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# CHAPTER 7

## CARING

### FOR YOUR PRINTER

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**Subjects covered in Chapter 7 include—**

- **Cleaning the printer**
- **Changing the ribbon**
- **Replacing the print head**

Dust and heat will make any mechanism wear more quickly. The best maintenance is *preventive*, so the first step in any maintenance program is correct location of the printer. This is covered in greater detail in Chapter 1, but in general a normal home environment is best for both the computer and the printer.

#### **CLEANING THE PRINTER**

Cleaning the printer regularly will prolong its service life. Use a damp cloth on the exterior every week or so. For stubborn dirt, you may moisten the cloth with alcohol or water containing a mild detergent, but be careful not to spill any liquid into the interior of the printer or onto the print mechanism.

Use a soft brush to remove paper dust and lint from the interior. A small vacuum cleaner can also make this task easier — but be very careful not to bend or injure any electronic parts or wiring. The printer contains delicate electronic parts, so only clean those places where you have easy access.

#### **REPLACING THE RIBBON**

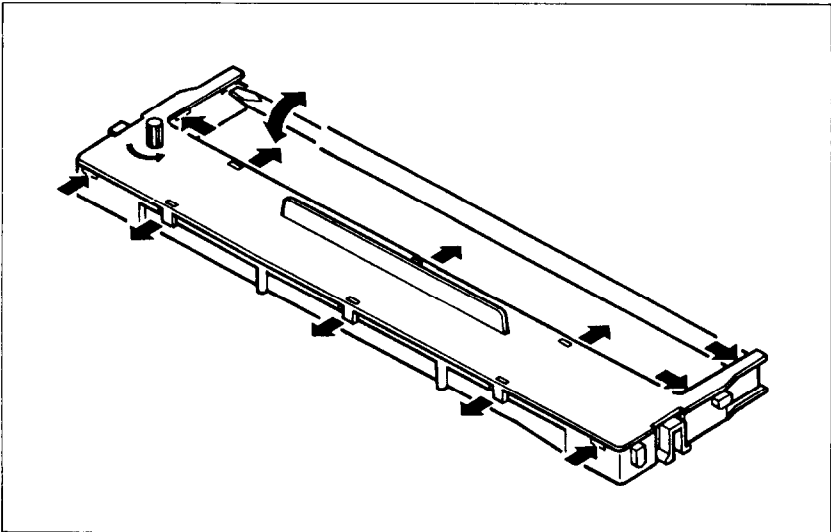
This printer uses an endless-type ribbon cartridge, meaning

that the ribbon is recycled automatically. In time, however, when the print becomes too faint to read clearly, you will need to change either the whole cartridge or the ribbon inside it.

Changing the whole cartridge is the simplest method, and because you don't need to touch the ribbon itself, it is the cleanest way too. To remove the old cartridge, remove the printer cover, grasp the ribbon cartridge with both hands, and pull straight up gently until the holder springs release. To fit the new cartridge, refer to Chapter 1, Installing the ribbon cartridge.

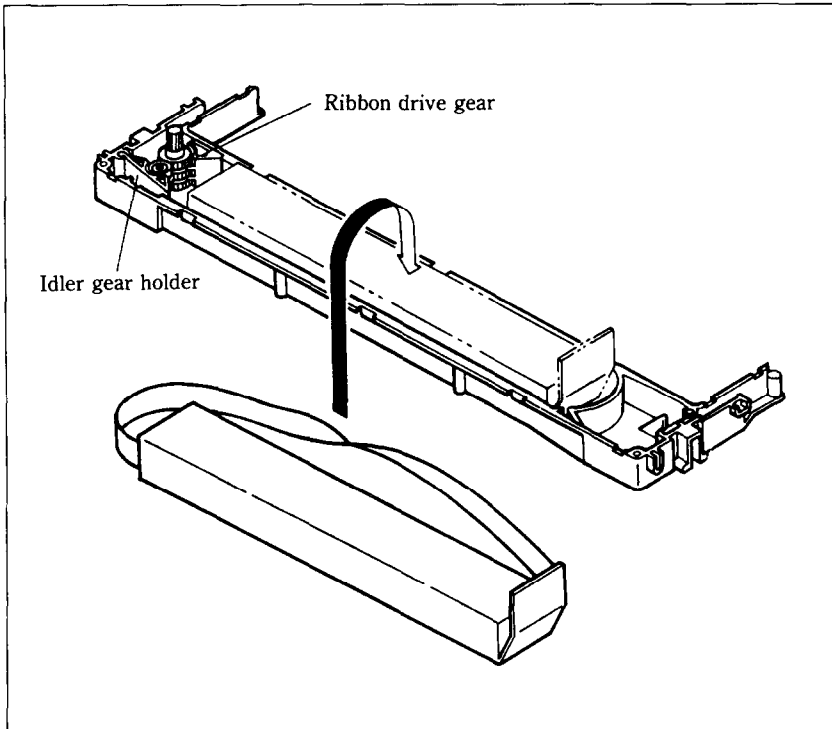
A more economical method is to only replace the ribbon itself. First, obtain the correct type of replacement sub-cassette from your dealer. Use the following procedure to change the ribbon.

1. Place the cartridge on a flat surface, and use a flat-bladed screwdriver to unhook the ten tabs holding the two sections of the cartridge together. See Figure 7-1.
2. After opening the cartridge, take a moment to notice how the ribbon is threaded. Then press a finger against the idler gear holder (it is held in position by spring pressure), and make enough space to remove the ribbon from between the two gears. See Figure 7-2.



**Figure 7-1.** Unhook tabs to pry open the cartridge.

3. Clean the inside of the cartridge, especially around the vicinity of the two gears.

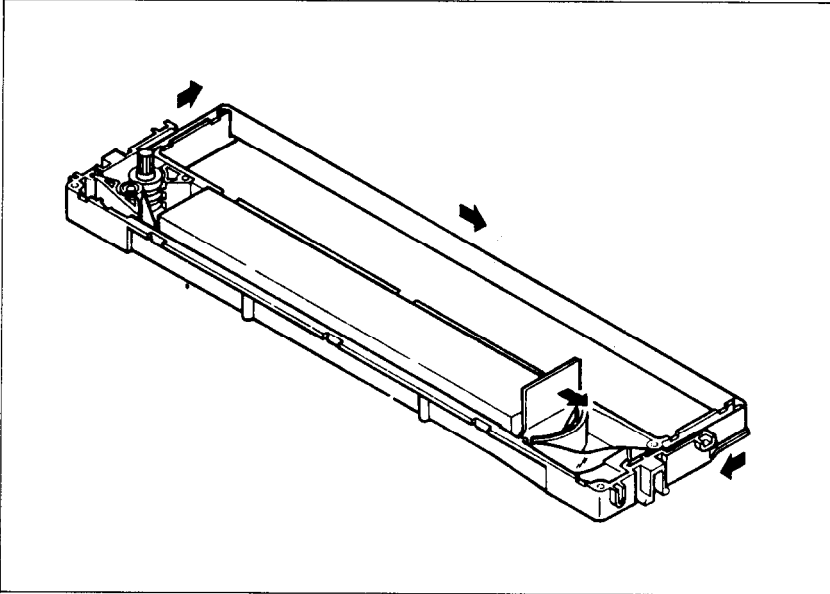


**Figure 7-2.** Replace the ribbon sub-cassette.

4. Take the new ribbon and holder out of the wrapper, remove the adhesive tape on the joint on the holder, and place it into the cassette as shown in Figure 7-2.
5. Pull sufficient ribbon out of the holder, and thread it as shown in Figure 7-3. Be careful that the half-twist in the ribbon is positioned in the right-hand section of the ribbon cartridge. Make sure that no twists occur anywhere else.
6. Again press on the idler gear holder and thread the ribbon between both gears.
7. Remove the top and bottom of the ribbon holder, and replace the cartridge top cover. Snap all ten tabs back into place.

8. When you've completed the installation, remount the cartridge to the printer.

**Note:** You should replace the whole cartridge after replacing the ribbon five times.



**Figure 7-3.** Make sure that the ribbon is not twisted when you thread it through its path.

## REPLACING THE PRINT HEAD

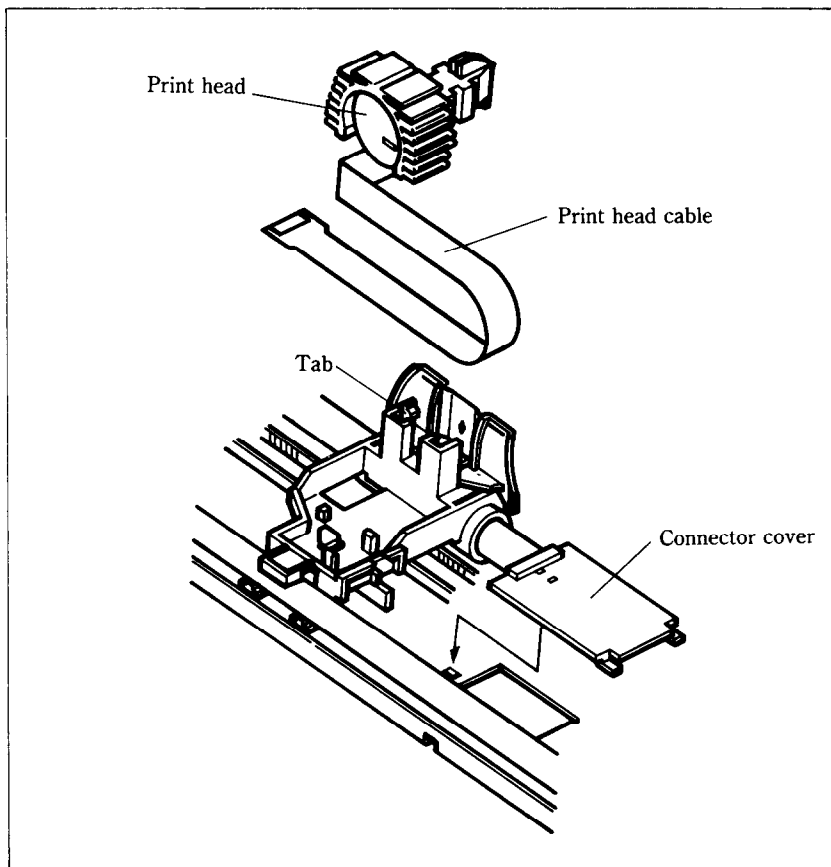
The dot matrix print head has an extremely long life, around 100 million characters, or years of normal use. However, when printing is too light even after replacing the ribbon, you'll know that the print head has reached the end of its service life.

Turn off the power, unplug the power cord, and use the following procedure to replace the print head.

**Warning:** The print head becomes hot during operation. If you have been using the printer, let it stand for a while so that the print head can cool off.

1. Remove the printer cover and the ribbon cartridge.

2. Remove the print head left along the carriage, until you can see the connector cover. Remove the cover from the printer frame; for details, see Figure 7-4. Unplug the print head cable from the head cable board.



**Figure 7-4.** Replacement of the print head.

3. Hold back the tab that locks the print head into place, and remove the print head.
4. Making sure that the new print head is facing the correct direction, carefully plug the cable into the connector on the head cable board. Make sure that this connection is secure, and that the cable is inserted far enough into the connector.

5. Replace the connector cover, and feed the cable under the support tab on the top of the cover.
6. Fit the new print head into its support, while holding the tab back. Make sure that the print head is inserted into its guides as far as it can go, and that the tab locks the print head into place.

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## APPENDIX A

# DIP SWITCH SETTINGS

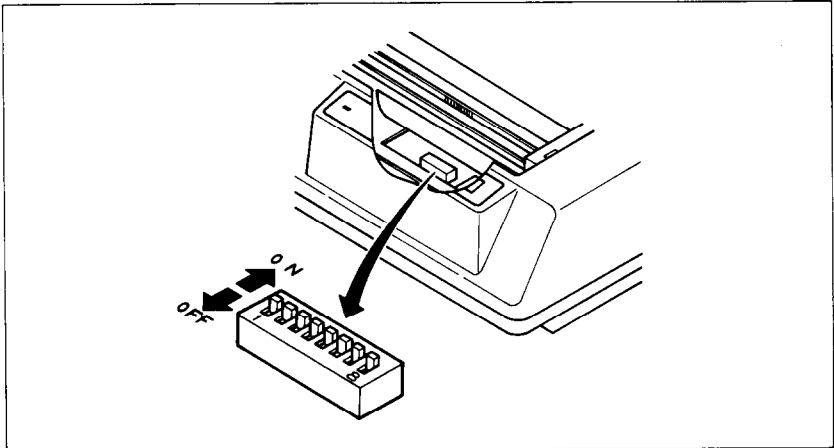
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The DIP (Dual In-line Package) switches control many of the functions of the printer. A DIP switch contains a number of small switches, and in this printer, one DIP switch has 8 individual switches.

