Code Selector - The code selector is basically the same as the selector described in Part II, Section 3 of this manual. The Recorder, having a proportional escapement mechanism, uses the six upper bails for controlling the three escapement magnets. Also, a contact operator is mounted to the space selector slide (number three slide) for the purpose of operating the word space contacts.

Tape Punch - The tape punch described in Part II, Section 5 is identical to the one used on the Justowriter Recorder. When this punch is used on the Justowriter Recorder, however, the number seven punching position is used.

Computer Mechanism - The computer is mounted to the rear left hand base of the machine, and works in conjunction with a computer code bar assembly which is mounted to the carriage.

If it is necessary to remove the computer or code bar assembly, the assembly and adjustment procedure is as follows: (the margin and tab rack adjustments must be correct before adjusting the computer.)

1. Assemble the computer code bar assembly to the carriage in the approximate vertical position and parallel to travel of the carriage.
2. Assemble the computer to the rear base with three mounting screws. Step the seekers up to the eighth position. Adjust the vertical position of the computer so that the top edge of seekers will be flush with the top edge of their respective code bar sections (S1, S2, S3, S4 and S5). This adjustment is obtained by the adjusting screws as shown in Figure 2-1.

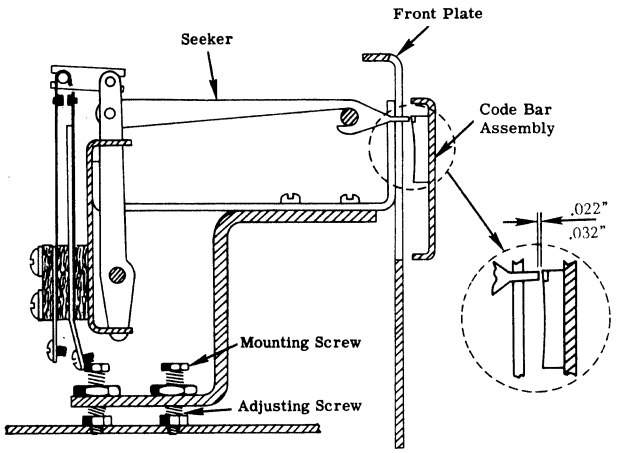


Figure 2-1 Computer Mounting Adjustment

3. Adjust the computer code bar assembly to provide .022" to .032" clearance between the computer code sections and the seekers (seekers in eighth position). (See Figure 2-1.)
4. After making the adjustment above, check to see that the pivot point of the seeker bail is aligned with the center of the arc of the code sections and zone cam. This may be checked by placing the carriage in the "O" position and moving the seeker bail from bottom to top position. If the zone contact arm does not remain stationary during this movement, it will be necessary to readjust the computer or code bar assembly.
5. Place the seekers in the lowermost position. Adjust the code bar assembly horizontally so

that at "O" position of the carriage the zone indicating contact is fully closed and will open one unit space each side of "O" position. Tab the carriage to the zero position to check this adjustment.

6. Step the seekers up to the eighth position. Move the carriage to the "O" position. Unhook the seeker bail spring (701). Adjust the five seeker contacts to have .020" gap. Replace seeker bail spring. Move the seekers & check to see that the common contact does not make until all five seeker contacts make. Carriage must be moved away from code bar.

If it is necessary to make a complete adjustment of the computer, proceed as follows:

1. Step the seekers up to the number four position. Unhook the bail spring (701). Hold the JCM armature against its core. Adjust the eccentric (699) so that the seekers extend 1/8" out from the front plate. (See Figure 2-2.)

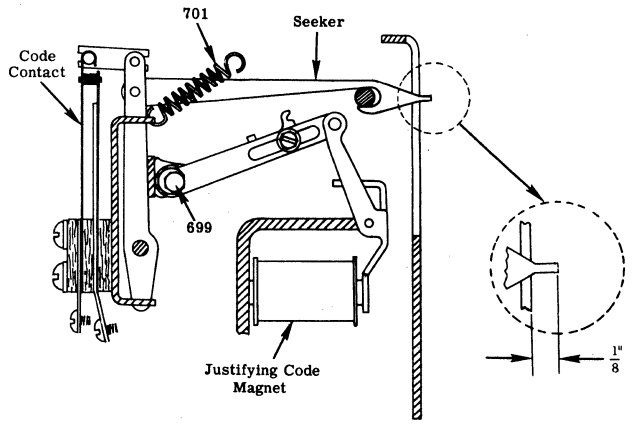


Figure 2-2 Seeker Adjustment

2. Hook the bail spring (701). Place the seekers in the lowermost position. Adjust the contact arm bail stop screw (641a) so that the seekers extend .020" from the front plate. (See Figure 2-3.)

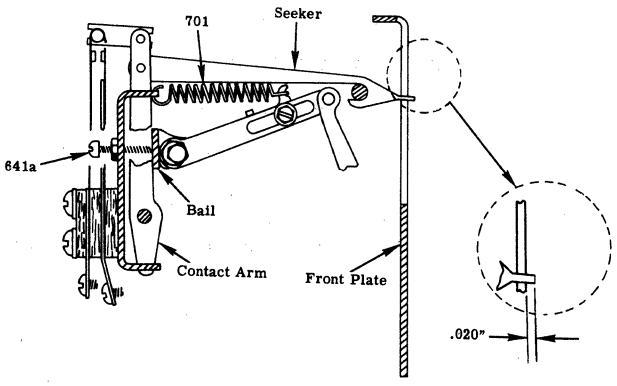


Figure 2-3 Seeker Adjustment

3. Move the pawl stop (656a) to the uppermost position. Check to see that the full movement of the JSM armature (646) will raise seeker bail (642) .005" to .010" more than one tooth space (check this .005" to .010" between tip of detent pawl 668 and tooth). If necessary, reform the JSM operating arm (646) to obtain this adjustment. (See Figure 2-4.)

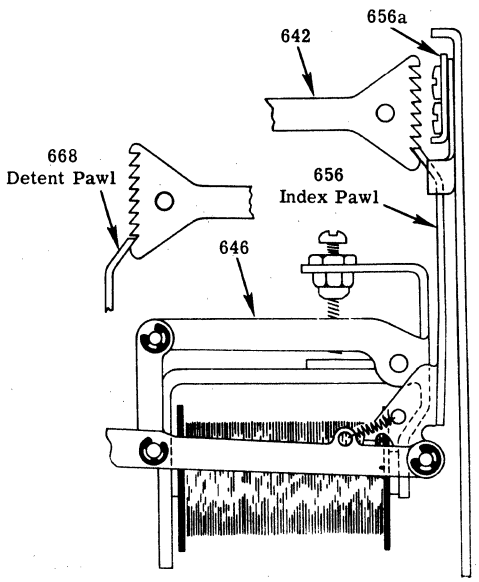


Figure 2-4 JSM Armature Arm Adjustment

4. Step the seekers up to the number one position. Adjust the JSM armature stop screw (646a) so that the pawl (656) will be opposite, or .005" above, the number three tooth. Check to see that the pawl (656) clears the tooth by .002" to .006". This clearance may be obtained by reforming the pawl (656). (See Figure 2-5.)

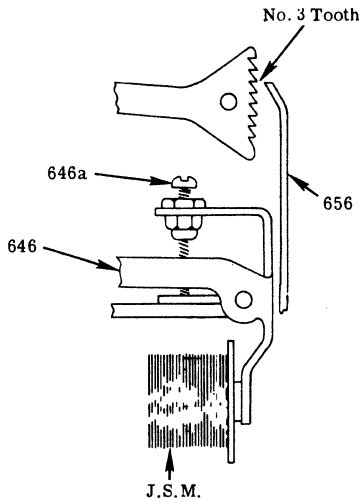


Figure 2-5 Index Pawl Adjustment

5. Place the seekers in the lowermost position. Adjust the lower bail stop (645) so that the pawl (656) will be opposite, or .005" above, the number two tooth. (See Figure 2-6.)
6. Adjust the pawl stop (656a) to allow .002" to .005" (check this between tip of detent pawl 668 and tooth) over travel of seeker bail when pawl is engaged in a tooth and JSM armature is fully operated.
7. Adjust the upper bail stop (645a) to allow .002" to .005" over travel of seeker bail when stepping to the eighth position. (See Figure 2-7.)
8. Adjust the spring bracket (677) so that the mounting screw is located in approximate center of slot. This should give the pawl spring (677a) a slight amount of tension when the seekers are in their lowermost position. (See Figure 2-6.)

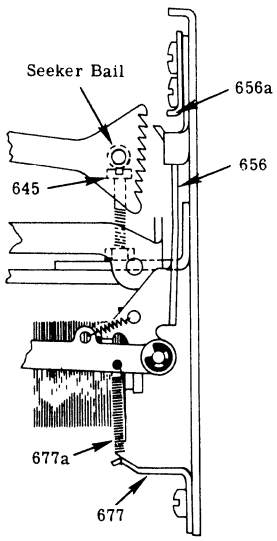


Figure 2-6 Lower Bail Stop Adjustment

Hole Count Relay (Figure 2-8) - The hole count relay is provided to insure that the distance between each justification code is at least three inches. This is necessary for the proper operation of the J Reader and print reader in the Reproducer (the distance between the two reading stations is three inches).

The hole count relay is of the indirect drive type, i.e., the cam is advanced during release of the armature rather than during its operation. When the coil is magnetized, it attracts the armature (causing the pawl to move into engagement with the next ratchet tooth), compresses the driving spring so as to store mechanical energy. During operation of the armature, the ratchet wheel and cam assembly are held in position by

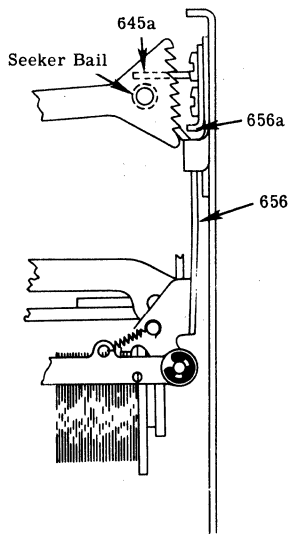


Figure 2-7 Upper Bail Stop Adjustment

a detent spring. Demagnetization of the coil allows the driving spring to exert force through the pawl on the ratchet tooth and thus move the cam assembly forward one step.

The following may be used as a guide for inspection and adjustment of the hole count relay:

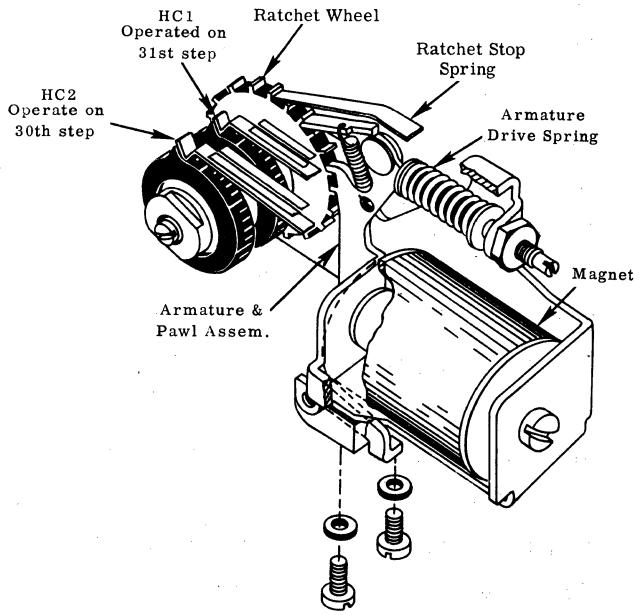


Figure 2-8 Hole Count Relay

Armature: The armature operation positions the pawl in the next tooth of the ratchet wheel. A spring restores the armature when the magnet is de-energized, rotating the cam one space, after which the stopping teeth on the armature engage the ratchet wheel teeth. For proper operation there must be no binds in the armature assembly.

1. The armature must be clear of the heelpiece. Also, in the operated position, a check with a .003" gage must be tight and a .0015" gage must be loose in the airline. The armature must be parallel to the heelpiece as gaged visually.
2. The edges of the pawl, along its length, must be parallel to the sides of the ratchet wheel. Also, the tip of the pawl must be parallel to the edge of the ratchet teeth as gaged by eye.
3. The armature stopping teeth must not project beyond either edge of the ratchet teeth by more than .010" in any position allowed by play in the armature bearings. The edge of the pawl shall project a minimum of 1/64", a maximum of 3/64" beyond the wiper side of the ratchet teeth in any position allowed by play in the armature and pawl bearings.

Ratchet Stopping Spring: The ratchet stopping spring is provided to hold the cam in place while the armature pawl is being prepared for the next step.

1. With the armature in the non-operated position, the ratchet stopping spring must clear the armature and pawl a minimum of 1/32".
2. With the play between the pawl and ratchet wheel taken up in the direction opposite to the cam rotation and the armature in the

non-operated position, there must be .003" maximum clearance between the spring tip and the radial surface of the ratchet tooth.

3. The tip of the ratchet stopping spring must project a minimum of 1/64" beyond the cam side of the ratchet wheel and must be parallel to the edge of the ratchet teeth as gaged by eye.

Armature Driving Spring: A spring restores the armature when the magnet is de-energized, thus driving the cam. An adjusting screw and locknut are provided. This spring is adjusted to completely restore the armature from the operated position when retarded by hand and allowed to restore slowly by hand.

Contacts:

1. The contact assembly is adjusted approximately parallel to the surface of the relay frame to which the cam shaft is mounted.
2. The apex of the V of the operate (middle) strap must line up with the center line of the lobe of the cam. There must be a definite clearance between the V and the lobe at the step immediately before and after the operated position. The contact farthest from the ratchet transfers on the 31st step, while the one nearest the ratchet transfers on the 32nd step.
3. The apex of the V of the operate straps must be approximately parallel to the cam shaft.
4. There must be a definite clearance between the V form of the operate strap and the cam on steps 1 through 30.
5. The make and break contact strap must have a minimum of .008" gap.

REPRODUCER

The writing machine in the Justowriter Reproducer is basically the same as the unit described in Part II, Section 2 (President Model) and also the Justowriter Recorder. The following parts and adjustments are different in the Reproducer.

The margin and tab racks for the 12 and 11 point Reproducers are the same as the Justowriter Recorder.

The 8 and 10 point Reproducer margin and tab racks differ as follows:

8 point - The margin stop may be set on all lines and dots.
The tab stops may be inserted in all slots.

10 point - The margin stop may be set on the dots only.
The tab stops may be inserted in slots with vertical lines only.

The over-all adjustments for the margin and tab racks on the above machines are the same as described for the Justowriter Recorder.

A carbon ribbon mechanism is used on the Reproducer. The color control mechanism is locked in one position because the standard ribbon feed mechanism (for fabric ribbon) is not used and the parts are not assembled to the machine. This mechanism is shown in Figure 2-9. It is important that the carbon ribbon mechanism operate smoothly, free of binds, due to the fact that it operates off the escapement mechanism.

Code Selector - The code selector used in the Reproducer has the six upper bails only for escapement operation. Also, the number three slide

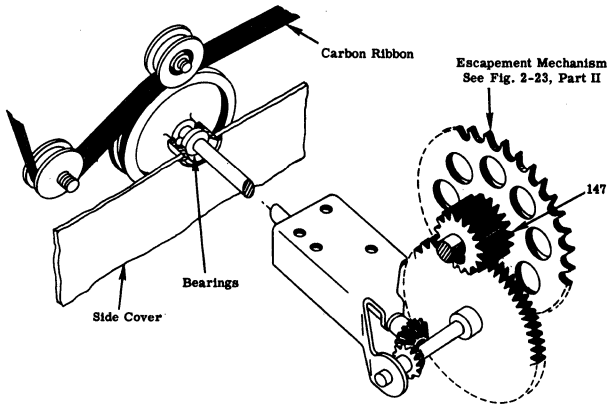


Figure 2-9 Carbon Ribbon Mechanism

(space) does not have cam surfaces and consequently does not operate the bails or contacts. This slide operates an individual set of word space contacts.

Double Reader - This reader has a double reading head and each head is basically the same as the single reader explained in Part II, Section 6 of this manual. The mechanical adjustments are the same as explained for the single reader.

The double reader contact adjustments are as follows:

Print Reader

1. Place a strip of tape (with feed holes only) in print reader and allow the pins to rest against the bottom of the tape.
2. Adjust all contacts to have a gap of .020" except PRC5 and PRC6 make contacts (in delay control circuit). PRC5 and PRC6 contacts above should be adjusted to .030" gap.
3. Remove the tape and set the PRC3 break contact at .020", the PRC7 N/C transfer contact at .020" and the PRC4 break contact at .030".
4. With the tape removed, operate the contacts and check to see that the PRC4 break contact breaks before PRC5 and PRC6 make contacts close (delay control circuit). Also, check to see that the PRCC breaks before the PRC7 make contact closes.
5. Open the PRTC contacts (by moving the hold down arm back), and set to a .020" gap.
6. Check to see that all contacts have a .005" follow after make.

J-Reader

1. Insert a tape (feed holes only) set all the contacts to have a .020" gap.
2. Remove the tape and set the JRC7 N/C transfer contact to a .020" gap.
3. Open the JRTC contacts (by moving the hold down arm back) and set to a .020" gap.
4. Check to see that all contacts have .005" movement after make.

RECORDER CIRCUIT DESCRIPTION

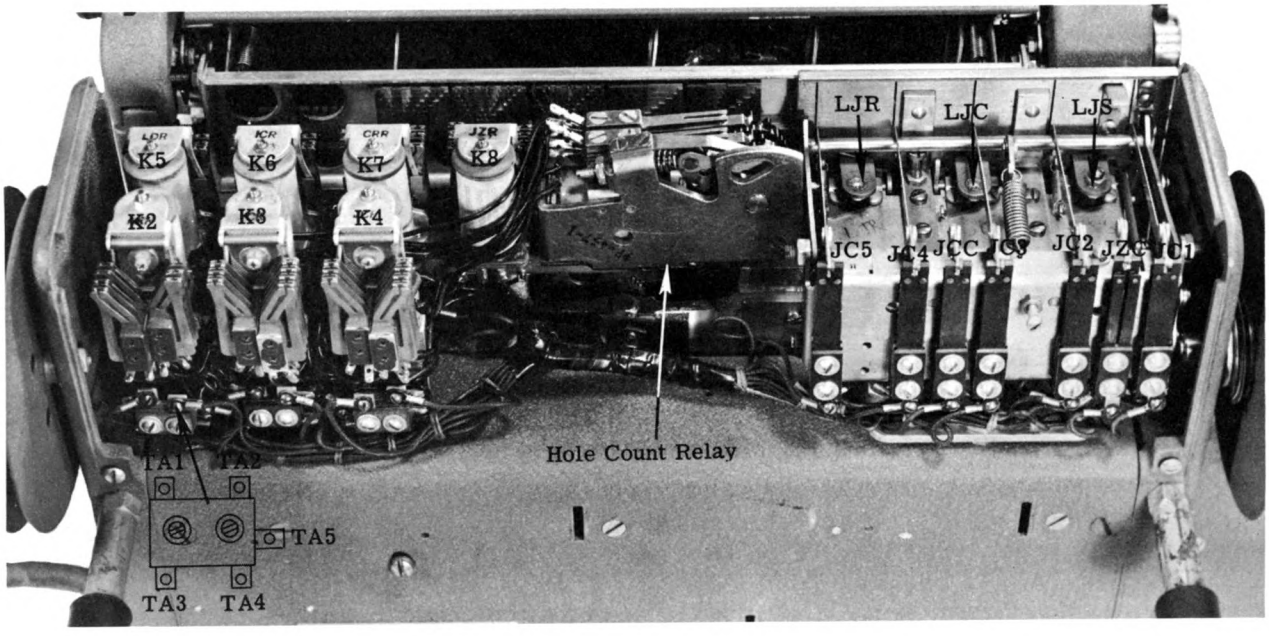


Figure 3-1 Relay Location

The following circuit descriptions are based on wiring diagram 1054058 (Figure 3-18).

Figures 3-1 thru 3-3 show the location of the various electrical components of the Recorder.

POWER CIRCUIT

The power circuit in the Recorder is identical to the power circuit described in Part II, Section 8 of this manual.

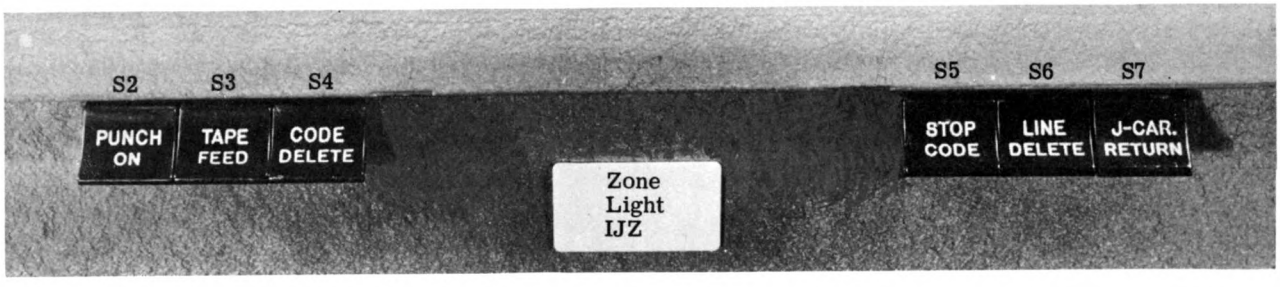


Figure 3-2 Control Panel

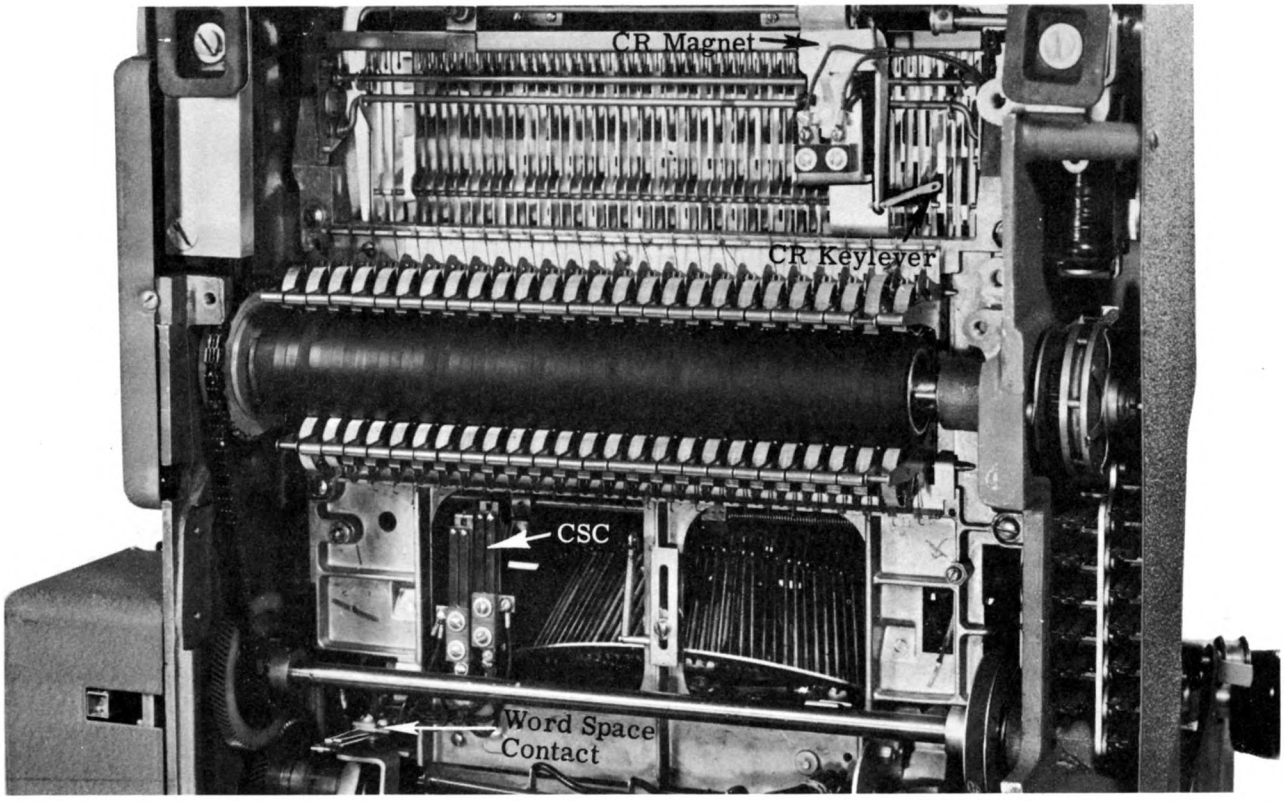


Figure 3-3 Space and Case Shift Contacts

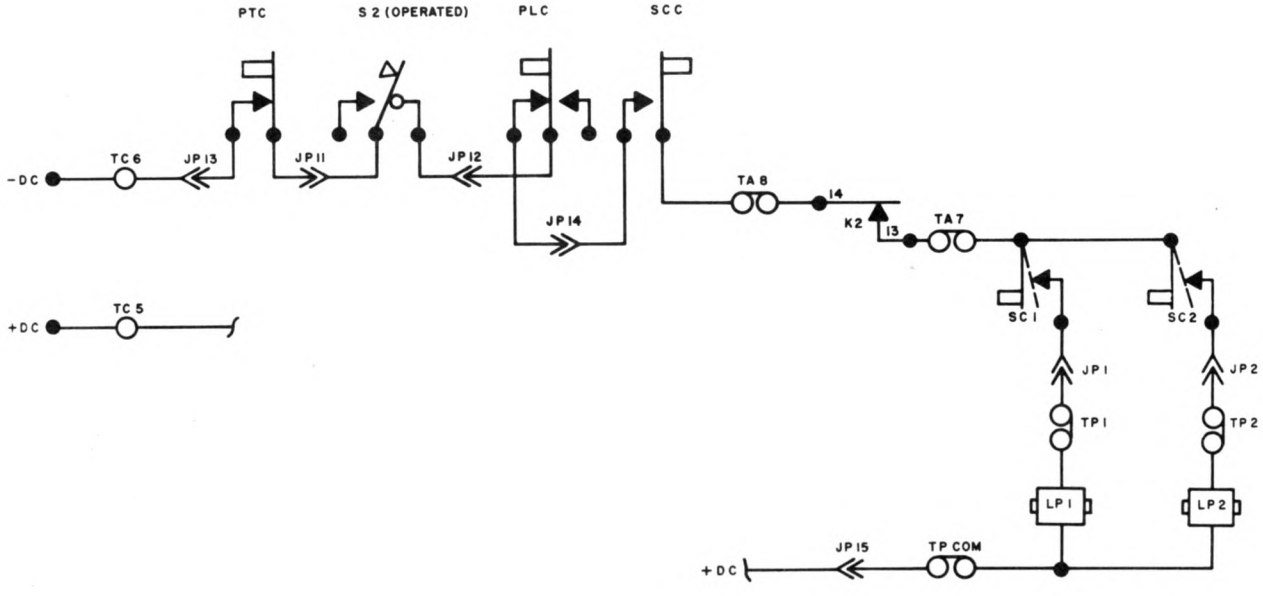


Figure 3-4 Punch Magnet Circuit

KEY LOCK MAGNET CIRCUIT

The Tape Punch used in the Justowriter Recorder is identical to the punch described in Part II of this manual, also, the Key Lock Magnet Circuit is the same.

