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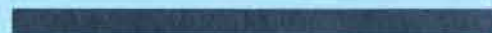
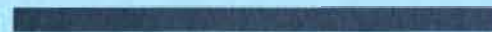
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561B DIGITAL RECORDER

OPERATING AND SERVICE MANUAL





OPERATING AND SERVICE MANUAL

MODEL 561B DIGITAL RECORDER

SERIALS PREFIXED: 334-

This manual applies directly to standard 11-column and special 12-column HP Model 561B Digital Recorders with serial number prefix 334-. Appendix I lists the changes required to adapt this manual to older instruments with serial prefix 241- or 038-.

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1501 PAGE MILL ROAD, PALO ALTO, CALIFORNIA, U.S.A.

CONTENTS

SECTION I	DESCRIPTION AND INSTALLATION	PAGE
1 - 1	General Description	I - 1
1 - 2	Power Cable	I - 1
1 - 3	Unpacking and Power Connection	I - 1
1 - 4	50-Cycle Operation	I - 2
1 - 5	Input Cable (Supplied) and Connectors	I - 2
1 - 6	Connecting to the Digital Voltmeter	I - 2
1 - 7	Connecting to Φ Electronic Counters	I - 3
1 - 8	Cable Fabrication	I - 3
1 - 9	Special Data Sources	I - 5
1 - 10	Multiple Inputs	I - 6
SECTION II	OPERATION	
2 - 1	Operating Controls	II - 1
2 - 2	Paper Tape	II - 1
2 - 3	Inked Ribbon	II - 1
2 - 4	Tape Duplicates	II - 4
2 - 5	Operator Maintenance	II - 4
2 - 6	Digital Voltmeter Readout	II - 4
SECTION III	THEORY OF OPERATION	
3 - 1	Print Wheel Positioning	III - 1
3 - 2	Timing Sequence	III - 1
3 - 3	The Print Command Circuit	III - 4
3 - 4	Power Supply	III - 4
SECTION IV	MAINTENANCE	
4 - 1	Cabinet Removal	IV - 1
4 - 2	Printer Mechanism Removal	IV - 1
4 - 3	Periodic Maintenance	IV - 1
4 - 4	Trouble Shooting	IV - 3
SECTION V	TABLE OF REPLACEABLE PARTS	
5 - 1	Table of Replaceable Parts	V - 1
APPENDIX I	MANUAL CHANGES	IA - 0



NOTICE

THIS INSTRUMENT IS PARTLY MECHANICAL AND REQUIRES PERIODIC CLEANING AND LUBRICATION FOR DEPENDABLE SERVICE. THE PRINTER MECHANISM SHOULD BE GIVEN A LIGHT CLEANING AFTER FOUR PADS OF PAPER HAVE BEEN PRINTED; REFER TO PARAGRAPH 2-5 OF THIS MANUAL. LUBRICATION IS REQUIRED AFTER 100 HOURS CONTINUOUS OPERATION OR TWO MONTHS INTERMITTENT OPERATION; FOR COMPLETE INSTRUCTIONS REFER TO YOUR PRINTER MECHANISM MANUAL.

SECTION I

DESCRIPTION AND INSTALLATION

1-1 GENERAL DESCRIPTION

The Hewlett-Packard Model 561B Digital Recorder is an electro-mechanical printer with parallel entry to all columns which prints up to eleven columns of data (12 columns available on special order) at rates up to five lines per second. This printing rate makes the 561B ideal for recording rapidly changing data in digital form. Model 561B makes a permanent printed record of data from the Ⓢ Model 405CR Digital Voltmeter and from Ⓢ in-line display vacuum tube electronic counters having modification kits installed. The basic design allows the 561B to be operated from beam switching tubes, stepping switches, relay matrices, and other data gathering systems using a 10-line code. Numerals 0 through 9, a minus (-) sign and a blank may be programmed in any column.

The Model 561B is supplied with a cable for operating directly with Ⓢ Model 405AR Digital Voltmeter or with modified Ⓢ Electronic Counters such as Ⓢ Models 521D, 521E, 523CR and 524C which have an in-line display. These counters may be furnished with internal circuitry and receptacle for connecting to Model 561B Digital Recorder, or kits may be obtained at a later date for field installation.

Data entry to the 561B is through a separate wire for each print wheel symbol. The input wires and two control lines, called COMMON and BIAS are brought out to connectors at the rear of the instrument. Both control lines are isolated from the 561 chassis, allowing either line to be grounded or connected to any voltage from -600 to +600, thus facilitating control from off-ground number selecting sources, such as beam-switching tubes.

In addition to this manual, the following items are included with your 561B Digital Recorder:

- 1) Printer Mechanism Service Manual (covers the mechanical portion of 561B).

00165-3


- 2) 561B-16A 100 conductor cable, 6 feet long.
- 3) 560A-95N Service Kit (packed in paper compartment).
- 4) 9281-0018 Folded Paper Tape (packed in paper compartment).
- 5) 560A-37M Pin for use with rolled paper tape (taped to bottom of paper compartment).
- 6) 9283-0002 Inked ribbon (installed).

1-2 POWER CABLE

The power cable of the 561B consists of three conductors and is terminated in a three-prong male connector recommended by the National Electrical Manufacturers' Association. The third contact is an offset round pin added to a standard two-blade connector which grounds the instrument chassis when used with an appropriate receptacle. To use the NEMA connector in a two-contact receptacle, a three-prong to two-prong adapter should be used. When the adapter is used, the third contact is terminated in a short green lead which should be grounded.

1-3 UNPACKING AND POWER CONNECTION



If the shipping carton is damaged, ask that the carrier's agent be present when the instrument is unpacked. Inspect the instrument for damage (scratches, dents, broken knobs, etc). If the instrument is damaged or fails to meet specifications notify the carrier and the nearest Hewlett-Packard field office immediately (field offices are listed at the back of this manual). Retain the shipping carton and the padding material for the carrier's inspection. The field office will arrange for the repair or replacement of your instrument without waiting for the claim against the carrier to be settled.

The  Model 561B can be operated from either 115- or 230-volt 60 cps power lines. Slide switch S101 on the instrument rear panel permits quick conversion for operation from either voltage. Insert a narrow-blade screwdriver in the switch slot and slide the switch to the right for 230-volt operation ("230" marking exposed) and to the left ("115" marking exposed) for 115-volt operation. Fuse F1 should be a 1.25 ampere, slow-blow type for 115-volt operation or a 0.6 ampere, slow-blow type for 230-volt operation.

1-4 50-CYCLE OPERATION

The 561B will operate from a 50-cycle source at slightly reduced speed. The normal maximum of five prints per second will be reduced to four. A special motor pinion gear is available which corrects for the reduced motor speed to provide five prints per second from a 50-cycle source. Refer to your Printer Mechanism Manual for pinion gear information.

1-5 INPUT CABLE (SUPPLIED) AND CONNECTORS


The 100-conductor cable supplied with the 561B is used to conveniently connect the 561B with the  Model 405CR Digital Voltmeter or  electronic counters equipped with a modification kit. Connectors on each end of the cable are identical so either end of the cable may be connected to the 561B.

Cable wiring consists of a connection between each pin in one connector and the identically numbered pin in the other connector. Pins 48 and 49 of the upper connector (print command input) are shielded; the shield is connected to pin 50 (ground).

External number selecting circuitry is connected to the 561B through two 100-pin connectors, J101 and J102, located on the rear of the chassis. Printing in columns one through six (the six columns on the right when facing the front of the instrument) is controlled through J101; printing in columns seven through eleven (the five columns on the left) is controlled through J102. An input from a six column source normally would be connected to J101, but may be connected to J102 with the loss of the most significant digit (i.e. the digit in the left hand column).

The PRINT COMMAND switch, located between J101 and J102, must be operated toward the connector which supplies print commands.

1-6 CONNECTING TO THE DIGITAL VOLTMETER

Data from the  Model 405CR Digital Voltmeter may be recorded by connecting the 405CR to the 561B with the 100-conductor cable supplied with the 561B. Connect one end of the cable to J3 on the Model 405CR. Connect the other end of the cable to either J101 or J102 on the 561B. If J101 is used, the 561B will print on columns one through six (the six right-hand columns). If J102 is used, the 561B will print on columns seven through eleven. Be sure to operate the PRINT COMMAND switch on the connector mounting plate toward the input jack connected to the Digital Voltmeter.

CAUTION

THE COMMON LINE OF THE 561B IS A FLOATING GROUND. IT ASSUMES THE POTENTIAL OF ANY SOURCE TO WHICH IT IS CONNECTED. WHEN THE DIGITAL VOLTMETER OR AN ELECTRONIC COUNTER IS USED WITH THE 561B, A POTENTIAL OF ABOUT +115 VOLTS IS ESTABLISHED ON THE COMMON LINE.

If a supplementary programming device is connected to COMMON, its ground return must be at the potential determined by the counter or digital voltmeter. Avoid low impedance circuits to chassis ground which may upset indicating circuits in the counter or voltmeter. See Figure 1-1.

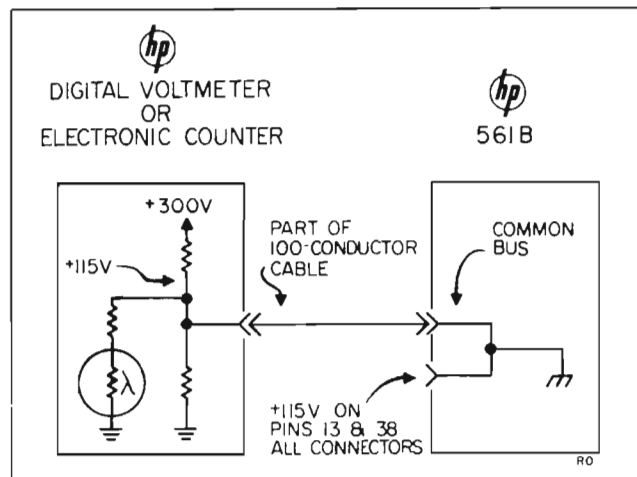







Figure 1-1. COMMON at Potential Determined by Data Source

1-7 CONNECTING TO ELECTRONIC COUNTERS



The 561B may be operated directly from  electronic counters having an in-line display such as  Models 521D, 521E, 523C, and 524C. These counters can have the necessary kits installed at the factory or kits may be obtained for field installation.

To record data from a modified  electronic counter, simply connect an  100-conductor cable between the 100-pin output connector on the counter and J101 or J102 on the 561B. The  Model 523C provides a six-digit output and normally would be connected to J101. The 524C provides an eight-digit output requiring the use of two 100-conductor cables and both input connectors on the 561B.

Be sure to operate the PRINT COMMAND switch toward the appropriate input connector.

Read CAUTION notice in paragraph 1-6. Refer to Figure 1-1.

1-8 CABLE FABRICATION

Connection of the 561B to data sources other than the  Model 405CR Digital Voltmeter or modified  counters may require construction of a cable terminated with a connector which will mate with J101 or J102. Procurement instructions for cables and connectors are given in Section V, Table of Replaceable Parts.

Use small gage telephone-type wire. Number 26 gage wire meeting MIL-B-76A, with 7 strands #34 gage wire, tinned after stranding, with 105° C plastic insulation, has been found satisfactory. Print command input wires should be shielded.

Select a systematic color code for wires to avoid errors. Use care in soldering. Repairing faulty connections after all wires are connected is very difficult.

A piece of #14 gage wire makes an excellent soldering tip for use on closely-spaced connector terminals. See Figure 1-2.

