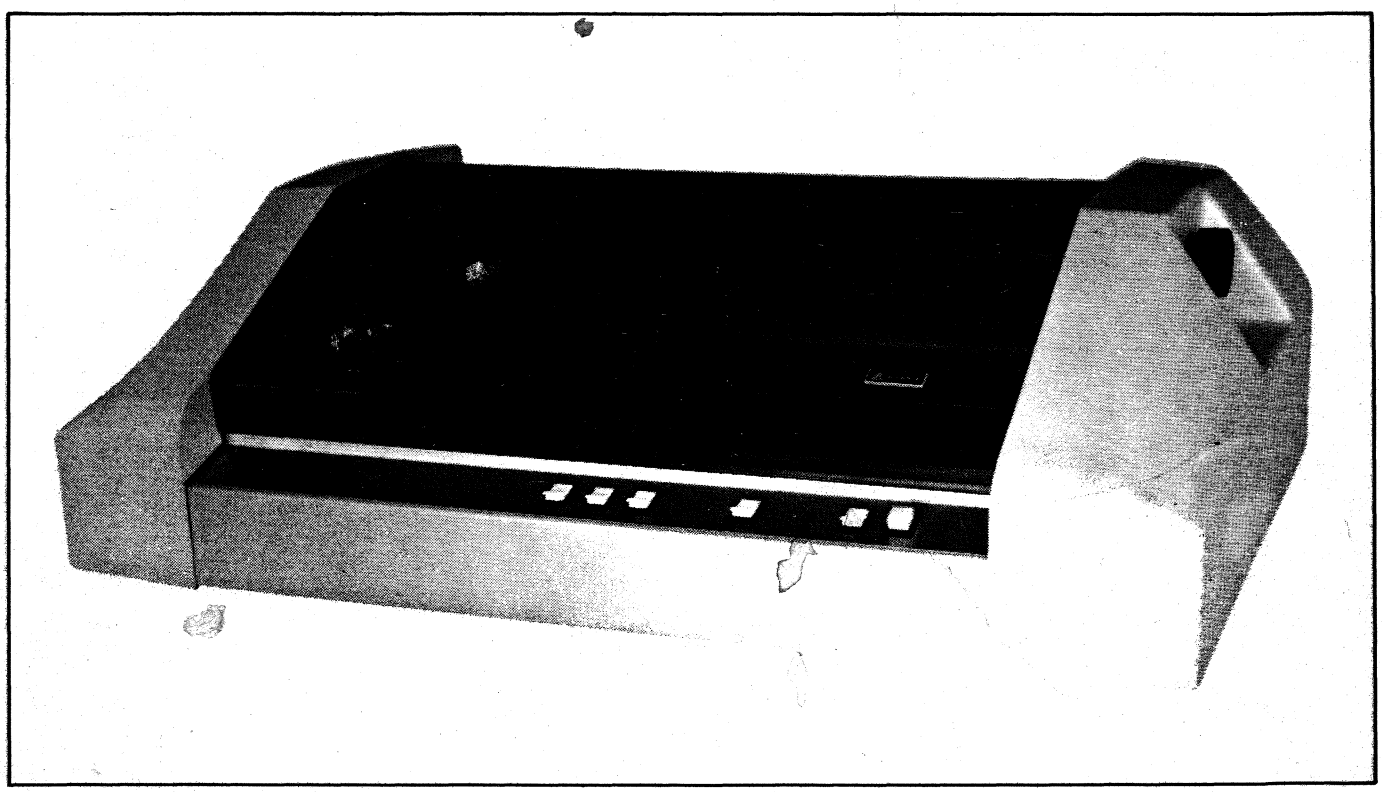
OPERATORS MANUAL

MODEL DP-9000, DP-9001, DP-9500 AND DP-9501

ALPHANUMERIC/GRAPHICS PRINTER



Anadex

9825 De Soto Ave. • Chatsworth, CA 91311
Telephone (213) 998-8010 • TWX 910-494-2761

MAY 1, 1981

Anadex

WARRANTY POLICY

Unless otherwise stated, ANADEX, INC., warrants the Models DP 9000, DP 9001, DP 9500, and DP 9501 Printers to be free from defects in material and workmanship and to perform in accordance with applicable specifications for 90 days from date of shipment

ANADEX will provide free service at the factory or at any of our Authorized Service Centers, including parts, labor and transportation back to the customer, for any malfunction of its products, which are returned transportation charges prepaid.

Customers desiring to return a product to ANADEX for repair should contact the Customer Service Department by telephone at (213) 998-8010 to obtain return authorization. The information required at this time will be the complete model number and serial number of the product, the mode of shipment, and an estimated arrival date at ANADEX.

All shipments to ANADEX must be sent freight prepaid and addressed as follows: (Please note that this address differs from our mailing address.)

ANADEX, INC.
20700 Lassen Street
Chatsworth, CA 91311

Attn: Repair Dept.

RE: (Insert Return
Authorization Number)

A complete and detailed statement of the reason for return must accompany the unit. If possible, include a copy of sample printout. A nominal handling charge will be made on units for which a malfunction cannot be verified.

Returned units must be packed as well as they were when first shipped. If possible, use the original packing. Remove and retain the ribbon before shipping. Do not return detachable power cord or manuals with unit.

This warranty is void if the product has been subjected to misuse, neglect, accident, or improper installation of application

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SECTION I

GENERAL DESCRIPTION

1.1 INTRODUCTION

This manual provides information and instructions for the operator/user of the Anadex Models DP-9000, DP-9001, DP-9500, and DP-9501 Alphanumeric/Graphic Printers. These four printer models are similar, except for maximum paper and printing width, the character dot matrix and timing. The instructions in this manual are applicable to all models, except as noted otherwise. The following paragraphs give a general description of the characteristics and features of your printers. A summary of printer specifications are given in Table 1-1.

NOTE

> The user of these printers should thoroughly review the contents of this manual before attempting to operate the printer. Your printer is a flexible and sophisticated machine requiring a thorough understanding of its controls to obtain proper results.

1.2 OPERATING CHARACTERISTICS

Your printer is a dot matrix printer using a 9-wire, solenoid actuated print head. For the DP-9000 and DP-9500, two basic character font matrices are printed, 9x9 and 7x9. Printing is 10, 12, or 13.3 characters per inch horizontally, and 6 or 8 lines per inch vertically. For the DP-9001 and DP-9501, the character font matrices are 11x9 and 7x9. Printing is 10, 12.5, 15, or 16.7 characters per inch horizontally, and 6 or 8 lines per inch vertically. Double width printing is available in all character fonts. A conversion kit is available on special order to convert either printer to its alternate. The DP-9000 and DP-9001 printers accommodate paper widths from 1.75 to 12.5 inches with an 8 inch maximum line width while the DP-9500 and DP-9501 accommodate paper widths of 1.75 to 16.88 with a maximum line width of 13.2 inches. A high density, individual dot addressable graphics capability is included. Printing is bidirectional with internal logic seeking the shortest path to the next print position for

maximum throughput. Paper advance is stepper motor driven for accurate paper positioning in 0.014 inch increments. Both vertical and horizontal forms control is provided in firmware, and is communications selectable. External operator controls include POWER, ON/OFF LINE, SELF TEST, and VERTICAL ALIGNMENT.

1.3 ELECTRICAL/ELECTRONIC CHARACTERISTICS

All functions of your printer are powered from a DC power supply, and are independent of line frequency. Input power is selectable between 115 VAC and 220 VAC nominal. All logic and control components are integral on a single circuit card mounted beneath the print mechanism. Components not mounted on the circuit card are the transformer, drive motors, sensors, operator switches, and cabling. Interfacing with the data source is selectable between parallel bit serial character (Centronics compatible), RS-232-C serial, and current loop serial. Full duplex communications control is provided through X-ON/X-OFF codes and/or STX/ETX/ACK/NAK codes. The FIFO buffer storage capacity is greater than 600 characters. An additional 2K of buffer is optionally available. A self-test function checks logic and control circuitry, and all operating charactertistics. Three DIP switches modules are on the circuit card and accessible to the operator to initially establish interface, format, and communications protocol.

1.4 MECHANICAL/PHYSICAL CHARACTERTISTICS

Your printer is lightweight and styled as an attractive peripheral device for desk top or stand mounting. Paper may be fed from the rear or through the bottom. The paper drive utilizes a stepper motor driven tractor mechanism mounted inside the cover above the print position, and may be manually operated bidirectionally in 0.056 inch increments. The print head is driven by a DC motor and capstan system. The mechanism is mounted on and hinged to a heavy duty structural foam plate. The mechanism is housed within moulded plastic end bells and a hinged covers. The paper exits through the top of the printer. The ribbon is in a Mobius loop cartridge driven continuously during print head movement.

TABLE 1-1. SUMMARY OF SPECIFICATIONS AND FEATURES

PRINTING CHARACTERISTICS

FONT	MAX. NO. COLS.		DOT MATRIX	PRINTING RATE	
	DP-9000 & DP-9001	DP-9500 & DP-9501		DP-9000 & DP-9500	DP-9001 & DP-9501
10 char/in.	80	132	11x9	-	120 cps
10 char/in.	80	132	9x9	150 cps	-
12 char/in.	96	158	7x9	180 cps	-
12.5 char/in.	100	165	7x9	-	150 cps
13.3 char/in.	106	176	7x9	200 cps	-
15.0 char/in.	120	198	7x9	-	180 cps
16.7 char/in.	133	220	7x9	-	200 cps

PRINT HEAD VELOCITY		15 in/sec.	12 in/sec.
DOT DIAMETER (NOMINAL)		0.014 in.	0.014 in.
DOT SPACING - CENTER TO CENTER (NOMINAL) AND DOT DENSITY			
	- Vertical	0.014 in. 72 dots/in	0.014 in. 72 dots/in.
	- Horizontal	0.0166 in. 60 dots/in	0.0135 in. 75 dots/in.

LINE SPACING - 6 or 8 lines per inch

GRAPHICS PRINTING

- Full high-density graphics printing by individually addressing each of the 6 print wires used in the graphics mode, using one data byte for each print head strobe with up to 6 vertical dots per strobe.

PAPER DRIVE

- Stepper motor driven in 0.014-inch increments. Vertical slew rate is 3.0 in/sec. (nominal). Manual feed is bidirectional in 0.056-inch increments. Front panel switch-controlled feed in either 0.014-inch increments or in 1-line increments.

PAPER TYPE

- Edge punched, fan folded, up to 12-inch wide (DP-9000/9001) or 16-7/8 inch wide (DP9500/9501).
- Single-part paper weight 15 to 100 weight.
- Multipart thickness to 0.018-inch maximum.

TABLE 1-1. SUMMARY OF SPECIFICATIONS AND FEATURES (Continued)

RIBBON SYSTEM

- Capstan-driven ½ in. x 30 yds. Mobius loop nylon with black matrix ink in a compact cartridge.

FORMS CONTROL	Frt. Panel Switch	Rear Access Switch	Comm. Link (Software)
- Top of Form	Yes	N/A	Yes
- Form Length	No	Yes	Yes
- Printing Width	No	Limited	Yes
- Vertical Tabs	No	No	Yes
- Horizontal Tabs	No	No	Yes
- Skip-Over-Perf.	No	Yes	Yes
- Char. Font Chge	No	Yes/Part.	Yes
- Lines per Inch	No	Yes	Yes
- Auto Line Feed	No	Yes	Yes
- Wraparound	No	Yes	No
- Graphics	No	No	Yes
- Form Feed	Yes	No	Yes
- Line Feed	Yes	No	Yes

COMMUNICATIONS

- Parallel Bit, Serial Character (Centronics)
- Asynchronous Serial Bit, Serial Character - RS-232-C
- Asynchronous Serial Bit, Serial Character - Curr. Loop
- Serial Protocols - X-ON/X-OFF
  - STX/ETX
  - STX/ETX/LRCC
- Validity Checks - No Parity
  - Even Parity
  - Odd Parity
  - Echoplex
- Code - USASCII - 96 printable characters plus 24 control codes.

INPUT DATA BUFFER SIZE

- Greater than 600 characters of true FIFO storage.
- An additional 2K buffer is available as an option.

DATA INPUT RATE

- Parallel Interface - >1000 char/sec.
- RS-232-C Interface - 9600 Baud
- Current Loop Interface - 4800 Baud

TABLE 1-1. SUMMARY OF SPECIFICATIONS AND FEATURES (Continued)

POWER REQUIREMENTS

- 110, 120, 220, or 240 vac ±10%, 47 to 63 Hz, single phase.
  VA max. at idle: 20
  VA max. average printing: 120
  VA max. executing form feed: 50

ENVIRONMENT

- Temperature: 41°F (5°C) to 104°F (40°C)
- Humidity: 10% to 90% without condensation
- Storage: 0°F (-18°C) to 130°F (55°C)

PHYSICAL CHARACTERISTICS

- Dimensions: 21.63 inches (53.2 cm) wide (DP-9000/9001)
  26.63 inches (67.6 cm) wide (DP-9500/9501)
  15.43 inches (39.2 cm) deep
  8.29 inches (21.0 cm) high

- Weight: 34 pounds (14.3 kg) (DP-9000/9001)
  36 pounds (16. kg) (DP-9500/9501)
  48 pounds (21.6 kg) shpg wt. (DP-9000/9001)
  50 pounds (24.5 kg) shpg wt. (DP-9500/9501)

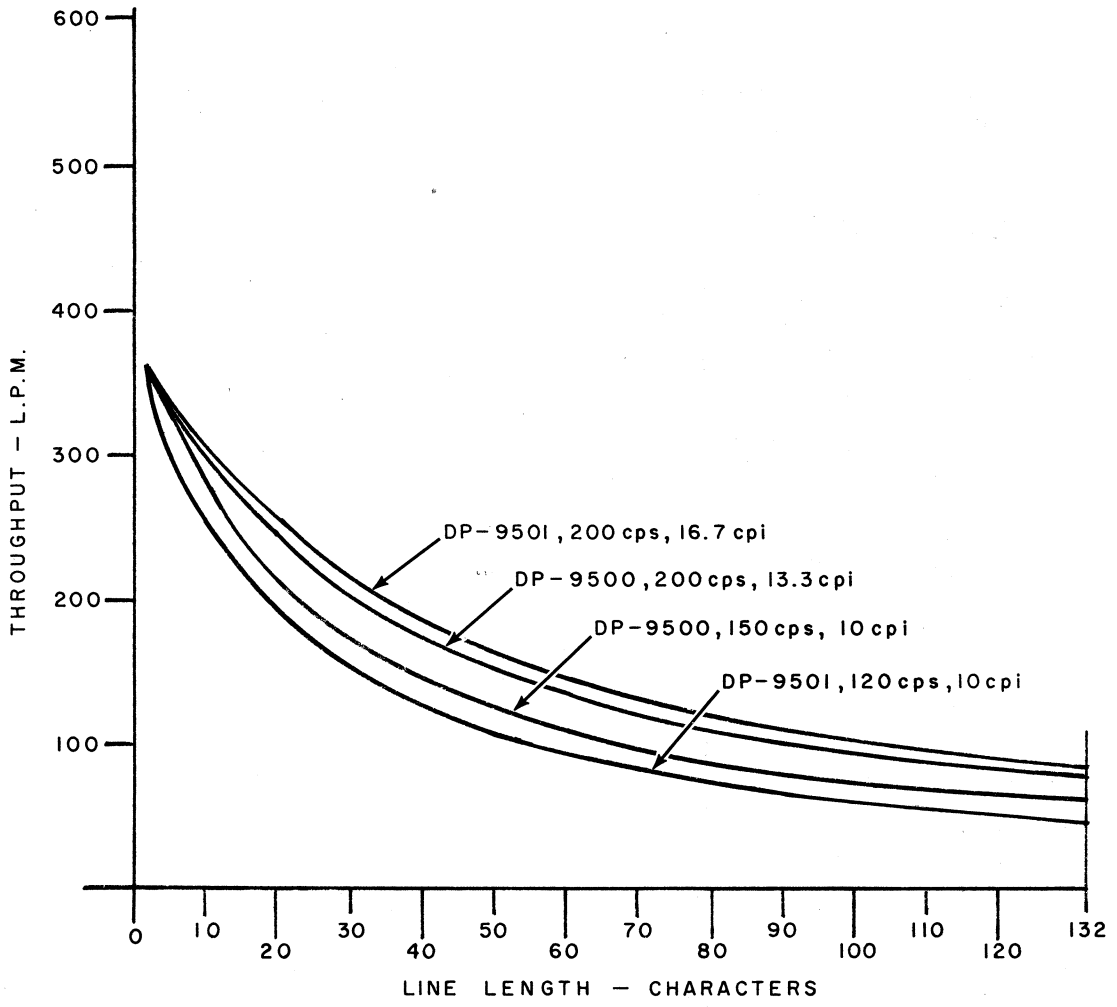


FIGURE 1-1. PRINTING THROUGHPUT

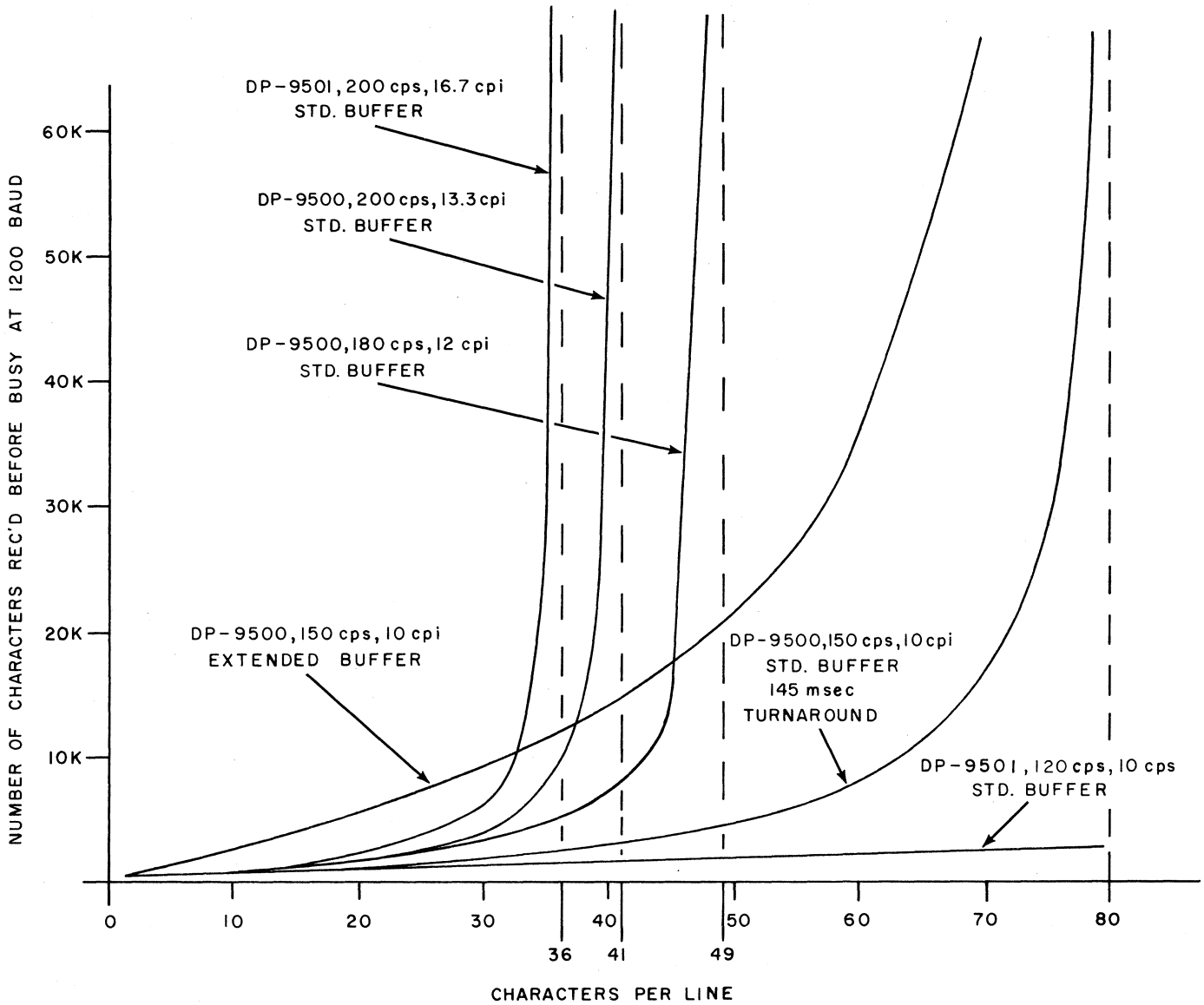


FIGURE 1-2. CONTINUOUS DATA TRANSMISSION RATES

SECTION II

INSTALLATION

2.1 GENERAL

The information and instructions in this section should be read and followed closely so that your printer will perform as specified and with maximum efficiency.

2.2 UNPACKING AND INSPECTION

Before removing the printer from the shipping container, inspect the container for evidence of shipping damage or mishandling. If such evidence is present, a report should be filed with the carrier as soon as possible. Do not remove or operate the printer if any possibility of damage to the printer is evident until the carrier has had opportunity to verify the damage.

1. Remove Operator's Manual, Warranty Registration Card, ribbon cartridge, power cord, and printer cover.

2. Reach in and grasp molded foam shock absorbing end bells on each side of printer.

3. Pull straight up and remove the printer from the shipping container. Place the printer on a firm, flat surface such as a table or the floor.

4. Remove end bells and plastic protective bag.

5. Install the transparent plastic printer cover by sliding the left hinge block over the left hinge pin molded in the printer's left end bell. With the cover in its normal closed position, snap the right hinge block over the right hinge pin.

2.2 UNPACKING AND INSPECTION (Continued)

6. Shipping container and packing material should be kept indefinitely for possible future equipment storage or shipment.

7. Proceed with site selection and installation.

2.3 OPERATING SITE SELECTION

Your printer should be located in a clean environment and where the printer is not subject to excessive shock, vibration, or wide ranges of temperature variations. Under no circumstances should the limits of +5°C (40°F) to +40°C (105°F), or 10 percent to 90 percent humidity with no condensation, be exceeded. The location should allow the operator free access to both front and rear of the printer with adequate space for the paper supply and printer output accumulation. A minimum of 76 mm (3 inches) should be allowed on each side for cooling air flow. Select a location where line power is convenient.