PUNCH MAGNET CIRCUIT

When a keylever is depressed, one or more selector contacts will close, depending upon the binary code given that particular keylever position. There are six selector code contacts (one for each unit of code), plus one selector common contact (SCC). The common contact (SCC) will close after the code contacts to insure all circuits to the punch magnets will be completed simultaneously.

For an example circuit assume that the "A" character keylever was depressed (Figure 3-4). A D.C. circuit will be completed to the LP1 and LP2 (No. 1 and No. 2 punch magnets)as follows: from -DC, TC6, JP13, PTC, JP11, N/OS2, JP12, N/C PLC, JP14, SCC, TA8, K2 14 and 13, TA7, SC1 and SC2, JP1 and JP2, TP1 and TP2, LP1 and LP2, TP COM, JP15, TC5 to +DC. Therefore, the 1-2 code will be perforated in the tape during the punch cycle of operation.

PUNCH CLUTCH MAGNET CIRCUIT

When a key lever is depressed as described, a circuit is completed to the punch clutch magnet (LPC) also (Figure 3-5). This circuit is as follows: from -DC, TC6, JP13, PTC, JP11, N/0 S2, JP12, N/C PLC, JP14 SCC, TA8, K2 4 and 3, TA10, JP8, LPC, JP15, TC5, to +DC. Thus, the clutch magnet circuit is completed at the same time as the punch magnet circuits, but due to the characteristics of the coils, the punch magnets will be energized and accordingly, the latch levers will engage the operating levers before the clutch magnet armature is attracted and the punch shaft starts its rotation.

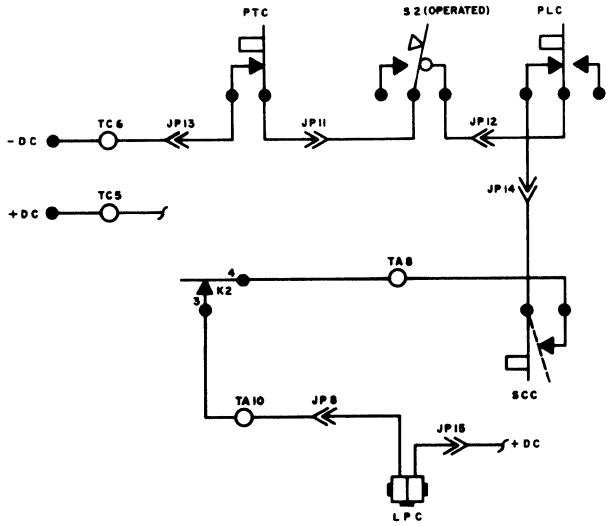


Figure 3-5 Punch Clutch Magnet Circuit

During the punch shaft rotation, the PLC (punch lock contact) transfers, thus completing a circuit to, and energizing the K2 (anti-repeat) relay. When K2 is operated, the circuits to the punch magnets (through contacts 13 and 14) and the clutch magnet (through contacts 3 and 4) are broken. If the SCC contact on the selector did not open before the punch completed its cycle, the K2 relay would remain energized through a holding circuit established by K2 15 and 16 contacts in series with the SCC contact. Thus, for one keylever operation only one cycle of the punch will take place.

HOLE COUNT RELAY MAGNET CIRCUIT

Each keylever operation, besides completing circuits to the punch and clutch magnets as just described, also completes a circuit to the hole count relay. However, this only takes place on the first 30 keylever operations after which, the hole count relay magnet circuit is broken until the J-carriage return switch S7 is depressed.

The operation of the hole count relay does not take place until after the magnet (LHC) is de-energized. That is, the armature movement indexes the pawl which engages a ratchet tooth, and when the magnet (LHC) is de-energized the pawl movement rotates the hole count shaft one tooth position. This ratchet tooth movement is referred to as a "step." The hole count relay will take 30 steps before the HC2 contacts will transfer, breaking the circuit to LHC.

The circuit which energizes the hole count magnet (LHC) when a keylever is depressed, is as follows: (Figure 3-6) from neg. D.C., TC6, JP13, PTC, JP11, N/0 S2, JP12, N/C PLC, JP14, SCC, TA8, K2-4 and 3, TA10, N/C S3, TA27, HC2 (11 and 12), TA13, K2-2 and 1, TA14, LHC, TA26, TC5, to pos. D. C. During the punch cycle, the PLC contact transfers, energizing K2. Thus, contacts 1 and 2 on K2 open, breaking the circuit to LHC causing the relay to step one position.

When the 30th relay step takes place, the high point of HC2 cam moves operate strap No. 12 to break with strap No. 11 and make with strap

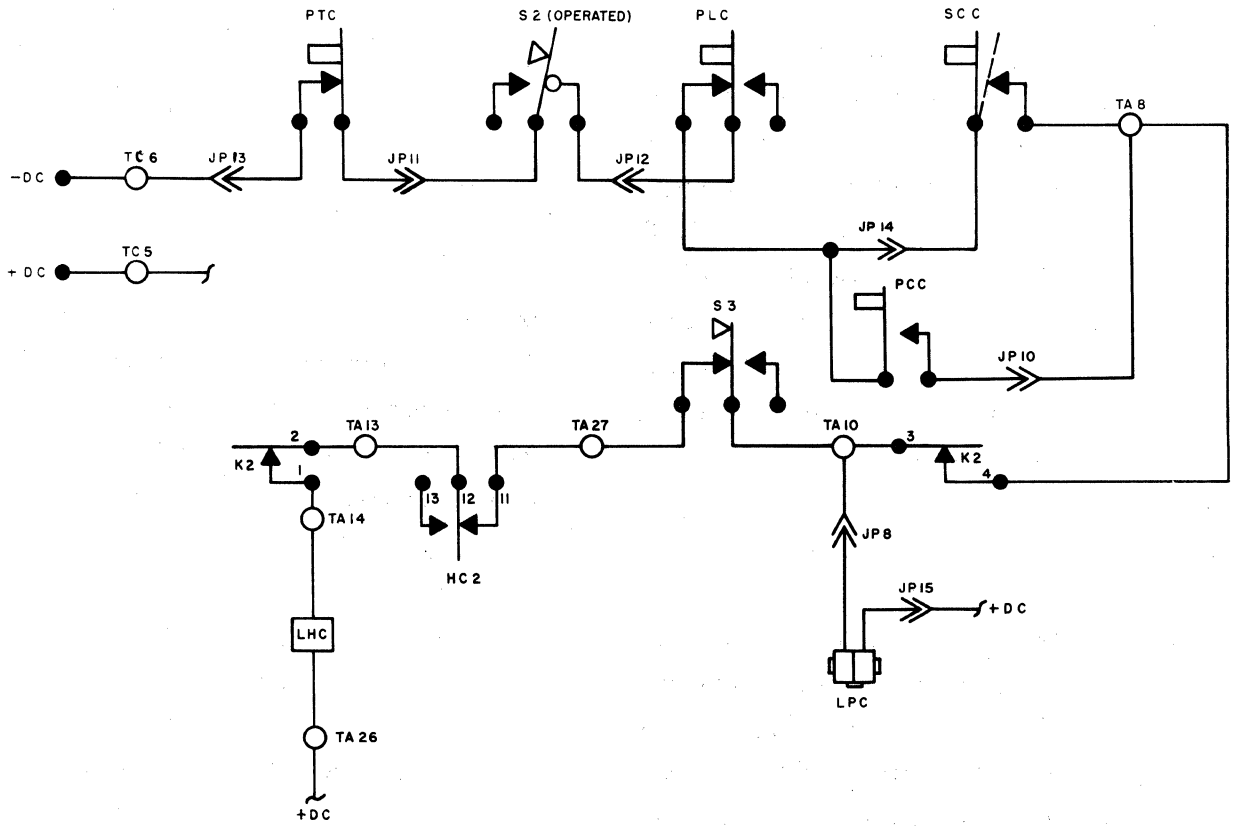


Figure 3-6 Hole Count Magnet Circuit

No. 13. Therefore, the circuit to LHC explained above, is no longer possible and additional key-lever operations will not step the hole count relay. A circuit will be complete to LHC, however, when the J-carriage return switch S7 is depressed.

J-CARRIAGE RETURN SWITCH CIRCUITS

When the S7 switch is depressed, the hole count relay automatically steps three positions (steps 31, 32 and 33) and the punch completes three additional cycles. This results in a justification code being perforated in the tape depending upon the number of word spaces in the line and the number of units from zero that a line is ended. This justification code will include a number seven code only in the 31st position, a seven - six plus a combination of one through five code units in the 32nd position and in the 33rd position a three - five - six - carriage return code.

When an operator finishes a line and depresses the S7 switch, the following circuit sequence takes place, (hole count relay on 30th step with contact straps 12 and 13 made):

Energizing the No. 7 Punch Magnet - When the S7 switch is depressed the K6 relay is energized as follows: (Figure 3-7) from neg. D.C. TC6, JP13, PTC, JP11, N/O S2, JZC, (JZC is closed,

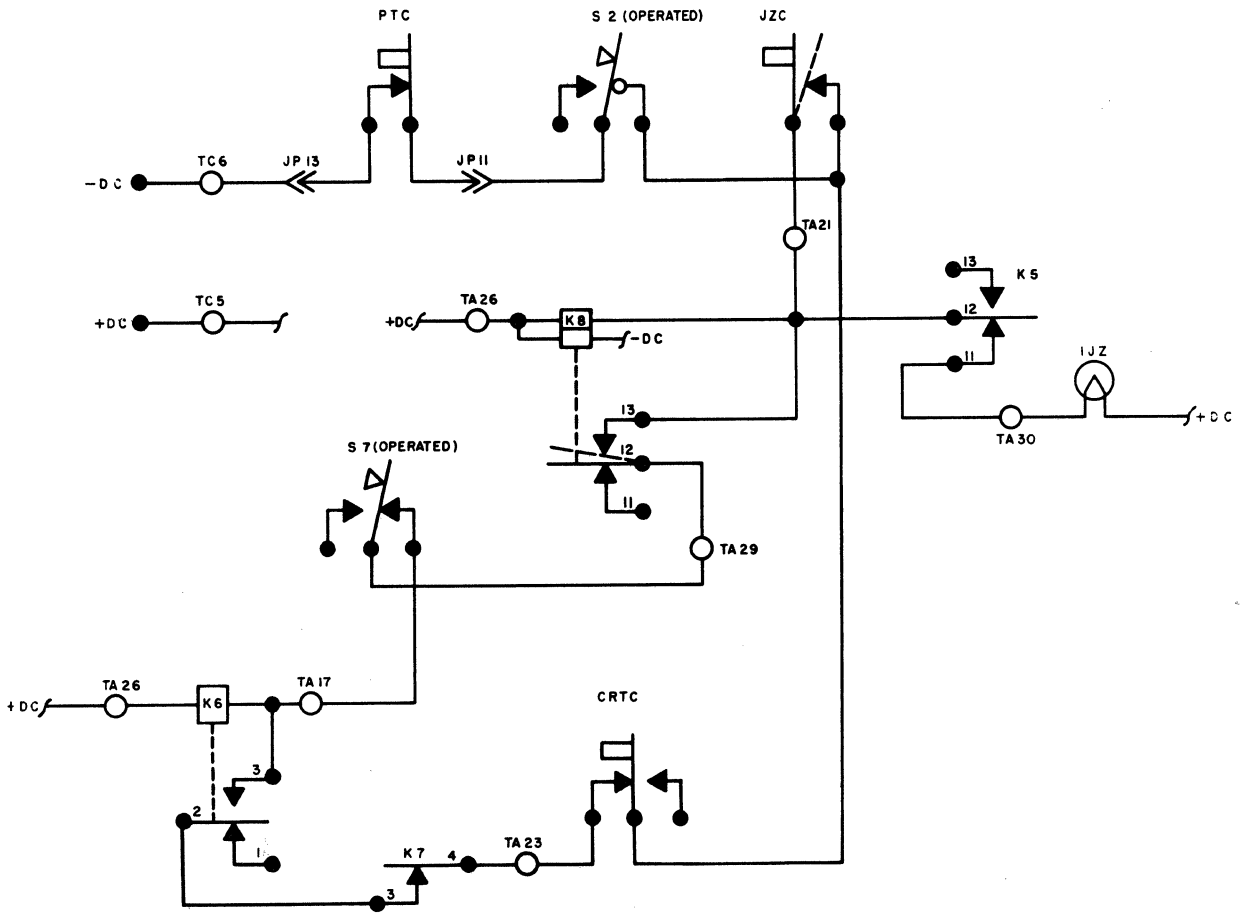


Figure 3-7 ICR (K6) Circuit

thus energizing IJZ and K8), TA21, K8 13 and 12, TA29, N/O S7, TA17, K6 coil, TA26, TC5, to pos. D.C. The interlock control relay (K6) is energized and a holding circuit is complete to it from neg. D.C., TC6, JP13, PTC, JP11, N/O S2, CRTC, TA23, K7 4 and 3, K6-2 and 3, K6 coil, TA26, TC5, to pos. D.C. When the S7 switch is released, the S7 operate strap (which is connected to negative D.C. as described) makes with the S7 normal strap, thus a D.C. circuit is now complete to LP7 (Figure 3-8) through the normally closed S7, TA18, K6-5 and 4, K4-12 and 11, TA13, HC2 (12 and 13), TA25, JP7, TP7, LP7, TPC, JP15, TC5, to pos. D. C.

Note: A D.C. Circuit is also completed to the LHC through the K2-2 and 1, through TA14, LHC, TA26, to pos. D. C. (See Figure 3-6.) Thus, the hole count magnet is energized also.

The LP7 punch magnet being energized attracts the number seven punch magnet armature which releases the number seven punch latch lever. The movement of the number seven latch lever in turn moves the punch common contact bail which closes the punch common contact (PCC). The operate strap of PCC is connected to negative D.C., therefore, a D.C. circuit is complete to the punch clutch magnet (LPC) from PCC, JP10, TA8, K2-4 and 3 TA10, JP8, LPC, JP15, TC5, to pos. D.C. (See Figure 3-6.) When the LPC becomes energized the punch shaft rotates, during which the PLC contacts transfer, completing a DC circuit to and energizing K2 (anti-repeat) relay. K2-1 and 2 contacts break, thus, the LHC circuit is open, de-energizing the hole count magnet. This results in the hole count relay stepping to the 31st position. Also, due to the rotation of the punch shaft, and the LP7 energized, the seven code will be perforated in the tape.

31st Step of Hole Count Relay - When the hole count relay steps to the 31st position, the high lobe of HC2 cam allows the No. 12 strap to break

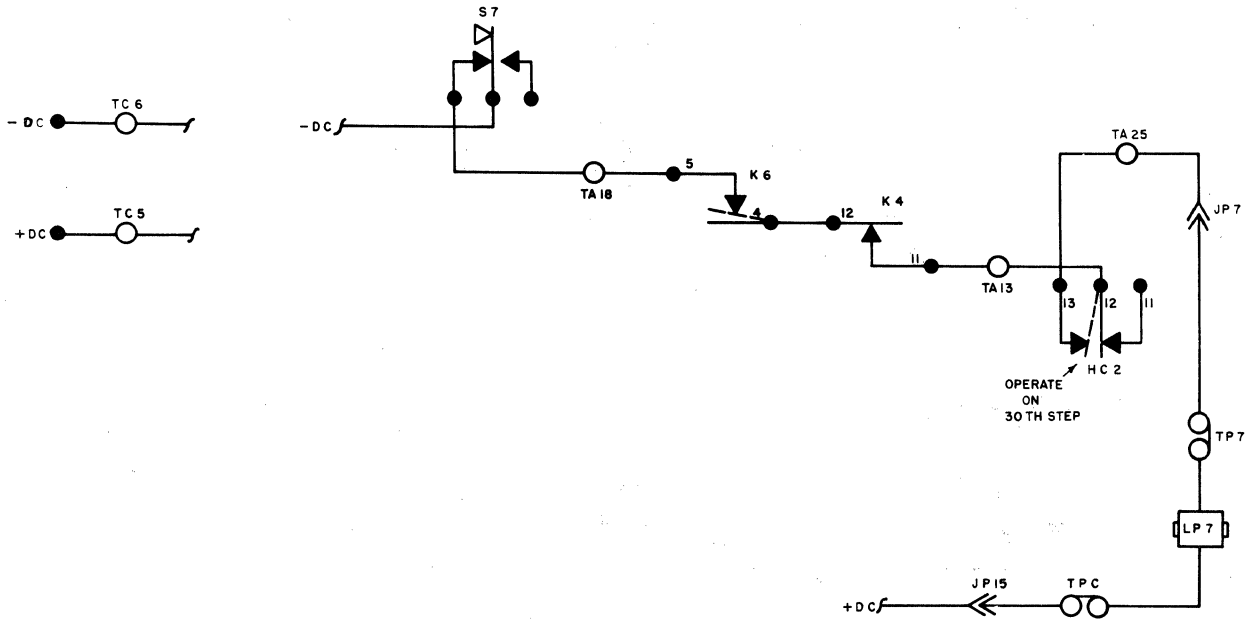


Figure 3-8 No. 7 (LP7) Punch Magnet Circuit

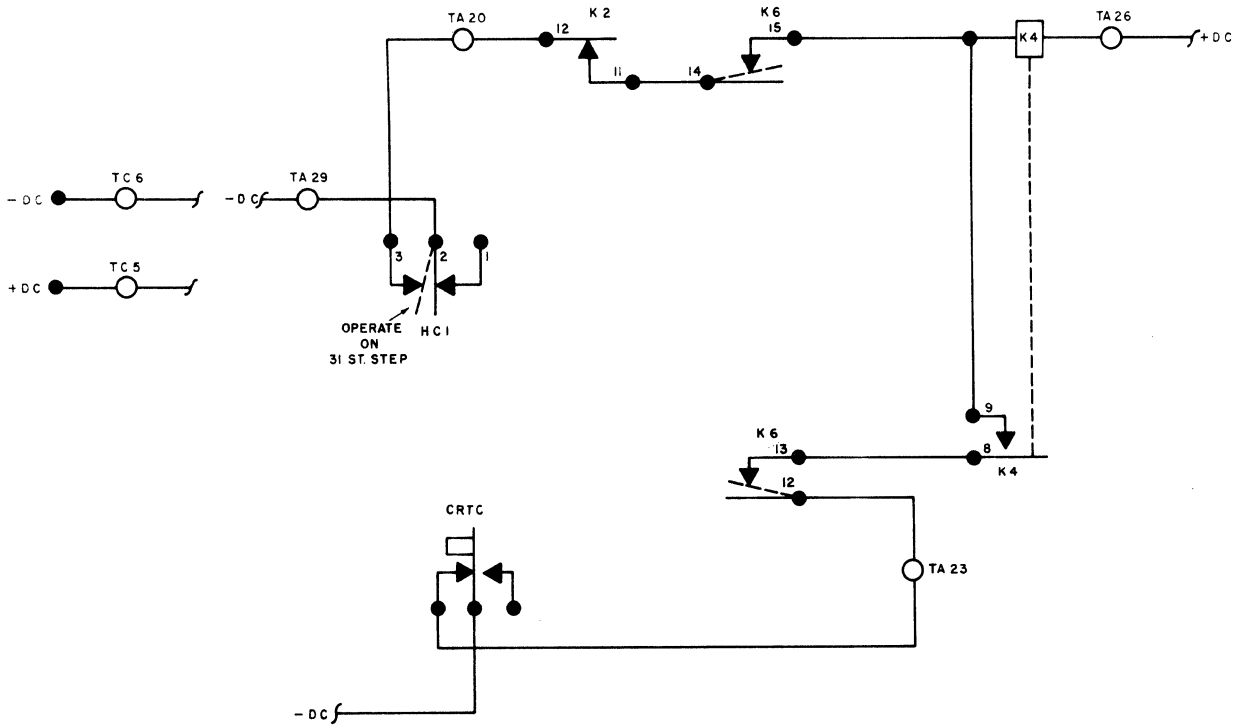


Figure 3-9 JCR (K4) Circuit

with No. 13 strap and make with the No. 11 strap. Also, the high lobe of HC1 cam moves the No. 2 strap to break with No. 1 and make with No. 3. It should be noted that HC 1 - No. 2 strap is connected to negative D.C., therefore, a D.C. circuit is completed to and energizes the justification control relay (K4) as follows: (Figure 3-9) from HC1 - No. 2 and 3 straps, TA20, K2-12 and 11 (this contact closes near end of punch cycle when K2 relay drops out), K6 - 14 and 15, K4 coil, TA26, TC5, to pos. D.C. The K4 (JCR) relay is energized and a holding circuit is established as follows: from negative D.C. to CRTC contact, TA23, K6 - 12 and 13, K4 - 8 and 9, K4 coil, TA26, TC5, to pos. D.C.

The justifying code magnet (LJC), located on the computer, is energized at the same time as the K4 relay. This circuit is as follows: (Figure 3-10) from negative D.C. on HC1 - 2 and 3 straps, TA20, K2 -12 and 11, K6 - 14 and 15, K7 - 1 and 2, K5 - 2 and 1, K8 - 5 and 6, TA22, LJC, TC5, to pos. D.C. The operation of LJC allows the seekers to move to their respective cams on the computer code bar. Thus, a combination of JC1 through JC5 (plus JCC) contacts will close, depending upon the level of the seekers (number of word spaces in a line) and the number of units from zero that the line is ended. Therefore, due to the JCC and combination of JC1 through JC5 contacts closing a DC circuit will be completed to the LP7, LP6 and those punch magnets (LP1 through LP5) whose corresponding JC contacts have closed (Figure 3-11).

The circuit to LP6 is as follows: from neg. D.C., N/C S7, TA18, K4 - 2 and 3, K8 - 2 and 3, TA28, JCC, TA8, K2 - 14 and 13, K4 - 14 and 15, TA6,

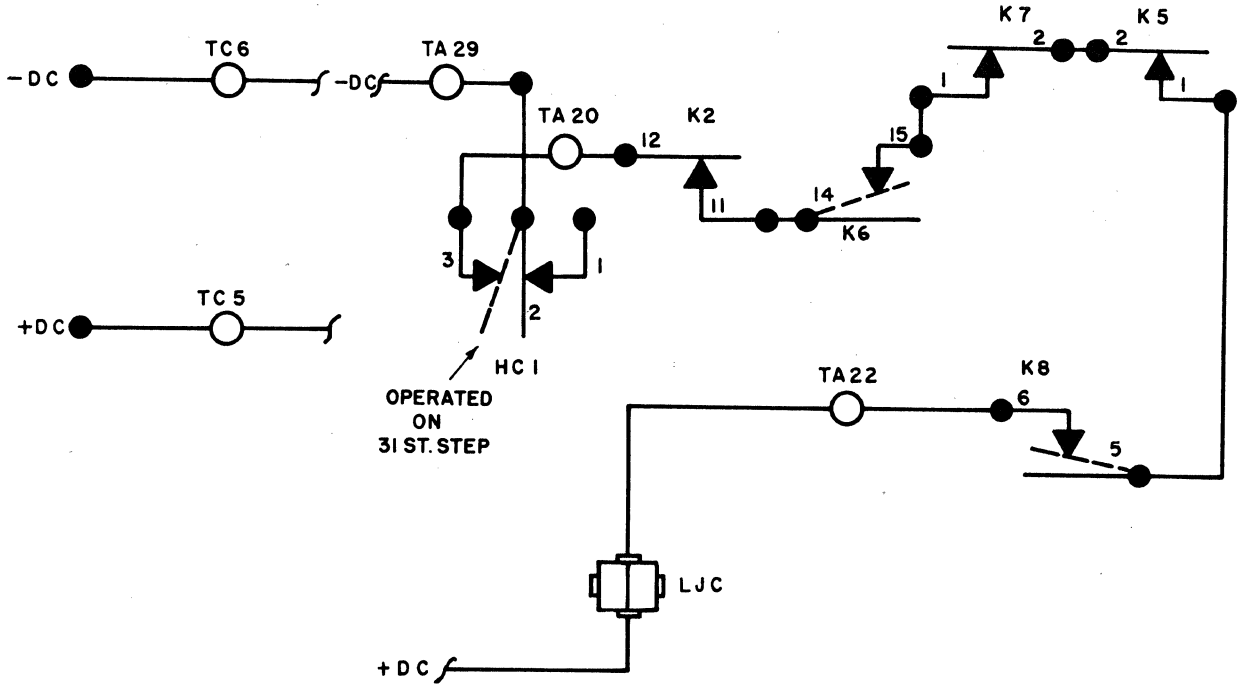


Figure 3-10 Justifying Code Magnet (LJC) Circuit

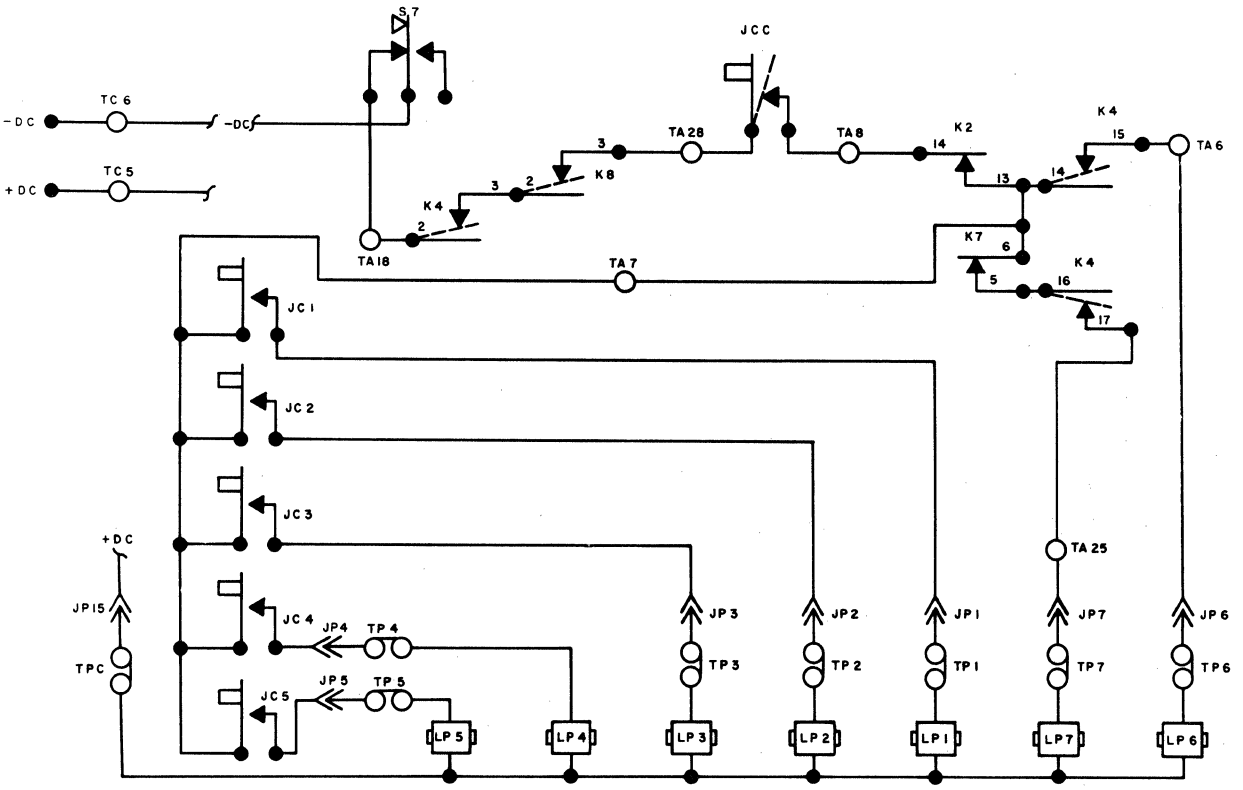


Figure 3-11 Justification Code Circuit

JP6, TP6, LP6, TPC, JP15, TC5, Pos. D.C.