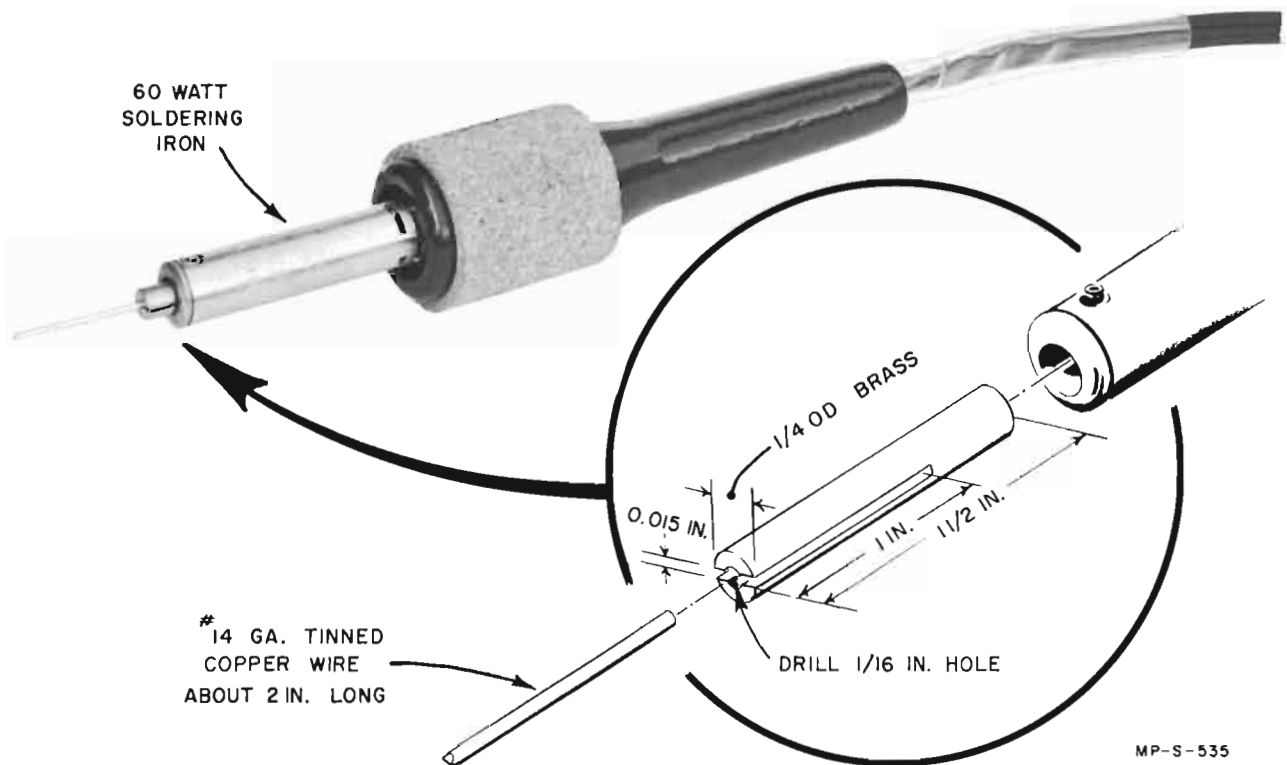


Figure 1-2. Wire Soldering Tip

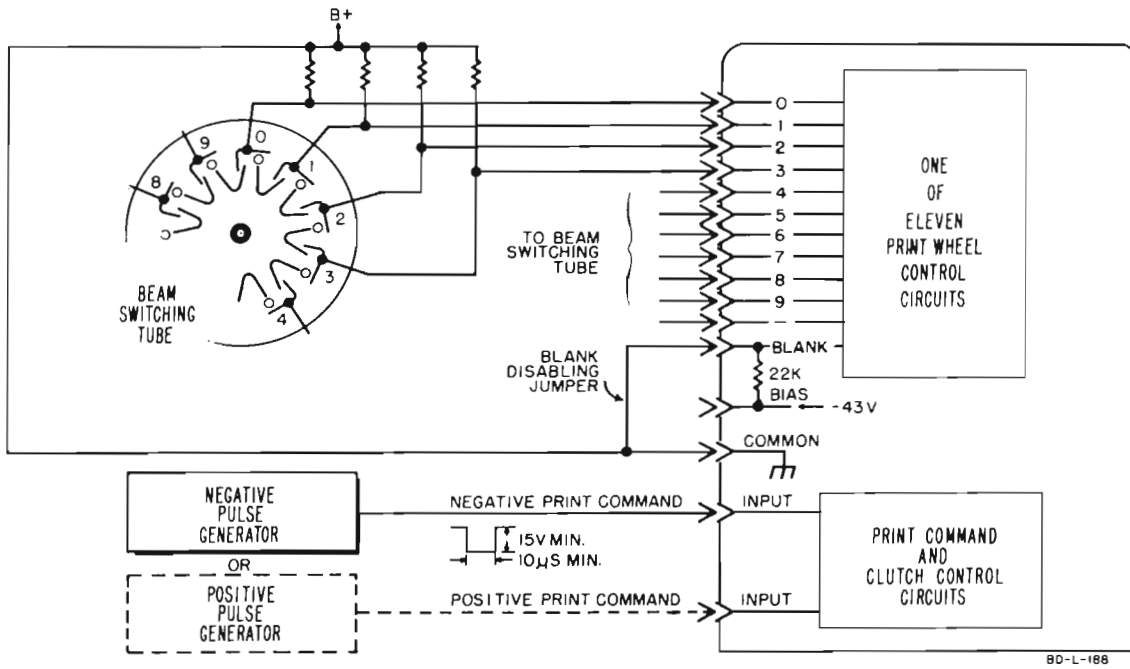
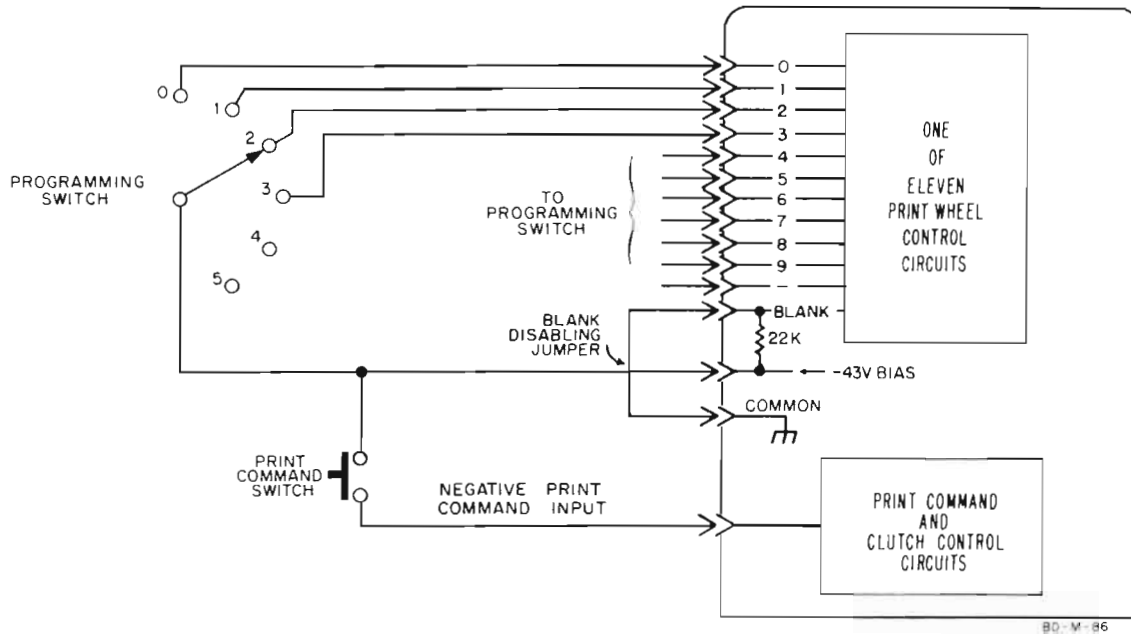


Figure 1-3. External Programming Systems

1-9 SPECIAL DATA SOURCES

This paragraph discusses the following important factors which must be considered when connecting the 561B to a data source other than digital-indicating equipment:

- a) Input connections must be made to deliver print wheel positioning data to the 561B.
- b) Print wheels with no input are automatically programmed to the BLANK position. External jumper must be installed to prevent print wheels from locking in the BLANK position.
- c) External number selecting system must provide a print command signal each time a number is to be printed. When positive print command is less than +115 volts, install .01 μ f capacitor in series with this input. Negative print command possible by switching this input to ground or to -43V line.
- d) The external system must be connected to the 561B disable relay or counter disable pulse (see Table 1-2) so that the number selection will not be changed while the relay is energized.

A. PROGRAMMING

One means of programming a print wheel symbol is to externally connect the BIAS line (-43v) to the appropriate input terminal as indicated

in the Tables 1-1 and 1-2. This method may be used with relay matrices, stepping switches, and other contact closure systems.

Another programming method is to connect -15 to -100 volts between the COMMON BUS and the input terminal of the number to be printed. For example, to print data from a beam-switching tube, connect its B+ to the COMMON BUS and its targets to the appropriate input terminal. Refer to Figure 1-3.

B. BLANK

A 22K resistor is internally connected between the BIAS line and the BLANK input. This programs unused print wheels to the no-print or BLANK position, preventing random printing by wheels which are not connected to an external number selecting circuit. To program symbols other than BLANK, a shorting jumper must be installed between the BLANK input and COMMON. The jumper may be installed on the external connector at the 561B, or if the BLANK input terminal is connected to the output of the driving equipment, the shorting jumper may be installed there. Refer to Figure 1-3.

A print wheel which has had the BLANK position disabled by an external jumper may be programmed to any position except BLANK. To enable external circuitry to program BLANK, remove the BLANK

TABLE 1-1. PRINT WHEEL CONNECTIONS

Print Wheel Symbol	J102B		J102A			J101B			J101A			CONNECTOR COLUMN PRINT WHEEL
	11	10	9	8	7	6	5	4	3	2	1	
0	25	1	26	25	1	26	25	1	26	25	1	PIN NUMBER
1	24	2	27	24	2	27	24	2	27	24	2	
2	23	3	28	23	3	28	23	3	28	23	3	
3	22	4	29	22	4	29	22	4	29	22	4	
4	21	5	30	21	5	30	21	5	30	21	5	
5	20	6	31	20	6	31	20	6	31	20	6	
6	19	7	32	19	7	32	19	7	32	19	7	
7	18	8	33	18	8	33	18	8	33	18	8	
8	17	9	34	17	9	34	17	9	34	17	9	
9	16	10	35	16	10	35	16	10	35	16	10	
-	15	11	36	15	11	36	15	11	36	15	11	
BLANK	14	12	37	14	12	37	14	12	37	14	12	

disabling jumper and disconnect the appropriate 22K resistor. The 22K resistors are located on a resistor board on the connector mounting plate at the rear of the 561B chassis. The wheel which a given resistor affects may be identified by the last two digits of the designation printed on the resistor board. For example, R107 programs BLANK in column seven (seventh wheel from the right as viewed from the front of the instrument).

TABLE 1-2. CONTROL CONNECTIONS

Description	Pin Number	Connector
COMMON (Floating ground)	13, 38	J101A, J101B J102A, J102B
CHASSIS (Power line ground)	50	J101A, J102A
BIAS (-43 volts)	39, 41, 44	J101A, J102A
	48, 49, 50	J101B, J102B
PRINT COMMAND NEGATIVE	48	
POSITIVE	49	
RELAY K1 NORM CLOSED	45	
COMMON ARM NORM OPEN	46 42	
COUNTER DISABLE	47	

C. PRINT COMMAND

The external system must provide a print command pulse to initiate a printing cycle each time a number is to be printed. This pulse may be either positive or negative, and it must be at least 15 volts in amplitude and 10 microseconds in duration. Rise time of the pulse should be at least one volt per microsecond. The pulse may be obtained from an external pulse circuit or by momentarily shorting the BIAS line to the NEGATIVE PRINT COMMAND input. See Figure 1-3.

To prevent noise pickup from starting unwanted printing cycles, terminate the unused print command input with a resistor whose value is approximately equal to the source impedance of the print command circuit. For example, if a negative pulse generator with an output impedance of 200,000 ohms supplies the print command pulse to pin 48 of J101A, connect a 200,000-ohm resistor between pins 49 and 38 of J101A.

D. SOURCE DISABLE

Accurate print wheel positioning requires that the data source be prevented from changing number selections during the printing cycle. Relay K1 is included to disable external number selecting circuits. The relay is energized at the beginning of the printing cycle. The external number selecting circuit can be disabled during the printing cycle by connecting its supply voltage through the normally closed contacts of the relay. Maximum potential across open contacts: 200 volts. Maximum current through relay contacts: 50 milliamperes. It may be necessary to add a resistor in series with the contacts to prevent excessive cable-capacity charging currents.

The counter disable pulse (see Table 1-2) may also be used to disable special data sources. The pulse is about 160 milliseconds in duration, rises from zero to an open-circuit voltage of +240 volts (internal impedance 100K).

