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Customer Engineering Division

Model 61 Matrix Printer

Maintenance
Preliminary Manual

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Maintenance Preliminary Manual

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SECTION 1
INTRODUCTION

1.1 SCOPE

This is the first preliminary manual describing the Model 61 Medium Speed Printer manufactured by Wang Laboratories, Inc.

General information, detailed theory of operation and maintenance routines are included to enable Customer Engineering personnel to maintain the printer.

The manual is arranged in the following manner:

SECTION 1 - INTRODUCTION: Provides the reader with the scope of this manual and a general description of the printer.

SECTION 2 - INSTALLATION: Contains unpacking and installation instructions for the printer.

SECTION 3 - OPERATION: Describes the function of all operator controls and indicators including the basic 2200 CPU operations for outputting data.

SECTION 4 - THEORY OF OPERATION: Contains descriptions of the mechanical assemblies and the printed circuit board electronics.

SECTION 5 - ADJUSTMENTS, REMOVAL AND REPLACEMENT PROCEDURES.

SECTION 6 - MAINTENANCE: Includes diagnostics, preventive maintenance and troubleshooting tables.

SECTION 7 - ELECTRICAL SCHEMATICS: Contains a complete set of schematics, wiring and interconnection diagrams. (Information to follow.)

SECTION 8 - MECHANICAL ASSEMBLY DRAWINGS: Allows the user to identify any part of the printer. (Information to follow.)

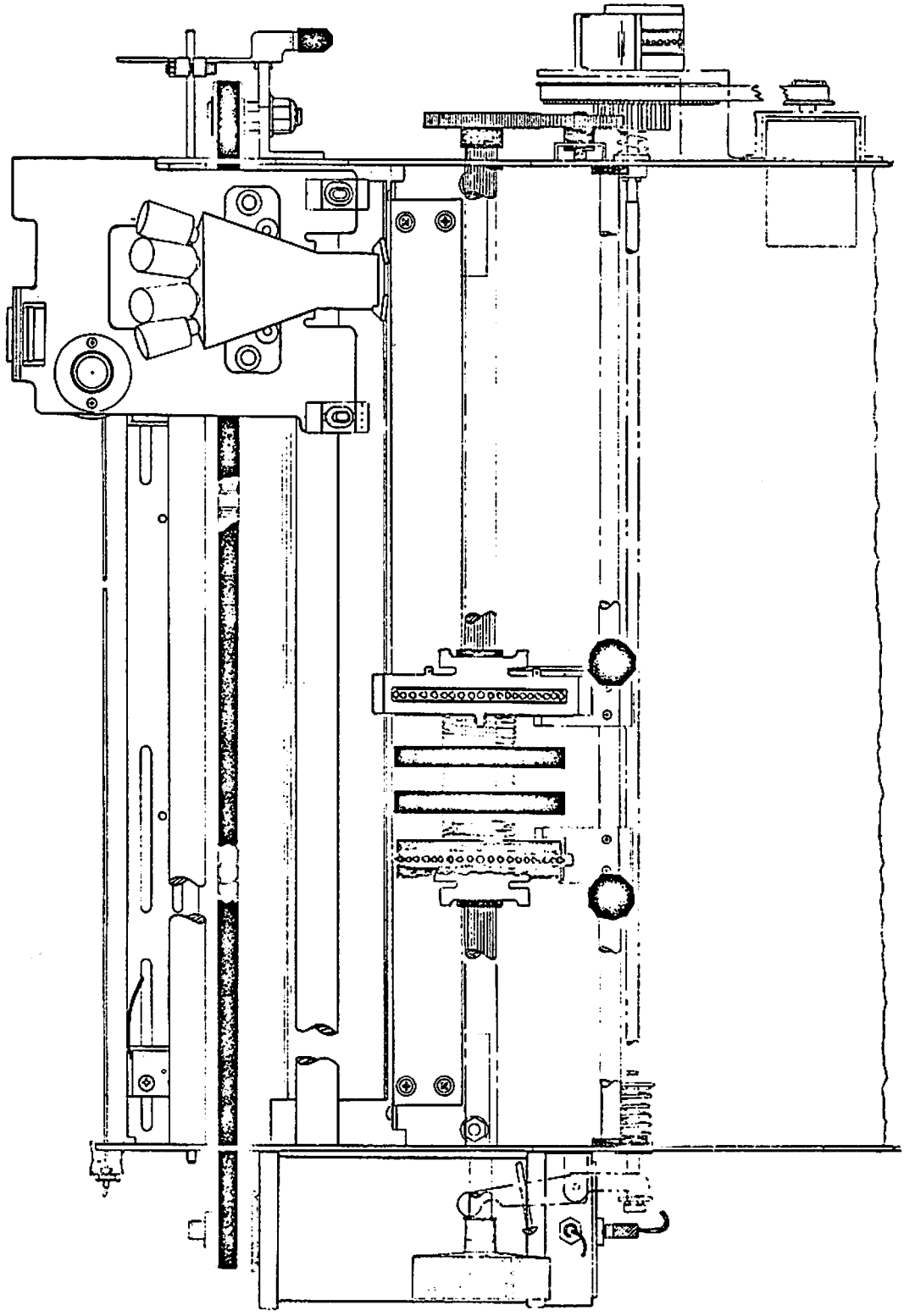


FIGURE 1-1 MODEL 61 PRINTER

1.2 DESCRIPTION (SEE FIGURE 1-1)

The Model 61 printer (which is marketed as a 2231W) uses a matrix impact printing technique that generates printed characters in matrix form. The characters are composed by a 7w x 9h matrix and print lines up to 112 characters long using a 96 character set. The printer operates at a rate of 120 characters per second and can achieve a rate of 40 to 250 lines per minute dependent upon line length. Characters are printed 6 lines and 10 characters to the inch (2.4 lines/cm and 4.3 characters/cm). An expand feature doubles the width of the characters (14w x 9h matrix).

The printer contains a print head and carrier assembly, an inking medium, a paper movement mechanism, a vertical format unit, and control electronics.

1.2.1 *PRINT HEAD AND CARRIAGE*

Printing is accomplished by firing selected solenoids on the print head as the carriage moves from left to right across the paper. When a solenoid is fired, the attached print wire is extended impacting against the ribbon and paper printing a dot. Two magnetic reluctance sensors and a timing disk provide electrical signals which are used to control print head motion and print timing.

1.2.2 *INKING*

The Model 61 printer contains a mobius loop fabric ribbon cartridge. As the print head moves from left to right the ribbon is advanced and inverted inside the ribbon cartridge by a pulley mounted under the carriage. The pulley mechanism disengages from the ribbon cartridge as the carriage returns to the left side of the paper.

1.2.3 *PAPER MOVEMENT*

Continuous-form paper, of widths from 4 to 12.8 inches (10.2 to 32.4 cm), can be used in the printer as the distance between the pin-feed unit is continuously adjustable.

A stepping motor, geared to the pinfeed units, is used to advance the paper.

The stepping motor is activated by either a carriage return or by program control. The stepping motor may advance the paper one line or the vertical format unit may be used to halt the stepping motor at the end of a formatted distance of paper advancement.

1.2.4 *VERTICAL FORMAT UNIT (VFU)*

The vertical format unit is a punched tape reader which uses a punched paper tape to automatically control paper movement. Under program control or manual operation of control panel switches, the VFU will advance the paper to the next *vertical tab* stop or *top of form* stop. The tape and paper are advanced simultaneously by the stepping motor.

1.2.5 *CONTROL ELECTRONICS*

The control electronics are located on printed circuit boards in the rear of the printer. These boards contain a line buffer, function decoder logic, character generator, and power driver circuits.

1.3 MODEL 61 TECHNICAL CHARACTERISTICS

Printing Rate:	Characters/Second - 120 Lines/Minute - 40-250 LPM
Data Input:	(Language) USASCII
Programmable Control Codes:	See paragraph 3.3.8 or Appendix B
Character Font:	7w x 9h Dot Matrix Nominal (dots not in adjacent columns of the same row)
Paper Dimensions and Specs:	See Appendix A

Dimensions:	Height: 10 inches (26 cm) Width: 24 inches (61 cm) Depth: 18 inches (46 cm)
Operating Temperature:	50° to 90°F (10° to 32°C)
Humidity:	40 to 80% Relative, non-condensing
Power Source:	50/60 cycle ±1 Hz 140 WATTS 115 or 230 VAC ±10% (INTERNAL SELECTION) (SEE SECTION 6.5.1)
Weight (Approx.):	68 lbs. (38.4 kg)
Storage Temperature:	-40° to 130°F (-40 to 55°C)
Storage Humidity:	0 to 90% Relative, non-condensing

SECTION 2
INSTALLATION

2.1 SITE CONSIDERATIONS

If the Model 61 printer is to be used without the stand, it must be placed on a table with the front edge of the printer overhanging and paralleled to the front edge of the table. The ventilation fan intake screen must not be obstructed by any objects which could reduce normal airflow. For environmental temperature, humidity, etc., see Technical Characteristics in paragraph 1.3.

2.2 MATRIX PRINTER STAND (OPTIONAL)

The Model 61 Matrix Printer has paper feed guides which permit the paper to be fed to the printer from the bottom or the front. The drawing for this stand is included in the mechanical drawing set in Section 8 of this manual. See Drawing Number for assembly purposes.

2.3 UNPACKING AND PACKING PROCEDURES

2.3.1 *UNPACKING (See Figure 2-1)*

1) Open top of box and remove cardboard spacer placed around printer.

2) Remove jiffy bag from carton.

3) Remove printer from box.

4) Remove four foam blocks from corners of plywood base.

5) Place the printer on a table surface and remove plastic covering from the printer.

6) Extend one corner of the printer over the edge of the table. Remove the shipping bolt recessed in that corner of the plywood. Repeat for the remaining three corners.

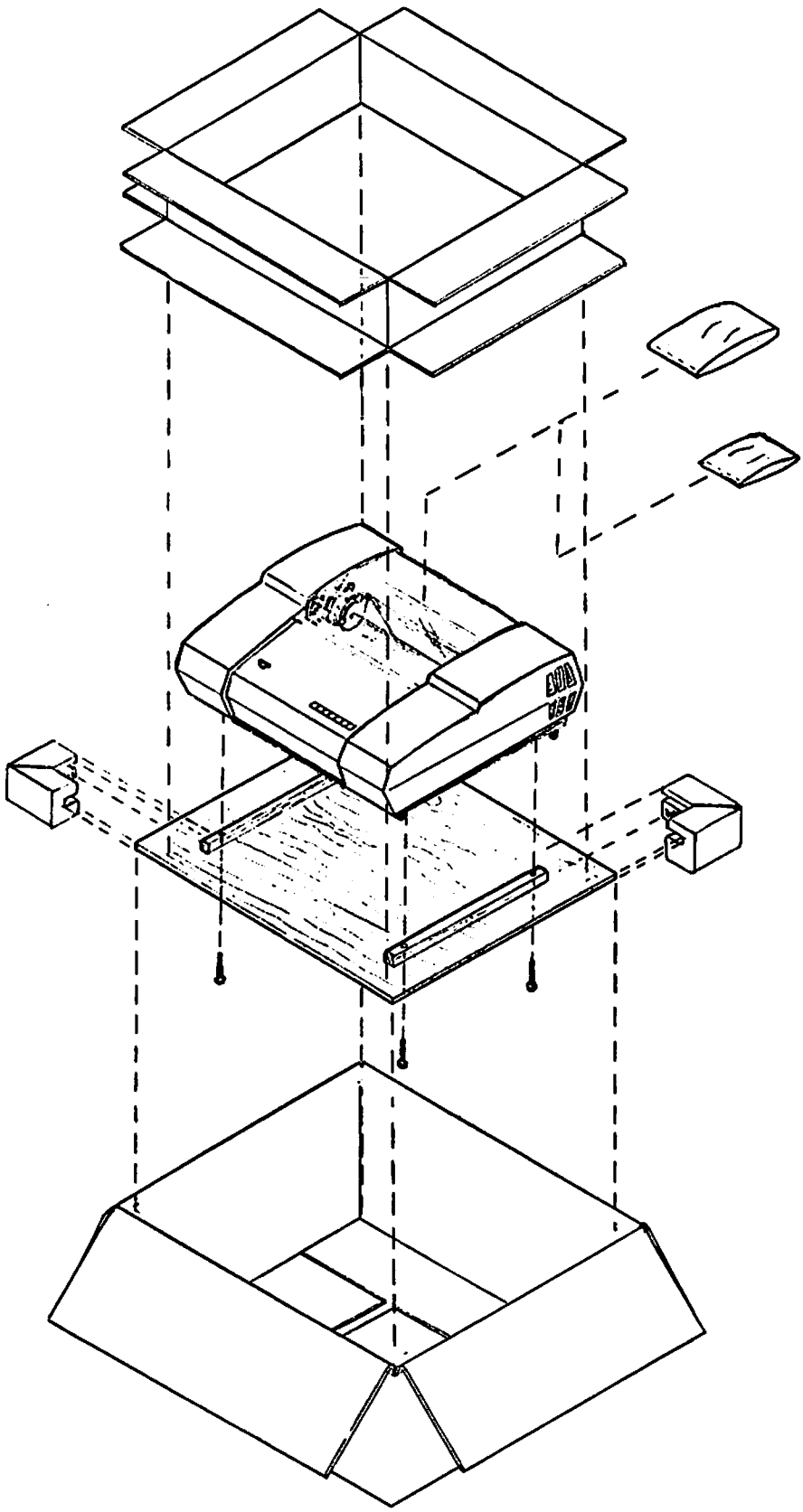


FIGURE 2-1 UNPACKING THE PRINTER

7) Slide the printer off the plywood base onto the table.

8) Remove the tape securing the printer cover.

9) Lift the cover (front lifts upward toward the rear) to remove the tape from the following areas: (Refer to Figure 2-2).

   a. Paper Tape Reader "A"
   b. Left and Right Paper Feed Units "B".
   c. Print Head "C".

10) Remove I/O cable & ribbon cartridge from jiffy bag. Install ribbon cartridge (Section 3.2.2) and close cover.

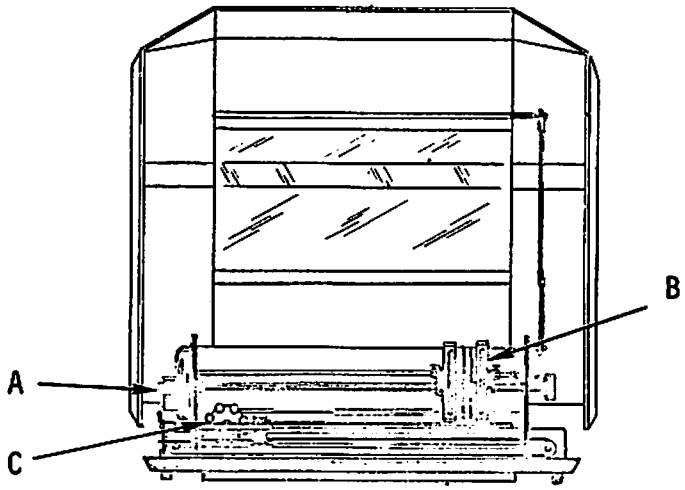


FIGURE 2-2 REMOVAL OF PACKAGING TAPE

2.3.2 *PACKING*

Reverse steps 2 through 10 of the unpacking procedure, 2.3.1.

2.4 UNIT INSPECTION PROCEDURE

1) Lift cover, front to rear. The cover is attached to the chassis via wiring cable attached to the lamps and function switches.

2) With the interior completely visible, inspect all parts of the printer. Look for any unusual conditions. The following list is a suggested procedure. If any faults are found that require replacement or adjustment, refer to Section 5 of this manual.

WARNING

No power is to be applied to the printer during this inspection.

(a) Inspect the wiring to all three reed switches prior to checking the timing disk and magnetic reluctance pickups. Insure that the pickups and timing disk do not make contact.

(b) Check for damaged or loose parts. Make sure ribbon advance cable is properly seated on the ribbon drive pulley. Slowly move the carriage from left to right while observing the ribbon assembly for proper operation of pulley and ribbon cartridge.

(c) Check that the printed circuit boards are properly seated in their connectors.

(d) Check the cable connectors and fingerboards to insure they are firmly in their sockets.

(e) Verify that paper tape is properly seated in vertical format unit.

2.5 OPERATOR CONTROLS AND INDICATORS

2.5.1 *CONTROL PANEL*

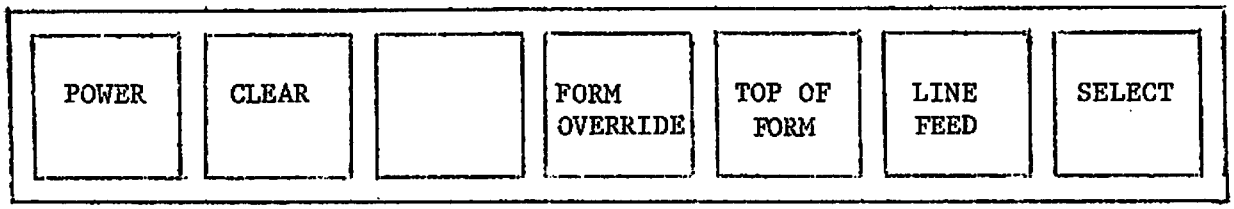


FIGURE 2-3 CONTROL PANEL

POWER ON LAMP: Illuminates when power is on.

SELECT SWITCH: Enables input to the unit. The switch illuminates when the printer is selected.

TOP OF FORM SWITCH: Advances paper vertically to next top of form position; switch is disabled when unit is selected.

LINE FEED SWITCH: Advances paper vertically one line. If held down continually, will advance paper continually. Switch is disabled when unit is selected.

PAPER OUT SWITCH: Opens about one inch before paper runs completely out. At this time the switch disables the input and turns on the audio alarm for approximately 1 second.

FORM OVERRIDE SWITCH: Overrides the paper out switch and allows completion of the final form. The switch illuminates when the paper out switch opens.

PAPER OUT LAMP: May be cleared by refilling paper and depressing Forms Override Switch.

SERVO ALARM LAMP: Lights when servo fuse is open and servo logic is active.

2.5.2 *REAR PANEL*

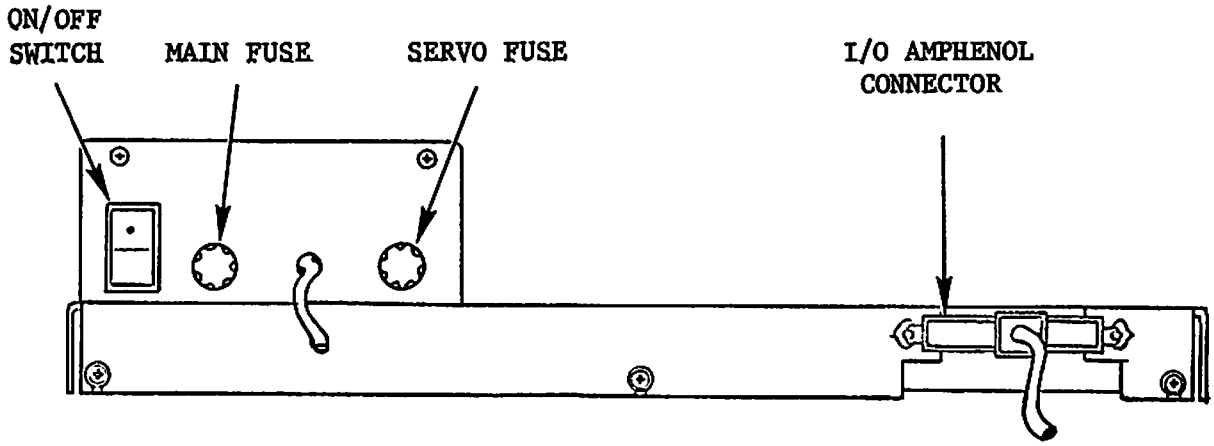


FIGURE 2-4 REAR PANEL

ON/OFF SWITCH: Switches power on and off.

SERVO MOTOR FUSE: 2.5A SLO BLO Fuse - protects servomotor during paper jam conditions or logic failure.

MAIN FUSE: 2 amp (SB) 250 volt fuse for 115 VAC or 1 amp (SB) for 230 VAC which fuses entire unit.

2.5.3 *PRINTER CHASSIS*

HORIZONTAL VERNIER KNOB: Advances the paper when manually depressed and turned. To vertically align forms, depress Top of Form Switch and then manually advance forms for proper alignment.

PAPER MARGIN KNOBS: Adjust sprockets to paper width.

HEAD ADJUSTMENT ARM: The head adjustment arm adjusts the distance between the printhead bearing and the striker bar. The arm is adjusted for the best print quality (position 1 to 9). To load a new ribbon cartridge, move the Head Adjustment Arm to position L.

2.6 DYNAMIC CHECKOUT

1) Connect power cord to 115 or 230 volt outlet as specified. Insure that unit has the proper input.

2) Connect I/O cable to I/O connector on rear of unit and connector on control card 6379 in CPU or the work station printer connector.

3) Load paper. NEVER OPERATE THE PRINTER WITHOUT PAPER.
   (a) Place printer near and parallel to the front of table to allow insertion of paper into paper slot.
   (b) Loosen paper margin knobs of pin feed sprockets and adjust to paper width.
   (c) Slide paper into paper slot on the bottom or bottom front of the machine. Push it through until it reaches the pin feed sprockets. Fit the feed holes of the paper into the pin feed sprockets and close the paper guide covers.

4) Turn power on and insure that the cooling fan is running.

5) Select the unit and run 2231W printer diagnostic.

SECTION 3
OPERATION

3.1 VERTICAL FORMAT UNIT

The Vertical Format Unit (VFU) is a two (2) channel tape reader, located on the left side of the printer, which reads a standard 1" wide, 8-channel black opaque paper or mylar tape. Because the operation of the tape reader is dependent on the switching of light via punched holes in the tape, the use of transparent tape could result in vertical format errors.

The VFU is linked directly to the stepping motor which advances the paper (by one line) and the paper tape (by one sprocket hole for each line feed). This linkage produces six (6) lines per inch. On the standard VFU paper tape shipped with the printer, vertical tab holes are spaced six sprocket holes apart, corresponding to a one inch tab (2.54 cm), and top of form holes spaced sixty-six (66) sprocket holes apart (corresponding to an eleven inch (27.9 cm) form.

If it is desired to use a shorter or longer form, then a new paper tape must be punched to change the vertical tab and top of form positions on the tape.

Each *vertical tab* function will advance the tape to the next hole on channel five of the paper tape.

Each *top of form* function will advance the tape to the next hole on channel seven of the paper tape.

A format tape may be punched using a Teletype[R]. Figure 3-1 illustrates a typical tape and a chart with characters or functions on a Teletype which may be used to punch the selected holes. Format tapes will vary in length with paper form sizes.

[R] Registered Trademark, Teletype Corporation

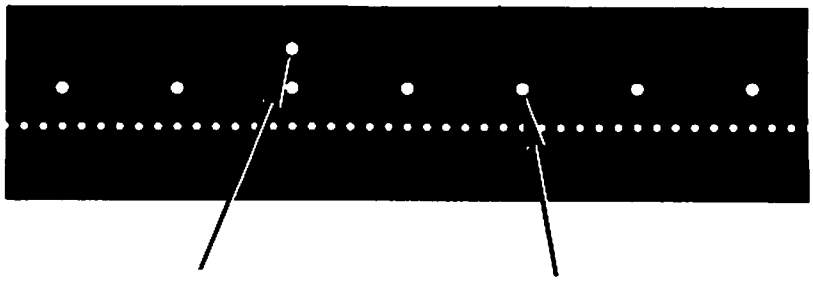


FIGURE 3-1 VERTICAL FORMAT TAPE

TYPICAL FORMAT TAPE

FUNCTION DESIRED	CHARACTER OR FUNCTION ON TELETYPE WHICH CORRESPONDS
VERTICAL TAB	CONTROL P
TOP OF FORM	SHIFT P
SIMULTANEOUS VERTICAL TAB AND TOP OF FORM	P
SPACING BETWEEN FUNCTIONS	CONTROL SHIFT P

NOTE:

Holes punched anywhere other than channels 5 and 7 are ignored by the VFU.

To splice prepared format tape, cut a piece of 1" black opaque paper tape at least 15" long. (This length will provide two *top-of-form* functions.) Determine exactly where the tape is to be spliced by counting sprocket holes and vertical tab holes. Overlap the tape ends, mark the tape accurately, cut the surplus tape square across so the new ends butt evenly to the same sprocket hole. Trim as necessary and then splice the ends using splicing squares WL# 660-0176 on both sides of tape to prevent catching and breaking of splice (see Figure 3-2).

To replace the Vertical Format Tape, lift the cover of the printer to gain access to the tape reader. Lift upper reader cover (Figure 3-3) and install tape, ensuring that the sprocket teeth protrude through the paper tape. Close reader cover.

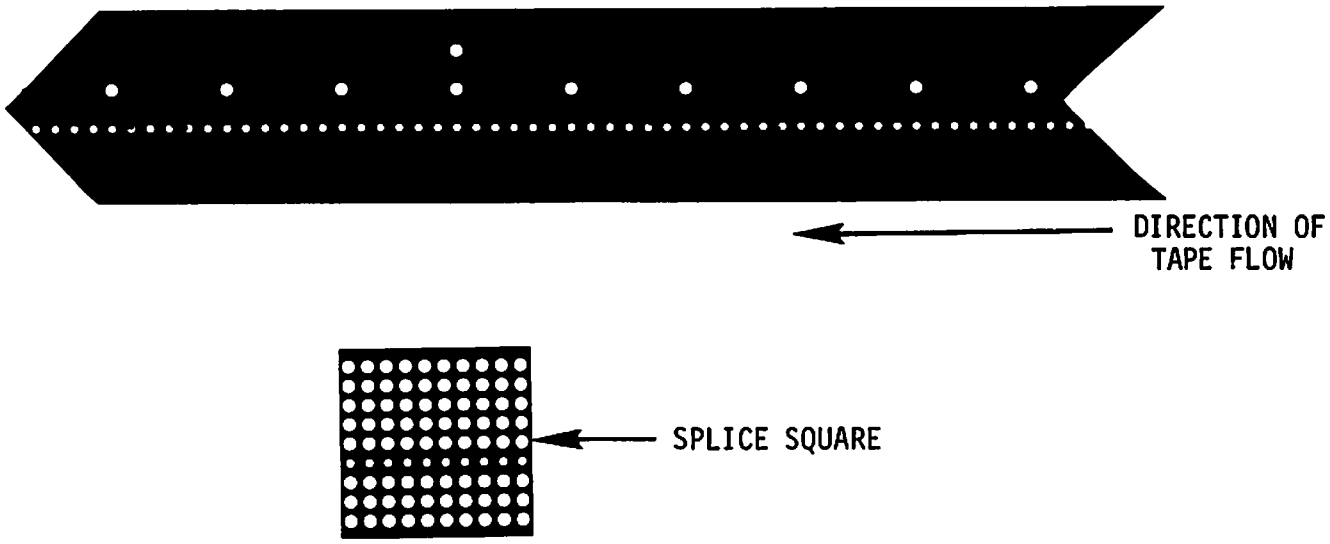


FIGURE 3-2 TAPE FLOW AND SPLICING SQUARE

NOTE:
It is important that the tape proceed through the tape reader in the up direction with the channel holes punched as shown in Figure 3-2. If the paper tape loop is inadvertently turned inside out, the paper feed will not work properly.

3.2 RIBBON CARTRIDGE REMOVAL AND REPLACEMENT

3.2.1 *REMOVAL*

1) Lift open the printer cover.

2) Move Head Adjustment Arm to load (L) position (Figure 3-4).

3) Pull up vertically on the right side of the ribbon cartridge until it is completely off its spindle.

4) Remove the ribbon from print head ribbon guide and remove ribbon cartridge.

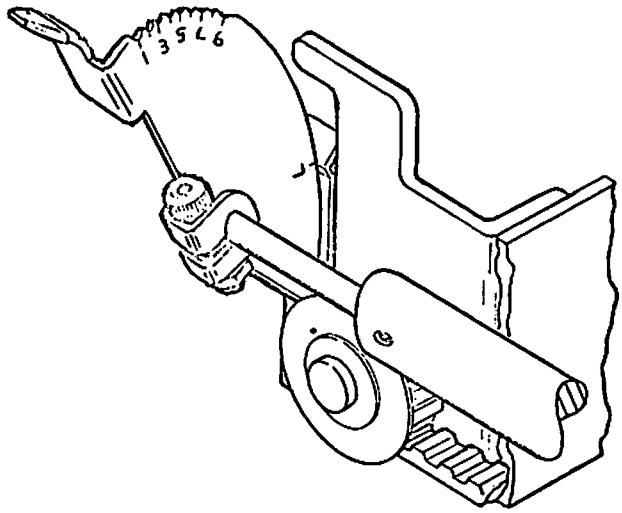


FIGURE 3-3 HEAD ADJUSTMENT ARM

3.2.2 *REPLACEMENT*

1) Move Head Adjustment Arm to load (L) position (Figure 3-3).

2) Turn Ribbon Advance Knob counterclockwise to take up slack in ribbon.

3) In this step it should not be necessary to handle the ribbon. Tilt the ribbon towards the bottom rear of the machine while sliding the ribbon into the ribbon guides on the print head. Tilt ribbon cartridge downward toward the rear of the machine so the lip at the left and right corners of the cartridge slip into the carriage guides. Push down on cartridge until carriage spring seats in cartridge indentation by the ribbon advance knob.

4) Turn Ribbon Advance Knob counterclockwise to take up slack in ribbon.

5) Move the Head Adjustment Arm back to its original position (1 to 9) and close the top cover.

3.3 OPERATION OF 2231W VIA 2200 CPU

3.3.1 *DEVICE ADDRESS CODES*

A three character device code, HEX XYY, is assigned to each peripheral that is connected to the 2200 CPU. The first character, X, is the device type and the next two characters, YY, are the device address.

There are three device types for the 2231W:

1) HEX X = 0: This device type addresses devices that do not index when a carriage return is executed; the 2200 automatically adds an index to the device. Since the 2231W generates an index with a carriage return, the output of the 2231W will be double spaced if a 0 is used.

2) HEX X = 2: This device type addresses devices that generate an index with a carriage return. The output of the 2231W will be single spaced if a 2 is used.

3) HEX X = 4: The SELECT statement specifies the maximum line length on the line printer. When the number of characters equals the specified line length, a carriage return is executed. Choosing device codes 415 or 416, however, suppresses this feature by not executing a carriage return when the number of characters equals the line length. The carriage return is not executed until the carriage return command is given or the buffer on the 2231W is filled. This gives a more interesting double spaced output when used to list program steps. Each individual statement longer than 112 characters will be single spaced, while the space between statements will be double spaced. Samples of printouts can be seen in Diagnostic Section 6.2.

There are two device address codes for the 2231W:

1) HEX YY = 15: This is the address normally used when one printer is connected into a system. If two printers are connected in a system, code 15 addresses the first printer.

2) HEX YY = 16: This addresses the second printer connected to a 2200 system.

3.3.2 *SELECT STATEMENTS*

There are three select statements which select the 2231W for distinct types of output: SELECT PRINT; SELECT LIST; and SELECT CO.

NOTE:

In this Manual, the symbol Ø is equivalent to the numeral zero.

(a) SELECT PRINT 215

The above statement selects the 2231W with the device address code 215 for output resulting from the execution of PRINT or PRINTUSING statements.

EXAMPLE:

Insure that all units are on, the 2231W selected.
Key the following program:

```
CLEAR
10  SELECT PRINT 215
20  PRINT "X", "LOG X"
30  FOR X = 1 TO 1Ø
40  PRINT X, LOG (X)
50  NEXT X
RUN
```

PRINTOUT:

```
 X             LOG X
 1              0
 2              .69314718055597
 3              1.098612288667
 4              1.386294361119
 5              1.609437912433
 6              1.791759469227
 7              1.945910149055
 8              2.079441541679
 9              2.197224577335
 10             2.302585092994
```

If statement 10 was SELECT PRINT Ø15, the output would be double spaced.

(b) SELECT LIST 215

The above statement selects the 2231W with the device address code 215 for all program listings.

EXAMPLE:

To list the preceding program, key the following:

```
SELECT LIST 215
LIST
EXECUTE
```

PRINTOUT:

```
10 SELECT PRINT 215
20 PRINT "X", "LOG X"
30 FOR X = 1 TO 10
40 PRINT X, LOG(X)
50 NEXT X
```

(c) SELECT CO 215

The above statement selects the 2231W with the device address code for printing all console output. All information keyed into the 2200 system will be printed on the 2231W until any other console output device is selected.

EXAMPLE:

Key the following:

```
SELECT CO 215
EXECUTE
RESET
```

PRINTOUT:

```
READY
```

Assuming the CRT was being used, it is now deselected and the 2231W outputs all information. The printer prints a line anytime the RETURN key is depressed or as soon as the previously set line length is exceeded (see Section 3.3.3). To deselect the 2231W and select the CRT, key the following:

```
SELECT CO ØØ5
EXECUTE
```

The CRT is now the selected device. To list the program on the CRT, enter:

```
SELECT LIST ØØ5
```

3.3.3 *LINE LENGTH*

(a) The 2231W has a maximum of 112 characters per line. When turning system power on, the line length on all devices is set for 64 characters (because of CRT line length). To make use of all 112 characters, the 2231W must be commanded in its address statement:

SELECT PRINT 215 (112)

The 112 in parenthesis indicates that 112 characters will be allowed to be printed before an automatic carriage return is given.

(b) Any amount of characters may limit the line length:

SELECT PRINT 215 (25)

The 25 in parenthesis only allows 25 characters to be printed on a line; an automatic carriage return would be generated if this number of characters is exceeded. The remaining characters would be printed on the next line(s).

NOTE:

If a line limit of 25 characters is given for the 2231W, this limitation applies to any output device that is selected after the 2231W if no new limitation is specified.

(c) More than one line length may be combined in a select statement.

EXAMPLE:

SELECT PRINT 215 (25), LIST 215 (64), CO 215 (112)

3.3.4 *TAB FUNCTION*

When a print statement containing a TAB(expression is encountered, the printer will advance to the column indicated in parenthesis in the TAB(expression.

EXAMPLE:

```
10 SELECT PRINT 215 (112)
20  PRINT TAB (25); "WANG LABS"
30  STOP
RUN
```

When these statements are executed, the 2231W advances to column 25 and prints "WANG LABS".

NOTE:

If a semicolon (;) is not used after the TAB(function, the 2231W will not necessarily tab to the correct column.

3.3.5 *EXPAND FUNCTION: HEX (ØE)*

The regular characters, 10/horizontal inch, can be expanded to double their width, 5/horizontal inch, with the following statement:

```
PRINT HEX (ØE), "WANG LABS"
```

The expand function only expands one line of print. Assuming a line limit of 112 characters in the 2231W, when more than 56 characters are to be printed with the expand function, only the first 56 are printed, the 2231W performs a carriage return and all other characters are lost. If a line limit of less than 56 characters is selected, and the number of expanded characters exceeds the selected line length, the expanded characters are printed up to the line limit, the printer carriage returns and prints the remaining characters on the next line(s) in regular size.

EXAMPLE:

```
10  SELECT PRINT 215 (5)
20  PRINT HEX (ØE), "111222333444"
30  STOP
```

PRINTOUT:

```
1 1 1 2 2
23334
44
```

A line limit of 5 was given to the printer; the printer was instructed to expand the twelve numbers. The printout illustrates that:

1) The printer only printed five elongated characters on the first line.

2) When the characters are expanded, so are the columns.

3) The excess characters were printed on the next two lines, the second line containing only five characters and the third line the rest.

Not only does the expand function expand the characters and columns, but also the zones.

3.3.6 *ZONES*

The 2231W is divided into seven zones of 16 characters each. The zones constitute columns 0-15, 16-31, 32-47, 48-63, 64-79, 80-95, and 96-111 respectively.

If commas separate elements in a PRINT statement, then each element begins at the start of a new zone. If semicolons separate elements in a PRINT statement, the zoned format is ignored, and the output appears in packed format.

3.3.7 *HEX FUNCTION*

The HEX function is used in a BASIC program to output characters on the printer that do not appear on the standard keyboards or to output special printer control codes. The HEX function has the form:

HEX ([hh][hh]...)

where h = a hex digit 0 to 9 or a letter A to F. An even number of characters must always appear in a HEX statement; spaces are not allowed. (See the Wang BASIC Reference Manual for hexadecimal characters and codes.) HEX codes can be combined.