The circuit to LP7 is as follows: from neg. D.C., N/C S7, TA18, K4 - 2 and 3, K8 - 2 and 3, TA28, JCC, TA8, K2 - 14 and 13, K7 - 6 and 5, K4 - 16 and 17, TA25, JP7, TP7, LP7, TPC, JP15, TC5, to pos. D.C.

The circuits to LP1 through LP5 are as follows: from neg. D.C., N/C S7, TA18, K4 - 2 and 3, K8 - 2 and 3, TA28, JCC, TA8, K2 - 14 and 13, TA7, JC1 through JC5 (depending on which are closed), to LP1 through LP5, TPC, JP15, TC5 to pos. D.C.

The LHC and LPC are also energized when JCC closes, thus the punch shaft rotates, during which the K2 relay is energized (because PLC transfers), therefore, K2 - 1 and 2 contacts open, breaking the circuit to LHC, causing the hole count relay to step to the 32nd position. Also, during punch rotation, the seven - six plus a combination of one through five code units are perforated in the tape.

32nd Step of Hole Count Relay - When the hole count relay steps to the 32nd position, the high lobe of the HC1 cam allows the No. 2 strap to break with No. 3 strap and make with the No. 1 strap. Because the No. 2 strap is connected to negative D.C. a circuit is complete to the K7 carriage return relay as follows: (Figure 3-12) from neg. D.C., HC1 straps 2 and 1, TA16, K2 - 17 and 18, K4 -4 and 5, K7 coil, TA26, TC5, pos. D.C.

A holding circuit is complete to the K7 relay through the CRTC contact (normally closed), TA23 through K7 13 and 14, coil, TA26, TC5 to pos. D.C.

When the K7 relay picks up, K7 contacts 3 and 4 break, thus breaking the holding circuit to the K6 relay and the K6 relay drops out. This in turn, results in the K4 relay de-energizing because of K6 contacts 12 and 13 breaking. (See Figures 3-7 and 3-9.)

The result of this sequence of operations is a D.C. circuit to the carriage return magnet (LCR) as follows: (Figure 3-13) from negative D.C., N/C S7, TA18, K4 - 2 and 1, K7 - 15 and 16, TA24, LCR, TC5, pos. D.C. The carriage return magnet operation (LCR is located under the right

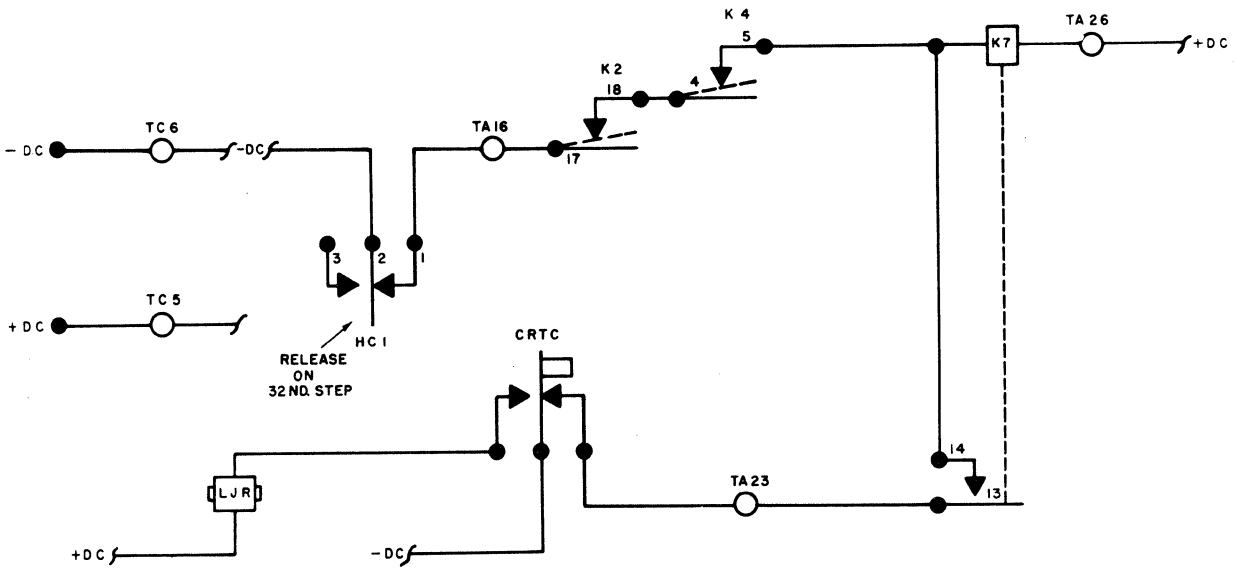


Figure 3-12 CRR (K7) Circuit

hand end of the keyboard) pulls down the carriage return keylever and trips the CR cam. The CR cam operation causes carriage return operation, also CR selector slide operation. The mechanical CR linkage will transfer the CRTC contact, thus breaking the K7, K8 and IJZ holding circuits. Also, the CRTC operate and transfer straps, when made, complete a D.C. circuit to the justifying restoring magnet (LJR). (See Figure 3-12.) The LJR operation restores the seekers and the zone bail to the zero position (lowest position).

The CR selector slide operation closes SCC, SC3, SC5 and SC6 contacts, thereby completing circuits to and energizing the LP3, LP5 and LP6 punch magnets, also the LPC and LHC coils are energized. Due to LPC operation, the punch shaft rotates, during which the PLC contacts transfer, causing the K2 to pick up. The K2 - 1 and 2 contacts break de-energizing the LHC and causing the hole count relay to step to the 33rd position. Also, during punch shaft rotation, the three - five - six code units are perforated in the tape. When the carriage returns to the left hand margin, the CRTC contacts return to the normal position and the LJR is de-energized.

S7 Circuit (Not in Zone)

The preceding circuit explanations function when the carriage is in the justifying zone (and JZC contacts are closed). If, however, the carriage is not in the zone and the J-carriage return switch S7 is operated, only the 7,6-7 and 3-5-6 codes will be perforated in the tape. In other

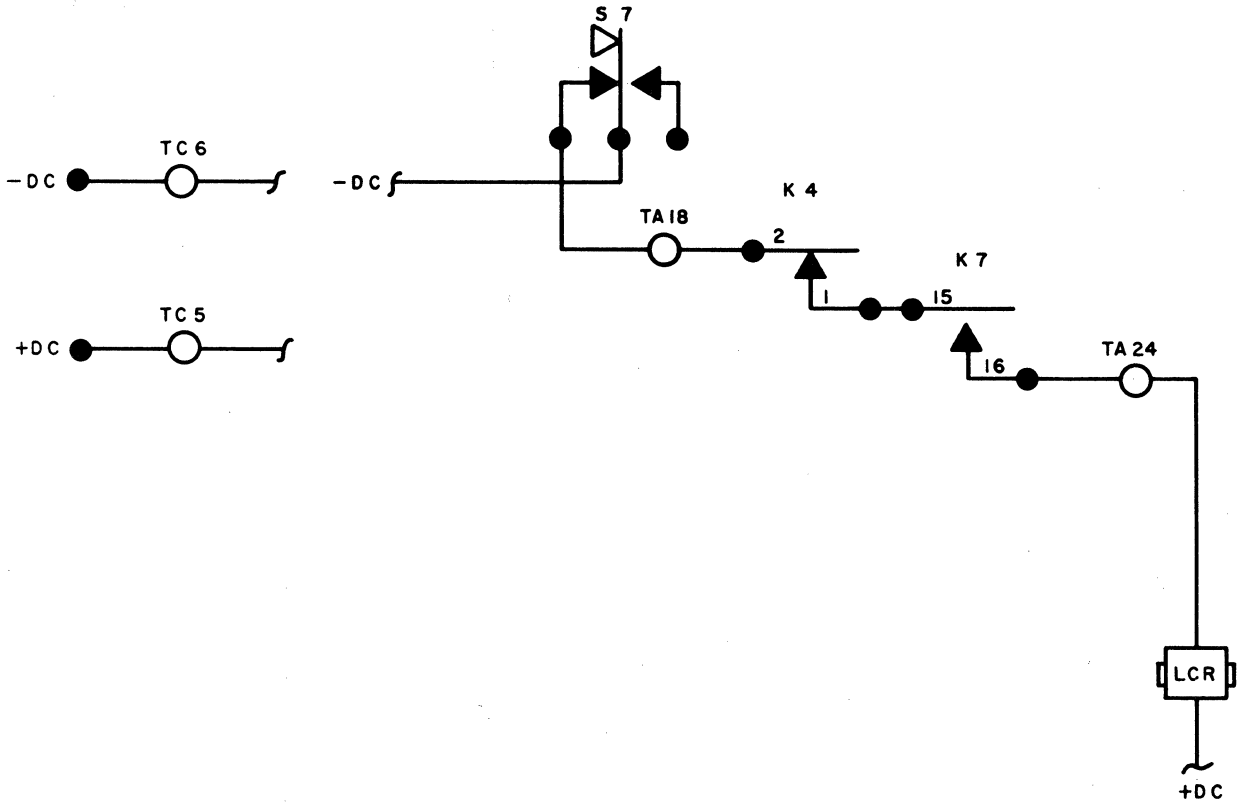


Figure 3-13 CR Magnet (JCR) Circuit

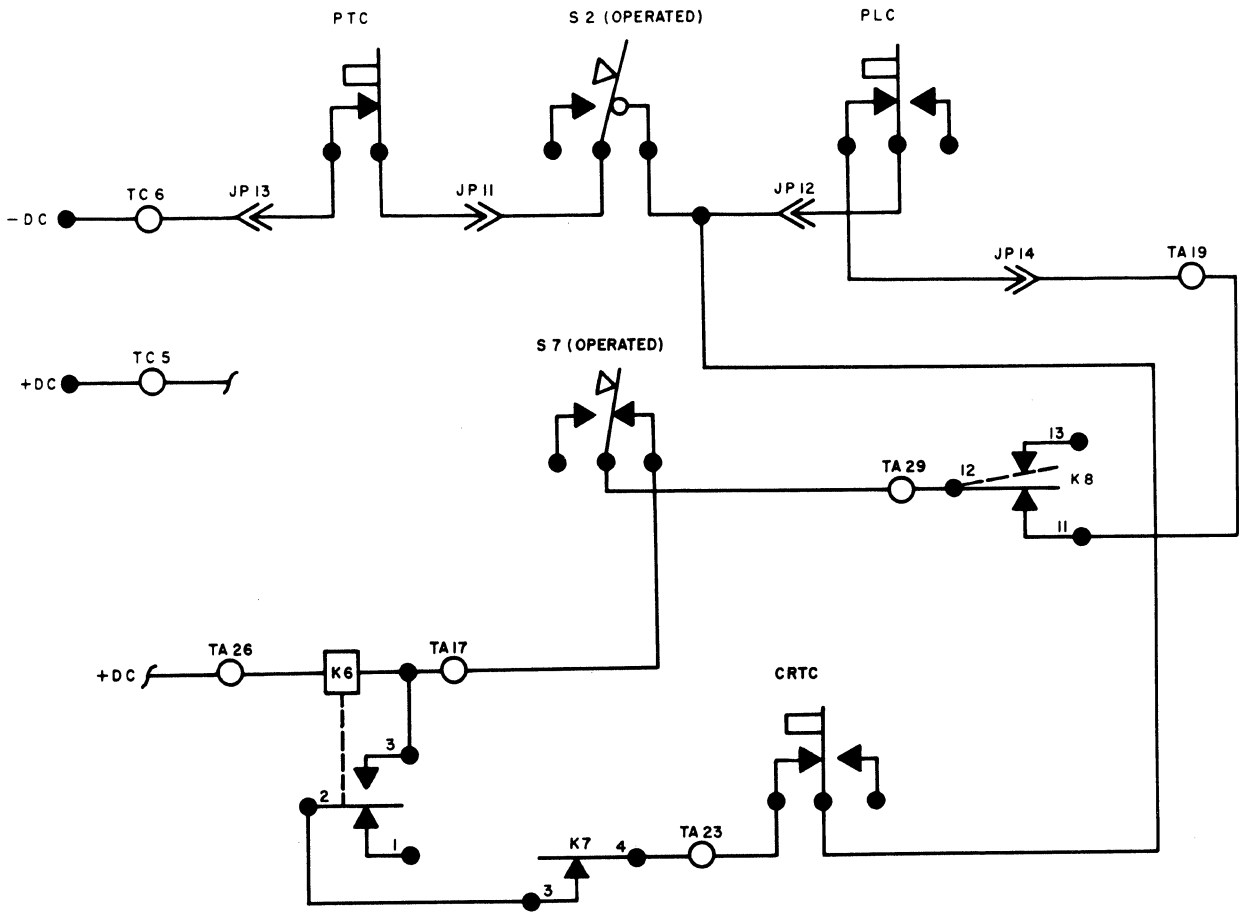


Figure 3-14 K-6 Circuit (not in zone)

words, the justifying zone magnet (LJC) does not become energized, thus, the seeker contacts will not close. The LJC can only be energized on the 31st step if the JZC contacts are closed and the justifying zone relay K8 is energized.

Also, when not in the zone (K8 not energized) the negative DC to the operate strap of the S7 switch is different than previously explained. This circuit is as follows: from -DC, TC6, JP13, PTC, JP11, N/O S2, JP12, N/C PLC, JP14, TA19, K8-11 and 12, TA29, to S7 operate strap. (See Figure 3-14.)

LINE DELETE CIRCUIT

When the line delete switch S6 and the J-carriage return switch S7 are depressed simultaneously, a line delete code (1-2-3-4-5-6-7) is perforated in the justification code, which when read in the reproducer will delete an entire line.

The same sequence of operation will take place as previously explained except for the circuits completed on the 31st step of the hole count relay. These circuits will differ because the line delete relay (K5) will be energized. This will result in the

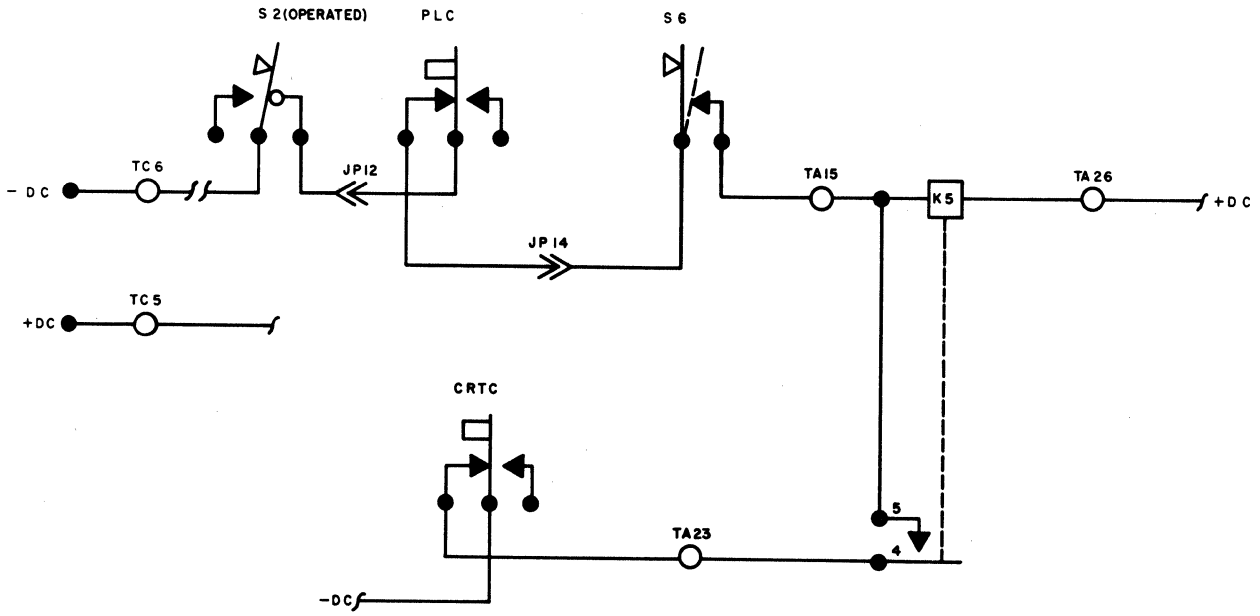


Figure 3-15 LDR (K5) Circuit

code relay (K3) picking up and completing a circuit to the LP1 through LP6 punch magnets (the LP7 is energized in the same manner as previously explained) instead of the LJC operation.

The line delete relay (K5) is energized by completing the following circuit: (Figure 3-15) from neg. D.C., TC6, N/0 S2, JP12, N/C PLC, JP14, N/0 S6, TA15, K5 coil, TA26, TC5, pos. D.C.

The holding circuit to K5 is from neg. D.C. to N/C CRTC, TA23, K5-4 and 5, K5 coil, TA26, TC5, to pos. D. C.

On the 31st step of the hole count relay the following circuit is complete to the K3 relay: (Figure 3-16) from neg. D.C., TC6, JP13, PTC, JP11, N/0 S2, JZC, TA21, K8 - 13 and 12, TA29, HC1 (2 and 3), TA20, K2 - 12 and 11, K6 - 14 and 15, K7 - 1 and 2, K5 - 2 and 3, K3 coil, TA26, TC5, to pos. D.C.

When the code relay (K3) is energized, the LP1 through LP3 punch magnets are energized as follows: (Figure 3-17) from neg. D.C., through K5 - 2 and 3, TA11, N/C S5, TA12, K2 - 6 and 5, K3 - 2 and 3 - 4 and 5 - 6 and 7, TA1 - TA2 - TA3, JP1 - JP2 - JP3, TP1 - TP2 - TP3, LP1 - LP2 - LP3, TPC, JP15, TC5, to pos. D.C.

The LP4, LP5 and LP6 punch magnets are energized as follows: from neg. D.C., TC6, JP13, PTC, JP11, N/0 S2, JP12, PLC, JP14, TA19, K3 - 8 and 9, K2 - 14 and 13, K3 - 12 and 13 - 14 and 15 - 16 and 17, TA4 - TA5 - TA6, JP4 - JP5 - JP6, TP4 - TP5 - TP6, LP4 - LP5 - LP6, TPC, JP15, TC5, to pos. D.C.

The LP7 punch magnet is also energized with the other six magnets in the same manner as previously discribed.

The punch clutch magnet (LPC) and the hole count magnet (LHC) are energized also, which result in the line delete code (1-2-3-4-5-6-7) perforated in the tape and the hole count relay steps to the 32nd position.

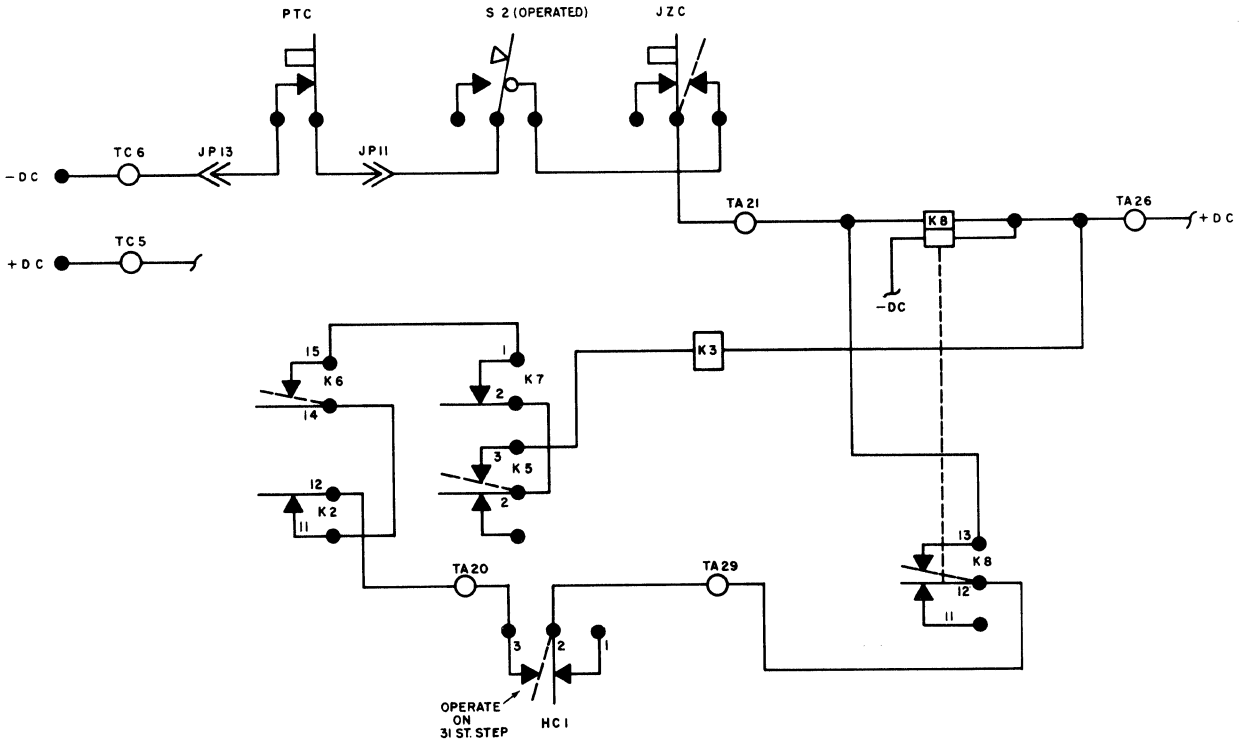


Figure 3-16 CR (K3) Circuit

TAPE FEED CIRCUIT

When the tape feed switch (S3) is depressed, the tape feeds out continuously with just feed hole perforations for as long as S3 is held depressed. This is accomplished because of the following circuit: from neg. D.C., TC6, JP13, PTC, JP11, N/0 S2, JP12, N/C PLC, JP14, N/0 S3, JP8, LPC, JP15, TC5, pos. D.C.

CODE DELETE CIRCUIT

The code delete switch (S4) when depressed, will result in the 1-2-3-4-5-6 code units perforated in the tape. This code, when read by the reproducer will not cause any function of the writing machine.

The code relay (K3) is energized when the S4 switch is depressed as follows: (Figure 3-18) from neg. D.C., TC6, JP13, PTC, JP11, N/0 S2, JP12, PLC, JP14, N/0 S4, TA11, K3 coil, TA26, TC5, to pos. D.C.

There is a negative D.C. potential on the K3 - 8 strap, therefore, when K3 - 8 and 9 make, a circuit is complete to the LP4, LP5 and LP6 punch magnets as follows: neg. D.C., K3 - 8 and 9, K2 - 14 and 13, K3 - 12 and 13 - 14 and 15 - 16 and 17, TA4 - TA5 - TA6, JP4 - JP5 - JP6, TP4 - TP5 - TP6, LP4 - LP5 - LP6, TPC, JP15, TC5, pos. D.C. The LP1, LP2 and LP3 are energized at the same time as follows: from neg. D.C., N/0 S4, N/C S5, TA12, K2 - 6 and 5, K3 - 2 and 3 - 4 and 5 - 6 and 7, TA1 - TA2 - TA3, JP1 - JP2 - JP3, TP1 - TP2 - TP3, LP1 - LP2 - LP3, TPC, JP15, TC5, pos. D.C. Also, the punch clutch magnet (LPC) is energized which will cause punch shaft rotation, perforating the delete code

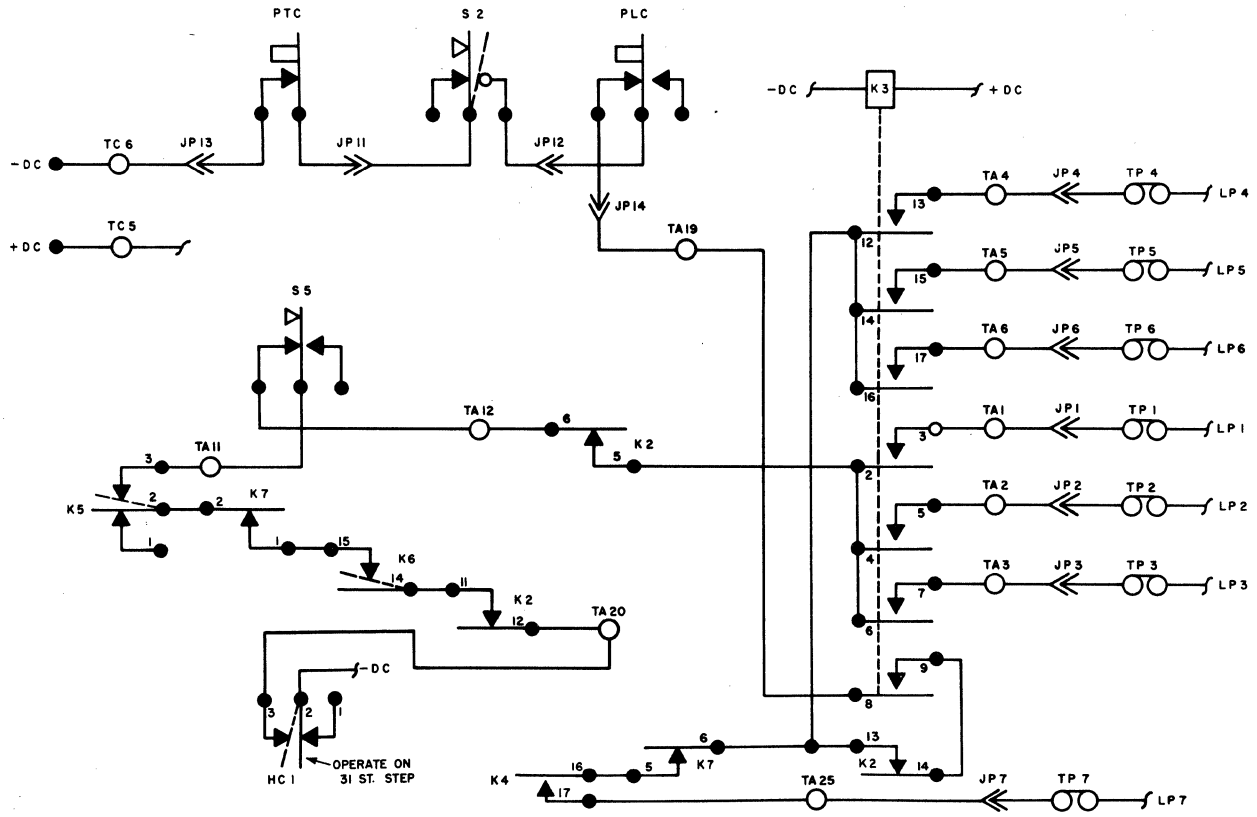


Figure 3-17 Line Delete Code Circuit

(1-2-3-4-5-6) in the tape.