1-10 **MULTIPLE INPUTS**

Successful data recording from two or more sources requires that the data sources be timed or synchronized in such a way that data from each source is ready for printing when the 561B receives a print command signal.

It is important that the entire system external to the 561B selects and holds data which is fed to the 561B. Each source must continue to hold its data output until the completion of the 561B printing cycle.

After all data has been presented to the 561B, some element of the external system must provide a print command signal to the 561B.

CAUTION

THE COMMON LINE OF THE 561B IS A FLOATING GROUND. IT ASSUMES THE POTENTIAL OF ANY SOURCE TO WHICH IT IS CONNECTED. USE CAUTION WHEN CONNECTING SEVERAL DATA SOURCES TO THE COMMON LINE.

The details of every multiple-source recording system will naturally be different for each application. If complex systems are contemplated, contact your representative for assistance.

SECTION II


OPERATING INSTRUCTIONS

2-1 OPERATING CONTROLS

Operation of front panel controls of the 561B is shown in Figure 2-1.

The PRINT COMMAND switch (S101) is mounted between J101 and J102 on the connector mounting plate at the rear of the 561B chassis. Operating the switch toward J101 supplies the 561B with print command signals from the data source connected to J101. Operating the switch toward J102 supplies the 561B with print command signals from the data source connected to J102.

2-2 PAPER TAPE

Special  folded tape is recommended for use with your recorder. High-quality standard 3-inch rolled adding machine type may also be used.

Folded tape permits convenient take-up in the paper drawer and allows easy inspection of any portion of the tape. It is perforated at each fold to allow neat separation of portions of recorded data. Folded tape may be reversed and re-run to use both sides. With single spacing, about 15,000 prints can be made on one side of a folded pad. One pad will last about 40 minutes at maximum print rate.

Follow the instructions in Figure 2-2 to load folded paper tape. Follow these additional instructions if roll tape is used:

- 1) Insert spindle through roll. Spindle is taped to bottom of paper compartment when instrument is shipped from the factory.
- 2) Hang roll by ends of spindle from ledges on both sides of paper compartment.
- 3) Paper must feed out from the bottom of the roll.

- 4) Continue with loading as shown in Figure 2-2.

To feed paper rapidly use the PAPER ADVANCE thumb wheel. To manually feed paper backward, set the SPACE SELECTOR to "0" and roll the PAPER ADVANCE wheel in the reverse (up) direction. Paper feed may be reversed only with the SPACE SELECTOR set to "0".

Be sure paper is inserted squarely in the paper feed mechanism to prevent jamming. If paper does not feed smoothly, place the RECORD switch in the center position, and remove all paper from the feed mechanism. Use tweezers to pick out torn bits of paper. Re-thread paper as shown in Figure 2-2 and resume printing.

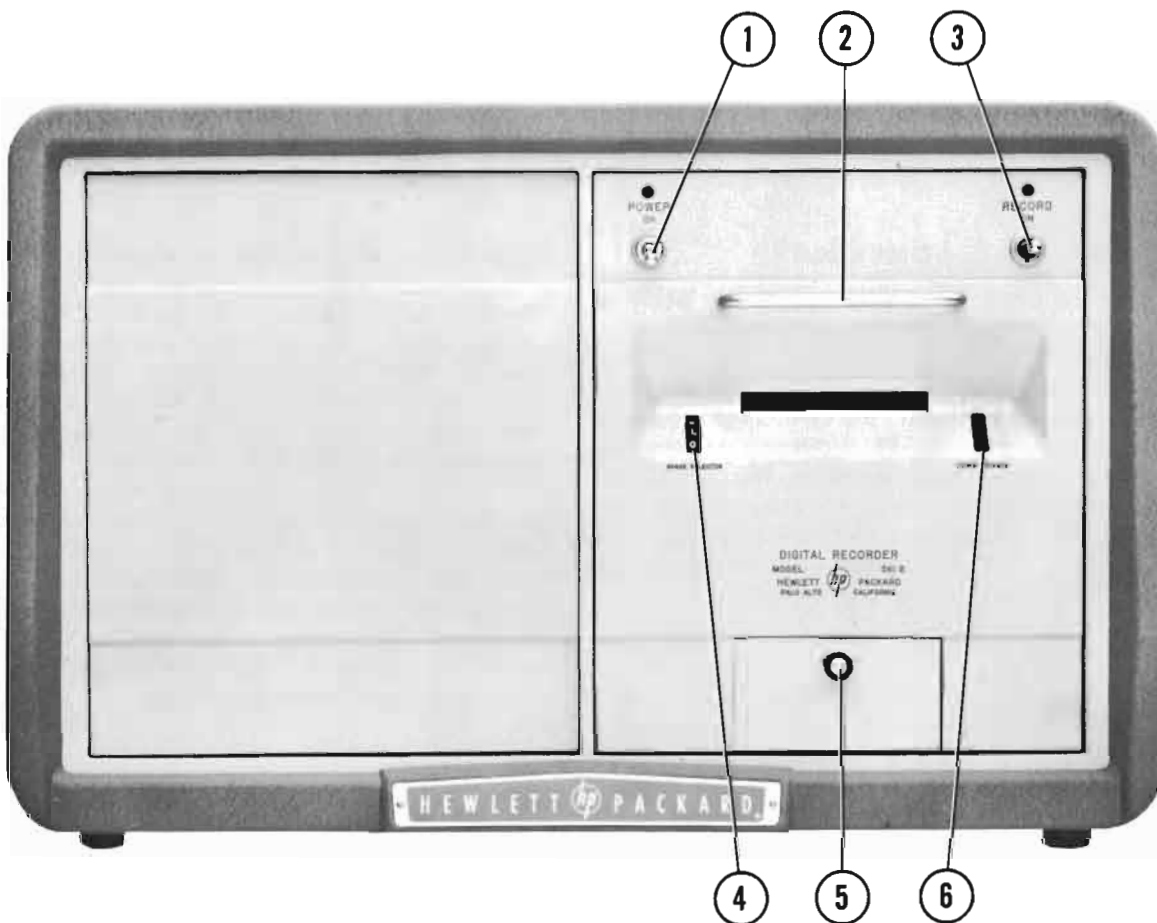
2-3 INKED RIBBON

All models of the printer mechanism use a special heavily-inked silk ribbon available from the Hewlett-Packard Company. Standard typewriter ribbon on an Underwood spool, with reversing rivets near the ribbon ends, may also be used; however, impressions will be lighter than with the Hewlett-Packard ribbon.

To install new ribbon, proceed as follows:

- 1) Open the hinged front panel to gain access to the printer mechanism.
- 2) Loosen the two printer mechanism retaining screws located on the lower front corners of the mechanism by turning 1/4 turn counterclockwise.
- 3) Slide mechanism out of cabinet until ribbon spools are readily accessible.
- 4) Wind all the ribbon onto one spool.
- 5) Shift the two ribbon spool retaining springs away from the spools, and remove spools.

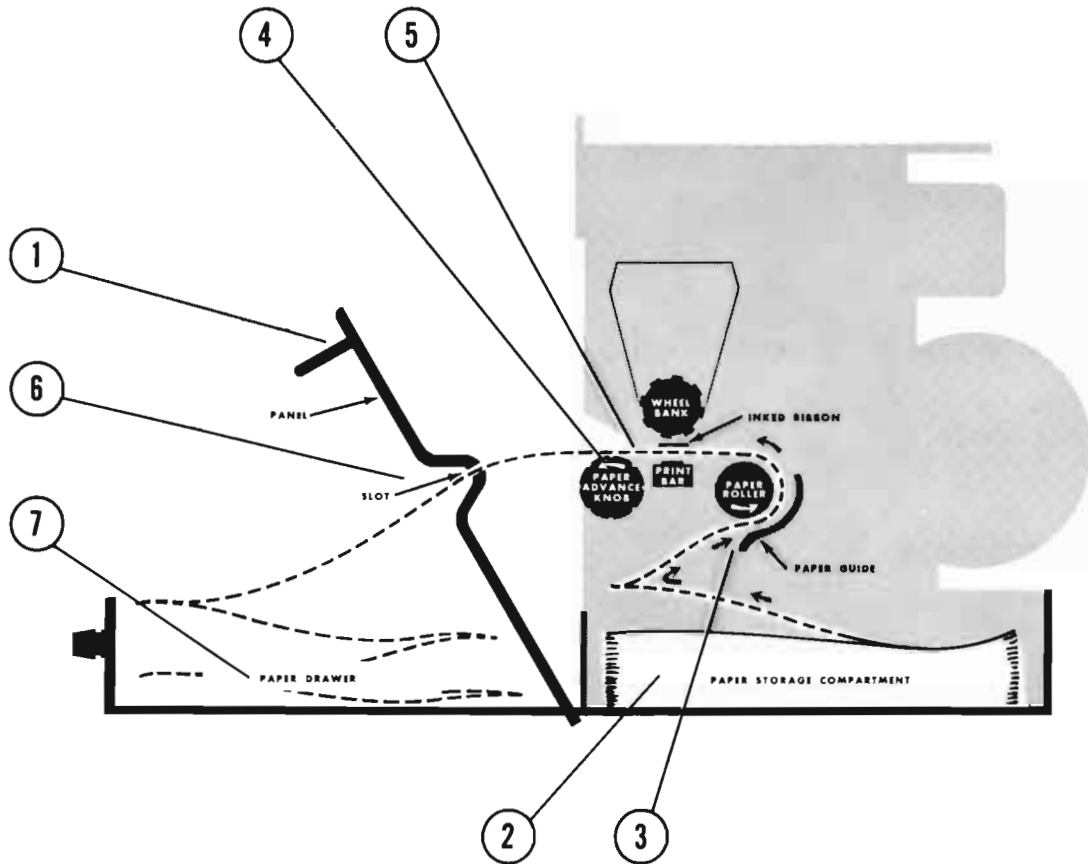
FRONT PANEL CONTROLS



1. **POWER** switch turns on line power to all circuits.
2. **PANEL HANDLE** is used to open hinged front panel for paper tape or inked ribbon replacement.
3. **RECORD** switch controls printer mechanism.
Center position: Printer is in standby operation.
Up Position (ON): Printer will print one line for each print command pulse received.
Down position (momentary): Printer will print at maximum rate (print command pulse not required).
4. **SPACE SELECTOR** thumb wheel selects line spacing.
"0" or no-print position allows paper to be rolled forward or backward.
"1" or single space position advances paper one space for each printed line.
"2" or double space position advances paper two spaces for each printed line.
5. **PAPER DRAWER** is used to collect folded paper tape after printing.
6. **PAPER ADVANCE** thumb wheel allows manual paper advance. Paper can be moved backward if **SPACE SELECTOR** is set at "0".

Figure 2-1

LOADING PAPER TAPE



- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Open front panel. 2. Load paper in compartment. 3. Fold paper back one inch and crease. Insert paper between roller and guide plate. | <ol style="list-style-type: none"> 4. Manually advance paper. Paper will feed easier and can be reversed with SPACE SELECTOR set to "0". 5. Feed paper <u>under</u> inked ribbon. 6. Feed paper through slot. Close front panel. 7. Collect printed paper in drawer. |
|---|--|

Figure 2-2

- 6) Take the ribbon out of the mechanism. Save the empty spool.
- 7) Hook end of new ribbon on empty spool. Wind about 10 inches of ribbon on the spool so that the reversing rivet is on the spool.
- 8) Install new ribbon by feeding it over the ribbon rollers and between the print wheels and paper tape.
- 9) Feed ribbon through the slots in the reversing arms and around the lower guides. Ribbon must be twisted 90° between the ribbon roller and the slot in the reversing arm.
- 10) Place ribbon spools on their shafts. Fasten spools in place with the spool retaining springs. Ribbon must feed out from the bottom of each spool.
- 11) Replace printer mechanism in cabinet and tighten retaining screws.

2-4 TAPE DUPLICATES

You may have a need for duplicate tape records. Contact print duplicating methods, such as the Ozalid process, can be used by printing directly from the original tape records. For Ozalid (Diaz) copies, HP 560A-131B (24-packet carton) translucent paper is recommended.

Quality of copies is greatly improved by treating the original tape record to increase its translucency. Use a compound such as "Transparentizer" made by the Technifax Corporation, Holyoke, Mass.