The DIP switch is easily accessible from the top of the printer. Remove the ribbon cartridge, and you will see the DIP switch underneath a sheet of protective plastic film, which you fold back for access. The individual switches of DIP switch are named from 1-1 to 1-8.

To change a setting, turn the power OFF, and use a ball-point pen or similar to move any of the small white switches to the front or back of the printer. The "on" position for all switches is towards the back of the printer, and "off" is to the front. Figure A-1 shows the location of the printer's DIP switch.



**Figure A-1.** The DIP switch is located under the printer cover.

**Caution:** Never change the setting of any of the DIP switches when the power is on. The printer only reads the DIP switch settings at the moment the power is turned on. Turn off power to both the computer and the printer when changing settings, and turn on again to use the new settings.

Table A-1 shows a summary of DIP switch functions.

**Table A-1**  
**DIP switch settings**

Switch	ON	OFF
1-1	Ignore download characters	Enable download characters
1-2	Paper-out detected	Paper-out not detected
1-3	LF from host	Auto LF with CR
1-4	No bottom margin / Character set #1	Set bottom margin to 1 inch / Character set #2
1-5	11-inch page length	12-inch page length
1-6	Set Standard mode	Set IBM mode
1-7	International character set selection — see Table A-2.	
1-8		

## SWITCH FUNCTIONS

### Switch Function

- 1-1 This switch controls the RAM. When this switch is on, the download character definitions are ignored and the RAM is used as a print buffer. When this switch is off, the download character definitions are enable and the print buffer is set to a one line buffer. This switch is set on at the factory.
- 1-2 This switch disables the paper-out detector. If this switch is on, the printer will signal the computer when it runs out of paper and printing will stop. If this switch is off, the printer will ignore the paper-out detector and will continue printing. This switch is set on at the factory.
- 1-3 When this switch is on, the computer must send a line feed command each time to advance the paper. When this switch is off, the printer will automatical-



- ly advance the paper one line every time it receives a carriage return. (For example, most BASIC's send a line feed with every carriage return; in this case, this switch should be on.) This switch is set on at the factory.
- 1-4 This switch determines the default bottom margin or selects the default character set depending on the setting of DIP switch 1-6. When the DIP switch 1-6 is set on and this switch is on, the bottom margin is not set at power-on. When this switch is off with the DIP switch 1-6 on, the bottom margin is automatically set to 1 inch. When the DIP switch 1-6 is set off and this switch is on, the default character set is Character Set #1. Character Set #2 is selected when this switch is set off with the DIP switch 1-6 off. This switch is set on at the factory.
- 1-5 This switch sets the default page length. If this switch is on the default page length is 11 inches. If this switch is off the default page length is 12 inches. This switch is set on at the factory.
- 1-6 This switch selects the active control codes. Turn this switch on to use the "Standard" mode. Turn this switch off to use the "IBM" compatible mode. This switch is set on at the factory.
- 1-7,1-8 These switch determine the default international character set, as shown in Table A-2. These switches are all set on at the factory.

**Table A-2**  
**International character sets**

<b>Switch</b>	<b>U.S.A</b>	<b>France</b>	<b>Germany</b>	<b>England</b>
1-7	ON	OFF	ON	OFF
1-8	ON	ON	OFF	OFF

**MEMO**

# APPENDIX B

## ASCII CODE

### CONVERSION CHART

Decimal	Binary	Hexadecimal	Decimal	Binary	Hexadecimal	Decimal	Binary	Hexadecimal
0	00000000	00	46	00101110	2E	92	01011100	5C
1	00000001	01	47	00101111	2F	93	01011101	5D
2	00000010	02	48	00110000	30	94	01011110	5E
3	00000011	03	49	00110001	31	95	01011111	5F
4	00000100	04	50	00110010	32	96	01100000	60
5	00000101	05	51	00110011	33	97	01100001	61
6	00000110	06	52	00110100	34	98	01100010	62
7	00000111	07	53	00110101	35	99	01100011	63
8	00001000	08	54	00110110	36	100	01100100	64
9	00001001	09	55	00110111	37	101	01100101	65
10	00001010	0A	56	00111000	38	102	01100110	66
11	00001011	0B	57	00111001	39	103	01100111	67
12	00001100	0C	58	00111010	3A	104	01101000	68
13	00001101	0D	59	00111011	3B	105	01101001	69
14	00001110	0E	60	00111100	3C	106	01101010	6A
15	00001111	0F	61	00111101	3D	107	01101011	6B
16	00010000	10	62	00111110	3E	108	01101100	6C
17	00010001	11	63	00111111	3F	109	01101101	6D
18	00010010	12	64	01000000	40	110	01101110	6E
19	00010011	13	65	01000001	41	111	01101111	6F
20	00010100	14	66	01000010	42	112	01110000	70
21	00010101	15	67	01000011	43	113	01110001	71
22	00010110	16	68	01000100	44	114	01110010	72
23	00010111	17	69	01000101	45	115	01110011	73
24	00011000	18	70	01000110	46	116	01110100	74
25	00011001	19	71	01000111	47	117	01110101	75
26	00011010	1A	72	01001000	48	118	01110110	76
27	00011011	1B	73	01001001	49	119	01110111	77
28	00011100	1C	74	01001010	4A	120	01111000	78
29	00011101	1D	75	01001011	4B	121	01111001	79
30	00011110	1E	76	01001100	4C	122	01111010	7A
31	00011111	1F	77	01001101	4D	123	01111011	7B
32	00100000	20	78	01001110	4E	124	01111100	7C
33	00100001	21	79	01001111	4F	125	01111101	7D
34	00100010	22	80	01010000	50	126	01111110	7E
35	00100011	23	81	01010001	51	127	01111111	7F
36	00100100	24	82	01010010	52	128	10000000	80
37	00100101	25	83	01010011	53	129	10000001	81
38	00100110	26	84	01010100	54	130	10000010	82
39	00100111	27	85	01010101	55	131	10000011	83
40	00101000	28	86	01010110	56	132	10000100	84
41	00101001	29	87	01010111	57	133	10000101	85
42	00101010	2A	88	01011000	58	134	10000110	86
43	00101011	2B	89	01011001	59	135	10000111	87
44	00101100	2C	90	01011010	5A	136	10001000	88
45	00101101	2D	91	01011011	5B	137	10001001	89

Decimal	Binary	Hexadecimal	Decimal	Binary	Hexadecimal	Decimal	Binary	Hexadecimal
138	10001010	8A	178	10110010	B2	218	11011010	DA
139	10001011	8B	179	10110011	B3	219	11011011	DB
140	10001100	8C	180	10110100	B4	220	11011100	DC
141	10001101	8D	181	10110101	B5	221	11011101	DD
142	10001110	8E	182	10110110	B6	222	11011110	DE
143	10001111	8F	183	10110111	B7	223	11011111	DF
144	10010000	90	184	10111000	B8	224	11100000	E0
145	10010001	91	185	10111001	B9	225	11100001	E1
146	10010010	92	186	10111010	BA	226	11100010	E2
147	10010011	93	187	10111011	BB	227	11100011	E3
148	10010100	94	188	10111100	BC	228	11100100	E4
149	10010101	95	189	10111101	BD	229	11100101	E5
150	10010110	96	190	10111110	BE	230	11100110	E6
151	10010111	97	191	10111111	BF	231	11100111	E7
152	10011000	98	192	11000000	C0	232	11101000	E8
153	10011001	99	193	11000001	C1	233	11101001	E9
154	10011010	9A	194	11000010	C2	234	11101010	EA
155	10011011	9B	195	11000011	C3	235	11101011	EB
156	10011100	9C	196	11000100	C4	236	11101100	EC
157	10011101	9D	197	11000101	C5	237	11101101	ED
158	10011110	9E	198	11000110	C6	238	11101110	EE
159	10011111	9F	199	11000111	C7	239	11101111	EF
160	10100000	A0	200	11001000	C8	240	11110000	F0
161	10100001	A1	201	11001001	C9	241	11110001	F1
162	10100010	A2	202	11001010	CA	242	11110010	F2
163	10100011	A3	203	11001011	CB	243	11110011	F3
164	10100100	A4	204	11001100	CC	244	11110100	F4
165	10100101	A5	205	11001101	CD	245	11110101	F5
166	10100110	A6	206	11001110	CE	246	11110110	F6
167	10100111	A7	207	11001111	CF	247	11110111	F7
168	10101000	A8	208	11010000	D0	248	11111000	F8
169	10101001	A9	209	11010001	D1	249	11111001	F9
170	10101010	AA	210	11010010	D2	250	11111010	FA
171	10101011	AB	211	11010011	D3	251	11111011	FB
172	10101100	AC	212	11010100	D4	252	11111100	FC
173	10101101	AD	213	11010101	D5	253	11111101	FD
174	10101110	AE	214	11010110	D6	254	11111110	FE
175	10101111	AF	215	11010111	D7	255	11111111	FF
176	10110000	B0	216	11011000	D8			
177	10110001	B1	217	11011001	D9			

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# APPENDIX C

# CHARACTER CODE

# TABLE

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The purpose of this Appendix is to provide a quick reference for the relationship between the characters available on this printer and the decimal or hexadecimal values.

For example, when you refer the character "A", it sits in the "4" column and the "1" row. So its hexadecimal value is "41". Similarly, it is written "65" close to the character, which shows the decimal value.

When you refer the table, there are many control codes, which are written inside broken brackets.

**[Sample]**

Hexa- decimal	0	1	2	3	4	5	6	7
0	<NUL> 0	16	SP 32	0 48	@ 64	P 80		p 112
1	1	<DC1> 17	! 33	1 49	A 65	Q 81	a 97	q 113
2	2	<DC2> 18	" 34	2 50	B 66	R 82	b 98	r 114
3					C 67	S 83	c	

Character

Hexadecimal value  
(high order)

Hexadecimal  
value  
(low order)

Control code

Decimal value

## STANDARD MODE CHARACTERS

Hexa- decimal	0	1	2	3	4	5	6	7
0	<NUL> 0	16	32	0 48	@ 64	P 80	' 96	P 112
1	1	<DC1> 17	! 33	1 49	A 65	Q 81	a 97	q 113
2	2	<DC2> 18	" 34	2 50	B 66	R 82	b 98	r 114
3	3	<DC3> 19	# 35	3 51	C 67	S 83	c 99	s 115
4	4	<DC4> 20	\$ 36	4 52	D 68	T 84	d 100	t 116
5	5	21	% 37	5 53	E 69	U 85	e 101	u 117
6	6	22	& 38	6 54	F 70	V 86	f 102	v 118
7	<BEL> 7	23	' 39	7 55	G 71	W 87	g 103	w 119
8	<BS> 8	<CAN> 24	( 40	8 56	H 72	X 88	h 104	x 120
9	<HT> 9	25	) 41	9 57	I 73	Y 89	i 105	y 121
A	<LF> 10	26	* 42	: 58	J 74	Z 90	j 106	z 122
B	<VT> 11	<ESC> 27	+ 43	; 59	K 75	[ 91	k 107	{ 123
C	<FF> 12	28	, 44	< 60	L 76	\ 92	l 108	! 124
D	<CR> 13	29	- 45	= 61	M 77	] 93	m 109	} 125
E	<SO> 14	30	. 46	> 62	N 78	^ 94	n 110	~ 126
F	<SI> 15	31	/ 47	? 63	O 79	_ 95	o 111	<DEL> 127

Hexa- decimal	8	9	A	B	C	D	E	F
<b>0</b>	<NUL> 128	144	160	0 176	@ 192	P 208	' 224	p 240
<b>1</b>	129	<DC1> 145	! 161	1 177	A 193	Q 209	a 225	q 241
<b>2</b>	130	<DC2> 146	" 162	2 178	B 194	R 210	b 226	r 242
<b>3</b>	131	<DC3> 147	# 163	3 179	C 195	S 211	c 227	s 243
<b>4</b>	132	<DC4> 148	\$ 164	4 180	D 196	T 212	d 228	t 244
<b>5</b>	133	149	⌘ 165	5 181	E 197	U 213	e 229	u 245
<b>6</b>	134	150	& 166	6 182	F 198	V 214	f 230	v 246
<b>7</b>	<BEL> 135	151	' 167	7 183	G 199	W 215	g 231	w 247
<b>8</b>	<BS> 136	<CAN> 152	( 168	8 184	H 200	X 216	h 232	x 248
<b>9</b>	<HT> 137	153	) 169	9 185	I 201	Y 217	i 233	y 249
<b>A</b>	<LF> 138	154	* 170	: 186	J 202	Z 218	j 234	z 250
<b>B</b>	<VT> 139	<ESC> 155	+ 171	; 187	K 203	[ 219	k 235	{ 251
<b>C</b>	<FF> 140	156	, 172	< 188	L 204	\ 220	l 236	 252
<b>D</b>	<CR> 141	157	- 173	= 189	M 205	] 221	m 237	} 253
<b>E</b>	<SO> 142	158	. 174	> 190	N 206	^ 222	n 238	~ 254
<b>F</b>	<SI> 143	159	/ 175	? 191	O 207	_ 223	o 239	<DEL> 255