2.4 STAND ASSEMBLY (OPTIONAL ACCESSORY)

The most efficient paper feed path is through the bottom of the printer. Anadex recommends the use of the Anadex Printer Stand Assembly Model PS-9500 for mounting Models DP-9500/DP-9501. However, a steady table capable of securely supporting 22.5 kg (50 pounds) can be used. In this case, paper feed is normally through the rear of the printer or possibly from the bottom, if the table has a slot for that purpose. If you have purchased the stand, assemble it in accordance with the instructions packed with the stand.

2.5 RIBBON CARTRIDGE INSTALLATION AND REMOVAL

Your printer is originally shipped with a ribbon cartridge specially designed by Anadex for simple installation and removal, and long life. Replacement cartridges, PN 9500-6000-001 are available from ANADEX in cartons of 6 cartridges or singly from your local distributor or dealer. To install the ribbon cartridge:

CAUTION

ATTEMPTING TO INSTALL OR REMOVE THE RIBBON CARTRIDGE WITHOUT THE HEAD GAP AT ITS MAXIMUM OPEN POSITION CAN DAMAGE THE RIBBON AND/OR PRINT NEEDLES.

1. Verify Power is off.

2. Lift the hinged printing compartment cover.

3. Grasp the print head mounting plate and gently move the print head near the center of the printing compartment.

4. Pull the head gap adjustment lever (see Figure 2-1) to its maximum open position (nearest the operator).

5. Verify that the ribbon is taut and smooth in the print head window of the cartridge. Slight creases from folding in the Mobius loop inside the cartridge are normal. If necessary, rotate the manual ribbon feed knob in the direction of the arrow. (See Figure 2-2).

6. Align the cartridge over the print head and the ribbon drive shaft and press down gently. If necessary, rotate the manual ribbon drive knob slightly to engage the ribbon drive shaft. The cartridge should seat easily with a slight snap.

7. Verify that the ribbon is smoothly in place in front of the print head nose and was not caught by the print head nose and bunched up above the nose.

8. Set the head gap adjustment lever for the proper gap according to the paper to be printed. (See paragraph 2-6.)

9. Close the printing compartment cover.

CAUTION

CARE MUST BE TAKEN WHEN REMOVING THE RIBBON CARTRIDGE TO AVOID CATCHING A PRINT NEEDLE AND BREAKING IT.

To remove the ribbon cartridge:

1. Raise the cover.

2. Open the print head gap adjustment lever to its maximum open position.

3. Using both hands, lift the ribbon cartridge straight up.

2.6 PAPER LOADING

Paper may be loaded through the bottom slot or through the slot in the back of the printer. Loading paper through the bottom slot is the preferred path since the paper travels a more direct path through the printer in this manner. The loading method is the same in both cases.

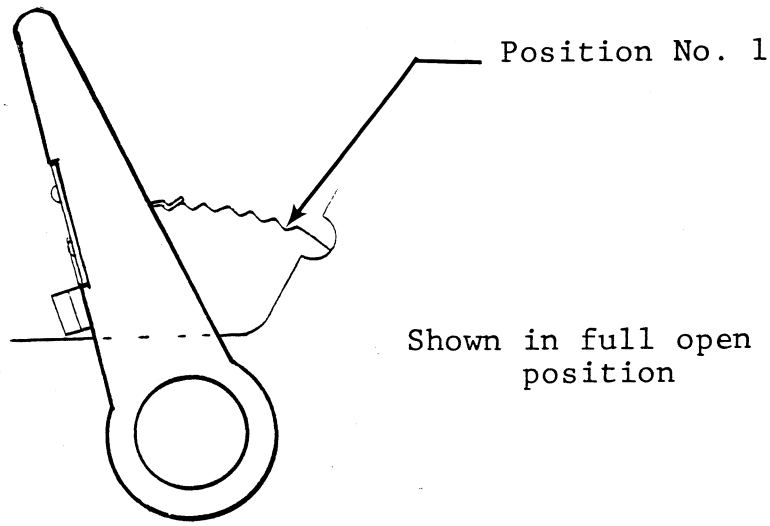


FIGURE 2-1 PRINT HEAD GAP ADJUSTMENT LEVER

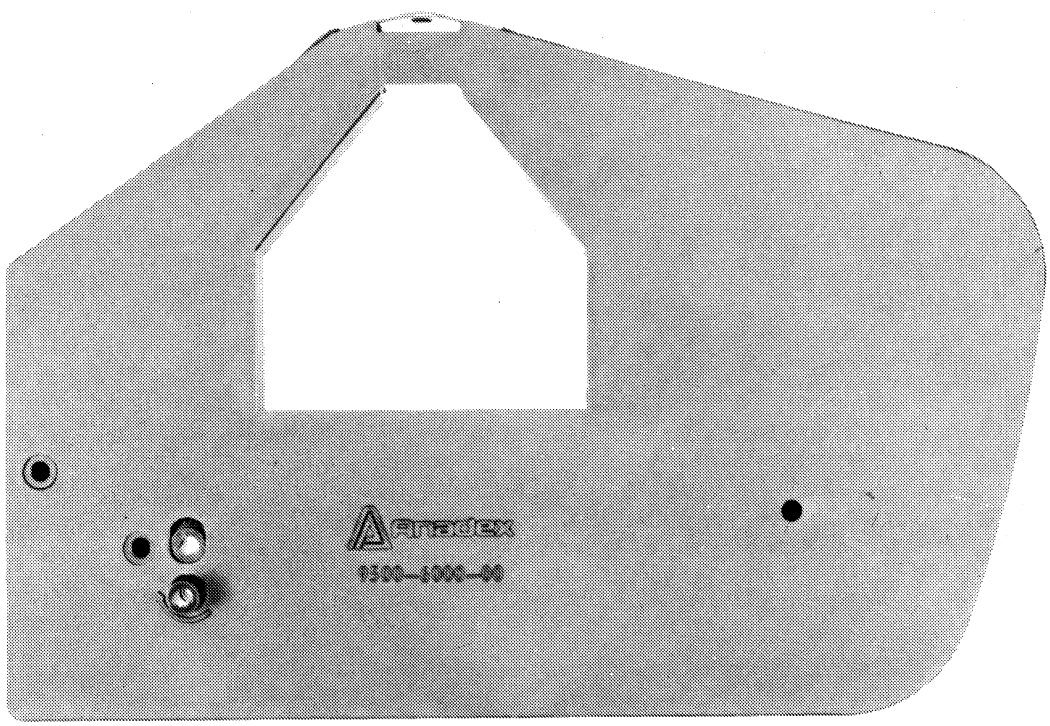


FIGURE 2-2 RIBBON CARTRIDGE

To load the paper:

1. Lift the printing compartment cover.

2. Raise both tractor paper hold-down gates.

3. Move the head gap adjustment lever all the way toward the front of the printer (maximum open position).

4. Insert the paper through the bottom or rear paper entry slots (see Figure 2-3). Push the paper through until the paper clears the print head and ribbon cartridge assembly.

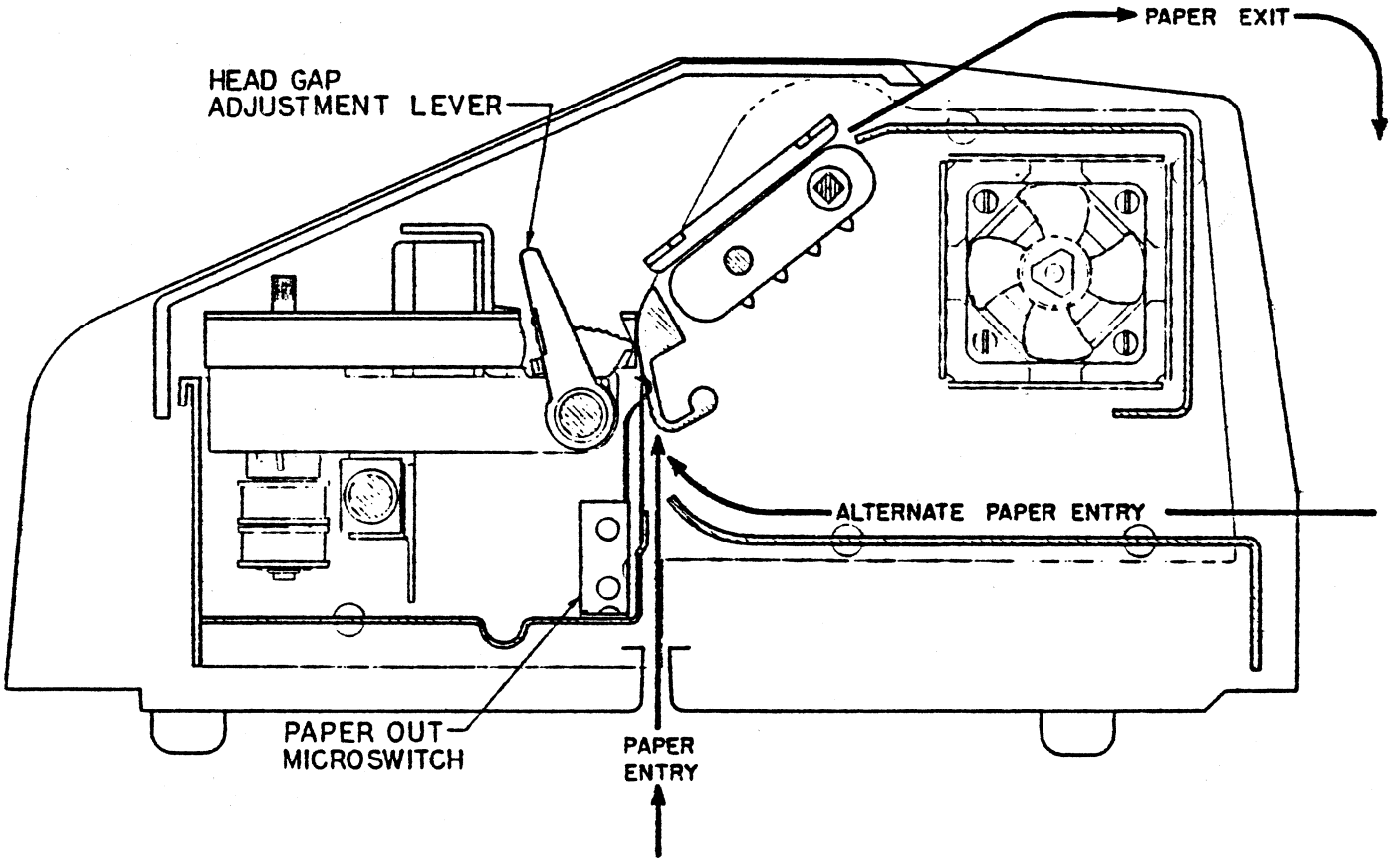


FIGURE 2-3. PAPER FEED PATH

CAUTION

FAILURE TO ENSURE THAT THE PAPER HAS PROPERLY ENGAGED THE PAPER-OUT MICROSWITCH CAN CAUSE PAPER TEARING AND JAMS WITH POSSIBLE DAMAGE TO THE PRINT HEAD.

5. Pull the paper up and engage the left side of the paper with the left tractor engagement pins. Close the left tractor paper hold-down gate.

6. If the left margin print portion is not aligned with print column number 1 as marked on the clear plastic paper guide below the print head carriage, then release the tractor locking cam. Slide the paper and tractor right or left as required to align the left print margin with printer column number 1. Relock the tractor locking cam.

7. Engage the paper with the right-hand tractor paper engagement pins. (Unlock and move the tractor if required as described above.) Close the hold-down gate. Verify that the paper is smooth between tractors but not stretched.

8. Close the printing compartment cover and manually rotate the adjust knob until the paper extends beyond the printing compartment cover.

9. Continue manually feeding the paper until the desired Top-Of-Form position is aligned with the print head. If a finer alignment is required, the paper can be adjusted in 0.014 inch increments after power is applied, using the TOF and FEED or FORM FEED switches together. (See Section III for operating details.)

NOTE

Print quality is a function of print head gap, paper quality, and ribbon condition (and, in multipart forms, of carbon quality).

10. Open the cover and adjust the head gap adjustment lever toward the paper to the most open position which gives satisfactory printing. The following rules will aid in initially establishing the correct gap:

    a. For single copy, single weight paper, start with the first notch (nearest the paper). Single weight paper is approximately 0.0035 inches thick.

    b. Each notch of the head gap adjustment represents approximately 0.0025 inches.

c. For each additional copy of paper or 0.003 inch of thickness, open the gap one notch.

d. Print one or two lines of printing. Readjust the head gap adjustment to the most open position which provides satisfactory print quality. The wider the gap the longer the life which can be obtained from the print head. Close the gap one more notch. Make a note of this position for use when changing the ribbon or replenishing paper.

2.7 POWER CONNECTION

Your printer requires 120 Watts of power. AC voltage may be 100, 120, 220, or 240 Volts AC at a frequency between 48 and 62 Hertz. Your printer was shipped to match the power normally expected for your area. However, before applying power to the printer, you should verify the correct setting. The power line connector is located at the right rear corner of your printer and is a multifunction module containing the line connector, power fuse, and a line voltage selector card. (See figure 2-4.)

To check the line voltage setting (line cord must be disconnected), slide the plastic cover on the Power Line Module to the left. The selected line voltage can then be read on the Voltage Selector Card.

CAUTION

ATTEMPTING TO REMOVE THE VOLTAGE SELECTOR CARD WITHOUT USING THE PROPER TOOL MAY DAMAGE THE CARD.

CARE MUST BE TAKEN TO AVOID DAMAGING THE SHORTING BARS ON THE VOLTAGE SELECTOR CARD.

To select a different line voltage, slide the clear plastic door to the left (power cord must be removed) and pull the FUSE PULL extractor lever all the way to the left. Remove the fuse. Using an extractor tool made from hooked music wire or equivalent, or a pair of Duck Bill or Long Nose pliers, pull the Voltage Selector Card straight out (the FUSE PULL lever must remain all the way to the left.)

FIGURE 2-4. POWER LINE MODULE

Turn the Voltage Selector Card so that the desired line voltage will be readable when the card is inserted, and reinsert the card fully into the Power Line Module. Replace the fuse and slide the cover to the right side. The line power cord can now be connected.

CAUTION

THE LINE POWER CORD SHOULD ALWAYS BE CONNECTED TO A GROUNDED OUTLET. DO NOT USE AN UNGROUNDED ADAPTER TO CONNECT THE POWER CORD TO A TWO-WIRE OUTLET. IF THE POWER CORD GROUND IS BYPASSED OR UNGROUNDED, STATIC ELECTRICITY PROBLEMS CAN DEVELOP WITHIN THE PRINTER, CAUSING SEVERE DAMAGE TO THE PRINTER, AND/OR THE ELECTRONIC COMPONENTS WITHIN.

CAUTION

SELF TEST PRINTOUT PRINTS AN 11-INCH LINE, THEREFORE PAPER OF SUFFICIENT WIDTH MUST BE IN THE PRINTER TO PRECLUDE PRINTING DIRECTLY ON THE PLATEN OR SWITCH 3, SECTION 2 MUST BE ON TO LIMIT THE PRINT LINE TO EIGHT INCHES. IF THIS SWITCH IS OFF IT IS POSSIBLE TO PRINT BEYOND THE RIGHT HAND MARGIN AND DRIVE THE PRINT HEAD INTO THE "DEAD MAN SWITCH" (S6) WITH POSSIBLE LOSS OF DATA AND FORMAT.

2.8 SELF TEST

A Self Test feature is incorporated in your printer. With paper and ribbon installed and power applied, verify that the ON LINE indicator is illuminated. The SELF TEST feature provides protection against inadvertent activation during printing. To initiate SELF TEST, press and hold the TOF switch then press the SELF TEST switch. Release both switches. After approximately 4½ seconds, the printer will print out the results of the test. Figure 2-10 shows a typical Self Test printout.

1st Line: Results of initialization test. If ROMS CRCC fails no printout will occur. Printer will not come on line. If RAM failure is detected the address of first failure is printed.

2nd Line: Indicates status of rear switches. A 1 indicates ON, a Ø indicates OFF. The first group is for S2, the second group is for S1. When S3-1 is ON (serial mode) a third group is printed for sections 3 through 8 of S3.

3rd Line: If any vertical tabs have been set the line numbers are given here.

4th Line: If any horizontal tabs have been set the column numbers are given here.

5th Line:
- FIFO = Size of the character buffer installed is indicated in HEX.
- LNG = Form length given in the number of lines in Hex.
- WDTH = Line width in HEX times tenths of an inch.

6th Line: Status of Auto Line Feed, Communications Mode and Skip over perforation distance.

7th Line: The complete ASCII printable character set is printed.

```
ROMS CRCC MATCH, RAM ERROR=0000
00001100 01101010 00110010
VERTICAL TABS SET=
HORIZONTAL TABS SET=
FIFO=0AC0H BYTES; LNG=42H LINES; WDTH=84H x 0.1 INCH
AUTO-LF OFF; COMM.=STX/ETX/LRC; SKIP @ LINE 42H
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
```


FIGURE 2-5 SELF TEST PRINTOUT

2.9 SIGNAL CONNECTIONS

Your printer has provisions for selecting one of three standard interfacing methods: parallel bit, serial character (Centronics convention); serial character serial bit (EIA RS-232-C); and serial character serial bit (20-60 ma current loop). Selection of the appropriate interface is made by internal switch configuration and cable connection to the appropriate connector. The parallel connector is the 36 pin connector on the bottom at the rear left of your printer.

NOTE

Any time the printer default configuration is changed by changing S1, S2 or S3, printer power must be cycled OFF and ON again to reinitialize the system.

2.9.1 PARALLEL BIT, SERIAL CHARACTER: This interface system meets the compatibility requirements of the Centronics parallel interface convention. Many computer systems using a Centronics type parallel interface do not have the full synchronization technique called for in the convention. Anadex has made provision for these situations also by providing a special "handshake" signal. For full utilization of capabilities and features of both the data source and the printer, the user must be familiar with the requirements, limitations, and capabilities of both systems.

CAUTION

WHEN PARALLEL INTERFACE IS SELECTED (S3-1 OFF), THEN ALL SECTIONS OF S3 MUST BE IN THE OFF POSITION.

Figure 2-5 shows the pin connections for the 36 pin parallel interface connector, and Figure 2-6 shows the timing relationship of the input and output signals. Anadex provides the following input/output signals:

DB1 THROUGH DB8 INPUT - Data Bits 1 through 8 - Characteristically, Bit 8 is a parity bit or special purpose bit. This bit is ignored in the printer logic. Only the first 7 bits are used in the 128 character ASCII set. Data bits should be active high.

$\overline{\text{DSTR}}$ INPUT - DATA STROBE - This input signal is used to indicate data is on the bus. This signal is normally active low, but a jumper is provided to invert the signal. Data should be on the bus for at least 300 nanoseconds before the strobe. Strobe duration minimally should be 0.5 microseconds.

$\overline{\text{ACK}}$ OUTPUT - ACKNOWLEDGE - This is nominally a 4 microseconds active low pulse indicating that the data has been received and processed and the printer is ready for the next data strobe. The $\overline{\text{ACK}}$ pulse will occur within 1 millisecond after the $\overline{\text{DSTR}}$. An $\overline{\text{ACK}}$ pulse is also transmitted immediately following power up initialization. If the last character received fills the FIFO buffer, then the $\overline{\text{ACK}}$ pulse is delayed until after the buffer is again available.

BUSY OUTPUT - This signal is available but not normally used but can be activated at J3-11 by relocating a jumper. This signal is an active high signal. On power-up, BUSY is high and goes low when initialization is complete and the printer goes ON LINE. (See the ON-LINE discussion below.) A high BUSY signal indicates the printer is unable to accept any more data. BUSY goes high upon receipt of the $\overline{\text{DSTR}}$ for the character which fills the FIFO buffer, after the $\overline{\text{DSTR}}$ following the printer sensing an Out-of-Paper condition, when the printer is placed OFF LINE, or immediately upon receipt of an $\overline{\text{INPUT PRIME}}$ signal (RESET). BUSY goes low on the true condition of paper inserted, ON LINE (not RESET), and buffer space available.

IBZ OUTPUT - INPUT BUSY - This signal combines the characteristics of both $\overline{\text{ACK}}$ and BUSY, and is an active high signal. IBZ goes low simultaneously with $\overline{\text{ACK}}$ and remains low until 2 microseconds after $\overline{\text{DSTR}}$. IBZ then remains high until the next $\overline{\text{ACK}}$. This is the appropriate signal for those I/O systems monitoring only one printer status line.

$\overline{\text{INPUT PRIME}}$ INPUT - This signal is effectively a reset signal and is active low. When this input is driven low by the data source, the printer microprocessor and the associated logic circuits are forced to the reset condition. When the input is again allowed to go high, the printer is reinitialized.

$\overline{\text{EMPTY}}$ OUTPUT — BUFFER EMPTY - This is an active low signal which indicates that the FIFO buffer is ready to accept a data dump of its maximum capacity. This signal is particularly useful in graphics and CRT dumps. The signal goes high coincidentally with BUSY going high, but remains high until the FIFO buffer becomes empty.

PE OUTPUT - PAPER ERROR - This is an active high signal indicating an Out-of-Paper condition. When an Out-of-Paper condition is sensed, this signal goes high, and after the next $\overline{\text{DSTR}}$ the BUSY signal goes high. SELECT and $\overline{\text{FAULT}}$ both go low immediately, and the ON LINE indicator light extinguishes. $\overline{\text{ACK}}$ and IBZ remain high. When the paper has been replenished, PE goes low, and when the ON/OFF LINE front panel switch is momentarily depressed, SELECT and $\overline{\text{FAULT}}$ return to their normal high condition. $\overline{\text{ACK}}$ and IBZ go low at their proper times, and the printer continues to process the data.