EXAMPLE:

```
10  SELECT PRINT 215
20  PRINT HEX(2424)
30  END
```

PRINTOUT:

$$

3.3.8 *CONTROL CODES*

The special Control Codes for the printer are:

FUNCTION	HEX CODE	DESCRIPTION
ALARM	HEX (07)	Generates an audible tone about one second in duration in the speaker at the rear of the printer.
LINE FEED	HEX (0A)	Advances paper one line.
VERTICAL TAB	HEX (0B)	Advances paper until the next hole in channel 5 of the Vertical Format Unit paper tape is reached.
FORM FEED	HEX (0C)	Advances paper until the next hole in channel 7 of the Vertical Format Unit paper tape is reached.

FUNCTION	HEX CODE	DESCRIPTION
CARRIAGE RETURN	HEX (0D)	Causes the line of characters stored in the printer buffer to be printed. An automatic line feed occurs after the line has been printed and the print head returns to the left side of the printer carrier.
ELONGATED CHARACTER	HEX (0E)	Prints a line up to 56 characters as expanded (double width) characters.
DELETE	HEX (7F)	Clears buffer of partial line prior to the '7F'.

NOTE:

When HEX codes are combined, control codes are executed first.

See Appendix B for complete listing of hexadecimal codes.

SECTION 4
THEORY OF OPERATION

4.1 INTRODUCTION

This section of the manual consists of three basic parts: a mechanical section including a general description of carriage movement, and paper movement; an electrical section with detailed logic description of carriage paper movement; and an electrical section with detailed logic description of the printed circuit boards.

4.2 GENERAL

The Model 61 Printer consists of the following basic blocks (Figure 4-1):

Input Buffer - Buffers input data to function decoder and shift registers.

Storage Shift Registers - 2-quad 80 bit and 2-quad 32 bit shift registers are used in series to store up to 112 input characters.

Function Decoder - Monitors input data for function commands and transmits function to be performed to the control logic.

Character Generator - Converts 7-bit ASCII character codes to the dot-matrix pattern used to drive the print solenoids.

Driver Circuits - Power transistors, clamping diodes, etc. Used as output drivers for the print solenoids and motors.

Carriage Servo - Circuit used to control speed and direction of the carriage motor. Feedback generated by pulses from timing wheel and magnetic reluctance pickup provide the error correction voltage.

Stepping Motor Control - Provides START/STOP logic for serial pulse train generator. A state generator (circular shift register) provides the proper pattern to the phases of the stepping motor.

Control Logic - Consists of the following: main clock, power-up, prime, busy and shift circuits and control for all operations.

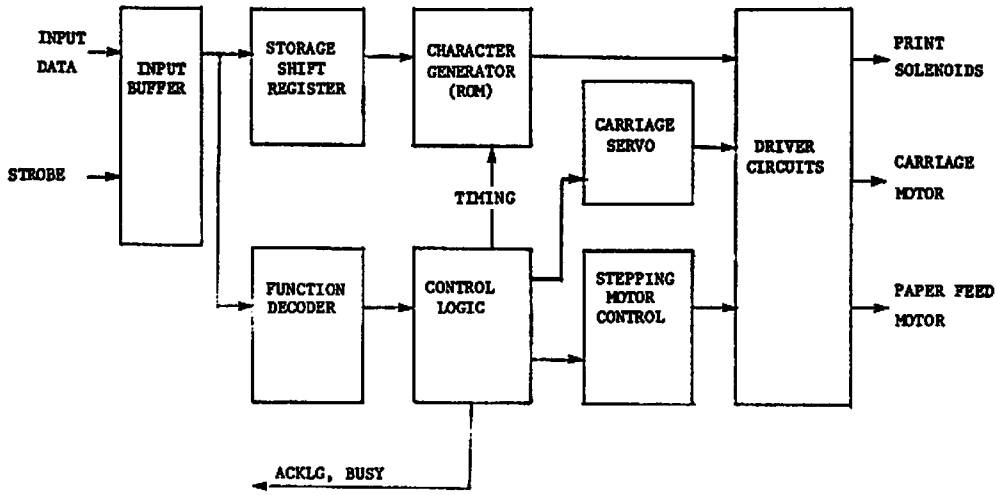


FIGURE 4-1 MODEL 61 BASIC BLOCK DIAGRAM

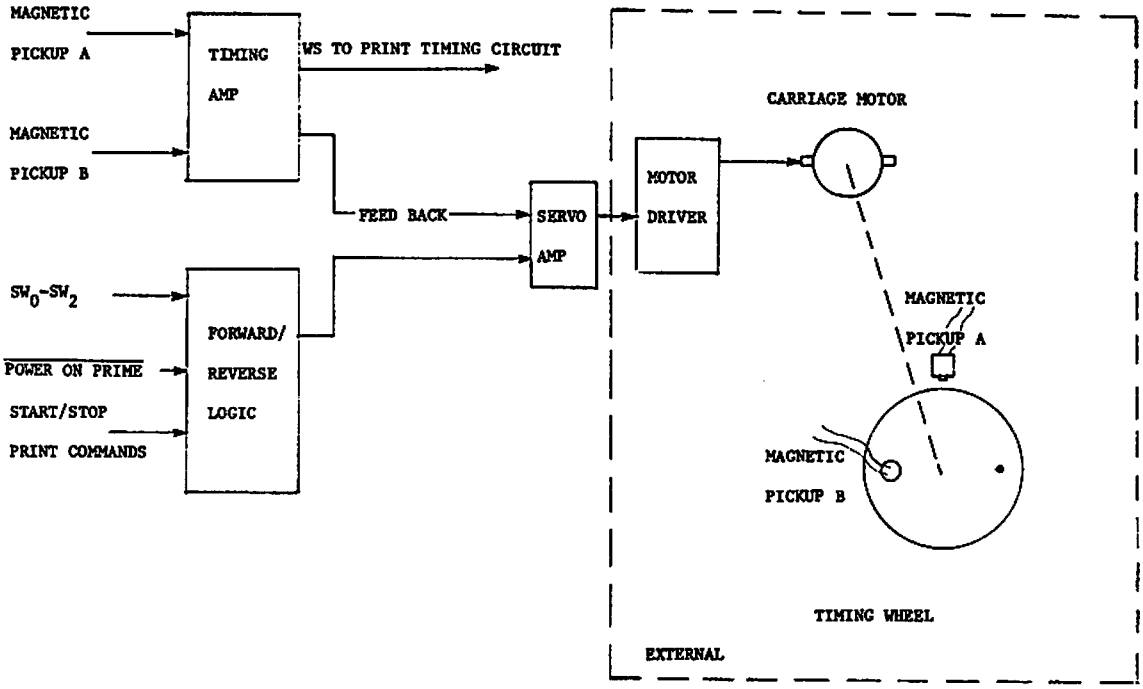


FIGURE 4-2 CARRIAGE MOVEMENT

4.2.1 *CARRIAGE MOVEMENT (Figure 4-2)*

A carriage assembly moves the print head across the paper. Printing is performed by selectively firing the print head solenoids as the assembly moves from left to right. Synchronization of the print process and carriage movement is provided by two magnetic reluctance pickups and a timing disk. The disk is made from a ferrous metal, has 780 teeth around its circumference, and one hole drilled through its flat surface.

A magnetic reluctance pickup, located near and perpendicular to the circumference of the disk, senses flux changes as the disk's teeth rotate by. These flux changes create a small voltage pulse in the pickup which is amplified and shaped by the timing amplifier. This signal is used to generate a reference strobe ($\overline{WS}$) for print timing, and negative feedback to the servomotor amplifier.

Another magnetic reluctance pickup, located on the circle traveled by the drilled hole in the disk, generates an index pulse which determines the left hand margin when printing.

The carriage is driven by a servomotor. The Forward/Reverse logic block controls the speed and direction of the carriage motor.

There are three reed switches (SW_0 - SW_2) located on the frame of the carriage block. These switches are activated by a magnet located on the underside of the carriage. The outputs of these switches and Start/Stop logic are used to control forward and reverse logic for the servomotor.

4.2.1.1 Servomotor Logic

A timing disk and magnetic reluctance pickups are used to generate print timing and feedback for the servo system. The timing disk is mounted to the rear shaft of the carriage servomotor. As the servomotor

and disk turn, magnetic reluctance pickups MPA and MPB sense flux changes and generate pulses which are amplified and applied to a logic network to develop timing and feedback signals.

Magnetic reluctance pickup, MPA, is mounted near and perpendicular to the circumference of the timing disk. As each tooth passes the pickup, the flux changes cause a small signal to be generated with a frequency which is a function of the motor speed. After amplification, the signal's leading and trailing edges are used to trigger four one-shots. Two of these one-shots generate 550 µs pulses which are ORed and applied to the $\overline{WS}$ gate. $\overline{WS}$ is used to generate print timing. The other two one-shots generate pulses which are applied to a summing network to provide the servo op-amps with a DC bias that varies directly with the motor speed.

The second magnetic reluctance pickup, MPB, is located perpendicular to the flat surface of the timing disk. This pickup senses the passing of the hole drilled in the disk. The signal generated by the passing hole is used to set a flip-flop to gate $\overline{WS}$ and insure a consistent left margin.

4.2.2 *PAPER MOVEMENT (Figure 4-3)*

Paper movement is originated by three separate functions: line feed, vertical tab and form feed. Each of these functions activates the stepping motor causing paper movement. Vertical tab and form feed will step the motor until a hole in the appropriate channel of the vertical format paper tape is detected by the tape reader.

The Vertical Format Unit (VFU) is an optical tape reader which only reads 2 channels (5 and 7). VFU tape movement is caused by direct mechanical linkage to the paper feed gear train.

LINE FEED - A line feed can be generated by any of the following three conditions:

(a) Automatic line feed during each carriage return.

(b) Receiving a line feed code HEX (0A) via the input as decoded by the function decoder.

(c) Depressing the line feed key on the control panel of the 2231W. (In this case, the printer must be deselected.)

VERTICAL TAB - A vertical tab can be generated only by receiving a vertical tab code HEX (0B).

FORM FEED - A form feed can be generated by:

(a) Receiving a form feed code HEX (0C) at the input decoded by the function decoder.

(b) Pressing the Top of Form key on the control panel. (Printer must be deselected.)

4.2.2.1 Paper Feed Logic (Refer to drawing E6761)

A stepping motor is used to drive the paper feed mechanism and the Vertical Format Unit (VFU). Each step of the motor accomplishes a 15° rotation; there are 4 steps for each line feed. The motor utilizes a two-phase drive provided by a J-K flip-flop. The phase generator is clocked by a resettable astable oscillator.

All conditions causing paper movement such as $\overline{\text{LFM}}$, $\overline{\text{LFP}}$, etc., set the paper feed flip-flop high enabling the oscillator and the phase generator J-K's. With the paper feed flip-flop set, LF will be high inhibiting the print gate.

The paper feed flip-flop L9 and L15 can be set by applying a low on any of the inputs of the expandable NAND L9. These inputs are:

a. $\overline{\text{LFP}}$ from the function decoder.
b. $\overline{\text{LFCR}}$ generated by carriage return as a first character.

c. Return gate output from the 2nd carriage return decoder or from the right limit switch $\overline{SW2}$.

d. $\overline{LFM}$ from the key on the control panel gated with $\overline{SL}$ and the line-feed delay one-shot.

e. Form feed flip-flop.

f. Vertical tab flip-flop.

The form feed flip-flop L16 is reset by $\overline{POP}$ on power up or by the 4th Step decoder. If either the form feed flip-flop or vertical tab flip-flop L16 and L25 remains set, the paper feed flip-flop cannot be reset.

The form feed flip-flop can be set by either $\overline{FFP}$ from the function decoder or the form feed manual switch ($\overline{FFM}$).

When a hole is detected in channel 7 of the VFU tape, the form feed flip-flop is reset by FFS.

The vertical tab flip-flop is set by pulse $\overline{VTP}$ from the function decoder and is reset when a hole is detected in the VFU tape, (channel 5).

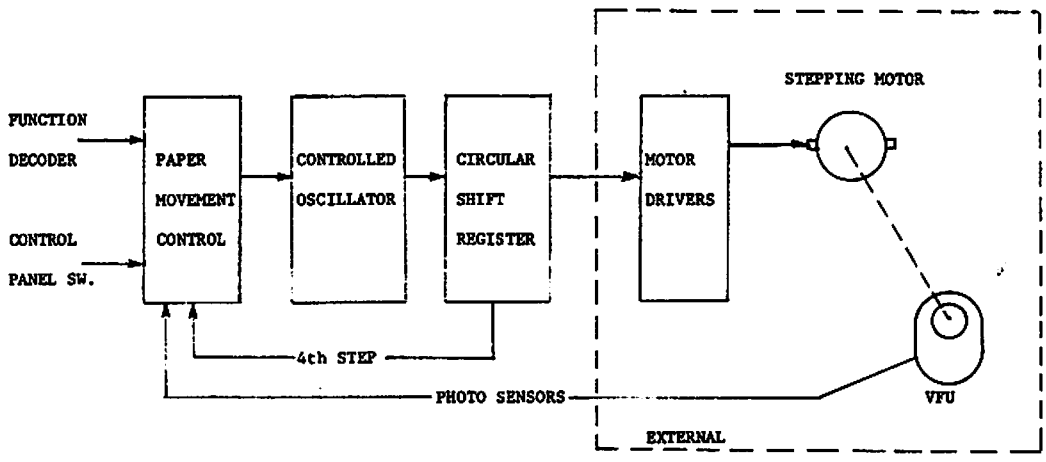


FIGURE 4-3 PAPER MOVEMENT

4.2.3 *PRINT OPERATION (Figure 4-4)*

All print timing is derived from $\overline{WS}$ signal using a clock generator circuit. As shown in the block diagram, the clock subscript represents its sequence with respect to $\overline{WS}$. The character bits b_1 to b_7 from the character shift register are presented to the ROMs as addressing bits. The column counter is used to address each column of the character matrix and is incremented by CLK_4 for each $\overline{WS}$. At a count of nine, $\overline{SF6}$ is sent to the character storage to shift out the next character. On the tenth count, the counter is reset to zero.

The carriage return code from the storage shift registers is decoded to indicate end of line; $\overline{CIP}$ is generated to prime the control logic and originate a carriage return.

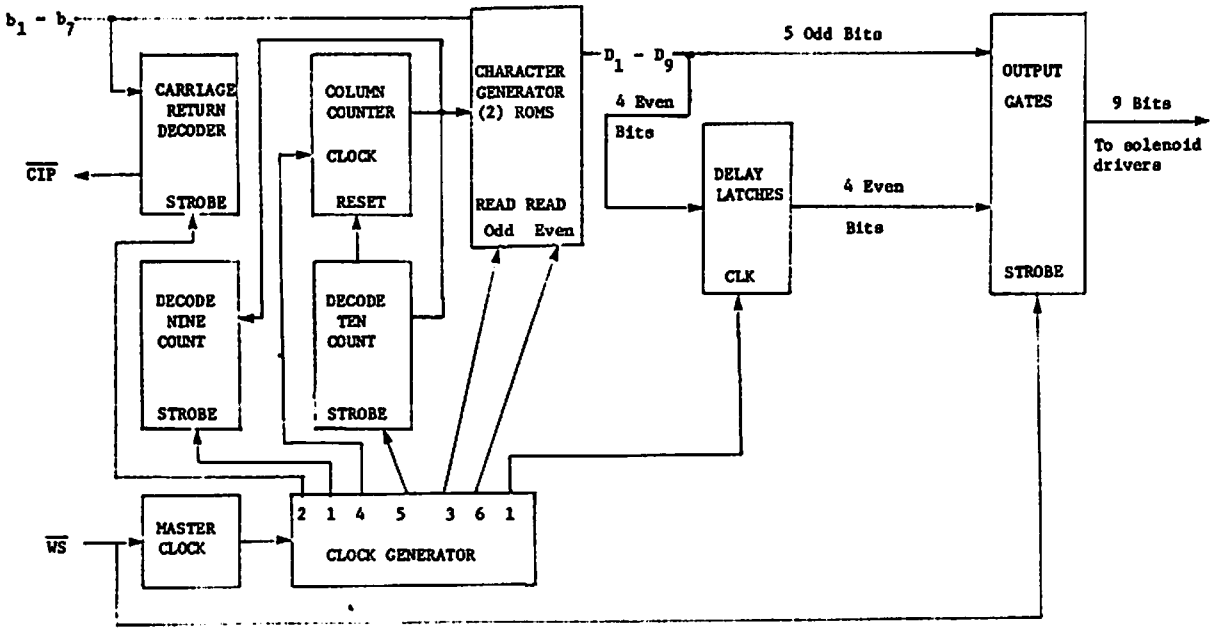


FIGURE 4-4 PRINT OPERATION

Due to mechanical considerations, the nine print solenoid wires are not in one vertical column. The five odd solenoid wires precede the four even wires as the print head moves across the carriage. Delay latches are used to delay the outputs to the even solenoids. The delay allows the print head to move in line with the dots printed by the odd print wires before printing with the even solenoids. This results in a vertical line of printed dots.

4.2.4 *I/O CONTROL AND CHARACTER STORAGE (Figure 4-5)*

The Model 61 Printer accepts a 7-bit ASCII code. A data strobe is necessary to accept and process the data. Data bits D_1 to D_7 are true for a logical "1" (high). $\overline{\text{DSTB}}$ must be a low pulse with a duration of .5 µs to 5 µs.

The input data is buffered to the storage shift registers and the function decoder. If a function is decoded, the control logic activates the appropriate circuits to perform the function. A BUSY status is provided at the I/O interface to indicate that the printer is busy. When the printer is ready, an acknowledge pulse ($\overline{\text{ACKLG}}$) is sent to the I/O connector.

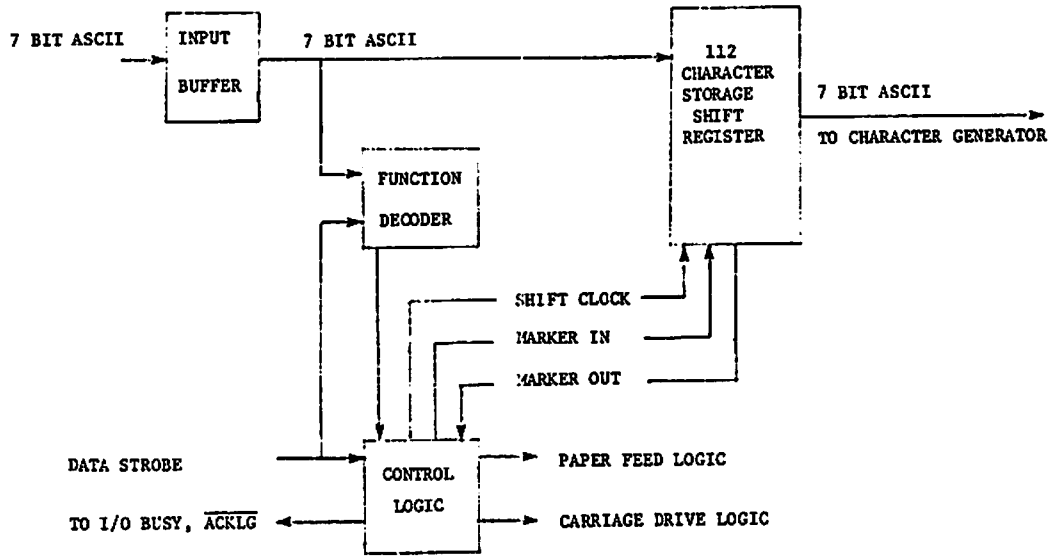


FIGURE 4-5 I/O CONTROL & CHARACTER STORAGE

The control logic generates the shift clocks necessary to shift data in and out of the storage registers, and the marker bit is used to indicate a buffer full condition. Upon detecting a carriage return code or a buffer full condition, the control logic initiates the print cycle. During the print cycle the carriage moves forward and the characters are shifted from the shift register to the character generator ROMs. When the print cycle is completed, the control logic initializes the printer circuits for a new line of input.

4.3 ELECTRICAL THEORY

4.3.1 *6761 TIMING AND PRINTING CONTROL (Refer to drawing E6761)*

4.3.1.1 Carriage Movement Detailed

When power is applied to the printer, $\overline{POP}$ is generated and initializes the carriage drive and paper feed control logic. If the carriage is not at home position (SW0 closed), a carriage return will be performed.

$\overline{PRINT}$ from the 7060 board starts the carriage moving by setting the forward and run flip-flops with $\overline{SFM}$. $\overline{CF}$ and $\overline{RN}$ enable the forward gate L30-8 which closes the forward relay. Thus, a positive voltage is switched to the output M0 for the motor drivers.

A timing wheel attached to the motor shaft has a toothed edge which passes a magnetic pickup. A sine-wave cycle is generated as each tooth passes. This signal is amplified and shaped to a rectangular pulse whose frequency is a function of the motor speed. The leading and trailing edges of this pulse are used to trigger the feedback one-shots, L28-9 and L28-7. Note that the feedback control gate L6-6 is held high by $\overline{CF}$, releasing the clear lines of the one-shots. The outputs of the feedback one-shots are applied to an integrating circuit causing the input of the carriage motor amplifier to be less negative. Since the amplifier is an inverting configuration, the

output MO will be less positive as the feedback increases. This serves to maintain a constant forward speed of the carriage assembly. Potentiometer R71 is used to adjust the speed of the carriage motor by changing the negative bias of the amplifier input.

Carriage return will be initiated by the limit switch SW2 (closed) or by a carriage return code sensed at the output of the shift registers. Either one will cause the forward flip-flop to be reset via the return gate L32-4. $\overline{CIP}$ is generated at this time to perform a prime routine. $\overline{CF}$ goes high disabling the forward gate and CF goes low to enable the reverse gate L30-6. The reverse relay closes switching the second stage output of the motor amplifier to the output. MO will now be negative causing the carriage to return. If the line printed was of sufficient length to cause the carriage to move past SW1, then the fast/slow decision flip-flop L6-3 will be set high. The feedback control gate L6-6 will go low disabling the feedback one-shots. With no feedback, a fast return is performed. On the return, the carriage magnet again closes SW1 and resets the fast/slow decision flip-flop. The feedback control gate L6-6 goes high releasing the one-shot clear lines. Feedback is generated to decelerate the carriage. When the magnet reaches SW0, the run flip-flop will be reset and $\overline{RN}$ will go high to disable both forward and reverse gates. Both relays are now open and the motor stops. If the line to be printed is so short that the carriage does not pass SW1, then the fast/slow decision flip-flop will not set and only a slow return will be accomplished.

As the carriage moves, the signal from the magnetic pickup MPA, is amplified and shaped. As stated previously, it is used to trigger the feedback one-shots. It is also applied to another pair of one-shots, L19-7 and L19-9 whose outputs are negative ORed by WS gate L3-3. Potentiometer R10 adjusts the duty cycle of the input signal by varying the DC bias on the Q5 (Figure 4-6).

There is also a magnetic pickup MPB, located near the index hole on the timing wheel. The signal developed by the magnetic pickup is amplified, shaped and used to generate a uniform left margin. This pulse is gated with a delayed L19-9 pulse to set the index flip-flop. $\overline{FSO}$ gate L10-6 is enabled when the index flip-flop is set and CF is high. The WS strobe is now used to synchronize print timing with the master clock (Figure 4-7).

4.3.1.2 Paper Movement Detailed (Refer to drawing E6761)

A stepping motor is used to drive the paper feed mechanism and the Vertical Format Unit (VFU). Each step of the motor accomplishes 15° rotation and there are 4 steps for each line feed. The motor utilizes a two-phase drive provided by L14 J-K flip-flop. This circuit is also referred to as the state generator.

L8 is a resettable astable oscillator whose output is used to clock the state generator. For each cycle of L8, a step of 15° is performed. All conditions causing paper movement such as $\overline{LFM}$, $\overline{LFP}$, etc., set the paper feed flip-flop L9-6 high. This high releases the clear inputs of the state generator and the reset line of the oscillator.

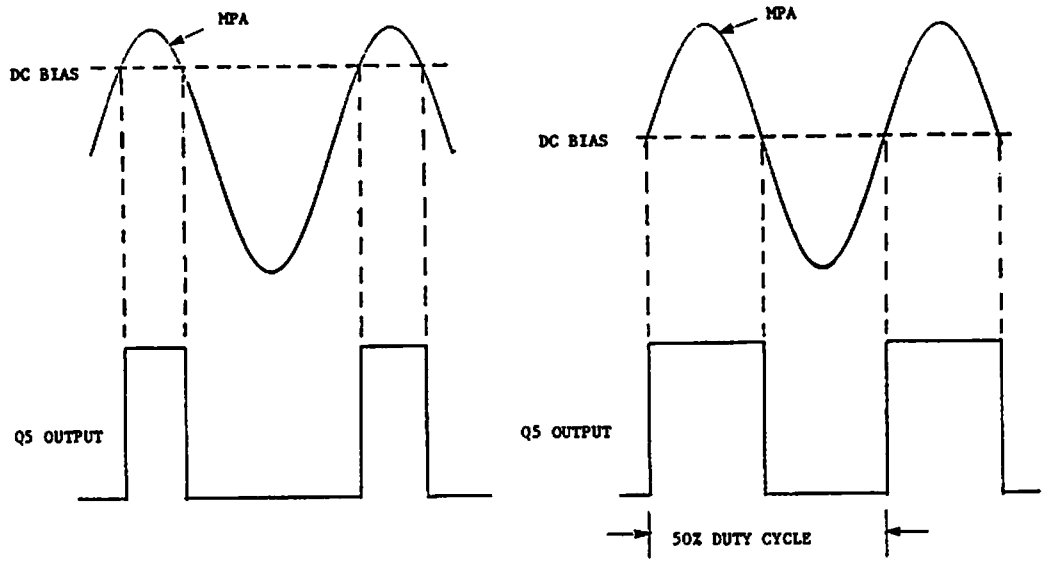


FIGURE 4-6 WINDOW STROBE (WS) ADJUSTMENT

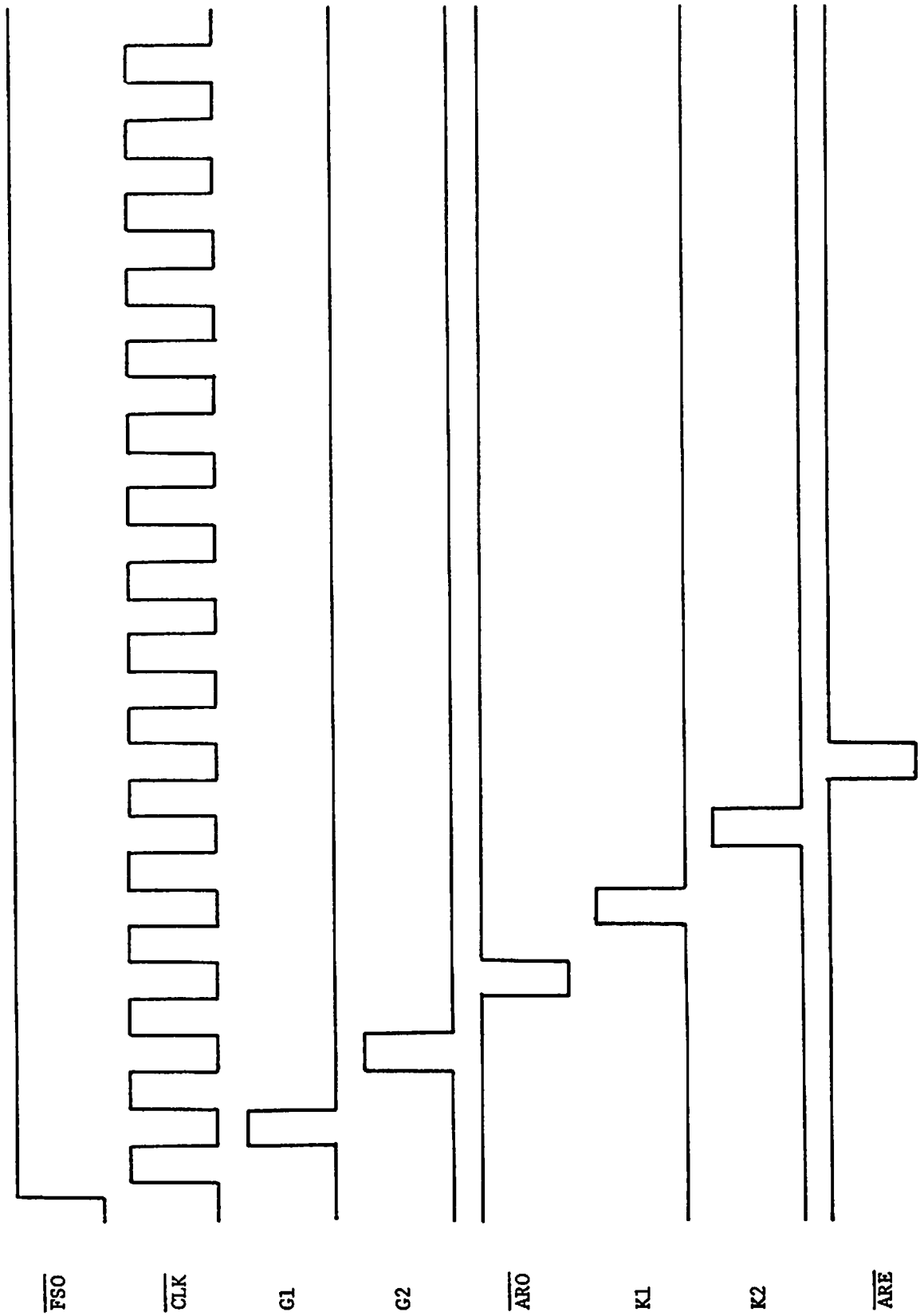


FIGURE 4-7 PRINT TIMING DIAGRAM

The circuit of L14 develops four combinations for stepping the paper motor. The fourth step gate L15-8 provides a negative pulse, following the fourth step, to reset the paper feed flip-flop. This action clears the state generator and disables the oscillator.

The paper feed flip-flop has an expandable NAND gate providing six ways to perform paper movement. When a line is terminated by a carriage return code or by the right limit switch (SW2), the return gate L32-4 sets the paper feed flip-flop via L9-2. $\overline{\text{LFP}}$ from the input function decoder is applied to L9-1. $\overline{\text{LFCR}}$ is a signal generated when a carriage return code is received as a first character to set the paper feed flip-flop via L9-5. $\overline{\text{LFM}}$ from the operator panel line-feed switch is NANDed with $\overline{\text{SL}}$ and the LFD one-shot and provides an input to the expanded input L9-3. The expanded input is also activated by the outputs of the form feed and vertical tab flip-flops.

The form feed flip-flop can be set by $\overline{\text{FFM}}$ from the panel switch or by $\overline{\text{FFP}}$ of the function decoder. While the form feed flip-flop is set it will keep the paper feed flip-flop from resetting. This is also true of the vertical tab flip-flop, which is set only by $\overline{\text{VTP}}$ from the input decoder. The form feed and vertical tab flip-flops are reset by FFS and VTS respectively. FFS (Channel 7) and VTS (Channel 5), outputs from the phototransistors of the VFU, are amplified, shaped and gated with the fourth step pulse to reset the corresponding flip-flops. The paper movement flip-flops are also reset at power-up by $\overline{\text{POP}}$.

It should also be noted that the manual functions $\overline{\text{FFM}}$, $\overline{\text{LFM}}$, and $\overline{\text{CLEAR}}$ are gated with $\overline{\text{SL}}$ such that they will be active only when the printer is deselected. Each of the outputs of the state generator X0 and Y0 are amplified by op-amps on the 6756 and applied to a complementary driver circuit. This circuit acts as a level translator to convert the logic levels of the state generator to levels of +17V or -17V for the motor windings.

4.3.2 *7060 I/O CONTROL AND DATA STORAGE BOARD (Refer to drawing E7060)*

4.3.2.1 7060 Operation

Data bits DT1 through DT7 are received at the input buffer. At the buffer output, the seven bits are monitored to decode any functions. If a function is decoded, the control logic sets the Busy flip-flop and executes the function. At the completion of the function, an Acknowledge pulse is sent to the external device. If the input is a printable character, then it is shifted into the 112-bit register by the control logic. An Acknowledge is sent to tell the external device that the character was received and is ready for the next input.

Function codes are not shifted into the 112-bit registers with the exception of carriage return which is used during shift out to terminate printing.

Upon receiving a CR code, or detecting the marker bit at the shift register output, the print cycle is initiated. Characters are shifted out through the output buffer to be printed. By monitoring the shift register output, the print cycle is terminated by the control logic.

4.3.2.2 Power-On-Prime (Refer to drawing E7060)

When power is applied to the printer, C12 (18 µf) charges through R55 (56K). This causes L5-6 to go low after C12 charges to TTL level. L11-4 is high at this time and L2-8 goes high to fire one-shot, L10-7. The duration of this one-shot is approximately 3.3 ms to activate the prime circuit. $\overline{\text{POP}}$ sets the 1st character CR Latch and resets the paper movement flip-flops.

4.3.2.3 Other Prime Conditions (Refer to drawing E7060)

The prime circuit may also be activated by $\overline{\text{CIP}}$, $\overline{\text{DELETE}}$, $\overline{\text{RESET}}$ and $\overline{\text{CLEAR}}$. Any one going low will cause L42-8 to go high, firing L10-9 one-shot for 3.3 ms. L2-11 acts as a negative OR circuit as either one-shot L10-9 or L10-7 will cause L2-11 to go high for 3.3 ms.

4.3.2.4 Prime Circuit (Refer to drawing E7060)

When L2-11 goes high, L5-8 will go low to reset flip-flop L6-9 low. L5-8 will also be used to set the Prime Latch. $\overline{CLR}$ is used to reset EC (Expanded Character) flip-flop; clears the column counter on the 6761 board; clears MKR flip-flop L6-12; and goes to L26-12 to generate a Busy signal. It also serves to clock paper-out latch via L22-1.

The following paragraph describes the clearing and loading of a marker bit in bit position number 8 of the 112-bit shift register. A marker bit is used for two purposes. It indicates the position in the print buffer of the first character to be printed and indicates when the print buffer is full (contains 112 characters to be printed). In the prime routine, the marker bit is placed in the first position of the shift register after all random bits have been shifted out and replaced by zeroes.

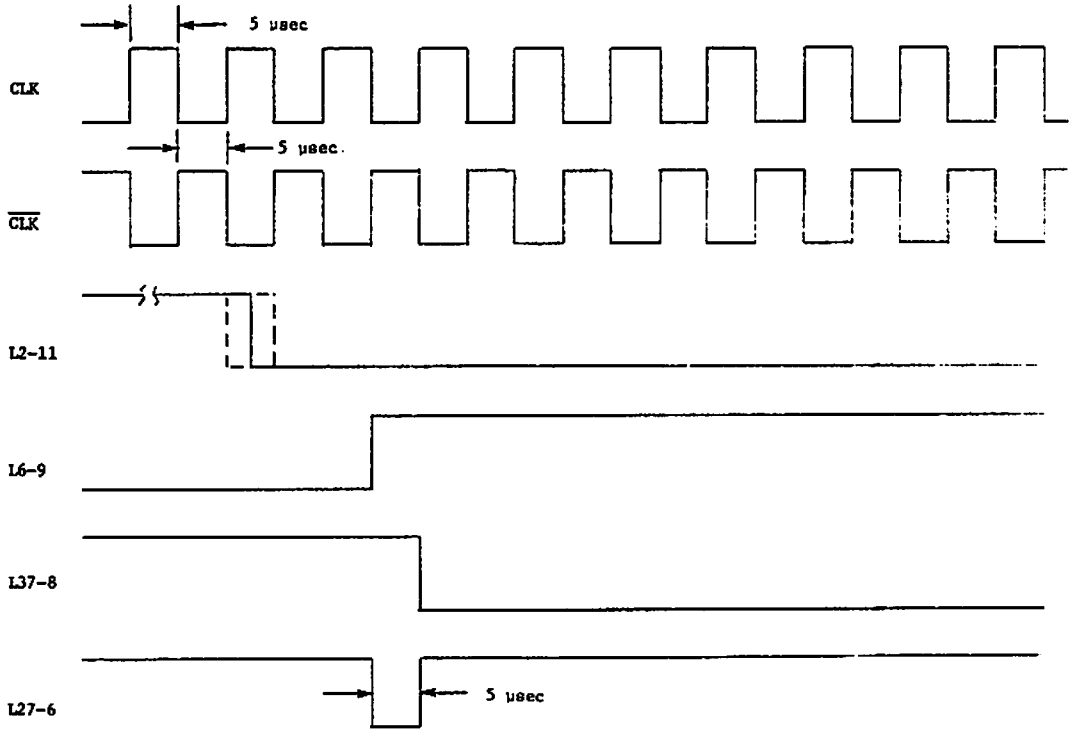


FIGURE 4-8 MARKER BIT GENERATOR

With L6-9 low, L37-8 will be kept high enabling L27-3 to follow $\overline{CLK}$. The Shift Gate will follow $\overline{CLK}$ firing PG L3-10 on each leading edge. L3-10 is used as a shift clock for the 112-bit registers. Since bit 8 at L27-8 is low during this time, zeroes will be shifted into the (D8) position of the shift registers, clearing out any Markers. The preceding conditions will exist until the 3.3 ms one-shots time out. At that time, L6-9 will set on trailing edge of CLK. A marker bit, at MKR gate, will exist at this time (Figure 4-8) and the leading edge of $\overline{CLK}$ will shift it into the first register. At the trailing edge of $\overline{CLK}$, L37-8 goes low to inhibit MKR gate and also to inhibit any more shift clocks via L27-3. $\overline{CLR}$ goes back high to release the Busy circuit. The logic is now initialized, and a marker bit is in the first position of the shift register. When selected the printer is ready to receive inputs.

