TRS-80®

TP-10

OPERATION MANUAL

Catalog Number 26-1261

CUSTOM MANUFACTURED FOR RADIO SHACK
A DIVISION OF TANDY CORPORATION

SERVICE POLICY

Radio Shack's nationwide network of service facilities provides quick, convenient, and reliable repair services for all of its computer products, in most instances. Warranty service will be performed in accordance with Radio Shack's Limited Warranty. Non-warranty service will be provided at reasonable parts and labor costs.

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3. The cost for the labor and parts required to return the Radio Shack computer equipment to original manufacturer's specifications will be charged to the customer in addition to the normal repair charge.

CONTENTS

Introduction

Congratulations for selecting the TP-10 Thermal Printer! We feel confident that this Printer will give you years of satisfaction. The TP-10 is designed for use with the MC-10 Micro Color Computer, but it will work with the TRS-80 Color Computer as well.

The TP-10's special features include:

- The ability to print 95 ASCII characters, plus 16 graphics characters.
- The ability to print up to 32 standard characters per line.
- Software-controlled character/graphics elongation.
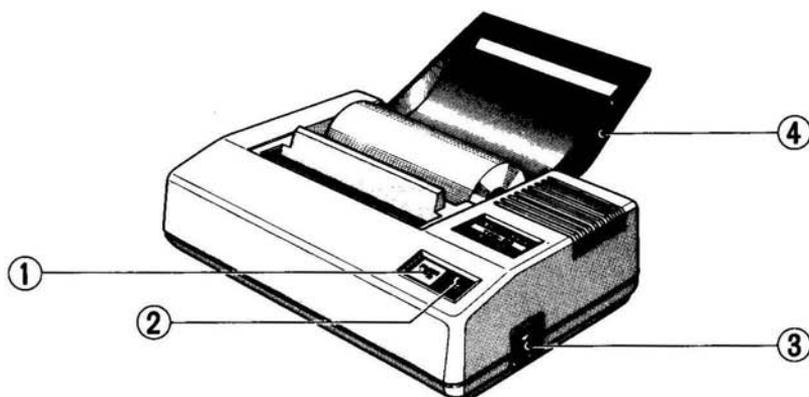- A repeat function.

and more!

This manual will:

- Describe the TP-10.
- Show you how to set up the TP-10 and connect it to the MC-10 or Color Computer.
- Show you how to use the TP-10 with BASIC commands and printer control codes.

1/Description of the TP-10

(Front view)
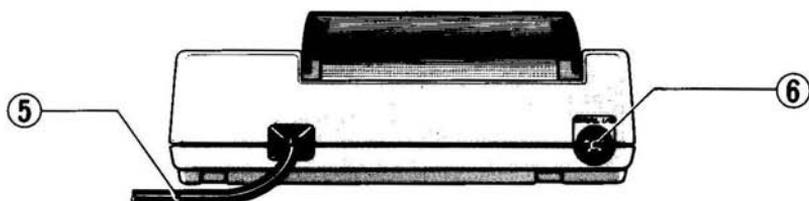
(Rear view)

1. **PAPER FEED Key:** Press to move the paper forward.

2. **POWER Indicator:** This indicator will light up when you turn the TP-10 on.

3. **Power On/Off Switch:** Press the ON side to turn the power on. Press the other side to turn off the power. When the print head cannot be shifted due to a paper jam, this indicator goes on and off.

4. **Cover:** Keep closed while the Printer is in operation. Raise to change the paper.

5. **Power Cord.**

6. **Serial Interface Connector:** Connect to the MC-10 or Color Computer via this jack. Use the 4-pin DIN to 4-pin DIN cable (Radio Shack Catalog No. 26-3020).

2/ Setting Up the TP-10 Printer

When you decide where and how to set up the Printer, remember the following:

- Avoid plugging the Printer into the same outlet as equipment which generates electrical noise such as an air conditioner.
- Choose a site that is not exposed to direct sunlight. Avoid dusty places and locations subject to temperature and/or humidity extremes.
- Place the Printer on a sturdy work surface.

Connecting the TP-10 to the MC-10

1. Turn the power off on both the TP-10 and the MC-10 or Color Computer.

2. Connect one end of the 4-pin DIN to 4-pin DIN cable (26-3020) to the connection on the rear of the Printer.

3. Connect the other end of the cable to the serial connector on the Computer.

Connecting the Power

1. Be sure that the Power switch is off.

2. Plug the TP-10 into a grounded AC outlet or approved power strip, such as the Line Filter (26-1451).

Power-up Sequence

1. Turn on the MC-10's power.

2. Turn on the TP-10's power.

Note: When turning the system off, reverse the above order.

Also note that when you're going to CSAVE a program with the MC-10, or RESET the MC-10, turn the TP-10's power off. Otherwise random characters may be printed.