SELECT OUTPUT - (ON LINE) - This signal is active high and indicates that the printer is ON LINE (Selected) and available for printing. SELECT goes low when a paper error is sensed, and $\overline{\text{INPUT PRIME}}$ signal is received, or the front panel ON/OFF LINE switch is depressed, causing the printer to go OFF LINE. If the cause of the OFF LINE was receipt of an INPUT PRIME signal, then return to the ON LINE (SELECT) condition is automatic after reinitialization. For all other conditions, return to the ON LINE condition requires that the operator press the ON/OFF LINE switch.

$\overline{\text{FAULT}}$ OUTPUT - This signal is identical with SELECT, as described above.

BIAS OUTPUT - This is a 5 Vdc voltage source available for test purposes. It is current limited by a 2.7 ohm series resistor.

SIGNAL LEVELS - All Logic 1 (High) signals are + 2.4 Vdc to + 5.0 Vdc. Logic Ø (Low) signals are specified as less than + 0.8 Vdc. Current sinking capabilities are as specified below:

. DATA BITS	- 3 ma Sink current.
. $\overline{\text{DSTR}}$	- 2 ma Sink current. Duration is 0.5 to 1.5 microseconds nominal.
. $\overline{\text{ACK}}$	- 16 ma nominal. Duration is 4 microseconds nominal.
. BUSY	- 16 ma nominal.
. IBZ	- 16 ma nominal.
. $\overline{\text{INPUT PRIME}}$	- 2 ma nominal.
. PE	- 16 ma nominal.
. SELECT	- 16 ma nominal.
. $\overline{\text{FAULT}}$	- 16 ma nominal.
. $\overline{\text{EMPTY}}$	- 16 ma nominal.
GROUNDS	- Two grounds are utilized, SIGNAL RETURN or COMMON, and CHASSIS GROUND. These two are separate DC grounding systems but are capacitively coupled for filtering.

J3		J3	
1	$\overline{\text{DSTR}}$	19	SIG GND
2	DB1	20	SIG GND
3	DB2	21	SIG GND
4	DB3	22	SIG GND
5	DB4	23	SIG GND
6	DB5	24	SIG GND
7	DB6	25	SIG GND
8	DB7	26	SIG GND
9	DB8	27	SIG GND
10	$\overline{\text{ACK}}$	28	SIG GND
11	IBZ (Alt. BUSY)	29	SIG GND
12	PE	30	SIG GND
13	SELECT	31	$\overline{\text{INPUT PRIME}}$
14	SIG GND	32	$\overline{\text{FAULT}}$
15	NC	33	$\overline{\text{EMPTY}}$
16	SIG GND	34	NC
17	CHASSIS GND*	35	NC
18	+ 5 Vdc BIAS	36	IBZ

* See comments under signal levels.

Mating Connector - ANADEX PN 2101-5001-01
AMPHENOL PN 57-30360 or equiv.

FIGURE 2-6. PARALLEL CONNECTOR J-3 PIN ASSIGNMENTS

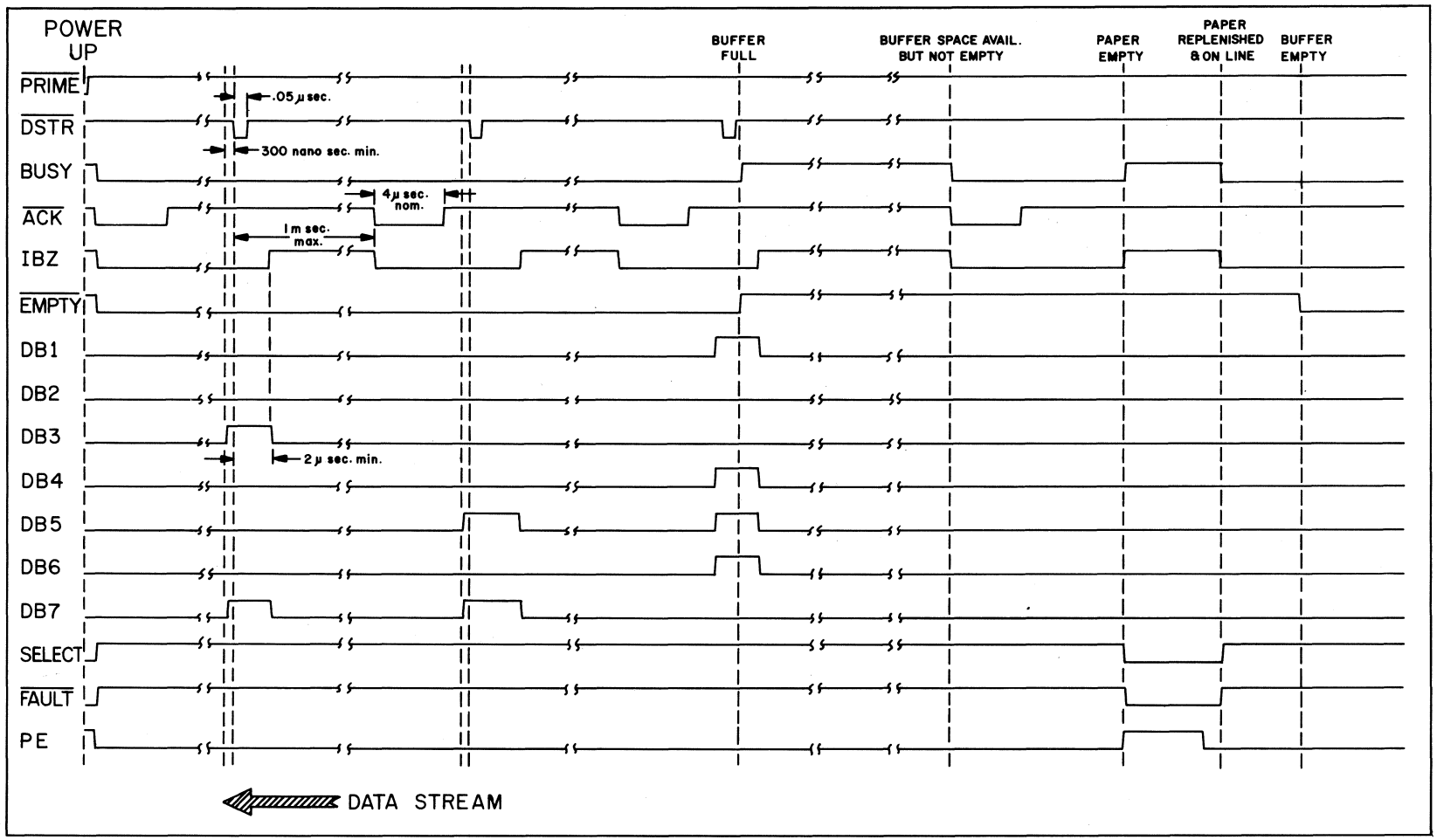


FIGURE 2-7. PARALLEL INTERFACE TIMING DIAGRAM

2.9.2 SERIAL BIT, SERIAL CHARACTER - RS-232-C: This interface system conforms to EIA standard RS-232-C. In utilizing this convention, the user must recognize that the printer is the DTE (Data Terminal Equipment) and configure the interconnection between the DTE and the DCE (Data Communications Equipment), which may be a modem or Data terminal (CRT) or a computer or other source. The EIA RS-232-C communications standard is a two-way communications standard, and therefore a signal which is defined as an output at one end may be an input at the other end. For example: TD (TRANSMIT DATA), which is assigned to pin 2 of the connector, is the data output line of the DCE, but is RD (RECEIVE DATA) at the DTE and is assigned to pin 3 of the DTE connector. Therefore, unless provision is available in the data source interface to switch these signal lines, the signal lines may require cross-connection from pin 3 to pin 2 in the cable. This principle applies to all signals in the RS-232-C interface.

NOTE

Those users who are not thoroughly knowledgeable in RS-232-C serial interface communication should refer to troubleshooting in Section IV for guidance in establishing communication.

The serial connector for both RS-232-C and current loop interface is the 25 pin connector at the rear left of the printer. Figure 2-7 shows the pin connections and internal strapping for the serial connector J-2, and Figure 2-8 shows the timing relationship of the data and status signals. The following paragraphs describe each of the input/output signals:

EIA DATA-IN INPUT - This is the asynchronous input data line. Data format is established by switch configuration by the operator. The format is one start bit, 7 or 8 data bit word, Ø to 1 parity bit, and 1 or 2 stop bits. Bit length is determined by the Baud rate and is nominally:

$$t = \frac{1 \text{ sec.}}{\text{Baud Rate}}$$

Signal levels for this interface are based upon conventional SPACE and MARK levels. The voltage level for a SPACE is + 3 Vdc to + 25 Vdc, and voltage level for a MARK is - 3 Vdc to - 25 Vdc.

EIA DATA-OUT OUTPUT - This data line is output asynchronous data from the printer in STX/ETX, STX/ETX/LRCC and X-ON/X-OFF DEC protocol, and conforms to the same standards for data as described above.

DTR OUTPUT - DATA TERMINAL READY - This is a status line indicating the availability of the printer, i.e., that the printer is present and power is ON. This line goes to the SPACE level on printer initialization.

CD INPUT - CARRIER DETECT - This is a status line from the data source indicating that communications capability is open and conditions the printer to receive data. When a carrier is detected (communications open), this signal should be at the SPACE level.

This line is normally strapped at the SPACE level at all times, but if a user has the requirement for an active CD, a trace cut will put this line in service. (See Figure 2-9.) This pin is not inserted in connector J-2 but is available and tied back.

RTS OUTPUT - READY TO SEND - This signal is normally at the MARK level and shifts to the SPACE level when the printer has data to transmit. RTS then remains at the MARK level for 10 to 68 milliseconds nominal after the stop bit of the last character. The exact delay is a function of the Baud rate. This pin is not inserted in J2 but is available and tied back.

SRTS OUTPUT - SECONDARY READY TO SEND - (PRINTER BUSY Handshake) This signal is a printer status signal indicating when the printer is ON LINE and available to accept data. During this time, the SRTS line is at the SPACE level and shifts to the MARK level when the FIFO buffer is full. It also shifts to the MARK level for any OFF LINE conditions, such as Out-of-Paper, etc. Any character in transit when SRTS goes to the MARK level will be received and processed.

DSR INPUT - DATA SET READY - This input line is a data source signal indicating that the data source is open for communication and can accept or transmit data. In this status, the signal should be at the MARK level. Normally, in the printer, this line is strapped to the SPACE level. To implement half or full duplex operation, this trace should be cut. (See figure 2-9.) This pin is not inserted in J2 but is available and tied back.

CTS INPUT - CLEAR TO SEND - This input signal is a data source signal indicating the availability of the data source to receive data. It is expected that this signal is normally at the SPACE level and shifts to the MARK level when data can be received. In the printer, this line is strapped to the RTS output (MARK level). Users requiring half duplex operation should cut the strapping trace. (See figure 2-9.) This pin is not inserted but is also available and tied back.

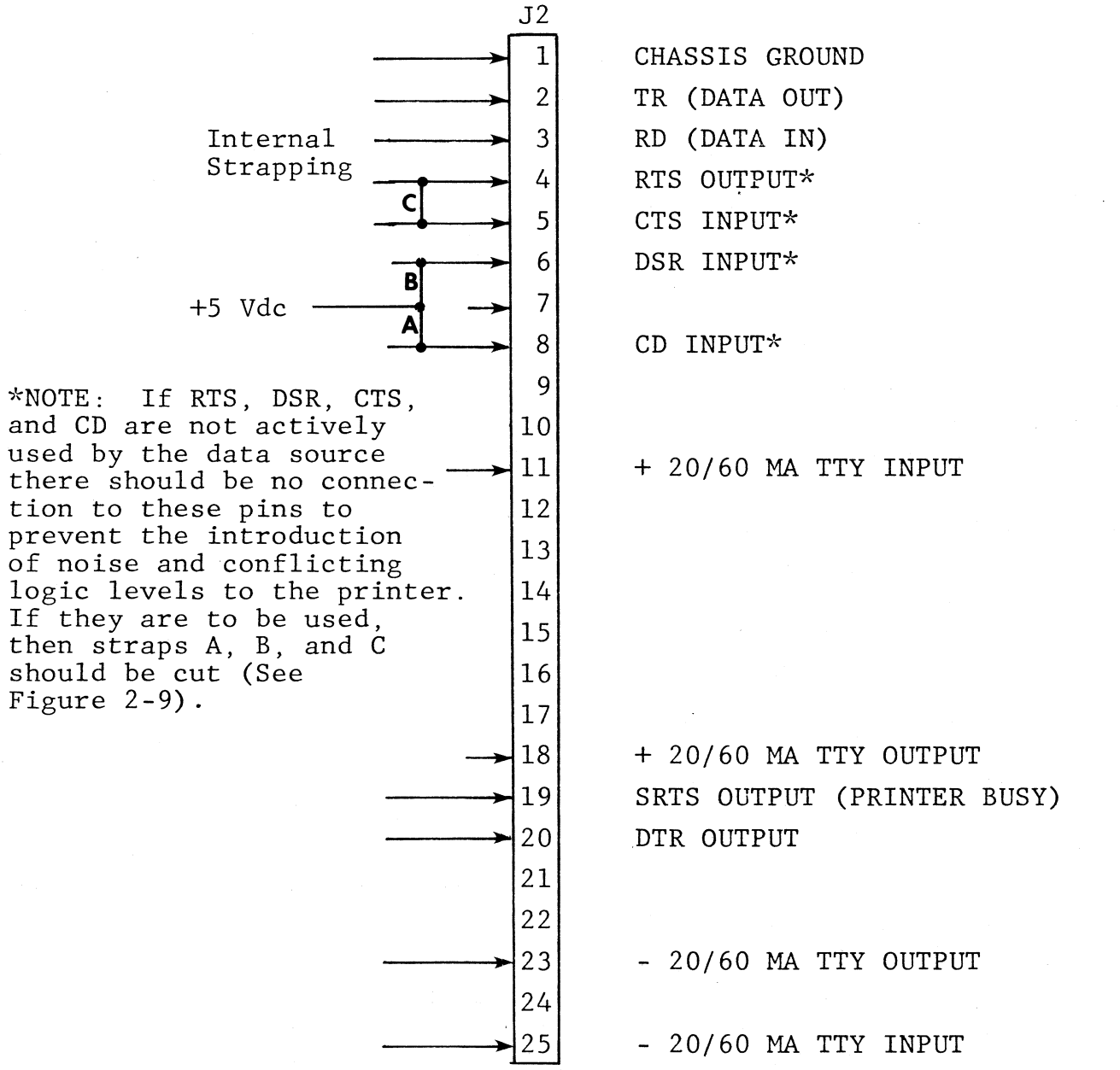
2.9.3 SERIAL BIT, SERIAL CHARACTER - TTY CURRENT LOOP: This interface system provides an asynchronous serial bit communications mode using the 20/60 ma current loop data transfer technique. The printer has facilities for both receiving and transmitting data. (See Figure 2-8 for the pin connections for serial connector J-2.) Data transmission timing is the same as for RS-232-C communications.

2.10 OPTIONS

Only one standard option is applicable to the Model DP-9000/DP-9500 or DP-9001/DP-9501 Printers: Option R (FIFO buffer expansion). This option may be installed by the factory at time of order, by the dealer at time of sale, by an Authorized Anadex Service Center, or by the user at any time after purchase. When the option is ordered separately, installation instructions will be provided with the option hardware.

2.10.1 OPTION R: This option expands the FIFO Random Access Memory (RAM) buffer from the nominal 600 characters standard memory to a nominal 2.7K character FIFO buffer. This option is particularly useful in graphic printing and applications requiring transfer of large blocks of data without "handshake" signals such as CRT dumps, etc., or where it is desirable to transfer a large block of data and allow the data source to perform additional processing while the printer is printing. (See Figure 2-11 for Option R installation location.

GROUNDS - Two grounding systems are used in the printer: SIGNAL COMMON and CHASSIS GROUND. These two systems are DC isolated from each other, and are capacitively coupled for filtering. Normally these grounds should not be shorted together either in the interface cable or at the data source. Ground loops and communications interference may occur.



Mating Connection: ANADEX PN. 2101-5029-00, CINCH PN. DB-25P
Hood: ANADEX PN. 2101-5029-01, CINCH PN. DP-51226-1