4.3.2.5 Select Circuit

Before accepting any data, the printer must be selected. This is done by depressing the select switch on the control panel.

When the switch is depressed, a low is applied to pin R_1 setting the Select Latch L36-7 high. Upon releasing the select switch, a low is applied at pin 14_1 and resets the Select Latch. On the negative edge of L36-7, PG L36-13 fires to clock SL flip-flop L21-9. With SL high, the Busy circuit is released and other gates are enabled. A lamp inside the Select Key is lit and a select status bit SL is provided at the I/O interface. Prime Latch, L17-13, is gated with SL at L22-8 for a Busy condition. Set low at the end of each print cycle, the Prime Latch sets with the receipt of the first printable character. If the printer is deselected during buffer loading, then a low on L22-11 will inhibit L22-8 from causing a Busy at this time.

The printer may be selected and deselected alternately by pressing and releasing the Select switch. Also, note that SL latch is cleared by the power-up circuit to keep the printer deselected at power-on.

4.3.2.6 Print Buffer Loading

Data bits, DT1 through DT7, are buffered and presented at the inputs of the shift registers and the function decoders. L35-8 decodes the bell function or audio alarm. L34-8 decodes the delete function. L33, a BCD-TO-DECIMAL decoder, decodes line feed, vertical tab, form feed, and carriage return. L32-12 decodes any function or character in the range of Hex (00) to Hex (1F) except for carriage return. The output is used to inhibit the loading of functions to the shift registers. Note that all function decoders are gated by DSTB, and that the duration of each output will be a direct function of the pulse width of DSTB.

DSTB is used to fire $\overline{\text{AKDLY}}$ one-shot and to generate $\overline{\text{PS}}$ to clock the shift registers via the shift gate. DSTB is gated with L32-12 function decode output and if low, DSTB will not get through. For printable characters, L32-12 is high and $\overline{\text{PS}}$ is generated. $\overline{\text{PS}}$ resets L17-13 prime latch, resets 1st character CR latch low and causes shift gate L12-8 to go high. On the low to high transition L3-10 PG is fired to shift in the character on the input lines.

$\overline{\text{AKDLY}}$ is low for a 7 µsec duration. If the character at the input didn't cause a busy condition, then the trailing edge of $\overline{\text{AKDLY}}$ will fire the $\overline{\text{ACKLG}}$ one-shot via L2-6. If a busy condition did exist longer than 7 µsec, then $\overline{\text{ACKLG}}$ would be generated by the trailing edge of RDY/BSY. $\overline{\text{ACKLG}}$ may be used to initiate the next DSTB on the sending device.

4.3.2.7 READY/BUSY Circuit (Refer to drawing E7060)

The BUSY circuit is used to indicate to the sending device that an operation is in process. It also inhibits the $\overline{\text{ACKLG}}$ pulse to allow the printer to become ready before more input is accepted.

The following conditions will cause the busy flip-flop L37-12 to go low or busy.

1. $\overline{\text{CLR}}$ - prime circuit is active (L26-12)
2. AL - 1.1 second audio alarm active (L26-10)
3. $\overline{\text{Cover Open}}$ - gated with Prime Latch or Marker Detect F/F (L26-9)
4. $\overline{\text{SL}}$ - select status gated with Prime Latch or Marker Detect F/F (L26-9)
5. $\overline{\text{LF}}$ - paper feed in process (L38-1)
6. $\overline{\text{CF}}$ - carriage forward indicating device is printing (L38-5)
7. $\overline{\text{MKR}}$ - buffer full condition (L38-2)
8. CR - Latch set (L38-4)
9. $\overline{\text{PAPER OUT SW}}$ - paper out sensed (L26-13)

$\overline{\text{LF}}$, $\overline{\text{CF}}$, CR Latch and $\overline{\text{MKR}}$ are negative ORed by gate L38-6. Any low input will cause L38-6 to go high and L39-6 to go low. This low is applied to D6 and negative ORed with other inputs by expandable gate L26-8. Again, any low input will cause L26-8 to be high, giving a low on busy latch clear input, keeping it busy.

$\overline{\text{PAPER-OUT}}$ and $\overline{\text{BELL}}$ are negative ORed by L28-6. This gate serves to generate an audio alarm, MA, and a busy condition by L39-12 and L26-8.

$\overline{\text{Cover Open}}$ and SL are negative ORed at L36-9 and NANDed with output of L22-11 (negative ORed PRIME LATCH and $\overline{\text{MKR}}$). This delays setting of the BUSY F/F L37-12 by a cover open or a deselect condition until after buffer registers finish receiving the current line of data being inputted and the line has been printed.

The busy latch is set to READY on the first CLK after the busy condition is removed.

4.3.2.8 Print Cycle (Refer to drawing E7060)

The print cycle is initiated by detecting a print buffer full condition or decoding a CR at the input.

Buffer Full Print Cycle

As each character is shifted into the buffer, the marker bit is shifted along ahead of the data in. When 112 printable characters have been inputted, the MKR bit is sensed by MKR flip-flop L6-12. $\overline{MRK(Q)}$ goes low to set printer busy. MRK(Q) goes high to enable print gate, L38-8. $\overline{PRINT}$ sets logic on the 6761 board to start the carriage moving. As the timing wheel passes the magnetic pickup, print timing is generated and the character at the buffer output b1 through b7 is printed. Each time the magnetic pickup senses five teeth $\overline{SF6}$, pin 1_3 goes low generating a shift clock to shift out the next character. After printing the 112th character, the carriage magnet closes SW2 (rightmost reed switch) to reverse the servo logic. $\overline{CIP}$ from the 6761 board generates a prime condition to initialize the printer for a new line of data.

Decoded Carriage Return Print Cycle

When a CR code is received at the input and less than 111 printable characters have been shifted into the registers, $\overline{CRP}$ (decoded by L33-5) initiates the print cycle. Since the first character to be printed could be in any one of the 111 register positions, some means must be used to shift it to the output before carriage movement is initiated.

Upon decoding a carriage return at the input buffer, $\overline{CRP}$ goes low and sets CR Latch L17. On the trailing edge of DSTB, $\overline{CRP}$ goes high and produces a low on L24-6. This causes a busy condition, and holds inverter L11-2 high to enable shift control gate L12-6. For each CLK, a low is generated at L12-6 which causes L12-8 to go high. Thus, L3-10 PG is fired at each CLK until the marker is sensed at the output of the shift register. At this time Marker Detect F/F sets and inhibits the Shift Control Gate L12-6 stopping the shift pulses. It also enables the Print Gate which initiates forward carriage motion.

When the carriage return code is shifted to the shift register output, it indicates that all the characters have been printed. Rather than wait for the carriage to activate the right reed switch, time may be saved by returning it from its present position. CR code is detected at the output of the shift registers by L39-6 on the 6761 board at $\overline{G2}$ time.* On return, $\overline{CIP}$ causes a prime routine to ready the printer for another line of input.

4.3.2.9 Audio Alarm (Refer to drawing E7060)

The audio alarm is produced by the following conditions.

1. Power-on circuit action
2. On receipt of Bell code, Hex (07)
3. On sensing paper-out condition

$\overline{BELL}$, $\overline{PAPER\text{-}OUT}$ and Limit Latch (set) are gated at L28-6.** When any of the three conditions occur, L1-6 one-shot on the 6761 board is triggered for a duration of 1.1 seconds by MA. This gates the output of the Alarm Oscillator to the audio amplifier on the 6761 board. The frequency of the audio signal is approximately 300 Hz. Transistor Q4 in the one-shot L1-6 circuit is necessary when a large value RX_1 is used for such a large time constant.

4.3.2.10 Cover Open (Refer to drawing E7060)

When the front cover is opened, pin P_1 goes low. $\overline{CO}$ is negative ORed with SL and NANDed with Prime Latch or Marker Detect F/F to cause a busy condition. If the cover is opened during buffer loading, L22-11 will be low and inhibit the busy. When CR code is received as a line terminator and the marker is detected at the shift register output, L22-11 will go high to enable L22-8 causing a busy via Busy Gate 2.

* Actually decodes any code between Hex (00) and Hex (1F) but only a CR code Hex (0D) can be shifted into the buffer.

** Note: The Limit Latch circuit was used to indicate a carriage malfunction. It is presently not in use.

4.3.2.11 Paper-Out Switch (Refer to drawing E7060)

While paper is moving over the $\overline{\text{PAPER-OUT SW}}$ actuator, the switch remains open. When the end of the form passes the switch, the switch closes making pin 10_1 low. Paper out F/F, L21-12 will set upon receiving a clock via L22-3 gate. Either $\overline{\text{LF}}$ or $\overline{\text{CLR}}$ will provide this clock to set the latch. L21-13 ($\overline{Q}$) is buffered and made available at the I/O interface for monitoring. $\overline{Q}$ is also used to trigger the alarm one-shot via MA and to cause a busy condition. The Q output is buffered and used to turn on the paper-out light.

4.3.2.12 Form Override (Refer to drawing E7060)

$\overline{\text{FOR}}$ switch applies a low to the clear input of the paper out F/F. If the switch is released, the latch will again set by $\overline{\text{LF}}$ or $\overline{\text{CLR}}$. The latch cannot be set as long as the override switch is held down.

4.3.3 *PRINT OPERATION*

The dot pattern for all the characters are contained in 2 ROMs. One ROM contains the odd column dot pattern of the matrix for each character while the other ROM contains the even column patterns. By alternately selecting and reading each ROM, the full 8w x 9h dot matrix* may be printed. (*The printer matrix size is referred to as a 7w x 9h, however, a few characters are actually 8w x 9h.)

As the carriage starts moving, a signal is generated by the magnetic pickup MPA, and its associated amplifier. As the second magnetic pickup, MPB, senses the index hole, the index flip-flop is set and gates the signal from the $\overline{\text{WS}}$ gate to the clock network. Thus synchronization is maintained between printing and carriage movement.

On each edge of $\overline{\text{FSO}}$ at L10-6 (Refer to E6761) the master clock is gated to the timing counter L36. Its output is decoded by L37 to generate sequential timing for print operations.

On power-up and at the end of each line printed the prime circuit produces a clear pulse $\overline{CLR}$. It is used to reset the ÷2 flip-flop, L4-12 and the column counter L5.

G1 time strobes the $\overline{SF6}$ gate which decodes a nine count and delay latch L29 on the 7060 board. $\overline{G2}$ strobes the CR decoder L39-6 on the 6761 board to insure that the character being printed is completed before reversing the carriage and also delay latch L30 on the 7060 board.

On the 7060 board, $\overline{ARO}$ is the read strobe for the Odd ROM and $\overline{ARE}$ is the read strobe for Even ROM. Note that although $\overline{ARO}$ and $\overline{ARE}$ are both generated each cycle, they will have no effect unless the corresponding chip select $\overline{SCO}$ or $\overline{SCE}$ is active.

On the 6761 board, K1 time is used to increment the column counter and K2 strobes the count of ten decoder, L22-8 used to reset the counter.

$\overline{FSE}$ gate, L39-8 is a quad input NOR w/strobe. The strobe is derived from an inverted $\overline{FSO}$ signal. $\overline{FSE}$ is active for only the even counts of the column counter except zero. At counts of zero and one, the expand ÷2 flip-flop will not be set thus keeping $\overline{FSE}$ high. This action is necessary to keep the even solenoids from firing until the delay latches have been conditioned. On power-up, the delay latches, L29 and L30 of the 7060 contain undetermined information.

$\overline{A_1}$ and $\overline{A_2}$, the 2-bit and 4-bit outputs of the column counter address the ROMs. These two address bits select 4 locations in each of the two ROMs for a total possible 8 column by 9 row matrix.

During expanded print operation, $\overline{EC}$ will be low, causing column counter output, QA to be divided by two before being gated to the BIN input of the column counter. The effect is that each column of a normal size character is printed twice resulting in a symmetrical expanded character.

The ROM outputs are ORed through L4 and L23 which act as level translators. The outputs for the odd numbered solenoids are gated by $\overline{FSO}$ directly to the solenoid drivers. The even numbered outputs are applied to the delay latch, L29 at G1 time and at G2 time are loaded into delay latch L30. L30 outputs are gated with $\overline{FSE}$ to the even solenoid drivers. The print head is physically constructed so that the odd numbered solenoids actually lead the even ones. Thus the delay latches provide the necessary delay to the even solenoids so the even dots are aligned with the odd dots for a straight vertical line.

The solenoid drivers on the 6756 board act as sink elements for current flow from +32 volts through the solenoid coils causing the solenoids to energize. Return diodes are used to protect the driver transistors from damaging high voltage transients as the coils collapse.

4.3.4 *SERVO ALARM LIGHT*

The servo alarm light is connected across (in parallel) the servomotor fuse. The lamp only illuminates when the servo amplifier is active and the servomotor fuse is open.

SECTION 5

ADJUSTMENT, REMOVAL AND REPLACEMENT PROCEDURES

5.1 INTRODUCTION

This section describes the adjustment, removal and replacement of each major mechanical assembly in the Model 61 printer.

The electrical section contains voltage and timing adjustment procedures and a listing of all the electrical component boards used in the Model 61 printer.

The mechanical section contains the mechanical and electromechanical adjustment checks, adjustment procedures and removal/replacement procedures.

5.2 ELECTRICAL ADJUSTMENTS (REFER TO FIGURE 5-1)

(a) Check, and adjust if necessary, first character position per Section 5.3.9 (a).

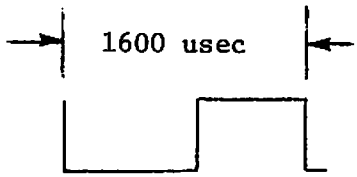
CAUTION:

To perform the following print timing adjustments the print head should be disconnected electrically.

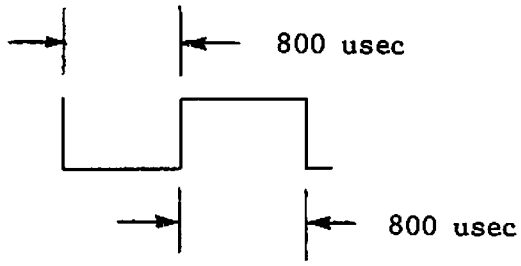
(b) Print Head Adjustment - To prevent damage to the print head while making the following adjustments, disconnect the print head electrically by disconnecting the finger board which plugs into the 6756 PCB. Then run a program for continuous printing. Each adjustment required for print timing is listed in Table 5-1. Perform the +5VR adjustment before proceeding to print timing.

1) WS Adjustments - (Figure 5-1) WS is generated by the timing disk teeth passing the magnetic reluctance pickup. This signal must be adjusted by R71 on the 6761 board for a complete cycle of 1600 µs $\pm$25 µs monitored at L19 Pin 5 of the 6761 board (negative trigger in normal trigger mode). R10 must then be adjusted to obtain a squarewave (50% duty cycle).

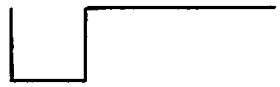
SCOPE: L19-5
NEG. TRIGGER
ADJUST: R71



SCOPE: L19-5
NEG. TRIGGER
ADJUST: R10



SCOPE: L19-7
NEG. TRIGGER
ADJUST: R16



SCOPE: L19-9
NEG. TRIGGER
ADJUST: R19

SCOPE: Channel 1 L13-13
POS TRIGGER
Channel 2 L3-12
ADJUST: Pivot Plate

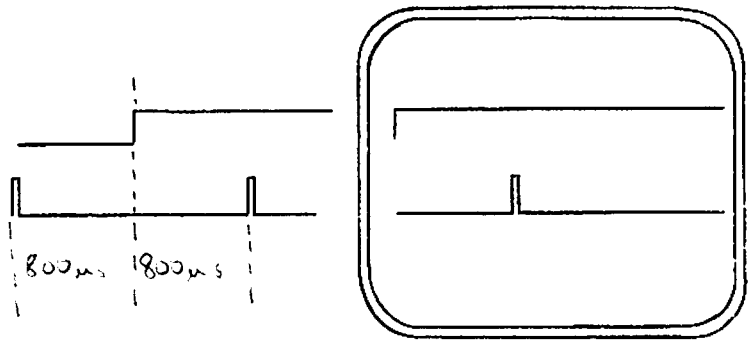


FIGURE 5-1 WS TIMING ADJUSTMENT

2) After obtaining the proper waveform for WS (Figure 5-1), the following pulses should be checked and/or adjusted.

WS trailing edge - Adjust R16 on the 6761 board for a 550-560 µs negative pulse at L19 pin 7.

WS leading edge - Adjust R19 on the 6761 board to obtain a 550-560 µs negative pulse at L19 pin 9.

The WS leading and trailing edge strobes are only present during the printing period. Replace print head solenoid fingerboard connector.

3) To properly phase the signals from the two magnetic reluctance sensors, pivot the mounting plate holding the magnetic reluctance sensor for the index hole of the timing disk (Figure 5-18) for a difference of 800 µsec ±50 µsec between positive edge of signal at L3 pin 12 and L3 pin 13 (positive edge of signal from L3 pin 13 is used to trigger oscilliscope sweep).

TABLE 5-1

LEVEL OR SIGNAL	BOARD	LOCATION	MEASUREMENT	ADJUSTMENTS
+5VR	6756	Pin C_1	+5 volts ± .25 volts	R24
WS	6761	L19 pin 5	1600 µs ± 25 µs full cycle squarewave (50% duty cycle)	R71 R10
WS(TRAILING EDGE)	6761	L19 Pin 7	550-560 µs negative pulse	R16
WS(LEADING EDGE)	6761	L19 Pin 9	550-560 µs negative pulse	R19
INDEX	6761	Ch. 1 L3 pin 13 and Ch. 2 L3 pin 12 (Trig. Ch. 1)	L3 pin 13 should lead L3 pin 12 by 800 µs	Pivot plate

NOTE:

1. Whenever the 6761 board is changed, all electrical adjustments must be checked.
2. All timing pots should be secured with Glyptal after adjustment to prevent any changes due to vibrations in the printer.

The complement of Electrical Circuit Boards used in the Model 61 are listed in Table 5-2. Refer to Figure 5-2 for locating the position of Electrical Circuit boards on the Electrical Chassis Assembly.

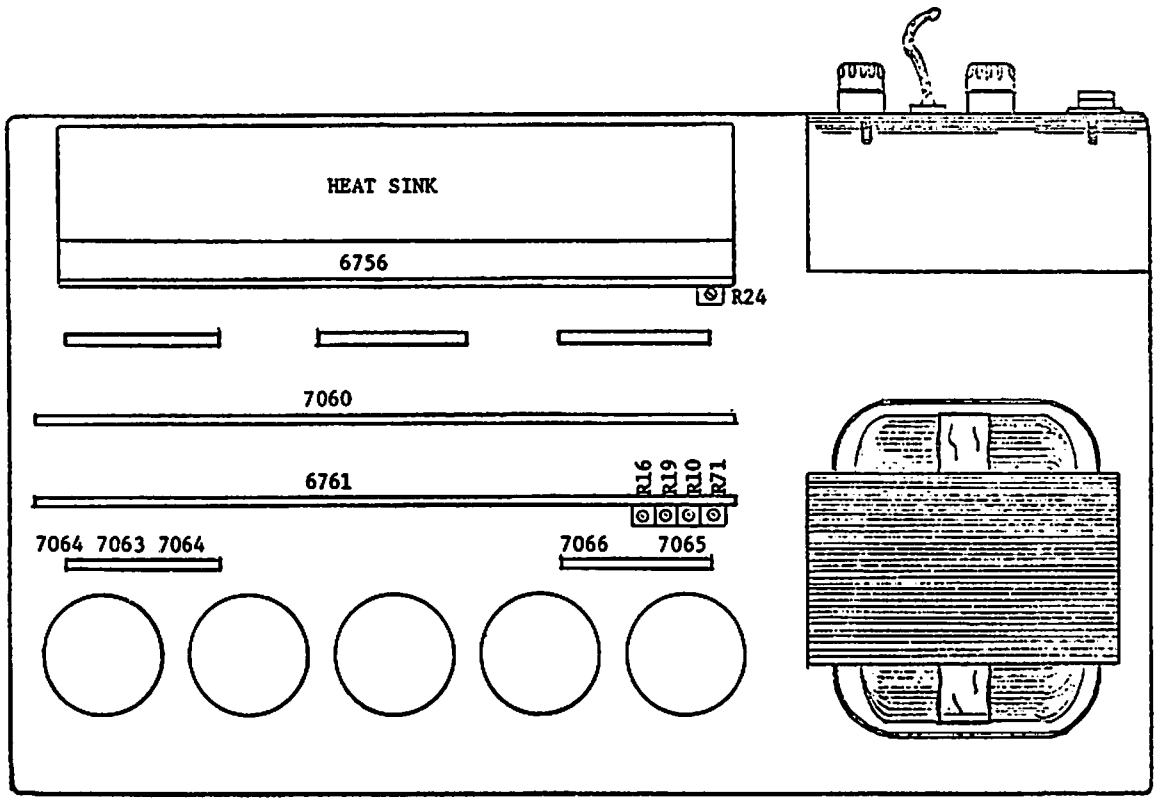


FIGURE 5-2 ELECTRICAL CHASSIS ASSEMBLY LAYOUT

TABLE 5-2

ELECTRICAL CIRCUIT BOARDS	PART NUMBER
1) Power Transistor Board	210-6756
2) Motherboard	210-6757

3)	Timing and Format Control	210-6761
4)	I/O Control, Data Storage and Character Generator	210-7060
5)	Print Head Fingerboard	210-6758
6)	Print Head Cable Fingerboard	210-6759
7)	Center Panel Fingerboard (6 x 2)	210-7062
8)	Reed Switch Fingerboard (5 x 2)	210-7063
9)	Format Control Fingerboard (4 x 2)	210-7064
10)	Panel Switch Board	210-6762
11)	Power Line Slide Switch (115V/230V)	210-6749
12)	Fingerboard (7 x 2)	210-7065
13)	Fingerboard (8 x 2)	210-7066

5.3 MECHANICAL AND ELECTROMECHANICAL ADJUSTMENT, REMOVAL/REPLACEMENT INDEX

5.3.1 *PAPER GUIDES (Figure 5-3)*

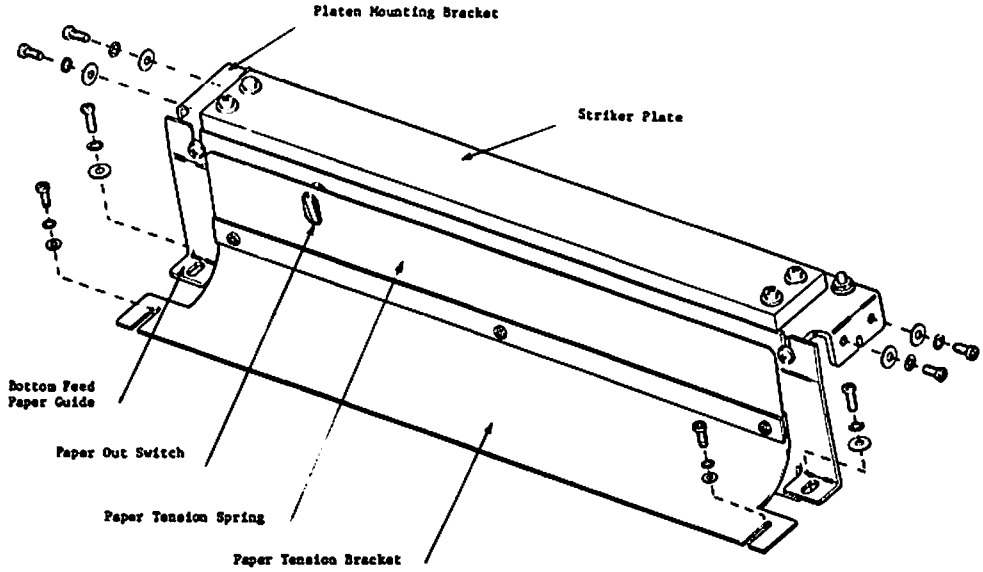


FIGURE 5-3 PAPER GUIDE ASSEMBLY

(a) Adjustment Checks

1) The paper tension spring must be parallel to the bottom feed paper guide across its entire length.

2) The point at which the paper exits from the paper tension spring should be the only place where the spring contacts the bottom feed paper guide. This may be difficult to see, so it is suggested that a piece of paper be pushed squarely through the front feed or bottom feed paper guides as if paper was being loaded. In doing this a slight resistance should be felt along the entire width of the paper just as the paper begins to appear at the front of the machine.

3) As a single sheet of paper is pulled upward through the paper tension spring, check for a two ounce (57 gram) force applied to pull paper to produce movement. (An 8 part form, or 8 sheets of paper, should not bind when pulled through.)

(b) Adjustment

Loosen two screws holding paper tension bracket and move forward or backward parallel to bottom feed paper guide to achieve the proper tension.

(c) Removal and Replacement

1) Remove striker plate (Section 5.3.3 (c)).

2) Remove paper out switch wires.

3) Remove print head mounting screws and lift print head clear of carriage.

4) Remove four bottom feed paper guide mounting screws and guide.

5) Loosen two paper tension bracket mounting screws and remove bracket and spring assembly.

6) Reverse procedure to reassemble.

5.3.2 *HEAD ADJUSTMENT ARM (Figure 5-4)*

(a) Adjustment Check

1) Move head adjustment arm to position 5 and check that Allen screw in carriage shaft is vertical.

(b) Adjustment

1) Rotate carriage shaft so Allen screw is vertical.

2) Loosen Allen screw holding left hand pivot pin.

3) Place head adjustment arm (on left hand pivot pin) to position 5, center arm on detent spring and tighten Allen screw.

4) Check striker plate adjustment (Section 5.3.3).

(c) Removal and Replacement

1) Loosen Allen head cap screw and nut on head adjustment arm and slide lever off end of pivot pin. [For carriage shaft removal, see Section 5.3.15 (c)].

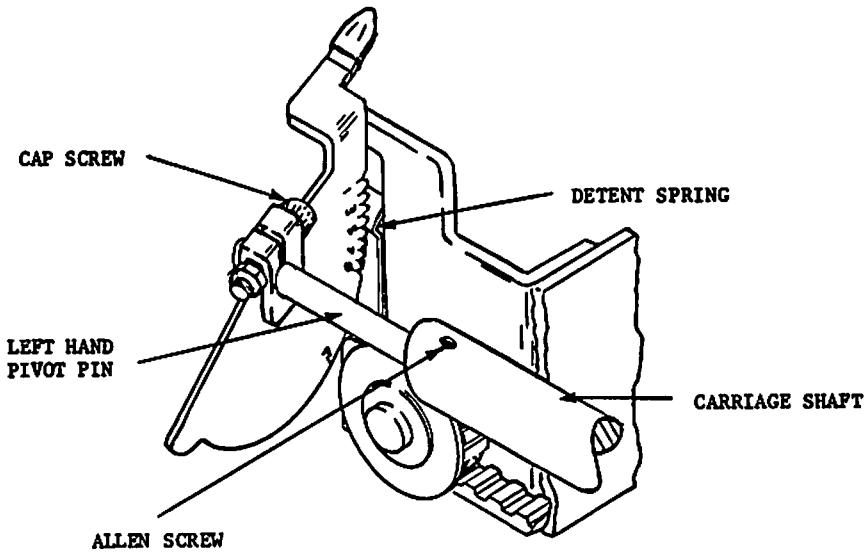


FIGURE 5-4 HEAD ADJUSTMENT ARM ASSEMBLY

5.3.3 *STRIKER PLATE AND PLATEN BRACKETS (Figure 5-5)*

(a) Adjustment Check

1) With the print head in the far left carriage position and ribbon cartridge removed, move the head adjustment arm to position 1 (to move the print head as close as possible to the striker plate). A .013" (.33 mm) gauge should just fit between the striker plate and the solenoid wires.

2) Move the head to the far right carriage position and check for the same gap.

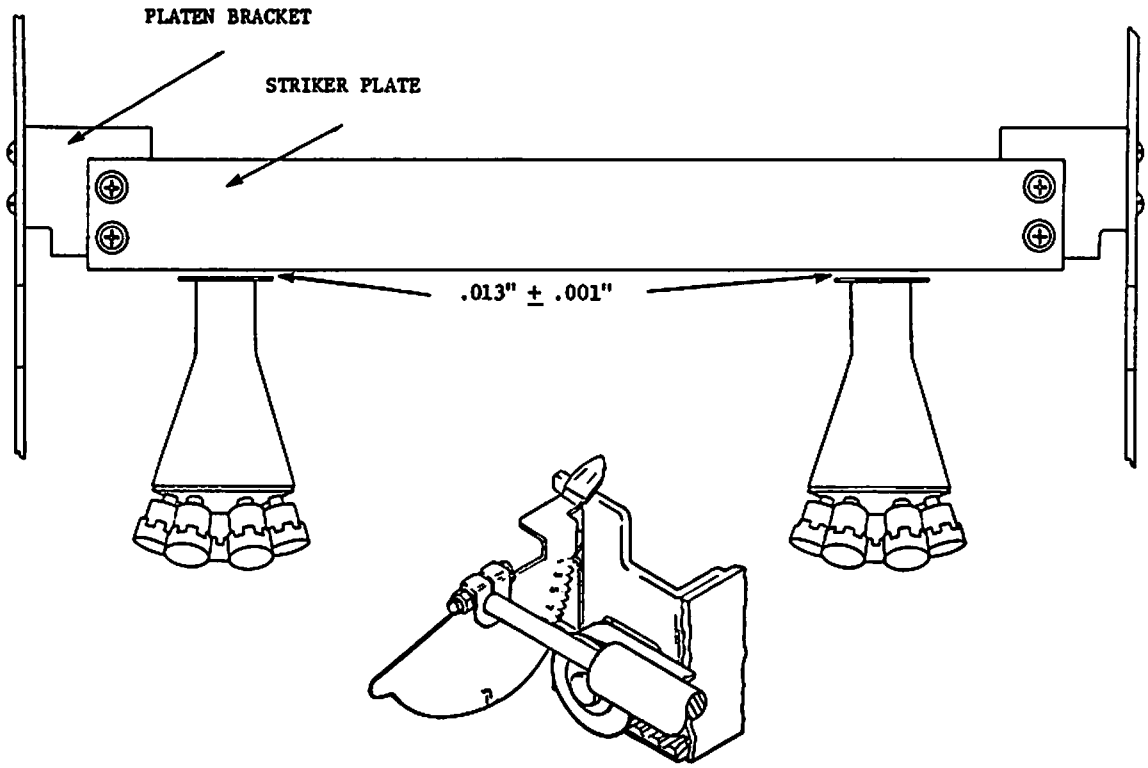


FIGURE 5-5 STRIKER BAR ADJUSTMENT

(b) Adjustment

Fine Adjustment

1) Move the head adjustment arm to position 1.

2) Remove the ribbon cartridge from the print head to allow for proper measurement (Section 3.2.1).

3) Loosen the four Phillips head screws holding the striker plate to platen mounting brackets.

4) Adjust the striker plate in or out to meet adjustment tolerances.

Coarse Adjustment (if necessary)

1) Loosen the four screws holding the striker plate to the platen mounting bracket; slide striker plate to front of printer and retighten screws.

2) Move print head to left side of printer and set head adjustment arm to position 5.

3) Loosen two screws holding platen mounting bracket on left side frame and adjust in or out for a gap of .013" (.33 mm) between striker plate and solenoid wires. Tighten screws.

4) Repeat step 2 and 3 for right side.

5) Check paper guide adjustment (Section 5.3.1).

6) Do striker plate fine adjustment step 1 to 4.

(c) Striker Bar Removal and Replacement

1) Move the head adjustment arm to position L.

2) Remove the four Phillips screws that attach the striker plate to the platen mounting brackets.

3) Reverse procedure to reassemble and then readjust striker plate.

4) Check the paper guide adjustment (Section 5.3.1).

5.3.4 *MAIN DRIVE BELT*

(a) Adjustment Check

1) Move the carriage to the extreme right hand position.

2) Using a spring gauge and scale, deflect the middle of the belt .31" or 5/16" (7.9 mm). The gauge should read 1 lb $\pm$ 2 oz (453 grams $\pm$ 57 grams). (Figure 5-6).

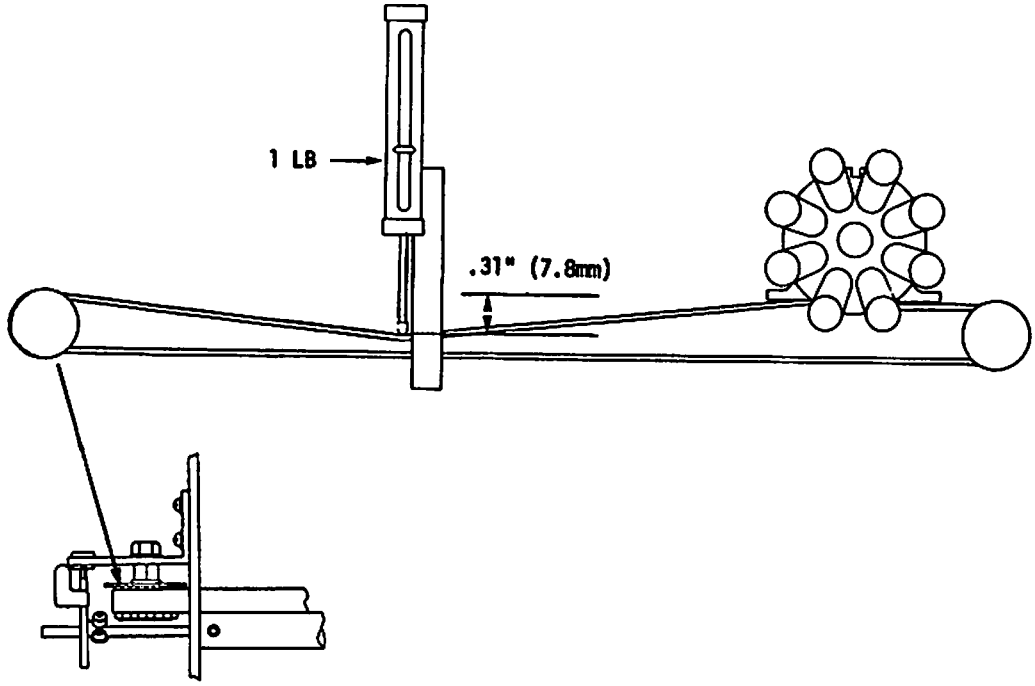


FIGURE 5-6 MAIN DRIVE BELT ADJUSTMENT

(b) Adjustment

Loosen the 7/16" nut holding the main drive belt pulley on the left side of the printer. Move the pulley in the desired direction and retighten the pulley nut.

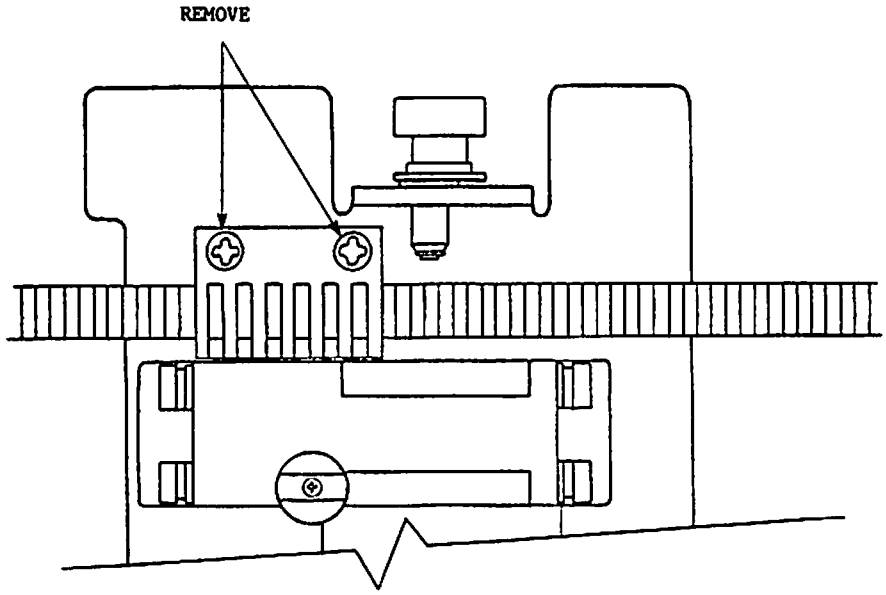


FIGURE 5-7 MAIN DRIVE BELT REMOVAL

(c) Removal and Replacement

1) Remove the carriage assembly (Section 5.3.15).