The circuit is designed to allow only one code delete perforation for each depression of the S4 switch. This is accomplished through the use of an anti-repeat circuit which prevents more than one cycle of the punch even though the S4 switch is held depressed. The anti-repeat relay (K2) picks up during punch shaft rotation which results in the following:

K2 - 13 and 14 breaks - opens circuit to LP4, LP5 and LP6.

K2 - 3 and 4 breaks - opens circuit to LPC.

K2 - 5 and 6 breaks - opens circuit to LP1, LP2 and LP3.

K2 - 15 and 16 make - holds K2 energized as long as S4 is held depressed.

STOP CODE CIRCUIT

The stop code (4-5-6) is perforated in the tape when the S5 switch is depressed. This code when read by the reproducer will automatically stop reader operation.

Depressing the S5 switch will energize the K3 code relay and complete a circuit to LP4, LP5 and LP6 punch magnets as explained previously in the Code Delete Circuit description. However, the LP1, LP2 and LP3 punch magnets will not be energized because the circuit is broken to these magnets when the S5 switch is depressed. (See Figure 3-17.)

The anti-repeat circuit explained in the Code Delete Circuit description applies to stop code operation also.

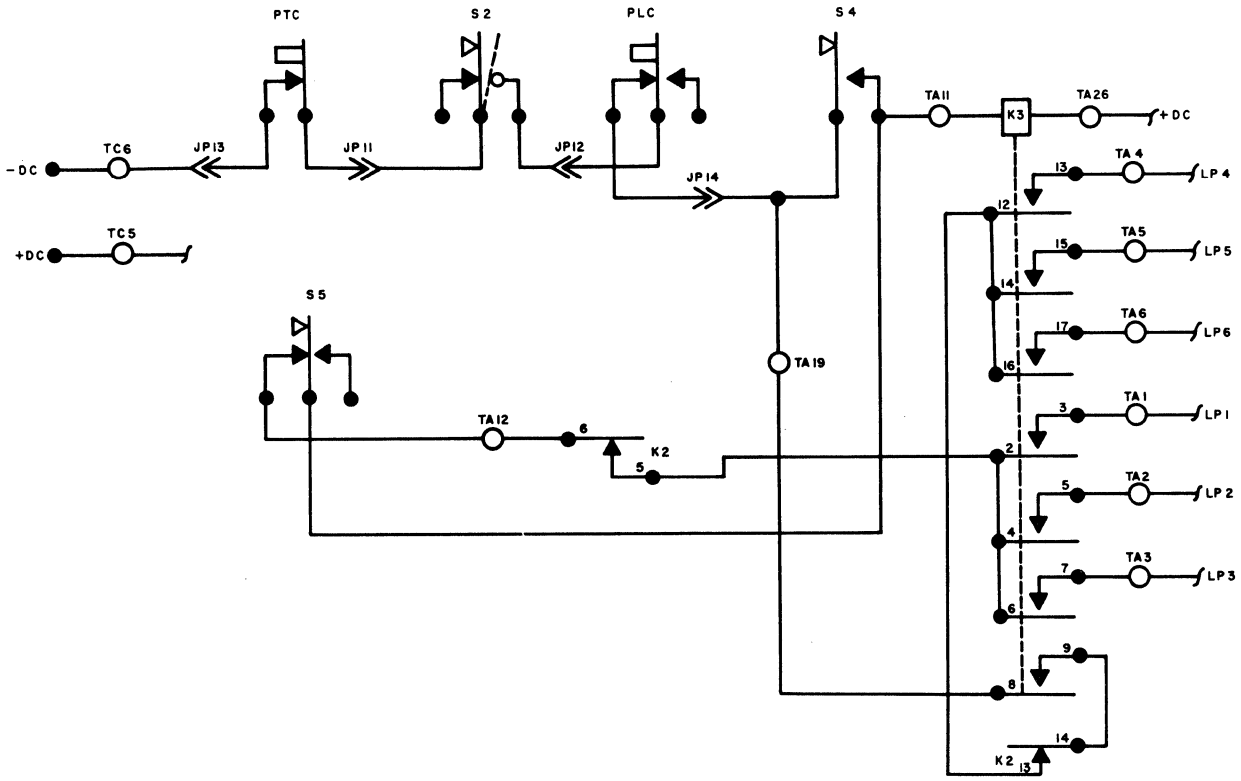


Figure 3-18 Code Delete and Stop Code Circuit

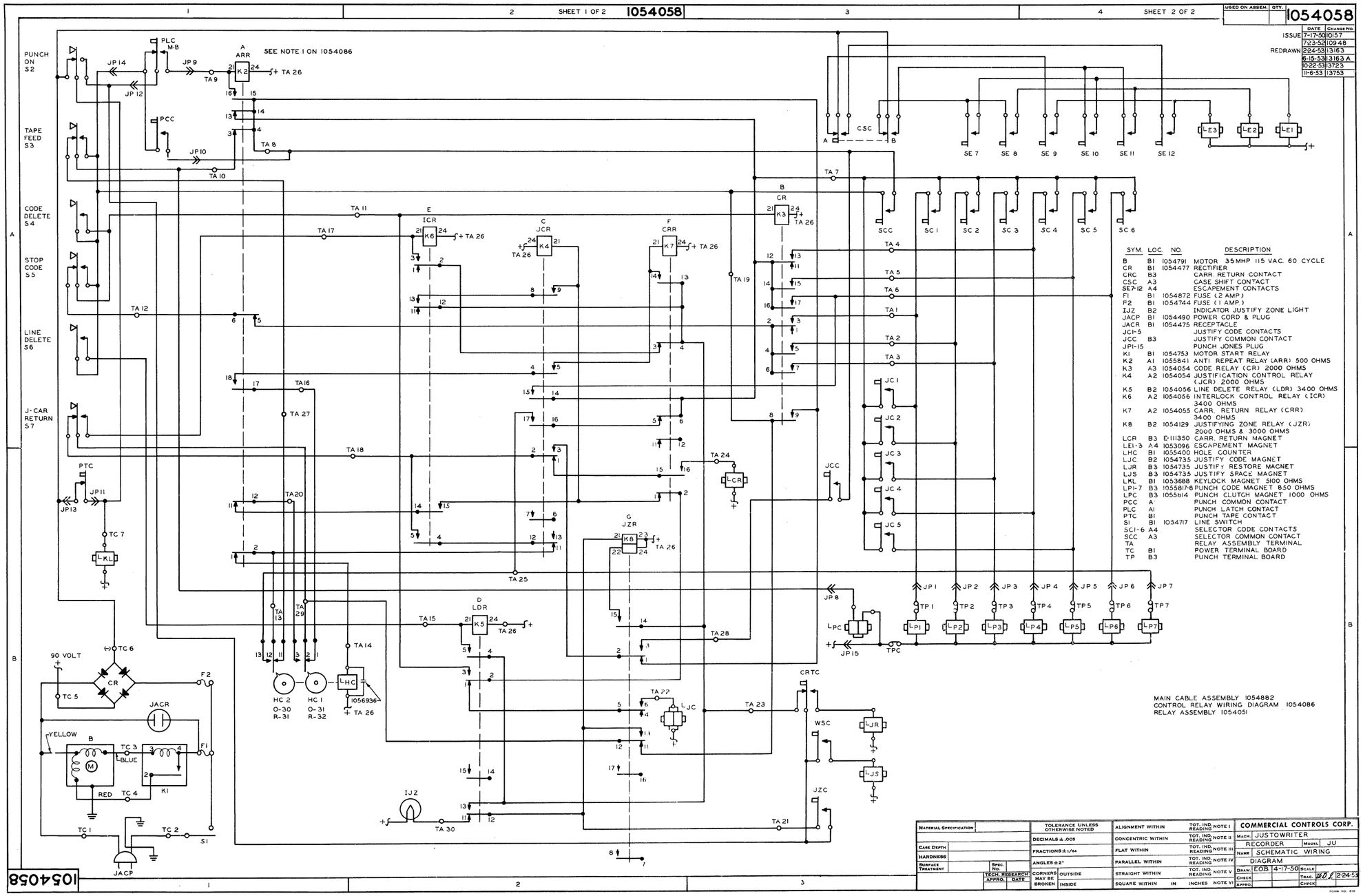


Figure 3-19 Justowriter Recorder Wiring Diagram

REPRODUCER CIRCUIT DESCRIPTION

Figure 4-1 Control Panel

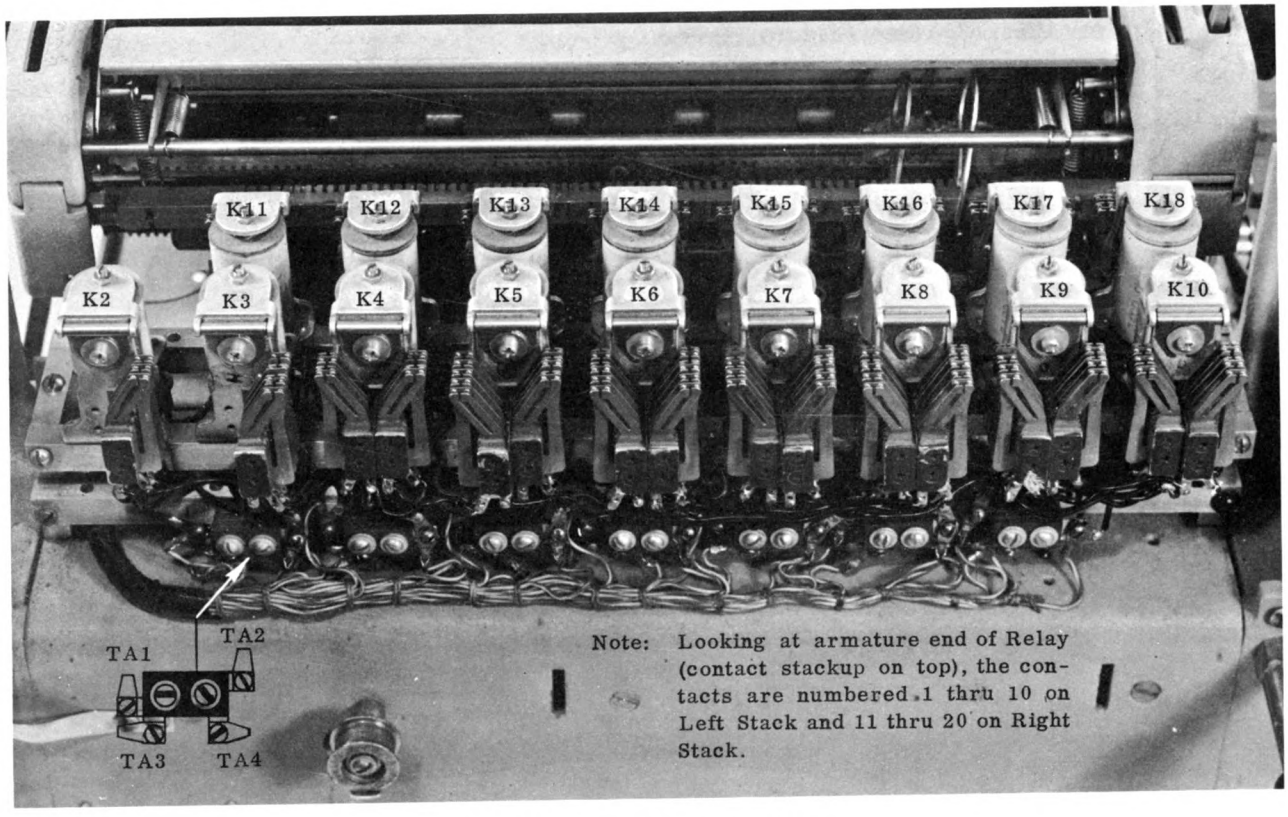


Figure 4-2 Relay Location

Reproducer Circuit Description

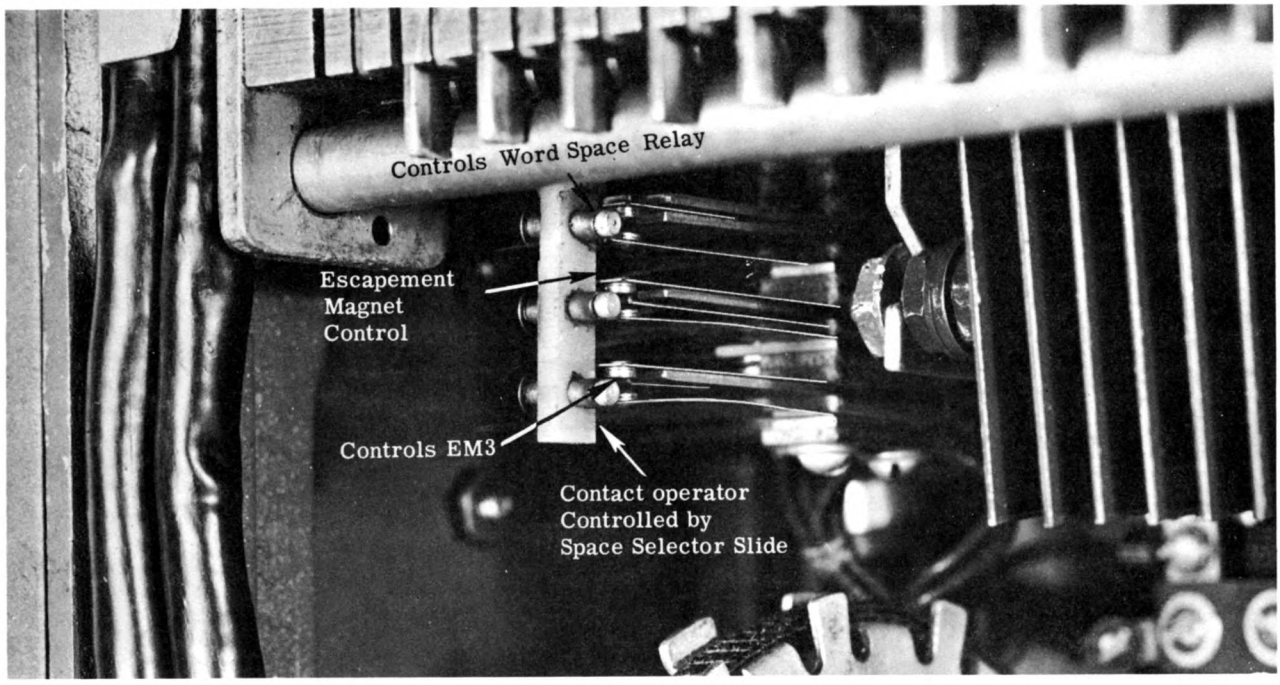


Figure 4-3 Word Space Contacts

The following circuit descriptions are based on wiring diagram 1054133. (See Figure 4-26.) Figures 4-1 through 4-3 show Reproducer component locations.

POWER CIRCUIT

The power circuit in the Reproducer is identical to the power circuit described in Part II, Section 8 of this manual.

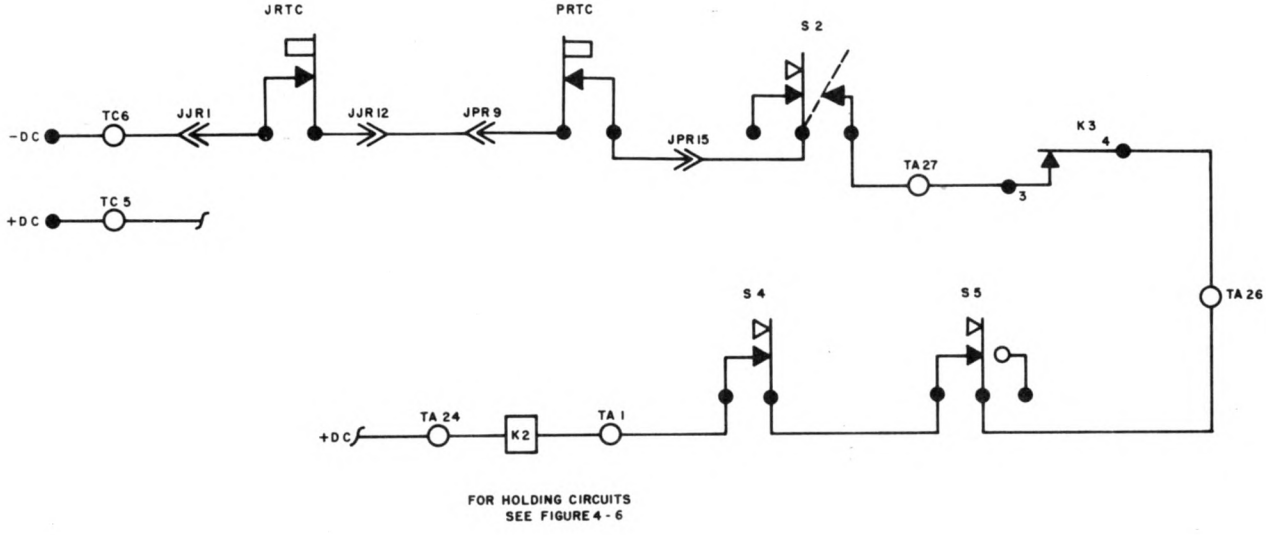


Figure 4-4 JRR (K2) Pick Up Circuit

START READ CIRCUIT (J-READER)

When the start read switch (S2) is depressed and released, the J-reader starts reading and feeding the tape. This function takes place due to the transferring of the S2 contacts which completes a D. C. circuit to the justify reader relay (K2) as follows: (Figure 4-4) from -DC, TC6, JJR1, JRTC, JJR12, JPR9, PRTC, JPR15, N/O S2, TA27, K3 - 3 and 4, TA26, N/C S5, N/C S4, TA1, K2 coil, TA24, TC5, to +DC.

With the K2 relay picked up and the S2 switch returned to normal position, the J-reader magnet (LJR) is energized by the following circuit: (See Figure 4-5) from -DC, N/C S2, TA6, K11 - 2 and 1, K2 - 3 and 4, TA7, JJR5, LJR, JJR11, TC5, to +DC. Therefore, with the J-reader magnet energized, the tape is fed through the J-reader (rear).

The J-reader relay (K2), once it is energized, is held energized by the following circuits: K2 holding circuit No. 1: (Figure 4-6) from -DC, TC6, JJR1, JRTC, JJR12, JPR9, PRTC, JPR15, JJR15, N/C transfer JRC7, JJR3, TA5, K2 - 1 and 2, K2 coil, TA24, TC5, to +DC. The holding circuit just described is through a normally closed transfer contact of JRC7, therefore, when a seven code is read in the J-reader this holding circuit to K2 is broken.

K2 holding circuit No. 2: (Figure 4-6) Another holding circuit for K2 is through the normally closed 5 and 6 contacts of the print reader relay (K3), as follows: from -DC, TA9, K3 - 6 and 5, K2 - 5 and 6, TA26, N/C S5, N/C S4, TA1, K2 coil, TA24, TC5, to +DC. Thus, it is obvious, that when the K3 relay is energized, this 2nd holding circuit to K2 is broken.

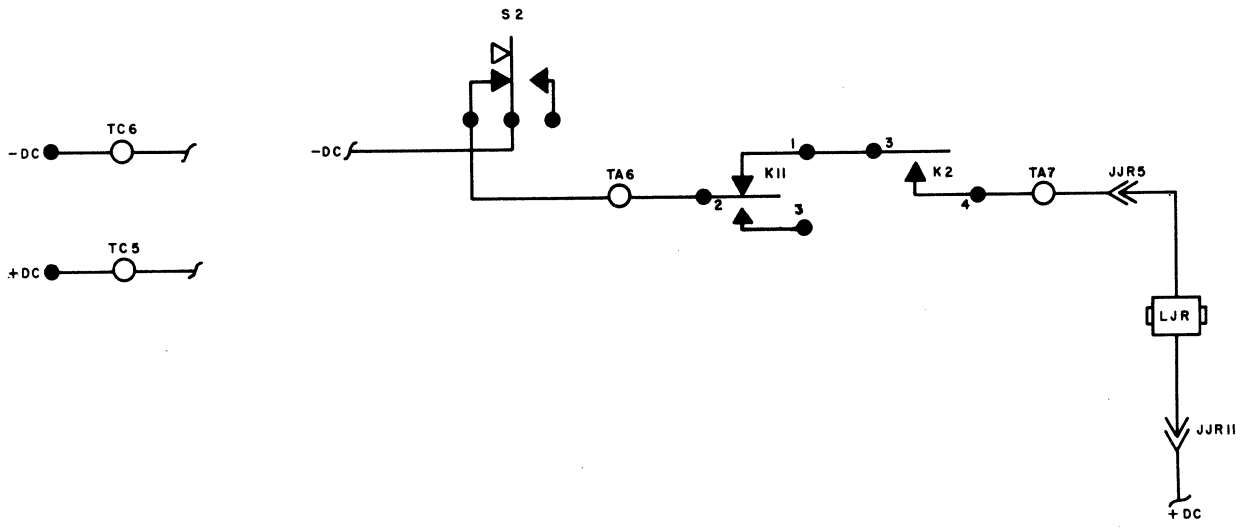


Figure 4-5 J-Reader Magnet (LJR) Circuit

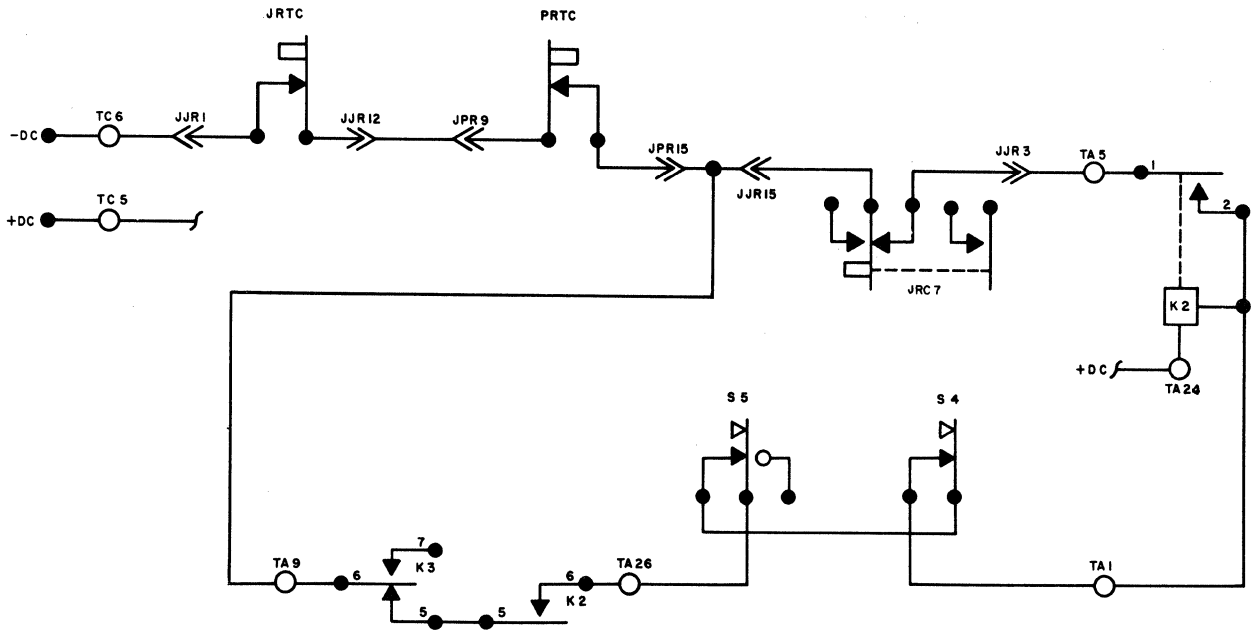


Figure 4-6 JRR (K2) Holding Circuit

JUSTIFYING RELAY PICK-UP CIRCUITS

There are five justifying relays (JR1 through JR5) mounted on the relay bank in the rear of the machine. These relays are used as storage relays to store the justification information of each line. The initial pick-up circuit to these relays can take place only when the 6-7 justification code is read in the tape. The JRC1 through JRC5 J-reader contacts are connected respectively to the JR1 through JR5 justifying relays. Thus, it follows that when a 6-7 plus a combination of the 1 through 5 code is read in the J-reader, the respective justifying relays will be energized.

For an example, assume that a 1-2-3-4-6-7 justification code was read by the J-reader. This would result in the JR1 (K9), JR2 (K10), JR3 (K14) and JR4 (K15) relays being energized. Thus, with these particular relays energized, the Reproducer has stored the following information: the first and second word space operations will escape the carriage five units, and the next six word spaces will have a four unit escapement. If there are more than eight word spaces in a line, the remaining will have the normal two unit escapement.