2-5 OPERATOR MAINTENANCE

Inspect print wheels frequently when the printer is in use. Print wheels should be cleaned when an accumulation of ink and dust builds up on the type faces. It is good practice to clean the print wheels after every fourth pad of paper has been printed. Failure to clean ink from the print wheels may let ink get onto the print wheel pawls and commutator contact surfaces, resulting in sluggish pawl operation and misprinting.

Place a four inch piece of paper under the print wheels during cleaning to prevent dirt from falling into the mechanism. Clean the print wheels with plastic type cleaner only. Suitable type cleaner is included in your service kit. Press the type cleaner against the print wheels. Clean the type cleaner by folding dirty portions to the center of the cleaner.

WARNING

DO NOT USE SOLVENT TO CLEAN PRINT WHEELS. DO NOT USE A BRUSH TO CLEAN TYPE FACES. DAMAGE TO THE PRINT WHEEL MECHANISM MAY RESULT.

Give the printer mechanism a light cleaning each time the paper is changed. Simply wipe out paper dust which has accumulated in the paper compartment and on other accessible parts of the mechanism.

NOTICE

LUBRICATION OF THE PRINTER MECHANISM IS REQUIRED AFTER 100 HOURS OF CONTINUOUS OPERATION OR TWO MONTHS OF INTERMITTENT OPERATION. FOR COMPLETE INSTRUCTIONS REFER TO YOUR PRINTER MECHANISM MANUAL.

2-6 DIGITAL VOLTMETER READOUT

Five columns are used to record data from the Φ Model 405AR Digital Voltmeter. Three significant figures are recorded. Polarity is indicated by a minus sign for a negative voltage and a blank for a positive voltage. Decimal position is indicated by a code number giving the number of digits to the right of the decimal.

The following examples indicate proper interpretation of recorded information from the Model 405AR Digital Voltmeter:

284-1	=	-28.4 volts
580 2	=	+5.80 volts
842 0	=	+842 volts
101-3	=	-0.101 volts

SECTION III THEORY OF OPERATION

3-1 PRINT WHEEL POSITIONING

Each print wheel has 12 printing positions, including the digits 0 to 9, a minus sign and a no-print or BLANK position. Each print wheel is rotated by the print wheel shaft through a friction clutch. A locking pawl associated with each wheel normally keeps the wheel locked in place with one type face in printing position. The pawl is lifted at the beginning of a printing cycle, allowing the wheel to rotate with the shaft. The pawl is dropped into a notch in the print wheel when the desired type-face is in printing position, locking the wheel in the desired position while the shaft continues to rotate. At the end of the printing cycle, the paper tape and inked ribbon are pressed against the type face, printing the desired character on the paper. Refer to Figure 3-1.

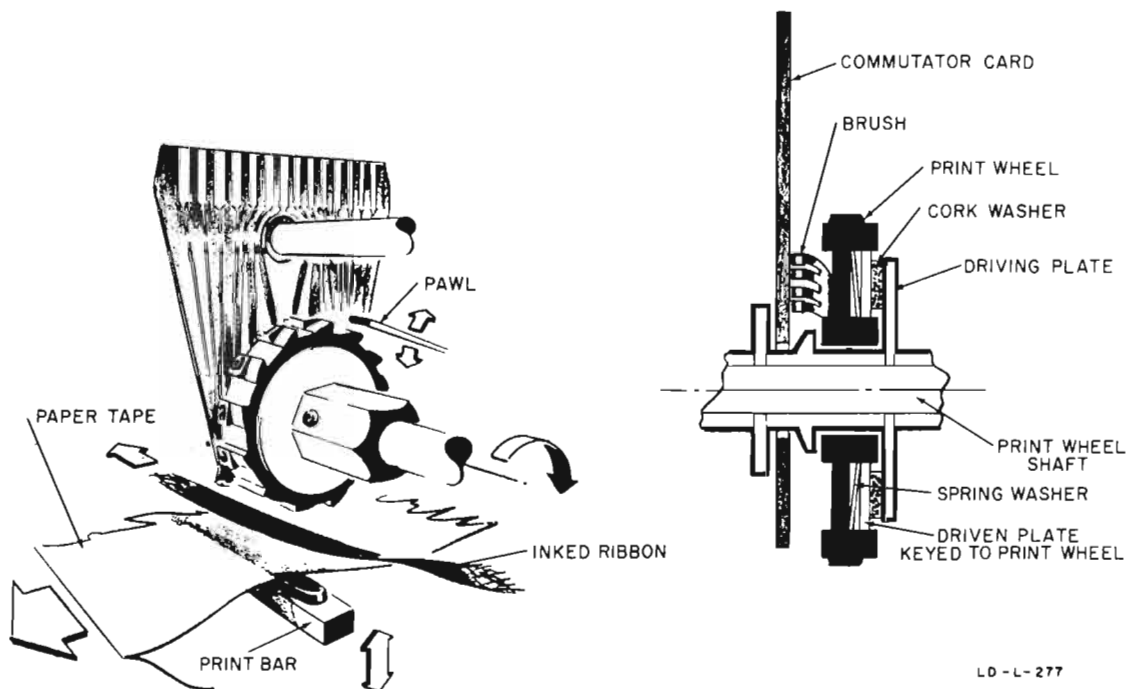


Figure 3-1. Print Wheel Operation

3-2 TIMING SEQUENCE

The following conditions exist before the printing cycle begins. Refer to Figures 3-2 and 3-3.

- The drive motor runs continuously after power is turned on.
- The clutch is disengaged.
- Switch S302 is in the position shown. The RECORD switch is operated to the ON position as shown.
- Pawl magnets are de-energized; print wheels are locked by their pawls.

The printing cycle is started when a print command pulse is applied to the appropriate PRINT

COMMAND input terminal. The pulse may be supplied by external pulse circuitry or generated by momentarily shorting the NEGATIVE PRINT COMMAND input to the BIAS line.

The print command pulse is amplified, and a positive triggering pulse is sent to the thyatron control grid.

The thyatron is triggered into conduction, energizing the clutch solenoid. Notice that the clutch solenoid may be energized and a printing cycle initiated in absence of a print command pulse by operating the RECORD switch to the momentary position.

The clutch is engaged, and the cam shaft and print wheel shaft begin to turn. The clutch is constructed so that it will remain engaged for only one revolution per print command.

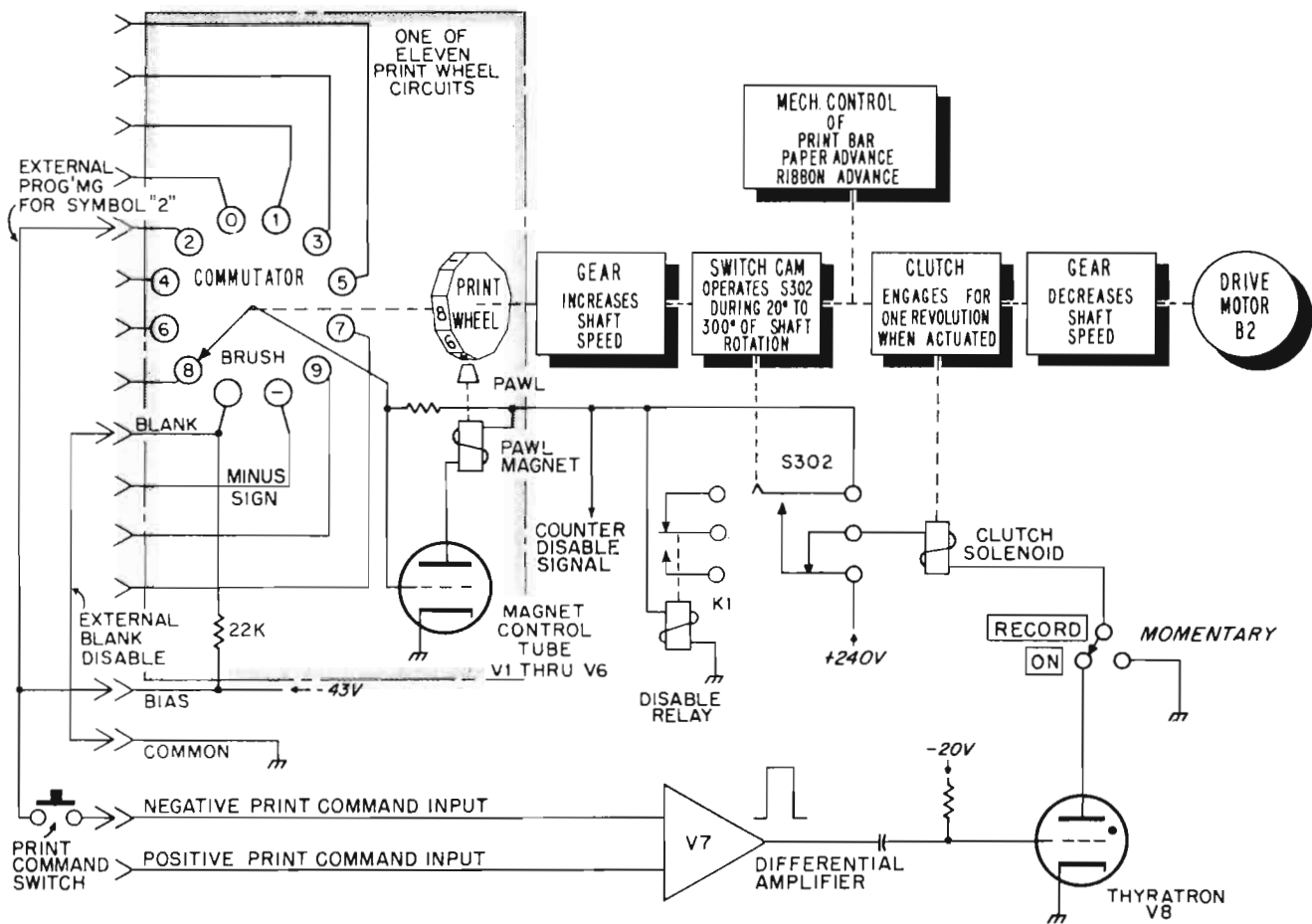
After 20° of clutch rotation, S302 is operated by the switch cam:

a) The normally closed contacts open, halting thyatron conduction and de-energizing the clutch solenoid. The clutch remains engaged until the completion of the printing cycle.

b) The normally open contacts of S302 close, supplying B+ to control tubes and energizing pawl magnets for all print wheels not in proper position. The pawls are lifted, and the print wheels are free to turn.

If the initial position of the print wheel is correct, the brush applies cut-off bias to the control tube at the beginning of the printing cycle. The pawl magnet will not energize, and the print wheel will not rotate.

c) The closing of the normally open contacts also energizes the disable relay. External number



80-M-85

Figure 3-2. Simplified Recorder Diagram

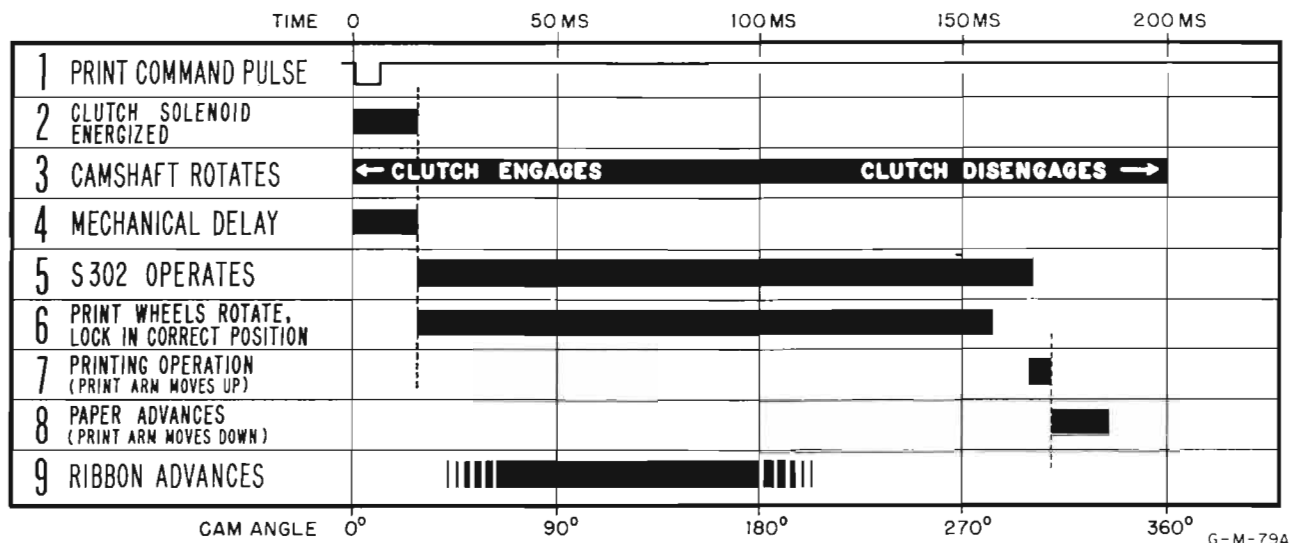


Figure 3-3. Timing Sequence

selecting circuitry has been connected to the relay contacts, to prevent number selections from being changed while the relay is energized.