2) Turn carriage assembly upside down, remove two belt holding plate screws and remove belt (Figure 5-7).

3) To replace reverse procedure.

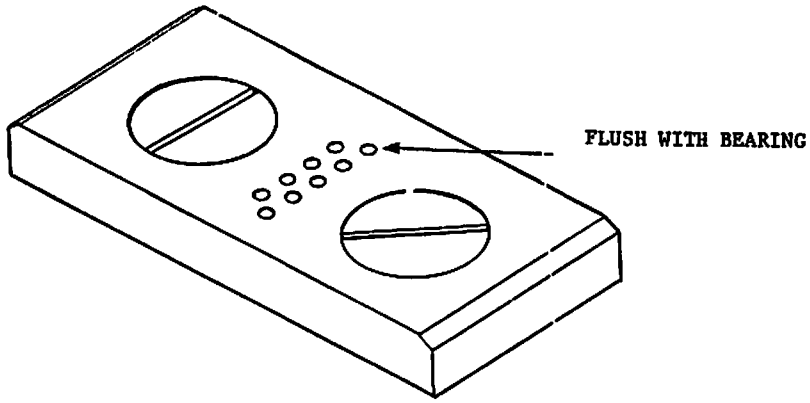


FIGURE 5-8 SOLENOID WIRE ADJUSTMENT

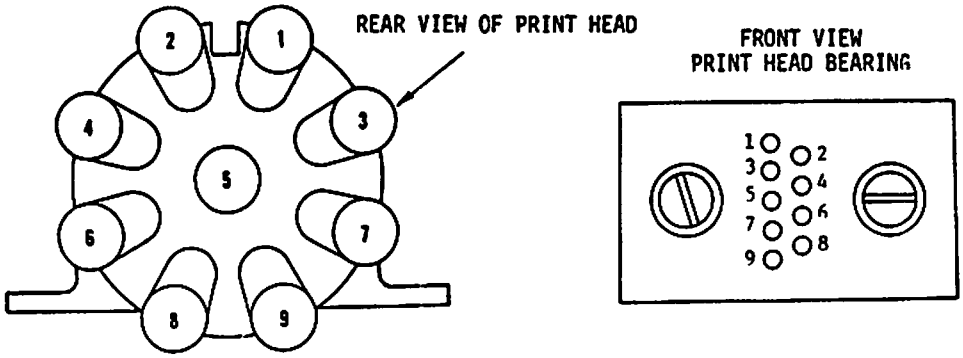


FIGURE 5-9 IDENTIFICATION OF SOLENOIDS

5.3.5 *PRINT HEAD ADJUSTMENT*

(a) Adjustment Check

1) Loosen mounting screw holding 6758 fingerboard retainer and rotate away from finger board.

2) Remove the print head from the carriage assembly by disconnecting fingerboard from connector and removing the two print head mounting screws.

3) With a jewelers loupe (magnifier) look at the head bearing (Figure 5-8). All the solenoid wires must be flush with the bearing surface.

NOTE:

When replacing solenoid fingerboard Wang Logo faces front of printer.

(b) Adjustment of Print Head

1) Remove the head cover by removing the two Phillips screws.

2) Unlock the desired solenoid by loosening its corresponding nylon tip locking set screw WL #650-4086 (8-32 x $\frac{15}{64}$). These screws are positioned radially at the rear of the print head.

CAUTION:

In Step 3, while turning solenoid, grasp the metal body of the solenoid, not the plastic endcap. Using the endcap as a gripping point may damage the coil wires protruding from the endcap.

3) Turn the solenoid to be adjusted in or out while watching the solenoid wire at the bearing (Figure 5-9).

4) Tighten nylon tip set screw and check the bearing again.

(c) Solenoid Removal and Replacement

NOTE:

If more than one solenoid requires replacement, only one solenoid should be removed, replaced and adjusted at one time.

1) Remove print head from carriage assembly by removing the fingerboard and the two screws holding print head to carriage assembly.

2) Remove print head cover; loosen 6758 fingerboard retainer bracket and remove 6758 fingerboard.

3) Unsolder solenoid wires from 6758 fingerboard.

4) Loosen desired lock set screw and unscrew solenoid from head casting (Figure 5-10).

5) Remove lubricant pad. Remove any broken wire material at pad location.

6) Dip the new solenoid wire into the lubricant (obtained from the Home Office; no other lubricant can be substituted). See lubrication procedure in Section 6. Cautiously insert the new solenoid being careful not to bend the new print wire. With a pair of tweezers (or springhook) guide the wire into its guide tube and then into its respective bearing hole. Relock the solenoid with nylon tip set screw. Separating the two rows of print wires with a feeler gauge aids in guiding the new solenoid wire into the printhead bearing.

7) Solder solenoid wires to 6758 fingerboard.

CAUTION:

The next step is lubricating the new solenoid wire and the bearing. Lubrication is necessary or damage to the new wire will result.

NOTE:

When replacing 6758 fingerboard, Wang Logo faces front of printer.

8) Dip the lubricant pad into the lubricant material (obtained from Home Office; no other lubricant can be substituted) and place it back into the print head. Tip the head forward to allow the lubricant to reach the tip of the print wires.

9) Replace print head on carriage assembly and operate for several minutes to insure that lubricant is distributed (lubricant has a wax base and does not flow readily).

10) Dab entrance to each guide tube with swab soaked with lubricant and run head in printer again.

11) Replace print head cover and tighten 6758 retaining bracket.

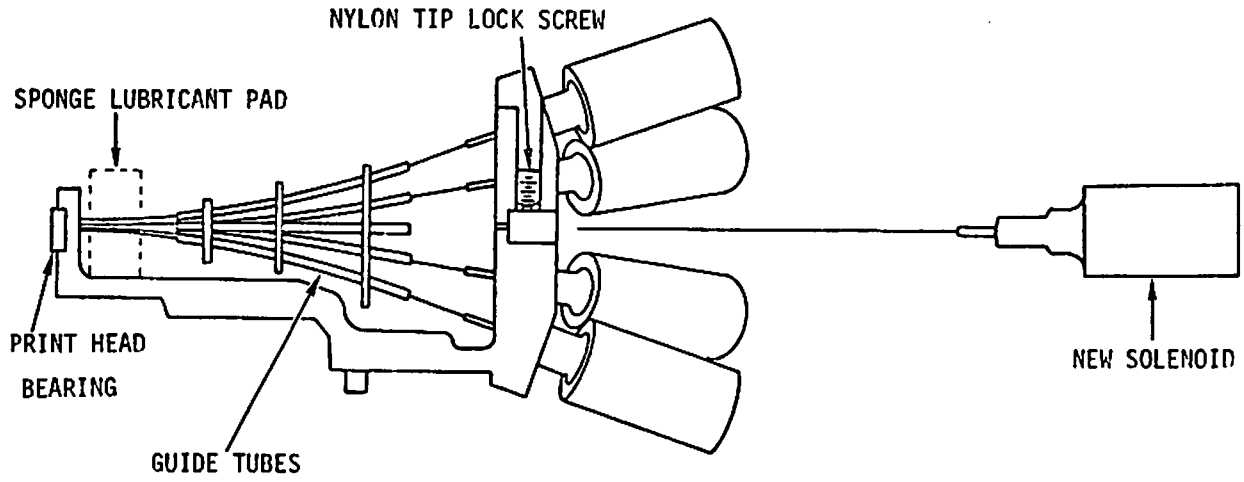


FIGURE 5-10 REMOVAL & REPLACEMENT OF SOLENOIDS

5.3.6 *RIBBON CLUTCH ASSEMBLY AND CARTRIDGE GUIDES*

(a) Adjustment Check

1) The distance from the center line of the ribbon clutch to the inside front edge of the ribbon cartridge guides is 4.38 to 4.42 inches (11.12 cm to 11.23 cm) (Figure 5-11).

a) Remove printhead and insert first character position alignment tool in print head pin holes. Check that ribbon cartridge guides are flush with the forward edge of the alignment tool.

2) Check that the ribbon advance cable is properly seated on ribbon drive pulley (Figure 5-12).

3) Ribbon cartridge should lift free of ribbon cartridge spring with an upward force of 2 lbs. ±2 oz. (906 grams ±57 grams) applied to the rear of the ribbon cartridge.

(b) Adjustment

1) Loosen Allen screws and move ribbon cartridge guides in appropriate direction (Figure 5-11).

2) Loop ribbon advance cable around ribbon drive pulley so the cable is to the rear of the pulley (Figure 5-12).

3) Loosen hex head screws on bottom of carriage and move ribbon cartridge spring in appropriate direction (Figure 5-11).

(c) Removal and Replacement

1) Remove Allen screw from center of cartridge guides.

2) Compress ribbon advance cable spring on right side frame and slide cable upward out of spring, remove from ribbon drive pulley and slide out of left side frame (Figure 5-12).

3) Remove C clip from bottom of ribbon drive pulley, remove 2 screws from top of ribbon drive assembly and pull through carriage assembly (Figure 5-13).

4) Remove ribbon cartridge spring screws from bottom of carriage assembly and slide ribbon cartridge spring out (Figure 5-11).

5) Reverse procedure to reassemble.

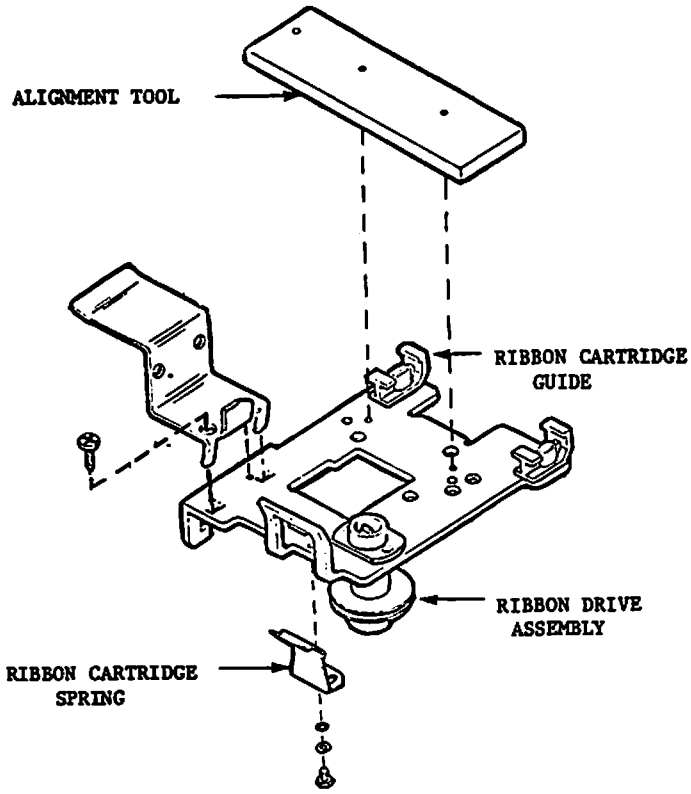


FIGURE 5-11 CARRIAGE ASSEMBLY

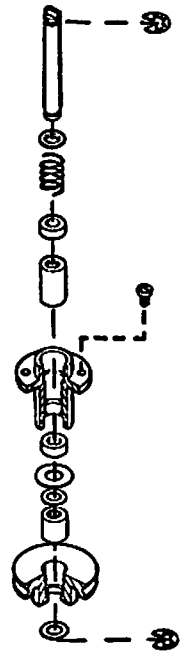


FIGURE 5-12 RIBBON DRIVE

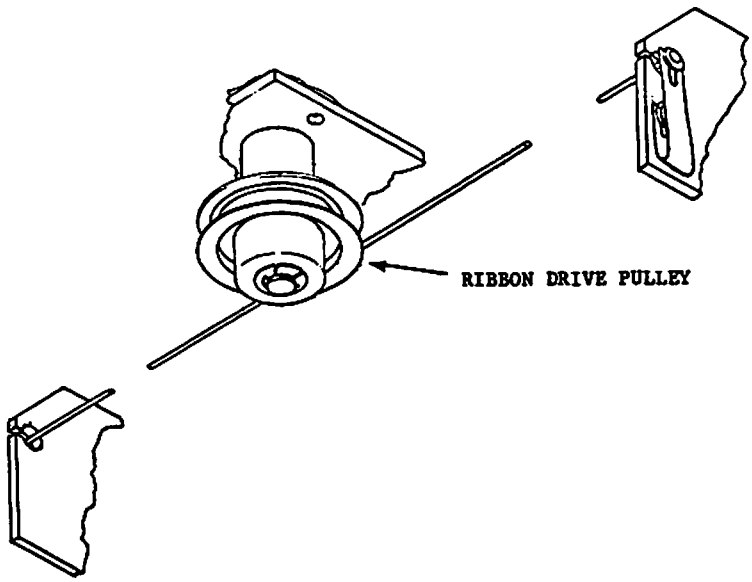


FIGURE 5-13 RIBBON ADVANCE CABLE

5.3.7 *REED SWITCHES AND MOUNTING BRACKET (Figure 5-14, 15)*

(a) Adjustment Check

1)

FROM	TO	MEASURE
Left side frame	Left side of SW_0	1.70" ± .015" (4.32 cm ± .04 cm)
Left side frame	Left side of SW_1	3.15" ± .015" (8.00 cm ± .04 cm)
Right side frame	Right side of SW_2	.80" ± .050" (2.03 cm ± .13 cm)
Reed switch magnet	Top of SW_0/SW_2	.060" ± .015" (.15 cm ± .04 cm)

2) A carriage return should occur automatically after a full buffer condition (112 characters) is generated. This can be accomplished by sending a line of more than 112 characters from the CPU, or by plugging in the printer exerciser (Section 6.4.2).

3) WITH POWER OFF, a gap of .060" ± .015" (.152 cm ± .038 cm) should exist between the reed switch packages and the reed switch magnet.

(b) Adjustment

WARNING:

Because the screwdriver used may be magnetic, always adjust the reed switches with power off. The accidental closing of these switches could be hazardous.

1) Adjust the switches by loosening the screws holding the reed switch brackets and use the previous adjustment checks in steps 1, 2, 3 and 4.

During the adjustment check if a reed switch appears to be faulty or misadjusted, shut off the power. Pull the reed switch fingerboard, 7063, from the electronic chassis. Proceed to check the defective reed switch by using an

ohmmeter for continuity while moving the carriage magnet over the suspected switch or switches. The black lead on the fingerboard is common to all 3 switches. The color code for each switch is as follows:

SW0 (GREEN), SW1 (VIOLET) and SW2 (WHITE).

2) Loosen the four screws holding the reed switch bracket to side frames and move assembly up or down to adjust for .060" ± .015" (.152 cm ± .038 cm) gap between magnet and reed switch packages (Figure 5-14).

3) To adjust slot direction of the magnet, loosen the screw in the center of the magnet, turn the magnet to desired position and retighten screw.

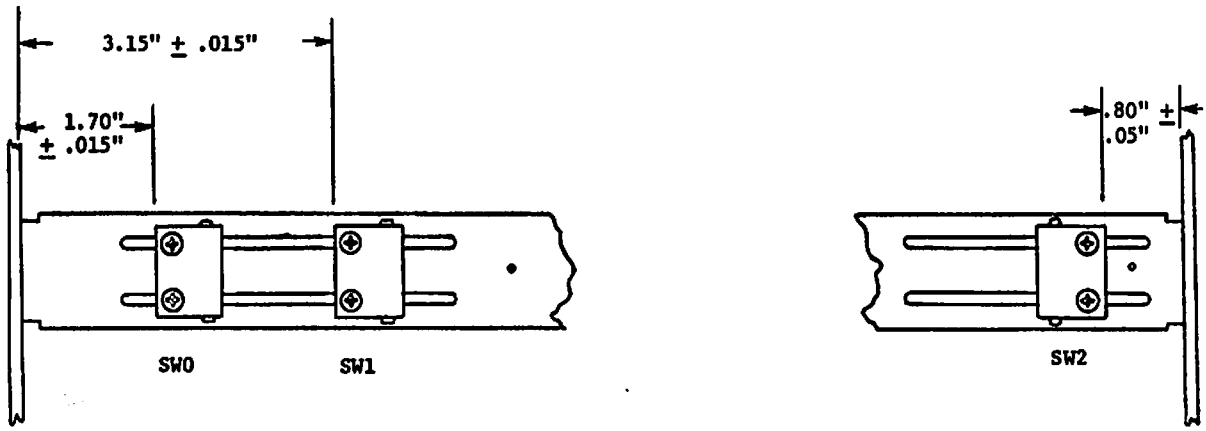


FIGURE 5-14 REED SWITCHES AND MOUNTING BRACKET

(c) Removal and Replacement

Reed Switch

1) Remove screws holding switch package.

2) Remove the wires from the solder lugs.

3) When replacing the switch, do not overheat the lugs and damage the switch.

4) Readjust the switch location [Section 5.3.7 (a)].

Mounting Bracket

1) Remove 7063 fingerboard from the electronic chassis.

2) Remove four screws holding the reed switch bracket to side frames and lift out.

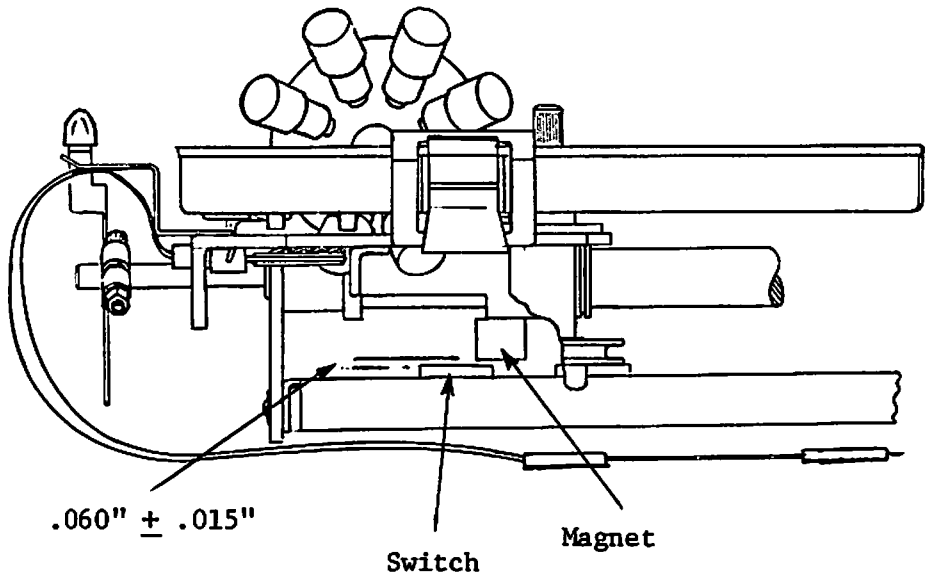


FIGURE 5-15 REED SWITCH MAGNET

5.3.8 *REED SWITCH MAGNET (Figure 5-15)*

(a) Adjustment Check

Looking from the side of the carriage, the magnet should be centrally located over the reed switches, and the slot of the magnet should face in the direction of carriage motion.

(b) Adjustment

See Removal and Replacement Procedure.

(c) Removal and Replacement

1) Remove carriage assembly (Section 5.3.15 (c)).

2) Remove screw in center of magnet.

3) Reverse procedure to reassemble.

4) Readjust carriage belt tension, head adjustment arm, and striker plate (Section 5.3.2 to 5.3.4).

5.3.9 *MAGNETIC RELUCTANCE PICKUP AND TIMING DISK*

(a) Adjustment Check

1) Place adjustment plug through pivot plate hole and into timing disk hole. Check for a distance of 1.18" $\pm$ .01" (3 cm $\pm$ .025 cm) between carriage assembly and left side frame (Figure 5-17), or remove print head and insert first character position alignment tool in ribbon cartridge assembly. With plug removed from timing disk, move carriage to the left until alignment tool is against inside edge of the left side frame. You should be able to insert plug into index hole without moving the carriage away from side frame.

2) Magnetic pickups and timing disk should not contact one another.

3) The distance between the edge/face of the timing disk and the pickups should be consistent along the circumference of the disk with a gap of .005" ± .001" (.127 mm ± .025 mm) (Figure 5-16).

(b) Adjustment

1) Loosen timing disk set screw; place adjustment plug through pivot plate hole and into timing disk hole.

2) Move carriage 1.18" ± .01" (3 cm ± .025 cm) from left side frame (Figure 5-16, 17) and tighten timing disk set screw.

3) Loosen the magnetic reluctance pickup locking nut.

4) Back out pickup and place .005" (.127 mm) gauge between pickup and timing disk. Turn pickup in until it just contacts gauge and retighten locking nut.

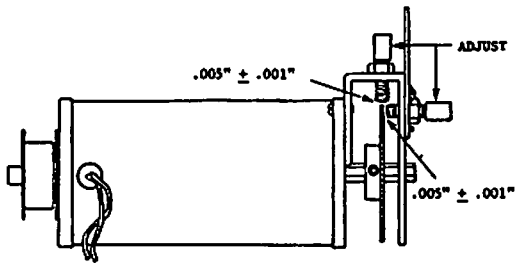


FIGURE 5-16 MAGNETIC PICKUP ADJUSTMENT

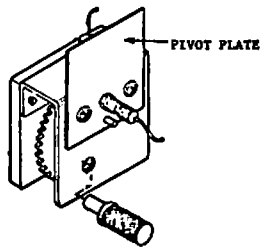


FIGURE 5-17 FIRST CHARACTER POSITION ADJUSTMENT

(c) Removal and Replacement

1) Unsolder magnetic reluctance pickup wires from fingerboard.

2) Loosen pickup locking nut and unscrew pickups.

3) Reverse procedure to reassemble.

5.3.10 *PAPER FEED SPROCKETS AND PAPER GUIDE COVER*

(a) Adjustment Check

1) With each of the sprocket wheel covers closed, (Figure 5-19), there should be a gap between cover and paper feed sprocket of .025" to .030" (.64 mm to .76 mm).

2) The teeth of the sprocket should be centrally located in the cover slot as shown in Figure 5-18.

(b) Adjustment

1) Adjust cover height with locking stop screw. Move screw down until a .030" (.76 mm) gauge begins to pinch between cover and rubber of sprocket.

2) Adjust sprocket cover pivot screws (2) to center teeth. This must be done to both paper guide assembly covers. The pivot screws act as eccentrics to center the cover.

(c) Removal and Replacement

Paper Feed Sprocket

1) Remove horizontal vernier knob by removing Allen screw from center of knob (Figure 5-19).

2) Remove C clip and washer from the external right end of the vernier actuating rod.

3) Remove vernier actuating pivot bracket.

4) Remove the paper drive gear from left side of the paper feed sprocket shaft and slide the paper feed sprocket springs and paper wheels off the splined shaft.

5) When removing and replacing the molded drive sprocket and rubber assembly (WL# 279-5070-63) for any reason, insure that both the left and right sprocket teeth line up on the splined shaft. Each sprocket has a molded rib on the inside hub which is the key for proper alignment and proper paper drive. When reassembling the paper feed sprocket assembly, follow the steps in paragraph 5.3.10 (c) in reverse, then check adjustments in Section 5.3.11 (a).

Paper Guide Cover

1) Remove Phillips screws from ends of paper guide cover shaft.

2) Remove shaft slipping paper feed sprocket side plates off paper feed sprockets.

3) Loosen plastic lock screw and slide assembly off the shaft.

5.3.11 *HORIZONTAL VERNIER CLUTCH (PAPER ADVANCE)*

(a) Adjustment Check

By using the horizontal vernier knob, push the vernier clutch in and out. With the use of a feeler gauge check for a clearance of .032" $\pm$ .007" (.081 cm $\pm$ .018 cm) between the idler gear and the cone gear as shown in Figure 5-21. Also when the knob is released after paper advancement the vernier clutch should fully reengage flush with gear surface as shown on Figure 5-20.

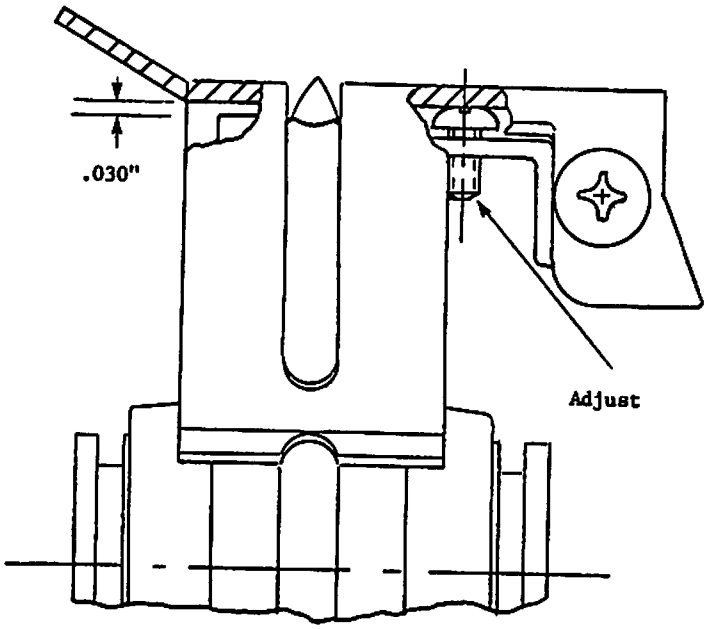


FIGURE 5-18 PAPER GUIDE COVER

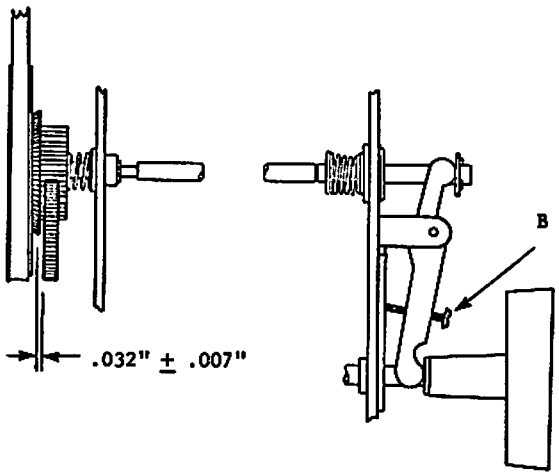


FIGURE 5-19 SPROCKET ADJUSTMENT (DISENGAGED)

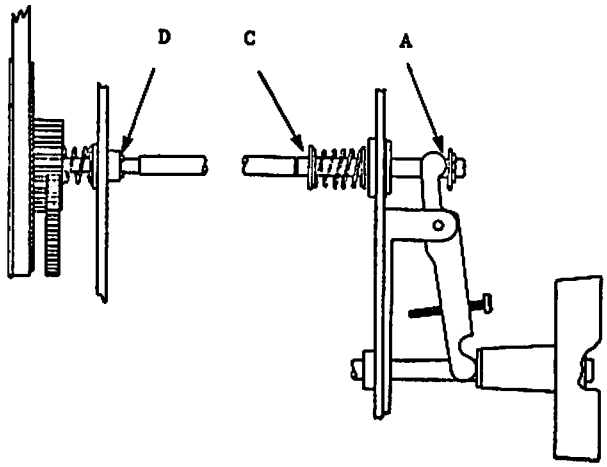


FIGURE 5-20 SPROCKET ADJUSTMENT (ENGAGED)

(b) Adjustment

1) With clutch engaged (automatic advance) adjust Allen screw in the center of horizontal vernier knob for a gap of .021" ± .004" (.053 cm ± .010 cm) between actuating arm and clutch rod washer (point A in Figure 5-20).

2) With clutch disengaged (manual advance), adjust screw (B) for a .032" ± .007" (.081 cm ± .018 cm) gap between the cone gear and idler gear (Figure 5-19). (The screw can be adjusted through hole in horizontal vernier knob.)

(c) Removal and Replacement

1) Remove Allen screw in center of horizontal vernier knob and slide knob off shaft.

2) Remove C clip and washer from the extreme right end of the vernier activating rod.

3) Remove two screws on vernier actuating pivot bracket and remove bracket.

4) Remove vertical format unit (Section 5.3.13 (c)).

5) Loosen paper feed motor mounting screws to release belt tension.

6) Remove three mounting nuts from (VFU) format control plate and remove plate.

7) Remove C clip (point C) and two snap rings (point D) from the vernier actuating rod and slide rod from the right to left out of the machine (Figure 5-20).

8) Remove C clip from paper drive idler gear and remove gear.

9) To reassemble reverse procedure.

10) Check belt tension per Section 5.3.12 (a) and (b).

11) Check all VFU adjustments per Section 5.3.13.

5.3.12 *PAPER MOVEMENT GEARS*

(a) Adjustment Check

1) Check paper sprocket drive gear for maximum backlash of .030" (.076 cm), holding vertical format unit gear immobile (Figure 5-21).

2) Stepping Motor Timing Belt with the belt depressed .1" (.25 cm), the scale should read 1 lb. (453 grams). (Figure 5-21.)

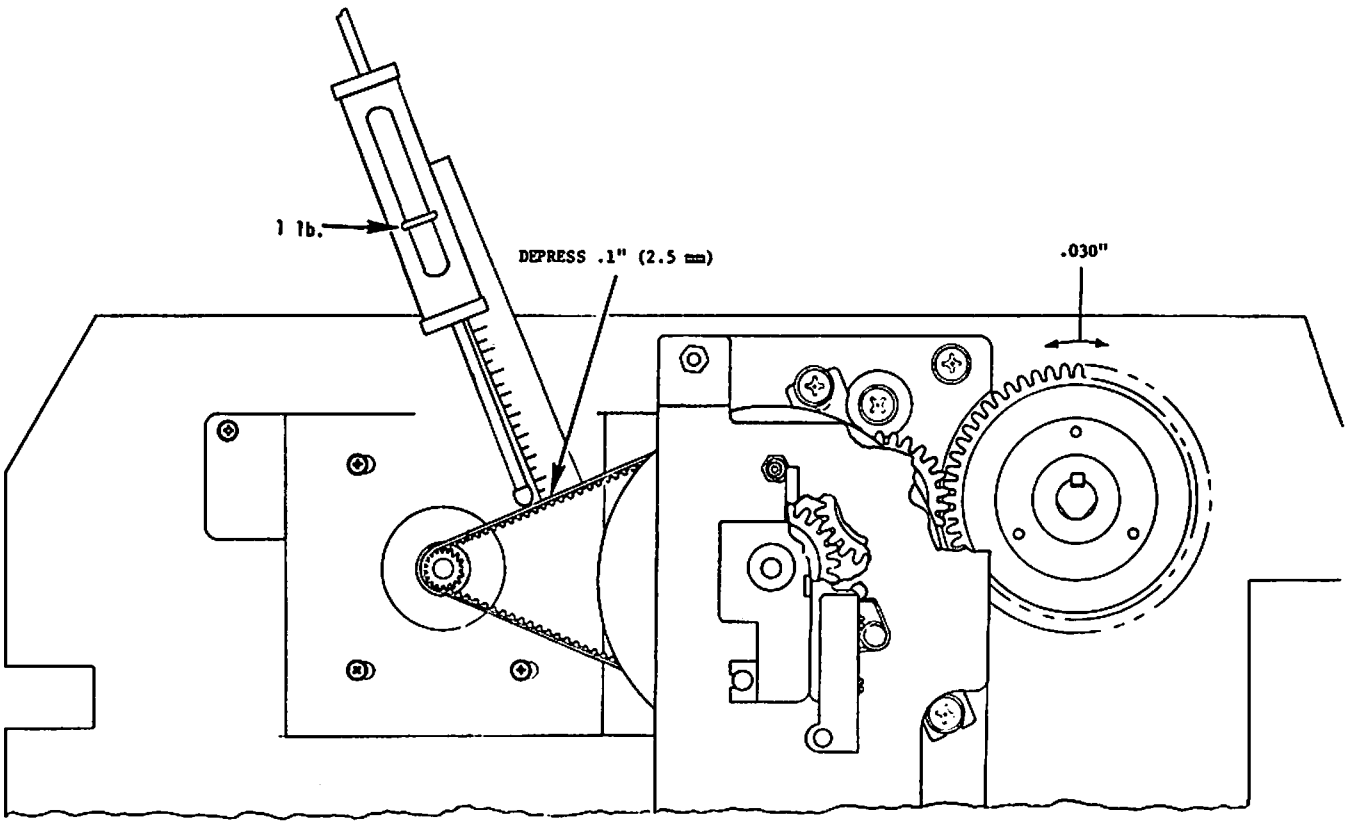


FIGURE 5-21 PAPER MOVEMENT ADJUSTMENT

(b) Adjustments

1) Loosen two idler gear mounting screws to adjust gear train backlash.

2) Motor Belt - Loosen screws holding the motor bracket to the side frame. Move the motor in desired direction and tighten screws. Check VFU phasing adjustment [Section 5.3.13 (a) step 5].

(c) Removal and Replacement

See Section 5.3.11 (c) step 1 to 11.

5.3.13 *VERTICAL FORMAT UNIT (VFU)*

(a) Adjustment Check

1) With the cover closed, there must be a .012" $\pm$ .002" (.31 mm $\pm$ .06 mm) uniform clearance between the cover and housing.

2) With the cover open and the tape well seated in the sprocket, the tape will be centered in the indented part of the housing.

3) The output of the phototransistor should be at least +4 volts on both channels of the VFU. Insert format tape in VFU and connect scope to the following pins of the 6761 board to determine their amplitude (hold the Top Of Form switch down continuously):

Channel 5 (VTS) M_3
Channel 7 (FFS) L_3 P_3

4) The stepping motor and VFU should be in phase. Connect a scope probe (channel 1) to pin M_3 of the 6761 and another probe to L15 pin 8. Trigger on channel 1. Key Top of Form

continuously. Channel 1 of the scope is the output of channel 5 of the VFU and channel 2 of the scope is the 4th step signal (L15 pin 8) from the motor circuit. The 4 step pulse should appear just left of center of the VFU signal. See Figure 5-23A. If signals are incorrect proceed to adjustment section step 7.

(b) Adjustment

1) The sprocket and housing are separate parts, hence with cover open, loosen the two screws holding the housing (Figure 5-22). Move the housing so that the base of the sprocket is flush with the housing.

2) Adjust cover stop eccentric to set a gap of .012" $\pm$ .002" (.31 mm $\pm$ .06 mm) between the cover and housing (Figure 5-22).

3) Connect scope probes to pins M_3 and L_3 of the 6761 board.

4) With cover closed and no tape in format unit, loosen the three cover mounting screws and move the cover up or down until +5 volts from both channels is attained while maintaining the clearances specified between housing and cover.

5) Replace the format tape and close the cover. With probes attached as in Section 5.3.13 (a), step 4, key Top of Form continuously. The signals should be at least +4 volts on each channel. If signals are less than +4 volts, then remove cell mount cover and adjust horizontal position of paper tape sprocket (see Section 5.3.13 (c) step 6).