The pick-up circuit to the JR relays in the example code would be complete when JRC6 and JRC7 operate simultaneously. This would put a DC potential on one strap of the other five JRC contacts. Therefore, when JRC1, JRC2, JRC3 and JRC4 contacts operate, JR1, JR2, JR3 and JR4 would pick-up. (See Figure 4-7.)

To hold these relays energized and store the information for the line, a holding circuit is complete through a contact on the print read relay (K3 contacts 6 and 7).

NOTE: The print read relay K3 picks up when the JRC 6 and 7 contacts close also.

The holding circuit to the JR1 (K9), JR2 (K10)

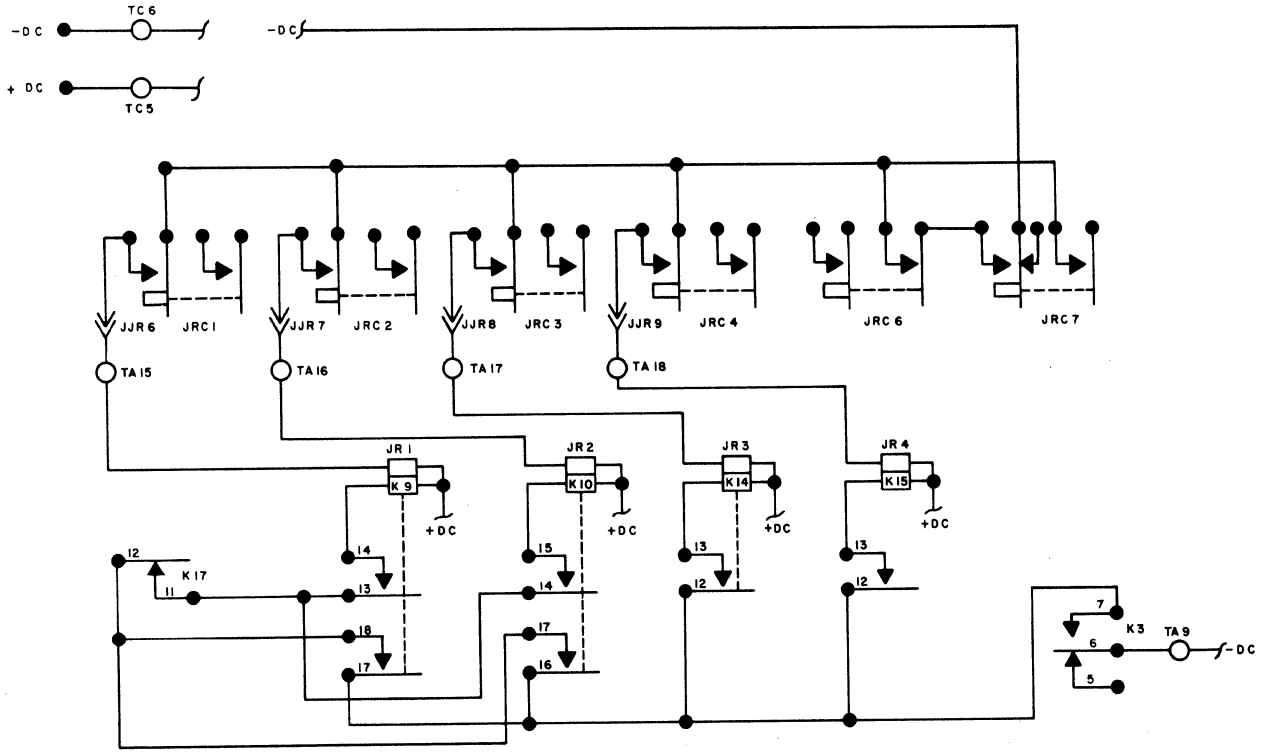


Figure 4-7 Justifying Relay P. U. and Hold Circuit

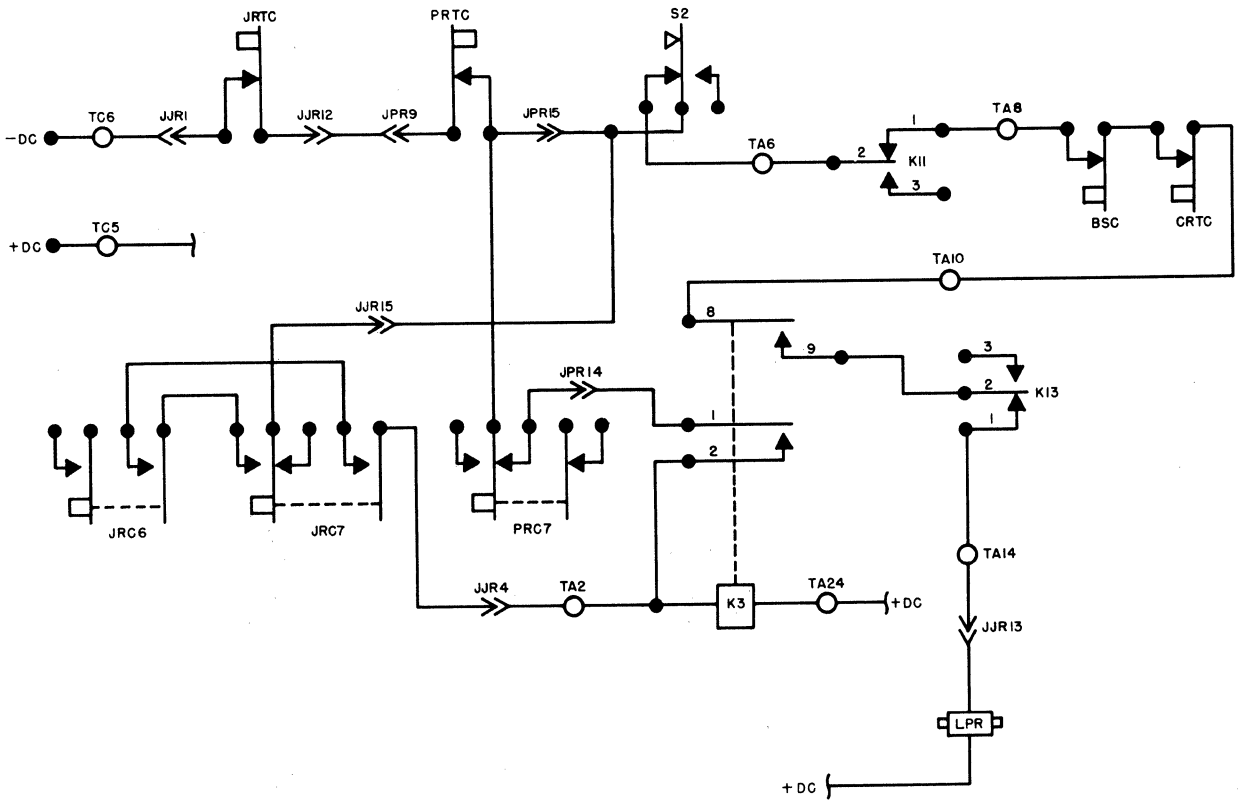


Figure 4-8 Print Reader Magnet (LPR) Circuit

and SDR (K18 - if energized) is through a normally closed contact on CR8 (K17 - 11 and 12 contacts). Thus, after the eighth word space operation, the JR1, JR2 and SDR relay will de-energize and cause two unit escapement operation for the remainder of word spaces in the line (if any). The JR3, JR4 and JR5 relays, however, will remain energized until the K3 - 6 and 7 contacts open (at the end of the line).

START READ CIRCUIT (P READER)

The print reader (front) starts reading and feeding tape when the 6-7 justification code is read by the J-reader. This operates JRC6 and JRC7 contacts completing a pick-up circuit to the print relay K3 as follows: from -DC to the operate strap of JRC7 transfer contact, through JRC6, JRC7 make contact, JJR4, TA2, K3 coil, TA24, TC5, to +DC. (See Figure 4-8.)

The K3 relay is held energized by a circuit through the normally closed transfer contacts of PRC7, through K3 - 1 and 2 to the K3 coil. Thus, if a 7 code is read by the print reader and operates the PRC7 contacts, the holding circuit to the K3 relay will be broken.

With K3 energized, contacts K3 - 8 and 9 are closed completing a circuit to the print reader magnet as follows: (Figure 4-8) from -DC, N/C S2, TA6, K11 - 2 and 1, TA8, BSC, CRTC, TA10, K3 - 8 and 9, K13 - 2 and 1, TA14, JJR13, LPR, TC5, to +DC.

Thus, with the print reader magnet energized, print reader operation takes place, whereby the codes read will result in translator operation causing type bar and functional operation of the Reproducer.

WORD SPACE CONTACT CIRCUITS

When the number three code unit is read by the print reader, the correct escapement of the carriage takes place which depends on the word space contact (WSC) operation and the position of the contacts of K9, K10 and K18. Assuming that just the K9 relay was energized, the LE3 escapement magnet would be energized when the

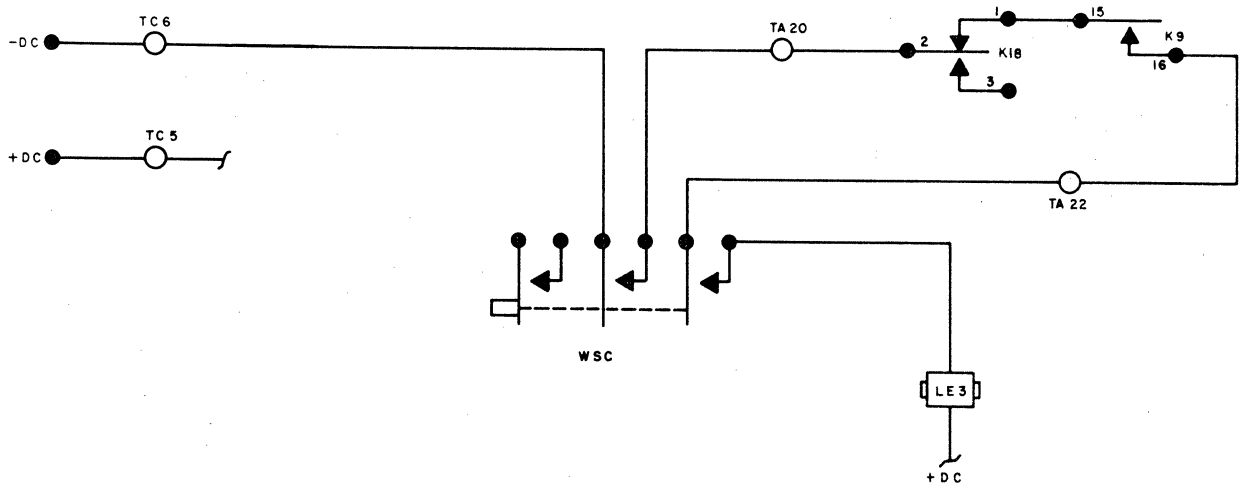


Figure 4-9 Circuit to LE3 (K9 Energized)

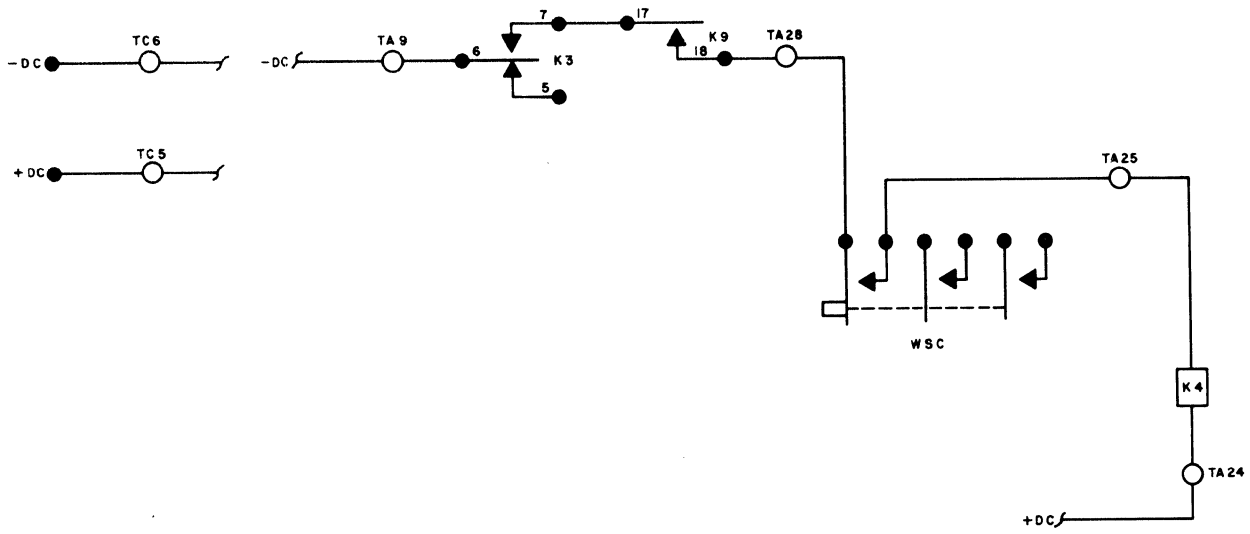


Figure 4-10 Example Word Space Relay (K4) Circuit

word space contacts operated. This circuit would be as follows: (Figure 4-9) from -DC, TC6, WSC, TA20, K18 - 2 and 1, K9 - 15 and 16, TA22, WSC, LE3, TC5, to +DC.

The operation of the word space contact would also energize the K4 word space relay provided one or more of the JR relays were energized (either K9, K10, K14, K15 or K16). If the K9 relay was energized, for example, the K4 relay would be energized as follows: (Figure 4-10) from -DC, TA9, K3 - 6 and 7, K9 - 17 and 18, TA28, WSC, TA25, K4 coil, TA24, TC5, to +DC.

The K4 relay would remain energized until the completion of the space cam cycle, at which time the WSC contacts would open, breaking the circuit to K4.

From the above, it is apparent that each word space code read in the print reader will result in the pick-up and drop-out of the K4 word space relay.

The contacts of the word space relay are used to control the circuits to the counting relays (K5, K6, K7, K8 and K17). These counting relays operate in a definite sequence in each line and thus are a means of counting the number of word spaces in a line with an end result of determining when to energize the step down relay (K18) in a line.

SEQUENCE OPERATION OF RELAYS FOR JUSTIFICATION							
SEQUENCE OPERATION OF WS CONTACT IN ANY JUSTIFIED LINE	SEQUENCE OPERATION OF CR RELAYS IN ANY JUSTIFIED LINE	RELAY					
		WSR	CR-3	CR-4	CR-5	CRP	CR-8
FIRST	3	PU	PU				
		DO	U			PU	
SECOND	3-4	PU	U	PU		U	
		DO	U	U		DO	
THIRD	4	PU	DO	U			
		DO		U		PU	
FOURTH	4-5	PU		U	PU	U	
		DO		U	U	DO	
FIFTH	5	PU		DO	U		
		DO			U	PU	
SIXTH	3-5	PU	PU		U	U	
		DO	U		U	DO	
SEVENTH	3-4-5	PU	U	PU	U		
		DO	U	U	U	PU	
EIGHTH	3-4-5	PU	U	U	U	U	PU
		DO	U	U	U	DO	U

PU - PICK UP DO-DROP OUT U-HELD UP OR OPERATED

Figure 4-11 Counting Relay Operational Chart

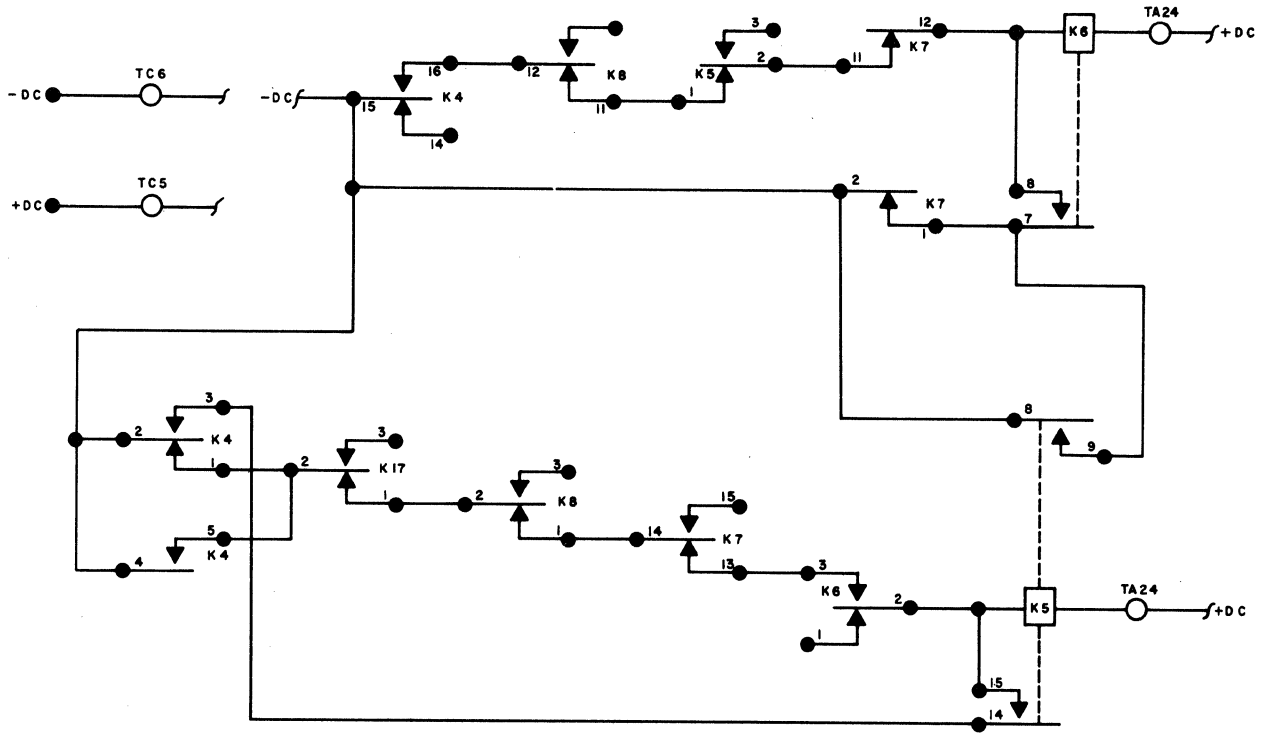


Figure 4-12 First Word Space CR Circuits

COUNTING RELAY CIRCUITS

As stated above, the counting relays pick-up and drop-out in a definite sequence in each line.

This sequence is shown in the chart in Figure 4-11 and the circuits are as follows:

First W. S. Relay (K4) Pick-Up - As shown in the chart, this first pick-up of K4 will energize the CR3 (K6) relay. K6 is energized as follows: from -DC, K4 - 15 and 16, K8 - 12 and 11, K5 - 1 and 2, K7 - 11 and 12, K6 coil, TA24, TC5, to +DC. (See Figure 4-12.)

First W. S. Relay (K4) Drop-Out - The K6 will remain energized and the CRP (K5) will pick-up. K6 holding circuit is as follows: from -DC, K7 - 2 and 1, K6 - 7 and 8, K6 coil, TC5, to +DC.

The K5 pick-up circuit is as follows: from -DC, K4 - 2 and 1, K17 - 2 and 1, K8 - 2 and 1, K7 - 14 and 13, K6 - 3 and 2, K5 coil, TA24, TC5, to +DC. With K5 energized, a holding circuit is established through K5 - 4 and 5 through the same circuit just mentioned.

Second W. S. Relay (K4) Pick-Up - The K5 and K6 will remain energized and the K7 will pick-up.

Because K7 will pick-up on this second W. S. operation, another holding circuit is necessary for K6 (original holding circuit was through K7 - 2 and 1). Since the K5 relay is energized, K5 - 8 and 9 complete a holding circuit to K6. (See Figure 4-13.)

The K7 relay pick-up is as follows: from -DC, K4 - 15 and 16, K8 - 12 and 11, K5 - 13 and 12, K6 - 19 and 20, K7 coil, TA24, TC5, to +DC.

K5 is held energized through K4 - 2 and 3 and K5 - 14 and 15.

Second W. S. Relay (K4) Drop-Out - The K6 and

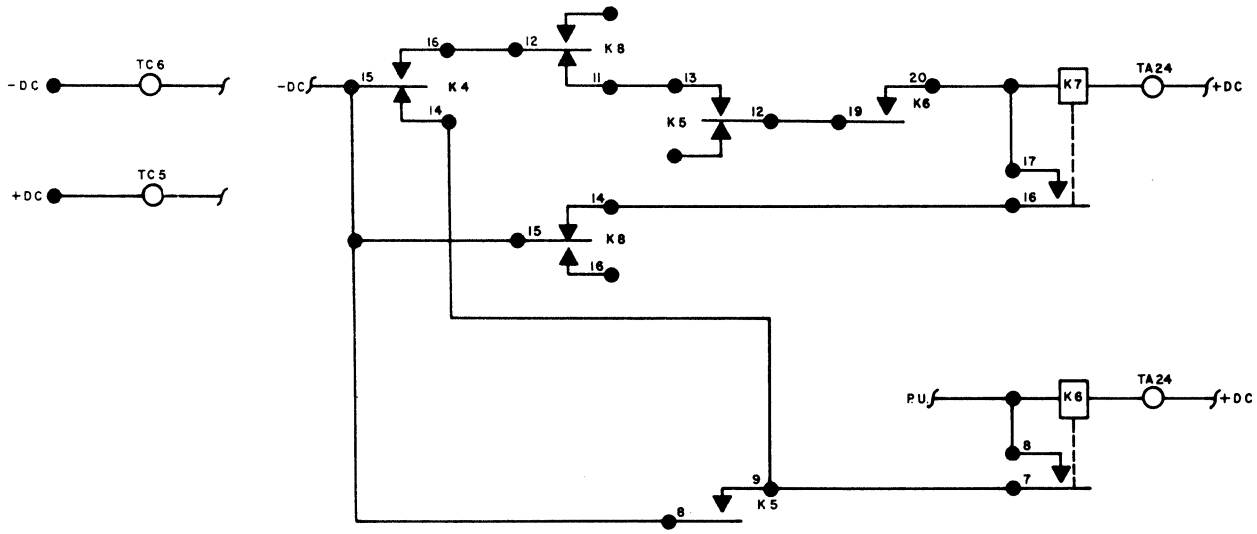


Figure 4-13 Second Word Space CR Circuits

K7 will remain energized and K5 will drop-out.

The holding circuit for K6 is through K4 - 15 and 14 and K6 - 7 and 8.

The holding circuit for K7 is through K8 - 15 and 14 and K7 - 16 and 17.

The K5 holding circuit is broken when K4-2 and 3 break.

Third W. S. Relay (K4) Pick-Up - The K6 drops-out and K7 remains energized.

When K4 - 14 and 15 break, the holding circuit to K6 is broken, thus K6 is de-energized.

The holding circuit for K7 is through K8 - 15 and 14 and K7 - 16 and 17.

Third W. S. Relay (K4) Drop-Out - The K7 relay remains energized and the K5 picks-up.

The K7 holding circuit is through K8 - 15 and 14 and K7 - 16 and 17. (See Figure 4-14.)

The K5 pick-up circuit is as follows: from -DC, K4 - 2 and 1, K17 - 2 and 1, K8 - 2 and 1, K7 - 14 and 15, K6 - 1 and 2, K5 coil, TA 24, TC5, to +DC.

Fourth W. S. Relay (K4) Pick-Up - The K5 and K7 remains energized and the K8 picks-up. (See Figure 4-15.)

The K5 holding circuit is through K4 - 2 and 3 and K5 - 14 and 15.

The K7 holding circuit is through K5 - 6 and 7 and K7 - 16 and 17.

The K8 relay is energized as follows: from -DC, K4 - 12 and 13, K5 - 17 and 16, K7 - 18 and 19, K6 - 12 and 11, K8 coil, TA24, TC5, to +DC.

Fourth W. S. Relay (K4) Drop-Out - The K7 and K8 relays remain energized and the K5 drops out.

The K7 holding circuit is through K4 - 12 and 11 and K7 - 16 and 17.

The K8 holding circuit is through K8 - 17 and 18 (K8 once energized will not drop out until the end of the line).

The K5 holding circuit is broken when K4 - 2 and 3 break.

Fifth W. S. Relay (K4) Pick-Up - The K8 relay remains energized and the K7 relay drops out.

The K8 relay holding circuit is through K8 - 17 and 18.

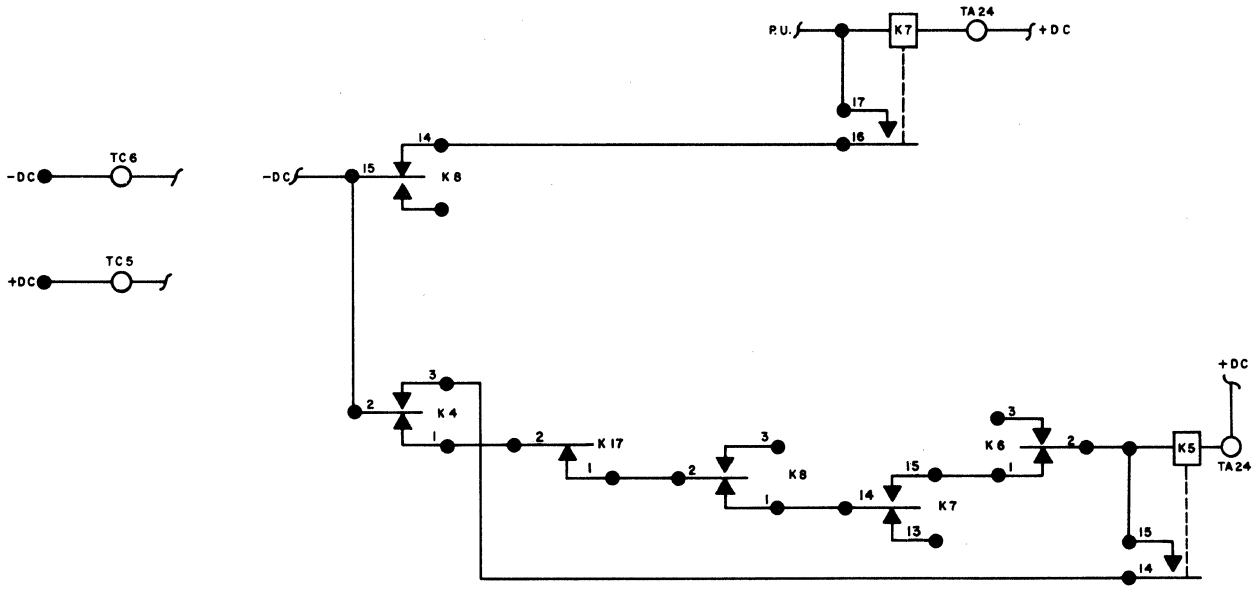


Figure 4-14 Third Word Space CR Circuits

The K7 relay drops out when K4 - 12 and 11 break.