The print wheels rotate on the print wheel shaft, seeking the position selected by the external circuitry. Each wheel carries a brush which makes contact with segments on an adjacent commutator.

External programming circuitry has previously connected the BIAS line to the desired input segment of each commutator. The desired type-face is in printing position when the brush makes contact with the segment to which the BIAS line has been connected.

When brush contact is made with the segment connected to the BIAS line, -43 volts is applied to the grid of the control tube. Plate current is cut off, and the pawl magnet is de-energized, allowing the pawl to drop into a notch on the print wheel. The print wheel is now locked in the correct position. The clutch between the wheel and the print wheel shaft slips until completion of the printing cycle. Each wheel is locked independently in the above manner.

Print wheels which have no input are automatically programmed to the BLANK position. A 22K resistor is internally connected between the BLANK input of each wheel and the BIAS line. Cut-off bias is delivered through the commutator to the print wheel magnet control tube when the print

wheel is in the BLANK position, locking the print wheel. When a print wheel is connected to an external data source, a shorting jumper must be installed externally between the BLANK input and the COMMON line, preventing BLANK programming.

All print wheels are correctly positioned after the print wheel shaft has made one revolution. The cam shaft continues to turn while the following events occur:

- a) The switch cam operates S302 to its original position. The print wheel magnet circuits are opened, preventing the pawl from being raised between printing cycles. The disable relay is de-energized. The thyatron (V8) plate circuit is closed, arming the clutch for the next printing cycle.
- b) The print bar operates upward, pressing the paper against the inked ribbon and print wheels. An impression is made of all print wheel characters in the printing position. Note: The inked ribbon was advanced slightly to expose fresh ribbon while the print wheels were being positioned.
- c) The paper tape is advanced for display.
- d) Unless another print command is received, the clutch disengages after one revolution, ending the printing cycle.

Refer to your Printer Mechanism Manual for a complete discussion of the details of mechanical operation.

3-3 THE PRINT COMMAND CIRCUIT

The print command circuit energizes the clutch solenoid when a print command pulse is received. The circuit may be triggered either by a positive or a negative pulse, 15 volts or more in amplitude and 10 microseconds or more in duration. The pulse may be supplied by an external pulse circuit or by momentarily shorting the NEGATIVE PRINT COMMAND input to the BIAS line. The PRINT COMMAND switch (S101) permits the print command signal to be selected from the external system connected to either J101 or J102. Refer to the schematic diagram Figure 4-5.

If a negative print command pulse is used, it is applied to the grid of V7B, where it is amplified and inverted. The positive output pulse is coupled to the grid of V8.

If a positive print command pulse is used, it is applied to the grid of V7A, cathode coupled to V7B, and amplified without inversion. Again a positive output is sent to the grid of V8.

The positive input pulse causes thyatron V8 to fire. Thyatron plate current energizes the clutch solenoid (L312) to begin the printing cycle. Cam-operated switch S302 removes B+ from the plate circuit and extinguishes the thyatron (V8) shortly after the cam shaft begins to turn. Before the end of the printing cycle, contacts on S302 close and supply B+ to the thyatron plate, readying it for the next print command.

3-4 POWER SUPPLY

The power supply uses a conventional bridge rectifier to supply +240 volts to all circuits. Refer to the schematic diagram, Figure 4-5. Note that the negative return is the COMMON line and is not grounded to the chassis. The silicon rectifiers are protected from overload by fuse F2.

The BIAS line is supplied with -43 volts from half-wave rectifier CR5. A resistive voltage divider, R3 and R4, supplies -20 volts fixed bias to thyatron V8.

SECTION IV MAINTENANCE

4-1 CABINET REMOVAL

Recorders which are mounted in a cabinet may be removed for servicing as follows:

- 1) Remove the four screws holding the back cover on the cabinet.
- 2) Remove the back cover.
- 3) Place the instrument on its back (front panel up).
- 4) Loosen the two large set screws in the bottom of the front panel bezel.
- 5) Lift the cabinet up and off the chassis.

Replace cabinet in reverse order.

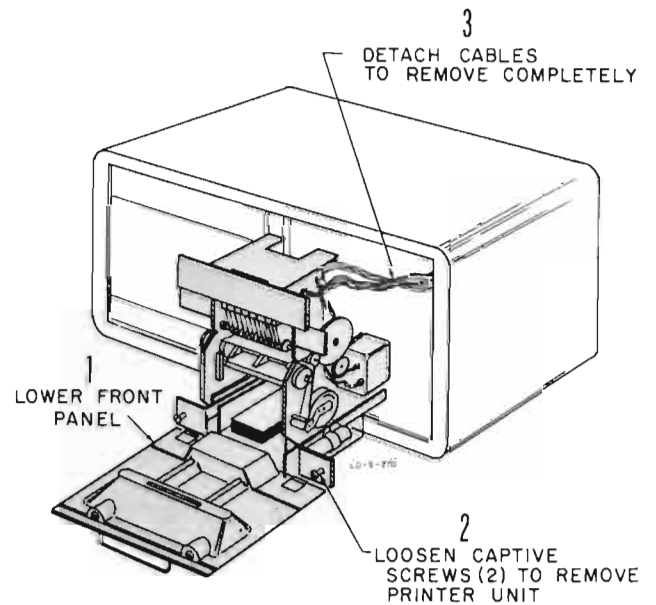


Figure 4-1. Printer Mechanism Removal

4-2 PRINTER MECHANISM REMOVAL

To remove the printer mechanism from the main recorder chassis, proceed as follows:

- 1) Open the hinged front panel.
- 2) Loosen the two captive screws located on the lower corners of the printer mechanism.
- 3) Pull the entire mechanism out through the front panel.
- 4) To completely remove the mechanism, (a) detach the connector mounting plate at the rear of the main recorder chassis (six screws), (b) unplug the 8-pin connector near the connector mounting plate, and (c) unplug the connector on the printer mechanism frame. See Figure 4-1.

4-3 PERIODIC MAINTENANCE

A. LIGHT CLEANING

The recorder operator should give the printer mechanism a light cleaning each time the paper is changed. Print wheels should be cleaned at least after every fourth pad of paper has been printed. Refer to paragraph 2-5, Operator Maintenance, for details.

WARNING

DO NOT USE SOLVENT TO CLEAN PRINT WHEELS. DO NOT USE A BRUSH TO CLEAN TYPE FACES. DAMAGE TO THE PRINT WHEEL MECHANISM MAY RESULT.

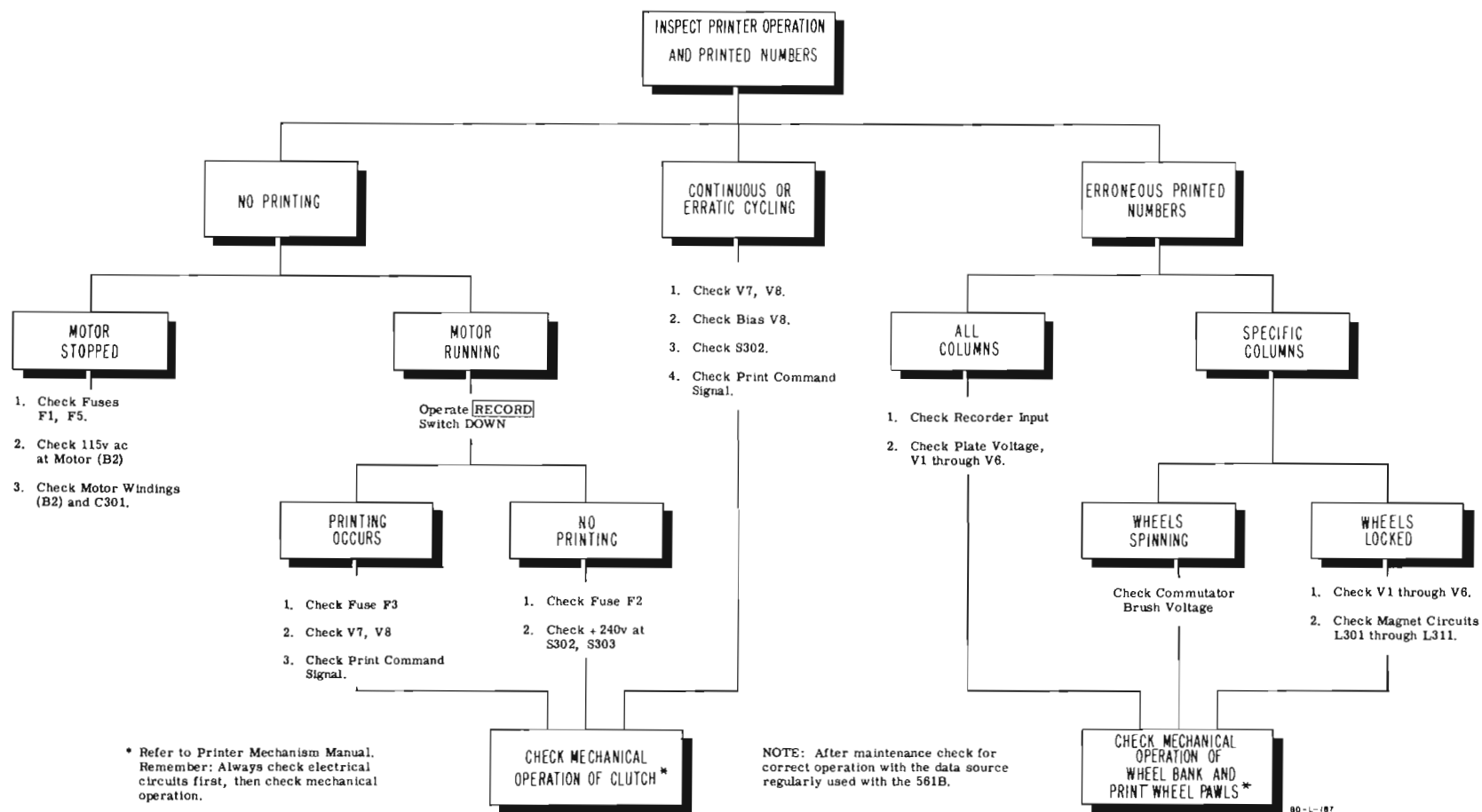


Figure 4-2. Trouble-Shooting Chart

B. LUBRICATION

The printer mechanism requires periodic cleaning and lubrication for dependable service. Lubricate after 100 hours of continuous operation or two months of intermittent operation. For complete lubrication instructions refer either to the instruction sheet included with your service kit or see your Printer Mechanism Manual.