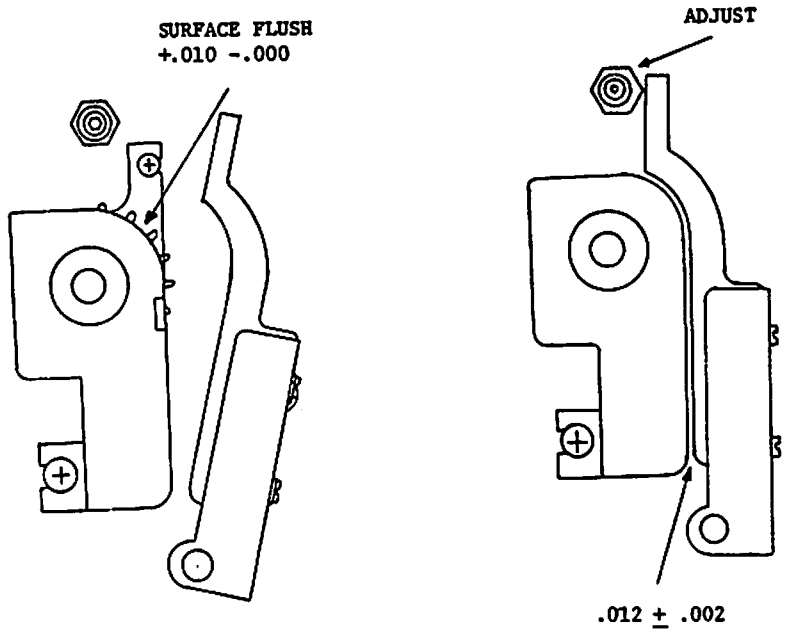


FIGURE 5-22 VERTICAL FORMAT HOUSING ADJUSTMENTS

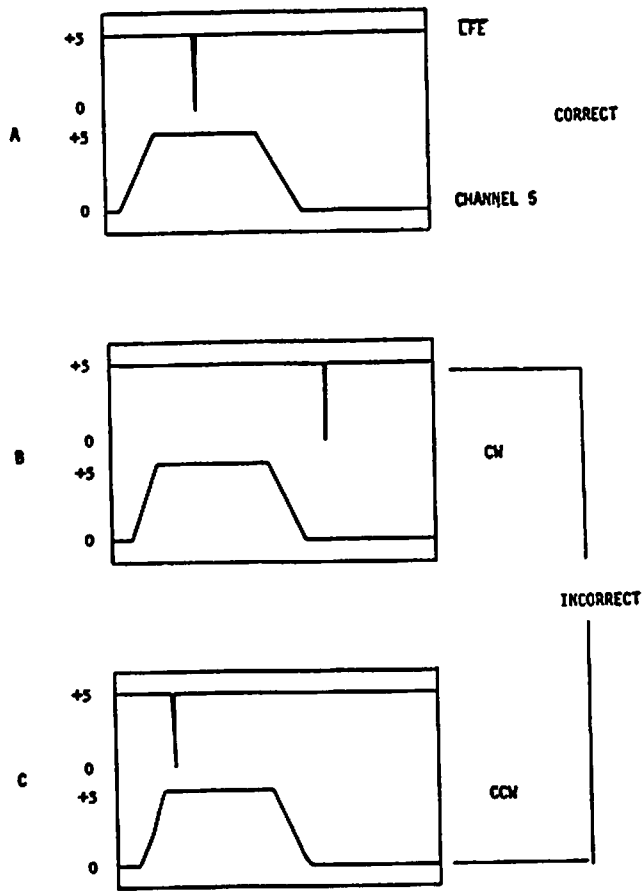


FIGURE 5-23 VFU AND STEPPER MOTOR PHASE CHECK

NOTE:

The following steps are purely for phase adjustment. Do not perform this adjustment unless absolutely necessary.

6) Follow step (a) 5 to set up for this adjustment and to check phase. (Format tape is in VFU for this adjustment.)

7) If phase is off by more than a centimeter, a course alignment is necessary. Remove the belt between the stepping motor and timing gear (Horizontal Vernier Clutch Assembly) and rotate the Horizontal Vernier Clutch Assembly behind the VFU in desired direction several teeth and replace the belt. If the VFU signal is (channel 5) ahead of the 4th step pulse (Figure 5-23B), turn the Horizontal Vernier Clutch Assembly clockwise. If the 4th step pulse is ahead of the VFU signal (Figure 5-23C) then turn the Horizontal Vernier Clutch Assembly counterclockwise. If phase is off by a centimeter or less, loosening the motor retaining screws and then turning the motor in desired direction will correct phase error.

(c) Removal and Replacement (Figure 5-24)

Removal

1) Remove format tape. Remove cell mount cover.

2) Turn horizontal vernier knob until paper tape sprocket Allen screw is visible, then loosen Allen screw.

3) Loosen VFU housing mounting screws and remove housing.

Replacement

4) Slide paper tape sprocket on vernier actuating rod.

5) Mount VFU housing and tighten mounting screws.

6) Rotate vernier actuating rod so flat surface is under paper tape sprocket Allen screw and tighten Allen screw. (Loosen Allen screw to adjust horizontal position on shaft for required signal in Section 5.3.13 (b) step 5.)

7) Replace cell mount cover.

8) Check VFU adjustments (Section 5.3.13 (a)).

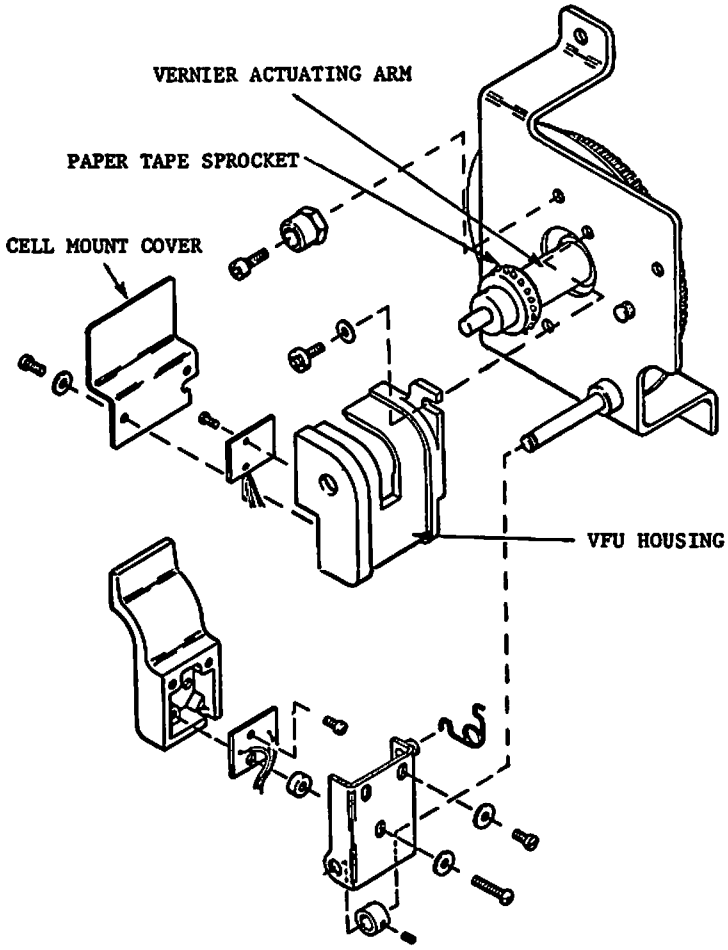


FIGURE 5-24 VERTICAL FORMAT UNIT

5.3.14 *CARRIAGE SERVOMOTOR REMOVAL AND REPLACEMENT*

Removal and Replacement

1) Using 2-7/16" wrenches, remove main drive belt pulley on left side of printer.

2) Remove 3 hex head screws holding servo to side plate assembly.

3) Unplug servo/magnetic pickup cable finger board and remove servo assembly.

4) Reverse procedure to reassemble.

5.3.15 *CARRIAGE ASSEMBLY REMOVAL AND REPLACEMENT*

1) Remove ribbon cartridge (see Section 3.2.1).

2) Remove head adjustment arm (Section 5.3.1.(c)).

3) Using 2-7/16" wrenches, remove main drive belt pulley from left side of printer.

4) Loosen Allen set screws on right and left side of carriage shaft and remove shaft end pins.

5) Remove main carriage belt from servo drive gear.

6) Remove carriage stops on carriage shaft and slide carriage off the carriage shaft.

7) Reverse procedure to reassemble.

8) Readjust carriage belt tension and head adjustment arm (Section 5.3.2 to 5.3.4).

5.3.16 *ELECTRONIC ASSEMBLY COVER REMOVAL AND REPLACEMENT*

1) Loosen three screws on rear of electronic chassis.

2) Loosen two hex nuts on top of platen mounting bracket and slide cover back and lift out.

3) Reverse procedure to reassemble.

5.3.17 *COVER REMOVAL AND REPLACEMENT*

1) Loosen rear side frame mounting bracket hex screws on both sides of printer.

2) Rotate cover retainer clip backward.

3) Remove control panel fingerboard and remove ribbon cable from retaining clips.

4) Lift rear cover and slide out of slot.

SECTION 6
MAINTENANCE

6.1 INTRODUCTION

This section of the manual consists of three sections: diagnostics, preventive maintenance and troubleshooting.

The diagnostics section contains a description, operating procedure and a sample diagnostic program to be run on the Model 2231W Printer by the companion Model 2200 computer. The diagnostic program is written to aid the user in the checkout of equipment and to assure sustained quality of character printing.

The preventive maintenance section will amplify Section 5 (Adjustments, Removal and Replacement) by directing the user to the more frequent problems solved by inspection (visual checks) such as cleaning, wear, adjustments and lubrication.

Troubleshooting tables are available to aid in finding the cause and the solution to operating problems. The tables commence with the most common and basic faults and progress to the less frequent and more complex faults.

6.2 DIAGNOSTICS

The Model 2231W Matrix Printer uses a tape diagnostic program. The tape may be run through all tests for a complete checkout or individual tests may be chosen to perform only specific checks.

6.2.1 *2231W DIAGNOSTIC*

1. Perform the following functions in order shown:

   Key CLEAR EXECUTE
   Key LOAD EXECUTE
   Key RUN EXECUTE

2. The CRT will display the following readout:

Enter 0 for diagnostic, 1 for burn-in, 2 for test 1-5?

a. 0 for diagnostic

Complete diagnostic checkout.

b. 1 for burn-in

Prints regular and expanded characters for quality check.

c. 2 for test 1-5

Test 1 - Short checkout of keyboard and function codes.
Test 2 - Print quality and consistency in print pattern.
Test 3 - Repeated keyboard printout.
Test 4 - Vertical character alignment.
Test 5 - Repeated line feed.

1. THIS IS THE FIRST LINE OF THE PRINT OUT

6. THIS IS THE SIXTH LINE.
7. VERTICAL TAB STARTS FROM THIS LINE

12. VERTICAL TAB. HEX(0D)

18. VERTICAL TAB. HEX(0B)

24. VERTICAL TAB. HEX(0B)

30. VERTICAL TAB. HEX(0B)

36. VERTICAL TAB. HEX(0B)

42. VERTICAL TAB. HEX(0B)

48. VERTICAL TAB. HEX(0B)

54. VERTICAL TAB. HEX(0B)
55. THE NEXT TEST IS FOR THE LINE FEED CODE HEX(0A)

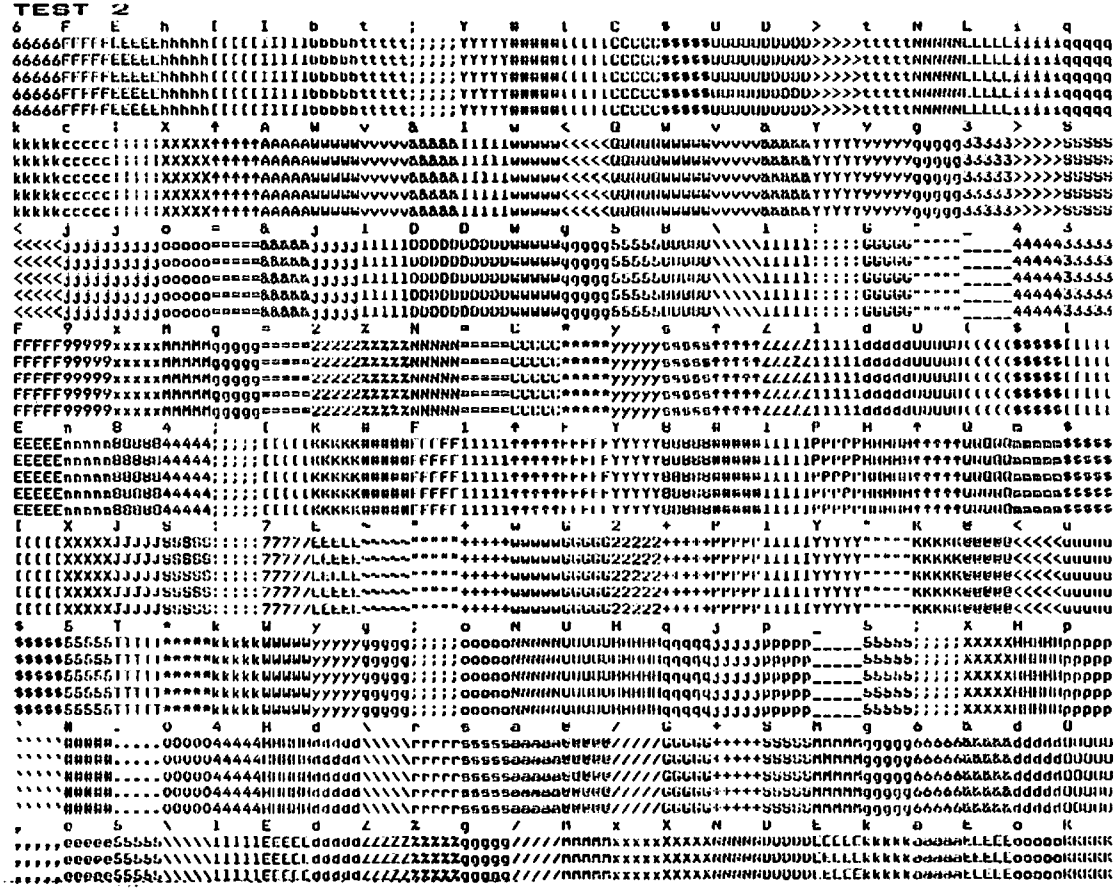
59. THIS LINE SHOULD BE PRINTED BEFORE FORM FEED HEX(0C)

1.----------THIS SHOULD BE THE FIRST LINE AFTER FORM FEED.----------
A
B
C
D
E
F

37. YOU SHOULD HEAR THE BELL SOUND THREE TIMES
38. AFTER THIS LINE IS PRINTED THERE SHOULD BE A FORM-FEED

EXAMINE THE FOLLOWING OUTPUT FOR PRINT QUALITY AND CONSISTENCY IN THE PRINT PATTERN

TEST 2



,,,,,ooeee55555\\\\\11111EEEECddddd2ZZZZZxxxxxqqqqq/////MMMMMxxxxxXXXXXnnnnnUUUUUEEEECkkkkkaaaaaLLLLLoooooRRRRR
,,,,,ooeee55555\\\\\11111EEEECddddd2ZZZZZxxxxxqqqqq/////MMMMMxxxxxXXXXXnnnnnUUUUUEEEECkkkkkaaaaaLLLLLoooooRRRRR

TEST 3

!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop!"#$%&'()*+,-./0123456789:;<=>
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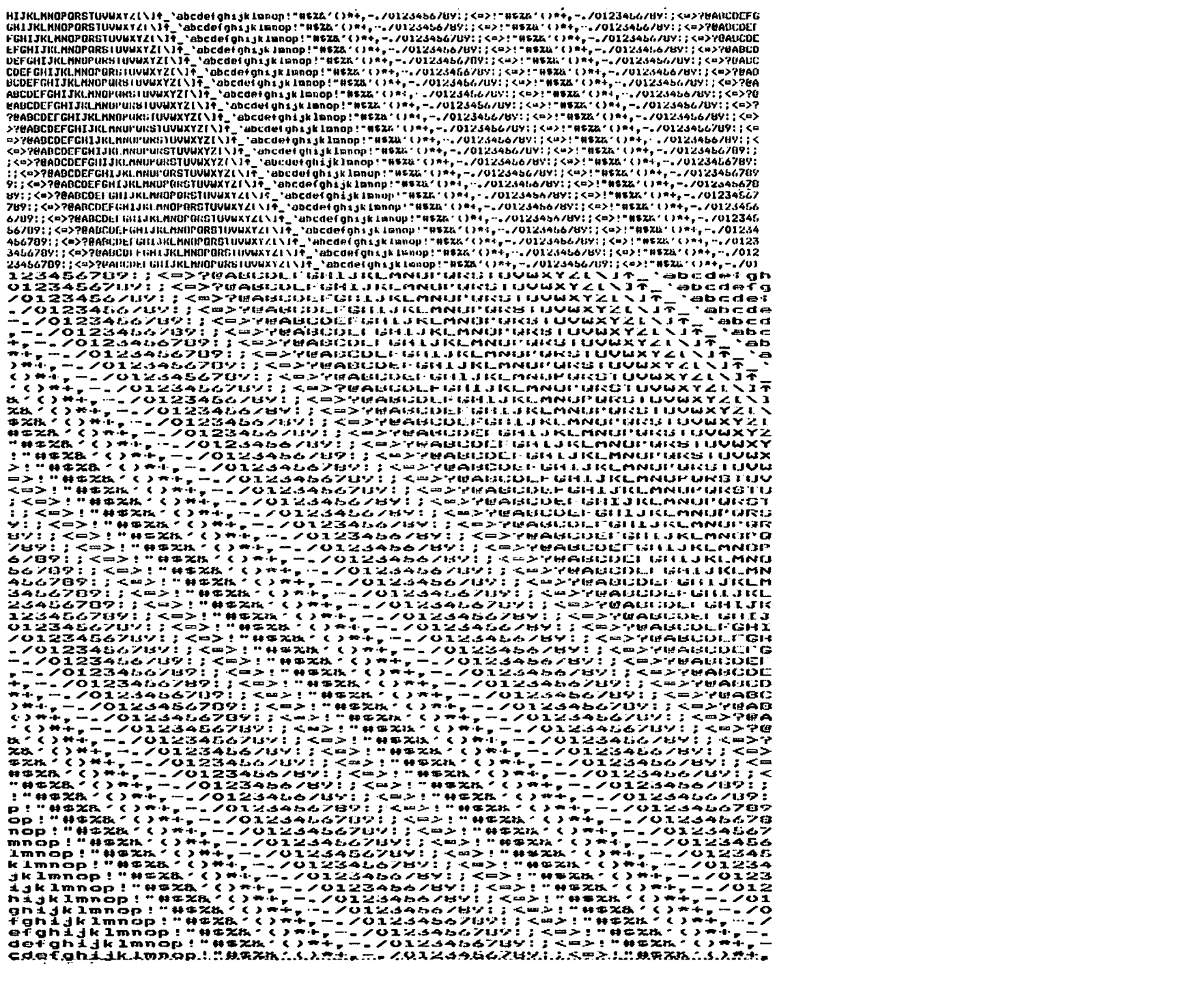

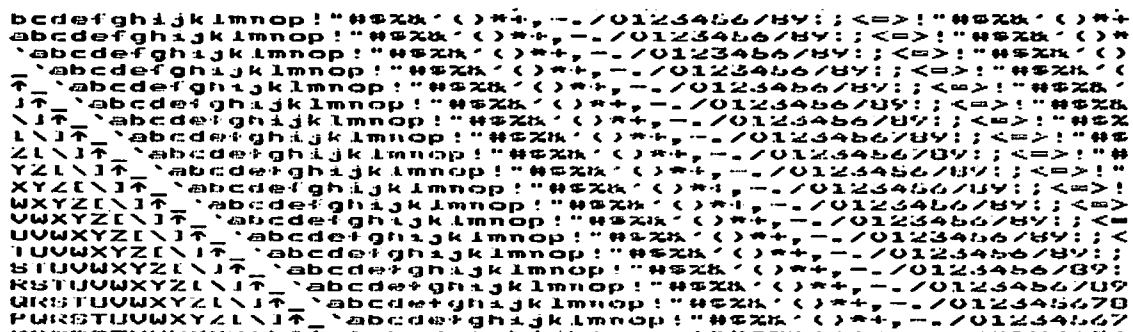

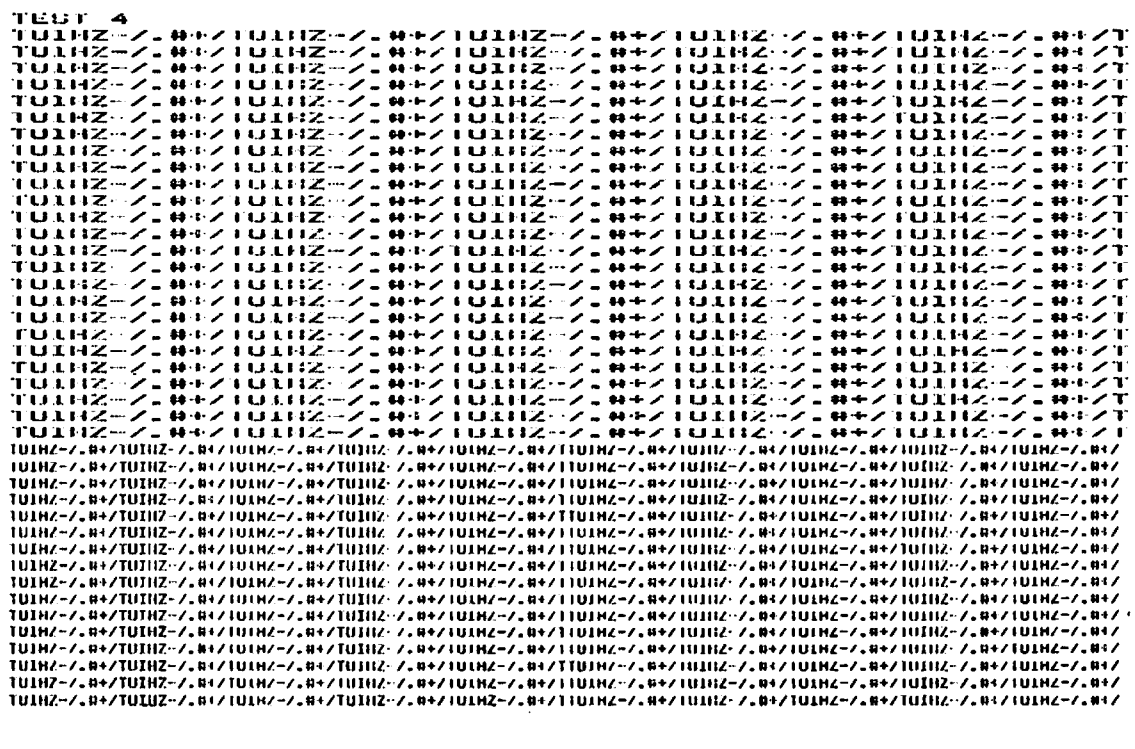

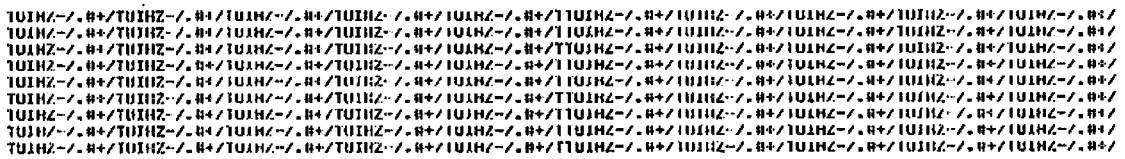

TEST 5
SKIP 1 LINE

SKIP 2 LINES

SKIP 3 LINES

SKIP 4 LINES

SKIP 5 LINES

SKIP 6 LINES

SKIP 7 LINES

SKIP 8 LINES

SKIP 9 LINES

THIS SHOULD BE THE LAST LINE OF THIS PAGE. END OF TEST

6.3 PREVENTIVE MAINTENANCE

6.3.1 *VISUAL CHECKS (QUARTERLY)*

1. Printer cooling fan. Check for obstructions.

2. Cleanliness of carriage guide bar and guide plate. If dirty, oil and wipe clean.

3. Check all drive belts for wear, tension and alignment.

4. Check cartridge ribbon for wear and quality of print.

5. Check striker bar for cleanliness and surface condition.

6. Check paper guide for spring tension and alignment.

7. Check electrical ribbon conductor and wiring for possible abrasions from rotating units. Insure that wiring has not vibrated loose from retaining clips and troughs.

8. Examine carriage stops for excessive wear.

6.3.2 *ADJUSTMENTS*

Any adjustments required are covered in detail in Section 5.

6.3.3 *LUBRICATION (QUARTERLY)*

Print Head lubrication is a requirement to reduce print wire breakage.

LUBRICATION PROCEDURE

NOTE:

Lubricant can be ordered using Wang Part #660-0180.

Remove the print head cover. Remove the sponge from the print wires and soak it with the lubricant. Press the sponge against the rear of the print bearing. This forces some of the lubricant into the bearing holes. Using a Q tip or lint free absorbent material, dab each entrance and exit hole of the guide tubes with the lubricant. Replace sponge and print head cover.

Immediately after lubricating, exercise the print head for several minutes insuring that each solenoid is used during printing. This allows the lubricant to make contact with all surfaces of the guide tubes and bearing.

6.4 TROUBLESHOOTING

6.4.1 *TROUBLESHOOTING HINTS*

TABLE 6-1

SYMPTOM	CAUSE	SOLUTION
1. Power turn on and no lights.	1A. Power fuse blown. 1B. +5V low. 1C. No voltage. 1D. Q1 (heat sink) bad. No +5V to logic.	1A. Replace power fuse. 1B. Check and adjust +5V. 1C. Replace 6756. 1D. Replace Q1.
2. Power turn on and alarm light	2A. Servo fuse open. 2B. Servo fuse blows repeatedly.	2A. Replace servo fuse. 2B. Adjust SW0 and SW1 as per Section 5.3.7 and 5.3.8.
3. Print is inverted.	3A. 6758 Fingerboard reversed. 3B. 6759 Fingerboard reversed.	3A. Reverse 6758. 3B. Reverse 6759.
4. Power prime and carriage does not return to left margin.	4A. Check servo fuse. 4B. Check for paper jam in paper guide preventing carriage from returning. 4C. Main drive belt and pulleys binding.	4A. Replace fuse. 4B. Remove paper. Check paper guides for alignment and tension. 4C. Check adjustments as per Section 5.3.4.
5. Power on; depress select button and select lamp does not come on.	5A. Defective lamp. 5B. Defective switch. 5C. Defective connection to switch. 5D. Defective 7060.	5A. Replace lamp. 5B. Replace switch. 5C. Continuity check. 5D. Replace 7060.

NOTE:
Use the same procedure for checking Top of Form, clear and linefeed switches. (These switches are connected to 6761 PC board.)

SYMPTOM	CAUSE	SOLUTION
6. *Front cover is open*; CPU tells printer to print but no carriage movement.	6A. Cover open switch is on.	6A. Manually pull switch to closed position.
7. *Front cover is closed*; CPU tells printer to print but no carriage movement.	7A. Cover open switch wired wrong. 7B. Cover open switch defective. 7C. Defective 6761.	7A. Check wiring. 7B. Replace switch. 7C. Replace 6761.
8. Erratic forward motion of carriage during printing.	8A. Defective servo circuit. 8B. Defective servo.	8A. Replace 6756 or 6761. 8B. Replace servo motor.
9. Carriage assembly returning at slow speed after printing a line.	9A. SW1 reed switch defective (shorted). 9B. 6761 PCB defective.	9A. Replace reed switch 9B. Replace 6761.
10. Carriage return fast with no deceleration.	10A. Defective 6761. 10B. SW1 appears defective. (Open)	10A. Replace 6761. 10B. Replace SW1 or align magnet.
11. No power to servo drive mechanism, but power lights on.	11A. Servo fuse open. 11B. Bad connection. 11C. +5V logic not up.	11A. Replace fuse. 11B. Check seating of pins and connectors. 11C. Adjust +5V logic.
12. No printing, but carriage movement.	12A. No WS signal. 12B. Defective magnetic pickup. 12C. Timing on 6761.	12A. Check magnetic pickup signal. 12B. Replace magnetic pickup. 12C. Adjust 50% duty cycle on 6761 or replace 6761.
13. No delays between manual line feeds.	13A. 6761 (L7-7) defective.	13A. Replace 6761 (or L7).
14. No line feeds except under program control.	14A. Defective line feed switch. 14B. Defective 6761.	14A. Replace switch. 14B. Replace 6761.

SYMPTOM	CAUSE	SOLUTION
15. Continuous paper feed when top of form executed.	15A. Defective 6761.	15A. Replace 6761.
	15B. VFU defective.	15B1. Adjust VFU 15B2. Replace paper tape. 15B3. Replace LED. 15B4. Replace photocell.
	15C. No VFU tape.	15C. Install tape.
16. Poor print quality at one specific location.	16A. Burr on chassis.	16A. Check carriage bearing guide shaft or plate for dirt or burrs at that location.
	16B. Defective timing disk.	16B. Replace timing disk.
17. Poor print quality everywhere (characters not symmetrical).	17A. Timing 6761.	17A. Adjust 50% duty cycle 6761.
	17B. Magnetic pickup.	17B. Replace magnetic pickup.
	17C. Head penetration.	17C. Adjust head penetration.
	17D. Solenoids in head maladjusted.	17D. Remove head assembly and adjust print head to specification.
	17E. Print head loose.	17E. Tighten head.
18. Missing dots in character	18A. Defective ROM on 7060.	18A. Replace ROM in 7060.
	18B. Defective pwr. transistor on 6756.	18B. Replace transistor on 6756.
	18C. Maladjusted solenoid.	18C. Adjust solenoid.
	18D. Broken solenoid wire.	18D. Replace solenoid.
19. Print head catching ribbon during printing.	19A. Head penetration exceeds .000".	19A. Adjust penetration.
	19B. Ribbon worn out with too much head penetration.	19B. Replace ribbon and adjust penetration.
	19C. Solenoid staying in fixed position.	19C1. Replace solenoid. 19C2. Replace pwr. transistor on 6756. 19C3. Replace 7060.
	19D. Strobe too long.	19D. Adjust strobe length.
20. Print quality light on one side.	20A. Striker bar maladjusted.	20A. Adjust striker bar.

SYMPTOM	CAUSE	SOLUTION
21. Paper streaked during print.	21A. Head penetration to close.	21A. Increase head to striker bar gap.
	21B. Paper not within usable specs.	21B. Advise user to replace with paper meeting specifications.
	21C. Print solenoid dragging on paper.	21C. Adjust solenoid.
	21D. Ribbon cartridge guides maladjusted.	21D. Adjust cartridge ribbon guides.
22. No printing, but carriage moves to right and fails to return. Servo fuse blows.	22A. Loss of WS strobe.	22A. Check adjustment of magnetic pickup A and wires.
	22B. Missing index pulse.	22B. Check adjustment of magnetic pickup B and wires.
	22C. Defective 6761 PCB.	22C. Replace 6761 PCB.

6.5 MISCELLANEOUS

6.5.1 *115 VAC/230 VAC CONVERSION*

To convert the Model 61 Printer from 115 VAC to 230 VAC or vice versa, remove the cover from the on/off switch and fuse assembly and then unscrew the switch and fuse assembly from the chassis to uncover the 115/230 VAC selector switch. Move the switch to the proper setting and reassemble.

6.5.2 *SPARE PARTS LIST*

MODEL 61 IMPACT PRINTER
WANG PRINTED CIRCUIT BOARDS

210-6749	Power line slide switch
210-6756	Power transistor board
210-6757	Motherboard
210-6758	Fingerboard
210-6759	Fingerboard
210-6761	Timing and format control
210-6762	Control panel switch board
210-7060	I/O control, data storage and character generator
210-7062	Fingerboard
210-7063	Fingerboard
210-7064	Fingerboard
210-7065	Fingerboard
210-7066	Fingerboard

MECHANICAL/MISC PARTS/ASSEMBLIES

210-6574	Phototransistor assembly
210-6575	LED assembly
279-0181	Ribbon cartridge
279-5060	Print solenoid
279-5060-27	Wire rope
325-2403-M1	Paper out switch
325-2416	Reed switch
325-2417	Magnetic reluctance pickup
377-0325	ROM
377-0326	ROM
449-0122	Carriage drive pulley
449-0123	Idler pulley
449-0124	Paper drive pulley
449-0125	Idler gear
449-0126	Drive gear
449-0132	Vernier cone
449-0133	Vernier pulley
461-2020	10 Pitch encoder gear
478-0258	Sprocket pulley
656-0225	Timing belt
656-0226	Timing belt

6.5.3 *PRINTER CABLES*

220-0105-1	Printer I/O cable
220-3003	14 Conductor 40" flat cable assembly (control panel)
270-3061	Reed switch harness
270-3062	Format control harness
420-1017	Print head cable

SECTION 7
ELECTRICAL SCHEMATICS

7.1 INTRODUCTION

Section 7 consists of a signal run list to assist the technician in tracing signals that are wired to one or more electrical boards. Included are the schematics of electrical boards used in the printer listed in numerical order.

7.2 LIST OF ELECTRICAL SCHEMATICS*

DESCRIPTION	DRAWING NUMBER	PAGE NUMBER
Control Panel (WL# 220-3003)	C6482-14	
Reed Switch Harness	C6482-84	
Format Control Harness	C6482-85	
Print Head Cable	C6636-213	
Power Transistor Board	D6756	
Motherboard	D6757	
Timing and Format Control	E6761	
I/O Control, Data Storage and Character Generator	E7060	

7.3 SIGNAL RUN LIST*

* The listed information is not complete. A completed set of this information will follow when it becomes available.

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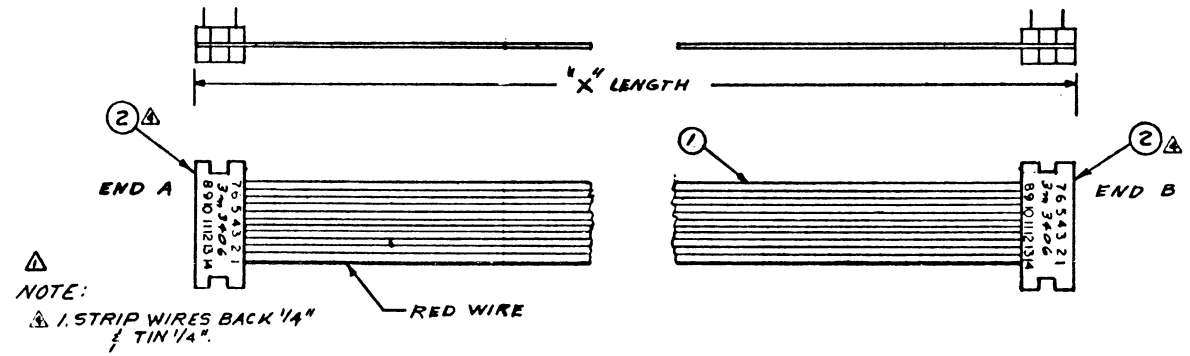
DO NOT SCALE



HOLE LEGEND		
DRILLED OR PUNCHED HOLE TOLERANCES:	HOLE DIA. .0135 to .125	TOL. ±.002 −.001
	.126 to .250	±.004 −.001
	.251 to .500	±.005 −.001

IDENT.	DESCRIPTION	QTY.
A		

W.L. PART No.	END A	END B	"X" LENGTH	MODEL(S) USED ON	
220-3007	350-0400	350-0400	39½" ± ½"	1222(J1), 1222(J2)	
220-3006	350-0400	350-0400	23¼" ± ¼"	1222(J5), 1222(J6)	
220-3005	350-0400	350-0400	36" ± ½"	1222(RTD.1), 1222(LTD.2)	2
220-3004	350-0400	350-0400	34" ± ½"	1222(RTD 2)	
220-3003	350-0400	350-0400	40" ± ½"	1222(LTD. 1)	2
220-3002	SEE NOTE 1	350-0400	9" ± ¼"	2224	
220-3009	350-0400	350-0400	2½" ± ⅛"	6713 P.C. Bd.	3

REVISION	BY	DATE	APPROVED
1 — REV. PER RFA #1061 7-9-74 RLH	DK/PF	7-9-74	7-9-74
2 — REV. PER ECN# 4486 11-12-74 JFM	DK/PF	11/12/74	11-12-74
3 — REV. PER RFA #1366 1/9/75 JFM	DK/PF	1-9-75	1/9/75
4 — REV. PER ECN 5402 DRC 4/8/76	DK/PF	4/8/76	4/8/76

WANG PART NO	ITEM	QTY	NAME	MATERIAL	DESCRIPTION
350-0400	1	YR	14 PIN FLAT CABLE PLUG		
420-0042	1	YR	14 WIRE FLAT CABLE		

WANG LABORATORIES, INC. TEWKSBURY, MASS. U.S.A.