Paper Handling

Notes for Paper Feeding

- It is very important that the paper enters straight into the TP-10 and that the paper loading operation is performed correctly. Otherwise, paper jamming may occur.
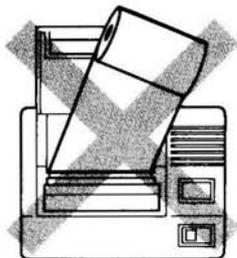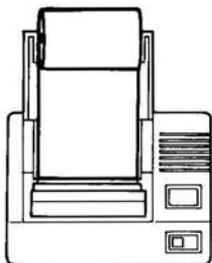
- If paper jam occurs during paper loading, just stop pressing the PAPER FEED key and pull the paper out slowly. Be careful not to tear the paper because taking a torn off piece of paper out of the Printer requires disassembling the Printer.
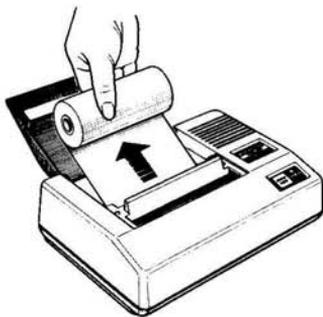
Loading the Paper

1. Open the cover.
2. With scissors, cut the end of the paper off square with the paper's edge.
3. Insert the end of the paper into the slot as far as it will go. Note that the heat sensitive surface is on the outside of the roll. This side should face toward the print head.
4. Turn the power on.
5. Press the PAPER FEED key to get the paper through the slot and around the platen.
6. Close the cover.
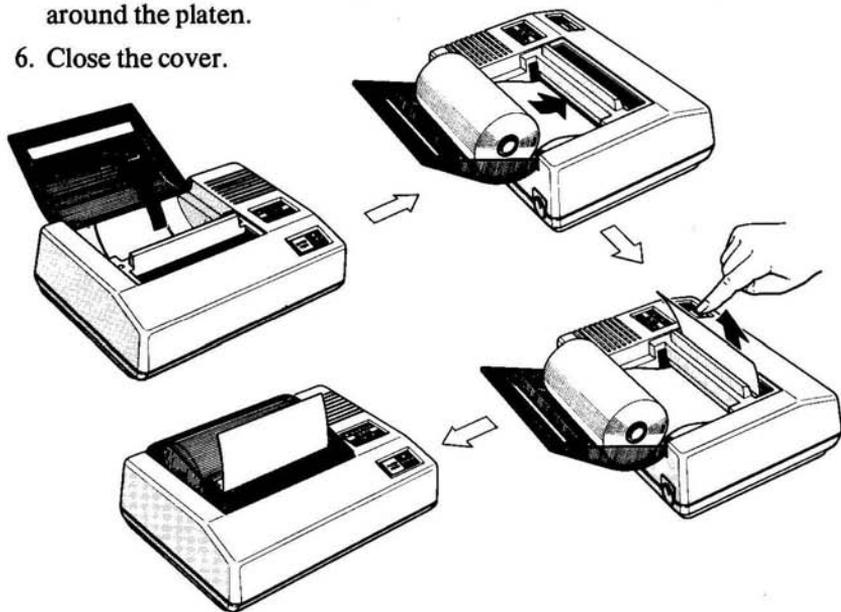
Cutting the Paper

1. Press the PAPER FEED key to advance the paper.
2. Grip the center edge of the paper and pull it as shown below.
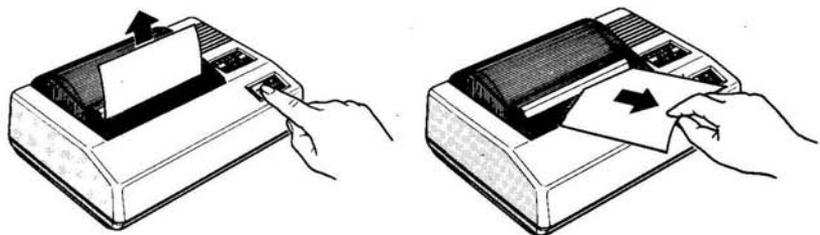
Removing the Roll of Paper