FIGURE 2-8. SERIAL INTERFACE CONNECTOR J2 PIN ASSIGNMENTS

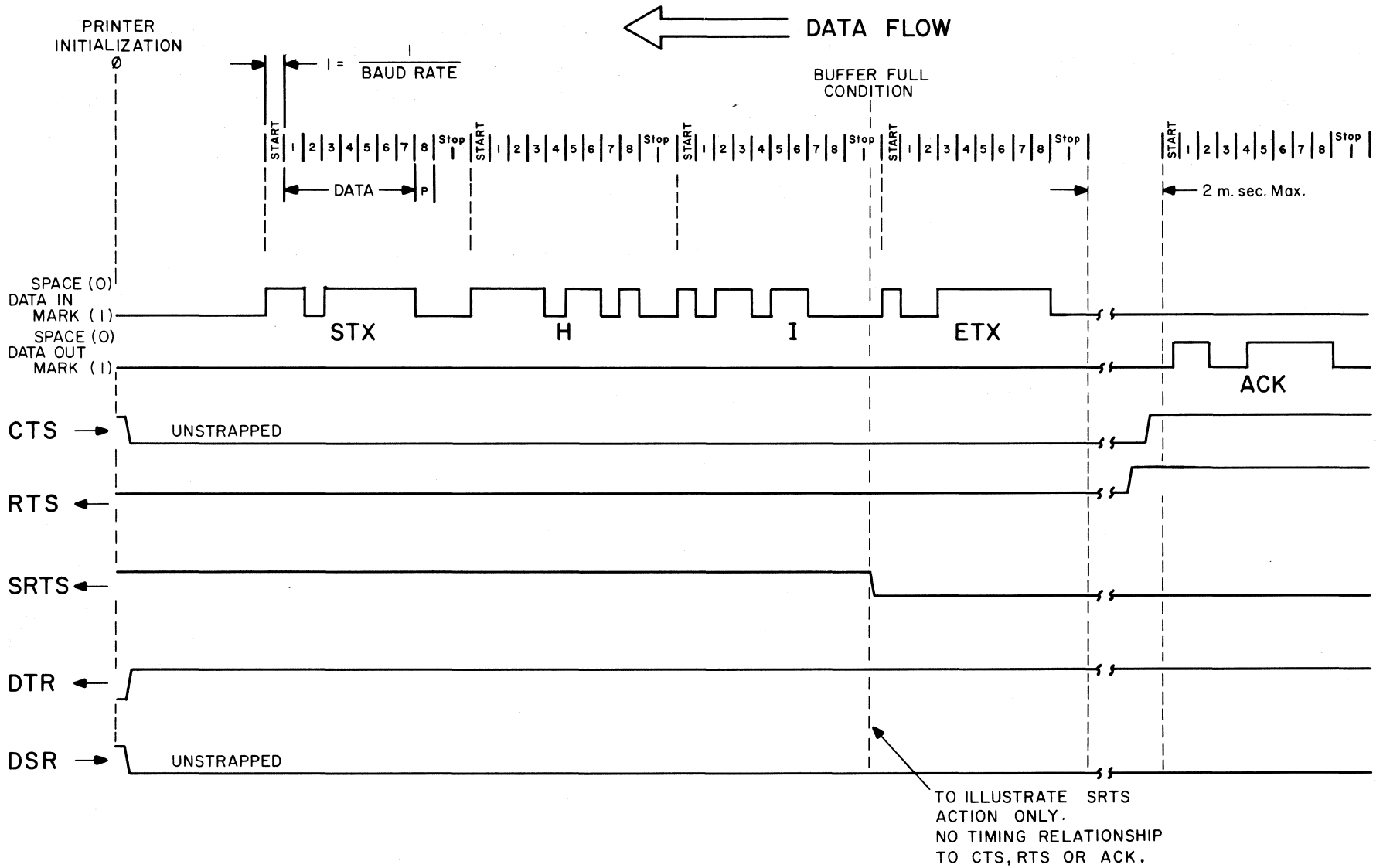


FIGURE 2-9. SERIAL INTERFACE SIGNAL TIMING RELATIONSHIPS

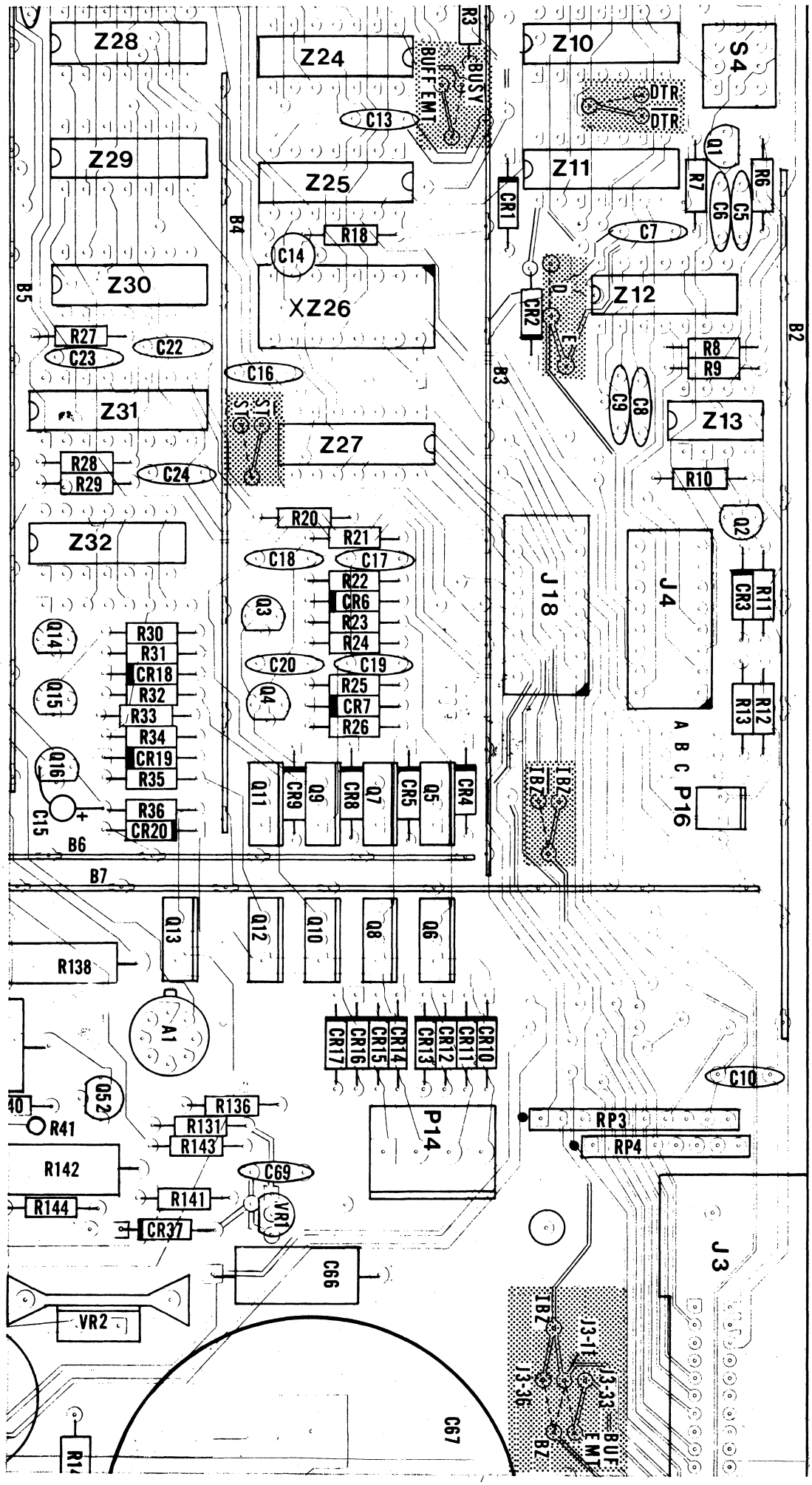


FIGURE 2-10. SERIAL INTERFACE STRAPPING LOCATIONS

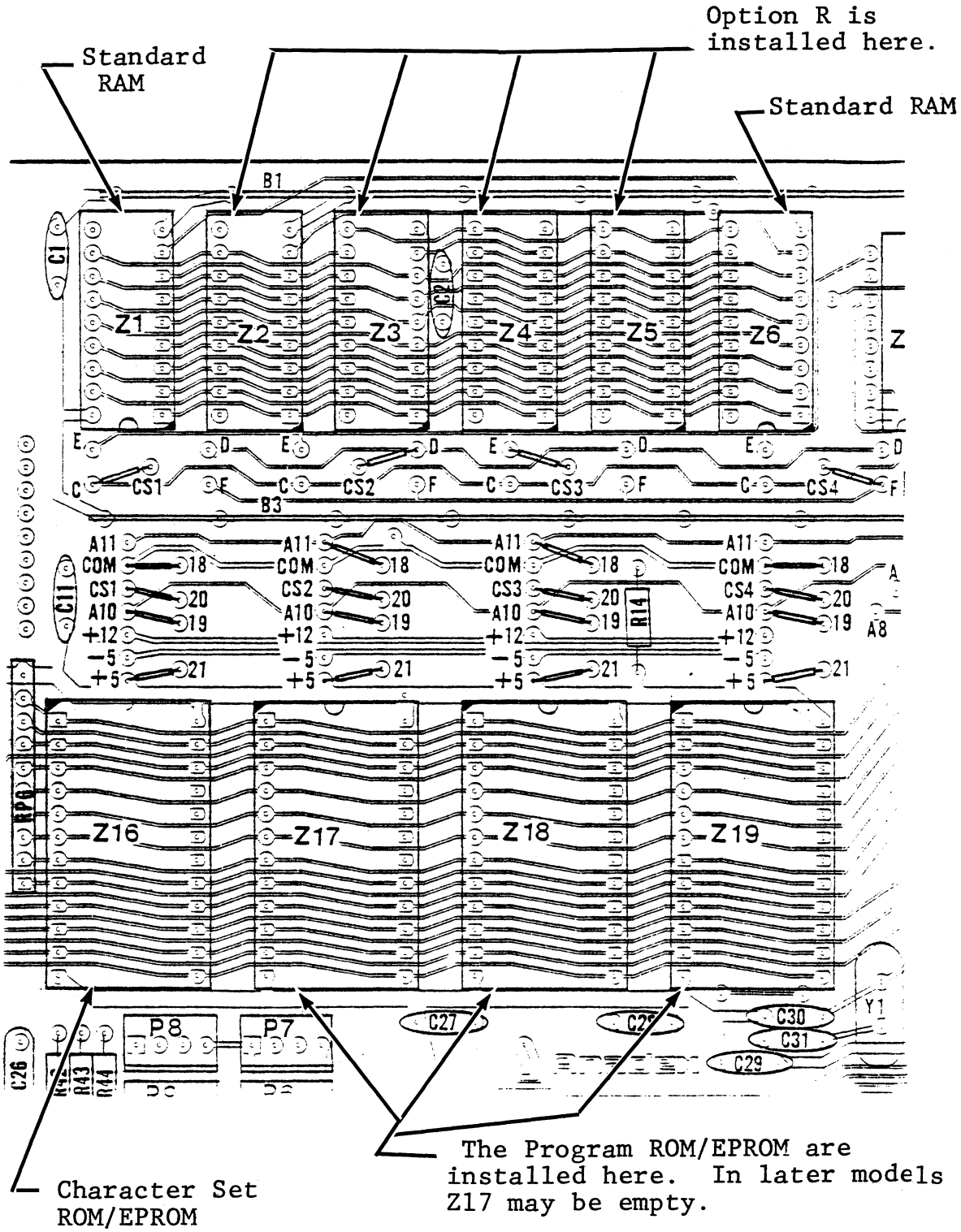


Figure 2-11 Option R and Internal Program Component Locations on Rev. B and C Boards.

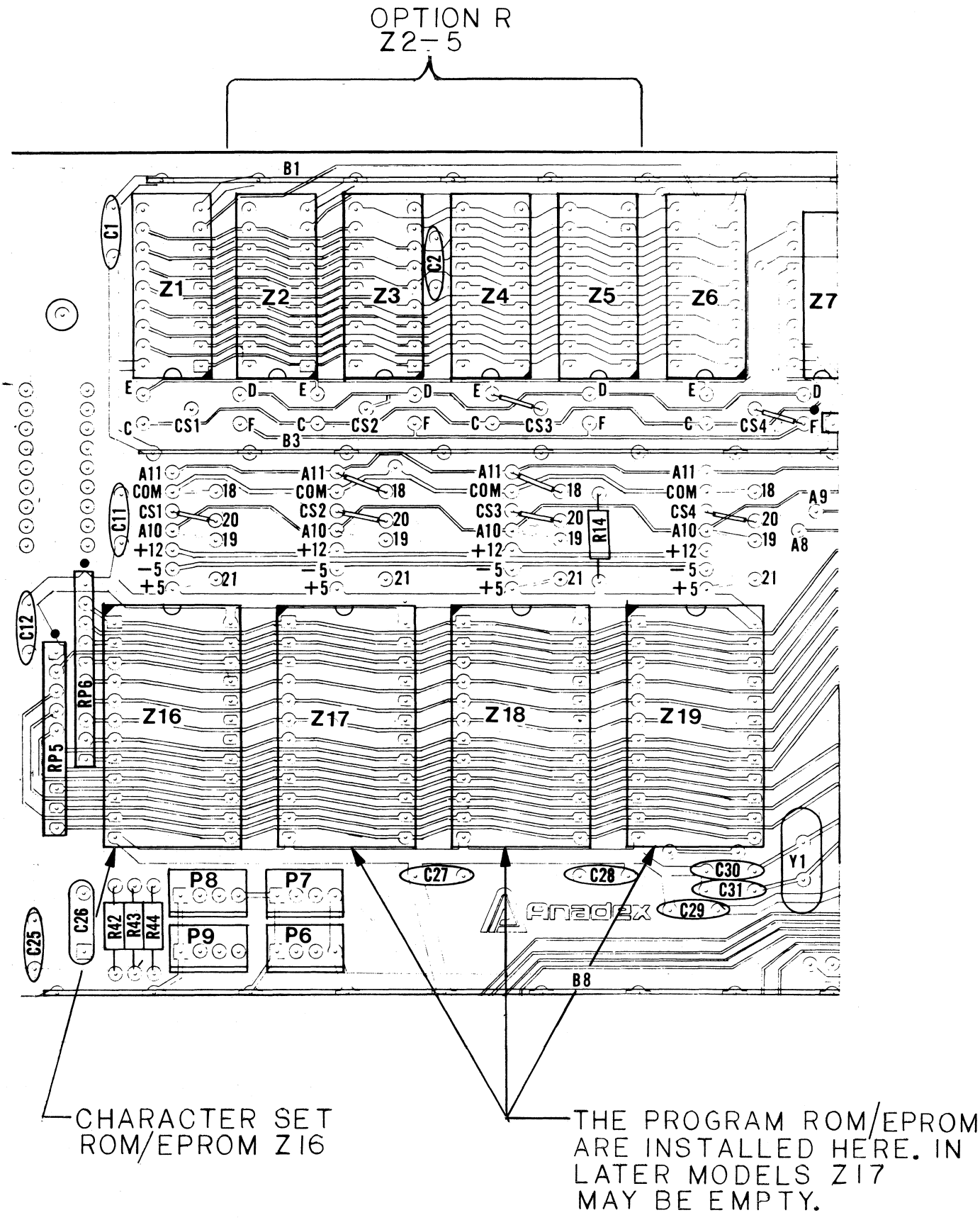


Figure 2-12. Option R and Internal Program Component Locations on Rev. D and E Boards.

SECTION III

OPERATION

3.1 GENERAL REQUIREMENTS

Effective operation and use of your printer requires a complete understanding of the use and functions of the switches, controls, and indicators on the printer. Many of the functions of your printer can also be controlled by control code addressing from the data source. A thorough understanding of the control codes recognized by your printer is essential to utilizing all of the many features of your printer. In the serial interface mode, several methods of validity checking and protocols are available.

3.2 CONTROLS AND INDICATORS

The controls and indicators for your printer are divided into two groups. Those which may require regular and frequent access are externally located, and those which are infrequently used are located internally, but are accessible from the outside at the rear. Certain other controls which are only used in test and alignment are internally located. These are not normally required by a user/operator. The final group are those controls accessible through the communications interface.

3.2.1 EXTERNAL CONTROLS AND INDICATORS: The following controls and indicators are located on the front panel or external to the printer. (See Figure 3-1.)

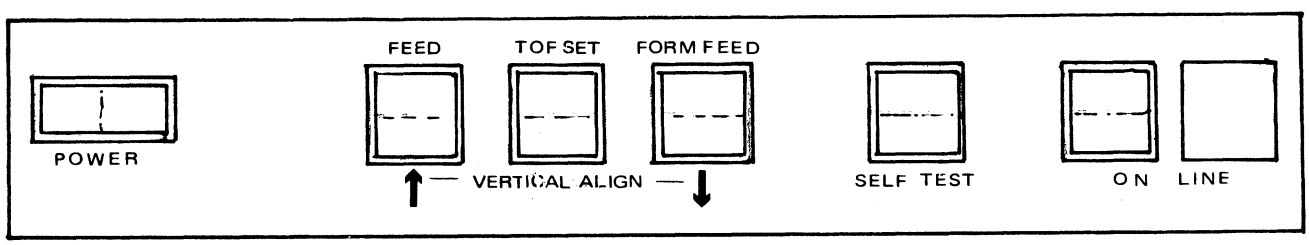


FIGURE 3-1. FRONT PANEL CONTROLS AND INDICATORS

POWER ON/OFF - Switch/Indicator for controlling main power to the printer.

ON/OFF LINE - Switch for placing printer ON or OFF LINE. An adjacent indicator lamp indicates status.

VERT ALIGN - A blank of three switches for vertical paper alignment. These switches are only operational when the printer is in the OFF LINE mode.

. FEED - This switch, when depressed, causes the paper to travel one line space. If the switch is held down, paper feed resumes after a short delay ($\sim \frac{1}{2}$ sec) and will then feed continuously until released or Top of Form is reached. If the current Form Length is 0, the feed is continuous until released. This is a dual function switch, see TOF SET for the alternate function.

. FORM FEED - Depressing this switch causes the paper to be fed to the top of the next form, unless current Form Length is 0, in which case no action occurs. This is a dual function switch, see TOF SET for the alternate function.

. TOF SET - Depressing this switch when the printer is OFF LINE establishes the current form position as TOP OF FORM (TOF). This switch is a dual function switch. When depressed in combination with the FEED switch, the paper is stepped forward in 0.014 inch increments.

CAUTION

THE OPERATOR MUST TAKE CARE WHEN FEEDING IN THE REVERSE DIRECTION TO ENSURE THAT THE FEED IS SMOOTH AND THAT THE PAPER IS NOT BUNCHED UP ABOVE THE PRINT HEAD WHEN THE PAPER PERFORATION IS BETWEEN THE TRACTORS AND THE PRINT HEAD.

When depressed in combination with the FORM FEED switch, the paper is stepped in the reverse direction in 0.014 inch increments. When depressed in combination with the SELF TEST switch and with the ON LINE indicator lit, SELF TEST is initiated.

. MANUAL PAPER - A manual paper adjustment knob is provided on the right side of the printer for manual paper position. The knob moves the paper in 0.056 inch increments bidirectionally. (See CAUTION above.)

. SELF TEST - Depressing this switch when the printer is in ON LINE status and if the TOF switch has been depressed and held, the SELF TEST program is initiated.

3.2.2 INTERNAL CONTROLS WITH EXTERNAL ACCESS: Four switch blocks, S1, S2, S3, and S4 are located internally on the printed circuit card, and are accessible to the user/operator through an access slot at the rear of the printer. (See figure 3-2.) See tables 3-1 through 3-3 for switch function assignments.

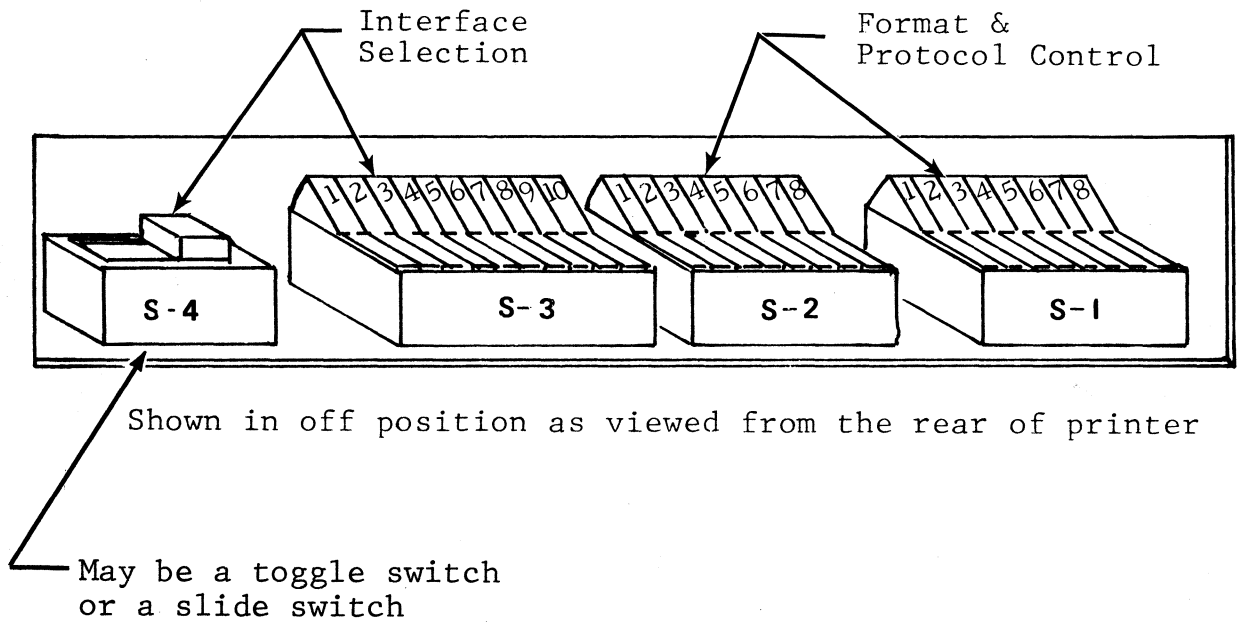


FIGURE 3-2. REAR ACCESS CONTROLS

FORM WIDTH - Both tractors can be repositioned by releasing the cam lock on each tractor and sliding the tractor to the desired position, then relocking the cam.

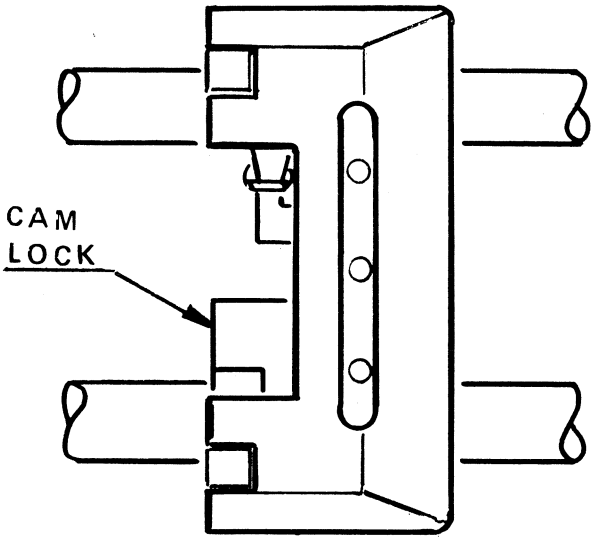


FIGURE 3-3. PAPER FEED TRACTORS

FORM THICKNESS - The print head to platen gap is adjustable by a lever-actuated cam to compensate for various form thicknesses. See paper installation instructions in Section II for use of this control.

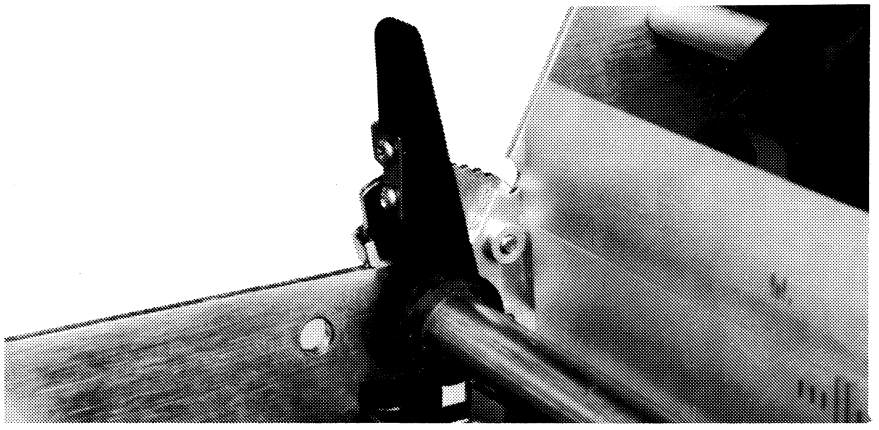


FIGURE 3-4. PRINT HEAD GAP ADJUSTMENT

NOTE

Any time the logic state of any of the following switches is changed, printer power must be cycled OFF, then ON, to reinitialize the printer logic.

The following paragraphs detail the functions that can be established by switch configuration. On printer power up, your printer always defaults to the status designated by the configuration of these switches. Many of these functions may later be modified by control codes transmitted through the communications interface. Tables 3-1 through 3-3 detail the switch assignments.

CAUTION

IF PARALLEL INTERFACE IS SELECTED, ALL SWITCHES IN S3 MUST BE IN THE OFF POSITION.

INTERFACE SELECTION - The proper interface, serial or parallel, is selected by S3-1. OFF selects parallel, ON selects serial interface. When serial is selected, S3-3 through S3-6 sets up the required Baud rate. S3-8 selects 1 or 2 stop bits, S3-7 selects 7-or 8-bit data word. The combined setting of S3-9 and S3-10 sets parity or ECHOPLEX. (See table 3-3 for switch assignment details.) When ECHOPLEX is selected, each character is echoed out on the DATA OUT line exactly as received, with a one-half bit time delay. Switch S4 is a slide switch and selects current loop or EIA RS-232-C mode. Away from S3 is TTY current loop. Serial protocols are available and operator selectable through combinations of S2-5 and S2-6, or S3-9 and S3-10. X-ON/X-OFF, STX/ETX, and STX/ETX/LRCC protocols are available.

FORM VERTICAL FORMAT - Switches S1 and S2 contain switch sections which initialize Forms Vertical Format parameters. These parameters can be modified through the communications link. (See paragraph on OPERATOR CONTROLS - COMMUNICATIONS LINK for details.)

- FORM LENGTH - Switches S1-1 through S1-5 set up the form length in ½ inch increments from Ø to 15½ inches. The sum of the switches in the ON position represents the total form length.

- SKIP-OVER-PERFORATION - Switches S2-1 and S2-2 establish the desired perforation skip-over-distance in ½ inch increments from Ø to 1½ inches. The sum of the switches in the ON position represents the total skip-over-distance.

- LINE SPACING - SELECTION OF 6 or 8 lines per inch vertical spacing is made by S2-4.

- LINE WIDTH - Default selection of 8 inch or 13.2 inch line width is made by S3-2.

- CHARACTER FONT - Regular or condensed characters are selected by S1-6.

- ALTERNATE CHARACTER - Selection of the # or £ symbol is available by S1-8.

- TIME-OUT - A 7.5 second time-out feature is selectable by S1-7. When selected, any unprinted and undetermined data will be automatically printed with a line feed after 7.5 seconds have elapsed since receipt of the last data entry. There is no time limit when S1-7 is OFF.

- AUTO LINE FEED - Switch S2-8 selects the Automatic Line Feed feature. With the switch ON, any line terminating code (CR, FF, LF, or VT) will cause the data line to be printed and one line feed to be activated. With the switch OFF, the CR will cause a line feed to be scheduled at any time.

- TRUNCATE/ WRAPAROUND - Switch S2-7 selects the truncate/wrap-around features. With the switch OFF, the printer is in the wraparound mode, and when a line contains more than the number of characters programmed for line length (8 or 13.2 inches determined by the position of S3-2 or through the communications link) the excess characters will be automatically printed on the next line. With the switch in the ON position, the excess characters are truncated.