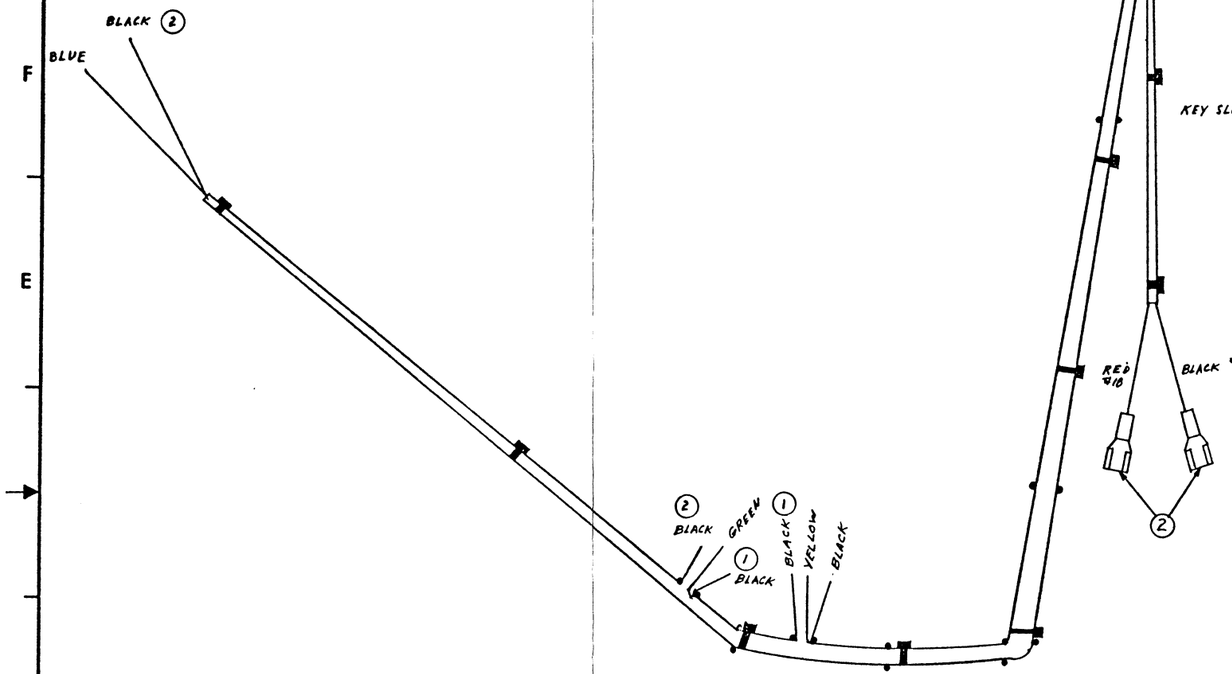
MATERIAL	MODEL NO	BY	DATE	APPROVED BY	DATE
		DWN	1/4/74	E ENGR	
		CHK		M ENGR	
	SEE ENGR SPECIFICATIONS No.	L C CONTROL		MFG ENGR	
FINISH	TOL EX AS NOTED XX ± .010 FRAC ± 1/64 XXX ± .005 ANG ± 1°30'	TITLE: 14 PIN FLAT CABLE ASS'Y			
	SCALE 4/1 SHT 1 OF 1	SEE CHART	C	6482-14	4
		WANG PART NUMBER	SIZE	DRAWING NUMBER	REV

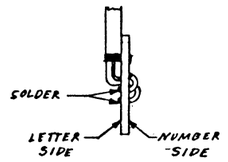
14-2882 C

MILLIMETERS IN PARENTHESIS.
TOLERANCES TO BE EQUIVALENT TO INCH DIMENSIONS.

DO NOT SCALE

HOLE LEGEND & TOLERANCES			
HOLE DIA		TOLERANCE	
.0135 - .125		± .003 - .001	
.126 - .250		± .004 - .001	
.251 - .500		± .005 - .001	
SYM.	DESCRIPTION		QTY.
A			





NOTE:
• 1. STRIP AND TIN 1/4"

SIGNAL	P.C.BD.7063	WIRE COLOR	GAUGE	LENGTH
	H			
CO	7	WHITE	#26	12"
	J			
$\overline{CO}$	B	GRAY	#26	12"
$\overline{SW_2}$	K	BLUE	#26	32"
	9			
$\overline{SW_0}$	L	YELLOW	#26	19"
$\overline{SW_1}$	10	GREEN	#26	21"
$\overline{PO}$	11	RED	#18	12"
±0V	M	BLACK	#26	19"
+0V	M	BLACK	#26	12"
-0V	M	BLACK	#18	12"

JUMPERS:
BLACK (1) #26 GA 4 1/2" LONG
BLACK (2) #26 GA 12 1/2" LONG

QTY.	ITEM	WANG PART NO.	DRAW. NO. NO.	DESCRIPTION
N/R		660-0203		SOLDER 63-37 ALLOY
A/R		600-0002		#18 RED
AR		600-0000		#18 BLACK
A/R		600-3009		#26 WHITE
A/R		600-3008		#26 GRAY
A/R		600-3006		#26 BLUE
A/R		600-3005		#26 GREEN
A/R		600-3004		#26 YELLOW
A/R		600-3000		#26 BLACK
12	3	604-1004		TERMINAL-MT
2	2	634-0082R		LAST ON RED
1	1	510-7063		PC BD 7063

NEXT ASSY.

(WANG) LABORATORIES, INC. TEWKSBURY, MASS. U.S.A.

	BY	DATE	APPROVED BY	DATE
DWN	[illegible]		E ENG	
CHK			M ENGR	
			MFG ENGR	

MATERIAL

MODEL NO.
SEE ENGRG SPECIFICATIONS
No.

TITLE
REED SWITCH HARNESS

FINISH

TOL EX AS NOTED
XX ± FRAC ±
XXX ± ANG ± FINISH √

WANG PART NUMBER	SIZE	DRAWING NUMBER	REV.
270-3061	D	6482-84	

SCALE SHT OF

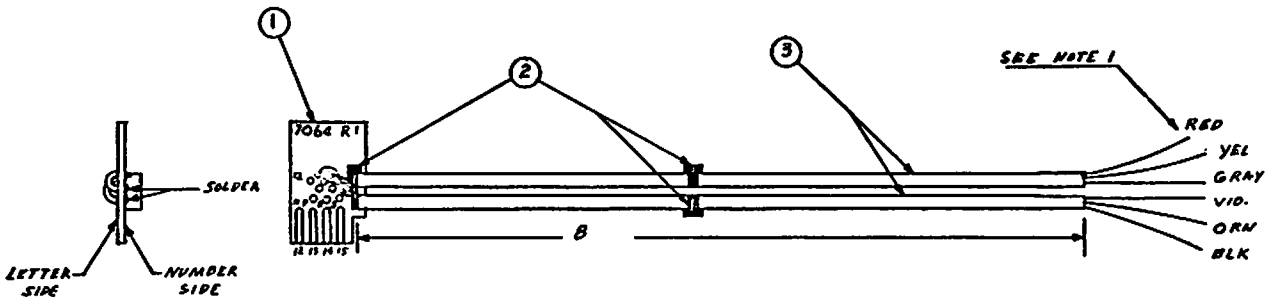
REVISION NO.	DATE	BY

D 6482-84

DO NOT SCALE

HOLE LEGEND		
DRILLED OR PUNCHED HOLE TOLERANCES:	HOLE DIA. .0135 to .125 .126 to .250 .251 to .500	TOL. ±.005 ±.005 ±.005

IDENT.	DESCRIPTION	QTY.
A		



NOTE:
1. STRIP AND TIN 1/8"
2. TOLERANCE ± 1/4"

SIGNAL	WIRE COLOR	GAUGE	LENGTH	PC. 7064
FFD	VIOLET	#26	10½"	P
VTS	GRAY	#26	10¼"	13
VTD	ORANGE	#26	10½	R
FFS	YELLOW	#26	10⅛"	16
+5V	BLACK	#26	10"	S
+5VR	RED	#26	10"	15

WANG PART NO	ITEM	QTY	NAME	MATERIAL	DESCRIPTION
660-0203		A/R	SOLDER		63-37 ALLOY
600-3008		.84	WIRE		#26 GRAY
600-3007		.84	WIRE		#26 VIOLET
600-3004		.84	WIRE		#26 YELLOW
600-3003		.84	WIRE		#26 ORANGE
600-3002		.83	WIRE		#26 RED
600-3000		.83	WIRE		#26 BLACK
605-0000	3	2	TUBING		#10 TUBING 8" LONG
605-1004	2	3	TY-RAP		PLTIM-M
510-7064	1	1	P.C. BD 7064		

Qty per Unit	FIRST USED ON	ASSY USED ON

WANG LABORATORIES, INC. TEWKSBURY MASS U.S.A.

MATERIAL

MODEL NO 2231W

SEE ENGRG SPECIFICATIONS No.

FINISH

TOL EX AS NOTED XX ± .010 FRAC ± 1/64 XXX ± .005 ANG ± 1°30' FINISH √

SCALE 1/1 SHT OF

BY	DATE	APPROVED BY	DATE
DWN		I ENGR	
CHK		M ENGR	
E C CONTROL		MFG ENGR.	

TITLE: FORMAT CONTROL HARNESS

270-3062	C	6482-E
WANG PART NUMBER	SIZE	DRAWING NUMBER

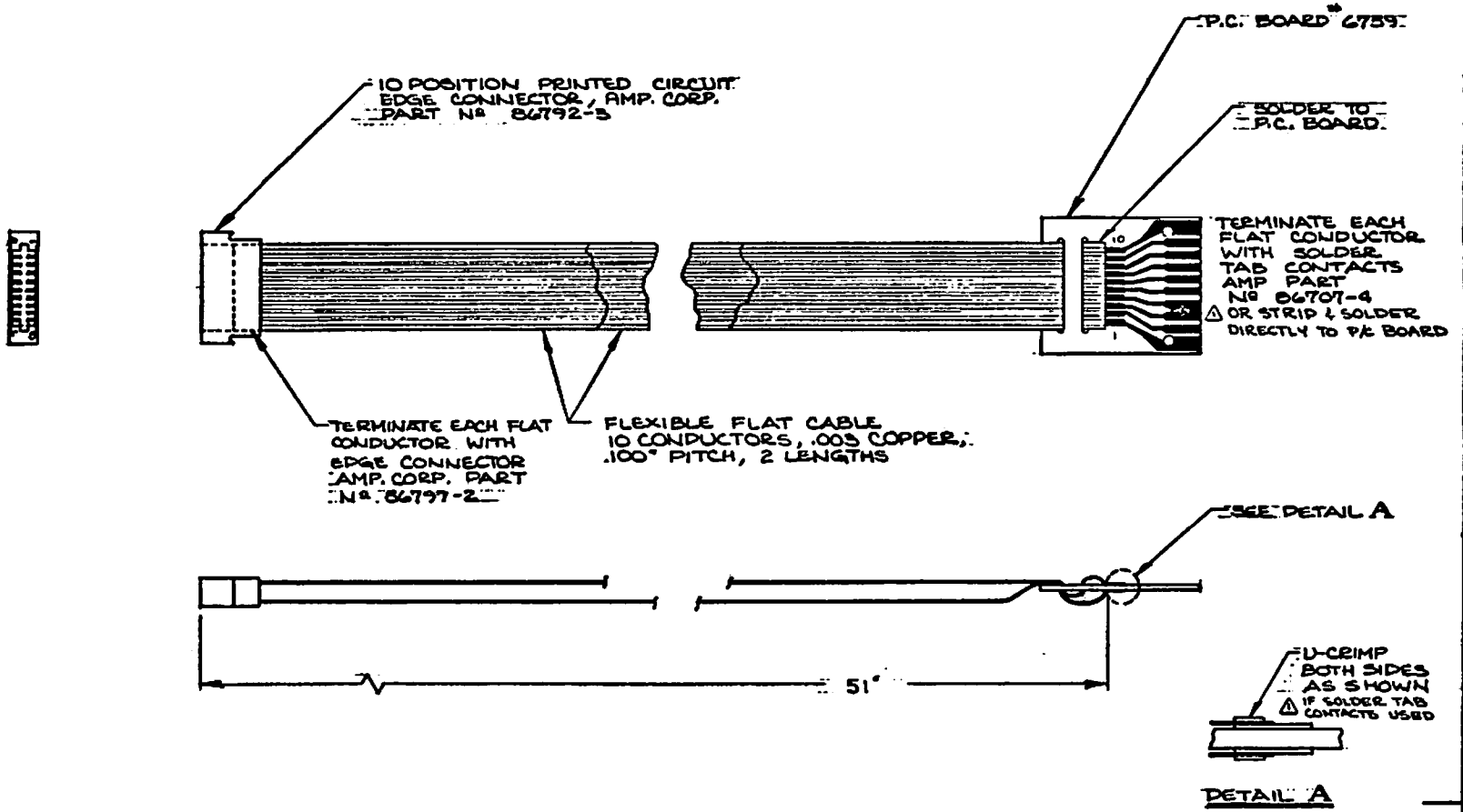
REVISION

DIMENSIONS IN PARENTHESIS. TOLERANCES TO BE EQUIVALENT TO INCH DIMENSIONS.

DO NOT SCALE

HOLE LEGEND & TOLERANCES

SYM.	DESCRIPTION	QTY.
A		



REVISION	BY	DATE
0	GBL. RELEASE PRINT	
1	REV PER ECA 2126 LET 4-10-76	

QTY.	ITEM	WANG PART NO.	DRAWING NO.	DESCRIPTION
NEXT ASSY.				

WANG LABORATORIES, INC. TEWKSBURY MASS. U.S.A.

BY	DATE	APPROVED BY	DATE
DWN B.T.	12/6/75	E ENGR	
CHK		M ENGR	
QTY/1		MFG ENGR	2/10/76

MATERIAL

MODEL NO. 62

SEE ENGRG SPECIFICATIONS No. ES-10031

FINISH

TOL. EX. AS NOTED .XX ± 0.01 FRAC. ± 1/64 XXX ± 0.005 ANG. ± 1°

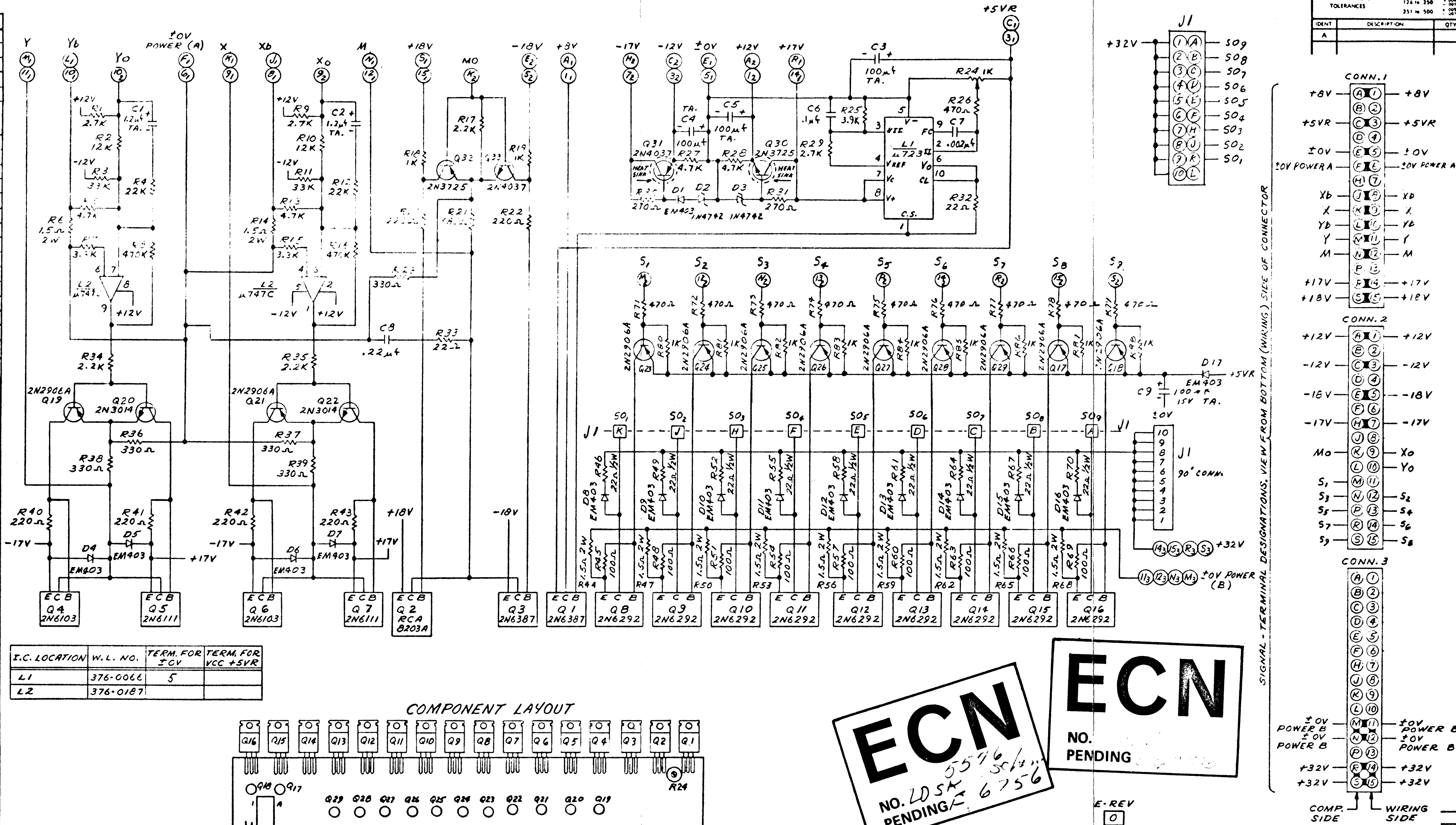
TITLE FLEX. CABLE ASS'Y (PRINT HEAD)

WANG PART NUMBER	SIZE	DRAWING NUMBER	REV.
420-1017	C	66336-213	1

SCALE 1/1 SHT 1 OF 1

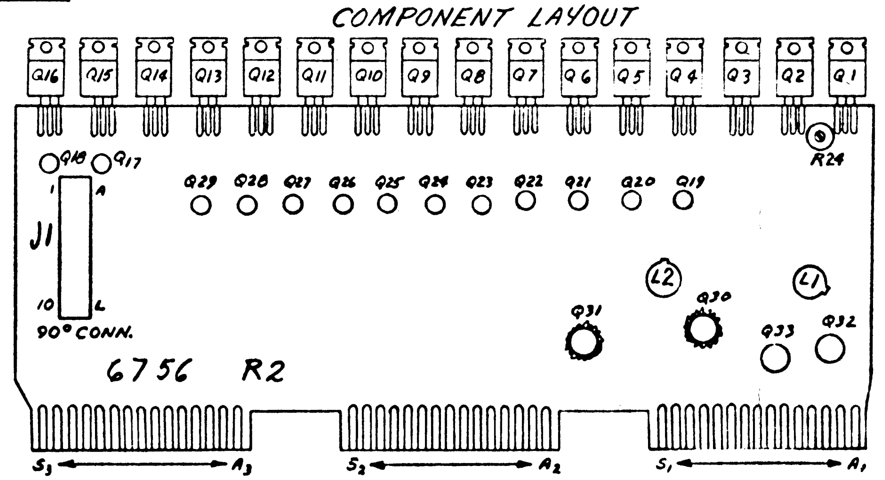
512-9699 D

COMPONENT	W.L. No.
R1,9,29	330-3027
R,2,10	330-4012
R3,11	330-4033
R4,12	330-4022
R5,13,27,28	330-3047
R6,14,44,47 59,53,56,59 62,65,68	331-0026
R7,15	330-3033
R8,16	330-5047
R18,19,80-88	330-3010
R20,22,40-43	330-2022
R21	330-2068
R23,36,37,38,39	330-2033
R24	336-1014
R25	330-3039
R26,71-79	330-2047
R17,34,35	330-3022
R30,31	330-2027
R32,33	330-1022
R45,48,51,54, 57,60,63,66, 69	330-2010
R46,49,52,55, 58,61,64,67,70	331-1022
C1,2	300-4013
C3,4,5,9	300-4021
C6	300-1901
C7	300-1913
C8	300-1902
D1,4-17	380-4000
D2,3	380-2121
Q1,3	375-1052
Q2	375-1053
Q4,6	375-1035
Q5,7	375-1034
Q8-16	375-1051
Q17,18,19,21 23-29	375-1016
Q20,22	375-0017
Q30,32	375-1027
Q31,33	375-0018
H.SINK	375-9010
TRANSIPAD LARGE	375-9001
TRANSIPAD SMALL	375-9004
J1	350-0037



I.C. LOCATION	W.L. NO.	TERM. FOR ±OV	TERM. FOR VCC +5VR
L1	376-0066	5	
L2	376-0187		

COMPONENT LAYOUT



WANG PART NO	ITEM	QTY	NAME	MATERIAL	DESCRIPTION

WANG LABORATORIES, INC. TEWKSBURY MASS U.S.A.

MODEL NO: 7X MATRIX PRINTER

TITLE: SCHEMATIC LOGIBLOC POWER TRANSISTOR BOARD

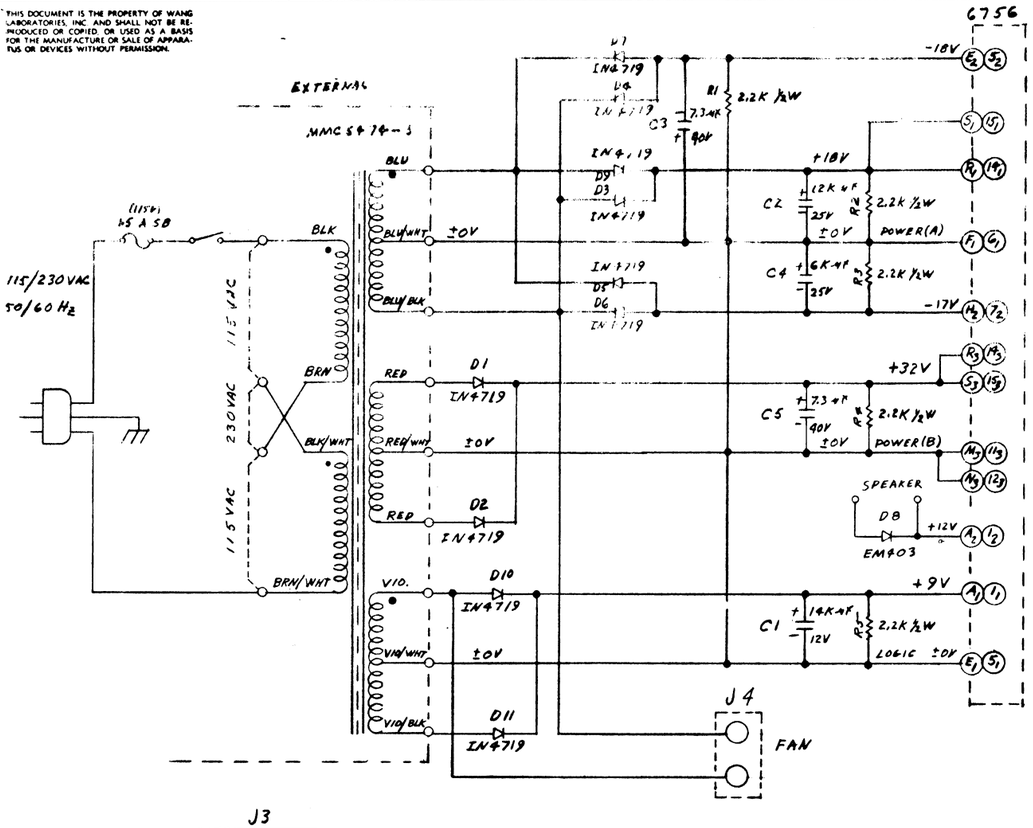
BY	DATE	APPROVED BY	DATE
DWN F. S.	11-11-	E ENGR	
CHK G. D.	7-22-5	M ENGR	
E C CONTROL		MFG ENGR	

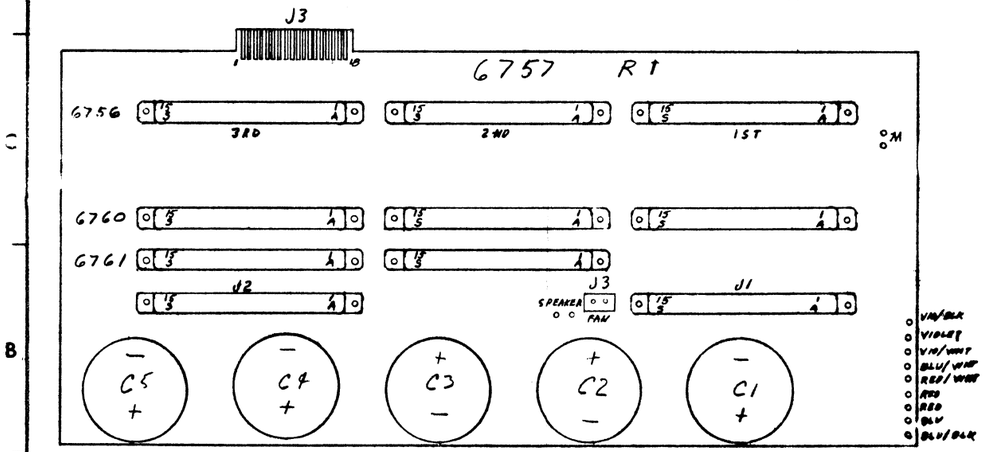
WANG PART NUMBER	SIZE	DRAWING NUMBER	REV
210-6756	D	6756	2

REVISION: ORIGINATED PER ECN; REVISED PER RFA #1876, APP'D; REVISED PER ECN, APP'D

D 6756

DO NOT SCALE



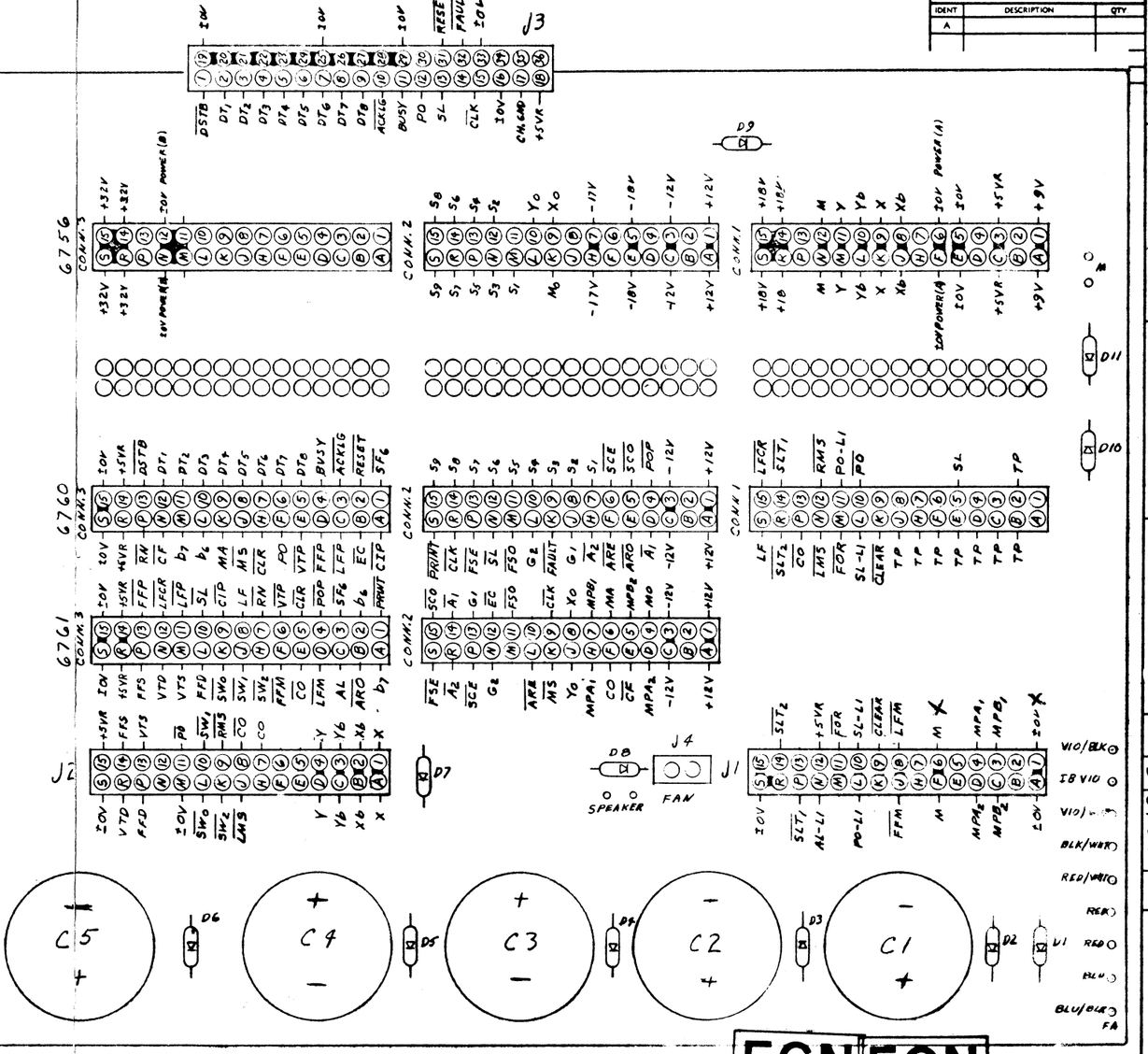


REV	REVISION	BY	DATE
A	ORG. PER DWR #E033 APP'D	KB	2-18-76
B	REVISED PER ECN # 2123 & ADDED	KB	5-13-76
C	REVISED PER ECN #2134 & ADDED	KB	9-17-76

HOLE LEGEND

DRILLED OR PUNCHED HOLE TOLERANCES	HOLE DIA	TOL
	0135 to 125	± .002
	126 to 250	± .003
	251 to 500	± .004

IDENT	DESCRIPTION	QTY
A		



COMPONENT	W. L. PART NO
R1, 2, 3, 4, 5	331-3022
C1	300-3045
C2	300-3073
C3, 5	300-3074
C4-7, 9, 10, 11	380-3002
CONN. 30 PIN	350-0011
CONN. 36 PIN	350-1038
D8	380-4000
J3 (2 PIN)	654-1196
C4	300-3019

ECN NO. PENDING

ECN NO. PENDING REV A

WANG PART NO	ITEM	QTY	NAME

Qty Per Unit	FIRST USED ON	ASSY USED ON

WANG LABORATORIES, INC. TEWKSBURY MASS. U.S.A.

MATERIAL	DESCRIPTION

BY	DATE	APPROVED BY	DATE
DWN		E ENGR	
CHK		M ENGR	
E C CONTROL		MFG ENGR	

MATERIAL

MODEL NO MD 62

SEE ENGRG SPECIFICATIONS No.

TITLE SCHEMATIC MOTHER BOARD

FINISH

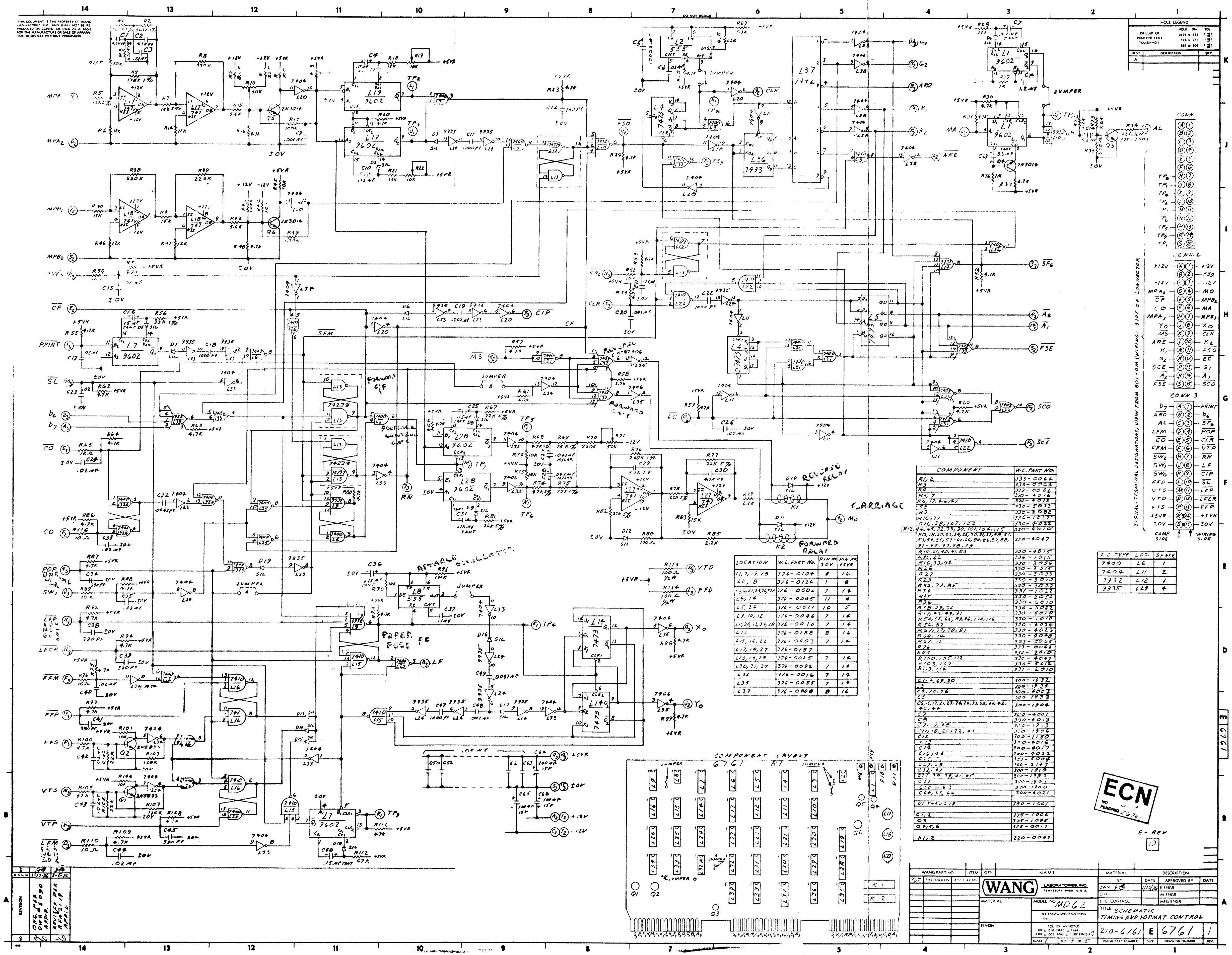
TOL EX AS NOTED
XX ± .010 FRAC ± 1/64
XXX ± .005 ANG ± 1°30' FINISH 125

SCALE | SHT 3 OF 3

210-6751 | D | 6757 | 2

WANG PART NUMBER | SIZE | DRAWING NUMBER | REV

D 6757



COMPONENT	W.L. PART No.
R1, 2	333-0064
R3	333-0063
R4	333-0066
R5, 7	330-4016
R6, 17, 46, 47	330-4012
R8	330-5033
R9	330-3082
R10, 71	336-1017
R11, 28, 102, 106	330-4022
R12, 44, 45, 72, 73, 90, 101, 104, 115	330-4010
R13, 18, 20, 23, 24, 26, 30, 31, 37, 48, 51, 53, 54, 55, 57-64, 66, 80, 86, 87, 88, 92-95, 97, 98, 99	330-4047
R14, 21, 40, 41, 83	330-4015
R15, 22	336-1015
R16, 33, 42	330-3056
R26	330-3315
R27	330-3033
R29	330-3010
R32, 79, 85	330-3022
R34	331-1022
R35	330-2056
R36	330-6010
R38, 39, 70	330-5022
R17, 43, 49, 91	330-5010
R50, 52, 65, 89, 96, 110, 116	330-1010
R56, 82	330-4034
R67, 77, 78, 81	330-4023
R68, 74	330-4048
R69, 75	333-0065
R76	333-0062
R84	330-2010
R100, 105, 112	330-4047
R103, 107	330-5012
R113, 114	331-2010
C1, 2, 29, 30	300-1932
C3	300-1934
C4, 10, 36	300-4003
C5	300-1933
C6, 15, 17, 21, 23, 24, 26, 33, 35, 44, 42, 43, 44	300-1904
C7	300-4001
C8	300-4013
C9, [illegible], 48	300-1913
C11, 16, 20, 22, 47	300-1906
C12	300-1150
C13	300-4016
C14	300-4017
C16, 46	300-4022
C[illegible]	300-4004
C27, [illegible]	300-2147
C32, 49	300-1910
C[illegible], 39, 41, 45	300-1393
C37	300-1901
C50-63	300-1900
C64, 65, 66	300-4021
D1 THRU D19	380-1001
Q1, 2	375-1006
Q3	375-1006
Q4, 5, 6	375-0017
K1, 2	220-0047

LOCATION	W.L. PART No.	PIN No. ±0V	PIN No. +5VR
L1, 7, 19, 28	376-0104	8	16
L2, 8	376-0126	1	8
L3, 6, 21, 25, 26, 32A	376-0002	7	14
L4, 14	376-0005	11	4
L5, 36	376-0011	10	5
L9, 10, 12	376-0046	7	14
L11, 20, 33, 34, 38	376-0010	7	14
L13	376-0188	8	16
L15, 16, 22	376-0003	7	14
L17, 18, 27	376-0187		
L23, 24, 29	376-0025	7	14
L30, 31, 39	376-0092	7	14
L32	376-0016	7	14
L35	376-0055	7	14
L37	376-0008	8	16

I.C. TYPE	LOC.	SPARE
7400	L6	1
7404	L11	2
9932	L12	1
9935	L29	4

ECN NO. PENDING E676

E-REV 0

WANG LABORATORIES, INC. TEWKSBURY MASS. U.S.A.