1. Cut the paper at the roll side and remove the roll.

2. Press the PAPER FEED key to remove the paper caught in the platen.
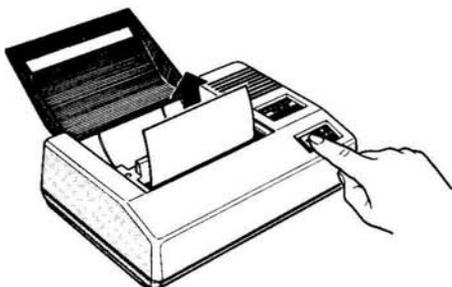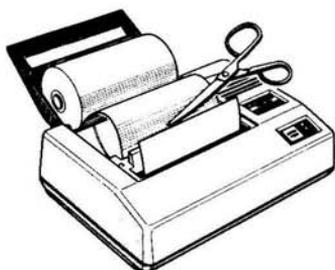
Do not pull the paper from the
roll side: this action may damage
the printer mechanism.
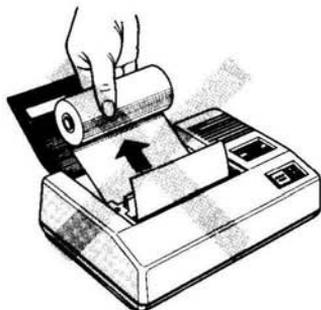
The Printer prints on thermal sensitive paper only. Obtain replacement
rolls from your local Radio Shack store. Ask for catalog number
26-1332.

Note: Since the paper is heat sensitive, take care when you store or
handle it to prevent:

* Exposure to temperatures over 50 degrees C (122 degrees F).
* Contact with alcohol, thinners, benzene or other liquids.
* Exposure to ultraviolet light rays, including sunlight.

Self-Test

The TP-10 has a built-in self-test feature which lets you check the printing quality and general Printer operation before you connect the Printer to your MC-10 or Color Computer. The self-test includes only alphanumeric characters.

Note: Be sure to disconnect the 4-pin DIN to 4-pin DIN cable from the Printer; otherwise, the self-test will not work.

1. Turn the power off.
2. While pressing the PAPER FEED key, turn the power on.
3. The Printer will begin printing all the characters repeatedly.
4. To stop the self-test, turn the power off.

3/Using the TP-10

If you're using the MC-10, the BASIC command to send information to the Printer is

LPRINT

If you're using the TRS-80 Color Computer, the same command is "PRINT #−2,".

Before printing, the Printer checks to see if the code sent is an instruction (how to print) instead of data (to be printed). An instruction, for example, might tell the Printer to print same character or change the character size.

Consequently, some ASCII codes were created as instructions to control the Printer (and therefore are called "Control Codes").

Your TP-10 recognizes 6 printer control codes and ignores or prints X for others.

To send an instruction to the Printer, use the function CHR$( ). Maybe you're already familiar with this function used to create the graphics characters on the MC-10 or your Color Computer.

For example, to tell the Printer that you want it to perform a carriage return and a single line feed (ASCII 13), use the command:

LPRINT CHR$(13) ⟮ENTER⟯

in a program line (or in the "immediate mode") and the Printer will perform a carriage return/line feed.

Any ASCII code (control codes, as well as data) can be sent to the Printer this way. In Appendix A, we show you a chart of printable characters and graphics characters. For instance, Appendix A will tell you that the ASCII code for letter Z is 90. Thus

LPRINT CHR$(90) ⟮ENTER⟯

will print the letter Z on the Printer. Or, if you use this command:

LPRINT CHR$(138) ⟮ENTER⟯

a solid bar will be printed. See Table 2 in Appendix A. Sure enough, ASCII 138 is a solid bar.

Note: The graphics characters TP-10 will generate are exactly the same as those of the MC-10. You can use the same ASCII codes as on the MC-10, but the TP-10 prints in black and white only.

If you use a computer other than the MC-10, the computer may not be able to send some codes. Refer to your computer owner's manual.

The alphanumeric characters the TP-10 prints are composed of a 5 x 7 dot matrix. Up to 32 characters can be printed in one line. The graphics characters are made up of a 7 x 12 dot matrix, with 32 characters per line.

With one of the control codes, you can also elongate the characters to double their normal width. So, the alphanumeric characters are printed in a 10 x 7 dot matrix, and graphics characters are printed in a 14 x 12 dot matrix. Of course, the number of characters per line decreases to half.

When the Printer receives a character code, it starts printing while receiving the next code. When the Printer receives the 33rd character in normal character width mode, the Printer automatically performs a carriage return and line feed and starts printing at the beginning of the next line (this is called "Wrap-Around").

If a line contains both elongated and normal characters, there may be cases where the first "half" of a letter can be printed on the end of a line. Your TP-10 is smart enough, though, that it performs a carriage return and line feed before this letter is printed and, therefore, prints the entire letter at the beginning of the next line.

It is important to note that all foreground colors on the TV screen will be printed on the TP-10 in black. That is, if you send a "red" code to the Printer, it will be printed in black. In the same sense, if you then send a "green" code to the TP-10, it also will be printed in black. Background colors on the screen are not printed on the TP-10.

Some Notes for Graphic Printing

The TP-10's print head can print 7 dots vertically at a time. Even though graphics characters consist of 12 dots vertically, the TP-10 is able to print them by dividing these graphics characters into upper and lower halves.