TABLE 3-1 FUNCTION ASSIGNMENTS FOR S1

Section 1 -	OFF	Form Length - 1/2 Inch Inactive
	ON	Form Length - 1/2 Inch Selected
Section 2 -	OFF	Form Length - 1 Inch Inactive
	ON	Form Length - 1 Inch Selected
Section 3 -	OFF	Form Length - 2 Inches Inactive
	ON	Form Length - 2 Inches Selected
Section 4 -	OFF	Form Length - 4 Inches Inactive
	ON	Form Length - 4 Inches Selected
Section 5 -	OFF	Form Length - 8 Inches Inactive
	ON	Form Length - 8 Inches Selected
Section 6 -	OFF	Regular Character Font - 10 Char/Inch
	ON	Condensed Character Font - See Note below
Section 7 -	OFF	No Time Out
	ON	7.5 Second Time Out Selected
Section 8 -	OFF	Alternate Character #
	ON	Alternate Character £

NOTE

Form Length is the summation of the S1 selected lengths and includes the Skip-Over-Perforation Length which is the summation of the S2 selected lengths.

Default Condensed Character Font -

	DP-9000	12. char/inch
	DP-9001	16.7 char/inch
Later	DP-9500	12. char/inch
	DP-9501	16.7 char/inch

TABLE 3-2 FUNCTION ASSIGNMENTS FOR S2

Section 1 -	OFF	Skip-Over-Perforation - 1/2 Inch Inactive
	ON	Skip-Over-Perforation - 1/2 Inch Selected
Section 2 -	OFF	Skip-Over-Perforation - 1 Inch Inactive
	ON	Skip-Over-Perforation - 1 Inch Selected
Section 3 -	OFF / ON	Spare
Section 4 -	OFF	Line Spacing - 6 Lines/Inch Selected
	ON	Line Spacing - 8 Lines/Inch Selected

		Serial Protocol			
Section 5 -	OFF / ON	5 OFF, 6 OFF	None	5 OFF, 6 ON	STX/ETX
Section 6 -	OFF / ON	5 ON, 6 OFF	X/ON-X/OFF	5 ON, 6 ON	STX/ETX/LRCC

Section 7 -	OFF	Wraparound Overlength Lines
	ON	Truncate Overlength Lines
Section 8 -	OFF	Auto Line Feed Inactive
	ON	Auto Line Feed Selected

TABLE 3-3 FUNCTION ASSIGNMENTS FOR S3

Section 1 - OFF Parallel Interface
ON Serial Interface

NOTE: All sections of S3 must be OFF for parallel operation

Section 2 - OFF Line Width Default = 13.2 inches
ON Line Width Default = 8 inches

Section 3 - BAUD RATE SELECTION

Section 4 -

RATE	S3 SECTION 3	4	5	6
50	OFF	OFF	OFF	OFF
50	OFF	OFF	OFF	ON
75	OFF	OFF	ON	OFF
110	OFF	OFF	ON	ON
135	OFF	ON	OFF	OFF
150	OFF	ON	OFF	ON
300	OFF	ON	ON	OFF
600	OFF	ON	ON	ON
1200	ON	OFF	OFF	OFF
1800	ON	OFF	OFF	ON
2400	ON	OFF	ON	OFF
3600	ON	OFF	ON	ON
4800	ON	ON	OFF	OFF
7200	ON	ON	OFF	ON
9600	ON	ON	ON	OFF
9600	ON	ON	ON	ON

Section 5 -

Section 6 -

Section 7 - OFF Word Length - 7-bits Selected
ON Word Length - 8-bits Selected

Section 8 - OFF Stop Bits - 1-bit Selected
ON Stop Bits - 2-bits Selected

Section 9 - OFF
ON

Section 10 - OFF
ON

Parity

9 OFF 10 OFF	None	9 ON 10 OFF	Even
9 OFF 10 ON	Odd	9 ON 10 ON	Echo (No Parity)

3.3 COMMUNICATIONS LINK CONTROLS

PROGRAMMING NOTE

Some computers/terminals trap certain control codes for internal use and do not transmit them to the printer. Adding 128 to the decimal value of the ASCII Code sets the eighth bit of the binary data word. Substituting this value for the desired code may by-pass the trap and get the code to the printer. Examples of the technique in BASIC are shown in Appendix A.

The Communications Link Controls are defined as those printing controls which can be established remotely by the data source (computer) through data word (byte) instructions. A printing record is defined as the set of data words (bytes) beginning with the first printable character or in-line control code and ending with the first occurrence of a Print Action, Vertical Movement, or CANcel code.

3.3.1 CONFIGURATION COMMANDS: These commands should not be transmitted while a printing record is open. A printing record is opened by any printable character or in-line control code. (See paragraph 3.3.2. A printing record is closed by the CAN code or a Print Action or Vertical Movement control code.

DC2 - ASCII Code 18 - Subsequent printing is to be in 9x9 character font for DP-9500, or 11x9 for DP-9501, at 10 char/inch. The maximum number of printing columns is recalculated based on the font characteristics and the currently established form width. Any existing horizontal tab stops are cleared.

DC4 - ASCII Code 20 - Subsequent printing is to be in 7x9 character font at 13.3 char/inch for DP-9500, or 16.7 for DP-9501. Other actions are the same as for DC2.

SUB - ASCII Code 26 - Print in 7x9 character font at 12 char/inch for DP-9500, or 15 char/inch for DP-9501. Otherwise, same as DC2.

EM - ASCII Code 25 - Applicable to DP-9501 only, print in 7x9 character font at 12.5 char/inch. Otherwise, same as DC2.

ESC - ASCII Code 27 - Prefix code for a character sequence which changes the printing format configuration from that established upon initialization or previously transmitted configuration sequences. Each sequence consists of the ESC prefix immediately followed by a modifier code defining the printing format characteristic to be modified. The modifier may be followed by zero to three bytes of ASCII numeric data which established the new value to be assigned. The following list defines each of the ESC sequences.

NOTE

The spaces shown below, between the segments of the ESC sequences are inserted for clarity only. The sequence must be transmitted as one continuous group with no intervening spaces or other codes such as CR's or spaces. See Appendix A for examples.

SEQUENCE CODES

ESC @ - Clear all Vertical Tab stops.

ESC 1 NNN - Set a Vertical Tab stop at line number NNN. (NNN is an ASCII decimal number in the range of ØØ1 to 225. Line number ØØ1 is Top of Form.) A maximum of 16 Vertical Tabs may be set.

ESC B - Clear all Horizontal Tab stops.

ESC 3 NNN - Set a Horizontal Tab stop at column number NNN. (NNN is an ASCII decimal number in the range of ØØ1 to 220. Column ØØ1 is the left-most column.) Tabs set beyond the current maximum number of columns are ignored. A maximum of 8 Horizontal Tabs may be set.

ESC 4 NNN - Set Form Length to NNN lines. (NNN is an ASCII decimal number in the range of ØØ1 to 254.) Actual length in inches depends upon whether the line spacing is 6 or 8 lines/inch. This sequence also clears all current Vertical Tab stops and Skip-Over-Perforation and establishes the current position as Top-Of-Form; therefore, these functions must be reentered each time Form Length is changed.

ESC % NN - Set Skip-Over-Perforation to NN lines. (NN is an ASCII decimal number in the range of ØØ to 99.) This number must be less than the currently set Form Length.

ESC VN - Set or reset Auto Line Feed mode. (N is either ASCII Ø or 1.) Ø resets Auto Line Feed to "inactive"; 1 sets Auto Line Feed to "selected".

ESC 7 NNN - Set width of printing area to NNN tenths of an inch. (NNN is an ASCII decimal number expressing the printing area in tenths of an inch in the range of 010 to 132.) This command also clears all current Horizontal Tab Stops, and the maximum number of printable columns is recalculated based upon the new form width and the current character font; therefore, any required Horizontal Tab Stops must be re-entered after changing the form width.

ESC H - Set Vertical Spacing to 6 lines per inch and zero form length. The proper Form Length and Skip-Over-Perforation must be retransmitted following this sequence to reestablish the form length. If the current position is not the true TOF, then a line count to the true TOF position should be made and form length established at that time.

ESC I - Set Vertical Spacing to 8 lines/inch and zero form length. The same conditions as for ESC H apply.

BEL - ASCII Code 7 - Causes activation of an optional audible device.

FS - ASCII Code 28 - Enter Graphics mode. (See paragraph 3.4.)

GS - ASCII Code 29 - Exits Graphics mode.

3.3.2 IN-LINE CONTROL CODES: These codes cause a printing record to be opened or closed as indicated, and an appropriate printing action to take place.

ANY PRINTABLE ASCII CHARACTER - Causes a printing record to be opened. That character and all subsequent characters received while the record is open will be printed when the record is closed.

FORMAT COMMANDS - These are part of a printing record, and when received, if a printing record is not open, will cause the record to be opened and become the first entry. If the record is open, they are acted upon.

SO - ASCII Code 14 - start double width printing. Automatically cancelled by LF or other record closing code except by wraparound action.

SI - ASCII Code 15 - end double width printing. If a printing record is closed while in double width, an SI is automatically inserted to default to single width except on wraparound.

RS - ASCII Code 30 - start underline.

US - ASCII Code 31 - end underline. If a record is closed while underlining, a US is automatically inserted, except on wraparound.

HT - ASCII Code 9 - causes blanks (spaces) to be inserted to the next right Horizontal Tab stop. If there is no tab stop set between current position and maximum right column, or no tab set at all, the code will be ignored.

PRINT ACTION & VERTICAL MOVEMENT - These codes always close an open printing record in addition to the commanded action. Closing a printing record causes the record to be printed.

CR - ASCII Code 13 - causes any open printing record to be closed. If Auto Line Feed is active, and a record is open, when CR is received the record is closed and one Line Feed is scheduled. In Automatic Line Feed Mode receipt of a CR code will always cause a line feed.

LF - ASCII Code 10 - causes an open printing record to be closed. In any case, one Line Feed is scheduled and activated.

FF - ASCII Code 12 - causes an open printing record to be closed. If a non-zero Form Length is set, the exact number of Line Feeds is scheduled to position the form at the next TOF location. If Line Feeds are scheduled after the last printing record, but before the FF code, the Line Feeds are ignored. Additional Line Feeds or Vertical Tabs after the FF code will be acted upon.

VT - ASCII Code 11 - causes an open printing record to be closed. One or more Line Feeds are scheduled to move the form to the next tab stop, higher than the current position. If none are set, or no higher stop is set, the form is moved to the next TOF position. If no Form Length is set, the VT code is ignored, except to close the record.

ETB - ASCII Code 23 - causes any open printing record to be closed and printed. It never causes Line Feeds to be scheduled. This code may be used in lieu of CR when in the Auto Line Feed mode to prevent a Line Feed occurring when the data is printed.

CAN - ASCII Code 24 - causes any open printing record to be cancelled and closed. No printing action takes place. If an ESC sequence is occurring and not completed, it is cancelled.

DEL - ASCII Code 127 - This code is recognized as a printable character, and the printer will print an inverted question mark, i.e., ¿ .

3.3.3 PROTOCOLS: Four serial communications link protocol modes are available: No Protocol, X-ON/X-OFF, STX/ETX, or STX/ETX/LRCC. In all cases, the data input port is open to receive data; but when the communications mode is set to OFF (COMM OFF), the only data acted upon is the code to set the communications mode to ON (COMM ON). When in the No Protocol status, then the mode is always COMM ON. Protocols are selected by positioning switches S2-5 and S2-6 in proper combination for the desired protocol. Protocols are only used in serial interface; therefore, in parallel interface, the protocol select switches are ignored.

X-ON/X-OFF

- Current Versions: (All printers labeled on the back panel with PROG 2 or later.) This protocol emulates the DEC NET protocol. DC1 (X-ON) and DC3 (X-OFF) when received by the printer are ignored. DC1 is transmitted by the printer on the DATA OUT line (pin 2) at the end of a POWER-ON Initialization and each time the BUFFER EMPTY signal goes to the READY state (Not Busy). Each time the BUFFER EMPTY signal goes to the BUSY state the printer transmits a DC3 code. Each time a code is to be transmitted by the printer the RTS line goes to the SPACE Level and looks for a CTS SPACE level in return.

- Early Versions:
With this protocol selected, the printer begins in the X-OFF status. In this status, the data port is open and data is read but discarded until receipt on an X-ON code. After the X-ON code is received, all data is acted upon exactly as though No Protocol was in effect until receipt of an X-OFF code. Any extraneous X-ON codes received during X-ON status are ignored. When the X-OFF code is received, the printer reverts to COMM OFF status. Any unterminated data line (open printing record) is cancelled. Should an X-OFF code be received during an incomplete ESC sequence, the sequence is cancelled. Control code DC1 (ASCII 17) is assigned as X-ON and control code DC3 (ASCII 19) is assigned as X-OFF.

X-ON/X-OFF (cont'd) - (These are normally strapped together internally for automatic operation). The main FIFO character buffer in the printer is reduced from 704 characters to 640 characters. The short-receive FIFO is extended to 128 characters. The short FIFO goes busy when 102 character bytes remain available. Therefore, in serial communications mode, whenever the printer goes busy ($\overline{\text{BUFFER EMPTY}}$ high on SRTS at MARK level) 100 or more character bytes can still be accepted without loss of data.

STX/ETX - When this protocol is switch selected, the printer initializes in ETX status. The data port remains open and data is read and discarded until an STX code is received. When an STX code is received, the data is received and transferred to the FIFO buffer, but not printed. Any communications errors (parity, buffer overrun, incorrect number of stop bits, etc.) are noted. When the data block is complete, as indicated by receipt of the ETX code, the printer transmits an ACK code if no errors were detected. The printer then waits for an STX or EOT or CAN code. If the returning code is STX the printer proceeds to print the stored data and simultaneously accepts the next block of data. If the returning code is EOT, the preceding data block is printed, but the printer remains in the COMM OFF mode. Receipt of a CAN code cancels the data block, and the printer remains in the COMM OFF mode. In the event an error has been detected, the printer transmits a NAK code, the data block is cancelled, and the printer reverts to the COMM OFF mode. When blocking data careful consideration must be given to the installed FIFO buffer size since overrunning the buffer can prevent the receipt of the ETX code and lock up the printer.

STX/ETX/LRCC - In this protocol, operation is identical as described for STX/ETX, except that beginning with the first character following STX, and for each subsequent character in the data block including the ETX code, a Longitudinal Redundancy Check (LRC) is

STX/ETX/LRCC (Continued) - made. The data source is expected to compute its own LRC and transmit an LRC Character (LRCC) following the ETX. The printer will then compare the LRCC received against its own LRCC. If no communications errors occurred, and the LRCC's match, an ACK is transmitted by the printer. If errors are detected, the transmitted code is NAK. Subsequent actions are the same for STX/ETX. The LRCC character calculation is made by nulling a register and then XORing each character transmitted exclusive of the STX but including the ETX. The result is then transmitted as the character immediately following the ETX.

STX/ETX and STX/ETX/LRCC - When errors are detected and the data block is cancelled, certain ESC sequences are not cancelled.

These are:

ESC B	Set Horizontal Tabs
ESC C	Clear Horizontal Tabs
ESC 7	Set Form Width
ESC VN	Set or Reset Auto-LF Mode

TABLE 3-4. U.S.A. STANDARD CODE FOR INFORMATION INTERCHANGE (ASCII)

	X10	X8	X16	X2		X10	X8	X16	X2		X10	X8	X16	X2		X10	X8	X16	X2
NUL	0	000	00	0000000	SP	32	040	20	0100000	@	64	100	40	1000000		96	140	60	1100000
SOH	1	001	01	0000001	!	33	41	21	0100001	A	65	101	41	1000001	a	97	141	61	1100001
STX	2	002	02	0000010	"	34	42	22	0100010	B	66	102	42	1000010	b	98	142	62	1100010
ETX	3	003	03	0000011	#	35	43	23	0100011	C	67	103	43	1000011	c	99	143	63	1100011
EOT	4	004	04	0000100	$	36	44	24	0100100	D	68	104	44	1000100	d	100	144	64	1100100
ENQ	5	005	05	0000101	%	37	45	25	0100101	E	69	105	45	1000101	e	101	145	65	1100101
ACK	6	006	06	0000110	&	38	46	26	0100110	F	70	106	46	1000110	f	102	146	66	1100110
BEL	7	007	07	0000111	'	39	47	27	0100111	G	71	107	47	1000111	g	103	147	67	1100111
BS	8	010	08	0001000	(	40	50	28	0101000	H	72	110	48	1001000	h	104	150	68	1101000
HT	9	011	09	0001001	)	41	51	29	0101001	I	73	111	49	1001001	i	105	151	69	1101001
LF	10	012	0A	0001010	*	42	52	2A	0101010	J	74	112	4A	1001010	j	106	152	6A	1101010
VT	11	013	0B	0001011	+	43	53	28	0101011	K	75	113	4B	1001011	k	107	153	6B	1101011
FF	12	014	0C	0001100	,	44	54	2C	0101100	L	76	114	4C	1001100	l	108	154	6C	1101100
CR	13	015	0D	0001101	-	45	55	2D	0101101	M	77	115	4D	1001101	m	109	155	6D	1101100
SO	14	016	0E	0001110	.	46	56	2E	0101110	N	78	116	4E	1001110	n	110	156	6E	1101101
SI	15	017	0F	0001111	/	47	57	2F	0101111	O	79	117	4F	1001111	o	111	157	6F	1101110
DLE	16	020	10	0010000	0	48	60	30	0110000	P	80	120	50	1010000	p	112	160	70	1101111
DC1	17	021	11	0010001	1	49	61	31	0110001	Q	81	121	51	1010001	q	113	161	71	1110000
DC2	18	022	12	0010010	2	50	62	32	0110010	R	82	122	52	1010010	r	114	162	72	1110001
DC3	19	923	13	0010011	3	51	63	33	0110011	S	83	123	53	1010011	s	115	163	73	1110010
DC4	20	024	14	0010100	4	52	64	34	0110100	T	84	124	54	1010100	t	116	164	74	1110011
NAK	21	025	15	0010101	5	53	65	35	0110101	U	85	125	55	1010101	u	117	165	75	1110100
SYN	22	024	16	0010110	6	54	66	36	0110110	V	86	126	56	1010110	v	118	166	76	1110101
ETB	23	027	17	0010111	7	55	67	37	0110111	W	87	127	57	1010111	w	119	167	77	1110110
CAN	24	030	18	0011000	8	56	70	38	0111000	X	88	130	58	1011000	x	120	170	78	1110111
EM	25	031	19	0011001	9	57	71	39	0111001	Y	89	131	59	1011001	y	121	171	79	1111000
SUB	26	032	1A	0011010	:	58	72	3A	0111010	Z	90	132	5A	1011010	z	122	172	7A	1111001
ESC	27	033	1B	0011011	;	59	73	3B	0111011	[	91	133	5B	1011011	{	123	173	7B	1111010
FS	28	034	1C	0011100	<	60	74	3C	0111100	\	92	134	5C	1011100	:	124	174	7C	1111011
GS	29	035	1D	0011101	=	61	75	3D	0111101	]	93	135	5D	1011101	}	125	175	7D	1111100
RS	30	036	1E	0011110	>	62	76	3E	0111110	^	94	136	5E	1011110	~	126	176	7E	1111101
US	31	037	1F	0011111	?	63	77	3F	0111111	_	95	137	5F	1011111	DEL	127	177	7F	1111111

3.4 GRAPHICS

The printer has a full, high density graphics printing capability. Anadex strongly recommends that if graphics are to be used, Option R be installed. The following paragraphs discuss the use of the graphics printing mode.

CAUTION

IF OPTION R (EXPANDED FIFO BUFFER) IS NOT INSTALLED, IT IS POSSIBLE TO "LOCK UP" THE PRINTER IF THE PROGRAMMING INSTRUCTIONS GIVEN ARE NOT FOLLOWED PRECISELY.

NOTE

Resettability of each print dot in the DP-9500 and DP-9501 is excellent, however, paper shift, tractor hole variation, paper print head gap, expansion, etc., can affect the accuracy of the printout. When printing critical graphics, Anadex suggests that at least several inches of paper be electrically or manually driven through the printer to settle the paper path after installing new paper supply and before beginning graphics printing.

The graphics mode is entered by receipt of the control code FS. This code should not occur while a printing record is open. Any FS code received while a printing record is open is ignored; but subsequent graphic bytes may be incorrectly printed.

In graphics, one byte of data controls one strobe of the print head. The printable graphics byte must always have bit 7 set (Logic 1). Each set of the remaining 6 bits causes the corresponding print wire to strike. (See Figure 3-5). The LSB of the graphics byte corresponds to the bottom wire of the 6 graphics print wires. The wires used are number 2 through 7, where wire number 1 is the top wire and wire number 9 is the bottom wire. Wire number 7 is the lowest dot position of any non-descending character. The range of the graphics bytes corresponds to a range of 40H to 7FH. (Figure 3-5 illustrates the complete range of dot combinations.)

The graphics line is terminated by receipt of one or more ASCII numerals 0 through 9 (30H through 39H). This graphics code will cause the paper to be fed a number of dot intervals equivalent to the decimal value of the sum of the numerals. (Example: 30H causes zero paper movement, 39H 35H causes paper movement of 14 dot positions.) Receipt of the sequence ;NNN,

where N equals an ASCII decimal number, causes an indent of the number of horizontal dot positions equivalent to the decimal value of the three numbers received. (Example: 3BH 3ØH 35H 30H causes an indent of 50 dot positions.) This sequence may be sent immediately after the FS code or after the line terminating code (NNNN); however, this sequence must immediately precede a printable graphics byte, i.e., 40H through 7FH. (See Appendix A for examples of Graphics coding.)

There is no wraparound feature in the graphics mode. Any graphics bytes beyond the programmed printing width is truncated. Caution is required here since the truncated codes would include the termination and the printer could lock up. There is no Form Length in the graphics mode; therefore, the Top of Form and Form Length must be reestablished after exiting the graphics mode.