## IBM MODE CHARACTERS

## ■ Character set #1

Hexa- decimal	0	1	2	3	4	5	6	7
<b>0</b>	<NUL> 0	16	32	48	@	P	'	p
<b>1</b>	1	<DC1> 17	!	33	49	A	Q	a
<b>2</b>	2	<DC2> 18	"	34	50	B	R	b
<b>3</b>	3	<DC3> 19	#	35	51	C	S	c
<b>4</b>	4	<DC4> 20	\$	36	52	D	T	d
<b>5</b>	5	21	%	37	53	E	U	e
<b>6</b>	6	22	&	38	54	F	V	f
<b>7</b>	<BEL> 7	23	'	39	55	G	W	g
<b>8</b>	<BS> 8	<CAN> 24	(	40	56	H	X	h
<b>9</b>	<HT> 9	25	)	41	57	I	Y	i
<b>A</b>	<LF> 10	26	*	42	58	J	Z	j
<b>B</b>	<VT> 11	<ESC> 27	+	43	59	K	[	k
<b>C</b>	<FF> 12	<FS> 28	,	44	60	L	\	l
<b>D</b>	<CR> 13	29	-	45	61	M	]	m
<b>E</b>	<SO> 14	30	.	46	62	N	^	n
<b>F</b>	<SI> 15	31	/	47	63	O	_	o
				?	63			<DEL> 127



Hexa- decimal	8	9	A	B	C	D	E	F
0	<NUL> 128		á 160	 176	⌞ 192	⌞ 208	α 224	≡ 240
1		<DC1> 145	í 161	 177	⌞ 193	⌞ 209	β 225	± 241
2		<DC2> 146	ó 162	 178	⌞ 194	⌞ 210	Γ 226	¿ 242
3		<DC3> 147	ú 163	 179	† 195	⌞ 211	π 227	¿ 243
4		<DC4> 148	ñ 164	† 180	- 196	⌞ 212	Σ 228	∫ 244
5			ñ 165	† 181	† 197	† 213	σ 229	∫ 245
6			á 166	† 182	† 198	† 214	μ 230	+ 246
7	<BEL> 135		Ω 167	† 183	† 199	† 215	τ 231	≈ 247
8	<BS> 136	<CAN> 152	¿ 168	† 184	⌞ 200	† 216	Φ 232	° 248
9	<HT> 137		¬ 169	† 185	† 201	† 217	θ 233	· 249
A	<LF> 138		¬ 170	 186	⌞ 202	† 218	Ω 234	- 250
B	<VT> 139	<ESC> 155	½ 171	† 187	† 203	 219	δ 235	∫ 251
C	<FF> 140	<FS> 156	¾ 172	† 188	† 204	■ 220	∞ 236	∩ 252
D	<CR> 141		í 173	⌞ 189	= 205	 221	∅ 237	² 253
E	<SO> 142		« 174	† 190	† 206	 222	€ 238	· 254
F	<SI> 143		» 175	† 191	⌞ 207	■ 223	∩ 239	

■ Character set #2

Hexa- decimal	0	1	2	3	4	5	6	7	
<b>0</b>	(NUL) 0	16	32	48	@	P	'	p	
<b>1</b>	1	<DC1> 17	!	33	49	A	Q	a	q
<b>2</b>	2	<DC2> 18	"	34	50	B	R	b	r
<b>3</b>	♥ 3	<DC3> 19	#	35	51	C	S	c	s
<b>4</b>	♦ 4	<DC4> 20	\$	36	52	D	T	d	t
<b>5</b>	‡ 5	§ 21	%	37	53	E	U	e	u
<b>6</b>	‡ 6	22	&	38	54	F	V	f	v
<b>7</b>	(BEL) 7	23	'	39	55	G	W	g	w
<b>8</b>	<BS> 8	<CAN> 24	(	40	56	H	X	h	x
<b>9</b>	<HT> 9	25	)	41	57	I	Y	i	y
<b>A</b>	<LF> 10	26	*	42	58	J	Z	j	z
<b>B</b>	<VT> 11	<ESC> 27	+	43	59	K	[	k	{
<b>C</b>	<FF> 12	<FS> 28	,	44	60	L	\	l	!
<b>D</b>	<CR> 13	29	-	45	61	M	]	m	}
<b>E</b>	<SO> 14	30	.	46	62	N	^	n	~
<b>F</b>	<SI> 15	31	/	47	63	O	-	o	<DEL> 127

Hexa- decimal	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	 176	⌞ 192	⌞ 208	α 224	■ 240
1	ü 129	æ 145	í 161	 177	⌞ 193	⌞ 209	β 225	± 241
2	é 130	Æ 146	ó 162	 178	⌞ 194	⌞ 210	Γ 226	∑ 242
3	â 131	ô 147	ú 163	 179	⌞ 195	⌞ 211	π 227	∑ 243
4	ä 132	ö 148	ñ 164	⌞ 180	— 196	⌞ 212	Σ 228	∫ 244
5	à 133	ò 149	ñ 165	⌞ 181	† 197	⌞ 213	σ 229	∫ 245
6	â 134	û 150	â 166	 182	⌞ 198	⌞ 214	μ 230	+ 246
7	ç 135	ù 151	Ω 167	⌞ 183	⌞ 199	⌞ 215	τ 231	≈ 247
8	ê 136	ÿ 152	¿ 168	⌞ 184	⌞ 200	⌞ 216	ϕ 232	° 248
9	ë 137	ÿ 153	⌞ 169	 185	⌞ 201	⌞ 217	θ 233	- 249
A	è 138	Û 154	⌞ 170	 186	⌞ 202	⌞ 218	Ω 234	- 250
B	ï 139	ç 155	½ 171	⌞ 187	⌞ 203	■ 219	δ 235	∫ 251
C	í 140	£ 156	¼ 172	⌞ 188	⌞ 204	■ 220	∞ 236	∞ 252
D	ì 141	¥ 157	ì 173	⌞ 189	= 205	■ 221	∅ 237	² 253
E	ⓧ 142	℞ 158	« 174	⌞ 190	⌞ 206	■ 222	€ 238	■ 254
F	Ⓐ 143	ƒ 159	» 175	⌞ 191	⌞ 207	■ 223	∩ 239	

**MEMO**

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# APPENDIX D

## FUNCTION CODES

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The purpose of this Appendix is to provide a quick reference for the various functions available on this printer. Codes are described in the following format.

<b>PURPOSE</b>	<b>Tells what the function code does.</b>
<b>CODE</b> (decimal ASCII) (hex ASCII)	Control code mnemonic ASCII decimal equivalent Hexadecimal equivalent
<b>REMARKS</b>	Briefly describes how the command is used.
<b>SEE</b>	Tells where any additional details of the command may be found.

Several commands require you to specify a value or values. In these cases, we have used an “*n*” or “*m*” to indicate a variable. You should insert the ASCII code for the proper value here.

## COMMANDS TO CONTROL PRINT STYLE

These commands are used to control the font style, the print pitch, and special effects.

### ■ Font style controls

**PURPOSE**                      **Selects italic characters.**

<b>CODE</b>	<b>&lt;ESC&gt;</b>	<b>"4"</b>
(decimal ASCII)	27	52
(hex ASCII)	1B	34

**REMARKS**                      This command causes all subsequent Draft characters to be printed in italics until italic printing is cancelled.

**SEE**                              Chapter 3

**PURPOSE**                       **Cancels italic characters.**

<b>CODE</b>	<b>&lt;ESC&gt;</b>	<b>"5"</b>
(decimal ASCII)	27	53
(hex ASCII)	1B	35

**REMARKS**                      This command causes the printer to cancel italic printing and select the standard roman characters.

**SEE**                              Chapter 3

**PURPOSE**                      **Selects an international character set.**

<b>CODE</b>	<ESC>	"R"	<i>n</i>
(decimal ASCII)	27	82	<i>n</i>
(hex ASCII)	1B	52	<i>n</i>

**REMARKS**                      This command selects the international character set according to the value of *n* as shown in the table below:

<i>n</i>	Character set	<i>n</i>	Character set
0	U.S.A.	6	Italy
1	France	7	Spain
2	Germany	8	Japan
3	England	9	Norway
4	Denmark I	10	Denmark II
5	Sweden		

You can select a particular international character set as a power-on default by adjusting the settings of DIP switches 1-7 and 1-8.

**SEE**                                      Chapter 5

**PURPOSE**                      **Selects character set #2.**

<b>CODE</b>	<ESC>	"6"
(decimal ASCII)	27	54
(hex ASCII)	1B	36

**REMARKS**                      This command selects the character set #2 when the DIP switch 1-6 is set off. You can select character set #2 as the power-on default by turning DIP switch 1-4 off.

**SEE**                                      Chapter 5

**PURPOSE**                      **Selects character set #1.**

<b>CODE</b>	<ESC>	"7"
(decimal ASCII)	27	55
(hex ASCII)	1B	37

**REMARKS**                      This command causes the printer to cancel character set #2 and selects instead character set #1 when the DIP switch 1-6 is set off. You can select character set #1 as the power-on default by turning DIP switch 1-4 on.

**SEE**                              Chapter 5

**PURPOSE**                      **Selects NLQ characters.**

<b>CODE</b>	<ESC>	"x"	1
(decimal ASCII)	27	120	1
(hex ASCII)	1B	78	01

**REMARKS**                      This command causes the printer to print near letter quality (NLQ) characters until the NLQ mode is cancelled. This command is ignored when the "Panel" mode is selected at power-on.  
**NOTE:** The character "1" (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE**                              Chapter 3



**PURPOSE** **Cancels NLQ characters.**

<b>CODE</b>	<ESC>	"x"	0
(decimal ASCII)	27	120	0
(hex ASCII)	1B	78	00

**REMARKS** This command cancels NLQ printing and returns the printer to the draft mode. This command is ignored when the "Panel" mode is selected at power-on.  
**NOTE:** The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

**SEE** Chapter 3

■ **Font pitch controls**

**PURPOSE** **Sets the print pitch to pica.**

<b>CODE</b>	<ESC>	"P"
(decimal ASCII)	27	80
(hex ASCII)	1B	50

**REMARKS** This command causes printing to be done in pica pitch, with 80 characters per line.

**SEE** Chapter 3

**PURPOSE** **Sets the print pitch to elite.**

<b>CODE</b>	<ESC>	"M"
(decimal ASCII)	27	77
(hex ASCII)	1B	4D

**REMARKS** This command causes printing except NLQ characters to be done in elite pitch, with 96 characters per line.

**SEE** Chapter 3

**PURPOSE**                      **Sets the printer to condensed print.**

**CODE**                            <SI>  
(decimal ASCII)                15  
(hex ASCII)                    0F

**REMARKS**                      This command causes printing to be done in condensed pitch, with 136 characters per line for pica condensed, and 160 characters per line for elite condensed (NLQ characters are not printed in condensed pitch).

**SEE**                             Chapter 3

**PURPOSE**                      **Sets the printer to condensed print.**

**CODE**                            <ESC>      <SI>  
(decimal ASCII)                27          15  
(hex ASCII)                    1B          0F

**REMARKS**                      Same as <SI>, above.

**SEE**                             Chapter 3

**PURPOSE**                       **Cancels condensed print.**

**CODE**                            <DC2>  
(decimal ASCII)                18  
(hex ASCII)                    12

**REMARKS**                      This command cancels condensed printing and returns the printer to the normal print pitch.

**SEE**                             Chapter 3

**PURPOSE**                      **Sets the printer to proportional print.**

CODE	<ESC>	“p”	1
(decimal ASCII)	27	112	1
(hex ASCII)	1B	70	01

**REMARKS**                      This command causes all subsequent Draft characters to be printed with proportional spacing until proportional printing is cancelled.

**NOTE:** The character “1” (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE**                              Chapter 3

**PURPOSE**                       **Cancels proportional print.**

CODE	<ESC>	“p”	0
(decimal ASCII)	27	112	0
(hex ASCII)	1B	70	00

**REMARKS**                      This command cancels proportional printing and returns to “fixed pitch” printing.

**NOTE:** The character “0” (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

**SEE**                              Chapter 3

**PURPOSE** Sets the printer to expanded print.

<b>CODE</b>	<ESC>	“W”	1
(decimal ASCII)	27	87	1
(hex ASCII)	1B	57	01

**REMARKS** This command causes characters to be printed twice as wide as normal (half the current pitch) until expanded printing is cancelled.