The upper half is printed first, while the lower half is stored in memory. When a carriage return or line feed code is received, or a wrap-around takes place, the lower half is printed.

Note: the TP-10 will not print the lower half of graphics characters until it receives a carriage return or line feed code, or a wrap-around takes place.

For example, in this program:

```
90 LPRINT CHR$(138);
```

The carriage return is not sent because the line ends with a semicolon. Therefore, the lower half of the graphics character will not be printed.

When you run the following program:

```
10 FOR N=128 TO 193
20 LPRINT CHR$(N);
30 NEXT
```

the lower halves of the graphics characters will not be printed. The guilty party, once again, is the semicolon at the end of line 20. To avoid this situation, either delete the semicolon, or add an "LPRINT" to the end of the program. For instance, to the program above, add:

```
40 LPRINT
```

and complete graphics characters should be printed.

4/BASIC Printer Control Codes

We've told you that six control codes are available. In this section we will discuss how to use these control codes. Normally, LPRINT CHR$( ) is used to send the instruction to the TP-10.

CHR$(10)
Line Feed only (no carriage return)

This command advances the paper one line, with the carriage staying in the current position.

CHR$(13)
Carriage Return with Line Feed

When this command is received, the Printer moves the carriage to the left margin and advances the paper one line.

CHR$(26)
Carriage Return only (no line feed)

When the Printer receives this code, the carriage is moved to the left, but the paper does not advance.

```
10 LPRINT CHR$(13);: REM TO BE SURE CARRIAGE
   IS AT LEFT
20 LPRINT "THIS IS IMPORTANT";
30 LPRINT CHR$(26);: REM CARRIAGE RETURN ONLY
40 LPRINT CHR$(28) CHR$(17) CHR$(95)
```

This program will print line 20, return the carriage to the left without advancing the paper, and then print an underline (ASCII code 95) under "THIS IS IMPORTANT". We will explain CHR$(28) shortly.

CHR$(27) CHR$(14)
Elongated Mode Set

This control code is somewhat different from the other control codes. Only when these two codes are received in succession, does the Printer enter the elongated mode. All the characters after this code sequence will be printed at twice the normal width.

CHR$(27) CHR$(15)
Elongated Mode Clear

This also is a two-code sequence. Upon receipt of this code sequence, the Printer exits the elongated mode and all the characters after this will be printed in normal size.

```
10 LPRINT "NORMAL";
20 LPRINT CHR$(27) CHR$(14);
30 LPRINT "ELONGATED";
40 LPRINT CHR$(27) CHR$(15);
50 LPRINT "NORMAL AGAIN"
```

CHR$(28) CHR$(n) CHR$(m)
Repeat Printing

This code tells the TP-10 to print the character repeatedly. The first figure n determines the number of repetitions (between 0 and 255: if 0 is input, printing repeats 256 times); the second figure m is the ASCII code for the character to be repeated. Note that the character need not be in code; put " " around the character to be printed.

```
LPRINT CHR$(28) CHR$(10) CHR$(134)
```

Prints the graphics character 10 times.

```
LPRINT CHR$(28) CHR$(5) "T"
```

Prints five T's.

Note: When codes other than those defined above are entered, TP-10 either ignores them or prints X.

Ignored codes

* 0, 1, 127
* codes other than 14 or 15 after 27
* redundant codes — CHR$(27) CHR$(14) while you're in elongated mode, or CHR$(27) CHR$(15) while you're in normal mode.

Codes printed as X
* codes between 2 and 31 which are not defined
* non-character codes which are specified to be repeated after code CHR$(28)

5/ Troubleshooting

If the Printer fails to operate properly, check the following table.

Problem	Checks
The Printer does not operate, despite the power switch being ON.	* Is the power cord plugged in correctly? * Is the power supply voltage low? It should be 120 V±12-1/2% of rated voltage. (±10% for European and Australian models)
Paper is not advanced smoothly.	* Has the paper been inserted in the paper insertion slot properly?
The power lamp flashes and the Printer does not operate.	* Is paper or other material jammed in the area of the print head? * If jamming is not the cause of the problem, turn the power switch OFF and ON.
Print density is too light.	* Are dust particles or any paper fragments, etc. adhering to the print head? * If so, remove the roll of paper and reinsert it with the reverse side of the paper facing the print head: then perform the self-test to advance the paper for about two feet. This process cleans the print head.
Test printing is normal, however, when the Computer is connected, the Printer operates and prints incorrectly.	* Is the interface cable OK? * Is the interface cable connected to the Computer and Printer correctly?

If the problem cannot be corrected after troubleshooting and making adjustment, check for secure contacts on all connectors. If you can't eliminate the problem, take the unit to your Radio Shack Store or Computer Center for repair.