If graphics are to be programmed and Option R is not installed, each block of graphics instructions is limited to 600 graphic bytes exclusive of the indent instruction and the FS and GS control codes. If more than 600 graphic bytes are required to complete a line of graphics printing, the following technique should be followed. At the 600 byte point or sooner, close the printing record with a 30H (decimal Ø) which causes the record to be cleared and printed without paper movement. Transmit ;601 (or the correct decimal number for the current print head position, plus 1, and transmit the remaining graphics bytes. Using this technique will result in some loss of throughput speed, but does permit printing graphics across the full 13.2 inches of form width, since 13.2 inches represent up to 990 graphics bytes and the available FIFO buffer is only 640-700 bytes, less a few bytes of overhead. Attempting to transmit a single printing record of more than 600 bytes can cause the printer to go BUSY with no way to terminate the record. In this case, and if the Time-Out feature is disabled by S1-7, the printer cannot print and make more room in the buffer, and it cannot time-out and clear the buffer. The only way to "unlock" the printer is to cycle power OFF and then ON again. If the printer is in the Time Out mode, wait the 7½ seconds and the data in the buffer will be printed, however this is an unreliable technique and data may be lost or modified.

The graphics mode is exited by receipt of ASCII control code GS.

3.5 FCC REGULATIONS

The Federal Communications Commission (FCC) of the United States of America has published regulations which govern the allowable limits of emanation of radio frequency energy of computing devices and associated peripherals. These regulations are concerned with interference to radio communications, such as radio and television. The regulations require equipment for end use in the United States to be labeled and to be accompanied by the following notice:

WARNING

THIS EQUIPMENT GENERATES, USES, AND MAY RADIATE RADIO FREQUENCY ENERGY AND IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTIONS MANUAL, MAY CAUSE INTERFERENCE TO RADIO COMMUNICATIONS. IT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS A COMPUTING DEVICE PURSUANT TO SUBPART J OF PART 15 OF FCC RULES, WHICH ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST SUCH INTERFERENCE WHEN OPERATED IN A COMMERCIAL ENVIRONMENT. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE INTERFERENCE IN WHICH CASE THE USER AT HIS OWN EXPENSE WILL BE REQUIRED TO TAKE WHATEVER MEASURES MAY BE REQUIRED TO CORRECT THE INTERFERENCE.

To minimize the potential for interference, shielded interconnecting cables must be used and true grounding of the equipment must be maintained at all times the equipment is in use.

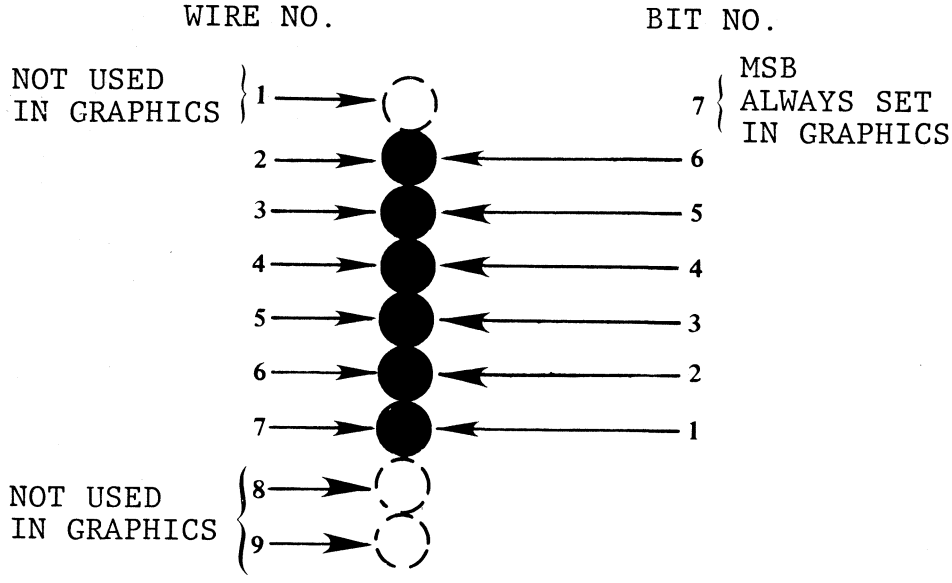


FIGURE 3-5. GRAPHICS DOT IDENTIFICATION

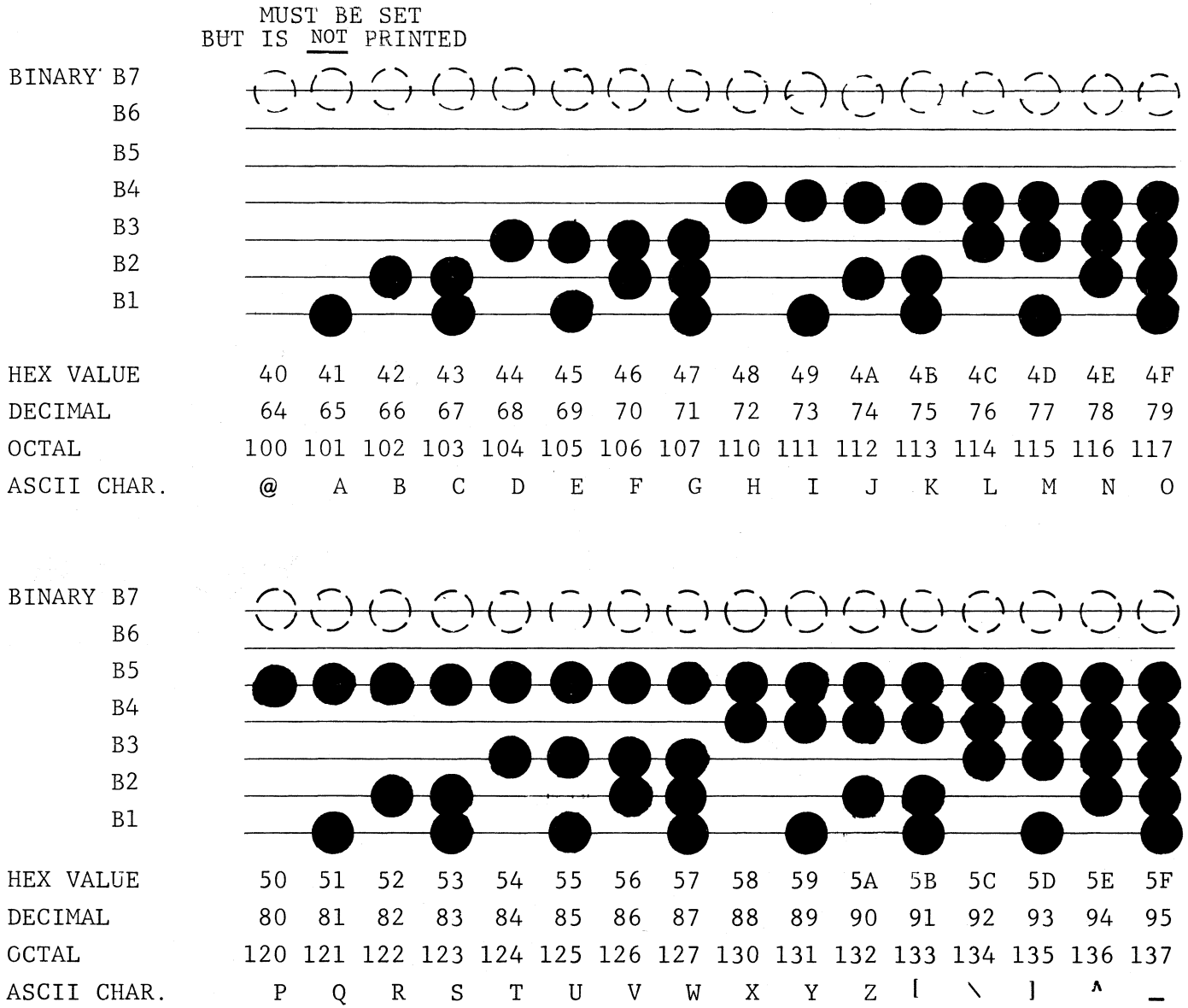
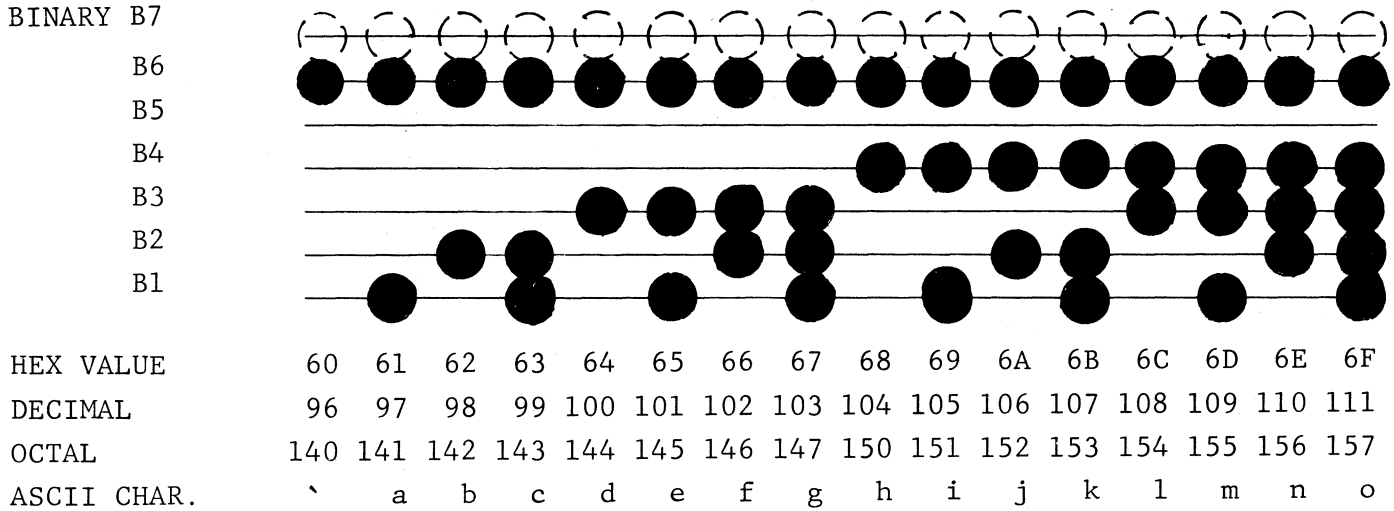


FIGURE 3-6. GRAPHICS DOT PATTERNS (Sheet 1 of 2)



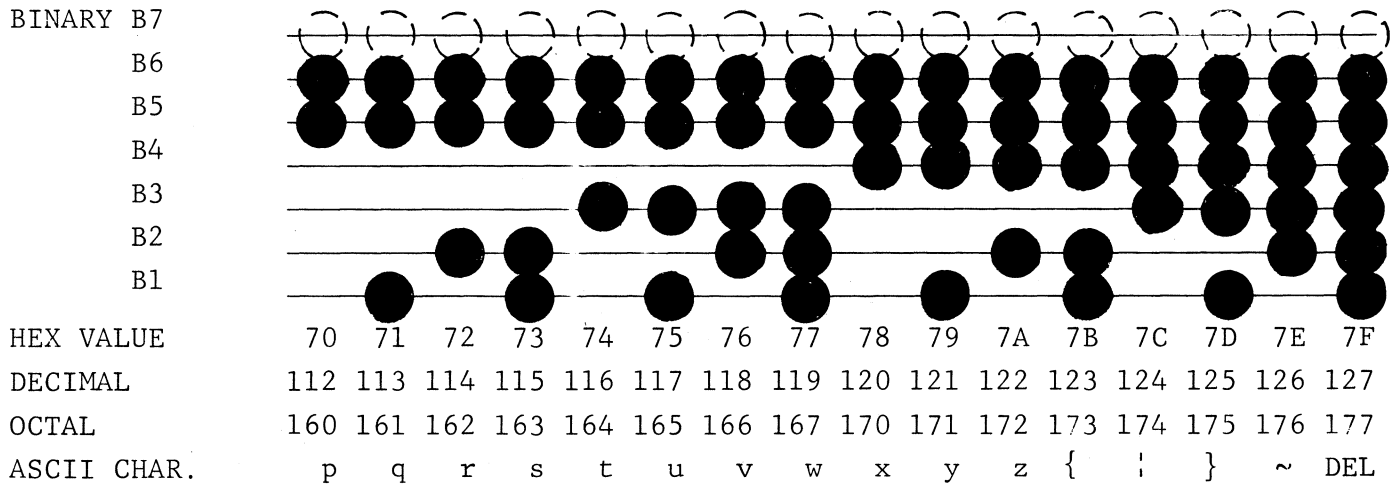


FIGURE 3-6. GRAPHICS DOT PATTERNS (Sheet 2 of 2)

TABLE 3-5 SUMMARY OF GRAPHICS PROGRAMMING RULES

1. Any character not recognized as a Graphics valid character will be ignored but may cause printing errors.

2. Anytime more than 100 spaces are to be programmed, it may be more efficient to close the record with Ø paper feed and indent to the next print position, i.e., XXXØ; 346XXX. Use of the indent for lesser spacing may degrade vertical registration.

3. The maximum number of print positions for the DP-9000 is 480, DP-9001 is 600, DP-9500 is 792, and for the DP-9501, it is 990.

4. Alphanumeric printing using the built-in character matrices utilizes the half-dot position to form the characters. The half-dot position cannot be addressed in Graphics. Care must be taken to achieve correct alignment of characters to Graphics in mixed printing.

5. The printer prints bidirectionally, but this logic is internal to the printer. All programming should be referenced to the left margin.

6. Closing a Graphics print statement with ASCII numeral Ø causes the data to be printed without moving the paper. Any ASCII numeral or group of numerals greater than Ø will cause paper feed a number of dot positions equal to the sum of the numerals.

7. There is no wraparound function in the Graphics mode, therefore the programmer must take precautions not to exceed the maximum allowable number of bytes per line.

8. Alphanumeric printing must be terminated with a CR or other printing record closing code before entering Graphics.

SECTION IV

MAINTENANCE

4.1 GENERAL

Maintenance of the DP-9000/1 or DP-9500/1 printers at the Operator/User level consists of preventive maintenance procedures (cleaning and operational checkout), a limited level of troubleshooting and replacement of a few common components. In general, detailed checkout, adjustments and repairs are not normally possible at this level because of the specialized test equipment and knowledge required. This section gives instructions for those maintenance procedures which can be performed without specialized equipment or knowledge beyond that given here.

4.2 PREVENTIVE MAINTENANCE

The only preventive maintenance required of the printer is periodic cleaning. The actual schedule will depend upon environment and usage. In normal usage a recommended interval for cleaning would be approximately every three months or 3000 pages of printing, whichever occurs first.

4.2.1 CLEANING.

The materials required for cleaning are:

- Soft Bristle Brush (2 inch paint brush)
- Soft Cotton Cloth
- Isoprophyl Alcohol or a good grade of plastic cleaner (test on an obscure corner before use)
- Very Low Pressure Air Source (breath pressure is sufficient)

Cleaning consists of wiping the head carriage shafts, cables, and other metal surfaces with a dry soft cloth. Do not use any cleaners on the shafts unless corrosion is evident. Sheet metal surfaces may be cleared of oil and other accumulations with a soft bristle brush or cloth and a small amount of isoprophyl alcohol. Plastic surfaces may also be cleaned with isoprophyl alcohol. Use a soft bristle brush and/or a low pressure air stream to clean the circuit board when required.

4.2.2 OPERATIONAL CHECKOUT. Operational checkout upon initial receipt of a printer or after repair consists of the procedures given below. Operational checkout at other times is not required unless a malfunction is suspected, in which case the procedures in the troubleshooting section should be followed. If improper indications are obtained by the checkout procedures refer to the troubleshooting section.

1. With only the power cord connected and ribbon and paper installed, turn on power to the printer by pressing the front panel POWER switch. The POWER switch should illuminate and after a small delay the ON LINE indication should illuminate. The print head should move to the left end of carriage travel or if already there it will move a short distance right and then back to the left.

2. Press the POWER switch momentarily. The switch light should go out. Rotate the manual paper advance knob on the right side of the printer a turn or two. The knob should turn freely and paper should advance smoothly. A very slight indent characteristic may be noticed while turning the knob. Press the POWER switch momentarily and again advance the paper manually. A distinct indent characteristic will now be present. Paper should advance 0.056 inches for each indent.

3. Press the ON LINE switch momentarily. The ON LINE indicator should go out.

4. Press the ON LINE switch momentarily. The ON LINE indicator should illuminate.

5. Lift the clear plastic cover and move the print head to the middle of the compartment. Close the cover and press the ON LINE switch. The ON LINE indicator should go out and the print head will move to the left.

6. Press the FEED switch momentarily. The paper should advance one line. Press the TOF SET switch and hold it on. Press the FEED switch momentarily. Paper should advance one dot increment (0.014 inch) each time the FEED switch is pressed.

7. Press and hold the TOF SET switch and then the FORM FEED switch. Paper should reverse one dot increment each time the FORM FEED switch is pressed.

8. Press the POWER switch off and set the configuration switches at the back of the printer as follows:

NOTE

OFF is when the numbers are visible from the back of the printer.

Switch S1 (far right)	- Sections 2, 3, and 5 ON All others OFF
Switch S2 (middle)	- All OFF
Switch S3 (10 section switch)	- Section 2 ON All others OFF (Mandatory for DP9000/ DP9001. Optional for DP9500/DP9501)

9. Manually position the paper so that the perforation is exactly at the top of the print bar, (or some other convenient locating point). Press the POWER switch ON. Momentarily press the ON LINE switch to the OFF LINE condition (light out). Momentarily press the FORM FEED switch. The paper should advance exactly 11 inches. (You may experiment with other form lengths if desired but each time any of the configuration switches are changed, power must be cycled OFF then ON to reinitialize the printer.)

10. Press and hold the FEED switch. A short pause will occur after one line feed then paper should advance continuously as long as the switch is held.

11. Momentarily press the ON LINE switch for the ON LINE condition. Press the TOF switch and SELF TEST switch momentarily. After a pause of approximately 4 seconds the printer will print out the results of the SELF TEST.

    The first line should read - ROMS CRCC MATCH, RAM ERROR ØØØØ.

    The second line should read - ØØØØØØØØ Ø11Ø1ØØØ.

    The third and fourth lines should indicate no tabs set.

    The fifth line gives the FIFO size in hexadecimal notation. The exact value will vary according to the firmware (ROMS) installed, however the standard FIFO is approximately Ø2CØH (704) and with Option R installed it is approximately ØACØH (2752).

The fifth line will also give the established forms length, in this case 42H (66) lines and line width equal 84H (132) times one tenth of an inch or in later models (remember S3-2 is ON), 50H (80).

The sixth line should read AUTO-LF OFF; COMM = PARALLEL MODE; SKIP @ LINE 00H.

The seventh line is the complete ASCII character set (may be wrapped-around at the 80th character).

12. Press the POWER switch OFF and connect the data source to the appropriate connector as described in Section 2.9. If serial communications is to be used set S-2 and S-3 as required.
13. Exercise the communications link by transmitting various data to the printer including such configuration changes by communications link as may be significant to printer operation. Refer to Section 3 for instruction.
14. Checkout is complete.

4.3 TROUBLESHOOTING

The following troubleshooting guides are provided to isolate some of the more common types of problems which can be corrected at the Operator/User level. Troubleshooting to greater depth is given in the maintenance manual for those with adequate technical skills and equipment. See the back of this manual for a list of authorized ANADEX Service Centers available as of the date of publication of this manual. No attempt is made in this table to examine or correct programming errors. Refer to Section 3 for programming examples.

TABLE 4-1. TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE AND ACTION
POWER indicator will not illuminate when pressed ON	Power cord not connected. Power fuse (F3) is blown. Replace the fuse (1.5A for 115 Vac, 0.75A for 230 Vac). If it blows again the transformer or power supply is faulty. Refer unit to service center. Faulty POWER switch or Voltage Selection card. Refer unit to service center.
POWER is ON but ON LINE indicator will not illuminate	No paper in the machine. Faulty paper detector switch. Refer unit to service center. A connection has been made between pin 31 of the parallel interface connector and the data source and this line is held low (OV) by the data source. Remove Power and the interface connection and try again. If the unit now comes ON LINE repair the cable or correct fault at data source. Press the FEED switch. If paper advances press the ON LINE switch and then press TOF and SELF TEST. If paper does not advance press TOF and SELF TEST. If the printer prints the SELF TEST results in either case the ON LINE light is faulty. Replace lamp (see replacement procedures). If SELF TEST does not work the circuit board is faulty. Refer unit to service center. NOTE Replacement of the circuit board also requires printer timing alignment which should be done by a trained technician with special equipment.

TABLE 4-1. TROUBLESHOOTING (Cont'd)

SYMPTOM	PROBABLE CAUSE AND ACTION
POWER ON and ON LINE is ON but one or more of the following faults exist: Print head jerks back and forth. Print head drives all the way to the right and stalls. ON LINE light is flickering on and off. SELF TEST does not print out. Print head moves properly for SELF TEST or other data input but no printing occurs. Prints correct data but has missing dots or random light dots. Other indications of serious malfunction.	Faulty circuit board or print head or both, or faulty drive motors. Refer unit to service center.
Correct data is printed but is very light density.	Print head gap is incorrect. Move print head gap adjustment lever forward until printing is satisfactory or if all the way forward refer to service center for head alignment/replacement. Ribbon is worn out or faulty. Replace the ribbon cartridge.

TABLE 4-1. TROUBLESHOOTING (Cont'd)

SYMPTOM	PROBABLE CAUSE AND ACTION
POWER is ON, ON LINE is ON, SELF TEST passes but one of the following is true:	
Data from the data source is not printed.	Parallel Interface
	One or more sections of S3 are ON, except S3-2.
	Printer BUSY, IBZ or $\overline{\text{ACK}}$ not properly connected to data source.
	$\overline{\text{DSTR}}$ strobe from data source is too late or data from data source is not on bus long enough.
	Faulty interface cable.
	Faulty printer circuit card. Refer unit to service center.
	Serial Interface
	Communication is EIA RS-232-C but S4 is set for TTY Current Loop or vice versa.
	S3-1 is not ON.
	S3 set for incorrect Baud rate.
	Improper word length, stop bit or parity condition set up.
	Incorrect protocol setup on S2. Refer to Paragraph 4.3.1, following, for guide in establishing serial communications.
Printer prints correct data for approximately the number of characters equal to the FIFO buffer size and then loses data and/or then prints garbage.	Printer BUSY or SRTS (PRINTER BUSY) not connected to proper pin at data source.