Fifth W. S. Relay (K4) Drop-Out - The K8 relay remains energized and the K5 relay picks-up. (See Figure 4-16.)

The K8 holding circuit is through K8 - 17 and 18.

The K5 pick-up circuit is as follows: from -DC, K4 - 2 and 1, K17 - 2 and 1, K8 - 2 and 3, K7 - 4 and 3, K6 - 4 and 5, K5 coil, TA24, TC5, to +DC.

Sixth W. S. Relay (K4) Pick-up - The K6 relay picks-up and the K5 and K8 relays remain energized.

The K8 relay holding circuit is through K8 - 17 and 18.

The K5 relay holding circuit is through K4 - 2 and 3 and K5 - 14 and 15.

The K6 relay pick-up circuit is as follows: from

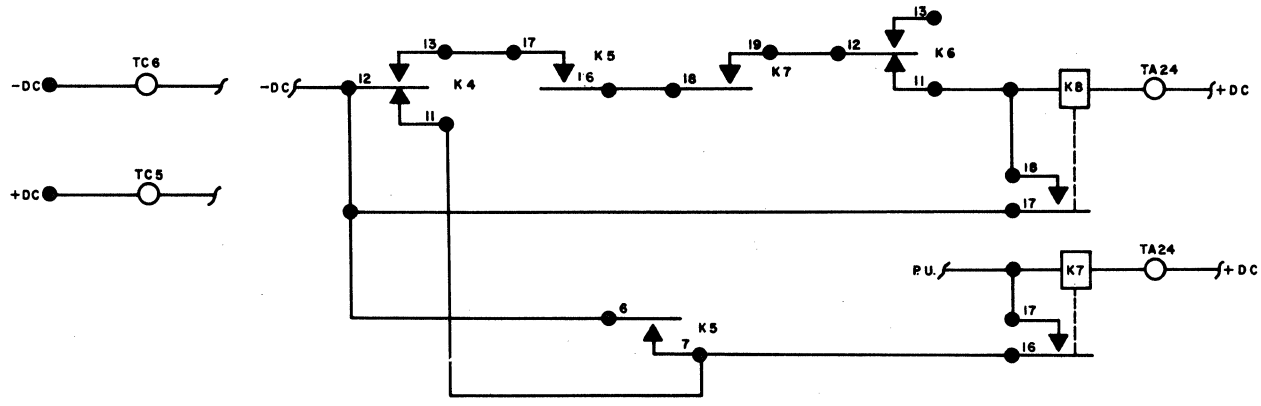


Figure 4-15 Fourth Word Space CR Circuits

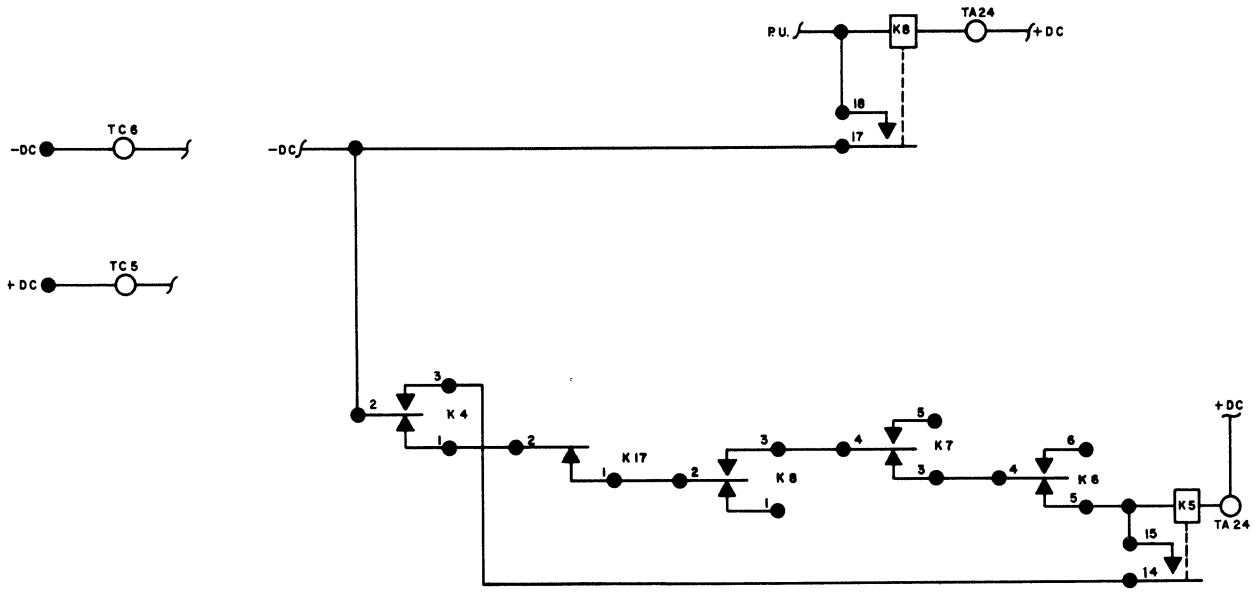


Figure 4-16 Fifth Word Space CR Circuits

-DC, K4 - 15 and 16, K8 - 12 and 13, K5 - 3 and 2, K7 - 11 and 12, K6 coil, TA24, TC5, to +DC. (See Figure 4-17.)

Sixth W. S. Relay (K4) Drop-Out - The K6 and K8 relays remain energized and K5 relay drops out.

The K6 relay holding circuit is through K8 - 15 and 16 and K6 - 7 and 8.

The K8 relay holding circuit is through K8 - 17 and 18.

The K5 relay holding circuit is broken when K4 - 2 and 3 break.

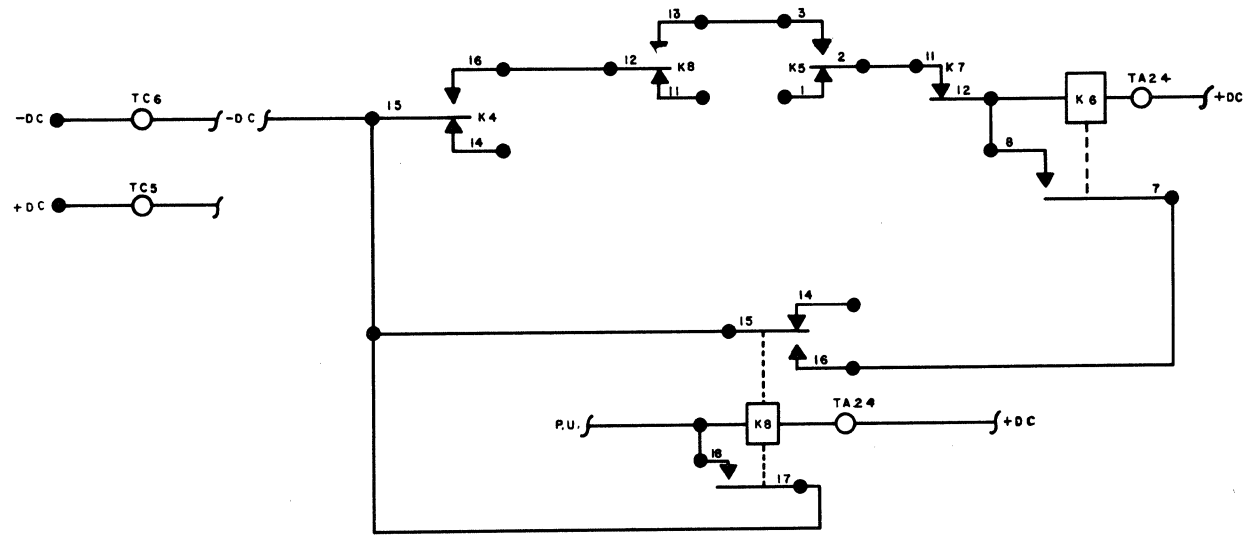


Figure 4-17 Sixth Word Space CR Circuits

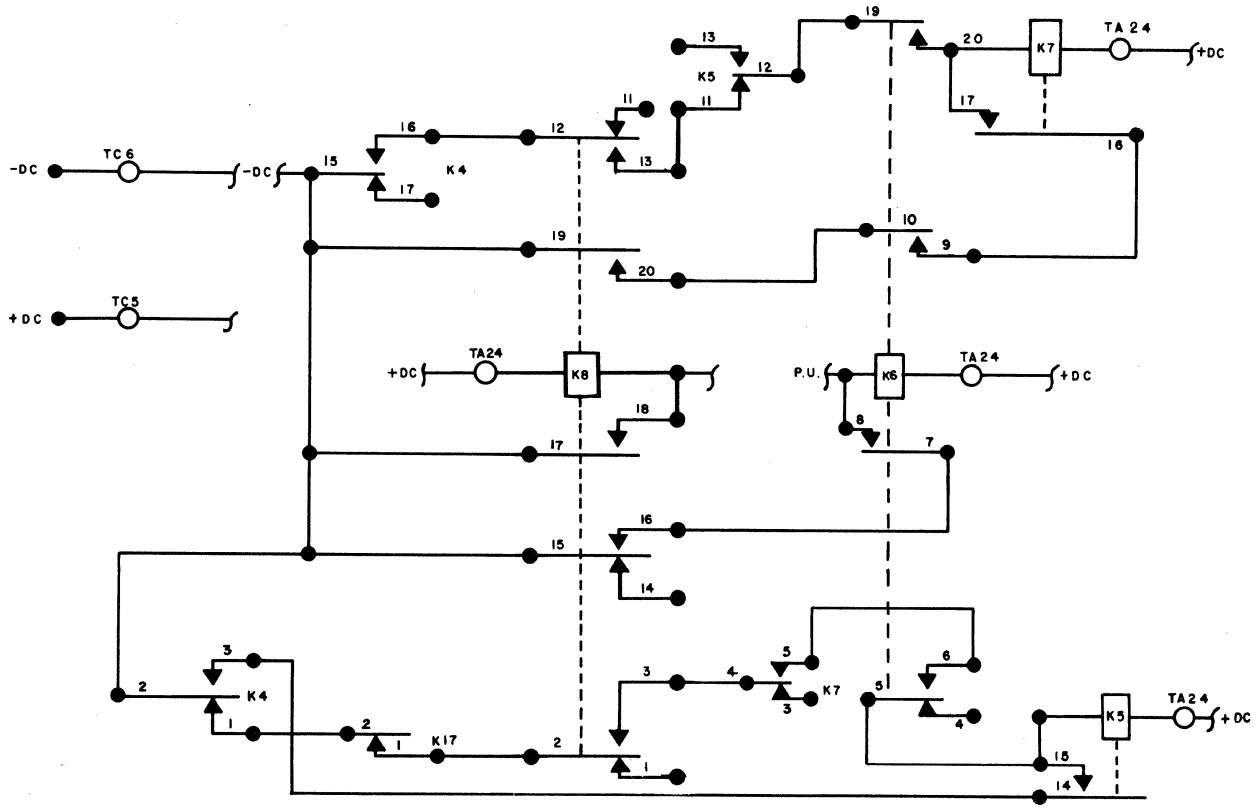


Figure 4-18 Seventh Word Space CR Circuits

Seventh W. S. Relay (K4) Pick-Up - The K6 and K8 relays remain energized and the K7 relay picks-up.

The K6 relay holding circuit is through K8 - 15 and 16 and K6 - 7 and 8.

The K8 relay holding circuit is through K8 - 17 and 18.

The K7 pick-up circuit is as follows: from -DC, K4 - 15 and 16, K8 - 12 and 13, K5 - 11 and 12, K6 - 19 and 20, K7 coil, TA24, TC5, to +DC. (See Figure 4-18.)

Seventh W. S. Relay (K4) Drop-Out - The K6, K7 and K8 relays remain energized and the K5 relay picks-up.

The K6 holding circuit is through K8 - 15 and 16 and K6 - 7 and 8.

The K7 holding circuit is through K8 - 19 and 20, K6 - 10 and 9 and K7 - 16 and 17.

The K8 holding circuit is through K8 - 17 and 18.

The K5 pick-up circuit is as follows: from -DC, K4 - 2 and 1, K17 - 2 and 1, K8 - 2 and 3, K7 -4 and 5, K6 - 6 and 5, K5 coil, TA24, TC5, to +DC.

Eighth W. S. Relay (K4) Pick-Up - The K5, K6, K7 and K8 relays remain energized and the K17 relay picks-up. The K5 relay holding circuit is through K4 - 2 and 3 and K5 - 14 and 15.

The K6 relay holding circuit is through K8 - 15 and 16 and K6 - 7 and 8.

The K7 relay holding circuit is through K8 - 19 and 20, K6 - 10 and 9, and K7 - 16 and 17.

The K8 holding circuit is through K8 - 17 and 18.

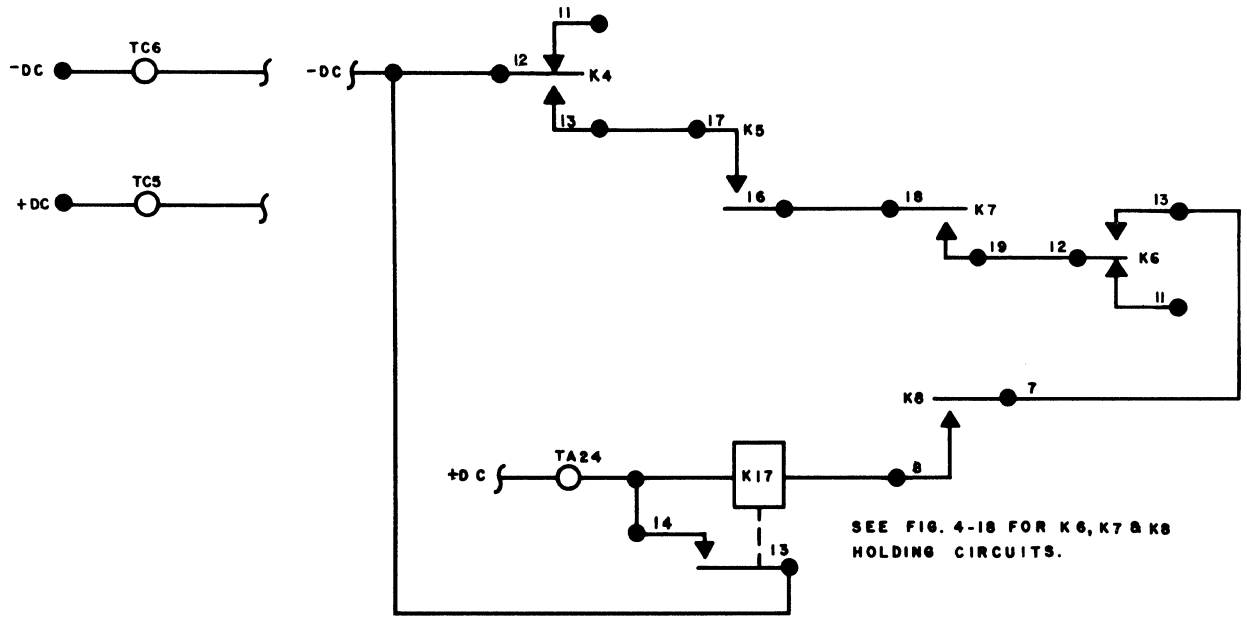


Figure 4-19 Eighth Word Space CR Circuits

The K17 pick-up circuit is as follows: from -DC, K4 - 12 and 13, K5 - 17 and 16, K7 - 18 and 19, K6 - 12 and 13, K8 - 7 and 8, K17 coil, TA24, TC5, to +DC. (See Figure 4-19.)

Eighth W. S. Relay (K4) Drop-Out - The K6, K7, K8 and K17 relays remain energized and the K5 relay drops out.

The K6 relay holding circuit is through K8 - 15 and 16 and K6 - 7 and 8.

The K7 relay holding circuit is through K8 - 19 and 20, K6 - 10 and 9 and K7 - 16 and 17.

The K8 holding circuit is through K8 - 17 and 18.

The K5 relay holding circuit is broken when K4 - 2 and 3 break.

The K17 relay holding circuit is through K17 - 13 and 14.

When CR8 (K17) is energized, K17 - 11 and 12 break, thus breaking the holding circuits to JR1 (K9) JR2 (K10) and SDR (K18). Therefore, if there are more than eight word spaces in a line every space after the eight will be a normal two units.

STEP-DOWN RELAY (K18) PICK-UP CIRCUIT

The SDR (K18) contacts are in series with the contacts of JR1 (K9) and JR2 (K10) in providing a variable circuit to the escapement magnets (LE1, LE2, and LE3).

For an example, if the justification code was 1-2-3-4-6-7, then the JR1 (K9), JR2 (K10), JR3 (K6) and JR4 (K7) relays would be energized when this code was read in the J-reader.

The arrangement of the K9, K10 and K18 contacts would be such that for the first and second word space, the LE 2 and LE 3 escapement magnets would be energized, thus escaping the carriage five units. After the second word space operation, however, the SDR (K18) will energize, changing the circuit to energize LE1 and LE3,

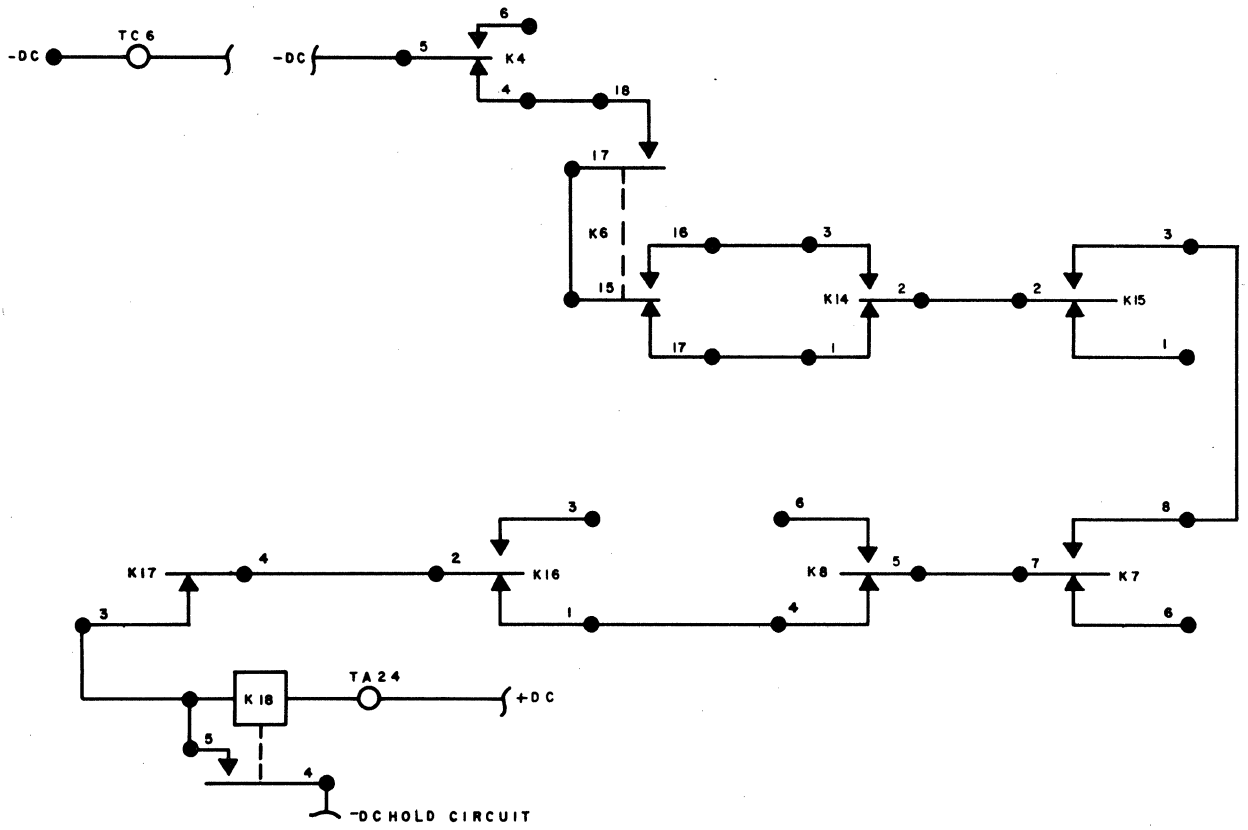


Figure 4-20 Example SDR (K18) Circuit

thus reducing the third word spacing (and all others up to the eighth) to four units.

The K18 is energized after the second word space (with the above code) because the counting relays CR3 (K6) and CR4 (K7) are energized, plus the fact that JR3 (K14) and JR4 (K15) are also energized. With these relays energized, their contacts are so arranged that a circuit is complete to the step-down relay (K18) as follows: from -DC, K4 - 5 and 4, K6 - 18 and 17, K6 - 15 and 16, K14 - 3 and 2, K15 - 2 and 3, K7 - 8 and 7, K8 - 5 and 4, K16 - 1 and 2, K17 - 4 and 3, K18 coil, TA24, TC5, to +DC. (See Figure 4-20.)

SEVEN CODE INTERLOCK CIRCUITS

The number seven code is used as an interlocking code for the two reading heads of the Reproducer double reader.

With both the J-reader and print reader operating, if the J-reader reads a number seven code before the print reader finishes a line, the J-reader will automatically stop.

When the number seven code is read in the J-reader, the JRC7 contact operates. This breaks the holding circuit to the K2 coil (through K2 - 1 and 2), thus de-energizing K2. The K2 - 3 and 4 break, opening the circuit to the J-reader magnet and stopping the J-reader operation. (See Figures 4-21 and 4-24.)

When the print reader finishes printing the line and reads the number seven code, the PRC7 contact transfers breaking the holding circuit to the K3 coil (through K3 - 1 and 2), thus, de-energizing K3. The K3 - 8 and 9 break, opening

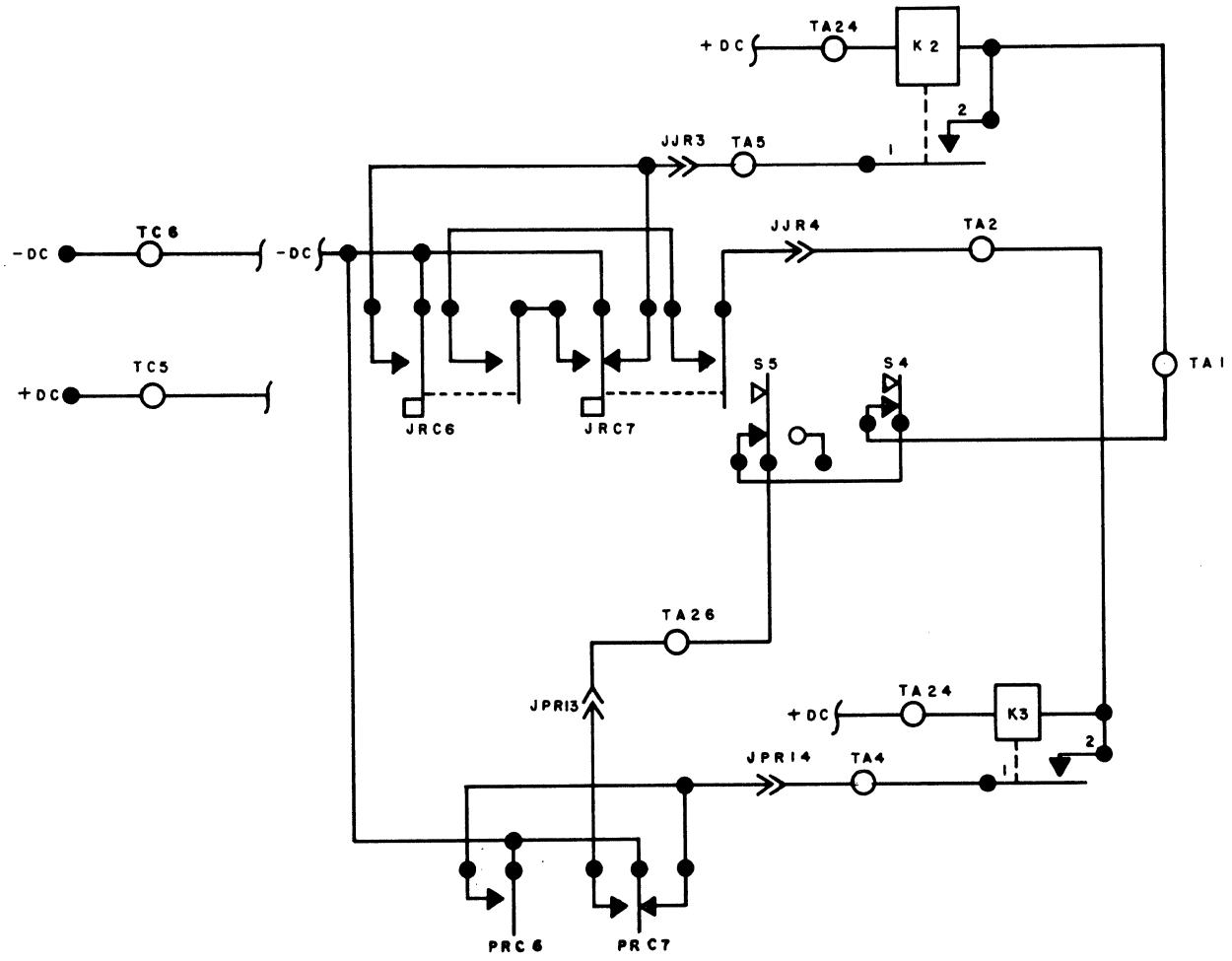


Figure 4-21 Seven Code Interlock Circuit

the circuit to the print reader magnet and stopping print reader operation. Also, the transferring of PRC7 contacts completes a pick-up circuit to the K2 relay, closing K2 - 3 and 4 and energizing the J-reader magnet. The J-reader reads the next line justification code (the 6-7 code units, plus combination of 1 through 5 code units), thus energizing the storage relays (K9, K10, K14, K15 or K16, depending on the code) and also completing a circuit to the K3 relay, starting print reader operation.

If a condition arises where the print reader finishes reading and printing a line before the J-reader reaches the next justification code, then the print reader will stop operation when the PRC7 contacts operate.