**NOTE:** The character “1” (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE** Chapter 3

**PURPOSE** Cancels expanded print.

<b>CODE</b>	<ESC>	“0”	0
(decimal ASCII)	27	87	0
(hex ASCII)	1B	57	00

**REMARKS** This command resets the character pitch to what it was before expanded printing was set.

**NOTE:** The character “0” (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

**SEE** Chapter 3

**PURPOSE**                   **Sets the printer to expanded print for the remainder of the current line.**

**CODE**                        **<SO>**  
(decimal ASCII)                14  
(hex ASCII)                    0E

**REMARKS**                   This command causes characters to be printed twice as wide as normally until a carriage return is sent. It can also be cancelled with **<DC4>**.

**SEE**                         Chapter 3

**PURPOSE**                   **Sets the printer to expanded print for the remainder of the current line.**

**CODE**                        **<ESC>**    **<SO>**  
(decimal ASCII)                27        14  
(hex ASCII)                    1B        0E

**REMARKS**                   Same as **<SO>**, above.

**SEE**                         Chapter 3

**PURPOSE**                   **Cancels one line expanded print.**

**CODE**                        **<DC4>**  
(decimal ASCII)                20  
(hex ASCII)                    14

**REMARKS**                   This command cancels one line expanded print set with **<SO>** or **<ESC> <SO>**.

**SEE**                         Chapter 3

## ■ Special print modes

### PURPOSE

**Sets the master print mode.**

### CODE

(decimal ASCII)

(hex ASCII)

<ESC>

27

1B

"!"

33

21

*n*

*n*

*n*

### REMARKS

This is a powerful command that allows the user to set several printing characteristics at one time: print pitch, condensed print, expanded print, boldface, italics, underlining, or any combination of these, as determined by *n*, a number from 0 to 255. (See Table 3-10 for details.)

### SEE

Chapter 3

### PURPOSE

**Selects emphasized printing.**

### CODE

(decimal ASCII)

(hex ASCII)

<ESC>

27

1B

"E"

69

45

### REMARKS

This command causes characters to be printed in emphasized until cancelled.

### SEE

Chapter 3

### PURPOSE

**Cancels emphasized printing.**

### CODE

(decimal ASCII)

(hex ASCII)

<ESC>

27

1B

"F"

70

46

### REMARKS

This command cancels emphasized printing and returns the printer to normal printing.

### SEE

Chapter 3

**PURPOSE**                   **Selects boldface printing.**

<b>CODE</b>	⟨ESC⟩	“G”
(decimal ASCII)	27	71
(hex ASCII)	1B	47

**REMARKS**                   This command causes characters to be printed in boldface until cancelled.

**SEE**                         Chapter 3

**PURPOSE**                    **Cancels boldface printing.**

<b>CODE</b>	⟨ESC⟩	“H”
(decimal ASCII)	27	72
(hex ASCII)	1B	48

**REMARKS**                   This command turns off boldface printing and returns the printer to normal printing.

**SEE**                         Chapter 3

**PURPOSE**                   **Selects underlining.**

<b>CODE</b>	⟨ESC⟩	“—”	1
(decimal ASCII)	27	45	1
(hex ASCII)	1B	2D	01

**REMARKS**                   This command underlines the following characters until cancelled.  
**NOTE:** The character “1” (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE**                         Chapter 3

**PURPOSE****Cancels underlining.**

CODE	<ESC>	"_"	0
(decimal ASCII)	27	45	0
(hex ASCII)	1B	2D	00

**REMARKS**

This command stops underlining.

**NOTE:** The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

**SEE**

Chapter 3

**PURPOSE****Selects superscripts.**

CODE	<ESC>	"S"	0
(decimal ASCII)	27	83	0
(hex ASCII)	1B	53	00

**REMARKS**

This command raises the following characters and prints them as superscripts until cancelled. Superscripts are printed from left to right only and in boldface.

**NOTE:** The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

**SEE**

Chapter 3



**PURPOSE****Selects subscripts.****CODE**

(decimal ASCII)

(hex ASCII)

&lt;ESC&gt;

27

1B

"S"

83

53

1

1

01

**REMARKS**

This command lowers the following characters and prints them as subscripts until cancelled. All conditions applicable to superscripts also apply to subscripts.

**NOTE:** The character "1" (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE**

Chapter 3

**PURPOSE****Cancels a superscript or subscript.****CODE**

(decimal ASCII)

(hex ASCII)

&lt;ESC&gt;

27

1B

"T"

84

54

**REMARKS**

This command stops printing of superscripts or subscripts and returns to the normal printing previously set. It also cancels uni-directional printing and boldface, which are set automatically for superscripts and subscripts.

**SEE**

Chapter 3

## CONTROLLING THE VERTICAL PRINT POSITION

These commands are used to move the paper relative to the print head. By moving the paper up or down, the print head, in effect, moves the opposite direction (down or up) on the page.

### ■ Line feed and reverse line feed controls

**PURPOSE**                      **Advances the paper one line (line feed).**

**CODE**                              <LF>  
 (decimal ASCII)                    10  
 (hex ASCII)                        0A

**REMARKS**                      The actual distance advanced of the line feed is set through various codes (see below). When the DIP switch 1-3 is off, a line feed is automatically generated whenever the printer receives a carriage return.

**SEE**                                Chapter 4

**PURPOSE**                      **Reverses the paper one line.**

**CODE**                              <ESC>      <LF>  
 (decimal ASCII)                    27            10  
 (hex ASCII)                        1B            0A

**REMARKS**                      This command causes the printer to reverse the paper (in effect moving the print head up on the sheet) one line. The actual distance travelled is set through various codes (see below).

**SEE**                                Chapter 4

**PURPOSE**                   **Sets line spacing to 1/8 inch.**

**CODE**                        <ESC>        "0"  
 (decimal ASCII)            27            48  
 (hex ASCII)                1B            30

**REMARKS**                This command sets the actual distance the paper advances or reverses during all subsequent line feeds to 1/8 inch.

**SEE**                        Chapter 4

**PURPOSE**                   **Sets line spacing to 7/72 inch.**

**CODE**                        <ESC>        "1"  
 (decimal ASCII)            27            49  
 (hex ASCII)                1B            31

**REMARKS**                This command sets the actual distance the paper advances or reverses during all subsequent line feeds to 7/72 inch.

**SEE**                        Chapter 4

**PURPOSE**                   **Sets line spacing to  $n/216$  inch.**

**CODE**                        <ESC>        "3"        *n*  
 (decimal ASCII)            27         51        *n*  
 (hex ASCII)                1B         33        *n*

**REMARKS**                This command sets the actual distance the paper advances or reverses during all subsequent line feeds to  $n/216$  inch. The value of  $n$  must be between 0 and 255.

**SEE**                        Chapter 4

PURPOSE	<b>Sets or defines line spacing to <math>n/72</math> inch.</b>		
CODE	<ESC>	"A"	$n$
(decimal ASCII)	27	65	$n$
(hex ASCII)	1B	41	$n$
REMARKS	<p>This command works in two different functions depending on the setting of DIP switch 1-6. When the DIP switch 1-6 is set off, this command defines the actual distance the paper advances during all subsequent line feeds to <math>n/72</math> inch. This command must be used in conjunction with &lt;ESC&gt; "2" which activates the &lt;ESC&gt; "A" definition.</p> <p>When the DIP switch 1-6 is set on, this command sets the actual distance the paper advances during all subsequent line feeds to <math>n/72</math> inch immediately. The value of <math>n</math> must be between 1 and 255.</p>		

SEE

Chapter 4

PURPOSE	<b>Sets line spacing to <math>n/72</math> inch, or Use &lt;ESC&gt;"A" definition.</b>		
CODE	<ESC>	"2"	
(decimal ASCII)	27	50	
(hex ASCII)	1B	32	

REMARKS

This command works in two different functions depending on the setting of DIP switch 1-6. When the DIP switch 1-6 is set off, this command activates the line spacing defined in the <ESC>"A" command. If the <ESC>"A" command has not been defined, the line spacing is changed to 1/6 inch. When the DIP switch 1-6 is set on, this command sets the actual distance the paper advances during all subsequent line feeds to 1/6 inch.

SEE

Chapter 4

**PURPOSE** Sends a one-time paper feed of  $n/216$  inch.

CODE	<ESC>	"J"	$n$
(decimal ASCII)	27	74	$n$
(hex ASCII)	1B	4A	$n$

**REMARKS** This command causes the printer to advance the paper  $n/216$  inch. It does not change the current value of line spacing and it does not cause a carriage return. The value of  $n$  must be between 0 and 255.

**SEE** Chapter 4

**PURPOSE** Sends a one-time reverse feed of  $n/216$  inch.

CODE	<ESC>	"j"	$n$
(decimal ASCII)	27	106	$n$
(hex ASCII)	1B	6A	$n$

**REMARKS** This command causes the printer to reverse the paper  $n/216$  inch. It does not change the current value of line spacing and it does not cause a carriage return. The value of  $n$  must be between 0 and 255.

**SEE** Chapter 4

**PURPOSE** Sets print position to  $n$  lines.

CODE	<ESC>	"f"	1	$n$
(decimal ASCII)	27	102	1	$n$
(hex ASCII)	1B	66	01	$n$

**REMARKS** This command sets the next print position to the  $n$ th line from the top of the current page.

**NOTE:** The character "1" (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE** Chapter 4

■ Form feed and related commands

**PURPOSE**                   **Advances the paper to the top of the next page (form feed).**

**CODE**                        <FF>  
 (decimal ASCII)            12  
 (hex ASCII)                0C

**REMARKS**                The actual length of a page ejected by a form feed is set either by setting of the DIP switch 1-5 or through various codes (see below).

**SEE**                        Chapter 4

**PURPOSE**                   **Reverses the paper to the top of the current page.**

**CODE**                        <ESC>    <FF>  
 (decimal ASCII)            27        12  
 (hex ASCII)                1B        0C

**REMARKS**                This command causes the printer to reverse the paper to the top of the current printing page (or form).

**SEE**                        Chapter 4

**PURPOSE**                   **Sets page length to *n* inches.**

<b>CODE</b>	<ESC>	"C"	0	<i>n</i>
(decimal ASCII)	27	67	0	<i>n</i>
(hex ASCII)	1B	43	00	<i>n</i>

**REMARKS**                This command sets the length of all subsequent pages to *n* inches. The value of *n* must be between 1 and 22. You can select a power-on default form length of 11 inches or 12 inches by setting DIP switch 1-5.

**SEE**                        Chapter 4

<b>PURPOSE</b>	<b>Sets page length to <math>n</math> lines.</b>		
<b>CODE</b>	<ESC>	"C"	$n$
(decimal ASCII)	27	67	$n$
(hex ASCII)	1B	43	$n$
<b>REMARKS</b>	This command sets the length of all subsequent pages to $n$ lines. The value of $n$ must be between 1 and 127.		
<b>SEE</b>	Chapter 4		

■ Top/bottom margins and vertical tabs

<b>PURPOSE</b>	<b>Sets the top margin.</b>		
<b>CODE</b>	<ESC>	"r"	$n$
(decimal ASCII)	27	114	$n$
(hex ASCII)	1B	72	$n$
<b>REMARKS</b>	This command sets the top margin to $n$ lines. Printing begins on the $(n + 1)$ th line on the page. The value of $n$ must be between 1 and 255.		
<b>SEE</b>	Chapter 4		

<b>PURPOSE</b>	<b>Sets the bottom margin.</b>		
<b>CODE</b>	<ESC>	"N"	$n$
(decimal ASCII)	27	78	$n$
(hex ASCII)	1B	4E	$n$
<b>REMARKS</b>	This command sets the bottom margin to $n$ lines. The printer will generate a form feed whenever there are $n$ lines left on the page. The value of $n$ must be between 1 and 127.		
<b>SEE</b>	Chapter 4		

PURPOSE	<b> Cancels top and bottom margins.</b>		
CODE	<ESC>	"O"	
(decimal ASCII)	27	79	
(hex ASCII)	1B	4F	
REMARKS	This command cancels both the top margin and the bottom margin.		
SEE	Chapter 4		
PURPOSE	<b> Advances paper to the next vertical tab position.</b>		
CODE	<VT>		
(decimal ASCII)	11		
(hex ASCII)	0B		
REMARKS	This command causes the paper to be advanced to the next vertical tab position, or the top of the next page, whichever is first. If the vertical tab positions are not set, this command works as a line feed command.		
SEE	Chapter 4		
PURPOSE	<b> Sets vertical tab positions.</b>		
CODE	<ESC>	"B"	<i>n1 n2 n3 ...</i> 0
(decimal ASCII)	27	66	<i>n1 n2 n3 ...</i> 0
(hex ASCII)	1B	42	<i>n1 n2 n3 ...</i> 00
REMARKS	This command cancels all current vertical tab positions and sets those defined at lines <i>n1</i> , <i>n2</i> , <i>n3</i> , etc. The maximum number of vertical tab positions allowed is 16. The ASCII 0 character is used as a command terminator. Each vertical tab position must be specified in ascending order.		
SEE	Chapter 4		



**PURPOSE****Selects vertical channels.****CODE**

(decimal ASCII)

(hex ASCII)

<ESC>	“/”	<i>n0</i>
27	47	<i>n0</i>
1B	2F	<i>n0</i>

**REMARKS**

This command selects one of the multiple vertical channels determined by the value of *n0*. The value of *n0* must be between 0 and 7.