6/Specifications

Printing	Thermal dot matrix (serial non-impact)	
Print operation	Continuous	
Characters	ASCII	95
	Graphic	16
Character matrices	Normal	5×7
	Elongated	10×7
	Graphic	7×12
Character size	Normal	1.8 mm (.0708″) (W) $\times$ 2.4 mm (.0944″) (H)
	Elongated	3.6 mm (.1417″) (W) $\times$ 2.4 mm (.0944″) (H)
	Graphic	2.4 mm (.0944″) (W) $\times$ 4.2 mm (.1654″) (H)
Characters per line	Normal	32
	Elongated	16
Character spacing	Normal	2.54 mm (1/10″)
	Elongated	5.08 mm (1/5″)
Line spacing	4.23 mm (1/6″)	
Printing speed	Normal	30 characters/sec
	Elongated	15 characters/sec
Paper	105^{+0}_{-1} mm (4-1/8″) wide thermal paper (26-1332)	
Interface	Serial interface	
	Baud rate 600 BPS (fixed)	
	Transfer format	1 start bit + 8 data bits + 2 stops bits
Dimensions	210 mm(W) $\times$ 150 mm(L) $\times$ 80 mm(H) (8-9/32″ $\times$ 5-29/32″ $\times$ 3-5/32″)	
Weight	1.5 kg (3.3 lbs) approx.	
Power supply	120 V AC, 60 Hz (220/240 V, 50 Hz for the units purchased in Europe/Australia) 18 W max.	

Environmental (Operating and Storage)

Input Voltage: $\pm 12.5\%$ of rated voltage ($\pm 10\%$ for European and Australian models)

Temperature and Humidity Durability:

Operating Conditions:	$+5°C$ $(+41°F)$ to $40°C$ $(104°F)$ 20% RH to 85% RH
Storage Conditions:	$-40°C$ $(-40°F)$ to $71°C$ $(160°F)$ 10% RH to 90% RH

Interface Specifications

Communication Method

This interface receives serial, asynchronous ASCII data.

Signal Pin Assignment

Pin No.	Name
1	NC
2	STATUS
3	GND
4	DATA
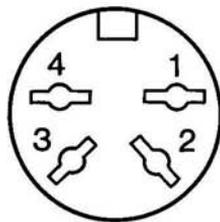
Interface Lines Description

1. **DATA (Pin No. 4)**

   Direction — To Printer.
   Signals on this circuit are generated by the Computer for transmission of data to the Printer.

2. **STATUS (Pin No. 2)**

   Direction — To Computer
   This signal indicates to the computer whether or not the Printer can accept data. The OFF condition (LOW) indicates that the Printer is BUSY and cannot accept any more data. The ON condition (HIGH) indicates the printer is NOT BUSY, and can accept more data from the Computer. This line goes LOW (BUSY) while:
   (a) One-code ASCII data is received.
   (b) Power-up is initialized.
   (c) The PAPER FEED Key is pressed and data is received.
   (d) Paper is jammed so that the Printer cannot shift the print head.
   (e) Executing the Self Test Printing.

3. GROUND (Pin No. 3)

This signal wire establishes a common ground between the Printer and the Computer.

Data Format
1 START BIT + 8 DATA BITS + 2 STOP BITS no parity bit.

Baud Rate
600 Baud only.