C. COMPLETE CLEANING

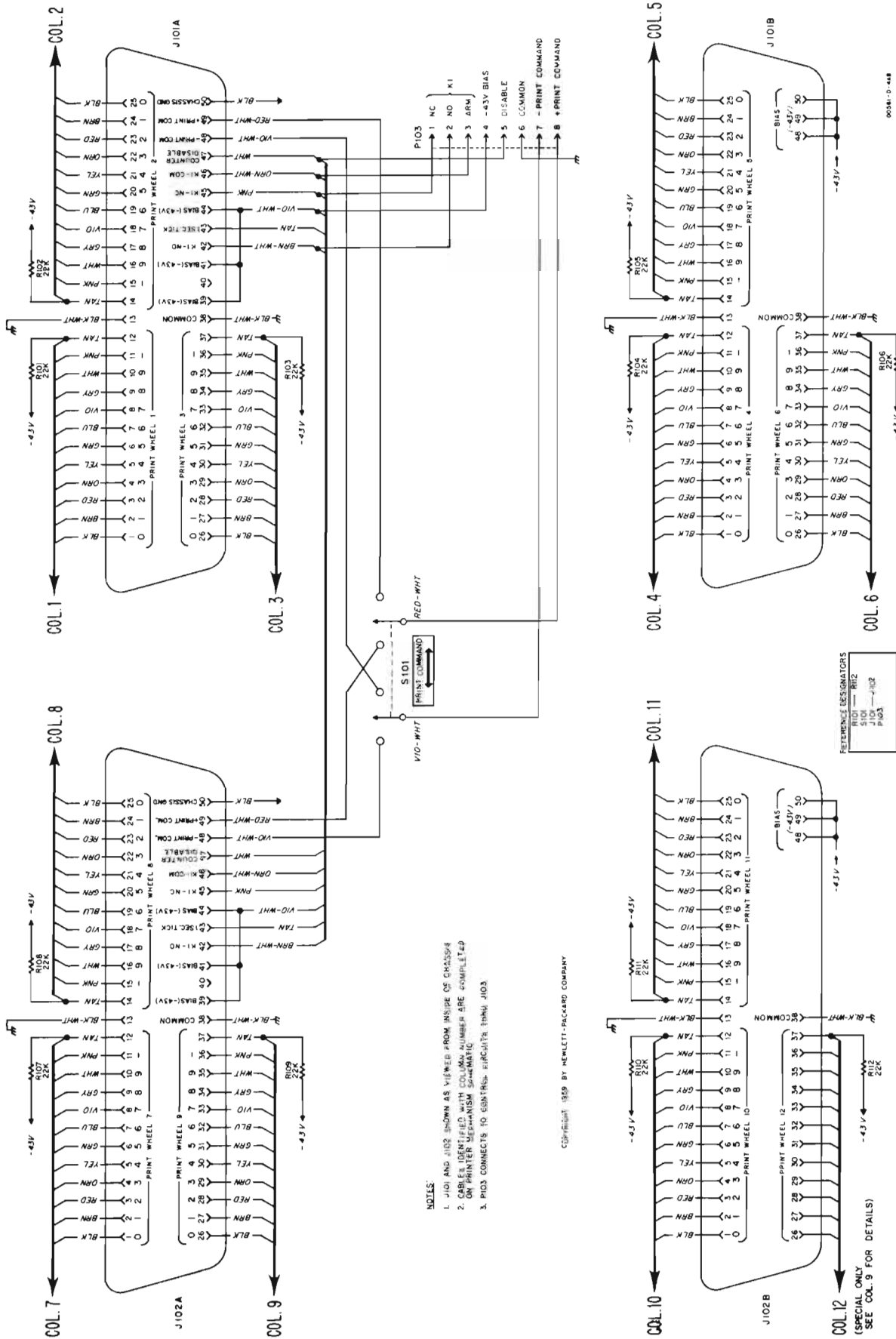
Normally, the printer mechanism will operate for a long period of time without any maintenance other than light cleaning and lubrication discussed above. However, to assure maximum reliability in critical applications the printer mechanism should be disassembled and thoroughly cleaned

after about 50 pads of paper have been printed. Refer to your Printer Mechanism Manual for complete instructions.

4-4 TROUBLE SHOOTING

Use the Trouble-Shooting Chart, Figure 4-2, to assist with trouble localization. Misprinting may be caused either by an electrical or a mechanical malfunction. Always check electrical circuits first. Refer to your Printer Mechanism Manual only after logical test procedures lead you to the printer mechanism.

Always check your recorder for correct operation after maintenance. Use the electronic counter or other data source which is regularly used with the recorder, for this check.

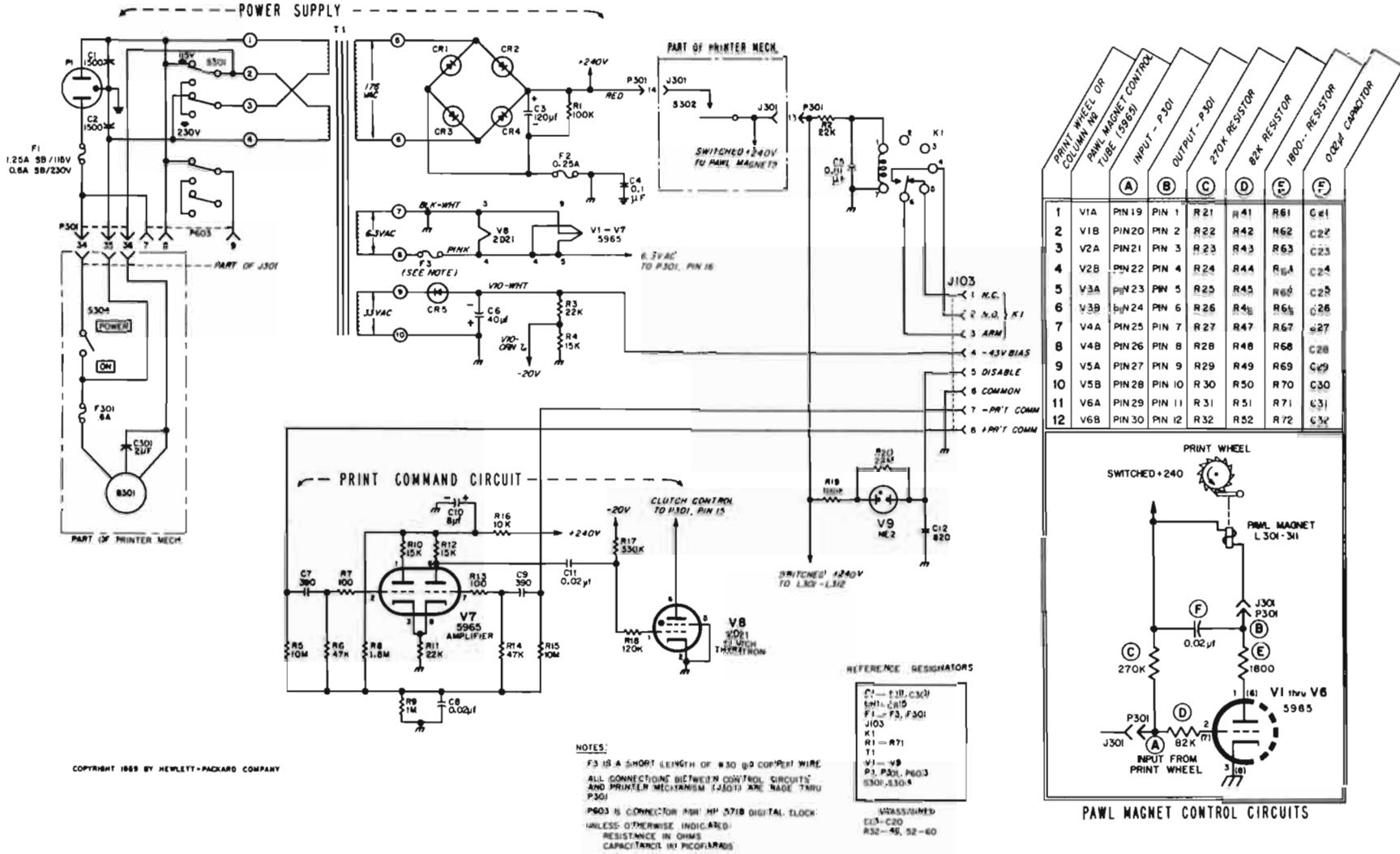


- NOTES:
1. J101 AND J102 SHOWN AS VIEWED FROM INSIDE OF CHASSIS
 2. CABLES IDENTIFIED WITH COLUMN NUMBER ARE COMPLETED ON PRINTER MECHANISM SCHEMATIC
 3. P103 CONNECTS TO CENTRAL CIRCUITS THROUGH J103

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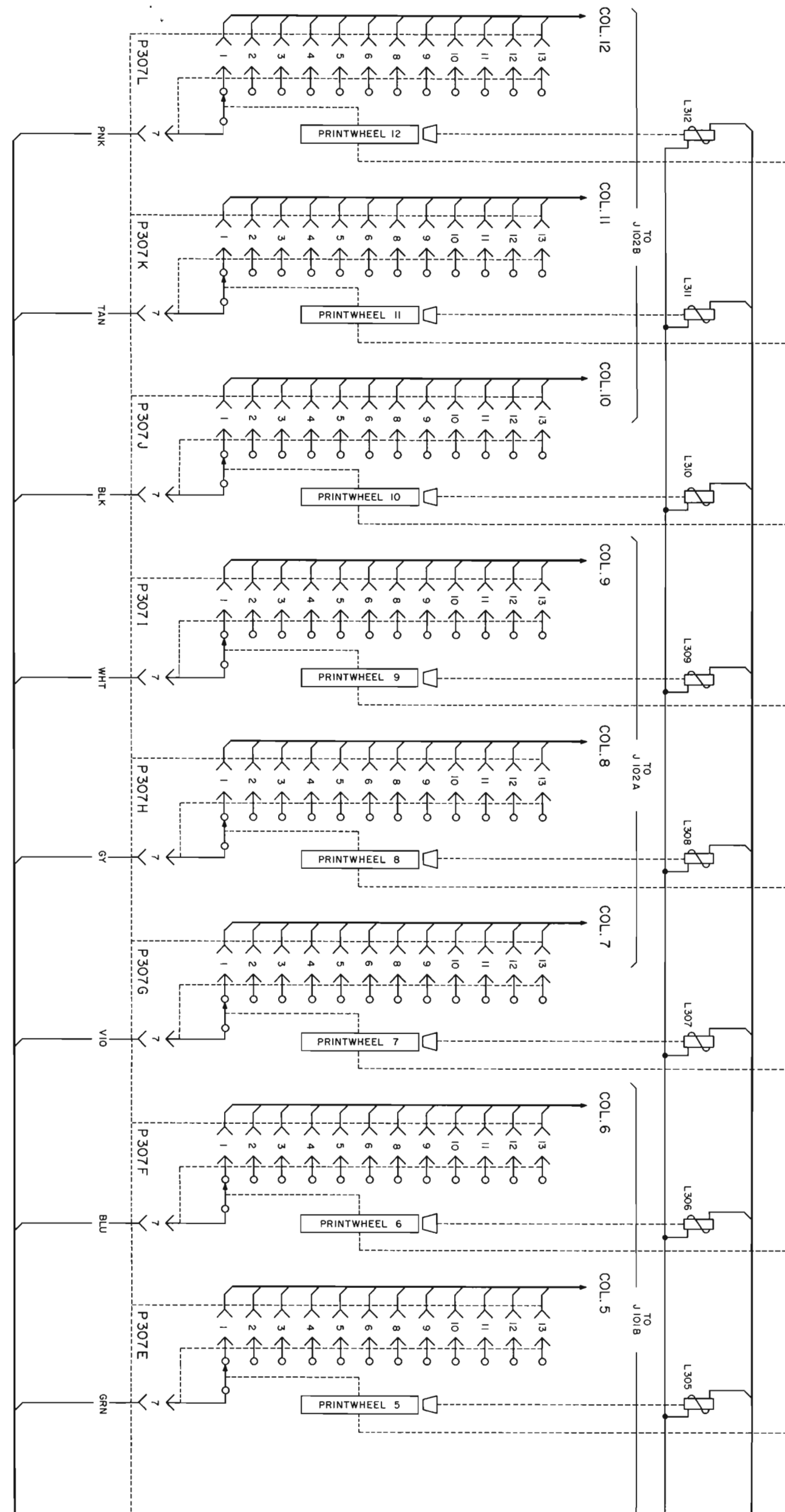
Figure 4-3. Connector Mounting Plate



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Figure 4-4. Control Circuits

COMM 9-348



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00561-0-2A

COL. 4

COL. 3

COL. 2

COL. 1

RED WIRES TO L 301 - L 312

PAWL MAGNETS

WHT

P 306

J 306

BRN

ORN

GRN

VIO

WHT

TAN

RED-GRN

VIO-WHT

RED

PNK

BLK-WHT

BLK

PAWL MAGNETS

COMMUTATOR BRUSHES

J 301

J 305

P 305

NC

BRN

ORN

GRN

VIO

WHT

TAN

NC

NC

VIO-ORN

GY-ORN

GY-WHT

NC

BRN

ORN

GRN

VIO

WHT

TAN

RED

YEL

BLU

GY

BLK

PNK

P 307D

P 307C

P 307B

P 307A

YEL

ORN

RED

BRN

L 304

L 303

L 302

L 301

TO J 101A

PRINTWHEEL 4

PRINTWHEEL 3

PRINTWHEEL 2

PRINTWHEEL 1

GEAR

CLUTCH

GEAR

B 301

CAM

S 302

R 307

R 306

L 313 (CLUTCH SOLENOID)

S 303 RECORD

DS 302 (RED)

OFF

OFF

DS 301 (WHT)

R 301

R 305

R 305

R 305

R 305

R 305

R 305

R 305

R 305

R 305

R 305

R 305

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COMMUTATOR CONNECTOR P 307

PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13
SYMBOL	0	2	4	6	8	BLANK	BRUSH CONNECTION	MINUS SIGN	9	7	5	3	1
WIRE COLOR	BLK	RED	YEL	BLU	GY	TAN	SEE SCHEMATIC	PNK	WHT	VIO	GRN	ORN	BRN

REFERENCE DESIGNATIONS

- B 301
- C 301 - 309
- CR 301
- DS 301, 302
- F 301
- J 301, 305, 306
- L 301 - 313
- P 305 - 307
- R 301 - 307
- S 302 - 304

UNASSIGNED:
C 302 - 304
R 302 - 304

NOTES


1. J 301 CONNECTS TO CONTROL CIRCUITS THRU P 301 (NOT SHOWN)
2. ∇ INDICATES SUPPLY RETURN (FLOATING GROUND)
3. \equiv INDICATES FRAME CONNECTION (POWER-LINE GROUND)

SECTION V TABLE OF REPLACEABLE PARTS

NOTE

Standard components have been used in this instrument, whenever possible. Special components may be obtained from your local Hewlett-Packard representative or from the factory.