**SEE**

Chapter 4

**PURPOSE****Sets vertical tab positions in a channel.****CODE**

(decimal ASCII)

(hex ASCII)

<ESC>	“b”	<i>n0 n1 n2 n3 ...</i>	0
27	98	<i>n0 n1 n2 n3 ...</i>	0
1B	62	<i>n0 n1 n2 n3 ...</i>	00

**REMARKS**

This command cancels all current vertical tab positions in channel *n0* and sets those defined at lines *n1*, *n2*, *n3*, etc. The maximum number of vertical tab positions for each channel allowed is 16. The ASCII 0 character is used as a command terminator. Each vertical tab position must be specified in ascending order. The vertical channel *n0* must be between 0 and 7.

**SEE**

Chapter 4

<b>PURPOSE</b>	<b>Sets vertical tab positions every <math>n</math> lines.</b>			
<b>CODE</b>	$\langle \text{ESC} \rangle$	"e"	1	$n$
(decimal ASCII)	27	101	1	$n$
(hex ASCII)	1B	65	01	$n$
<b>REMARKS</b>	This command cancels all current vertical tab positions and sets those every $n$ lines. <b>NOTE:</b> The character "1" (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.			
<b>SEE</b>	Chapter 4			

## CONTROLLING THE HORIZONTAL PRINT POSITION

This section described commands that move the print head and restrict its printing range (such as setting margins and tabs).

<b>PURPOSE</b>	<b>Returns print head to the left margin (carriage return).</b>			
<b>CODE</b>	$\langle \text{CR} \rangle$			
(decimal ASCII)	13			
(hex ASCII)	0D			
<b>REMARKS</b>	This command returns the print head to the left margin. If DIP switch 1-3 has been set off, this command will also cause a line feed character to be generated after the carriage return, thereby advancing to the beginning of the next print line automatically.			
<b>SEE</b>	Chapter 4			

**PURPOSE****Sets the left margin.**

CODE	<ESC>	"I"	<i>n</i>
(decimal ASCII)	27	108	<i>n</i>
(hex ASCII)	1B	6C	<i>n</i>

**REMARKS**

This command sets the left margin to *n* characters. Each line will begin in the (*n* + 1)th character position from the left edge. The value of *n* must be between 0 and 255.

**NOTE:** Changing the print pitch after the left margin has been set does not change the margin — it stays in exactly the same place on the page.

**SEE**

Chapter 4

**PURPOSE****Sets the right margin.**

CODE	<ESC>	"Q"	<i>n</i>
(decimal ASCII)	27	81	<i>n</i>
(hex ASCII)	1B	51	<i>n</i>

**REMARKS**

This command sets the right margin to *n*, which is the last character position that will be printed in a line. After execution of this command, any attempt to print beyond print position *n* will cause the printer to automatically generate a carriage return and a line feed before printing the remainder of the line. The value of *n* must be between 2 and 255.

**NOTE:** Changing the print pitch after the right margin has been set does not change the margin — it stays in exactly the same position on the page.

**SEE**

Chapter 4

<b>PURPOSE</b>	<b>Sets the left and right margins.</b>			
<b>CODE</b>	⟨ESC⟩	“X”	<i>n1</i>	<i>n2</i>
(decimal ASCII)	27	88	<i>n1</i>	<i>n2</i>
(hex ASCII)	1B	58	<i>n1</i>	<i>n2</i>
<b>REMARKS</b>	<p>This command sets the left margin to <i>n1</i> characters and the right margin to <i>n2</i>. The values of <i>n1</i> and <i>n2</i> must be between 1 and 255 and <i>n2</i> should be greater than <i>n1</i>.</p> <p><b>Note:</b> Changing the print pitch after the margins have been set does not change the margins — they stay in exactly the same positions on the page.</p>			
<b>SEE</b>	Chapter 4			
<b>PURPOSE</b>	<b>Moves the print head to the next horizontal tab position.</b>			
<b>CODE</b>	⟨HT⟩			
(decimal ASCII)	9			
(hex ASCII)	09			
<b>REMARKS</b>	<p>This command causes the print head to advance to the next horizontal tab position. The horizontal tab positions are set at power-on to print positions 8, 16, 24, etc. (to the maximum print position).</p>			
<b>SEE</b>	Chapter 4			

<b>PURPOSE</b>	<b>Sets horizontal tab positions.</b>			
<b>CODE</b>	<ESC>	"D"	<i>n1 n2 n3 ...</i>	0
(decimal ASCII)	27	68	<i>n1 n2 n3 ...</i>	0
(hex ASCII)	1B	44	<i>n1 n2 n3 ...</i>	00
<b>REMARKS</b>	This command cancels all current horizontal tab positions and sets those defined at print positions <i>n1</i> , <i>n2</i> , <i>n3</i> , etc. The maximum number of horizontal tab positions allowed is 32. The ASCII 0 character is used as a command terminator. Each horizontal tab position must be specified in ascending order.			
<b>SEE</b>	Chapter 4			

<b>PURPOSE</b>	<b>Sets horizontal tab positions every <i>n</i> characters.</b>			
<b>CODE</b>	<ESC>	"e"	0	<i>n</i>
(decimal ASCII)	27	101	0	<i>n</i>
(hex ASCII)	1B	65	00	<i>n</i>
<b>REMARKS</b>	This command cancels all current horizontal tab positions and sets those every <i>n</i> characters <b>NOTE:</b> The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.			
<b>SEE</b>	Chapter 4			

**PURPOSE**                               **Moves the print head to an absolute horizontal position.**

CODE	<ESC>	"\$"	<i>n1</i>	<i>n2</i>
(decimal ASCII)	27	36	<i>n1</i>	<i>n2</i>
(hex ASCII)	1B	24	<i>n1</i>	<i>n2</i>

**REMARKS**                               This command causes the printer to move the print head to an absolute horizontal position. The position, in inches, is determined by the formula  $(n1 + n2 \times 256)/60$ . The maximum distance is 8 inches.

**SEE**                                       Chapter 4

**PURPOSE**                               **Moves the print head to a specified horizontal position.**

CODE	<ESC>	"\"	<i>n1</i>	<i>n2</i>
(decimal ASCII)	27	92	<i>n1</i>	<i>n2</i>
(hex ASCII)	1B	5C	<i>n1</i>	<i>n2</i>

**REMARKS**                               This command causes the printer to move the print head to a specified horizontal position when the NLQ character mode is selected. It can move the print head either left or right. The distance, in inches, is determined by the formula  $(n1 + n2 \times 256)/60$ .

To move to the left, add 64 to the calculated value of *n2*. The maximum distance is 8 inches. The command will be ignored if you try to move to a position outside the current margins.

**SEE**                                       Chapter 4

**PURPOSE** Adds *n* dot spaces between characters.

CODE	<ESC>	"space"	<i>n</i>
(decimal ASCII)	27	32	<i>n</i>
(hex ASCII)	1B	20	<i>n</i>

**REMARKS** This command increases the space between characters by *n* dots when the DIP switch 1-6 is set on.

**SEE** Chapter 5

**PURPOSE** Sets the print position to *n* characters.

CODE	<ESC>	"f"	0	<i>n</i>
(decimal ASCII)	27	102	0	<i>n</i>
(hex ASCII)	1B	66	00	<i>n</i>

**REMARKS** This command sets the next print position to *n* columns from the left margin. The value of *n* must be between 0 and 127.

**NOTE:** The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

**SEE** Chapter 4

**PURPOSE** Sets alignment, or centering.

CODE	<ESC>	"a"	<i>n</i>
(decimal ASCII)	27	97	<i>n</i>
(hex ASCII)	1B	61	<i>n</i>

**REMARKS** This command causes the printer to format text as follows:

*n* Text formatting

---

0 Left justified (ragged right margin)

1 Centered

2 Right justified

**SEE** Chapter 4

## DOWNLOAD CHARACTER COMMANDS

**PURPOSE** Defines download characters into RAM.

<b>CODE</b>	<ESC>	"&"	0	<i>n1 n2 m0 m1 ... m11</i> [ <i>m12 ... m22</i> ]
(decimal ASCII)	27	38	0	<i>n1 n2 m0 m1 ... m11</i> [ <i>m12 ... m22</i> ]
(hex ASCII)	1B	26	00	<i>n1 n2 m0 m1 ... m11</i> [ <i>m12 ... m22</i> ]

**REMARKS** This command is used to define one or more user-defined characters and to store them into RAM for later use. RAM is cleared when the power is turned off. The values of *n1* and *n2* specify the range of positions in RAM that the characters are to occupy. Valid character positions are any number between 32 and 127. Following *n2* the printer expects character data bytes for each character to be defined. The first byte, *m0*, is the attribute byte, for it specifies whether the character is a descender (if the first bit is 0), and the proportional width of the draft character (starting and ending dot columns are defined by the low order seven bits). *m1* through *m11* determine which dots form the draft character. In the case of NLQ download characters *m1* through *m22* determine which dots form the character.

**NOTE:** This command is ignored when the DIP switch 1-1 is set on.

**SEE**

Chapter 6



**PURPOSE**                      **Copies standard character ROM font into RAM.**

CODE	<ESC>	“.”	0	0	0
(decimal ASCII)	27	58	0	0	0
(hex ASCII)	1B	3A	00	00	00

**REMARKS**                      This command copies all the standard characters to the corresponding download character RAM area. This destroys any existing user-defined characters in that range.

**NOTE:** This command is ignored when the DIP switch 1-1 is set on.

**SEE**                              Chapter 6

**PURPOSE**                      **Selects download character set.**

CODE	<ESC>	“%”	1
(decimal ASCII)	27	37	1
(hex ASCII)	1B	25	01

**REMARKS**                      This command causes the printer to select the download character set.

**NOTE:** The character “1” (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE**                              Chapter 6

PURPOSE	<b>Cancels download character set.</b>		
CODE	<ESC>	"%"	0
(decimal ASCII)	27	37	0
(hex ASCII)	1B	25	00
REMARKS	This command cancels the download character set and selects the previous character set. <b>NOTE:</b> The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.		
SEE	Chapter 6		

### DOT GRAPHICS COMMANDS

PURPOSE	<b>Prints normal-density graphics.</b>		
CODE	<ESC>	"K"	<i>n1 n2 m1 m2 .....</i>
(decimal ASCII)	27	75	<i>n1 n2 m1 m2 .....</i>
(hex ASCII)	1B	4B	<i>n1 n2 m1 m2 .....</i>
REMARKS	This command selects 60 dots-per-inch, column-scan, bit-image graphics mode. The values of <i>n1</i> and <i>n2</i> represent the number of graphics characters to be printed, where the total number of characters = <i>n2</i> times 256 + <i>n1</i> . The correct number of graphics data bytes ( <i>m1</i> , <i>m2</i> , etc.) must follow <i>n2</i> . The ASCII values of these bytes determine which pins are fired for each character.		
SEE	Chapter 6		

**PURPOSE****Prints double-density graphics.****CODE**

(decimal ASCII)

(hex ASCII)

<ESC>	"L"	<i>n1 n2 m1 m2</i> .....
27	76	<i>n1 n2 m1 m2</i> .....
1B	4C	<i>n1 n2 m1 m2</i> .....

**REMARKS**

This command selects 120 dots-per-inch, column-scan, bit-image graphics mode. The values of *n1* and *n2* are the same as in normal-density graphics. The correct number of graphics data bytes (*m1*, *m2*, etc.) must follow *n2*. The ASCII values of these bytes determine which pins are fired for each character.

**SEE**

Chapter 6

**PURPOSE****Prints double-density graphics at double-speed.****CODE**

(decimal ASCII)

(hex ASCII)

<ESC>	"Y"	<i>n1 n2 m1 m2</i> .....
27	89	<i>n1 n2 m1 m2</i> .....
1B	59	<i>n1 n2 m1 m2</i> .....

**REMARKS**

This command selects 120 dots-per-inch, column-scan, bit-image graphics mode at double-speed. The values of *n1* and *n2* are the same as in normal-density graphics. The correct number of graphics data bytes (*m1*, *m2*, etc.) must follow *n2*. The ASCII values of these bytes determine which pins are fired for each character.