Timing Chart

```
          LSB                    MSB
+V    ┌──┐ ┌┐┌┐┌┐┌┐┌┐┌┐┌┐ ┌┐ ┌────
-V DATA───┘ └┘└┘└┘└┘└┘└┘└┘ └─┘
          START                 STOP
          BIT                   BITS
          (SPACE)               (MARK)
+V STATUS─┐
-V        └──────BUSY (MARK)──────
      →│ │←
   380μs≦to≦800μs        SPACE = LOGIC 0
                         MARK = LOGIC 1

                    +3V<SPACE LEVEL<+15V
                    -15V<MARK LEVEL<-3V
```

```
DATA─┐┌┐┌┐┌┐┌┐┌┐┌┐┌───//──┐┌┐┌┐┌┐┌
STATUS─┐                  ┌─┐
       └──────────────//──┘ └──
       ├────16.8ms≦T1≦2700ms────┤
```
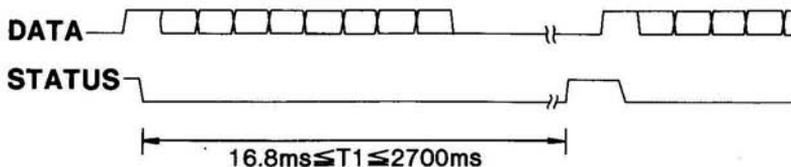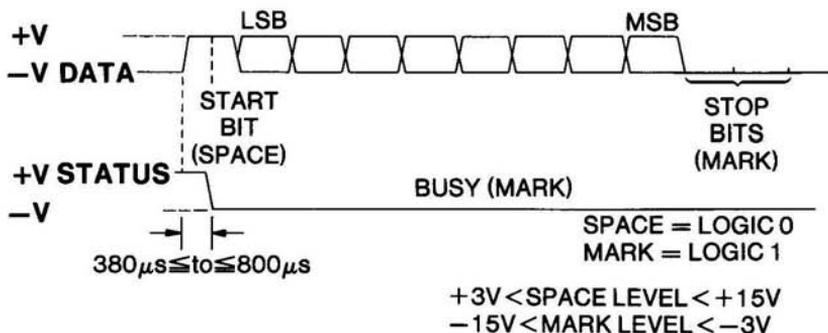
When PAPER FEED key is pressed, the status signal does not go LOW (BUSY) until the computer sends a byte of data. The TP-10 can receive this initial byte of data but will not print it. Subsequent bytes of data cannot be received. The status signal stays LOW (BUSY) until the PAPER FEED key is released. The received data is printed and subsequent data can be received.
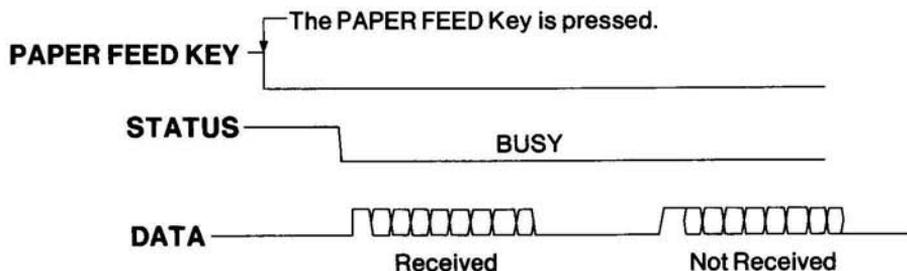
The width of the start bit should be more than 380μs.

If it is less than 380μs, the bit is ignored as noise.
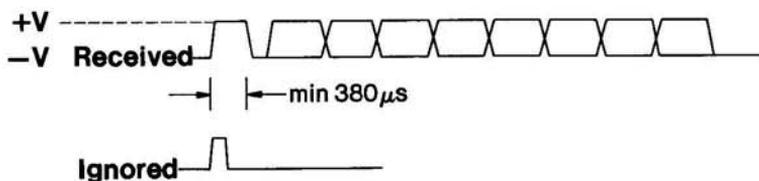
Schematic Diagram