Therefore, from the above, it can be seen that the number seven code will prevent the J-reader from reading the next justification code in a line while the print reader is still printing the preceding line. Also, the number seven code will prevent the print reader from printing a line before the J-reader has read the justification code for that line.

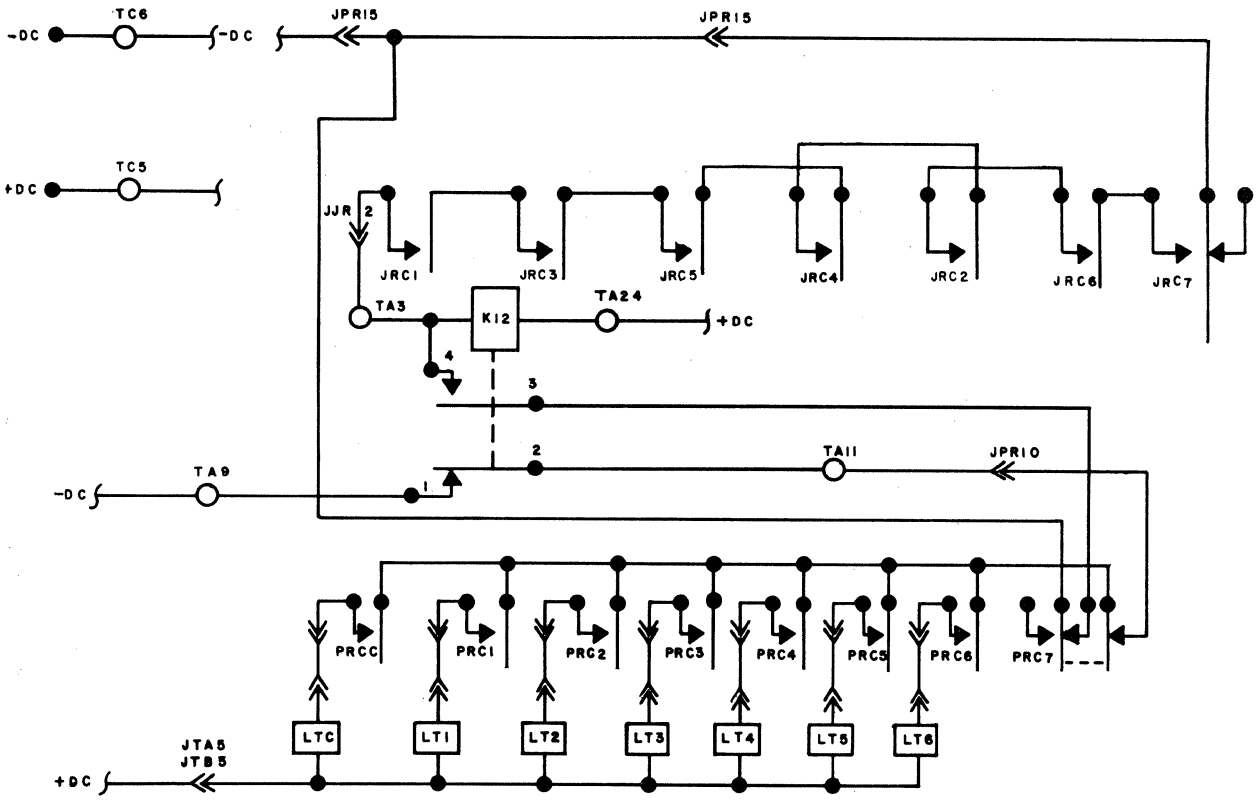


Figure 4-22 Line Delete Circuit

LINE DELETE CIRCUIT

When the line delete code (1-2-3-4-5-6-7) is read in the J-reader, a DC circuit is completed to the K12 cut-off relay as follows: from -DC, JRC7 transfer contact, JRC6, JRC2, JRC4, JRC5, JRC3, JRC1, JJR2, TA3, K12 coil, TA24, TC5, to +DC. (See Figure 4-22.) The above circuit energizes the K12 relay closing K12 - 3 and 4 and opening K12 - 1 and 2. When K12 - 3 and 4 close, a holding circuit is completed to K12 through a normally closed contact on PRC7. When K12 - 1 and 2 breaks, the negative DC potential is removed from the print reader contacts (PRC1 through PRC6 and PRCC), thus, when the print reader reads the character and function codes for that line, the contacts operate, but the translator magnets do not become energized and no printing or functional operation of the writing machine takes place.

The K12 relay is de-energized when the print reader reads the next number seven code (at the end of the line), thus PRC7 contact operates and breaks the holding circuit through K12 - 3 and 4 to the K12 coil.

END LINE CIRCUIT

The purpose of the end line switch S4 is to allow an operator to stop the tape at the end of a line and turn off the main power switch at a point where both readers stop after reading a 7 code.

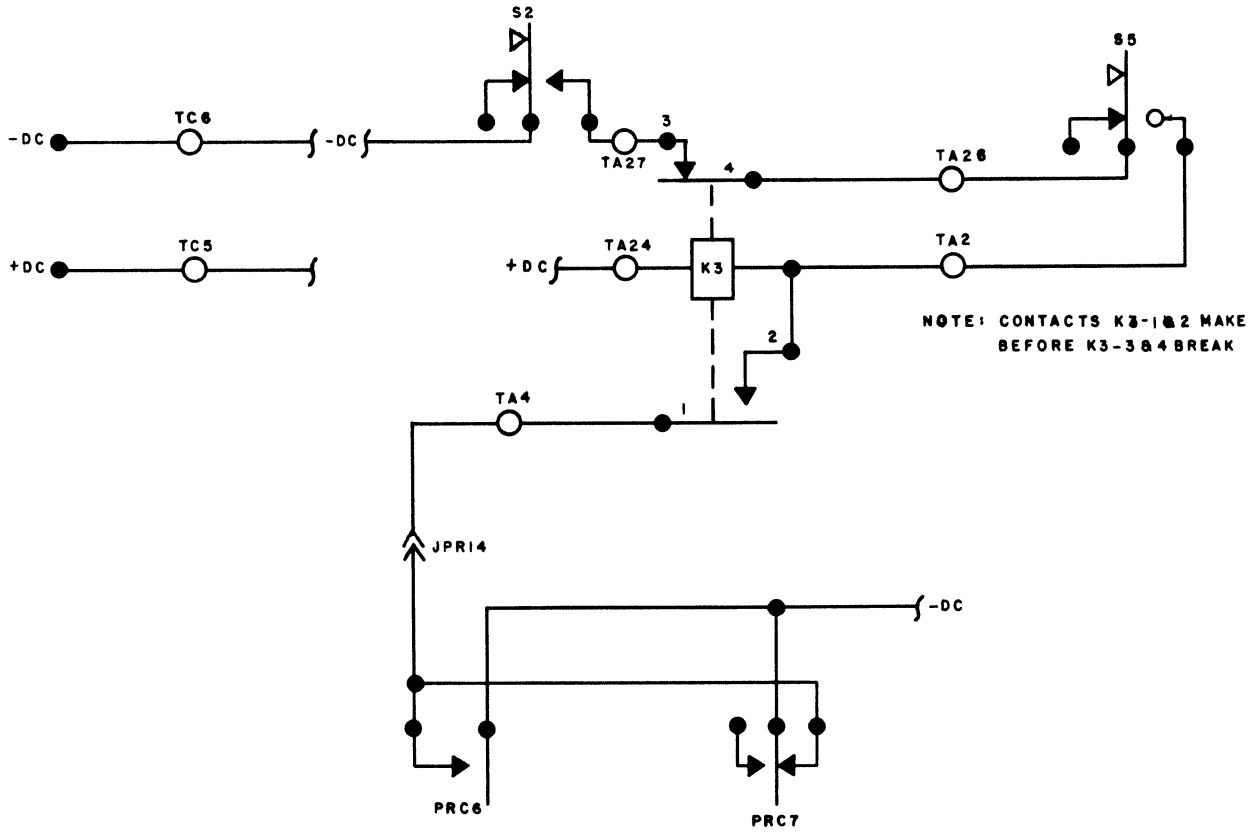


Figure 4-23 Non Justify Circuit

(See Figure 4-21.)

When the S4 switch is held depressed and the print reader reads a 7 code, the PRC7 contacts operate and break the holding circuit to K3, stopping print reader operation. Then when the J-reader reads a 7 code, the K2 holding circuit will be broken and the J-reader operation will stop. (Normally, when the print reader relay K3 is de-energized, the J-reader relay K2 will not drop out at this point. But due to the S4 switch being held in the operated position, the K2 holding circuit is broken.)

Thus, the S4 operation will cause both the J-reader magnet and the print reader magnet to be de-energized, stopping both reader operations.

When the readers resume operation, the first code read in each reader will be the 6-7 justification code.

NON-JUSTIFYING CIRCUIT

When the non-justify switch S5 is depressed, the K2 pick-up circuit is broken and the transferring of S5 contacts will complete a circuit to the K3 relay as follows: from -DC, S2 transfer, TA27, K3 - 3 and 4, TA 26, S5 transfer, TA2, K3 coil, TA24, to +DC. (See Figure 4-23.) The K3 - 1 and 2 contact will make before K3 - 3 and 4 break, consequently a holding circuit will be complete to the K3 coil before the pick-up circuit is broken.

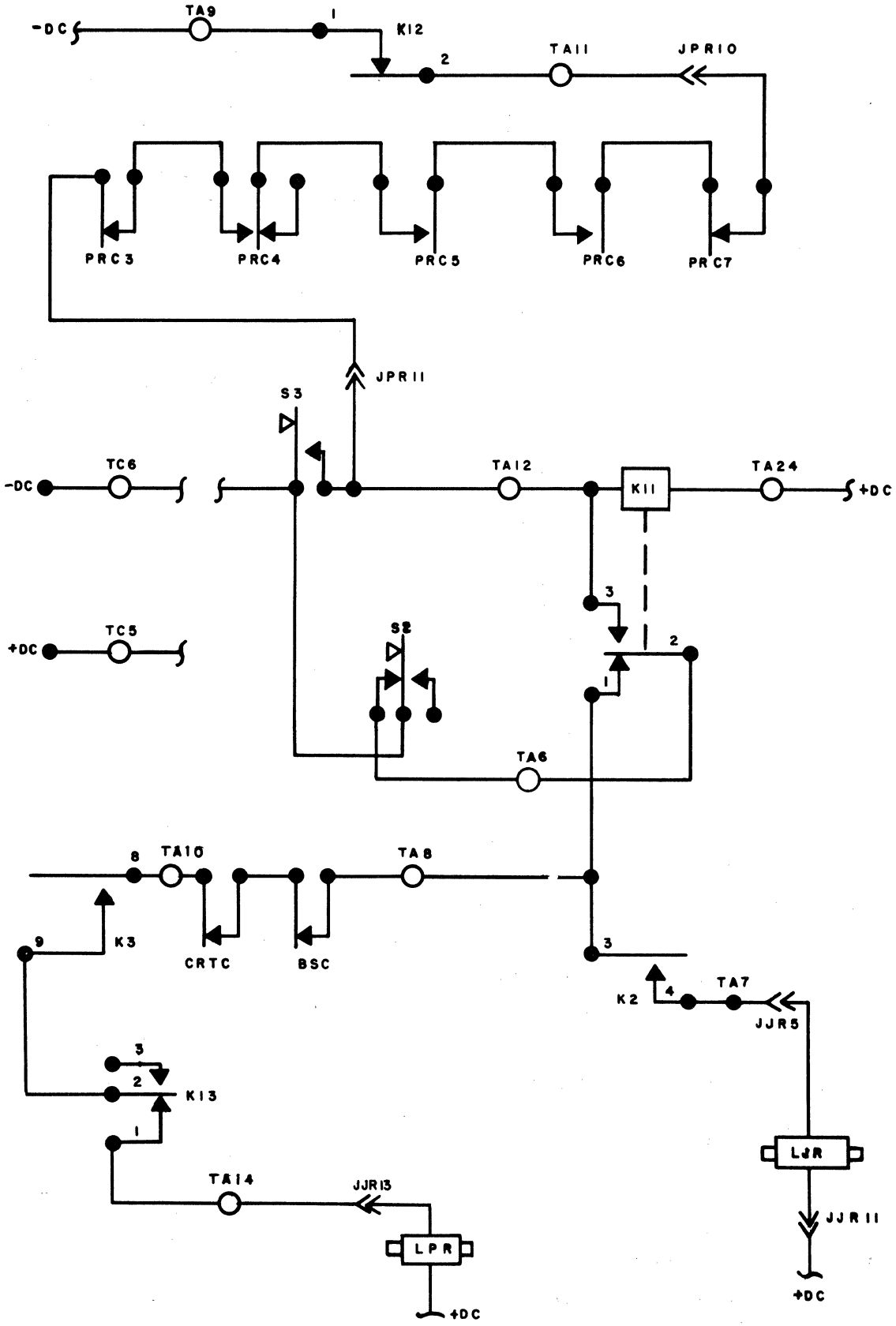


Figure 4-24 Manual and Automatic Stop Circuit

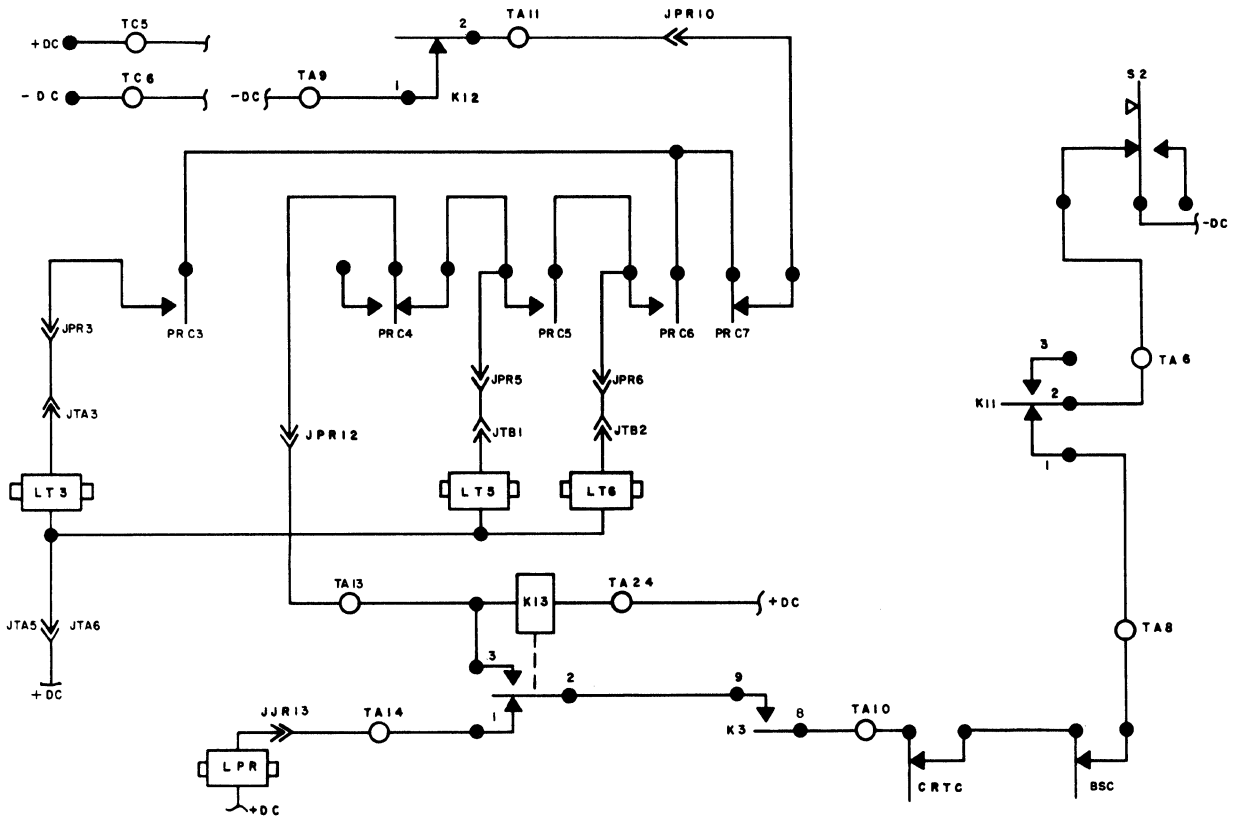


Figure 4-25 Delay Control Circuit

Therefore, the operation of the S5 switch will allow print reader operation only, and justification of lines will not take place.

MANUAL STOP CIRCUIT

When the stop read switch S3 is depressed, a circuit is completed to the stop for insert relay K11. This relay, when energized, will break the DC circuit to both reader magnets LJR and LPR, due to K11 - 1 and 2 breaking. K11 - 2 and 3 maintain a holding circuit to K11 coil, thus K11 will remain energized until the start read switch S2 is depressed. When S2 is operated, K11 drops out, K11 - 1 and 2 make and both readers resume operation.

AUTOMATIC STOP CIRCUIT (Figure 4-24)

When a 4-5-6 stop code is read by the print reader, the K11 relay is energized breaking the circuit to both reader magnets LJR and LPR, thus stopping reader operation. This circuit is as follows: from -DC, PRC7 (break contact), PRC6, PRC5, PRC4, PRC3, JPR11, TA12, K11 coil, TA24, TC5, to +DC.

Once K11 coil is energized, its own contact (K11 - 2 and 3) completes a holding circuit to K11 coil until such time as the S2 switch is depressed. Depressing S2 will break K11 holding

circuit and the readers will again resume operation.

DELAY CONTROL CIRCUIT

It is necessary to have an automatic delay control circuit incorporated in the Reproducer in order to delay operation of the tape reader until a function in the writing machine has been completed. There are three functions which require more operating time than the regular characters. These functions are: back space (1-5-6 code), carriage return (3-5-6 code) and tabular (2-5-6 code). Note that the 5 and 6 units are common in each of the three codes. Thus, PRC5 and PRC6 will operate when each of these codes are read. When PRC5 and PRC6 operate, without PRC4 operating, a circuit is completed to the delay control relay (K13) as follows: from -DC, PRC7 (break contact), PRC6, PRC5, PRC4, JPR12, TA13, K13 coil, TA24, TC5, to +DC. (See Figure 4-25.) When K13 is energized, K13 - 2 strap breaks with 1 strap and makes with 3 strap. The energizing circuit to the print reader magnet (LPR) is broken, thus stopping print reader operation. Also, when K13 - 2 and 3 make, a holding circuit to K13 is established (the original pick-up circuit to K13 will be open when contacts PRC5 and PRC6 return to normal).

Assume for the moment that the CR code 3-5-6 was read in the print reader, then at the same time the above mentioned circuit was complete to K13, a circuit would also be complete to the translator magnets LT3, LT5, LT6 and the translator clutch magnet LTC.

Translator operation would result, pulling down the CR keylever and starting a carriage return function. The operation of the CR mechanism would open contacts CRTC, thus breaking the holding circuit to K13. The K13 contacts would return to their normal position, but the circuit to the reader magnet would not be complete until the carriage returns to the left hand margin and the clutch toggle unlocks. When this happens, the CRTC contact closes, completing the energizing circuit to the reader magnet, starting the reader operation again.

Therefore, with the above circuit operation, when a Tab, CR or BS code is read by the print reader, the reader operation will automatically stop and will not start again until that particular function is complete.

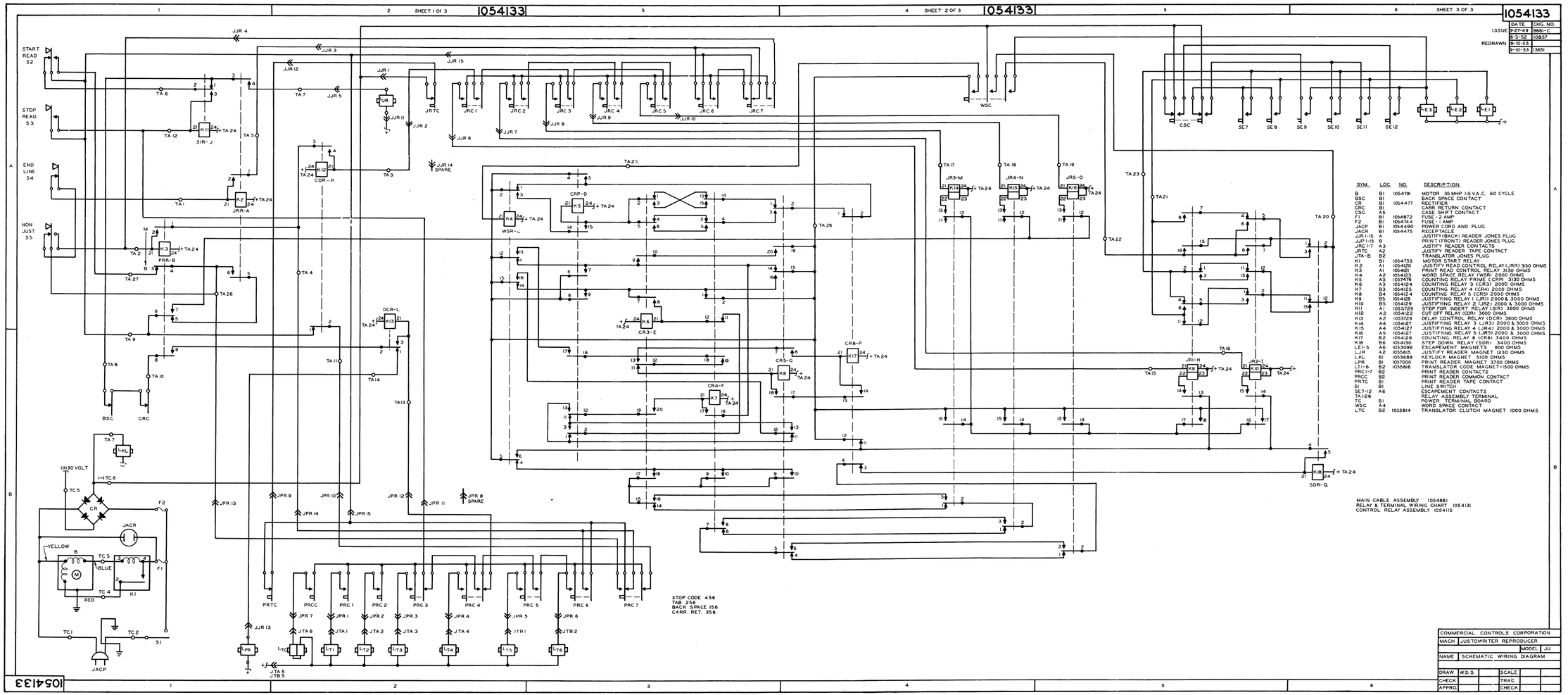


Figure 4-26 Justowriter Reproducer Wiring Diagram

RECORDER-REPRODUCER CIRCUIT DESCRIPTION

DESCRIPTION

The Justowriter Recorder-Reproducer is essentially the same as the Justowriter Recorder described in Part VII, Section 3. A single reader (described in Part II, Section 6) is added, which makes possible the reperforation of Justowriter tape, thus, duplicate or revised tapes can be made easily. The only manual typing required to incorporate changes in a new tape is the typing of the change itself.

OPERATION

A start read and stop read switch has been provided to control the reader operation, otherwise, the operation is the same as a Justowriter Recorder.

When a Justowriter tape is read in a Recorder-Reproducer, the reader stops automatically at the end of the line. The J-carriage return switch must be depressed to punch the justification code in the new tape (same as Justowriter Recorder), or the line may be deleted by depressing both the line delete and J-carriage return switches. The reader is started again with the start read switch. The start read or stop read switch can be used to stop the reader at any time to make corrections or additions through the keyboard.

When the reader senses the justification code in the tape, no operation of the writing machine will take place. The reader will sense the 7, 6-7 and 3-5-6 justification code and then stop operation.

CIRCUIT DESCRIPTION

The following circuit descriptions are based on wiring diagram 1055402. Those circuits involving the Justowriter Recorder operation are the same as described in Part VII, Section 3 and will not be described in this section.

Start and Stop Read Circuit - When it is desired to start reader operation, the S8 start read switch is depressed and released resulting in the reader magnet being energized causing reader operation. When the S8 switch is depressed, a circuit is completed to the read control relay K10 as follows: From -DC, TC6, CRTC, BSC, JP10, RTC, JR14, N/O S8, S9, TA20, K10 coil, TA38, TC5, to +DC. With K10 energized, a holding circuit is completed to the K10 coil as follows: from -DC, TC6, TA26, K7 - 2 and 1, TA25, JR13, RC-RC5 and RC6, JR8, TA21, K10 - 3 and 4, TA19, S9, TA20, K10 coil, TA38, TC5, to DC. (See Figure 5-1.)

When the S8 switch is released, a circuit is completed to the reader magnet LRM as follows: from -DC, TC6, CRTC, BSC, JP10, RTC, JR14, N/C S8, TA18, K9 - 2 and 1, K10 - 2 and 1, TA22, LRM, JR12, TC5, to +DC.

If it is necessary to stop the reader operation, the S9 stop read switch may be depressed, thus breaking the holding circuit to K10. K10 - 1 and 2 contacts will open breaking the circuit to the reader magnet.

By depressing the S8 switch, the circuit to the reader magnet LRM will be broken, stopping reader operation, but not de-energizing the K10 relay.