**SEE**

Chapter 6

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PURPOSE	<b>Prints quadruple-density graphics.</b>			
CODE	<ESC>	"Z"	<i>n1 n2 m1 m2</i>	.....
(decimal ASCII)	27	90	<i>n1 n2 m1 m2</i>	.....
(hex ASCII)	1B	5A	<i>n1 n2 m1 m2</i>	.....
REMARKS	This command selects 240 dots-per-inch, column-scan, bit-image graphics mode. The values of <i>n1</i> and <i>n2</i> are the same as in normal-density graphics. The correct number of graphics data bytes ( <i>m1</i> , <i>m2</i> , etc.) must follow <i>n2</i> . The ASCII values of these bytes determine which pins are fired for each character.			
SEE	Chapter 6			

**PURPOSE****Selects graphics modes.****CODE**

(decimal ASCII)

(hex ASCII)

<ESC>	"*"	<i>n0 n1 n2 m1 m2 .....</i>
27	42	<i>n0 n1 n2 m1 m2 .....</i>
1B	2A	<i>n0 n1 n2 m1 m2 .....</i>

**REMARKS**

This command selects one seven possible graphics modes, depending on the value of *n0*. The values of *n1* and *n2* are the same as normal-density graphics mode. The correct number of graphics data bytes (*m1*, *m2*, etc.) must follow *n2*. The ASCII values of these bytes determine which pins are fired for each character. The value of *n0* and its related graphics modes are shown below.

*n* Graphics mode

- 0 Normal-density (60 dots per inch)
- 1 Double-density (120 dots per inch)
- 2 Double-density at double-speed (120 dots per inch)
- 3 Quadruple-density (240 dots per inch)
- 4 Semi-double density (80 dots per inch)
- 5 Plotter graphics (72 dots per inch)
- 6 CRT graphics (90 dots per inch)

SEE

Chapter 6

<b>PURPOSE</b>	<b>Selects 9-pin graphics.</b>			
<b>CODE</b>	⟨ESC⟩	“^”	<i>n0 n1 n2 m1 m2 .....</i>	
(decimal ASCII)	27	94	<i>n0 n1 n2 m1 m2 .....</i>	
(hex ASCII)	1B	5E	<i>n0 n1 n2 m1 m2 .....</i>	
<b>REMARKS</b>	This command selects column-scan, 9-pin bit-image graphics mode. The value of <i>n0</i> determines the print density. The values of <i>n1</i> and <i>n2</i> are the same as normal-density graphics mode. The correct number of graphics data bytes ( <i>m1</i> , <i>m2</i> , etc.) must follow <i>n2</i> . The ASCII values of these bytes determine which pins are fired for each character.			
<b>SEE</b>	Chapter 6			

<b>PURPOSE</b>	<b>Redefines the graphics mode.</b>			
<b>CODE</b>	⟨ESC⟩	“?”	<i>n0</i>	<i>n1</i>
(decimal ASCII)	27	63	<i>n0</i>	<i>n1</i>
(hex ASCII)	1B	3F	<i>n0</i>	<i>n1</i>
<b>REMARKS</b>	This command redefines one of the 4 alternate graphics commands — ⟨ESC⟩ “K”, ⟨ESC⟩ “L”, ⟨ESC⟩ “Y”, or ⟨ESC⟩ “Z” — as one of the seven graphics density numbers with the ⟨ESC⟩ “*” command, where <i>n0</i> is “K”, “L”, “Y”, or “Z” and <i>n1</i> is 0, 1, 2, 3, 4, 5, or 6.			
<b>SEE</b>	Chapter 6			

## MACRO INSTRUCTION COMMANDS

<b>PURPOSE</b>	<b>Defines macro instruction.</b>			
<b>CODE</b>	⟨ESC⟩	“+”	.....	⟨RS⟩
(decimal ASCII)	27	43	.....	30
(hex ASCII)	1B	2B	.....	1E
<b>REMARKS</b>	This command cancels any existing macro instruction, and replace it with the defined instruction. The maximum number of characters allowed in the macro instruction is 16. The ⟨RS⟩ character marks the end of the macro definition.			
<b>SEE</b>	Chapter 5			
<b>PURPOSE</b>	<b>Executes macro instruction.</b>			
<b>CODE</b>	⟨ESC⟩	“+”	1	
(decimal ASCII)	27	43	1	
(hex ASCII)	1B	2B	01	
<b>REMARKS</b>	This command executes a previously defined macro instruction.			
<b>SEE</b>	Chapter 5			

**OTHER COMMANDS**

**PURPOSE**                      **Sets the value of the eighth data bit to logical 1.**

<b>CODE</b>	⟨ESC⟩	“)”
(decimal ASCII)	27	62
(hex ASCII)	1B	3E

**REMARKS**                      This command forces the eighth data bit of each subsequent character sent to the printer to logical 1. This code allows users with a 7-bit interface to access those characters whose ASCII code is greater than 127. This code should not be used to transmit printer control codes.

**SEE**                              Chapter 5

**PURPOSE**                      **Sets the value of the eighth data bit to logical 0.**

<b>CODE</b>	⟨ESC⟩	“=”
(decimal ASCII)	27	61
(hex ASCII)	1B	3D

**REMARKS**                      This command forces the eighth data bit of each subsequent character sent to the printer to logical 0. This code should not be used to transmit printer control code.

**SEE**                              Chapter 5



**PURPOSE**                      **Accepts the value of the eighth data bit as is.**

<b>CODE</b>	⟨ESC⟩	“#”	
(decimal ASCII)	27	35	
(hex ASCII)	1B	23	

**REMARKS**                      This command cancels either setting of the eighth data bit. The printer will use the value of the eighth data bit that is sent from the computer. This code allows users with a 7-bit interface to resume normal functions after accessing those characters whose ASCII code is greater than 127.

**SEE**                              Chapter 5

**PURPOSE**                      **Prints “slash zero”.**

<b>CODE</b>	⟨ESC⟩	“~”	1
(decimal ASCII)	27	126	1
(hex ASCII)	1B	7E	01

**REMARKS**                      This command causes to print the zero character with a slash.  
**NOTE:** The character “1” (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE**                              Chapter 5

PURPOSE	<b>Prints “normal zero”.</b>
CODE	⟨ESC⟩      “~”      0
(decimal ASCII)	27      126      0
(hex ASCII)	1B      7E      00
REMARKS	This command cancels printing the slash zero and returns printing to the normal zero character. <b>NOTE:</b> The character “0” (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.
SEE	Chapter 5
PURPOSE	<b>Moves the print head back one print position (backspace).</b>
CODE	⟨BS⟩
(decimal ASCII)	8
(hex ASCII)	08
REMARKS	This command shifts the print head one column to the left. If the print head is at the left margin, the command is ignored. This command can be used to overstrike or combine characters.
SEE	Chapter 5
PURPOSE	<b>Deletes the last character sent.</b>
CODE	⟨DEL⟩
(decimal ASCII)	127
(hex ASCII)	7F
REMARKS	This command deletes the last character received. This command is ignored if the last character received has already been printed, or if the last character received was all or part of a function code.
SEE	Chapter 5

<b>PURPOSE</b>	<b>Cancels a line.</b>
<b>CODE</b>	⟨CAN⟩
(decimal ASCII)	24
(hex ASCII)	18
<b>REMARKS</b>	This command deletes the last line in the print buffer at the time the command is used.
<b>SEE</b>	Chapter 5
<b>PURPOSE</b>	<b>Sets printer off line.</b>
<b>CODE</b>	⟨DC3⟩
(decimal ASCII)	19
(hex ASCII)	13
<b>REMARKS</b>	This command causes the printer to go off line, disregarding all subsequent characters and function codes, with the exception of ⟨DC1⟩, which will return the printer to the on line state. This is not the same as pushing the On Line key. When the On Line indicator is not lit the printer will not respond to ⟨DC1⟩.
<b>SEE</b>	Chapter 5
<b>PURPOSE</b>	<b>Sets printer on line.</b>
<b>CODE</b>	⟨DC1⟩
(decimal ASCII)	17
(hex ASCII)	11
<b>REMARKS</b>	This command resets the printer to the on line state, allowing it to receive and process all subsequent characters and function codes. This is not the same as pushing the On Line key. When the On Line indicator is not lit, the printer will not respond to ⟨DC1⟩.
<b>SEE</b>	Chapter 5

**PURPOSE**                   **Sounds the printer bell.**

**CODE**                        <BEL>  
(decimal ASCII)                7  
(hex ASCII)                    07

**REMARKS**                   This command causes the buzzer to sound for about a quarter of a second.

**SEE**                         Chapter 5

**PURPOSE**                   **Disables paper-out detector.**

**CODE**                        <ESC>     "8"  
(decimal ASCII)               27         56  
(hex ASCII)                   1B         38

**REMARKS**                   This command causes the printer to disregard the signal sent by the paper-out detector. The paper-out signal normally sounds the printer bell and stops printing until paper is inserted and the printer is reset. DIP switch 1-2 can also set to disable the paper-out detector.

**SEE**                         Chapter 5

**PURPOSE**                   **Enables paper-out detector.**

**CODE**                        <ESC>     "9"  
(decimal ASCII)               27         57  
(hex ASCII)                   1B         39

**REMARKS**                   This command restores the function of the paper-out detector.

**SEE**                         Chapter 5

**PURPOSE**                      **Selects uni-directional printing.**

CODE	<ESC>	“U”	1
(decimal ASCII)	27	85	1
(hex ASCII)	1B	55	01

**REMARKS**                      This command causes all subsequent printing to be done in uni-directional printing. Uni-directional printing is useful in printing tables or charts, since it ensures that vertical columns of characters will be aligned.

**NOTE:** The character “1” (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE**                              Chapter 5

**PURPOSE**                       **Cancels uni-directional printing.**

CODE	<ESC>	“U”	0
(decimal ASCII)	27	85	0
(hex ASCII)	1B	55	00

**REMARKS**                      This command cancels uni-directional printing and returns to the standard bi-directional printing, which is considerably faster.

**NOTE:** The character “0” (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

**SEE**                              Chapter 5

**PURPOSE**                      **Selects one-line uni-directional printing.**

<b>CODE</b>	⟨ESC⟩	“⟨”
(decimal ASCII)	27	60
(hex ASCII)	1B	3C

**REMARKS**                      This command immediately returns the print head to the left margin. The remainder of the line is printed from left to right. Normal (bi-directional) printing resumes following a carriage return.

**SEE**                              Chapter 5

**PURPOSE**                      **Enlarges characters in whole or in part; cancels same.**

<b>CODE</b>	⟨ESC⟩	“h”	<i>n</i>
(decimal ASCII)	27	104	<i>n</i>
(hex ASCII)	1B	68	<i>n</i>

**REMARKS**                      This special command enlarges characters following the command until the enlargement is cancelled. The values of *n* have the following effects.

<i>n</i>	Effect
0	Cancels enlargement
1	Double-high, double-wide
2	Quadruple-high, quadruple-wide
3	Double-high, double-wide (Lower half only)
4	Double-high, double-wide (Upper half only)
5	Quadruple-high, quadruple-wide (Lower half only)
6	Quadruple-high, quadruple-wide (Upper half only)

**SEE**                              Chapter 5

**PURPOSE**                      **Expands the printable area.**

<b>CODE</b>	⟨ESC⟩	“6”
(decimal ASCII)	27	54
(hex ASCII)	1B	36

**REMARKS**                      This command causes the printer to use the high-order control code area as a printable character area when the DIP switch 1-6 is set on.

**SEE**                              Chapter 5

**PURPOSE**                       **Cancels the expansion of printable area.**

<b>CODE</b>	⟨ESC⟩	“7”
(decimal ASCII)	27	55
(hex ASCII)	1B	37

**REMARKS**                      This command cancels the expansion of the printable character area and restores the high-order control code area when the DIP switch 1-6 is set on.

**SEE**                              Chapter 5

**PURPOSE**                       **Prints characters in the undefined control code area.**

<b>CODE</b>	⟨ESC⟩	“1”	1
(decimal ASCII)	27	73	1
(hex ASCII)	1B	49	01

**REMARKS**                      This command causes the printer to print characters in the undefined control code area.

**NOTE:** The character “1” (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE**                              Chapter 5

**PURPOSE****Selects undefined codes as control codes.**

<b>CODE</b>	<ESC>	"I"	0
(decimal ASCII)	27	73	0
(hex ASCII)	1B	49	00

**REMARKS**

This command cancels to print the characters in the undefined control codes and restores them as the control codes.

**NOTE:** The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

**SEE**

Chapter 5

**PURPOSE****Sets immediate print mode.**

<b>CODE</b>	<ESC>	"I"	1
(decimal ASCII)	27	105	1
(hex ASCII)	1B	69	01

**REMARKS**

This command selects the immediate print mode. In the immediate print mode the print head prints one character at a time, as you send it. The printer also moves the paper up so that you can see the current line and then down to continue printing. This kind of instant feedback can be especially helpful in telecommunications.

**NOTE:** The character "1" (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

**SEE**

Chapter 5



**PURPOSE****Cancels immediate print mode.****CODE**

〈ESC〉	“i”	0
-------	-----	---

(decimal ASCII)

27	105	0
----	-----	---

(hex ASCII)

1B	69	00
----	----	----

**REMARKS**

This command cancels the immediate print mode and returns the normal print mode.