When ordering parts always include:

1.  Stock Number.
2. Complete description of part including circuit reference.
3. Model number and serial number of instrument.
4. If part is not listed, give complete description, function and location of part.

Corrections to the Table of Replaceable Parts are listed on an Instruction Manual Change sheet at the front of this manual.

TABLE OF REPLACEABLE PARTS

CIRCUIT REF.	DESCRIPTION, MFR. * & MFR. DESIGNATION	Ⓢ STOCK NO.	TQ			
B1 thru B300	Not assigned					
B301 C1, 2	Part of Printer Mechanism Capacitor: fixed, paper, .0015 μ f \pm 10%, 600 vdcw	CC* 0160-0012	2			
C3	Capacitor: fixed, electrolytic, 120 μ f, 350 vdcw	CC* 0180-0042	1			
C4	Capacitor: fixed, paper, 0.1 μ f \pm 10% 1000 vdcw	CC* 0169-0001	1			
C5	Capacitor: fixed, ceramic .01 μ f \pm 20%, 1000 vdcw	CC* 0150-0012	6			
C6	Capacitor: fixed, electrolytic, 40 μ f, 450 vdcw	Electromotive Mfg. Co. 0180-0024	1			
C7	Capacitor: fixed, mica, 390 pf \pm 5%, 300 vdcw	V* 0140-0037	2			
C8	Capacitor: fixed, ceramic .02 μ f \pm 10%, 600 vdcw	Radio Materials Corp. 0150-0024	14			
C9	Same as C7					
C10	Capacitor: fixed, electrolytic, 8 μ f, 350 vdcw	CC* 0180-0048	1			
C11	Same as C8					
C12	Capacitor: fixed, mica, 820 pf \pm 10%, 500 vdcw	V* 0140-0010	2			
C13 thru C20	Not assigned					
C21 thru C32	Same as C8					
C33 thru C300	Not assigned					
C301	Capacitor: fixed, paper, 2 μ f \pm 10%, 600 vdcw	CC* 0160-0101	1			
C302 thru C304	Not assigned					
C305	Same as C5					

* See "List of Manufacturers Code Letters For Replaceable Parts Table".

TQ - Total quantity used in the instrument.

TABLE OF REPLACEABLE PARTS

CIRCUIT REF.	DESCRIPTION, MFR. * & MFR. DESIGNATION	Ⓟ STOCK NO.	TQ			
C306	Capacitor: fixed, mica, 470 pf $\pm 10\%$, 500 vdcw	V* 0140-0027	2			
C307	Same as C5					
C308	Same as C306					
C309	Same as C12					
CR1 thru CR5	Rectifier, silicon: 400V PIV, 500 ma	BV* 1901-0028	5			
DS1 thru DS300	Not assigned					
DS301,302	Lamp, 6V, GE #12	O* 2140-0012	2			
F1	Fuse, cartridge: for 115V operation: 1.25 amp, 125V, slow blow	E* 2110-0021	1			
	for 230V operation: .6 amp, 250V, slow blow	2110-0016				
F2	Fuse, cartridge: 1/4 amp, 250V	T* 2110-0004	1			
F3	Fuse: #30 gauge copper wire		1			
F4 thru F300	Not assigned					
F301	Fuse, cartridge: slow blow, .6 amp 125V	T* 2110-0016	1			
J1 thru J100	Not assigned					
J101, 102	Connector, female: 50 pin miniature	HH* 1251-0101	4			
J103	Connector, female: 8 pin	H* 1251-0043	1			
J104 thru J300	Not assigned					
J301	Connector, female: 36 pin	HH* 1251-0085	1			
J302 thru J304	Not assigned					
J305, 306	Connector, female: 13 pin Continental Connector Co.	1251-0098	1			
K1	Relay: SPDT	CT* 0490-0010	1			
L1 thru L300	Not assigned					
L301 thru L312	Part of Printer Mechanism	9161-0008	12			

* See "List of Manufacturers Code Letters For Replaceable Parts Table".

TQ - Total quantity used in the instrument.

TABLE OF REPLACEABLE PARTS

CIRCUIT REF.	DESCRIPTION, MFR. * & MFR. DESIGNATION	Ⓢ STOCK NO.	TQ			
L313	Part of Printer Mechanism	0491-0004	1			
P1	Power cable, with NEMA plug Elec. Cords Co.	8120-0015	1			
P2 thru P102	Not assigned					
P103	Connector, male: 8 pin H*	1251-0133	1			
P104 thru P300	Not assigned					
P301	Connector, male: 36 pin HH*	1251-0084	1			
P302 thru P304	Not assigned					
P305, 306	Connector, male: 13 pin, printed circuit HP*	561B-65A	2			
P307	Same as J305, 306					
R1	Resistor: fixed, composition, 100,000 ohms $\pm 10\%$, 1 W B*	0690-1041	1			
R2	Resistor: fixed, composition, 22,000 ohms $\pm 10\%$, 2 W B*	0693-2231	1			
R3	Resistor: fixed, composition, 22,000 ohms $\pm 10\%$, 1/2 W B*	0687-2231	13			
R4	Resistor: fixed, composition, 15,000 ohms $\pm 10\%$, 1/2 W B*	0687-1531	1			
R5	Resistor: fixed, composition, 10 megohms $\pm 10\%$, 1/2 W B*	0687-1061	2			
R6	Resistor: fixed, composition, 47,000 ohms $\pm 5\%$, 1/2 W B*	0686-4735	2			
R7	Resistor: fixed, composition, 100 ohms $\pm 10\%$, 1/2 W B*	0687-1011	2			
R8	Resistor: fixed, composition, 1.8 megohms $\pm 10\%$, 1/2 W B*	0687-1851	1			
R9	Resistor: fixed, composition, 1 megohm $\pm 10\%$, 1/2 W B*	0687-1051	1			
R10	Resistor: fixed, composition, 15,000 ohms $\pm 10\%$, 1 W B*	0690-1531	2			
R11	Resistor: fixed, composition, 22,000 ohms $\pm 10\%$, 1 W B*	0690-2231	1			

* See "List of Manufacturers Code Letters For Replaceable Parts Table".

TQ - Total quantity used in the instrument.

TABLE OF REPLACEABLE PARTS

CIRCUIT REF.	DESCRIPTION, MFR. * & MFR. DESIGNATION	hp STOCK NO.	TQ			
R12	Same as R10					
R13	Same as R7					
R14	Same as R6					
R15	Same as R5					
R16	Resistor: fixed, composition, 10,000 ohms $\pm 10\%$, 1 W	B* 0690-1031	1			
R17	Resistor: fixed, composition, 330,000 ohms $\pm 10\%$, 1/2 W	B* 0687-3341	1			
R18	Resistor: fixed, composition, 120,000 ohms $\pm 10\%$, 1/2 W	B* 0687-1241	1			
R19	Resistor: fixed, composition, 100,000 ohms $\pm 10\%$, 1/2 W	B* 0687-1041	1			
R20	Resistor: fixed, composition, 22 megohms $\pm 10\%$, 1/2 W	B* 0687-2261	1			
R21 thru R32	Resistor: fixed, composition, 270,000 ohms $\pm 10\%$, 1/2 W	B* 0687-2741	12			
R33 thru R40	Not assigned					
R41 thru R52	Resistor: fixed, composition, 82,000 ohms $\pm 10\%$, 1/2 W	B* 0687-8231	11			
R53 thru R60	Not assigned					
R61 thru R72	Resistor: fixed, composition, 1800 ohms $\pm 10\%$, 1 W	B* 0690-1821	11			
R73 thru R100	Not assigned					
R101 thru R112	Same as R3					
R113 thru R300	Not assigned					
R301	Resistor: fixed, composition, 10,000 ohms $\pm 10\%$, 1 W	B* 0690-1031	1			

* See "List of Manufacturers Code Letters For Replaceable Parts Table".

TQ - Total quantity used in the instrument.

TABLE OF REPLACEABLE PARTS

CIRCUIT REF.	DESCRIPTION, MFR. * & MFR. DESIGNATION	hp STOCK NO.	TQ			
R302 thru R304	Not assigned					
R305	Resistor: fixed, composition, 120 ohms $\pm 10\%$, 1/2 W	B* 0687-1211	1			
R306	Resistor: fixed, composition, 100 ohms $\pm 10\%$, 1 W	B* 0690-1011	1			
R307	Resistor: fixed, composition, 33 ohms $\pm 10\%$, 1W	B* 0690-3301	1			
S101	Switch, Slide, DPDT	3101-0011	1			
S102 thru S300	Not assigned					
S301	Switch, Slide, 4 pole, double throw	AT* 3101-0034	1			
S302	Switch, SPDT, cam-operated, make-before-break	KK* 3101-0013	1			
S303	Switch, toggle	CR* 3101-0015	1			
S304	Switch, toggle: SPST, 125V, 15 amp	CR* 3101-0030	1			
T1	Transformer, power	HP* 9100-0111	1			
V1 thru V7	Tube, electron: 5965	ZZ* 1932-0009	7			
V8	Tube, electron: 2D21	ZZ* 1941-0005	1			
V9	Lamp, neon: type NE2	O* 2140-0008	1			
<u>NOTICE</u>						
REFER TO PRINTER MECHANISM MANUAL FOR PARTS LOCATED ON PRINTER MECHANISM						
<u>Accessories:</u>						
	Paper tape, folded	9281-0018	1			
	Inked ribbon	9283-0002	1			
	Service kit - with type cleaner, moly oil, light machine oil, instructions	560A-95N				
	Cable: 100-conductor, 6 ft. long, connects 561B with -hp- equipment providing 10-line code.	561B-16A				
	Connector: 100 pin, mates with J101 or J102 on rear of chassis (same as connectors on 561B-16A cable)	561B-95D				
	Digital Recorder Kits for operating 561B from the following electronic counters:					
	Models 521D, 521E	521D-95B				
	Model 523C	523C-95B				
	Model 524C	524C-95B				

* See "List of Manufacturers Code Letters For Replaceable Parts Table".

TQ - Total quantity used in the instrument.