DWN JS 1/13/76

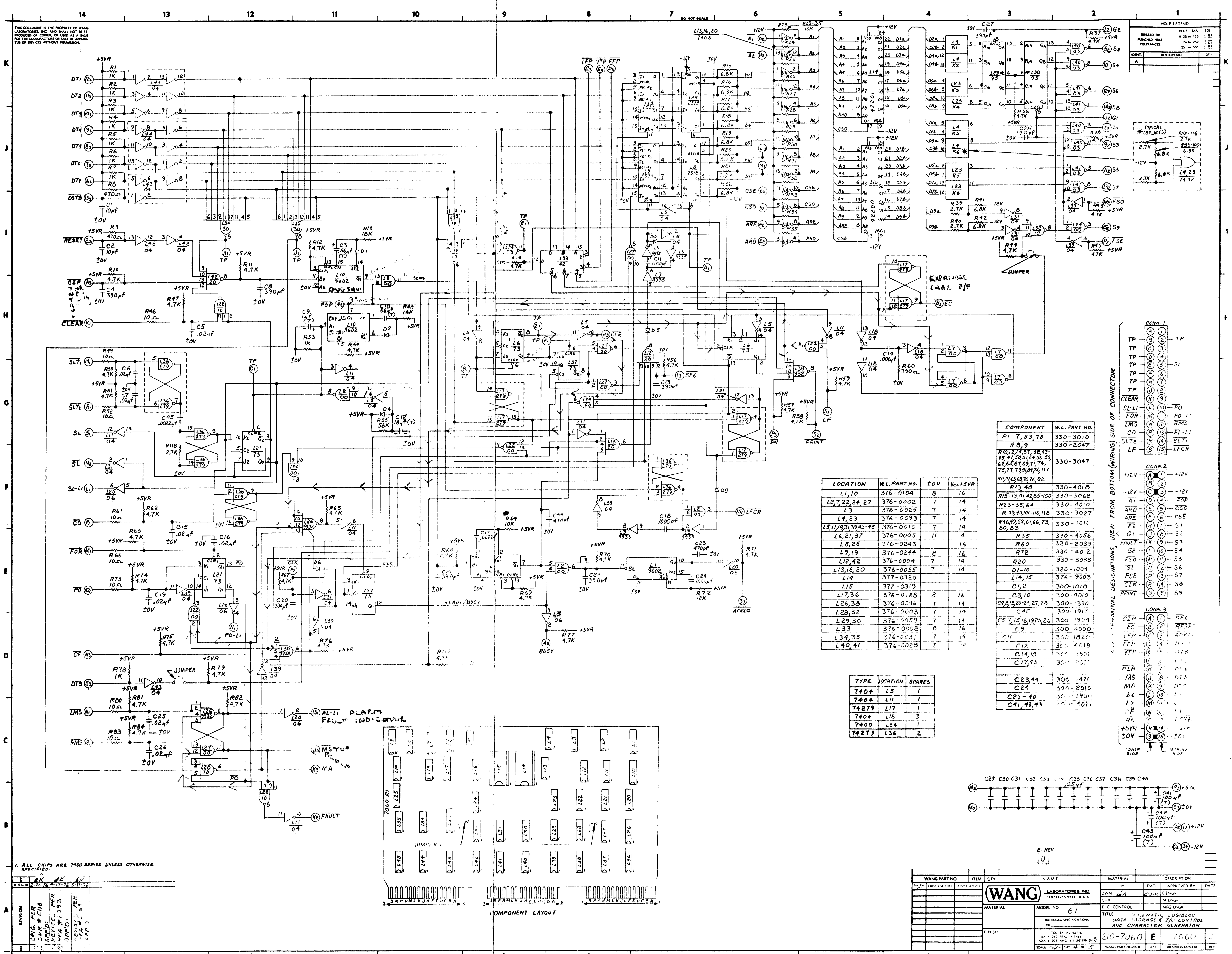
MODEL NO MD62

TITLE SCHEMATIC TIMING AND FORMAT CONTROL

WANG PART NUMBER 210-6761 | SIZE E | DRAWING NUMBER 6761 | REV. 1

SCALE / SHT 7 OF 5

TOL EX AS NOTED XX ± .010 FRAC ± 1/64 XXX ± .005 ANG ± 1°30' FINISH 125



LOCATION	W.L. PART NO.	±0V	Vcc+5VR
L1, 10	376-0104	8	16
L2, 7, 22, 24, 27	376-0002	7	14
L3	376-0025	7	14
L4, 23	376-0093	7	14
L5, 11, 18, 31, 39, 43-45	376-0010	7	14
L6, 21, 37	376-0005	11	4
L8, 25	376-0243		16
L9, 19	376-0244	8	16
L12, 42	376-0004	7	14
L13, 16, 20	376-0055	7	14
L14	377-0320		
L15	377-0319		
L17, 36	376-0188	8	16
L26, 38	376-0046	7	14
L28, 32	376-0003	7	14
L29, 30	376-0059	7	14
L33	376-0008	8	16
L34, 35	376-0031	7	14
L40, 41	376-0028	7	14

TYPE	LOCATION	SPARES
7404	L5	1
7404	L11	1
74279	L17	1
7404	L18	3
7400	L24	1
74279	L36	2

COMPONENT	W.L. PART NO.
R1-7, 53, 78	330-3010
R8, 9	330-2047
R10, 12, 14, 37, 38, 43-45, 47, 50, 51, 54, 56-59, 62, 65, 67, 69, 71, 74, 75, 77, 79, 81, 84, 36, 117 R11, 21, 63, 68, 70, 76, 82	330-3047
R13, 48	330-4018
R15-19, 41, 42, 85-100	330-3068
R23-35, 64	330-4010
R39, 40, 101-116, 118	330-3027
R46, 49, 52, 61, 66, 73, 80, 83	330-1010
R55	330-4056
R60	330-2039
R72	330-4012
R20	330-3033
D1-10	380-1004
L14, 15	376-9003
C1, 2	300-1010
C3, 10	300-4010
C4, 8, 13, 20-22, 27, 28	300-1390
C45	300-1917
C5-7, 15, 16, 19, 25, 26	300-1904
C9	300-4000
C11	300-1820
C12	300-4018
C14, 18	[illegible]
C17, 45	[illegible]
C23, 44	300-1470
C24	300-2010
C29-40	[illegible]
C41, 42, 43	[illegible]

1. ALL CHIPS ARE 7400 SERIES UNLESS OTHERWISE SPECIFIED.

E-REV 0

WANG PART NO	ITEM	QTY	NAME	MATERIAL	DESCRIPTION
WANG LABORATORIES, INC. TEWKSBURY, MASS. U.S.A.			MODEL NO 61	TITLE	SCHEMATIC LOGIBLOC DATA STORAGE & I/O CONTROL AND CHARACTER GENERATOR
WANG PART NUMBER 210-7060	SIZE E	DRAWING NUMBER 7060	SHT 4 OF 5		

7.3 SIGNAL RUN LIST

	6756	7065	7061	7062	7063	7064	7065	7066	6762	6758	6759	J3	J4	SWITCH
CH GRND ±0V	E_1,S_1	S_3,15_3	S_3,15_3		N	S	S					17 18,19 25,29 33		
±0V POWER(A) ±0V POWER(B)	F_1,6_1 K_3,M_3 11_3,12_3													
+5VR +8V	C_1,3_1 A_1,1_1	R_3,14_3	R_3,14_3			15	12					18		
+12V -12V	A_2,1_2 C_2,3_2	A_2,1_2 C_2,3_2	A_2,1_2 C_2,3_2											
+17V -17V	R_1,14_1 R_2,7_2													
+18V -18V	S_1,15_1 E_2,S_2													
+32V $\overline{A_1}$	S_3,R_3 14_3,15_3	D_2	14_2								1-10			
$\overline{A_2}$ $\overline{ACKLG}$		E_2 3_3	R_2									10		
AL AL-L1			C_3				N							
$\overline{ARE}$ $\overline{ARO}$		F_2 K_2	L_2 B_3											
b_6 b_7		L_3 M_3	2_3 A_3											
BUSY $\overline{CP}$		4_3 H_3	K_2									11		
$\overline{CIF}$ $\overline{CLEAR}$		A_3 K_1	9_3				9							
$\overline{CLK}$ $\overline{CLR}$		R_2 H_3	9_2 5_3									15		
$\overline{CO}$ DT_1		P_1 12_3	K_3		8							2		•
DT_2 DT_3		11_3 10_3										3 4		
DT_4 DT_5		9_3 8_3										5 6		
DT_6 DT_7		7_3 6_3										7 8		
DT_8 $\overline{DTSB}$		5_3 13_3										9 1		
$\overline{EC}$ FAN		B_3	12_2										•	
$\overline{FAULT}$ FFD		K_2	L_3			F						32		
$\overline{FFH}$ $\overline{FFT}$		D_3	P_3 13_3				J							
FFS $\overline{FOR}$		M_1	P_3			14	11							
$\overline{FSE}$ $\overline{FSO}$		P_2 M_2	S_2 11_2											
FUSE C_1		J_2	13_2											
C_2 K_1		L_2	M_2 N_2											

	6756	7060	7061	7062	7063	7064	7065	7066	6762	6758	6759	J3	J4	SW13
K2 LF		S_1	10_2 8_3											
$\overline{LFCR}$ $\overline{LFH}$		15_1	12_3 D_3				8							
$\overline{LFP}$ $\overline{LHS}$		C_3 H_1	11_3		J									
H HA	$N_1,12_1$	K_3	6_2					F,6						
N_0 HPA_1	K_2		4_2 H_2					4						
HPA_2 HPB_1			D_2 7_2					D 3						
HPB_2 $\overline{HS}$		J_3	5_2 K_2					C						
PO $\overline{PO}$		F_3 10_1			11							12		*
PO-L1 $\overline{POP}$		11_1 4_2	4_3				L							
$\overline{PRINT}$ $\overline{RESET}$		S_2 2_3	1_3									31		
$\overline{RPS}$ $\overline{RH}$		12_1 P_3	7_3		9									
S01 S02											K J			
S03 S04											H F			
S05 S06											E D			
S07 S08											C B			
S09 S1	N_2	7_2									A			
S2 S3	12_2 H_2	8_2 9_2												
S4 S5	13_2 P_2	10_2 11_2												
S6 S7	14_2 R_2	12_2 13_2												
S8 S9	15_2 S_2	14_2 15_2												
$\overline{SCE}$ $\overline{SCO}$		6_2 5_2	F_2 15_2											
$\overline{SF6}$ SL		1_3 5_1	3_3									13		
$\overline{SL}$ SL-L1		N_2 L_1	10_3				10							
$\overline{SLT_1}$ $\overline{SLT_2}$		14_1 R_1					P 14							
$\overline{SW0}$ $\overline{SW1}$			K_3 J_3		L 10									* *
$\overline{SW2}$ VTD			H_3 N_3		K	R								
$\overline{VTP}$ VTS		E_3	6_3 M_3			13								
X X_o	$K_1,9_1$ 9_2		S_2	A,1										
X_b Y	$J_1,8_1$ $M_1,11_1$			B,2 D,4										
Y_o Y_b	10_2 $L_1,10_1$		J_2	C,3										

SECTION 8
MECHANICAL ASSEMBLY DRAWINGS

8.1 INTRODUCTION

Section 8 lists the bill of materials for the Model 61 Printer in lieu of the mechanical assembly drawings. A set of assembly drawings will follow when they become available.

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
*=KIT TAG #=STATUS ITEM ###=FRACTIONAL QTY

PART NUMBER		DESCRIPTION		QUANTITY
210 6756	*	# 6756 MODULE		1.00
300 1901		.1 UF 10V +-20% CERAMIC CAPACITOR	RF1876	1.00
300 1913		.002 UF 200V 20% CERAMIC CAPACITOR		1.00
300 1926		.22 UF 100V 20% CERAMIC CAPACITOR	PCBFNL	1.00
300 4013		1.2 UF 35V 10% TANT CAPACITOR (B)		2.00
300 4021		100 UF 15V 10% TANT CAPACITOR (D)	RF1876	4.00
330 1010		10 OHM 1/4 W 10% .4 RESISTOR	PCBNNL	1.00
330 1022		22 OHM 1/4 W 10% .4 RESISTOR	PCBFNL	1.00
330 2010		100 OHM 1/4 W 10% .4 RESISTOR		9.00
330 2022		220 OHM 1/4 W 10% .4 RESISTOR	RF1876	6.00
330 2027		270 OHM 1/4 W 10% .4 RESISTOR	RF1876	2.00
330 2033		330 OHM 1/4 W 10% .4 RESISTOR	RF1876	5.00
330 2047		470 OHM 1/4 W 10% .4 RESISTOR	RF1876	10.00
330 2068		680 OHM 1/4 W 10% .4 RESISTOR	RF1876	1.00
330 3010		1K OHM 1/4 W 10% .4 RESISTOR	RF1876	11.00
330 3022		2.2K OHM 1/4 W 10% .4 RESISTOR	RF2092	3.00
330 3027		2.7K OHM 1/4 W 10% .4 RESISTOR	RF2092	3.00
330 3033		3.3K OHM 1/4 W 10% .4 RESISTOR	EC5576	3.00
330 3039		3.9K OHM 1/4 W 10% .4 RESISTOR	EC5576	1.00
330 3047		4.7K OHM 1/4 W 10% .4 RESISTOR		4.00
330 4012		12K OHM 1/4 W 10% .4 RESISTOR	RF2092	2.00
330 4022		22K OHM 1/4 W 10% .4 RESISTOR	RF2092	2.00
330 4033		33K OHM 1/4 W 10% .4 RESISTOR		2.00
330 5047		47OK OHM 1/4 W 10% .4 RESISTOR		2.00
331 1022		22 OHM 1/2 W 10% RESISTOR	RF1876	9.00
334 0026		1.5 OHM 2W 1% RESISTOR		11.00
336 1014		1K TRIMPOT 90 DEG MOUNT BECKMAN#72X		1.00
350 0037	*	20 PIN 90 DEG CONN AMP225-21021-105		1.00
375 0017		2N3014 SILICON TRANSISTOR		2.00
375 0018		2N4037 TRANSISTOR		2.00
375 1016		2N2906A TRANSISTOR (GT 545)	RF1876	11.00
375 1027		2N3725 TRANSISTOR		2.00
375 1034		2N6111 PNP PLASTIC POWER TRANSISTOR		2.00
375 1035		2N6103 / MJE5983 TRANSISTOR(PLASTIC		2.00
375 1051		TRANSISTOR 2N6292 (PLASTIC)		9.00
375 1052		TRANSISTOR 2N6387 (PLASTIC)		2.00
375 1053		TRANSISTOR RCA8203A (PLASTIC)		1.00
375 9001		TRANSIPAD 8977887-1 (LARGE		4.00
375 9004		TRANSIPAD TO-18 (SMALL)	PCBFNL	13.00
375 9010		HEAT SINK BIRTCHTER 3AL635-2R		2.00
375 9016		MICA INSUL#DF103A FOR 375-1034/1035	PCBFNL	16.00
376 0066		723 INTEGRATED CIRCUIT		1.00

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
*=KIT TAG #=STATUS ITEM ###=FRACTIONAL QTY

PART NUMBER	DESCRIPTION		QUANTITY
376 0187	MA747C I.C.		1.00
380 2121	1N4742A 12V 1W ZENER DIODE		2.00
380 4000	EM403 / 1N4004 RECTIFIER	RF1876	15.00
462 0262	SPACER,HEATSINK(62)B6636-230	EC5404	2.00
478 0304	HEATSINK,PART 1 (62) C6636-248	EC5404	1.00
478 0305	ANGLE HEATSINK,PART 2 C6636-249	EC5404	1.00
510 6756	# 6756 PRINTED CIRCUIT BOARD		1.00
650 3120	6-32 X 3/8 PAN HD PHL MS SS SEMS	PCBFNL	3.00
650 3131	6-32 X 3/8 NYLON COVERED FIL HD SLT	PCBFNL	16.00
650 3320	6-32 X 1 PAN HD PHL MS SS	EC5404	2.00
653 3001	NO. 6 INT T LK WASHER	EC5404	2.00
210 6761	* # 6761 MODULE		1.00
300 1390	390 PF 10% CERAMIC CAPACITOR	EC5547	6.00
300 1900	.05 UF 12V +80-20% CERAMIC CAP	EC5547	15.00
300 1901	.1 UF 10V +-20% CERAMIC CAPACITOR		1.00
300 1904	.02 UF 25V +80-20% CERAMIC CAP	RF2119	13.00
300 1906	.001 UF 200V 10% CERAMIC CAPACITOR	RF2119	5.00
300 1910	.0047 UF 500V 20% CERAMIC CAPACITOR	RF2119	2.00
300 1913	.002 UF 200V 20% CERAMIC CAPACITOR	EC5547	3.00
300 1932	4.7K PF 100V 10% CERAMIC CAPACITOR	RF2119	4.00
300 1933	.0022 UF 200V 10% CERAMIC CAPACITOR	RF2119	1.00
300 1934	.01 UF 100V 10% CERAMIC CAPACITOR	RF2119	1.00
300 2147	.047UF 100V MYLAR CAPACITOR		2.00
300 4001	.47 UF 35V 10% TANT CAPACITOR (A)		1.00
300 4002	.1 UF 35V 10% TANT CAPACITOR (A)	EC5547	2.00
300 4003	.12 UF 35V 10% TANT CAPACITOR (A)	EC5547	1.00
300 4004	.15 UF 35V 10% TANT CAPACITOR (A)	RF2119	2.00
300 4013	1.2 UF 35V 10% TANT CAPACITOR (B)		1.00
300 4016	3.3 UF 15V 10% TANT CAPACITOR (A)	RF2119	1.00
300 4017	5.6 UF 35V 10% TANT CAPACITOR (B)		1.00
300 4021	100 UF 15V 10% TANT CAPACITOR (D)		3.00
300 4022	15 UF 20V 10% TANT CAPACITOR (B)	RF2119	2.00
320 0047	12V REED RELAY 46D01A0012		2.00
330 1010	10 OHM 1/4 W 10% .4 RESISTOR	RF2119	7.00
330 2010	100 OHM 1/4 W 10% .4 RESISTOR	EC5547	1.00
330 2056	560 OHM 1/4 W 10% .4 RESISTOR		1.00
330 3010	1K OHM 1/4 W 10% .4 RESISTOR		1.00
330 3015	1.5K OHM 1/4 W 10% .4 RESISTOR		1.00
330 3022	2.2K OHM 1/4 W 10% .4 RESISTOR	EC5547	3.00
330 3033	3.3K OHM 1/4 W 10% .4 RESISTOR		1.00
330 3047	4.7K OHM 1/4 W 10% .4 RESISTOR	EC5547	38.00
330 3056	5.6K OHM 1/4 W 10% .4 RESISTOR		3.00

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
*=KIT TAG #=STATUS ITEM ###=FRACTIONAL QTY

PART NUMBER	DESCRIPTION		QUANTITY
330 3082	8.2K OHM 1/4 W 10% .4 RESISTOR	RF2119	1.00
330 4010	10K OHM 1/4 W 10% .4 RESISTOR	EC5547	9.00
330 4012	12K OHM 1/4 W 10% .4 RESISTOR		4.00
330 4015	15K OHM 1/4 W 10% .4 RESISTOR	EC5547	5.00
330 4016	15K OHM 1/4 W 5% RESISTOR	EC5547	2.00
330 4018	18K OHM 1/4 W 10% .4 RESISTOR	EC5547	1.00
330 4022	22K OHM 1/4 W 10% .4 RESISTOR	PCBFNL	2.00
330 4023	22K OHM 1/4 W 5% .4 RESISTOR	RF2119	4.00
330 4028	27K OHM 1/4 W 5% RESISTOR	EC5547	1.00
330 4034 UB	33K OHM 1/4 W 5% UB RESISTOR	EC5547	1.00
330 4047	47K OHM 1/4 W 10% .4 RESISTOR	EC5547	3.00
330 4048	47K OHM 1/4 W 5% .4 RESISTOR	RF2119	2.00
330 5010	100K OHM 1/4 W 10% .4 RESISTOR	EC5547	4.00
330 5012	120K OHM 1/4 W 10% .4 RESISTOR		2.00
330 5018	180K OHM 1/4 W 10% .4 RESISTOR	EC5547	1.00
330 5022	220K OHM 1/4 W 10% .4 RESISTOR	EC5547	2.00
330 5033	330K OHM 1/4 W 10% .4 RESISTOR	RF2119	1.00
330 6010	1M OHM 1/4 W 10% .4 RESISTOR		1.00
331 1022	22 OHM 1/2 W 10% RESISTOR		1.00
331 2010	100 OHM 1/2 W 10% RESISTOR		2.00
333 0062	249K OHM 1/8W 1% RESISTOR	RF2119	1.00
333 0063	30.1K OHM 1/8W 1% RESISTOR	RF2119	1.00
333 0064	56.2K OHM 1/8W 1% RESISTOR	RF2119	2.00
333 0065	75K OHM 1/8W 1% RESISTOR	RF2119	2.00
333 0066	178K OHM 1/8W 1% RESISTOR	RF2119	1.00
336 1016	25K TRIMPOT 90 DEG MOUNT BECKMN#72X	PCBFNL	2.00
336 1017	50K TRIMPOT 90 DEG MOUNT BECKMN#72X	EC5547	1.00
336 1019	100K OHM TRIMPOT 90 DEG MOUNT	PCBFNL	1.00
375 0017	2N3014 SILICON TRANSISTOR		3.00
375 1005	CORE DRIVER SIL TRANSISTOR		1.00
375 1006	NIXIE DRIVER SIL TRANSISTOR		2.00
375 9004	TRANSIPAD TO-18 (SMALL)	EC5547	6.00
376 0002	7400N INTEGRATED CIRCUIT	RF2119	6.00
376 0003	7410N INTEGRATED CIRCUIT		3.00
376 0005	7473N INTEGRATED CIRCUIT		2.00
376 0008	7442N INTEGRATED CIRCUIT		1.00
376 0010	7404N INTEGRATED CIRCUIT		5.00
376 0011	7493N INTEGRATED CIRCUIT		2.00
376 0016	7402 INTEGRATED CIRCUIT		1.00
376 0025	993559X/MC840P INTEGRATED CIRCUIT		3.00
376 0046	993259(832) INTERG.CIRCUIT W/OFF-74		3.00
376 0055	7406 INTEGRATED CIRCUIT		1.00

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
*=KIT TAG #=STATUS ITEM ###=FRACTIONAL QTY

PART NUMBER	DESCRIPTION		QUANTITY	
376 0092	7425 INTEGRATED CIRCUIT		3.00	
376 0104	9602 INTEGRATED CIRCUIT		4.00	
376 0126	555 SIGNETICS I.C.		2.00	
376 0187	MA747C I.C.		3.00	
376 0188	74279 I.C.		1.00	
380 1001 R *	D035 SIL DIODE 30V, 100MA AT 1V T&R EC5547		12.00	
510 6761	# 6761 PRINTED CIRCUIT BOARD		1.00	
210 6762 *	# 6762 MODULE (PRELIMINARY)		1.00	
220 3003	14 COND 40" FLAT CABLE ASY C6482-14	EC5504	1.00	
000 0001	LABOR SUB-SYSTEMS		.13	###
000 0011	LABOR QUALITY CONTROL		.03	###
350 0400	14 PIN FLAT CABLE PLUG 3M 3406		2.00	
420 0042	14 COND FLAT CABLE 3M 3365/14		3.33	###
325 2300	11SM804 MICRO SWITCH	RF2017	4.00	
325 2305	11SM1 MICRO SWITCH FOR CP-1	RF2017	1.00	
370 0015	CMR-820 CLEAR LAMP (NBR 9)		4.00	
370 1020	1200 LAMPHOLDER B5776-895		4.00	
510 6762	# 6762 PRINTED CIRCUIT BOARD		1.00	
510 7066	7066 PRINTED CIRCUIT BOARD	EC5504	1.00	
652 3002	6-32 NYLON NUT		4.00	
210 7060 A *	# 7060-A MODULE(PRELIMINARY)		1.00	
209 7060	# 7060 W/UNLOADED SOCKETS		1.00	
300 1010	10 PF 10% CERAMIC CAPACITOR		2.00	
300 1390	390 PF 10% CERAMIC CAPACITOR	PCBFNL	4.00	
300 1470	470 PF 10% CERAMIC CAPACITOR		2.00	
300 1820	820 PF 10% CERAMIC CAPACITOR	PCBFNL	4.00	
300 1900	.05 UF 12V +80-20% CERAMIC CAP		10.00	
300 1904	.02 UF 25V +80-20% CERAMIC CAP		8.00	
300 1906	.001 UF 200V 10% CERAMIC CAPACITOR		2.00	
300 1913	.002 UF 200V 20% CERAMIC CAPACITOR	PCBFNL	2.00	
300 1933	.0022 UF 200V 10% CERAMIC CAPACITOR	RF2169	1.00	
300 4000	1 UF 35V 10% TANT CAPACITOR (A)		1.00	
300 4010	.56 UF 35V 10% TANT CAPACITOR (A)		2.00	
300 4018	18 UF 15V 10% TANT CAPACITOR (B)		1.00	
300 4021	100 UF 15V 10% TANT CAPACITOR (D)	PCBFNL	2.00	
300 4032	10 UF 35V 10% TANT CAPACITOR (C)	PCBFNL	1.00	
300 5004	220 PF 500V 5% MICA CAPACITOR	PCBFNL	1.00	
300 5006	1000 PF 100V 5% MICA CAPACITOR	PCBFNL	1.00	
330 1011 R *	10 OHM 1/4 W 5% -R RESISTOR		8.00	
330 2039	390 OHM 1/4 W 10% .4 RESISTOR		1.00	
330 2047	470 OHM 1/4 W 10% .4 RESISTOR		2.00	
330 3010 R *	1K OHM 1/4 W 10% -R RESISTOR		9.00	

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
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PART NUMBER	DESCRIPTION			QUANTITY
330 3027 R *	2.7K OHM 1/4 W 10% -R RESISTOR	PCBFNL		18.00
330 3039	3.9K OHM 1/4 W 10% .4 RESISTOR	RF2169		2.00
330 3047 R *	4.7K OHM 1/4 W 10% -R RESISTOR	PCBFNL		35.00
330 3068 R *	6.8K OHM 1/4 W 10% -R RESISTOR	PCBFNL		24.00
330 4010 R *	10K OHM 1/4 W 10% -R RESISTOR			14.00
330 4012	12K OHM 1/4 W 10% .4 RESISTOR			1.00
330 4018	18K OHM 1/4 W 10% .4 RESISTOR			2.00
330 4033	33K OHM 1/4 W 10% .4 RESISTOR	PCBFNL		1.00
330 4056	56K OHM 1/4 W 10% .4 RESISTOR	PCBFNL		2.00
376 0002	7400N INTEGRATED CIRCUIT	PCBFNL		4.00
376 0003	7410N INTEGRATED CIRCUIT			2.00
376 0004	7420N INTEGRATED CIRCUIT			2.00
376 0005	7473N INTEGRATED CIRCUIT			3.00
376 0008	7442N INTEGRATED CIRCUIT			1.00
376 0010	7404N INTEGRATED CIRCUIT			8.00
376 0025	993559X/MC840P INTEGRATED CIRCUIT			1.00
376 0028	7403N INTEGRATED CIRCUIT			3.00
376 0031	7430 INTEGRATED CIRCUIT			2.00
376 0046	993259(832) INTERG.CIRCUIT W/OFF-74			2.00
376 0055	7406 INTEGRATED CIRCUIT			3.00
376 0059	7495 INTEGRATED CIRCUIT			2.00
376 0093	7432 INTEGRATED CIRCUIT			2.00
376 0104	9602 INTEGRATED CIRCUIT			2.00
376 0188	74279 I.C.			2.00
376 0243	2518 I.C.			2.00
376 0244	2532 I.C.			2.00
376 9003	24 PIN IC SOCKET BURNDY			2.00
380 1004 4B	D035 SIL DIODE 40V. 250MA AT IV .4B	PCBFNL		5.00
510 7060 #	7060 PRINTED CIRCUIT BOARD			1.00
377 0325 #	EA42202 ROM PATTERN (62 PRTR)			1.00
377 0326 #	EA42203 ROM PATTERN (62 PRTR)			1.00
220 0105 1	31W PRINTER CABLE	DC0520		1.00
350 2067	36 POS.PLUG-26GA.STRND AMP#552470-1			2.00
350 4228	36 POS.SR COVER AMP#552073-1			1.00
350 4231	36 POS 90 DEG STRAIN RELIEF COVER			1.00
420 0025	18 TWISTED PAIR 26 GAUGE			13.00
615 1297	LABEL PRINTER CABLE CONN A53001072			2.00
270 0300 *	60 SERIFS PRINTER CHASSIS ASSY			1.00
210 6757 * #	6757 MODULE			1.00
300 3045	14000 UF 12V ELECTROLYTIC CAPACITOR	R2123A		1.00
300 3073	6000 UF 25V ELECTROLYTIC CAP	PCBFNL		1.00
300 3074	7300 UF 40V ELECTROLYTIC CAP			2.00

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
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PART NUMBER	DESCRIPTION		QUANTITY
300 3076	12K UF 25V ELECTROLYTIC CAP	PCBFNL	1.00
331 3022	2.2K OHM 1/2 W 10% RESISTOR	PCBFNL	5.00
332 2027	270 OHM 1 W 10% RESISTOR	PCBFNL	1.00
350 0011	225-21521-110 PC CONN SOLDER TYPE	PCBFNL	10.00
350 1038	57-40360 CONN NCN-HI-BARRIER (PC'S)	PCBFNL	1.00
380 3002	IN4719 RECTIFIER	RF2123	10.00
380 4000	EM403 / 1N4004 RECTIFIER	PCBFNL	1.00
510 6757	# 6757 PRINTED CIRCUIT BOARD		1.00
654 1010	#10 GROUND LUG	PCBFNL	8.00
654 1198	2 POS PIN HEADER ASSY AMP 350209-1	RF2123	1.00
300 3045	14000 UF 12V ELECTROLYTIC CAPACITOR		1.00
300 3073	6000 UF 25V ELECTROLYTIC CAP		2.00
300 3074	7300 UF 40V ELECTROLYTIC CAP		2.00
300 9009	CAP CLAMP 1 1/4 INCH 2 LUG CMC-22		5.00
320 0300	SPEAKER 3" RECTANGULAR FILMOR TS-27		1.00
325 0021 2	ROCKER SWITCH (RED DOT)		1.00
325 2112	SLIDE SW.115/230 VAC		1.00
360 0001	FUSE HOLDER STR CONTACT		2.00
360 9000	RUBBER WSHR FOR 360-0000 / 360-0001		2.00
360 9002	HEX NUT FOR 360-0000 / 360-0001		2.00
360 9003	LOCK WSHR LF#905-23(FOR 360-0000&1)		2.00
380 3001	IN3255 RECTIFIER		1.00
410 0102	# MMC 5474-3 TRANSFORMER(62)C5068-102		1.00
420 1000	CORD POWER 3 COND		1.00
451 1096	# CHASSIS,INNER(62)D6636-236		1.00
451 4411	BRKT,FUSE MTG(62)C6636-232		1.00
452 3536	SHIELD,A.C.(62)C6636-243		1.00
462 0266	SPCR 4-40X1/4 PHEN THREADED SM#8660		3.00
510 6749	# 6749 PRINTED CIRCUIT BOARD		1.00
650 1123	3-48 X 3/8 PAN HD PHL MS SS SEMS		2.00
650 2240	4-40 X 3/4 PAN HD PHL MS SS SEMS		11.00
650 3080	6-32 X 1/4 PAN HD PHL MS SS SEMS		10.00
650 3092	6-32 X 1/4 FLAT HD 100 DEG CS MS SS		2.00
650 3120	6-32 X 3/8 PAN HD PHL MS SS SEMS		4.00
650 3200	6-32 X 5/8 PAN HD PHL MS SS		5.00
650 6160	10-32 X 1/2 PAN HD PHL MS SS SEMS		4.00
651 0404	RIVET AVEX FLAT HEAD 1604-0412		2.00
652 0032	6-32 LOCK-NUT KEPS 511-061800-00		5.00
652 2000	4-40 HEX NUT SS		11.00
652 3000	6-32 HEX NUT SS		2.00
653 0003	WASHER, NO.4 NYLON 1/8 ID X 3/8 OD		11.00
653 2000	NO. 4 FLAT WASHER		11.00

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
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PART NUMBER		DESCRIPTION	QUANTITY	
653 2002		NO. 4 INT T LK WASHER	11.00	
653 3003		NO. 6 SPLIT LOCK MED WASHER	2.00	
653 6000		NO. 10 FLAT WASHER	4.00	
654 1006		#6 GROUND LUG	2.00	
654 1203		GROMMET 1/2 ID FOR 5/8 HOLE	1.00	
654 1238		HEYCO STRAIN RELIEF SR5P-4	1.00	
279 0181	*	RIBBON CARTRIDGE ASSY(62)E6636-10	2.00	
449 0114		CARTRIDGE,TOP(62)E6636-119	1.00	
449 0115		CARTRIDGE,BOTTOM(62)E6636-118	1.00	
449 0116		GEAR,IDLER PIVOT(62 CART)C6636-108	1.00	
449 0117		GEAR,DRIVE (62 CART)C6636-109	1.00	
449 0118		HOLDER,IDLER GEAR(62 CART)C6636-110	1.00	
449 0119		HOLDER,DRIVE GEAR(62 CART)C6636-111	1.00	
449 0120		ROLLER,GUIDE(62 CART)B6636-120	2.00	
465 1623		SPRING,FLAT(62 CART)B6636-117	1.00	
465 1624		SPRING,COMPRESSION(62 CART)6636-159	1.00	
478 0299		WIRE,RIBBON INVERTER(62)C6636-116	1.00	
478 0306		WIRE,INK RIBBON GUIDE(62)B6636-251	1.00	
660 0024	*	RIBBON -62 CARTRIDGE B6636-226	.07	###
279 5061	*	-61 PRINTER MECHANICAL 10 PITCH	1.00	
279 5060 15		CARR MOTOR & ENCDR ASY(10P)C6636-15	1.00	
279 5060 18		MOTOR/PULLEY ASSY(CARR DR)B6636-18	1.00	
400 0032		# MOTOR,CARRIAGE DRIVE(62)B6636-172	1.00	
449 0122		PULLEY,CARRIAGE DRIVE(62)C6636-162	1.00	
651 1508		PR ROLL PIN 3/32 X 5/8	1.00	
279 5060 26		ENCODER BRKT ASSY B6636-26	1.00	
000 0020		LABOR PREP AREA	.03	###
451 4405		BRKT,ENCODER(62)C6636-152	1.00	
452 0042		ADJ.PLATE(62)MAG PICK-UP C6636-216	1.00	
650 4080		8-32 X 1/4 PAN HD PHL MS SS SEMS	2.00	
651 1516		ROLL PIN 3/8 X 1/8	1.00	
653 4000		NO. 8 FLAT WASHER	2.00	
325 2417		MAGNETIC PICK-UP TSI#VR250-1000ST	2.00	
461 2020		GEAR,ENCODER 10P 150T(62)C6636-197	1.00	
510 7065		7065 PRINTED CIRCUIT BOARD	1.00	
605 1004	*	CABLE TYE, PAN-TY PLTIM-M	3.00	
650 4061		8-32 X 3/16 SOC SET SCREW BK OX	1.00	
650 4120		8-32 X 3/8 PAN HD PHL MS SS SEMS	2.00	
652 0053		1/4-28 HEX NUT 7/16 A.F.X 1/8 THICK	2.00	
279 5060 19		CARRIAGE ASSY D6636-19	1.00	
279 5060 21		CARRIAGE PLATE ASSY B6636-21	1.00	
000 0020		LABOR PREP AREA	.02	###