Appendix A

Table 1 ── 95 ASCII Codes

ASCII Character Set

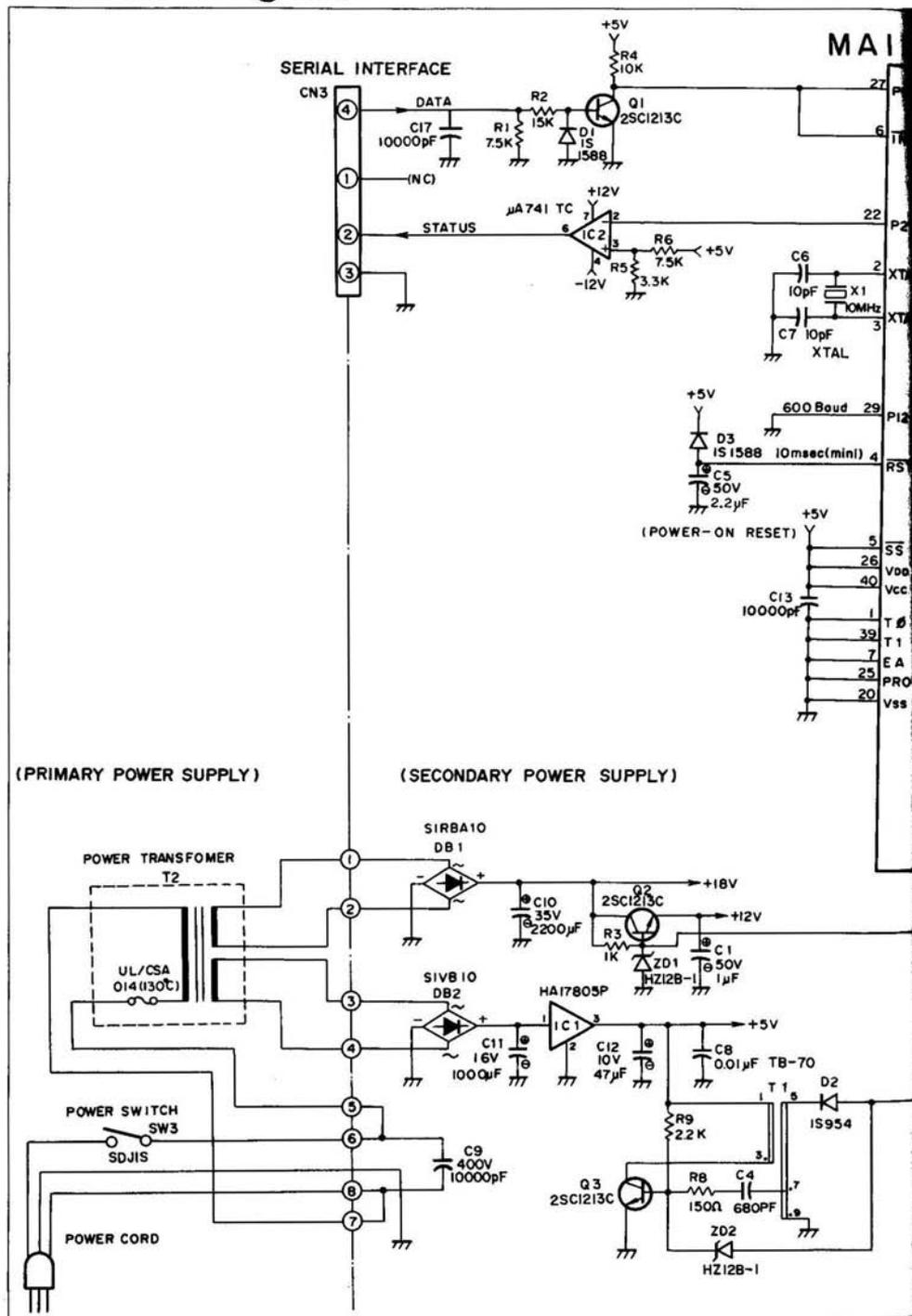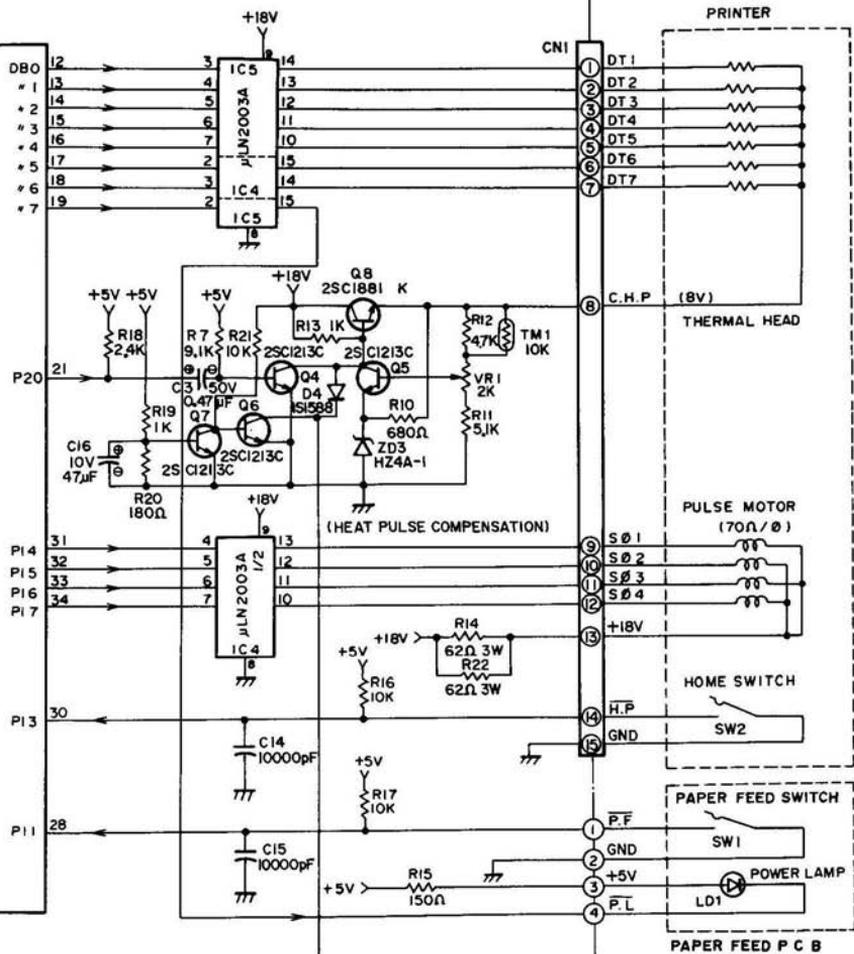| Code			Char.	Code			Char.	Code			Char.
Dec.	Hex.	Oct.		Dec.	Hex	Oct.		Dec.	Hex	Oct.	
32	20	40	(Space)	64	40	100	@	96	60	140	`
33	21	41	!	65	41	101	A	97	61	141	a
34	22	42	"	66	42	102	B	98	62	142	b
35	23	43	#	67	43	103	C	99	63	143	c
36	24	44	$	68	44	104	D	100	64	144	d
37	25	45	%	69	45	105	E	101	65	145	e
38	26	46	&	70	46	106	F	102	66	146	f
39	27	47	'	71	47	107	G	103	67	147	g
40	28	50	(	72	48	110	H	104	68	150	h
41	29	51	)	73	49	111	I	105	69	151	i
42	2A	52	*	74	4A	112	J	106	6A	152	j
43	2B	53	+	75	4B	113	K	107	6B	153	k
44	2C	54	,	76	4C	114	L	108	6C	154	l
45	2D	55	─	77	4D	115	M	109	6D	155	m
46	2E	56	.	78	4E	116	N	110	6E	156	n
47	2F	57	/	79	4F	117	O	111	6F	157	o
48	30	60	0	80	50	120	P	112	70	160	p
49	31	61	1	81	51	121	Q	113	71	161	q
50	32	62	2	82	52	122	R	114	72	162	r
51	33	63	3	83	53	123	S	115	73	163	s
52	34	64	4	84	54	124	T	116	74	164	t
53	35	65	5	85	55	125	U	117	75	165	u
54	36	66	6	86	56	126	V	118	76	166	v
55	37	67	7	87	57	127	W	119	77	167	w
56	38	70	8	88	58	130	X	120	78	170	x
57	39	71	9	89	59	131	Y	121	79	171	y
58	3A	72	:	90	5A	132	Z	122	7A	172	z
59	3B	73	;	91	5B	133	[	123	7B	173	{
60	3C	74	<	92	5C	134	\	124	7C	174	¦
61	3D	75	=	93	5D	135	]	125	7D	175	}
62	3E	76	>	94	5E	136	^	126	7E	176	~
63	3F	77	?	95	5F	137	─				