TABLE 4-1. TROUBLESHOOTING (Cont'd)

SYMPTOM	PROBABLE CAUSE AND ACTION
Printer prints the correct number of characters but data is garbage with random line feeds and/or form feeds.	One or more of Sections 3 through 10 of S3 are ON, while in parallel mode. Bad RAM on circuit board. Refer unit to service center. Faulty I/O circuits on circuit board. Refer unit to service center. Switch S-3 is not correctly set for proper word length stop bits or parity configuration.

4.3.1 SERIAL INTERFACE INITIAL SETUP. The following guidelines are provided for assistance when difficulty is encountered in establishing serial communications.

Previous satisfactory operation by another printer (except DP-9XXX series) is not in itself grounds to assume your DP-9XXX printer will interface with directly the same setup. The following procedure is recommended when interfacing your printer with a serial interface to insure proper operation.

1. Familiarize yourself with the signal characteristics and connector pin assignments of your data source.

2. With power off, set the printer switches as follows: (See Figure 3-2 for switch location)

   S1-7 ON, all other S1 sections OFF

   S2-8 ON, all other S2 sections OFF (If transmission without protocol cannot be made then set up the proper protocol.)

   S3-1, S3-2, S3-3 ON (1200 Baud - See NOTE below)

   S3-4, S3-5, S3-6 OFF

   S3-7 OFF (unless data source specifically transmits an 8 bit data word exclusive of the parity bit.)

   S3-8 OFF

   S3-9, S3-10 OFF (Set for odd or even if parity cannot be operator controlled. Parity - NONE means no parity bit, not just ignored.)

   NOTE

   1200 Baud is the preferred starting place but if changing the data source Baud rate is not under operator control then set in the correct matching Baud rate.

   S4 to the right (EIA) on left for TTY current drop.

3. Begin by connecting only the incoming data line to pin 3 of the DB-25 connector and the SIGNAL GROUND (COMMON) to pin 7. This constitutes the minimum required connection for serial communications. Additional "handshake" signals will be added later

after communications have been established. In the unusual event that your data source must have a "handshake" signal present to transmit then pin 19 should be connected to the required line.

4. "Bring up" your data source and apply power to your printer.

5. Transmit 15 characters followed by a CR to the printer.

6. If the printer immediately begins printing the correct data go to Step 8 below.

7. If within 8-10 seconds the printer prints all inverted question marks or a combination of characters and inverted question marks, one of the following is probably true:

   - If approximately 30 or more inverted questions marks are printed within 8-10 seconds a Baud rate mismatch has occurred and the data source is transmitting slower than the printer. Reset the printer Baud rate to a lower rate and go to Step 5 above.

   - If nothing happens, either data is not being received by the printer or the Baud rate of the data source is faster than the printer. Reset the printer Baud rate higher and go to Step 5 above.

   - 16 or 17 inverted question marks mean any one or combination of the following:

     . Parity Error

     . Framing Error

     . Overflow Error

     . Mismatch of DSR and CD (you have too many lines connected.)

     NOTE

     Each time a switch setting is changed printer power must be cycled OFF then ON.

   - For this, change the settings S3-7, S3-8, S3-9, and S3-10

8. Once initial communication has been established, the "handshake" can then be connected. Determine which line from the data source is used for the "printer busy" status and connect this line to pin 19 of the printer.

9. Adjust the Baud rate of both printer and data source to the desired operating rate and try another test transmission.

CAUTION

RTS (PIN 4), CTS (PIN 5), DSR (PIN 6), AND CD (PIN 8) ARE INTERNALLY STRAPPED TO THEIR NORMAL OPERATING LEVELS. IF THESE SIGNALS ARE NOT ACTIVELY USED BY THE DATA SOURCE, DO NOT CONNECT ANY WIRES TO THESE PINS AS WIRES ARE POTENTIAL NOISE COLLECTING ANTENNAS. IF THEY ARE TO BE ACTIVELY USED THEN THE STRAPS SHOULD BE CUT. (SEE SECTION 2.)

10. Implement additional "handshake" signals and/or protocols as required in a step-by-step process until full operating parameters are established.

4.4 REMOVAL AND REPLACEMENT

4.4.1 GENERAL. Instructions in the following paragraph provide guidance in disassembly and reassembly of your printers to the Operator/User replacement level. Disassembly below this level may require special skills and/or special equipment. For more detailed repair and parts replacement refer to the Maintenance Manual.

CAUTION

YOUR PRINTER IS A PRECISION ELECTROMECHANICAL DEVICE. ANADEX RECOMMENDS THAT THESE PROCEDURES NOT BE ATTEMPTED BY OPERATORS/USERS NOT HAVING PREVIOUS TECHNICAL SKILL AND EXPERIENCE WITH SIMILAR EQUIPMENT.

4.4.2 ON LINE INDICATOR LAMP REPLACEMENT. The ON LINE indicator lens is a snap-on device. Grasp the lens between thumb and forefinger and while squeezing, tilt the lens slightly to the left and pull up. The lamp is a push in-pull out type but is difficult to grasp with the fingers. Remove power from the printer then use a very small screwdriver or straightened paper clip to gently pry the lamp up from the base. Note the way in which the slender contact wires are bent up along the base of the lamp and prepare the new lamp to match. Insert the lamp in the socket. Set the lens in place and again, squeezing the sides, snap the lens in place.

CAUTION

WHILE EXTERNAL TRANSIENT CONDITIONS MAY CAUSE ONE OR THE OTHER OF THESE FUSES TO FAIL WHEN NO FAULT ACTUALLY EXISTS WITHIN THE PRINTER, NORMALLY FUSE FAILURE IS AN INDICATION OF A PROBLEM AND REPLACEMENT SHOULD ONLY BE MADE AFTER IDENTIFICATION AND CORRECTION OF THE FAULT. IN NO CASE SHOULD THESE FUSES BE REPLACED MORE THAN ONCE WITHOUT HAVING THE PRINTER THOROUGHLY TESTED AND REPAIRED BY A QUALIFIED TECHNICIAN.

4.4.3 FUSE REPLACEMENT. The power fuse (F3) is located in the line power module. With the line cord removed, slide the module cover all the way to the left. Pull the fuse pull lever out and remove the fuse. Insert the new fuse and push the lever back into the normal position. Close the cover and connect the line cord.

Fuses F1 and F2 are 4A fuses located in the power supply area on the right side of the circuit board.

4.4.4 OPENING THE PRINTER. For most purposes, removal of the two end covers on the printer is unnecessary. The print mechanism is hinged to the base for convenient access to the circuit card area. To open the printer:

1. Disconnect both the power and the interface cables.

2. Place the printer on a sturdy table or other flat surface.

3. Turn the printer up on its back side and remove the 3 screws along the left edge of the base plate. (These are slightly larger than the other screws in that area.)

4. Remove 2 similar screws from the right edge of the base plate.

5. Set the printer back down on its base and lift the plastic cover. Remove the 3 screws at the bottom of the print head compartment.

CAUTION

TAKE CARE AS THE PRINTER IS OPENED. ON EARLY VERSIONS THE LENGTH OF TWO INTERNAL CABLES ON THE RIGHT IS MARGINAL AND MAY TEND TO CATCH ON THE LARGE POWER SUPPLY CAPACITOR OR STRAIN ITS CONNECTOR.

6. The printer can now be opened by lifting at the lip just above the front panel switches.

APPENDIX A

GRAPHICS CODING

The two examples of graphics coding given in this Appendix illustrate some of the techniques useful in graphics programs. Program 1 is written in a common form of BASIC. Minor modifications in the commands or statements may be necessary to adapt this program to a specific BASIC interpretarion/compiler. Program 2 is a graphic printout of a mathematical function using a bit mapping in memory technique. The calculation is lengthy and in some computers in BASIC may require as much as two hours. These programs are not presented to demonstrate the most efficient method of programming, but are designed to demonstrate some of the available techniques. No attempt is made to indicate the algorithmic computations possible for digitizing the line slopes, etc. from a data base.

NOTE TO APPLE USERS: Line 380 of Program 2 will not function correctly using Applesoft Basic. To make Program 2 work on the Apple make the following program changes. These changes have been provided by the courtesy of Rudy Dietzman of NAEU Enterprises, Inc.

ADD:

```
55 DATA 173, 10, 3, 13, 11, 3, 141, 10, 3, 96
56 FOR I = 768 to 777: READ Z: POKE I, Z: NEXT
```

CHANGE:

```
380 POKE 778, PEEK (P)
```

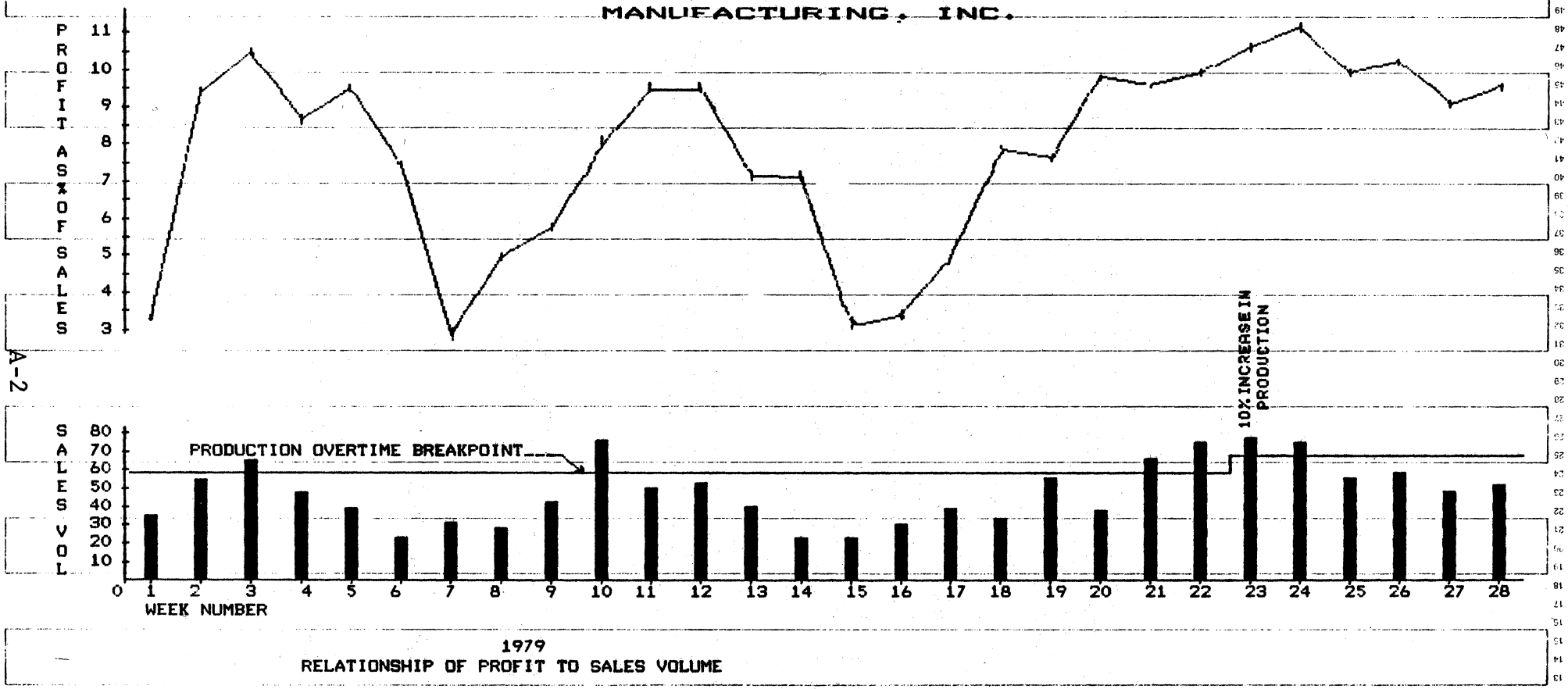
ADD:

```
382 POKE 779, A% (V-C6*INT (V/C6))
384 CALL 768
```

CHANGE:

```
390 POKE P, PEEK (778)
```

A-2



1979

RELATIONSHIP OF PROFIT TO SALES VOLUME

NOTE: REDUCED 25% FOR ILLUSTRATION HERE

PROGRAM NO. 1

```
10 REM ANADEX INC.  MODEL DP9500/DP9501 GRAPHICS DEMONSTRATION PROGRAM
20 REM PREPARED BY J. KING   APRIL 12, 1980
30 REM
40 REM THIS PROGRAM IS DESIGNED TO DEMONSTRATE THE GRAPHICS CAPABILITY OF THE ANADEX
MODELS DP-9500 AND DP-9501 ALPHANUMERIC/GRAPHICS PRINTERS.
50 REM IT IS ALSO INTENDED TO PROVIDE EXAMPLES OF THE VARIOUS TECHNIQUES USEFUL IN PR
OGRAMMING FOR GRAPHIC PRINTING WITH THE DP-9500 AND DP-9501
60 REM
70 REM THIS PROGRAM HAS BEEN WRITTEN IN A GENERALIZED VERSION OF BASIC LANGUAGE. AS S
UCH IT IS NOT EXPECTED THAT IT WILL RUN ON EVERY OR ANY SPECIFIC COMPUTER OR WITH ANY
 SPECIFIC VERSION OF BASIC WITHOUT MODIFICATION.
80 REM USERS SHOULD EXAMINE THE CODE CAREFULLY FOR COMPATIBILITY WITH THEIR OWN SYSTE
M AND MAKE SUCH MODIFICATIONS AS NECESSARY BEFORE ATTMEPTING TO RUN THE PROGRAM.
90 REM
100 REM
110 REM ************ FOR THIS EXAMPLE SWITCHES S1,S2,S3 SHOULD BE SET AS FOLLOWS:
120 REM S1-1 OFF,S1-2 ON, S1-3 ON, S1-4 OFF, S1-5 ON -- THIS SETS THE INITIAL DEFAULT
 FORM LENGTH TO 11 INCHES.  NOTE - IN GRAPHICS THE FORM LENGTH IS CANCELLED AND MUST
BE RESET BY THE PROGRAM ON FINAL EXIT FROM THE GRAPHICS MODE.
130 REM ** NOTE ** WHEN THE GRAPHICS MODE IS ENTERED THE FORM LENGTH IS CANCELLED AND
 RESESTABLISHED AT 0 INCHES, THEREFORE THESE SWITCH SETTINGS ARE MERELY A STANDARDIZE
D PROCEDURE IN THE EVENT ALPHANUMERIC PRINTING IS
140 REM INTENDED BEFORE ENTERING THE GRAPHICS MODE. IF ALPHANUMERIC PRINTING IS TO BE
 DONE AFTER FINAL EXIT FROM THE GRAPHICS MODE THE TOP OF FORM AND FORM LENGTH MUST BE
 REESTABLISHED BY PROGRAM COMMAND.
150 REM S1-6 OFF -- ALPHANUMERIC CHARACTER FONT DEFAULT TO 10 CHARACTERS PER INCH.
160 REM S1-7 OFF -- TIMEOUT IS INHIBITED
170 REM S1-8 OFF -- CROSS HATCH SYMBOL SELECTED
180 REM S2-1 OFF, S2-2 ON -- SKIP OVER PERFORATION DEFAULT SET FOR 1 INCH
190 REM S2-3 THROUGH S2-6 OFF -- DEFAULT TO 6 LINES PER INCH, NO PROTOCOLS, AND WRAPA
ROUND SELECTED.
200 REM **** NOTE **** THERE IS NO WRAPAROUND FUNCTION IN GRAPHICS BUT IT IS REACTIVA
TED DURING ALPHANUMERIC PRINTING.
210 REM S2-8 ON -- AUTO LINE FEED SELECTED. ** NOTE ** AGAIN AUTO LINE FEED IS INACTI
VE DURING GRAPHICS BUT IS ACTIVE DURING ALPHANUMERIC PRINTING. IN THE FOLLOWING PROGR
AM GRAPHICS ARE INTERMIXED SO AUTO LINEFEED WILL BE CANCELLED
215 REM BY COMMUNICATIONS INSTRUCTION AND RE ESTABLISHED AT THE COMPLETION OF THE PRO
GRAM.
220 REM S3-1 THROUGH S3-10 -- THIS SET OF SWITCHES SELECT THE INTERFACE. REFER TO SEC
TION iii OF THE MANUAL FOR THE CORRECT SETTINGS FOR YOUR REQUIREMENTS. *** NOTE *** F
OR PARALLEL ALL TEN SECTIONS MUST BE OFF.
240 REM
250 PRINT "INSURE THAT PAPER IS INSERTED IN THE PRINTER AND HAS BEEN ELECTRICALLY OR
MANUALLY DRIVEN FORWARD SEVERAL LINES. THIS INSURES CORRECT PAPER";
260 PRINT  " ALIGNMENT FOR MAXIMUM ACCURACY DURING GRAPHINCS PRINTING.  PROGRAM ENTRY
 SHOULD BEGIN WITH THE PAPER ONE HALF INCH BELOW THE PERFORATION."
270 PRINT"PRESS 'ENTER' WHEN READY";
280 INPUT Q$
290 REM ****  INSERT ANY REQUIRED HOUSEKEEPING CHORES HERE SUCH AS CLEARING STRING SP
ACE, DIMENSIONING VARIABLES AND ARRAYS, DEFINING FUNCTIONS, ETC.
300 CLEAR 2000
310 REM THE FOLLOWING HOUSKEEPING CHORES ARE NOT ESSENTIAL TO PURELY GRAPHICS PRINTIN
G BUT ILLUSTRATE SOME OF THE CONTROLS AVAILABLE TO THE PROGRAMMER
320 LPRINT CHR$(18);:REM THIS SETS THE CHARACTER FONT AT 10 CHARACTERS PER INCH WHICH
```

```
 GIVES CORRECT GRAPHIC/ALPHANUMERIC ALIGNMENT WITH THE DP9500, FOR THE DP9501 CHANGE
TO READ 'CHR$(25)'
330 LPRINT CHR$(27);"@";:REM THIS CLEARS ANY VERTICAL TABS AND ESTABLISHES THE CURREN
T POSITION AS TOP OF FORM
340 LPRINT CHR$(27);"B";:REM THIS CLEARS ANY HORIZONTAL TABS
350 LPRINT CHR$(27);"7132";:REM THIS SETS THE PRINT WIDTH LIMIT AT 13.2 INCHES.
360 LPRINT CHR$(27);"3050";:REM THIS SETS A HORIZONTAL TAB AT COLUMN 50
370 LPRINT CHR$(27);"V0":REM THIS RESETS THE AUTO LINE FEED MODE TO INACTIVE
380 LPRINT CHR$(27);"V0":REM DESELECTS AUTO LINEFEED MODE.
390 REM ******* THE ACTUAL GRAPHICS PROGRAM BEGINS HERE *******
400 REM NOTE EARLY VERSIONS OF THE DP9500/DP9501 WILL AUTOMATICALLY EXIT GRAPHICS ON
RECIEPT OF ANY NON GRAPHIC CODE. LATER VERSIONS IGNORE ALL NON GRAPHIC CODES. IN EITH
ER CASE IT IS ADVISABLE TO AVOID ANY NON GRAPHIC CODES DURING GRAPHICS.
420 REM NOTE ** IN THE CODE BELOW EXTENSIVE USE OF THE 'CHR$(NNN) FUNCTION IS USED TO
 ENTER ASCII CODES WHICH ARE NOT ALWAYS AVAILABLE ON LIMITED KEYBOARDS.
425 LPRINT CHR$(28);"@999";
426 REM THIS CAUSES THE PAPER TO BE FED A TOTAL OF 27 DOT POSITIONS. NOTE THAT THE TH
REE ASCII NUMERALS ARE ALWAYS PRECEDED BY A "PRINTABLE" GRAPHICS CODE, IN THIS CASE I
T IS A BLANK.
430 LPRINT CHR$(28);";380CGLXpXLGC@@@@@@";CHR$(127);CHR$(127);"ssss#";CHR$(95);"L";ST
RING$(6,"@");CHR$(95);CHR$(127);"pppppxX6";
440 REM NOTE THE ASCII NUMERAL 6 WHICH IS THE TERMINATING CHARACTER OF THE GRAPHICS S
TRING ABOVE. THIS IS THE PAPER FEED INSTRUCTION WHICH INSTRUCTS THE PRINTER TO FEED T
HE PAPER 6 VERTICAL DOT POSITIONS.
450 REM NOTE ALSO THE EXPRESSION ";380". THIS PORTION OF THE GRAPHICS CODE INSTRUCTS
THE PRINTER TO INDENT 380 HORIZONTAL DOT POSITIONS. THE ACTUAL LINEAR DISTANCE IS A F
UNCTION OF DOT DENSITY AND DIFFERS BETWEEN THE DP9500 AND DP9501
460 REM PROGRAMMERS WILL FIND THIS FEATURE EXTREMELY USEFUL AS A BYTE SAVER IN THE PR
INTERS BUFFER RAM AND THE COMPUTERS MEMORY.
470 REM THE 'STRING$(NN,AA)' FUNCTION IS MERELY A PROGRAMMING CONVENIENCE BUT DOES NO
T SAVE ANY PRINTER BUFFER SPACE SINCE THE COMPUTER WILL TRNASMITT EACH CHARACTER INDI
VIDUALLY.
480 LPRINT ";380";CHR$(124);CHR$(124);"ppppp";CHR$(124);CHR$(124);"@@@@@@";CHR$(124);
CHR$(124);"LLLL}xp@@@@@@x";CHR$(124);"LLLLL";CHR$(92);"X399";CHR$(29)
490 REM THE STATEMENTS ABOVE PRINT THE LETTERS 'A B C' IN A DOUBLE SIZE FORMAT THEN M
OVES THE PAPER 26 DOT POSITIONS AND EXITS GRAPHICS.
500 LPRINT CHR$(9);CHR$(14);"MANUFACTURING, INC."
510 LPRINT CHR$(15);CHR$(138): REM EXITS THE DOUBLE WIDTH MODE AND CAUSES ONE LINE FE
ED. NOTE THAT SOME COMPUTERS LINE PRINTER DRIVER OR I/O CARD TRAP CERTAIN CONTROL COD
ES AND USE THEM INTERNALLY FOR CERTAIN FUNCTIONS.
515 REM IN THESE CASES IT IS NECESSARY TO BYPASS THE TRAP BY ADDING 128 TO THE NORMAL
 CODE TO GET THE INSTRUCTION TO THE PRINTER. THE PRINTER WILL MASK OFF THE EXTRA VALU
E AND ACT ONLY ON ORIGINAL INTENDED CODE.
520 REM THE GRAPHICS PLOT BEGINS HERE WITH THE SCALARS AND TRENDLINES
530 LPRINT CHR$(28);:REM REENTER THE GRAPHICS MODE. THE FIRST TWO PASSES PLOT A VERTI
CAL LINE.
540 LPRINT";036";CHR$(127);"6;036";CHR$(127);"0;670A06";CHR$(29)
550 REM NOTE THE USE OF THE INDENT FUNCTION (;NNN) TO CONTROL THE PRINT POSITION.
560 REM THE NEXT INSTRUCTION ILLUSTRATES THE METHOD OF INTERMIXING ALPHANUMERICS AND
GRAPHICS.
570 LPRINT"P  11":LPRINT CHR$(28);";035D"CHR$(127);"DD0;657AABBDDDHHPP``@xPHDBA6";
580 REM NOTE THAT AFTER ALPHANUMERIC PRINTING THE LINE MUST BE TERMINATED BEFORE ENTE
RING GRAPHICS. NOTE ALSO AT THE END OF THE STATEMENT ABOVE THE ; IS USED TO SUPPRESS
THE AUTOMATIC CR TERMINATION
```