LIST OF MANUFACTURERS CODES

CODE LETTER	MANUFACTURER	ADDRESS	CODE LETTER	MANUFACTURER	ADDRESS
A	Aerovox Corp.	New Bedford, Mass.	AK	Hammerlund Mfg. Co., Inc.	New York 1, N. Y.
B	Allen-Bradley Co.	Milwaukee 4, Wis.	AL	Industrial Condenser Corp.	Chicago 18, Ill.
C	Amperite Co.	New York, N. Y.	AM	Insuline Corp. of America	Manchester, N. H.
D	Arrow, Hart & Hegeman	Hartford, Conn.	AN	Jennings Radio Mfg. Corp.	San Jose, Calif.
E	Bussman Manufacturing Co.	St. Louis, Mo.	AO	E. F. Johnson Co.	Waseca, Minn.
F	Carborundum Co.	Niagara Falls, N. Y.	AP	Lenz Electric Mfg. Co.	Chicago 47, Ill.
G	Centralab	Milwaukee 1, Wis.	AQ	Micro-Switch	Freeport, Ill.
H	Cinch-Jones Mfg. Co.	Chicago 24, Ill.	AR	Mechanical Industries Prod. Co.	Akron 8, Ohio
HP	Hewlett-Packard Co.	Palo Alto, Calif.	AS	Model Eng. & Mfg., Inc.	Huntington, Ind.
I	Clarostat Mfg. Co.	Dover, N. H.	AT	The Muter Co.	Chicago 5, Ill.
J	Cornell Dubilier Elec. Co.	South Plainfield, N. J.	AU	Ohmite Mfg. Co.	Skokie, Ill.
K	Hi-Q Division of Aerovox	Olean, N. Y.	AV	Resistance Products Co.	Harrisburg, Pa.
L	Erie Resistor Corp.	Erie 6, Pa.	AW	Radio Condenser Co.	Camden 3, N. J.
M	Fed. Telephone & Radio Corp.	Clifton, N. J.	AX	Shallcross Manufacturing Co.	Collingdale, Pa.
N	General Electric Co.	Schenectady 5, N. Y.	AY	Solar Manufacturing Co.	Los Angeles 58, Calif.
O	General Electric Supply Corp.	San Francisco, Calif.	AZ	Sealectro Corp.	New Rochelle, N. Y.
P	Girard-Hopkins	Oakland, Calif.	BA	Spencer Thermostat	Attleboro, Mass.
Q	Industrial Products Co.	Danbury, Conn.	BC	Stevens Manufacturing Co.	Mansfield, Ohio
R	International Resistance Co.	Philadelphia 8, Pa.	BD	Torrington Manufacturing Co.	Van Nuys, Calif.
S	Lectrohms Inc.	Chicago 20, Ill.	BE	Vector Electronic Co.	Los Angeles 65, Calif.
T	Littlefuse Inc.	Des Plaines, Ill.	BF	Weston Electrical Inst. Corp.	Newark 5, N. J.
U	Maguire Industries Inc.	Greenwich, Conn.	BG	Advance Electric & Relay Co.	Burbank, Calif.
V	Micamold Radio Corp.	Brooklyn 37, N. Y.	BH	E. I. DuPont	San Francisco, Calif.
W	Oak Manufacturing Co.	Chicago 10, Ill.	BI	Electronics Tube Corp.	Philadelphia 18, Pa.
X	P. R. Mallory Co., Inc.	Indianapolis, Ind.	BJ	Aircraft Radio Corp.	Boonton, N. J.
Y	Radio Corp. of America	Harrison, N. J.	BK	Allied Control Co., Inc.	New York 21, N. Y.
Z	Sangamo Electric Co.	Marion, Ill.	BL	Augat Brothers, Inc.	Attleboro, Mass.
AA	Sarkes Tarzian	Bloomington, Ind.	BM	Carter Radio Division	Chicago, Ill.
BB	Signal Indicator Co.	Brooklyn 37, N. Y.	BN	CBS Hytron Radio & Electric	Danvers, Mass.
CC	Sprague Electric Co.	North Adams, Mass.	BO	Chicago Telephone Supply	Elkhart, Ind.
DD	Stackpole Carbon Co.	St. Marys, Pa.	BP	Henry L. Crowley Co., Inc.	West Orange, N. J.
EE	Sylvania Electric Products Co.	Warren, Pa.	BQ	Curtiss-Wright Corp.	Carlstadt, N. J.
FF	Western Electric Co.	New York 5, N. Y.	BR	Allen B. DuMont Labs	Clifton, N. J.
GG	Wilkor Products, Inc.	Cleveland, Ohio	BS	Excel Transformer Co.	Oakland, Calif.
HH	Amphenol	Chicago 50, Ill.	BT	General Radio Co.	Cambridge 39, Mass.
II	Dial Light Co. of America	Brooklyn 37, N. Y.	BU	Hughes Aircraft Co.	Culver City, Calif.
JJ	Leecraft Manufacturing Co.	New York, N. Y.	BV	International Rectifier Corp.	El Segundo, Calif.
KK	Switchcraft, Inc.	Chicago 22, Ill.	BW	James Knights Co.	Sandwich, Ill.
LL	Gremor Manufacturing Co.	Wakefield, Mass.	BX	Mueller Electric Co.	Cleveland, Ohio
MM	Carad Corp.	Redwood City, Calif.	BY	Precision Thermometer & Inst. Co.	Philadelphia 30, Pa.
NN	Electra Manufacturing Co.	Kansas City, Mo.	BZ	Radio Essentials Inc.	Mt. Vernon, N. Y.
OO	Acro Manufacturing Co.	Columbus 16, Ohio	CA	Raytheon Manufacturing Co.	Newton, Mass.
PP	Alliance Manufacturing Co.	Alliance, Ohio	CB	Tung-Sol Lamp Works, Inc.	Newark 4, N. J.
QQ	Arco Electronics, Inc.	New York 13, N. Y.	CD	Varian Associates	Palo Alto, Calif.
RR	Astron Corp.	East Newark, N. J.	CE	Victory Engineering Corp.	Union, N. J.
SS	Axel Brothers Inc.	Long Island City, N. Y.	CF	Weckesser Co.	Chicago 30, Ill.
TT	Belden Manufacturing Co.	Chicago 44, Ill.	CG	Wilco Corporation	Indianapolis, Ind.
UU	Bird Electronics Corp.	Cleveland 14, Ohio	CH	Winchester Electronics, Inc.	Santa Monica, Calif.
VV	Barber Colman Co.	Rockford, Ill.	CI	Malco Tool & Die	Los Angeles 42, Calif.
WW	Bud Radio Inc.	Cleveland 3, Ohio	CJ	Oxford Electric Corp.	Chicago 15, Ill.
XX	Allen D. Cardwell Mfg. Co.	Plainville, Conn.	CK	Camloc-Fastener Corp.	Paramus, N. J.
YY	Cinema Engineering Co.	Burbank, Calif.	CL	George K. Garrett	Philadelphia 34, Pa.
ZZ	Any brand tube meeting RETMA standards.		CM	Union Switch & Signal	Swissvale, Pa.
AB	Corning Glass Works	Corning, N. Y.	CN	Radio Receptor	New York 11, N. Y.
AC	Dale Products, Inc.	Columbus, Neb.	CO	Automatic & Precision Mfg. Co.	Yonkers, N. Y.
AD	The Drake Mfg. Co.	Chicago 22, Ill.	CP	Bassick Co.	Bridgeport 2, Conn.
AE	Elco Corp.	Philadelphia 24, Pa.	CQ	Birnbach Radio Co.	New York 13, N. Y.
AF	Hugh H. Eby Co.	Philadelphia 44, Pa.	CR	Fischer Specialties	Cincinnati 6, Ohio
AG	Thomas A. Edison, Inc.	West Orange, N. J.	CS	Telefunken (c/o MVM, Inc.)	New York, N. Y.
AH	Fansteel Metallurgical Corp.	North Chicago, Ill.	CT	Potter-Brumfield Co.	Princeton, Ind.
AI	General Ceramics & Steatite Corp.	Keasbey, N. J.	CU	Cannon Electric Co.	Los Angeles, Calif.
AJ	The Gudeman Co.	Sunnyvale, Calif.	CV	Dynac, Inc.	Palo Alto, Calif.
			CW	Good-All Electric Mfg. Co.	Ogallala, Nebr.

APPENDIX I - MANUAL CHANGES

This manual applies directly to ϕ Model 561B/BR Digital Recorders with serial number prefix 334. This manual with the following changes also applies to older Recorders with serial prefix unbr 241 or 038. To adapt this manual to these older Recorders, make changes as follows:

Serial Number Prefix	Make Change
241	1
038	2

CHANGE 1: Section IV, Page 5, Figure 4-4 (Control Circuits),
(241) Revise diagram as shown in Figure 1 below.

Section V, Page 6, Table of Replaceable Parts,
Change S301 to read:
"S301, Switch, toggle, DPDT, ϕ Stock No. 3101-0033".

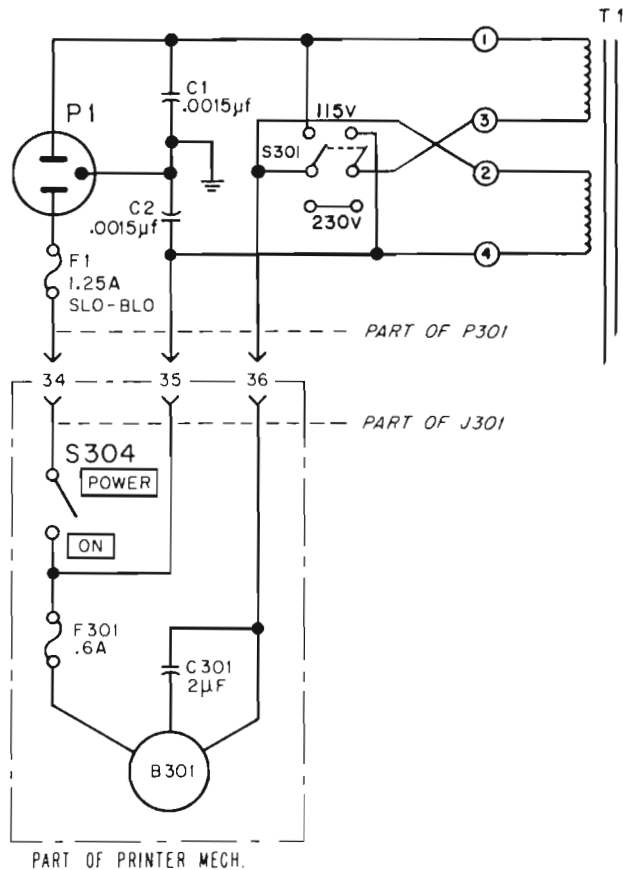


Figure 1. Changes for prefix 241

CHANGE 2:
(038)

Section IV, Page 5, Figure 4-4,(Control Circuits),
Revise diagram as shown in Figure 2 below.

Section V, Page 6, Table of Replaceable Parts,
Delete S301.

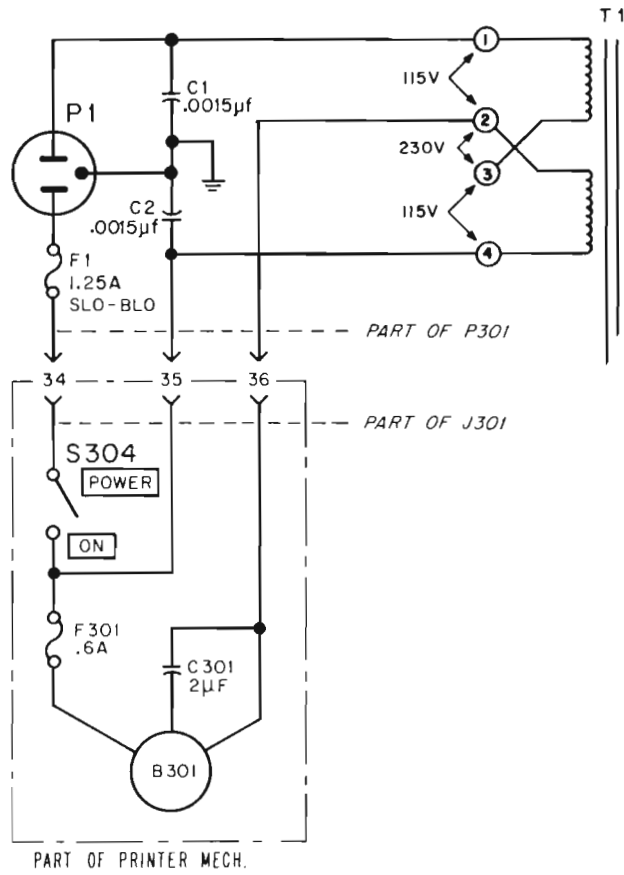


Figure 2. Changes for prefix 038



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