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
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PART NUMBER	DESCRIPTION	QUANTITY	
452 0041	PLATE,CARRIAGE(62)D6636-167	1.00	
461 3237	PIN,ROLLER(62)B6636-185	1.00	
465 0729	BUSHING,ECCENTRIC(62)B6636-184	1.00	
279 5060 24	HOUSING ASSY,RIBBON DRIVE B6636-24	1.00	
000 0020	LABOR PREP AREA	.02	###
461 3244	HOUSING,CLUTCH(62)C6636-139	1.00	
465 0246	ROLLER CLUTCH(BRG)(62)TORR#RC040708	1.00	
465 0247	BEARING,SLEEVE(62)B6636-141	2.00	
279 5060 25	PULLEY ASSY,RIBBON DRIVE B6636-25	1.00	
000 0020	LABOR PREP AREA	.01	###
449 0121	PULLEY,WIRE ROPE(62)C6636-142	1.00	
465 0246	ROLLER CLUTCH(BRG)(62)TORR#RC040708	1.00	
449 0134	GUIDE,CARTRIDGE(62)(MOLD)C6636-176	2.00	
449 0136	ROLLER,CARRIAGE(62)(MOLD)B6636-182	2.00	
451 4400	BRKT,FLEX CABLE(62)C6636-160	1.00	
452 2554	CLAMP,BELT TOP(62)C6636-146	1.00	
452 2555	CLAMP,BELT BOTTOM(62)C6636-147	1.00	
458 0332	RETAINER,HEAD PC BOARD(62)B6636-189	1.00	
461 3232	SHAFT,RIBBON DRIVE(62)B6636-144	1.00	
461 3236	PIN,ECCENTRIC(62)B6636-183	1.00	
462 0257	SPACER,SPRING(62)B6636-203	3.00	
465 1626	SPRING,CARTRIDGE(62)C6636-143	1.00	
465 1629	EXTENSION SPRING(62)LE-018A-0	1.00	
465 1633	SPRING,RIB.DR.SHAFT(62)B6636-221	1.00	
650 3080	6-32 X 1/4 PAN HD PHL MS SS SEMS	2.00	
650 3081	6-32X1/4 FL HD PHL MS SS	5.00	
650 3100	6-32 X 5/16 PN HD PHL MS SS	3.00	
650 3134	SCR,6-32 X 3/8 SOC HD CAP SS	4.00	
651 1701	5133-12PP SNAP RING	1.00	
651 1707	X5133-21 SNAP RING	1.00	
651 1712	5133-18 SNAP RING	2.00	
651 1719	SNAP RING TRUARC 5133-25	1.00	
651 1724	PLATEN SNAP RING TRUARC #5555-37	2.00	
653 3000	NO. 6 FLAT WASHER	3.00	
653 3001	NO. 6 INT T LK WASHER	8.00	
653 6019	WSHR,NYLON,265 ID .50 OD B6460-87	2.00	
656 0225	TIMING BELT 1/5 PITCH 195037	1.00	
279 5060 22 *	HEAD ASSY(-61)C6636-22	1.00	
279 5060 14 *	PRINT SOLENOID ASSY C6636-14	9.00	
320 0050	COIL,PRINT SOLENOID(62)B6636-106	1.00	
449 0129	END CAP,SOLENOID(62)(MOLD)C6636-102	1.00	
458 0328	GUIDE TUBE,SOL.BODY(62)B6636-181	1.00	

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
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PART NUMBER		DESCRIPTION	QUANTITY	
458 0329		WASHER,COIL RETAINING(62)B6636-103	1.00	
465 1625		PLUNGER SPRING(62)B6636-101	1.00	
478 0263		MDL70 SPRING RETAINER B6615-18	1.00	
478 0272		MP-70 SOLENOID PLUNGER B6615-15	1.00	
478 0300		BODY,SOLENOID(62)B6636-104	1.00	
478 0301		WIRE,SOLENOID(62)B6636-180	1.00	
660 0177	*	CONAPOXY 1200	.01	###
660 0181	*	CONACURE 02 HARDENER	.01	###
660 0205	*	SOLDER PREFORM(RING)F.F.#45	1.00	
279 5060 23	*	-61 HEAD & GUIDE TUBE ASSY C6636-23	1.00	
449 0131		RIBBON GUIDE(62)(MOLDED)B6636-190	1.00	
450 0098 M	#	HEAD CASTING(MOD.60)B6636-194	1.00	
452 4019		MDL72 TUBE GUIDE PART 1 C6615-90	1.00	
452 4020		MDL72 TUBE GUIDE PART 2 C6615-91	1.00	
452 4021		MDL71/72 TUBE PARTITION 3 C6615-37	1.00	
458 0286		MDL70 STRAIGHT GUIDE TUBE B6615-47	1.00	
458 0287		MDL70 CURVED GUIDE TUBE B6615-46	8.00	
461 3224		PIN,LOCATING(-72)B6615-232	1.00	
465 0245		BEARING,PRINT HEAD(62)10P C6636-192 PRERFA	1.00	
650 0064		00-90X3/16 FLAT HD SLOT SS SCREW	2.00	
651 1605		DOWELL PIN 1/8 X 3/8 SS	1.00	
660 0181	*	CONACURE 02 HARDENER	.01	###
660 0183	*	CONAPOXY,FR1210	.01	###
449 0102 M	#	COVER,PRINT HEAD(62)C6636-228	1.00	
510 6758	#	6758 PRINTED CIRCUIT BOARD	1.00	
605 1004	*	CABLE TYE, PAN-TY PLTIM-M	2.00	
650 2098		SCR 4-40 X 1/4 PAN HD PHL LONGLOK	2.00	
650 4086		8-32 X 15/64 NYLON TIP SET SCREW	9.00	
279 5060 27		WIRE ROPE ASSY(CART DR)B6636-27	1.00	
458 0275		CARRIER CABLE END FITTING B6497-198	2.00	
465 0417		COLLAR,CLUTCH CABLE(62)B6636-202	2.00	
465 0728		BUSHING,CABLE(62)B6636-149	2.00	
600 9102	*	STEEL CABLE (.046 PLASTIC COATED)	22.38	###
279 5060 29		FORMAT CONTROL ASSY C6636-29	1.00	
210 6574	* #	6574 MODULE	1.00	
000 0001		LABOR SUB-SYSTEMS	.08	###
000 0011		LABOR QUALITY CONTROL	.02	###
375 2104		TIL78 PHOTO TRANSISTOR	3.00	
510 6574	#	6574 PRINTED CIRCUIT BOARD	1.00	
210 6575	* #	6575 MODULE	1.00	
000 0001		LABOR SUB-SYSTEMS	.10	###
000 0011		LABOR QUALITY CONTROL	.02	###

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
#=KIT TAG #=STATUS ITEM ###=FRACTIONAL QTY

PART NUMBER	DESCRIPTION	QUANTITY	
380 0104	TIL32 LED (LIGHT EMITTING DIODE)	3.00	
510 6575	# 6575 PRINTED CIRCUIT BOARD	1.00	
270 3062	FORMAT CONTROL HARNESS(61)C6482-85	1.00	
510 7064	# 7064 PRINTED CIRCUIT BOARD	1.00	
600 3000	WIRE 26 GA BLACK	.83	###
600 3002	WIRE 26 GA RED	.83	###
600 3003	WIRE 26 GA ORANGE	.84	###
600 3004	WIRE 26 GA YELLOW	.84	###
600 3007	WIRE 26 GA VIOLET	.84	###
600 3008	WIRE 26 GA GRAY	.84	###
605 0000	TUBING #10 CLEAR	1.42	###
605 1004	CABLE TYE, PAN-TY PLTIM-M	3.00	
279 5060 30	PLATE ASSY(FORMAT CONTROL)B6636-30	1.00	
000 0020	LABOR PREP AREA	.02	###
452 0044	PLATE,FORMAT CONTROL(62)D6636-134	1.00	
461 3181	MP-70 SPRING PIN (F.C.) B6615-139	1.00	
461 3182	MP-70 PIVOT PIN (L.E.D.) B6615-133	1.00	
279 5060 36	HOUSING ASY(FORMAT CONTROL)B6636-36	1.00	
000 0020	LABOR PREP AREA	.01	###
461 3186	PHOTOTRANSISTOR HOUSING C6615-115	1.00	
465 0252	BEARING,FLANGE(62)BOST-BRONZFB-35-2	1.00	
279 5070 31	COVER ASSY,L.E.D.B6635-31	1.00	
000 0020	LABOR PREP AREA	.02	###
452 2141	MP-70 L.E.D.HOUSING COVER B6615-137	1.00	
461 3181	MP-70 SPRING PIN (F.C.) B6615-139	1.00	
458 0295	MP-70 FORMAT CONTROL STOP B6615-138	2.00	
461 3191	MP-70 L.E.D.HOUSING C6615-116	1.00	
462 0229	MP-70 L.E.D.COVER SPACER B6615-136	1.00	
465 0409	MDL 24 COLLAR,SET SCREW B5996-100	1.00	
465 0938	SPRING,TORSION B5776-249	1.00	
650 2043	4-40X1/8 KNURL CUP PT BK OX SET SCR	1.00	
650 3085	6-32 X 1/4 PAN HD PHL MS BK OX	2.00	
650 3134	SCR,6-32 X 3/8 SOC HD CAP SS	2.00	
651 0014	SCR,#2X1/4 SELF THREAD PAN HD T-25	2.00	
651 0015	SCR,#4X1/4 SELF THR SL FIL HD T-25	3.00	
651 0016	SCR,#4X1/2 SELF THR SL RND HD T-25	1.00	
653 2000	NO. 4 FLAT WASHER	3.00	
653 3000	NO. 6 FLAT WASHER	2.00	
279 5060 34 *	FRAME ASSY E6636-34	1.00	
279 5060 17	BRKT & PIVOT ARM ASSY(VERN)B6636-17	1.00	
000 0020	LABOR PREP AREA	.02	###
451 4401	BRKT,VERNIER ACT PIVOT(62)C6636-200	1.00	

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
*=KIT TAG #=STATUS ITEM ###=FRACTIONAL QTY

PART NUMBER	DESCRIPTION	QUANTITY	
456 0333	ARM,VERNIER ACTUATING(62)C6636-211	1.00	
465 0721	BUSHING,FSB-375	1.00	
651 1521	ROLL PIN .125 DIA X.938 LONG	1.00	
279 5060 20	HOUSING & BEARING ASY(CARR)B6636-20	1.00	
000 0020	LABOR PREP AREA	.02	###
461 3243	HOUSING,BEARING(CARR)(62)C6636-188	1.00	
465 0243	BEARING,SLEEVE,629 (62)B6636-161	2.00	
279 5060 28	BRKT & PIVOT ASY(IDLE GEAR)B6636-28	1.00	
000 0020	LABOR PREP AREA	.01	###
451 4406	BRKT,IDLER GEAR(62)C6636-132	1.00	
461 3242	PIVOT,IDLER GEAR(62)B6636-126	1.00	
279 5060 32	SHAFT ASSY(VERNIER)C6636-32 PRERFA	1.00	
000 0011	LABOR QUALITY CONTROL	.01	###
000 0020	LABOR PREP AREA	.05	###
449 0132	CONE,VERNIER(62)(MOLDED)C6636-174	1.00	
449 0133	PULLEY,VERNIER(62)(MOLDED)D6636-175	1.00	
461 3235	ROD,VERNIER ACTUATING(62)C6636-204	1.00	
461 3241	SHAFT,FORMAT CONTROL(62)C6636-206	1.00	
462 0258	SPACER,SHAFT(62).031 THK B6636-214	1.00	
465 1632	SPRING,VERN.CLUTCH(62)B6636-220	1.00	
651 1506	TR ROLL PIN 1/16 X 1/2	1.00	
651 1508	PR ROLL PIN 3/32 X 5/8	1.00	
651 1747	SNAP RING TRUARC 5100-37	1.00	
279 5060 33	IDLER PULLEY ASSY C6636-33 PRERFA	1.00	
000 0011	LABOR QUALITY CONTROL	.02	###
000 0020	LABOR PREP AREA	.08	###
449 0123	PULLEY,IDLER(62)C6636-163	1.00	
451 4402	BRKT,IDLER PULLEY(62)C6636-210	1.00	
461 3238	STUD,IDLER PULLEY(62)B6636-205	1.00	
465 0248	NEEDLE BEARING(62)INA#SCE 59	1.00	
465 1627	SPRING,HEAD ADJ DETENT(62)C6636-199	1.00	
650 4080	8-32 X 1/4 PAN HD PHL MS SS SEMS	1.00	
652 0064	1/4-28 STOP NUT ESNA 21NE-048	1.00	
653 0040	WASHER,NYLOMATIC .321 ID X 5/8 OD	2.00	
653 6006	WASHER 1/4 FLAT	1.00	
279 5060 35	SIDE & BUSHING ASSY(LEFT)B6636-35	1.00	
000 0020	LABOR PREP AREA	.02	###
452 0043	FRAME,SIDE(LH/RH)(62)D6636-217	1.00	
465 0721	BUSHING,FSB-375	1.00	
279 5060 37	MOTOR & PULLEY ASSY(P.F.)B6636-37 PRERFA	1.00	
400 0033	# MOTOR,PAPER FEED(62)B6636-173	1.00	
449 0124	PULLEY,PAPER DRIVE(62)C6636-164	1.00	

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ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
*=KIT TAG #=STATUS ITEM ###=FRACTIONAL QTY

PART NUMBER	DESCRIPTION		QUANTITY	
510 7062	# 7062 PRINTED CIRCUIT BOARD		1.00	
651 1508	PR ROLL PIN 3/32 X 5/8		1.00	
279 5060 42	BOTTOM PAN ASSY(PREP)D6636-42		1.00	
000 0011	LABOR QUALITY CONTROL		.01	###
000 0020	LABOR PREP AREA		.06	###
451 1220	# BOTTOM PAN(62)E6636-807		1.00	
651 0426	RIVET AVDEL 11310621		4.00	
654 1286	FLAT CABLE CLAMP 3M#3484-1000		5.00	
655 0234	BUMPER,FOOT,BLACK BH2098W		4.00	
279 5060 45	BRKT & BUSHG ASY(PF MOTOR)C6636-45		1.00	
000 0020	LABOR PREP AREA		.01	###
451 4404	BRKT,MOTOR(62)C6636-135		1.00	
465 0721	BUSHING,FSB-375		1.00	
279 5070 38	COVER L.H.PAPER GUIDE ASSY C6635-38		1.00	
000 0011	LABOR QUALITY CONTROL		.03	###
000 0021	LABOR PERIPHERAL SYSTEMS		.15	###
279 5070 40	SIDE PLATE ASSY LH B6635-40	EC4717	1.00	
000 0020	LABOR PREP AREA		.01	###
452 0045	SIDE PLATE,LEFT P.F.(62)D6636-235	EC5389	1.00	
461 3198	MP-70 SPRING PIN B6615-167		1.00	
451 2104	MP-70 PAPER GUIDE COVER C6615-81		1.00	
458 0304	MP-70 PAPER LIFT ARM(L.H.)B6615-166		1.00	
461 3199	MP-70 SPROCKET COVR PIVOT B6615-160		2.00	
465 0730	BUSHING,SPROCKET(62)C6636-229	EC5390	1.00	
465 1614	SPRING,LEE 016A-0		1.00	
650 2062	4-40X3/16 FL HD PHL MS SS	EC5306	2.00	
650 2098	SCR 4-40 X 1/4 PAN HD PHL LONGLOK		1.00	
650 2241	4-40X3/4 FL HD PHL MS BK OX		2.00	
650 3124	6-32 X 3/8 TRUSS HD PHL MS SS	EC5306	2.00	
653 2002	NO. 4 INT T LK WASHER		2.00	
279 5070 39	COVER R.H.PAPER GUIDE ASSY C6635-39		1.00	
000 0011	LABOR QUALITY CONTROL		.03	###
000 0021	LABOR PERIPHERAL SYSTEMS		.15	###
279 5070 41	SIDE PLATE ASSY RH B6635-41	EC4717	1.00	
000 0020	LABOR PREP AREA		.02	###
452 0046	SIDE PLATE,RIGHT P.F.(62)D6636-235	EC5389	1.00	
461 3198	MP-70 SPRING PIN B6615-167		1.00	
451 2104	MP-70 PAPER GUIDE COVER C6615-81		1.00	
458 0305	MP-70 PAPER LIFT ARM(R.H.)B6615-166		1.00	
461 3199	MP-70 SPROCKET COVR PIVOT B6615-160		2.00	
465 0730	BUSHING,SPROCKET(62)C6636-229	EC5390	1.00	
465 1614	SPRING,LEE 016A-0		1.00	

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
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PART NUMBER	DESCRIPTION		QUANTITY
650 2062	4-40X3/16 FL HD PHL MS SS EC5306		2.00
650 2098	SCR 4-40 X 1/4 PAN HD PHL LONGLOK		1.00
650 2241	4-40X3/4 FL HD PHL MS BK OX		2.00
650 3124	6-32 X 3/8 TRUSS HD PHL MS SS EC5306		2.00
653 2002	NO. 4 INT T LK WASHER		2.00
325 2403 M1	SWITCH(62)PAPER OUT B6636-225		1.00
449 0125	GEAR,IDLER(SPUR)(62)C6636-165		1.00
449 0126	GEAR,DRIVE(SPUR)(62)C6636-166	PRERFA	1.00
449 0137	MOLDED KNOB"E"(62)HOR.VERN.C6636195		1.00
449 0138	RETAINER,FELT(62)(MOLDED)C6636-196	PRERFA	2.00
449 0139	BUSHING,NYLON(62)(MOLDED)B6636-198		1.00
451 4407	BRKT,HOLD DOWN(62)B6636-215		4.00
451 4408	BRKT,PLATEN MTG L.H.(62)C6636-224		1.00
451 4409	BRKT,PLATEN MTG R.H.(62)C6636-224		1.00
451 4412	BRKT,PAPER TENSION(62)C6636-234		1.00
452 0040	PLATE,STRIKER(62)C6636-207		1.00
452 0043	FRAME,SIDE(LH/RH)(62)D6636-217		1.00
452 2557	CLAMP,PAPER TENSION(62)C6636-233		1.00
452 4035	PAPER GUIDE,BOTTOM FEED(62)D6636219		1.00
452 4036	PAPER GUIDE,FRONT FEED(62)C6636-227		1.00
458 0297	MP-70 LOCKING PAD B6615-144	PRERFA	2.00
458 0334	ARM,HEAD ADJUSTMENT(62)C6636-212		1.00
461 0103	NUT PLATE,PAPER SW(62)B6636-222		1.00
461 1029	DISC(MP-70)PAPER SUPPORT B6615-158	PRERFA	2.00
461 3233	SHAFT,ROLLER(62)B6636-186		1.00
461 3234	ROD,GUIDE(62)B6636-123		1.00
461 3239	SHAFT,CARRIAGE(62)B6636-124		1.00
461 3240	SHAFT,SPLINE(62)B6636-125		1.00
461 3247	PIVOT PIN L.H.(62)B6636-241		1.00
461 3248	PIVOT PIN R.H.(62)B6636-240		1.00
462 0258	SPACER,SHAFT(62).031 THK B6636-214		2.00
462 0263	SPACER,SHAFT(62).608 OD B6636-214		1.00
462 0264	SPACER,FAN MOTOR(62)SMITH #8735	PRERFA	4.00
465 1039	HUB,GROB SPLINE B6615-54	PRERFA	2.00
465 1605	MDL70 DISC SEPARATOR SPRNG B6615-80	PRERFA	3.00
465 1634	SPRING,PAPER TENSION(62)C6636-223		1.00
478 0258	MP-100 SPROCKET PULLEY C6615-76		2.00
550 0067	CAP,BLACK(62)HEAD ADJ ARM B6636-218		1.00
650 0120	2-56 X 3/8 SOC HD CAP MS SS	PRERFA	1.00
650 2200	4-40 X 5/8 PAN HD PHL MS SS SEMS		2.00
650 3120	6-32 X 3/8 PAN HD PHL MS SS SEMS		4.00
650 4061	8-32 X 3/16 SOC SET SCREW BK OX		2.00

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
*=KIT TAG #=STATUS ITEM ###=FRACTIONAL QTY

PART NUMBER	DESCRIPTION		QUANTITY	
650 4080	8-32 X 1/4 PAN HD PHL MS SS SEMS		3.00	
650 4120	8-32 X 3/8 PAN HD PHL MS SS SEMS		15.00	
650 4160	8-32 X 1/2 PAN HD PHL MS SS SEMS		8.00	
650 4200	8-32 X 5/8 PAN HD PHL MS SS		4.00	
650 4205	8-32 X 5/8 SOC HD NYLOCK		1.00	
650 4240	8-32 X 3/4 PAN HD PHL MS SS SEMS		1.00	
650 6120	10-32X3/8 PAN HD PHL MS SS		2.00	
650 6127	SCR,10-32 X 3/8 FLAT HD PHL SS		1.00	
650 6160	10-32 X 1/2 PAN HD PHL MS SS SEMS		3.00	
650 9022	1/4-20 X 3/8 HEX HD BOLT CAD PLTE		4.00	
651 1719	SNAP RING TRUARC 5133-25		1.00	
651 1748	RETAINER,PUSH-ON TRUARC 5105-62		1.00	
651 1749	BOWED F RING 5131-25		1.00	
652 0063	4-40 STOP NUT ESNA 22NTM-40	PRERFA	3.00	
652 2003	4-40 SELF LOCKING NUT ESNA 68NM-40		3.00	
652 4000	8-32 HEX NUT SS		9.00	
653 0016	NYLON WASHER, .250X.562X.031		1.00	
653 3000	NO. 6 FLAT WASHER		4.00	
653 4000	NO. 8 FLAT WASHER		20.00	
653 4001	NO. 8 INT T LK WASHER		4.00	
653 6001	NO. 10 INT T LK WASHER		2.00	
653 6006	WASHER 1/4 FLAT		5.00	
653 6009	1/4 INTERNAL TOOTH LOCK WASHER		5.00	
655 0167	KNOB,PAPER MARGIN(62)B6636-239		2.00	
655 0236	BUMPER,5/16 HIGH(62)B6636-253		1.00	
655 0237	BUMPER,7/16 HIGH(62)B6636-253		1.00	
656 0105	RING,FELT(62)B6636-201	PRERFA	2.00	
656 1006	MAGNET,ROUND IND.GEN#SV-1611	PRERFA	1.00	
279 5060 46	REED SWITCH ASSY C6636-46		1.00	
270 3061	REED SWITCH HARNESS(61)D6482-84		1.00	
510 7063	# 7063 PRINTED CIRCUIT BOARD		1.00	
600 0000	WIRE 18 GA BLACK UL		1.00	
600 0002	WIRE 18 GA RED UL		1.00	
600 3000	WIRE 26 GA BLACK		3.91	###
600 3004	WIRE 26 GA YELLOW		1.58	###
600 3005	WIRE 26 GA GREEN		1.75	###
600 3006	WIRE 26 GA BLUE		2.66	###
600 3008	WIRE 26 GA GRAY		1.00	
600 3009	WIRE 26 GA WHITE		1.00	
605 1004	CABLE TYE, PAN-TY PLTIM-M		13.00	
654 0082 R	FASTON TERMINAL RED .187		2.00	
325 2416	REED SWITCH,HAMLIN 5804		3.00	

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
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	PART NUMBER		DESCRIPTION	QUANTITY	
	451 4403		BRKT,REED SWITCH(62)D6636-187	1.00	
	461 0104		NUT PLATE,REED SWITCH(62)B6636-157	3.00	
	615 0364		INSULATOR,REED SWITCH(62)B6636-245	3.00	
	650 3160		6-32 X 1/2 PAN HD PHL MS SS SEMS	10.00	
	400 0020		MOTOR AIRTROL 11-9201 C5996113	1.00	
	400 9005		FAN GUARD,WIRE HOWARD #6-182-035	1.00	
	420 1017		HEAD CABLE(62)C6636-213	1.00	
	449 0135		SPROCKET,F.C. (62)(MOLDED)B6636-179	1.00	
	451 2132	#	COVER,REAR(62)E6636-169	1.00	
	451 4410		BRKT,HEATSINK MTG(62)C6636-231	1.00	
	452 2140		MP-70 CELL MOUNT COVER B6615-134	1.00	
	452 3535		SHIELD,FAN(62)B6636-242	1.00	
	461 0102		NUT PLATE,REED SW BRKT(62)B6636-157	2.00	
	462 0258		SPACER,SHAFT(62),031 THK B6636-214	3.00	
	462 0259		SPACER,SHAFT(62),062 THK B6636-214	3.00	
	462 0263		SPACER,SHAFT(62),608 OD B6636-214	1.00	
	462 0264		SPACER,FAN MOTOR(62)SMITH #8735	2.00	
	465 1630		COMPRESSION SPRING,ROD(62)#LC029E13	1.00	
	465 1631		SPRING,CABLE TENSION(62)B6636-208	1.00	
8	650 3080		6-32 X 1/4 PAN HD PHL MS SS SEMS	2.00	
1	650 3081		6-32X1/4 FL HD PHL MS SS	3.00	
1	650 4080		8-32 X 1/4 PAN HD PHL MS SS SEMS	1.00	
9	650 4120		8-32 X 3/8 PAN HD PHL MS SS SEMS	2.00	
	650 4133		8-32 X 3/8 FLANGE WHIZ-LOCK MS ZINC	3.00	
	650 4160		8-32 X 1/2 PAN HD PHL MS SS SEMS	5.00	
	650 6080		10-32X1/4 PAN HD PHL MS SS	2.00	
	651 0015		SCR,#4X1/4 SELF THR SL FIL HD T-25	2.00	
	651 1719		SNAP RING TRUARC 5133-25	2.00	
	651 1732		RETAINING RING TRUARC 5133-31	1.00	
	651 1747		SNAP RING TRUARC 5100-37	1.00	
	652 4000		8-32 HEX NUT SS	3.00	
	653 0031		WASHER NYLON 3/8 X 3/4 X 1/32	1.00	
	653 2000		NO. 4 FLAT WASHER	2.00	
	653 4000		NO. 8 FLAT WASHER	16.00	
	653 4001		NO. 8 INT T LK WASHER	3.00	
	653 6001		NO. 10 INT T LK WASHER	2.00	
	654 1286		FLAT CABLE CLAMP 3M#3484-1000	5.00	
	656 0226		TIMING BELT 62T 1/5DP SD#6R3-062025 PRERFA	1.00	
	660 0085	*	SPONGE TAPE 1/2 X 3/4 NEOPRENE	.75	###
446 0027			WINDOW(62 PRINTER)C6636-803	1.00	
449 0127		#	COVER SIDE,MOLDED(LH)(62)E6636-800	1.00	
449 0128		#	COVER SIDE,MOLDED(RH)(62)E6636-800	1.00	

ASSEMBLY PART NUMBER 177 2231 W1
ASSEMBLY DESCRIPTION 2231W PRINTER 10 PITCH (80 COLUMN)

LEGEND
*=KIT TAG #=STATUS ITEM ###=FRACTIONAL QTY

PART NUMBER		DESCRIPTION	QUANTITY
450 0061		WANG TAG (BLANK) C5300-1049	1.00
451 2131	#	COVER,FRONT(62)D6636-802	1.00
452 1050	#	BEARING PLATE(62)KEYBD B6636-806	1.00
452 2556		STIFFENER,WINDOW(62)B6636-805	1.00
458 0346		CAP,DRESS(LH)(62)B6636-813	1.00
458 0347		CAP,DRESS(RH)(62)B6636-813	1.00
461 3246		PIVOT ROD(62)B6636-808	2.00
550 0068	*	KEY STEM,SMALL LIGHTED B6815-14	4.00
550 0736	*	NO 36 INSERT GROUP (-62)(VINYL)	1.00
660 0554	*	SCREEN,SIDE COVER(62)C6636-809	2.00

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APPENDIX A

PAPER SPECIFICATIONS

If paper does not conform to these specifications, degraded forms handling can occur. No specifications are given for card stock; try a sample before purchasing.

1. Material must be margin-perforated fanfold paper or card stock, perforations are used for guiding by pin-feed units.

2. Maximum form length is not to exceed 11 in. (27.9 cm).

3. Paper Stock:

   a. for single part forms use 15 to 20 lb bond (20 lb for improved forms handling).

   b. for multipart forms use:

      2 ply: 15/15 lb bond, 7 lb carbon
      3 ply: 15/12/15 lb bond, 7 lb carbon
      4 ply: 12/12/12/15 lb bond, 7 lb carbon
      5 ply: 12/12/12/12/15 lb bond, 5 lb carbon
      (up to four copies in addition to the original can be used)

   c. form width must be:

      4 in. (10.2 cm) minimum
      12-3/4 in. (32.4 cm) maximum

4. Speciality Paper (Carbonless)

NCR Regulator	4
NCR +3	5
3M Type 200	4
Moore Carbonless Paper (MCP)	4

5. Fastening of multipart forms:

   a. improved multipart paper handling can be achieved with glued margins.

   b. multipart forms must otherwise be fastened with crimps every two inches (5.1 cm) along both edges of the forms.

   c. crimps must not come closer to the fanfold that 0.50 in. (1.27 cm).

   d. each crimp must have four prongs, two to enter both form and carbon and two to enter forms only.

6. Forms thickness:

   a. maximum in the print area: 0.018 in. (0.046 cm) allows for four 12 lb, one 15 lb and four 7 lb carbon parts.

   b. over crimps in the pin-feed margin: 0.030 in. (0.076 cm).

7. Sprocket holes:

   a. must run along both margins 0.25 $\pm$ .03 in. (0.635 $\pm$ 0.076 cm) from paper edge to the hole center lines.

   b. distance between hole centers along the margins must be 0.5 $\pm$ 0.005 in. (1.27 $\pm$ 0.013 cm) non-accumulative in any five in. (12.7 cm) length.

   c. hole diameters must be 0.156 $\pm$ 0.005 in. (0.396 $\pm$ 0.013 cm) the two top and bottom drive holes on each sheet (four per sheet) can be up to 0.200 in. (0.508 cm) in diameter to permit post or ring binding of output.

   d. distance between hole centers across the sheet must be uniform within 0.015 in. (0.038 cm) to a maximum of 12-5/16 in. (31.27 cm).

8. When using forms with wide and narrow copies in the same set, the top copy should always be fullest width.

9. For pre-printed forms:

   pin-hole center to left side of left-most character not less than 3/8 $\pm$ 1/16 in. (1.0 $\pm$ 0.2 cm).

   pin-hole center to right side of last character not less than 3/8 $\pm$ 1/16 in. (1.0 $\pm$ 0.2 cm).

APPENDIX B

HEXADECIMAL CODES

HEX CODE	PRINTER CHARACTER
HEX(07)	Alarm
HEX(0A)	Line Feed
HEX(0B)	Vertical Tab
HEX(0C)	Form Feed
HEX(0D)	Carriage Return
HEX(0E)	Elongated Character
HEX(20)	Space
HEX(21)	!
HEX(22)	"
HEX(23)	#
HEX(24)	$
HEX(25)	%
HEX(26)	&
HEX(27)	'
HEX(28)	(
HEX(29)	)
HEX(2A)	*
HEX(2B)	+
HEX(2C)	,
HEX(2D)	-
HEX(2E)	.
HEX(2F)	/
HEX(30)	0
HEX(31)	1
HEX(32)	2
HEX(33)	3
HEX(34)	4
HEX(35)	5
HEX(36)	6
HEX(37)	7
HEX(38)	8
HEX(39)	9
HEX(3A)	:
HEX(3B)	;
HEX(3C)	<
HEX(3D)	=
HEX(3E)	>
HEX(3F)	?
HEX(40)	@
HEX(41)	A
HEX(42)	B
HEX(43)	C
HEX(44)	D
HEX(45)	E
HEX(46)	F
HEX(47)	G
HEX(48)	H
HEX(49)	I
HEX(4A)	J
HEX(4B)	K
HEX(4C)	L
HEX(4D)	M
HEX(4E)	N
HEX(4F)	O
HEX(50)	P
HEX(51)	Q
HEX(52)	R
HEX(53)	S
HEX(54)	T
HEX(55)	U
HEX(56)	V
HEX(57)	W
HEX(58)	X
HEX(59)	Y
HEX(5A)	Z
HEX(5B)	[
HEX(5C)	
HEX(5D)	]
HEX(5E)	↑
HEX(5F)	_
HEX(60)	
HEX(61)	a
HEX(62)	b
HEX(63)	c
HEX(64)	d
HEX(65)	e
HEX(66)	f
HEX(67)	g
HEX(68)	h
HEX(69)	i
HEX(6A)	j
HEX(6B)	k
HEX(6C)	l
HEX(6D)	m
HEX(6E)	n
HEX(6F)	o
HEX(70)	p
HEX(71)	q
HEX(72)	r
HEX(73)	s
HEX(74)	t
HEX(75)	u
HEX(76)	v
HEX(77)	w
HEX(78)	x
HEX(79)	y
HEX(7A)	z
HEX(7B)	{
HEX(7C)	
HEX(7D)	}
HEX(7E)	~
*HEX(7F)	

*ASCII DEL, a non-printable control character

APPENDIX C

SIGNAL MNEMONICS

SIGNAL	DEFINITION
$A_1 - A_9$	Address bits of ROMS
$\overline{\text{ACK DELAY}}$	Acknowledge delay
$\overline{\text{ACKLG}}$	Acknowledge at I/O interface
AL	Alarm (output to speaker)
AL-L1	Fault indicator
$\overline{\text{ARE}}$	Read strobe for ROM (even)
$\overline{\text{ARO}}$	Read strobe for ROM (odd)
$b_1 - b_7$	Output of shift registers
$\overline{\text{BELL}}$	Audio function pulse
BUSY	Device busy status for I/O
$\overline{\text{CF}}$	Carriage forward
$\overline{\text{CIP}}$	Control input prime
$\overline{\text{CLEAR}}$	Manual clear switch
$\overline{\text{CLK}}$	System clock
$\overline{\text{CLR}}$	System clear
$\overline{\text{CO}}$	Cover open switch
$\overline{\text{CRP}}$	Carriage return decoded
D1a - D9a	9-Bit output of character generator ROMS (odd)
D1b - D9b	9-Bit output of character generator ROMS (even)
DELETE	Delete function pulse
$DT_1 - DT_8$	Data input at I/O interface
$\overline{\text{DTSB}}$	Data strobe at I/O interface
EC	Expanded character
$\overline{\text{FAULT}}$	Fault status at I/O interface
FFD	Form feed LED anode
$\overline{\text{FFM}}$	Form feed manual switch
$\overline{\text{FFP}}$	Form feed pulse
FFS	Form feed phototransistor emitter
$\overline{\text{FOR}}$	Form override switch
$\overline{\text{FSE}}$	Fire solenoid (even)
$\overline{\text{FSO}}$	Fire solenoid (odd)
G_1	Pulse 1 of print timing
G_2	Pulse 2 of print timing

SIGNAL	DEFINITION
K_1	Pulse 4 of print timing
K_2	Pulse 5 of print timing
LF	Line feed
$\overline{\text{LFCR}}$	Line feed developed from first character carriage return
$\overline{\text{LFM}}$	Line feed manual switch
$\overline{\text{LFP}}$	Line feed pulse
$\overline{\text{LMS}}$	Left margin switch
M	Output of servo motor driver
MA	Master alarm
M_0	Output of servo motor amplifier
MPA_1	Magnetic pickup (tooth)
MPA_2	Magnetic pickup common (tooth)
MPB_1	Magnetic pickup (hole)
MPB_2	Magnetic pickup common (hole)
$\overline{\text{MS}}$	Margin stop
PO	Paper-out status at I/O interface
PO-L1	Paper-out lamp (form override)
$\overline{\text{POP}}$	Power-On-Prime
$\overline{\text{PRINT}}$	Initiates print cycle
RDY/BUSY	READY/BUSY (Low for Busy)
$\overline{\text{RESET}}$	Input prime at I/O interface
$\overline{\text{RMS}}$	Right margin switch
$\overline{\text{RN}}$	Run F/F output (carriage in motion)
SO1 - SO9	Collector of solenoid drivers
S9	Base of solenoid drivers
$\overline{\text{SCE}}$	Select chip (even)
$\overline{\text{SCO}}$	Select chip (odd)
$\overline{\text{SF6}}$	Used to shift out next character from buffer
SL	Select status
SL-L1	Select indicator
$\overline{SLT_1}$	Select switch (NO)
$\overline{SLT_2}$	Select switch (NC)
SW0	Home position switch
SW1	Deacceleration switch
SW2	Return switch

SIGNAL	DEFINITION
VTD	Vertical tab LED anode
$\overline{\text{VTP}}$	Vertical tab pulse
VTS	Vertical tab phototransistor emitter
X	Output to motor winding (X)
X_o	Output to stepping motor amplifier (X)
X_b	Common for motor winding (X)
Y	Output to motor winding (X)
Y_o	Output to stepping motor amplifier (Y)
Y_b	Common for motor winding (Y)

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