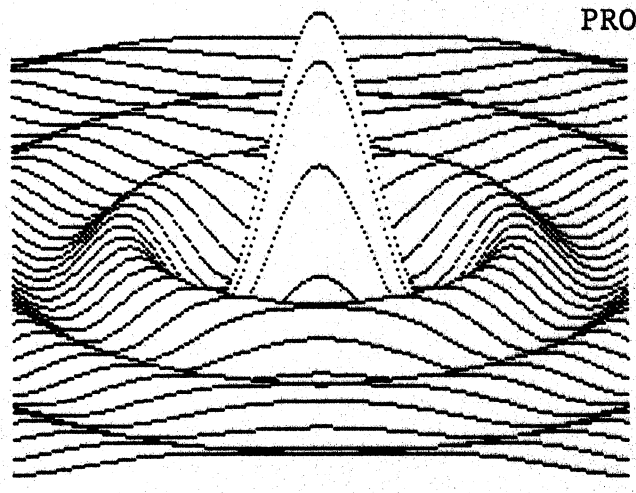
```
590 LPRINT";036";CHR$(127)"0;644GABBDDHHHPP``0;677`PLBA6";CHR$(29)
600 LPRINT"R":LPRINT CHR$(28);";035D";CHR$(127);"DD0;102AB";CHR$(95);"C0;634AABDDHHP
`x0;683`PHDBA6;036";CHR$(127);"0;096ABDHP`@@@pHFA0;625ABBDHHPP`0;689`PHDBA0";
610 LPRINT";712AAAABBBDDDDH";CHR$(94);"DBA6";CHR$(29)
620 LPRINT"O  10":LPRINT CHR$(28);";035D";CHR$(127);"DD0;090ABDHP`06;110pXBA0;613AAAB
ODDHPP``0;695pHDOBDDDHHHHPPP```0;728`PHDBA6";
630 LPRINT";036";CHR$(127);"0;084ABDHP`0;113`XDC0;561CL";CHR$(124);"PPPHHHHHDDDDDDBBB
BAAAAAA0;592AAABBBBDDDHHHHPPP````@@@@`0;698`0;735`PHDBA6";CHR$(29)
640 LPRINT"F":LPRINT CHR$(28);";035D";CHR$(127);"DD0;077GABDHP`0;117`XHC0;155AAB";CHR
$(95);"A0;319";CHR$(127);STRING$(26,"B");CHR$(126);"G0;558CLP0;588``x`0;741`PHDBA0;77
0AAABBDDDH";CHR$(126);"6";
650 REM THE USE IN BASIC OD THE 'STRING$(N,$)' FUNCTION IS A PROGRAMMING AID AVAILABL
E IN SOME BASICS BUT DOES NOT USE ANY LESS PRINTER BUFFER SPACE THAN THE REPEATED AHA
RACTER. THIS FUNCTION OUTPUTS AN 'N' LENGTH STRING OF '$' CHARACTERS.
660 LPRINT";036";CHR$(127);"0;076Gx0;121pHFA0;147ABDDHPP`@@@@`PLC0;314AFHP`0;349pNC0;
554CFp0;747`PHDCC@AAABBDDDHHHPP```6";CHR$(29)
670 LPRINT"I   9":LPRINT CHR$(28);";035D";CHR$(127);"DD0;075Op0;125pLBA0;138AABDDHP``
0;163pLC0;310CDHp0;352pLG0;551CFp0;752x`6";
680 LPRINT";036";CHR$(127);"0;074Op0;128`PLOBDHPP`0;166`XFA0;305ABLX`0;354`XFA0;548AF
X`6"CHR$(29)
690 LPRINT"T":LPRINT CHR$(28);";035D";CHR$(127);"DD0;073";CHR$(95);"`0;131x0;169`XFA0
;301AFHP`0;357`XFA0;545AFX`6";
700 LPRINT";036";CHR$(127);"0;072";CHR$(127);"0;173pLC0;293C@@@FHp0;360`XFA0;542AFX`6
";CHR$(29)
710 LPRINT"    8":LPRINT CHR$(28);";035D";CHR$(127);"DD0;070A";CHR$(124);"0;176pLBA0;
293";CHR$(127);"DX`0;363`XG0;509C0;539AFX`6";CHR$(29)
720 LPRINT"A":LPRINT CHR$(28);";036";CHR$(127);"0;069Cx0;179`XFA0;289ALX`0;366pLC0;50
8CLx``PPPPPHHHHHHDDDDDBBBBBBAAGFX`6";
730 LPRINT";035D";CHR$(127);"DD0;068Cx0;182`LD00;286AFHp0;369pFC0;505G";CHR$(92);"`0;
536p6";CHR$(29)
740 LPRINT"S":LPRINT CHR$(28);";036";CHR$(127);"0;067Gx0;185`";CHR$(94);"A0;283AAFX`0
;372PXOAAAAAAAAAAAAAAA0;503ANX6";CHR$(29)
750 LPRINT"    7":LPRINT CHR$(28);";035D";CHR$(127);"DD0;066Op0;187xG0;280AFX`0;374x0
;389PPPPPPPPPPPH";CHR$(126);"C0;500CF";CHR$(92);"`6";;CHR$(29)
760 LPRINT"X"
770 LPRINT CHR$(28);";036";CHR$(127);"0;065";CHR$(95);"p0;188`";CHR$(94);"A0;277AFX`0
;402PNA0;498C";CHR$(92);"`6";
780 LPRINT";035D";CHR$(127);"DD0;064";CHR$(95);"`0;190xG0;274CLp0;404xG0;495AFx6";CHR
$(29)
790 LPRINT"O":LPRINT CHR$(28);";036";CHR$(127);"0;063";CHR$(95);"`0;191`";CHR$(94);"A
0;271CLp0;406";CHR$(124);"C0;493CLp6";CHR$(29)
800 LPRINT"    6":LPRINT CHR$(28);";035D";CHR$(127);"DD0;062";CHR$(127);"0;193xG0;268
CLp0;407`";CHR$(94);"A0;491C";CHR$(92);"`6";CHR$(29)
810 LPRINT"F":LPRINT CHR$(28);";036";CHR$(127);"0;060A";CHR$(126);"0;194`";;CHR$(94);
"A0;262ABBD";CHR$(126);"p0;409p00;489Gx6";
820 LPRINT";035D";CHR$(127);"DD0;059A";CHR$(126);"0;196";CHR$(124);"C0;254ABBDHPP`0;4
11xG0;486ANp6";
830 LPRINT ";036";CHR$(127);"0;058C";CHR$(124);"0;197p00;246ABFDHPP`0;412xG0;483AFx6"
;CHR$(29)
840 LPRINT"S   5":LPRINT CHR$(28);";035D";CHR$(127);"DD0;057Gx0;199";CHR$(124);"C0;23
8AOBDHP``0;414pNA0;481AGx6";
850 LPRINT ";036";CHR$(127);"0;056Gx0;200p00;235AFX``0;416xG0;477CDHHx6";CHR$(29)
860 LPRINT"A":LPRINT CHR$(28);";035D";CHR$(127);"DD0;055OP0;202";CHR$(124);"C0;232CFX
`0;418";CHR$(124);"C0;472ABDX`6";
```

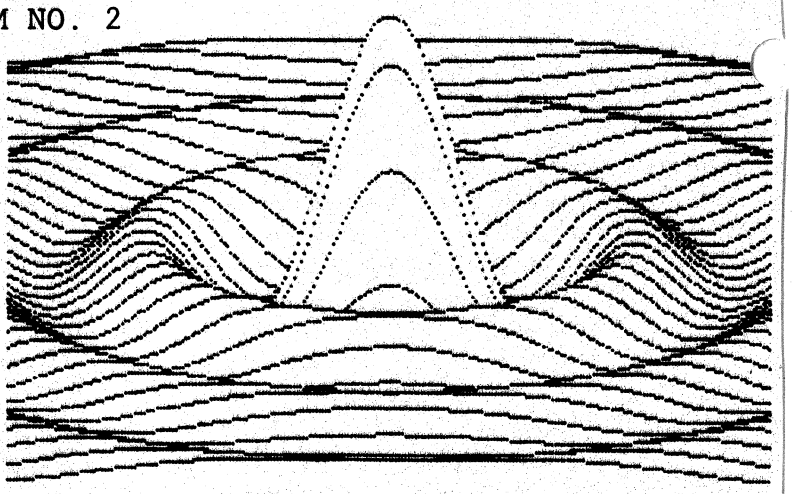
```
870 LPRINT ";036";CHR$(127);"0;054Op0;203pOO;229CLp0;419`";CHR$(94);"A0;468AFHP`6";CH
R$(29)
880 LPRINT"L    4":LPRINT CHR$(28);";035D";CHR$(127);"DD0;053";CHR$(95);"`0;205";CHR$
(126);"C0;225ABLp0;421pOO;464CDX`0;638HIJJLH6";
890 LPRINT";036";CHR$(127);"0;052";CHR$(127);"0;206pOO;222AFX`0;422xG0;459ABLP`0;638g
bbbbg6";CHR$(29)
900 LPRINT"E":LPRINTCHR$(28);";035D";CHR$(127);"DD0;051";CHR$(127);"0;208";CHR$(94);"
C0;219CDX`0;424`";CHR$(92);"C0;454AGFHp0;638C@AA@C@@@@bf¡¡rb6";
910 LPRINT ";036";CHR$(127);"0;049H";CHR$(124);"h0;209pOO;216CLp0;427H";CHR$(94);"GCA
AAAABBBBDDDDHHHHPPPP```xp0;638xIxyIx@@@@NQQQQN6";CHR$(29)
930 LPRINT"S   3":LPRINT CHR$(28);";035D";CHR$(127);"DD0;211";CHR$(124);"COLp0;428x0;
638xDLpDx@@@@NDDDDN6;212`";CHR$(124);"0;638";CHR$(92);"bb";CHR$(126);"bb@@@@";CHR$(95
);"DDDDD6";
940 REM
950 LPRINT";638";CHR$(95);"AOOA";CHR$(95);"@@@@GH@@HG6;638GHHGDH@@@@DddddC6";
960 REM
970 LPRINT";638cd@@dc@@@@QRRRRa6;638bRRRSb@@@@xIIIIx6;638IXhhHI@@@@xDDDDx6;638p````p@
@@@";CHR$(94)"bb";CHR$(94);"Rb6;638fVHDrq@@@@OQQOAA6;638GHHHHG6;638BcbbbG6";CHR$(29);
980 A$=STRING$(7,CHR$(127))
990 REM
1000 B$=STRING$(7,CHR$(95))
1010 C$=STRING$(128,"D")
1020 D$=STRING$(198,"A")
1030 E$=STRING$(20,"@")
1040 G$=STRING$(7,"@")
1050 F$=A$+E$
1060 LPRINT"S  80":LPRINT CHR$(28);";035D";CHR$(127);"DD6;036";CHR$(127);"0;290000000
00;614GGGGGGG";E$;A$;E$;"GGGGGGG6";CHR$(29);
1070 REM
1080 LPRINT "A  70       PRODUCTION OVERTIME BREAKPOINT";CHR$(95);CHR$(95);CHR$(95)
1090 REM
1100 LPRINT CHR$(28);";614";A$;E$;A$;E$;A$;"0;633";D$;"0;261@@DAAA@@AAAA@@@";G$;G$;A$
;"0;035D";CHR$(127);"DD6";
1110 REM
1120 LPRINT";036";CHR$(127);"0;101GGGGGGG0;272`PHDBA0;290";A$;"0;58700000000;614";A$;
STRING$(12,"@");CHR$(127);G$;A$;E$;A$;"6";CHR$(29);
1130 REM
1140 LPRINT"L  60":LPRINT CHR$(28);";035D";CHR$(127);"DD";D$;D$;D$;"0;101";A$;STRING$
(170,"@");"`RKG";CHR$(95);"O@@@@@@";A$;"0;587";A$;E$;A$;"@@@@@@@@@@@@";CHR$(127);"@@@
@@@@";A$;E$;A$;E$;G$;E$;"AAAAAAA6";
1150 REM
1160 LPRINT";036";CHR$(127);"0;074CCCCCCC";STRING$(20,"@");A$;"0;290";A$;"0;533GGGGGG
G";STRING$(47,"@");A$;E$;A$;E$;A$;E$;A$;E$;"GGGGGGG";E$;A$;"6";CHR$(29);
1170 REM
1180 LPRINT"E  50":LPRINT CHR$(28);";035D";CHR$(127);"DD";STRING$(35,"@");A$;E$;A$;"0
;290";A$;E$;"GGGGGGG";E$;A$;"0;533";A$;E$;G$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;"
AAAAAAA";E$;B$;"6";
1190 REM
1200 LPRINT"0;533";A$;E$;G$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;
1210 LPRINT "0;290";A$;E$;A$;E$;A$;"0;036";CHR$(127);STRING$(37,"@");A$;E$;A$;E$;A$;"
6";CHR$(29);
1220 LPRINT"S  40"
1230 LPRINT CHR$(28);
1240 REM
```

```
1250 LPRINT";035D";CHR$(127);"DD";STRING$(35,"@");A$;E$;A$;E$;A$;E$"CCCCCCC0;263";A$;
E$;A$;E$;A$;E$;A$;E$"GGGGGGG0;479CCCCCCC";E$;G$;E$;A$;E$;G$;E$;A$;E$;A$;E$;A$;E$;A$;E
$;A$;E$;A$;E$;A$;E$;A$;"6";
1260 REM
1270 REM
1280 LPRINT";479";A$;E$"AAAAAAA";E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A
$;E$;A$;"0";
1290 LPRINT";263";F$;F$;F$;F$;A$;"0;036";CHR$(127);STRING$(10,"@");"GGGGGGG";E$;F$;F$
;F$;A$;"6";CHR$(29);
1300 REM
1310 REM
1320 LPRINT"   30"
1330 REM
1340 LPRINT CHR$(28);";035D";CHR$(127);"DD";STRING$(8,"@");A$;E$;A$;E$;A$;E$;A$;E$;A$
;E$;G$;E$"0000000";E$;G$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;"0;452GGGGGGG";E$;A$;E$;A$;E$;
A$;E$;A$;E$;;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;"6";
1350 REM
1360 REM
1370 LPRINT";036";CHR$(127);"@@@@@@@@@@";A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;"@@@@@@@";E$;A
$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;"@@@@@@@";E$;"@@@@@@@";E$;A$;E$;A$;E$;A$;E$;
A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;E$;A$;"0";CHR$(29);
1380 LPRINT "V"
1390 LPRINT CHR$(28);"@6";CHR$(29);
1400 REM
1410 LPRINT "   20"
1420 REM
1430 REM
1440 LPRINT CHR$(28);";035D";CHR$(127);"DD0;047";F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;
F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;A$;"6"
1450 REM
1460 LPRINT CHR$(28);";036";CHR$(127);"@@@@@@@@@@";F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F
$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;A$;CHR$(29);
1470 LPRINT "0"
1480 LPRINT CHR$(28);"@6";CHR$(29);
1490 LPRINT "   10"
1500 REM
1510 LPRINT CHR$(28);";035D";CHR$(127);"DD@@@@@@@@";F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;
F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;A$;"6"
1520 REM
1530 REM
1540 LPRINT CHR$(28);";036";CHR$(127);"@@@@@@@@@@";F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F
$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;F$;A$;CHR$(29);
1550 LPRINT "L"
1560 G$=STRING$(3,CHR$(124))+CHR$(127)+STRING$(3,CHR$(124))+STRING$(20,"D")
1570 REM
1580 LPRINT CHR$(28);"@6;036";CHR$(127);"DDDDDDDDDD";G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$
;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;G$;"8";CHR$(29);
1590 REM
1600 LPRINT"     0  1   2    3    4   5   6    7   8    9   10  11   12   13  14   15
  16   17  18   19  20   21  22   23  24   25  26   27  28";CHR$(138)
1610 LPRINT"        WEEK NUMBER";CHR$(141);CHR$(138);CHR$(138)
1620 LPRINT STRING$(40," ");"1979";CHR$(141);CHR$(138)
1630 LPRINT STRING$(22," ");"RELATIONSHIP OF PROFIT TO SALES VOLUME"
1640 LPRINT CHR$(141);STRING$(27,CHR$(138))
1660 END
```

DP-9500

PROGRAM NO. 2





```
10 REM 01 OCT 80 ** SIN3DFUN/BAS ** COMPUTES, STORES AND PRI
NTS THE 3 AXIS FUNCTION OF SIN(R/10)*1000/R
20 REM **** NOTICE **** THIS PROGRAM MAY TAKE AS LONG AS 1 T
O 2 HOURS TO RUN FOR THE CALCULATION PORTION OR THE BIT MAP.
30 REM THIS PROGRAM HAS BEEN WITTEN FOR USE ON THE TRS-80 WI
TH A MINIMUM OF 32K MEM AND DISK WITH THE ANANDEX DP9000, DP
9001, DP9500 OR DP9501 GRAPHICS PRINTER.
40 REM FOR OTHER COMPUTERS OR LESS AVAILABLE MEMORY SLIGHT M
ODIFICATIONS ARE NECESSARY. THE BIT MAP USED BY THIS PROGRAM
 OCCUPIES 8K OF MEMORY AND SHOULD BE LOCATED IN FREE MEMORY
BY CHANGING THE VARIABLES CA AND CB.
50 REM THE FOLLOWING CONSTANTS ARE USED FOR CONVENIENCE IN E
XPERIMENTING WITH OTHER VARIATIONS IN THE FORMULA.
60 C0=0:C1=1:C5=5:C2=2:A=.4:CC=255:CA=-32268:CB=-24077:CD=64
70 CE=200:CF=-200:CG=-10:CH=-120:CI=120:CJ=10:CK=1000:A=.4:C
L=CB-255:CM=256:C6=6:CN=128:C0=96
80 DIM L(255):DIM H(255)
90 INPUT"IF THE DATA HAS BEEN PREVIOUSLY CALCULATED AND STOR
ED ON DISK PRESS  'P'  BUT IF THIS IS THE FIRST TIME THROUGH
 PRESS  'N'  AND 'ENTER'";Q$:IF Q$="P" THEN 560
100 REM SET UP THE CALCULATION ARRAY
110 VY=-SIN(A)
120 VZ=COS(A)
130 FOR I=C0 TO C5
140 L(I)=191
150 H(I)=0
160 A(I)=C2[I
170 NEXT
180 REM CLEAR THE BIT MAP IN MEMORY FOR THE GRAPHICS DATA
190 FOR I=CA TO CB
200 POKE I,CD
210 NEXT
220 REM COMPUTE THE FUNCTION
230 FOR Y=CE TO CF STEP CG
240 PRINT "&";:REM PUT SOMETHING ON THE SCREEN JUST TO LET Y
OU KNOW SOME THING IS HAPPENING. DELETE THIS TO SPEED THE PR
OGRAM UP SLIGHTLY.
250 FOR X=CH TO CI
260 R=SQR(X*X+Y*Y)
270 IF R<>C0 THEN Z=SIN(R/CJ)*CK/R
280 U=CN+INT(X):V=C0+INT(VY*Y+VZ*Z)
290 IF V<L(U) GOSUB 360:L(U)=V
300 IF V>H(U) GOSUB 360:H(U)=V
310 NEXT
320 NEXT
330 GOSUB 410
340 GOTO 500
350 END
360 REM POKE GRAHICS INTO THE BIT MAP
370 P=CL-(CM*INT(V/C6))+U
380 Q=PEEK(P) OR A(V-C6*INT(V/C6))
390 POKE P,Q
400 RETURN
410 REM PRINT THE MEMORY MAP
420 LPRINT CHR$(28);
430 FOR Y=C0 TO 31
440 FOR X=C0 TO CC
450 LPRINT CHR$(PEEK(CM*Y+X+CA))
460 NEXT
470 LPRINT "@@6";
480 NEXT
490 LPRINT CHR$(29):RETURN
500 REM STORE THE GRAPH MAP ON DISK. FOR SYSTEMS WITH CASSET
TE TAPES THIS WILL REQUIRE MINOR MOD.
510 OPEN "O",1,"SINR10/DAT"
520 FOR S=CA TO CB
530 PRINT#1,PEEK(S);
540 NEXT
550 CLOSE:END
560 REM GET THE DATA AND STORE IT IN THE BIT MAP. FOR CASSET
TE SYSTEMS THIS ROUTINE WILL REQUIRE MINOR MOD
570 OPEN "I",1,"SINR10/DAT"
580 FOR S=CA TO CB
590 INPUT#1,ZZ
600 POKE S,ZZ
610 NEXT
620 CLOSE
630 GOSUB 410
640 END
```