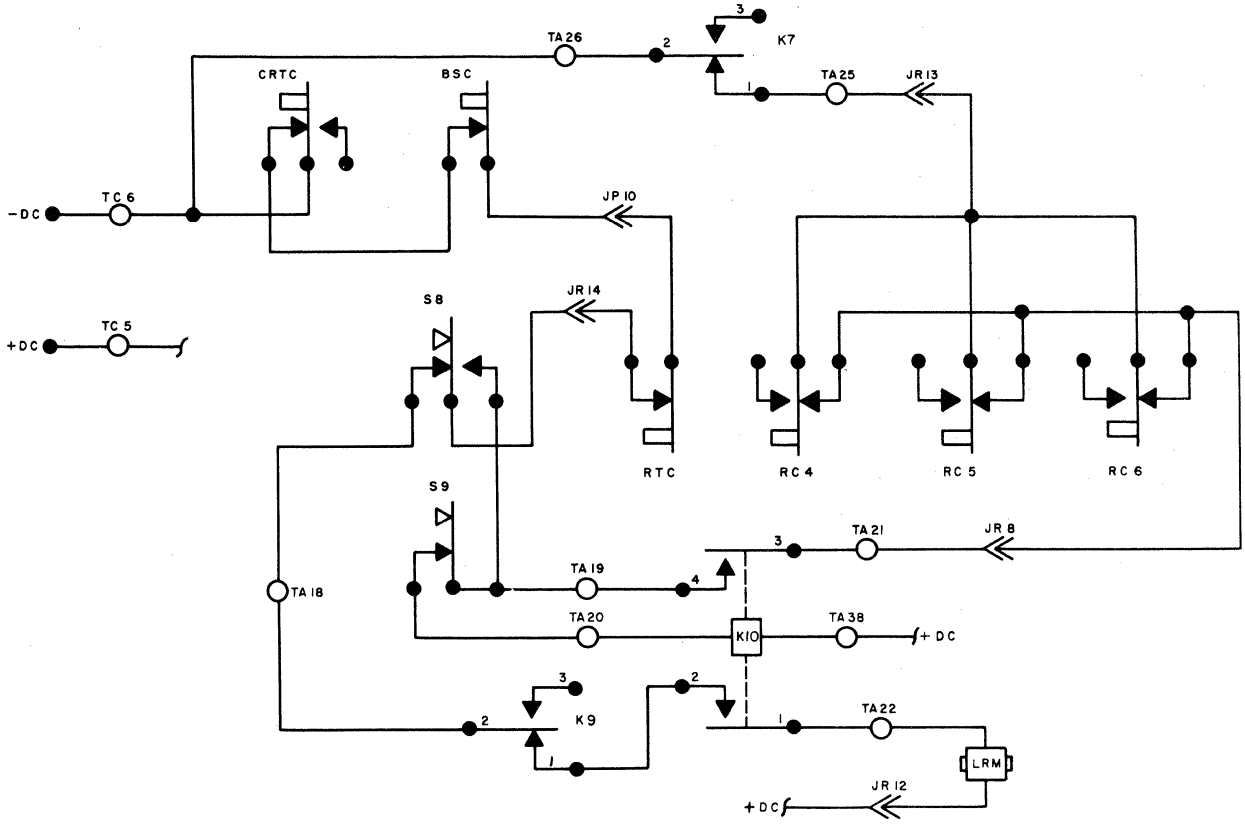


Figure 5-1 Start and Stop Read Circuits

The reader may be stopped at any point in the line automatically if the reader senses a stop code (4-5-6). When this code is read, RC4, RC5 and RC6 contacts will operate; breaking the holding circuit to the K10 relay. The S8 switch must be operated to start reader operation again.

Example Translator Magnet Circuit - When the reader senses the character and functional codes in the tape, the reader contacts operate, causing translator and writing machine operation.

For an example circuit, assume that a 1-2 code is read in the tape. Translator magnets LT1, LT2 and LTC would be energized as follows: from -DC, TC6, TA26, K7 - 2 and 1, TA25, JR13, RCC-RC1 and RC2, JR7-JR1 and JR2, JT6A-JT1A and JT2A, LTC-LT1 and LT2, JR12, TC5, to +DC. (See Figure 5-2.) Thus, the "A" keylever would operate causing the "A" typebar operation.

Line Relay (K7) Pick Up and Hold Circuit - When the reader senses the number 7 code at the end of a line, a circuit is completed to the line relay (K7) as follows: from -DC, TC6, CRTC, BSC, JR10, RTC, RC7, JR15, TA23, K7 pick up coil, TA38, TC5, to +DC. When the K7 relay is energized, a holding circuit is complete to the pick-up coil of K7 as follows: from -DC, TC6, CRTC, BSC, JR10, RTC, JR14, N/C S8, TA18, K9 - 2 and 1, K7 - 5 and 6, K7 pick up coil, TA38, TC5, to +DC. (See Figure 5-3.)

With K7 energized, the K7 number 2 contact strap transfers, breaking with number 1 strap and making with number 3 strap. This contact operation will break the negative DC to the reader

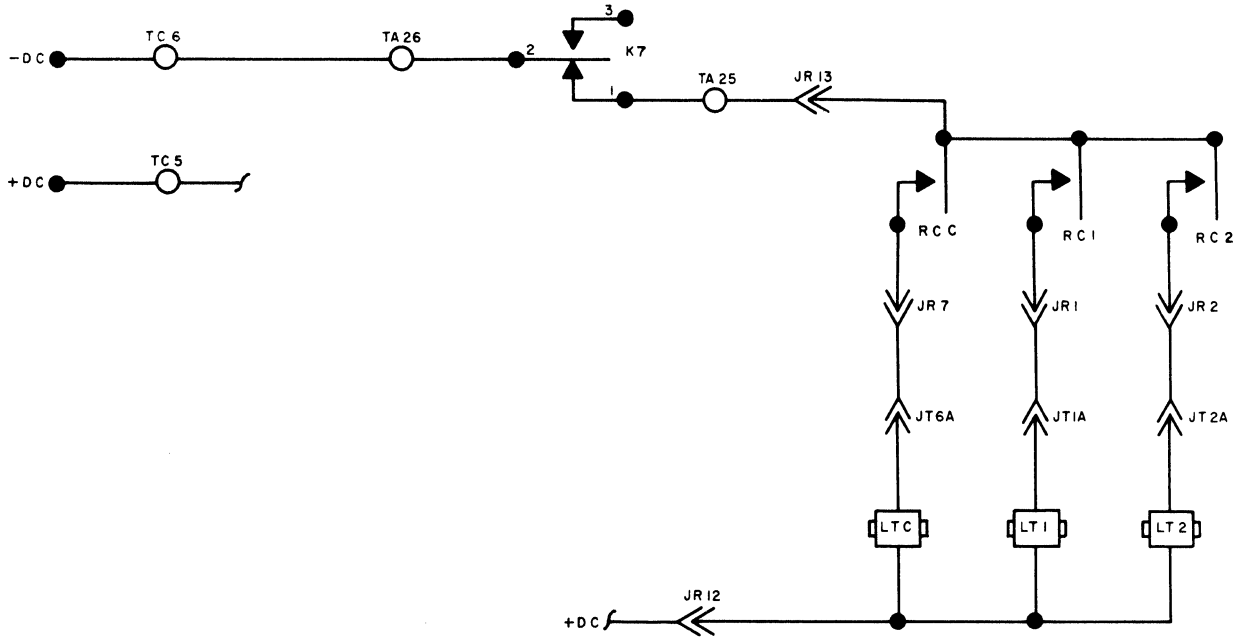


Figure 5-2 Example Translator Magnet Circuit

contacts. Thus, the holding circuit to the read control relay K10 is broken (through contacts RC4, RC5 and RC6 - Figure 5-1). The reader magnet however, will not de-energize when K10 drops out because of the make contacts K7 - 7 and 8. These contacts keep the reader magnet LRM energized allowing the reader to sense the 6-7 (plus combination of 1 through 5) code.

Due to the line relay K7 being energized and its contacts K7 - 2 strap broken with 1 strap, there is no negative DC on the reader contacts. Therefore, when the 6-7 code is read, the translator magnets will not become energized. The reader, then, will read and feed to the next code which is the 3-5-6 carriage return code.

Carriage Return J-Code Circuit - When the reader senses the 3-5-6 code at the end of a line, a circuit is completed to the delay control relay K9 as follows: from -DC, TC6, CRTC, BSC, JR10, RTC, RC7 transfer, RC6 make, RC4 break, RC5 make, JR9, TA24, K9 coil, TA38, TC5, to +DC. (See Figure 5-4.)

Also, a circuit is completed to the hold coil of K7 through the same path described above, through K7 - 13 and 12 (K7 was held energized), K7 hold coil, TA38, TC5, to +DC.

When the delay control relay K9 is energized, the circuit to the reader magnet (LRM) is broken (K9 contacts 2 and 1 break), thus stopping reader operation.

K9 contacts 2 and 3, when made, will complete a holding circuit to the K9 coil and complete a holding circuit to the K7 hold coil through K7 - 13 and 12 contacts.

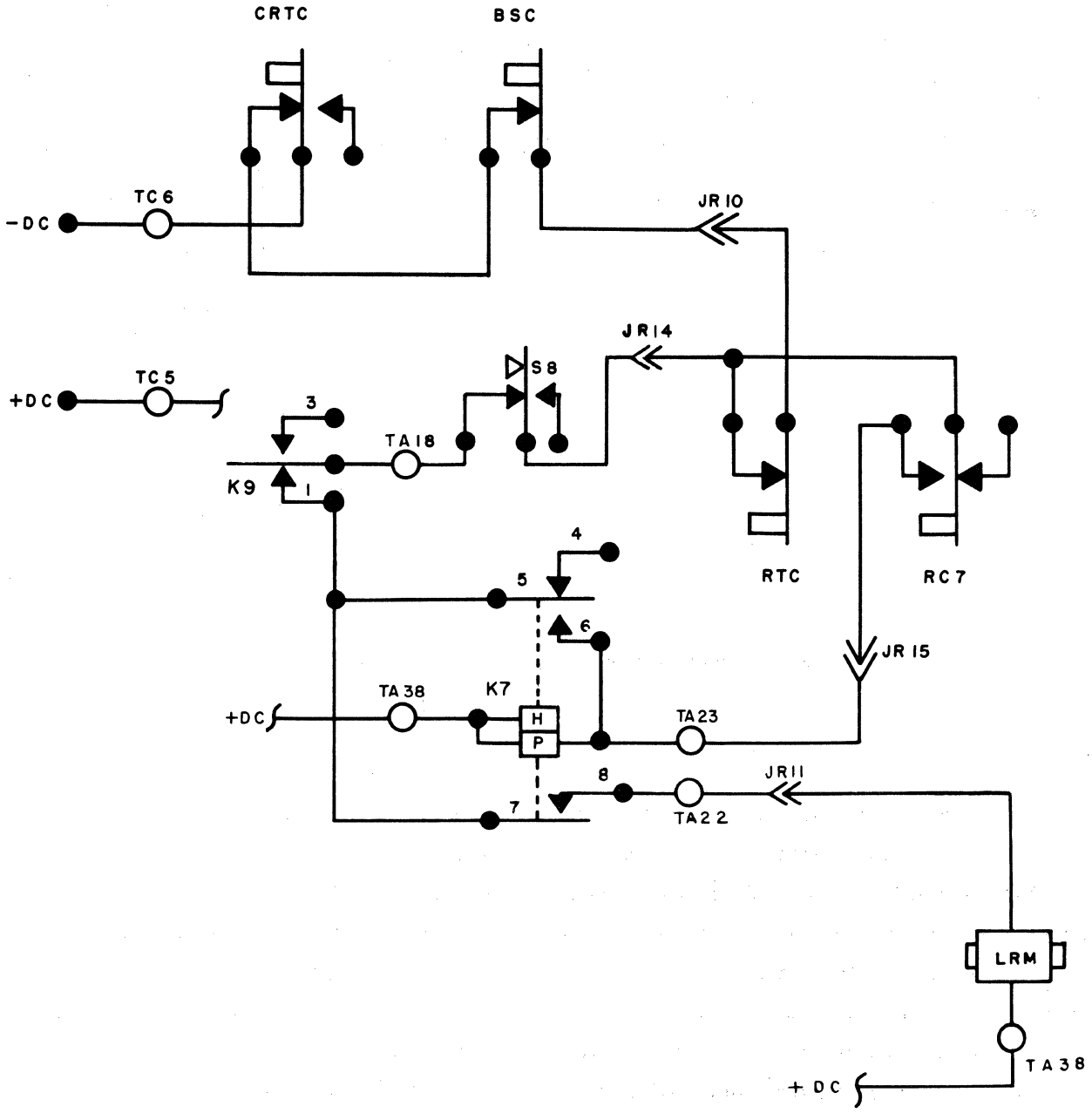


Figure 5-3 Line Relay Circuit

These two relays (K9 and K7) will remain energized until carriage return operation takes place and the CRTC contact transfers.

At this point the J-carriage return switch S7 must be depressed to punch the justification code in the new tape. The operation that takes place is the same as described in Section 3, Part VII, except as explained in the following paragraphs.

Circuit to Translator Magnets L3, L5 and L6 - When the J-carriage return switch S7 is depressed, a circuit is complete to the interlock control relay K6 and also the three translator magnets

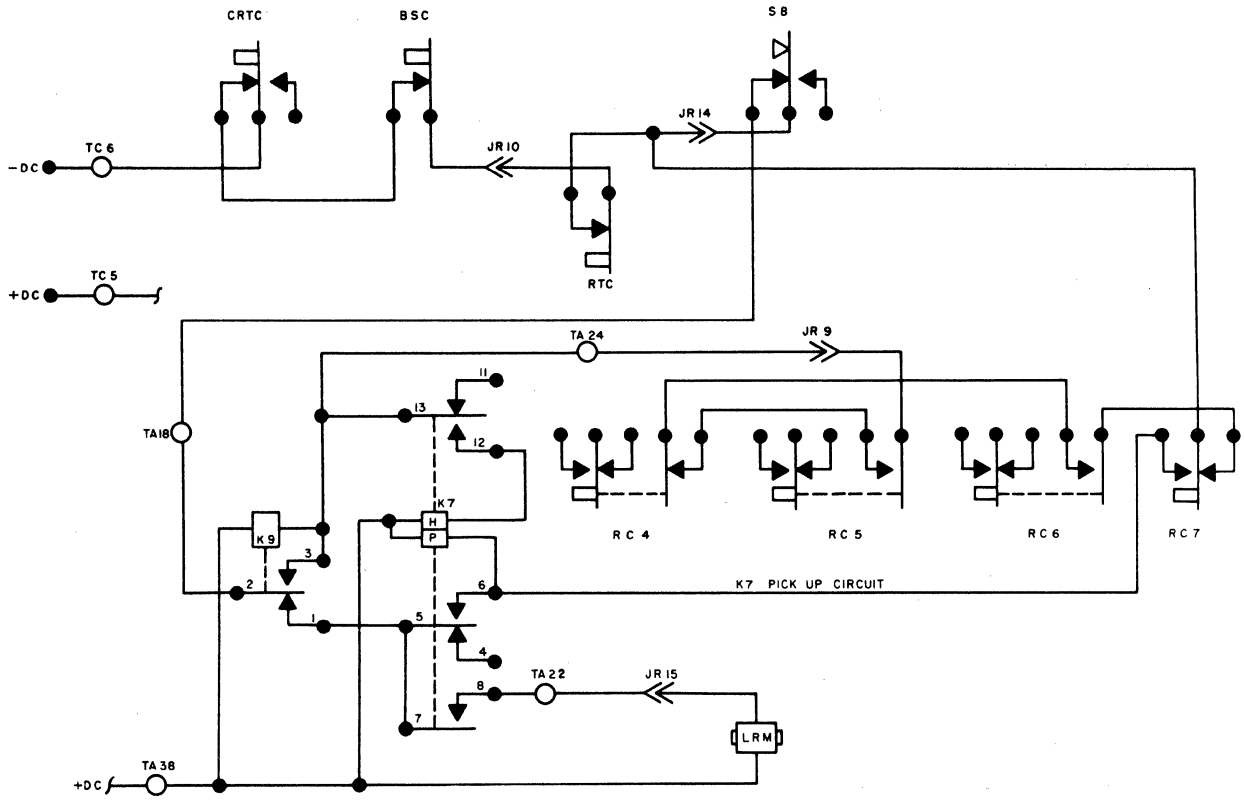


Figure 5-4 Carriage Return J-Code Circuits

L3, L5 and L6. This circuit is as follows: from -DC, TC6, JP13, PTC, N/O S2, JP12, PLC, JP14, TA31, K11 - 4 and 5, TA32, N/O S7, TA29, K6 - 4 and 5, 6 and 7, 8 and 9, TA16, TA15 and TA14, JT3A, JT5A and JT6A, LT3, LT5 and LT6, TA38, TC5, to +DC. (See Figure 5-5.)

Carriage return operation will not take place however, until the translator clutch magnet (LTC) is energized. The LTC will be energized when the CRR (K5) relay picks up on the 32nd step of the hole count relay.

Translator Clutch Magnet Circuit - The translator clutch magnet will be energized when the CRR (K5) relay is picked up and K5 contacts 9 and 10 make. The circuit to LTC is as follows: from -DC, TC6, JP13, PTC, N/O S2, JZC (in zone), TA33, K11 - 6 and 5, TA32, N/C S7, TA30, K4 - 2 and 1, K5 - 9 and 10, TA17, JT6A, LTC, TA38, TC5 to +DC. (See Figure 5-6.) The L3, L5 and L6 translator magnets were energized when the S7 switch was depressed, therefore, when the clutch operates, the CR keylever will function, causing carriage return operation.

This circuit to the L3, L5, L6 and LTC magnets is necessary because there is no room to use a carriage return magnet (LCR) when a translator is installed. (The LCR is used to operate the CR keylever in a Justowriter Recorder - Section 3, Part VII.)

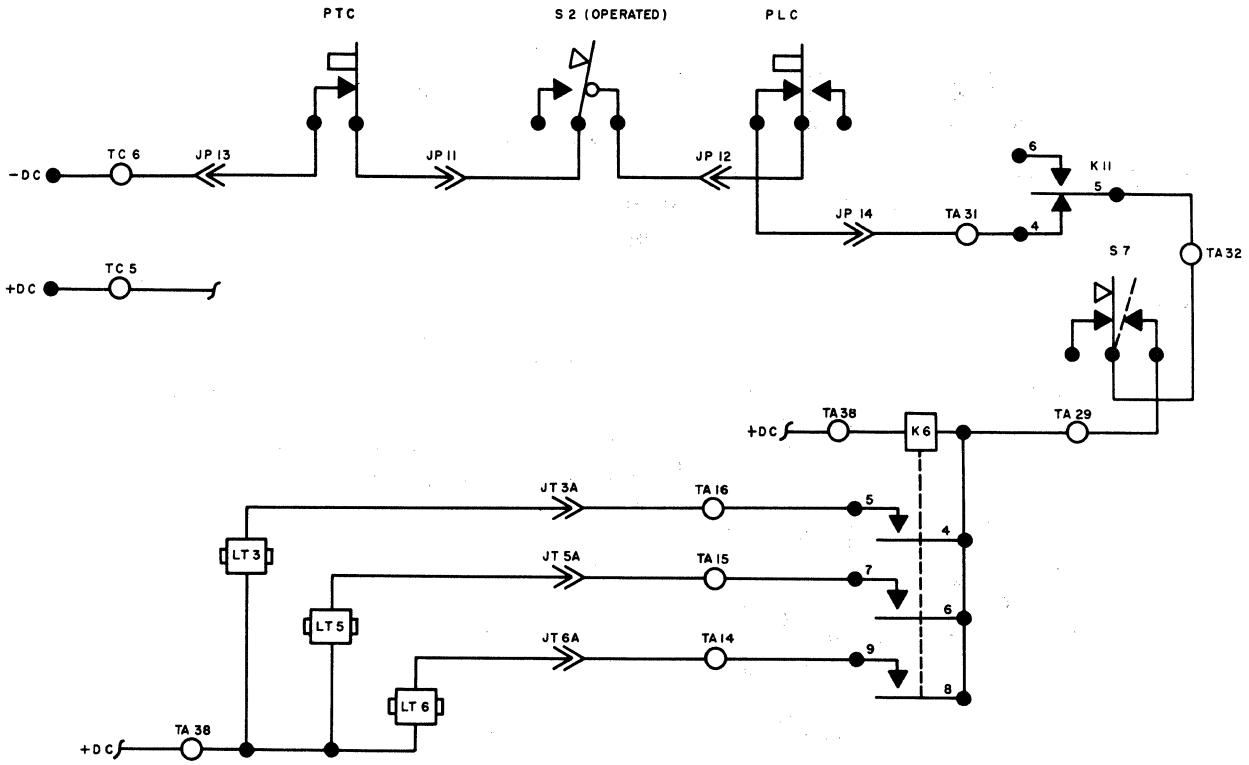


Figure 5-5 Circuit to Translator Magnets, L3, L5 and L6

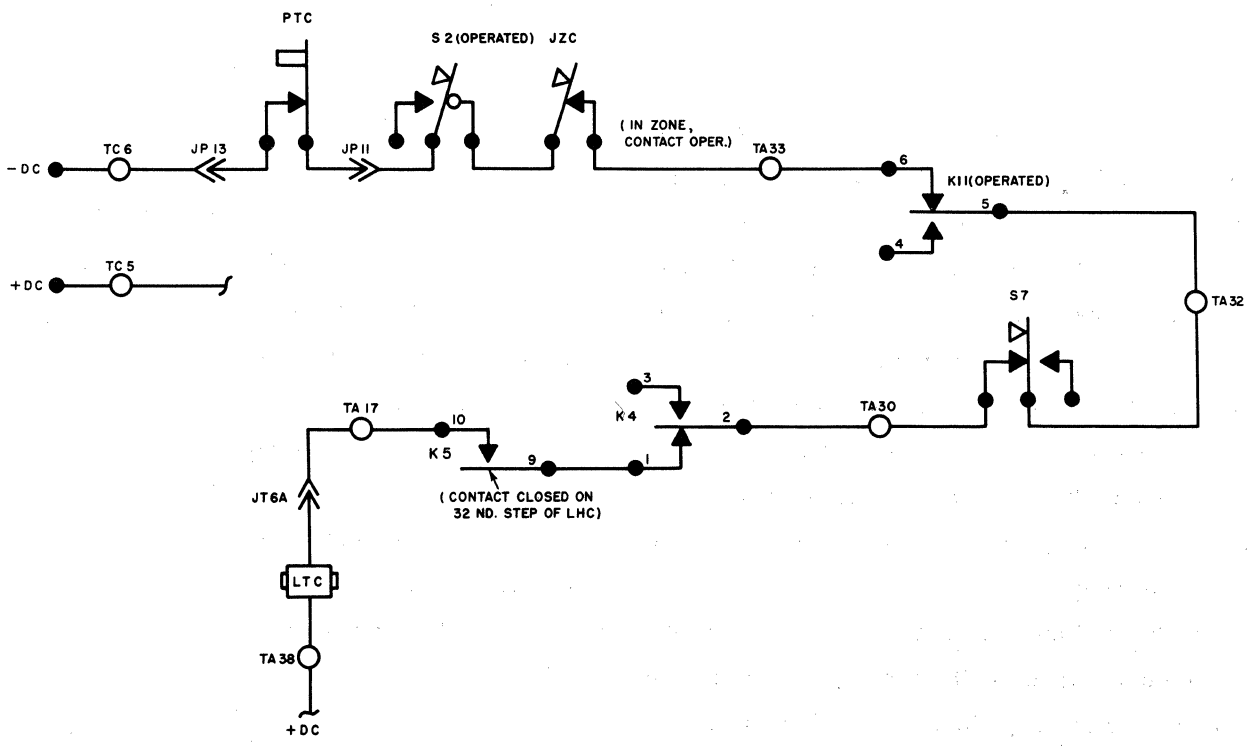


Figure 5-6 Translator Clutch Circuit

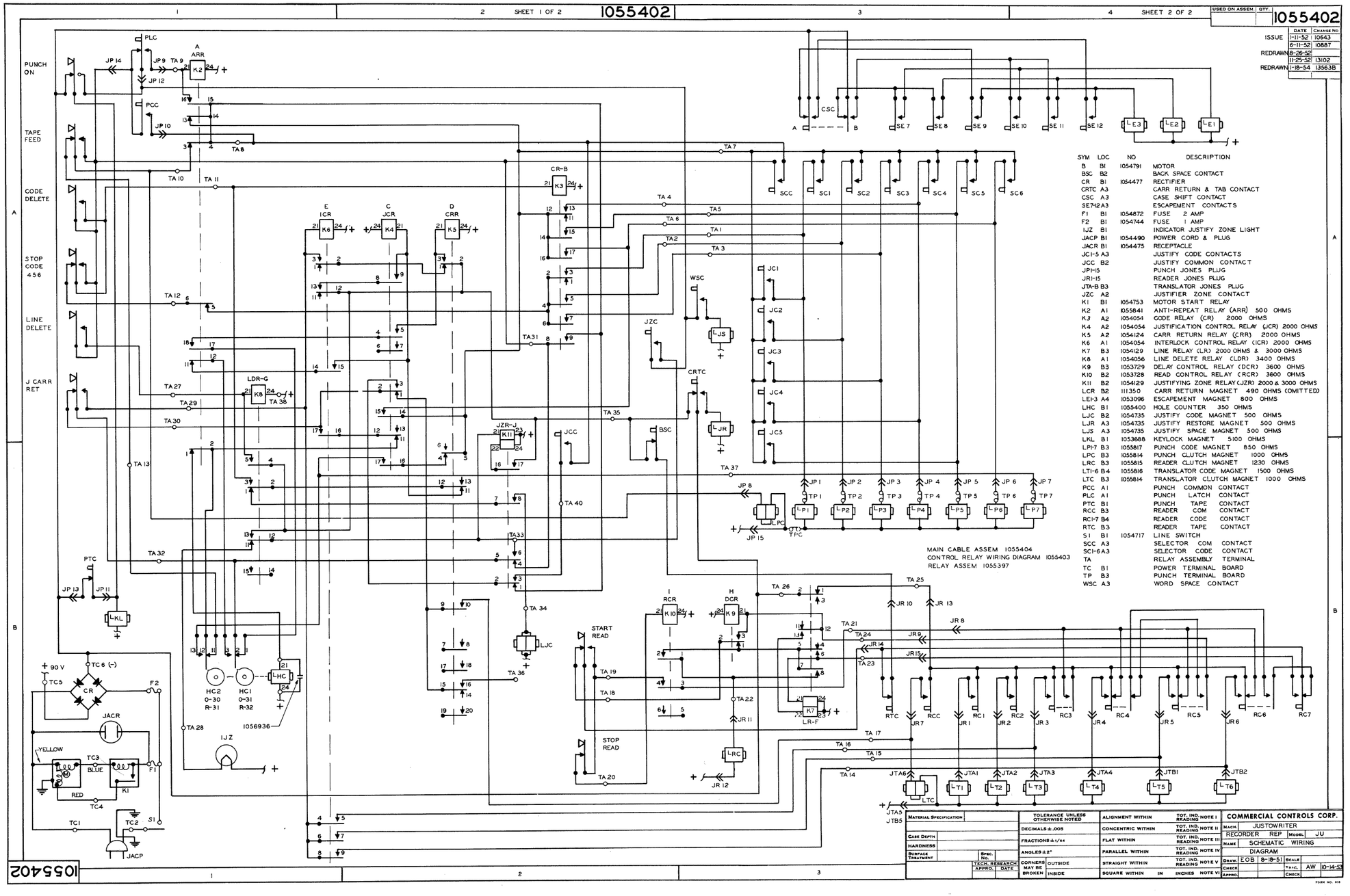


Figure 5-7 Justowriter Rec - Rep Wiring Diagram