**NOTE:** The character “0” (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

**SEE**

Chapter 5

**PURPOSE****Resets the printer.****CODE**

〈ESC〉	“@”
-------	-----

(decimal ASCII)

27	64
----	----

(hex ASCII)

1B	40
----	----

**REMARKS**

This command reinitializes the printer. The print buffer is cleared, and the form length, character set, bottom margin, and international character set are all reset to the values defined by their respective DIP switches. The main difference between the 〈ESC〉 “@” command and turning the printer off and back on again is that download characters and macro instructions are preserved with this command.

**SEE**

Chapter 5

**MEMO**

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# APPENDIX E

## COMMAND SUMMARY

### IN NUMERIC ORDER

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<b>Control code</b>	<b>Function</b>
CHR\$(7)	Sounds the printer bell
CHR\$(8)	Moves the print head back one print position (backspace)
CHR\$(9)	Moves the print head to the next horizontal tab position
CHR\$(10)	Advances the paper one line (line feed)
CHR\$(11)	Advances paper to the next vertical tab position
CHR\$(12)	Advances the paper to the top of the next page (form feed)
CHR\$(13)	Returns print head to the left margin (carriage return)
CHR\$(14)	Sets the printer to expanded print for the remainder of the current line
CHR\$(15)	Sets the printer to condensed print
CHR\$(17)	Sets printer on line
CHR\$(18)	Cancel condensed print
CHR\$(19)	Sets printer off line
CHR\$(20)	Cancel one line expanded print
CHR\$(24)	Cancel a line
CHR\$(27)	Escape (indicated as <ESC> below)
CHR\$(127)	Deletes the last character sent
<ESC> CHR\$(10)	Reverses the paper one line
<ESC> CHR\$(12)	Reverses the paper to the top of the current page
<ESC> CHR\$(14)	Sets the printer to expanded print for the remainder of the current line

⟨ESC⟩ CHR\$(15)	Sets the printer to condensed print
⟨ESC⟩ CHR\$(32) <i>n</i>	Adds <i>n</i> dot spaces between characters
⟨ESC⟩ “!” <i>n</i>	Sets the master print mode
⟨ESC⟩ “#”	Accepts the value of the eighth data bit as is
⟨ESC⟩ “\$” <i>n1 n2</i>	Moves the print head to an absolute horizontal position
⟨ESC⟩ “%” 0	Cancels download character set
⟨ESC⟩ “%” 1	Selects download character set
⟨ESC⟩ “&” CHR\$(0) <i>n1 n2 m0 m1 ... m11 [m12 ... m22]</i>	Defines download characters into RAM
⟨ESC⟩ “*” <i>n0 n1 n2 m1 m2 ...</i>	Selects graphics modes
⟨ESC⟩ “+” CHR\$(1)	Executes macro instruction
⟨ESC⟩ “+” ..... CHR\$(30)	Defines macro instruction
⟨ESC⟩ “-” 0	Cancels underlining
⟨ESC⟩ “-” 1	Selects underlining
⟨ESC⟩ “/” <i>n0</i>	Selects vertical channels
⟨ESC⟩ “0”	Sets line spacing to 1/8 inch
⟨ESC⟩ “1”	Sets line spacing to 7/72 inch
⟨ESC⟩ “2”	Sets line spacing to 1/6 inch or uses the ⟨ESC⟩ “A” definition
⟨ESC⟩ “3” <i>n</i>	Sets line spacing to <i>n</i> /216 inch
⟨ESC⟩ “4”	Selects italic characters
⟨ESC⟩ “5”	Cancels italic characters
⟨ESC⟩ “6”	Expands the printable area / Selects character set #2
⟨ESC⟩ “7”	Cancels the expansion of printable area / Selects character set #1
⟨ESC⟩ “8”	Disables paper-out detector
⟨ESC⟩ “9”	Enables paper-out detector
⟨ESC⟩ “:” CHR\$(0) CHR\$(0) CHR\$(0)	Copies standard ROM font into RAM
⟨ESC⟩ “<”	Selects one-line uni-directional printing
⟨ESC⟩ “=”	Sets the value of the eighth data bit to logical 0

⟨ESC⟩ “)”	Sets the value of the eighth data bit to logical 1
⟨ESC⟩ “?” <i>n0 n1</i>	Redefines the graphics mode
⟨ESC⟩ “@”	Resets the printer
⟨ESC⟩ “A” <i>n</i>	Sets or defines line spacing to <i>n/72</i> inch
⟨ESC⟩ “B” <i>n1 n2 n3 ...</i> CHR\$(0)	Sets vertical tab positions
⟨ESC⟩ “C” CHR\$(0) <i>n</i>	Sets page length to <i>n</i> inches
⟨ESC⟩ “C” <i>n</i>	Sets page length to <i>n</i> lines
⟨ESC⟩ “D” <i>n1 n2 n3 ...</i> CHR\$(0)	Sets horizontal tab positions
⟨ESC⟩ “E”	Selects emphasized printing
⟨ESC⟩ “F”	Cancel s emphasized printing
⟨ESC⟩ “G”	Selects boldface printing
⟨ESC⟩ “H”	Cancel s boldface printing
⟨ESC⟩ “I” 0	Selects undefined codes as control codes
⟨ESC⟩ “I” 1	Prints characters in the undefined control code area
⟨ESC⟩ “J” <i>n</i>	Sends a one-time paper feed of <i>n/216</i> inch
⟨ESC⟩ “K” <i>n1 n2 m1 m2 ...</i>	Prints normal-density graphics
⟨ESC⟩ “L” <i>n1 n2 m1 m2 ...</i>	Prints double-density graphics
⟨ESC⟩ “M”	Sets the print pitch to elite
⟨ESC⟩ “N” <i>n</i>	Sets the bottom margin
⟨ESC⟩ “O”	Cancel s the top and bottom margins
⟨ESC⟩ “P”	Sets the print pitch to pica
⟨ESC⟩ “Q” <i>n</i>	Sets the right margin
⟨ESC⟩ “R” <i>n</i>	Selects an international character set
⟨ESC⟩ “S” 0	Selects superscripts
⟨ESC⟩ “S” 1	Selects subscripts
⟨ESC⟩ “T”	Cancel s a superscript or subscript
⟨ESC⟩ “U” 0	Cancel s uni-directional printing
⟨ESC⟩ “U” 1	Selects uni-directional printing
⟨ESC⟩ “W” 0	Cancel s expanded print
⟨ESC⟩ “W” 1	Sets the printer to expanded print
⟨ESC⟩ “X” <i>n1 n2</i>	Sets the left and right margins

⟨ESC⟩ “Y” <i>n1 n2 m1 m2 ...</i>	Prints double-density graphics at double-speed
⟨ESC⟩ “Z” <i>n1 n2 m1 m2 ...</i>	Prints quadruple-density graphics
⟨ESC⟩ “\” <i>n1 n2</i>	Moves the print head to a specified horizontal position
⟨ESC⟩ “^” <i>n0 n1 n2 m1 m2 .....</i>	Selects 9-pin graphics
⟨ESC⟩ “a” <i>n</i>	Sets alignment or centering
⟨ESC⟩ “b” <i>n0 n1 n2 n3 ... CHR\$(0)</i>	Sets vertical tab positions in a channel
⟨ESC⟩ “e” <i>0 n</i>	Sets horizontal tab positions every <i>n</i> characters
⟨ESC⟩ “e” <i>1 n</i>	Sets vertical tab positions every <i>n</i> lines
⟨ESC⟩ “f” <i>0 n</i>	Sets the print position to <i>n</i> characters
⟨ESC⟩ “f” <i>1 n</i>	Sets print position to <i>n</i> lines
⟨ESC⟩ “h” <i>n</i>	Enlarges characters in whole or in part; cancels same
⟨ESC⟩ “i” <i>0</i>	Cancels immediate print mode
⟨ESC⟩ “i” <i>1</i>	Sets immediate print mode
⟨ESC⟩ “j” <i>n</i>	Sends a one-time reverse feed of <i>n/216</i> inch
⟨ESC⟩ “l” <i>n</i>	Sets the left margin
⟨ESC⟩ “p” <i>0</i>	Cancels proportional print
⟨ESC⟩ “p” <i>1</i>	Sets the printer to proportional print
⟨ESC⟩ “r” <i>n</i>	Sets the top margin
⟨ESC⟩ “x” <i>0</i>	Cancels NLQ characters
⟨ESC⟩ “x” <i>1</i>	Selects NLQ characters
⟨ESC⟩ “~” <i>0</i>	Prints “normal zero”
⟨ESC⟩ “~” <i>1</i>	Prints “slash zero”

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# APPENDIX F

## TECHNICAL

## SPECIFICATIONS

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### *Printing*

Printing method	Serial impact dot matrix
Printing speed	100 characters per second (in Draft pica) 25 characters per second (in NLQ mode)
Print buffer	2 KB
Paper feed	2.7 inches/second (for form feeding) Tractor and Friction feed
Printing direction	Bi-directional, logic seeking Uni-directional in dot graphics modes
Character set	
Draft characters	96 standard ASCII characters 132 international characters [11 sets] 81 IBM special characters 52 IBM block graphics characters 96 italic ASCII characters 132 italic international characters [11 sets] 81 italic IBM special characters 96 downloadable characters
NLQ characters	96 standard ASCII characters 132 international characters [11 sets] 81 IBM special characters 48 NLQ downloadable characters
Character matrix	18 × 11 dots, NLQ characters 9 × 11 dots, Draft characters 12 × 11 dots, IBM block graphics characters 8 × 480 dots, Normal-density graphics

	8 × 576 dots, Plotter graphics
	8 × 640 dots, Semi-double density graphics
	8 × 720 dots, CRT graphics
	8 × 960 dots, Double-density graphics
	8 × 1920 dots, Quadruple-density graphics
Line spacing	1/6 inch standard 1/8, <i>n</i> /72 or <i>n</i> /216 inch programmable
Column width	80, normal pica 96, normal elite 136, condensed pica 160, condensed elite 40, expanded pica 48, expanded elite 68, expanded condensed pica 80, expanded condensed elite and Proportional spacing
Special features	Near Letter Quality Automatic single sheet insertion Short form tear-off Easy access format switches Self-test and hex dump Downloadable characters Ultra hi-resolution bit image graphics Vertical and horizontal tabs Skip over perforation
<b>Paper</b>	
Single sheets	5.5 – 8.5 inches, wide 0.07 – 0.10 mm, thickness
Sprocket-feed paper	4 – 10 inches, wide 0.07 – 0.10 mm, one-part form thickness Max 0.28 mm, 3-part form thickness



**Printer**

Dimensions	Hight 104 mm (4.1 inches) Width 400 mm (15.7 inches) Depth 336 mm (13.2 inches)
Weight	6 Kg (13.2 pounds)
Power	120 VAC $\pm$ 10%, 60Hz. 220 VAC $\pm$ 10%, 50/60Hz. 240 VAC $\pm$ 10%, 50/60Hz.
Environment	Temperature: 5 to 40°C (40 to 104°F) Humidity: 10 to 80%, non condensing
Ribbon	Black cloth ribbon in special cartridge Ribbon life: 2 million draft characters
Print head life	100 million draft characters

**Parallel interface**

Interface	Centronic-compatible, 7 or 8 bit
Synchronization	By external supplied Strobe pulses
Handshaking	By ACK or BUSY signals
Logic level	TTL
Connector	57-30360 Amphenol

**MEMO**

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# APPENDIX G

## THE

# PARALLEL INTERFACE

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This printer has a parallel interface to communicate with the computer. The operating specifications of the parallel interface are as follows:

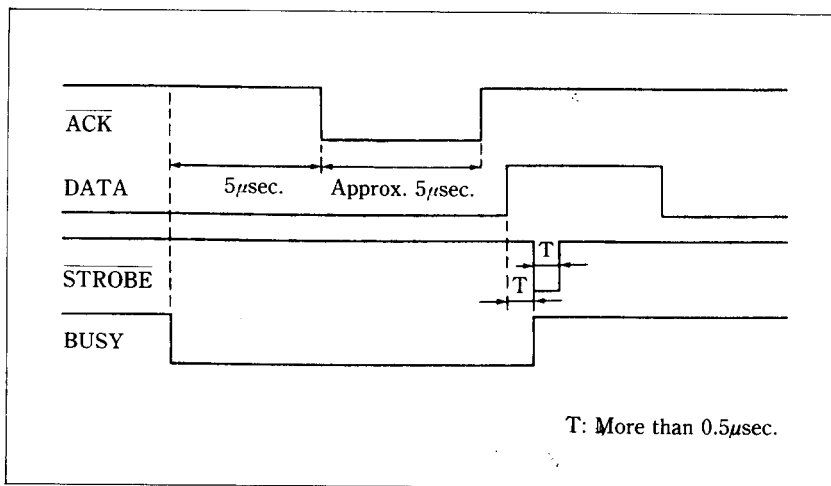
Data transfer rate:	1,000 to 6,000 characters per second
Synchronization:	Via externally supplied $\overline{\text{STROBE}}$ pulses
Handshaking:	ACK and BUSY signals
Logic level:	Compatible with TTL level

The parallel interface connects to the computer by a 36 pin connector on the back of the printer. This connector mates with an Amphenol 57-30360 connector. The functions of the various pins are summarized in Table G-1.