Table 2

3 dots | 4 dots

6 dots

6 dots
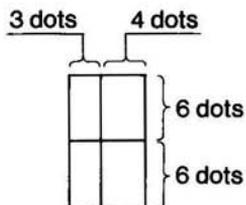
Graphics Character Codes

Code													Char.
Dec.				Hex.				Oct.					
128	144	160	176	80	90	A0	B0	200	220	240	260		
192	208	224	240	C0	D0	E0	F0	300	320	340	360		
129	145	161	177	81	91	A1	B1	201	221	241	261		
193	209	225	241	C1	D1	E1	F1	301	321	341	361		
130	146	162	178	82	92	A2	B2	202	222	242	262		
194	210	226	242	C2	D2	E2	F2	302	322	342	362		
131	147	163	179	83	93	A3	B3	203	223	243	263		
195	211	227	243	C3	D3	E3	F3	303	323	343	363		
132	148	164	180	84	94	A4	B4	204	224	244	264		
196	212	228	244	C4	D4	E4	F4	304	324	344	364		
133	149	165	181	85	95	A5	B5	205	225	245	265		
197	213	229	245	C5	D5	E5	F5	305	325	345	365		
134	150	166	182	86	96	A6	B6	206	226	246	266		
198	214	230	246	C6	D6	E6	F6	306	326	346	366		
135	151	167	183	87	97	A7	B7	207	227	247	267		
199	215	231	247	C7	D7	E7	F7	307	327	347	367		
136	152	168	184	88	98	A8	B8	210	230	250	270		
200	216	232	248	C8	D8	E8	F8	310	330	350	370		

Code			Char.
Dec.	**Hex.**	**Oct.**	

Dec.				Hex.				Oct.				Char.
137	153	169	185	89	99	A9	B9	211	231	251	271	
201	217	233	249	C9	D9	E9	F9	311	331	351	371	
138	154	170	186	8A	9A	AA	BA	212	232	252	272	
202	218	234	250	CA	DA	EA	FA	312	332	352	372	
139	155	171	187	8B	9B	AB	BB	213	233	253	273	
203	219	235	251	CB	DB	EB	FB	313	333	353	373	
140	156	172	188	8C	9C	AC	BC	214	234	254	274	
204	220	236	252	CC	DC	EC	FC	314	334	354	374	
141	157	173	189	8D	9D	AD	BD	215	235	255	275	
205	221	237	253	CD	DD	ED	FD	315	335	355	375	
142	158	174	190	8E	9E	AE	BE	216	236	256	276	
206	222	238	254	CE	DE	EE	FE	316	336	356	376	
143	159	175	191	8F	9F	AF	BF	217	237	257	277	
207	223	239	255	CF	DF	EF	FF	317	337	357	377	

IMPORTANT INFORMATION

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient the receiving antenna

Relocate the computer with respect to the receiver

Move the computer away from the receiver

Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

"How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No.004-000-00345-4.