### ■ Functions of the Connector Signals

Communications between the computer and the printer use many of the pins of the connector. To understand how the system of communications works, let's look at the functions of the various signals carried by the pins of the interface connector.

Pin 1 carries the  $\overline{\text{STROBE}}$  pulse signal from the computer to the printer. This signal is normally held high by the computer. When the computer has data ready for the printer it sets this signal to a low value for at least 0.5 microseconds. When the printer sees this pulse on the strobe pin, it reads the data that the computer supplies on pins 2 through 9. Each of these lines carries one bit of information. A logical "1" is represented by a high signal level, and a logical "0" is represented by a low signal level. The computer must maintain these signals for a period



**Figure G-1.** The interface timing diagram.

Signal Name	Circuit Example
DATA 1-DATA 8 (To Printer)	<p>4.7k<math>\Omega</math> 74LS Compatible</p>
$\overline{\text{STROBE}}$ (To Printer)	<p>4.7k<math>\Omega</math> 100<math>\Omega</math> 470pF 74LS Compatible</p>
BUSY, $\overline{\text{ACK}}$ (From Printer)	<p>4.7k<math>\Omega</math> 74LS Compatible</p>

**Figure G-2.** Typical interface circuit.

beginning at least 0.5 microseconds before the strobe pulse starts and continuing for at least 0.5 microseconds after the strobe pulse ends.

When the printer has successfully received the byte of data from the computer it sets pin 10 low for approximately 5 micro-seconds. This signal acknowledges the receipt of the data and so is called the  $\overline{\text{ACK}}$  (for "acknowledge") signal.

**Table G-1**  
**Parallel interface pin functions**

Pin No.	Signal Name	Direction	Function
1	STROBE	IN	Signals when data is ready to be read. Signal goes from HIGH to LOW (for at least 0.5 microseconds) when data is available.
2	DATA1	IN	These signals provide the information of the first to eighth bits of parallel data. Each signal is at HIGH level for a logical 1 and at a LOW level for a logical 0.
3	DATA2	IN	
4	DATA3	IN	
5	DATA4	IN	
6	DATA5	IN	
7	DATA6	IN	
8	DATA7	IN	
9	DATA8	IN	
10	ACK	OUT	A LOW pulse acknowledges receipt of data.
11	BUSY	OUT	When this signal goes LOW the printer is ready to accept data.
12	PAPER OUT	OUT	This signal is normally LOW. It will go HIGH if the printer runs out of paper. This signal can be held LOW permanently by turning DIP switch 1-2 off.
13	SELECTED OUT		This signal is HIGH when the printer is on-line.
14-15	N/C		Unused
16	SIGNAL GND		Signal ground.
17	CHASSIS GND		Printer's chassis ground, isolated from logic ground.
18	+ 5VDC	OUT	External supply of + 5VDC.
19-30	GND		Twisted pair return signal ground level.
31	RESET	IN	When this signal goes LOW the printer is reset to its power-on condition.
32	ERROR	OUT	This signal is normally HIGH. This signal goes LOW to signal that the printer cannot print due to an error condition.
33	EXT GND		External ground.
34-36	N/C		Unused.

Pin 11 reports when the printer is not able to receive data. The signal is called BUSY. When this signal is high, the printer cannot receive data. This signal will be high during data transfer, when the printer is off-line and when an error condition exists.

The printer will report that it has run out of paper by making the PAPER OUT signal on pin 12 high. This pin can be held low by turning DIP switch 1-5 off. When the printer is in the on-line state, pin 13 is held high. This signal (SELECTED) tells the computer that the printer is ready to receive data.

Pins 14, 15, 34-36 are not used, while pins 16, 17, 19-30 and 33 are grounded. Pin 18 is connected to the + 5VDC supply in the printer.

Pin 31 can be used to reset the printer. If this signal ( $\overline{\text{RESET}}$ ) goes low the printer will reinitialize. Pin 32 is used to report error conditions in the printer. This signal ( $\overline{\text{ERROR}}$ ) is high during normal operation and goes low to report that the printer cannot print due to an error condition.

# INDEX

- 9-pin graphics, 93, 148
- Absolute tab, 51, 140
- Adjusting paper gap, 16
- Adjusting width of space, 63
- Advance paper, 37, 128, 129, 130, 131, 132, 133
- Aligning text, 57, 141
- Alternate graphics codes, 93
- American Standard Code for Information Interchange, 21
- ASCII code conversion chart, 105
- ASCII codes, 21, 76
- Attribute byte, 83
  
- Backspace, 61, 152
- BASIC, 19, 21
- <BEL>, 60, 154
- Bell, 59, 154
- Bi-directional print, 64, 155
- Big characters, 72, 156
- Bit image graphics, 90
- Block graphics, 66
- Boldface print, 33, 34, 35, 125
- Bottom margin, 102, 133
- <BS>, 61, 152
  
- <CAN>, 61, 153
- Cancel, NLQ, 25, 119
  - boldface print, 34, 125
  - emphasized print, 34, 124
  - expanded print, 29, 122, 123
  - italics, 26, 116
  - margins, 45, 134
  - proportional print, 32, 121
  - superscripts and subscripts, 27, 127
  - text, 61, 153
  - underlining, 26, 126
- Carriage return, 37, 136
- Centering text, 57, 141
- Changing line spacing, 39, 129
  - page length, 44, 132, 133
- Channels, vertical tab, 55, 135
- Character code, 107
- Character graphics, 66
- Character set #1, 66, 102, 118
- Character set #2, 66, 102, 117
- Character space, 141
- Character width, 28
- Characters in the control code area, 71
- Chart, ASCII code, 105
- Chart, character set #2, 68
- CHR\$ function, 21
- CHR\$(7), 154
- CHR\$(8), 152
- CHR\$(9), 49, 138
- CHR\$(10), 37, 128
- CHR\$(11), 53, 134
- CHR\$(12), 43, 132
- CHR\$(13), 37, 136
- CHR\$(14), 29, 123
- CHR\$(15), 31, 120
- CHR\$(17), 60, 153
- CHR\$(18), 31, 120
- CHR\$(19), 60, 153
- CHR\$(20), 29, 123
- CHR\$(24), 61, 153
- CHR\$(127), 61, 152
- Clamp lever, 12, 14
- Cleaning, 95
- Clearing margins, 45
- Combining print modes, 35
- Command syntax, 23
- Commands, dot graphics, 144
  - download characters, 142
  - font pitch, 119
  - font style, 116
  - form feed, 132
  - horizontal position, 136
  - line feed, 128
  - macro instruction, 149
  - print style, 116
  - vertical position, 128
- Computer paper, 14
- Condensed print, 30, 35, 120
- Connecting the printer, 18
- Connector, interface, 7
- Control code area, 71
- Control codes, 21
- Control key, 22
- Control panel, 8
- Copying characters to download RAM, 84, 143
- Cord, power, 7
- Cover, printer, 2, 7, 13
- Covers, sprocket, 14

- ⟨CR⟩, 37, 136
- ⟨DC1⟩, 60, 153
- ⟨DC2⟩, 120
- ⟨DC3⟩, 60, 153
- ⟨DC4⟩, 123
- Defining characters, 80, 142
  - macro instruction, 74, 149
- ⟨DEL⟩, 61, 152
- Delete, 61, 152
- Deselect printer, 60, 153
- Detector, paper-out, 60, 154
- DIP switches, 11, 38, 40, 63, 66, 101, 117, 128, 130, 132, 136, 141, 154, 157, 159
- Dot graphics, 90, 147
- Dot graphics commands, 144
- Dot matrix, 79
- Double density graphics, 92, 145
- Download characters, 60, 79, 87, 102, 142, 159
- Eighth bit controls, 66, 150, 151
- Elite pitch, 28, 35, 119
- Emphasized print, 33, 34, 35, 124
- Enlarged characters, 72, 156
- Environment, 1
- Escape code, 23
  - ⟨ESC⟩ "!" n, 124
  - ⟨ESC⟩ "#", 66, 151
  - ⟨ESC⟩ "\$", 140
  - ⟨ESC⟩ "%" n, 84, 143
  - ⟨ESC⟩ "&" CHR\$(0), 83, 142
  - ⟨ESC⟩ "\*" n, 90, 147
  - ⟨ESC⟩ "+", 75, 149
  - ⟨ESC⟩ "-" 0, 26, 126
  - ⟨ESC⟩ "-" 1, 26, 125
  - ⟨ESC⟩ "/", 55, 135
  - ⟨ESC⟩ "0", 41, 129
  - ⟨ESC⟩ "1", 41, 129
  - ⟨ESC⟩ "2", 40, 130
  - ⟨ESC⟩ "3" n, 40, 129
  - ⟨ESC⟩ "4", 26, 116
  - ⟨ESC⟩ "5", 26, 116
  - ⟨ESC⟩ "6", 66, 71, 117, 157
  - ⟨ESC⟩ "7", 66, 71, 118, 157
  - ⟨ESC⟩ "8", 154
  - ⟨ESC⟩ "9", 154
  - ⟨ESC⟩ ":", 84, 143
  - ⟨ESC⟩ "<", 64, 156
  - ⟨ESC⟩ "=", 66, 150
  - ⟨ESC⟩ ">", 66, 150
  - ⟨ESC⟩ "?", 93, 148
  - ⟨ESC⟩ "@", 60, 159
  - ⟨ESC⟩ "A" n, 40, 130
  - ⟨ESC⟩ "a" n, 57, 141
  - ⟨ESC⟩ "B", 53, 134
  - ⟨ESC⟩ "b", 55, 135
  - ⟨ESC⟩ "C", 44, 132, 133
  - ⟨ESC⟩ CHR\$(14), 29
  - ⟨ESC⟩ CHR\$(15), 31
  - ⟨ESC⟩ CHR\$(32), 141
  - ⟨ESC⟩ "D", 50, 139
  - ⟨ESC⟩ "E", 34, 124
  - ⟨ESC⟩ "e0", 50, 139
  - ⟨ESC⟩ "e1", 54, 136
  - ⟨ESC⟩ "F", 34, 124
  - ⟨ESC⟩ "f0", 141
  - ⟨ESC⟩ "f1", 54, 131
  - ⟨ESC⟩ ⟨FF⟩, 44, 132
  - ⟨ESC⟩ "G", 34, 125
  - ⟨ESC⟩ "H", 34, 125
  - ⟨ESC⟩ "h" n, 73, 156
  - ⟨ESC⟩ "I" n, 71, 157
  - ⟨ESC⟩ "i" n, 63, 158, 159
  - ⟨ESC⟩ "J" n, 41, 131
  - ⟨ESC⟩ "j" n, 41, 131
  - ⟨ESC⟩ "K", 92, 144
  - ⟨ESC⟩ "L", 92, 145
  - ⟨ESC⟩ ⟨LF⟩, 38, 128
  - ⟨ESC⟩ "l" n, 48, 137
  - ⟨ESC⟩ "M", 28, 119
  - ⟨ESC⟩ "N" n, 45, 133
  - ⟨ESC⟩ "O", 45, 134
  - ⟨ESC⟩ "P", 28, 119
  - ⟨ESC⟩ "p" 0, 32, 121
  - ⟨ESC⟩ "p" 1, 32, 121
  - ⟨ESC⟩ "Q" n, 48, 137
  - ⟨ESC⟩ "R" n, 117
  - ⟨ESC⟩ "r" n, 45, 133
  - ⟨ESC⟩ "S" 0, 27, 126
  - ⟨ESC⟩ "S" 1, 27, 127
  - ⟨ESC⟩ ⟨SI⟩, 120
  - ⟨ESC⟩ ⟨SO⟩, 123
  - ⟨ESC⟩ "T", 27, 127
  - ⟨ESC⟩ "U" n, 64, 155
  - ⟨ESC⟩ "W" n, 30, 122
  - ⟨ESC⟩ "X" n1 n2, 48, 138
  - ⟨ESC⟩ "x" 0, 25, 119
  - ⟨ESC⟩ "x" 1, 25, 118
  - ⟨ESC⟩ "Y", 92, 145
  - ⟨ESC⟩ "Z", 92, 146
  - ⟨ESC⟩ "\", 140
  - ⟨ESC⟩ "~", 93, 148
  - ⟨ESC⟩ "~" n, 151



- Execute macro instruction, 149
- Expanded print, 29, 35, 122
- Extra functions, 9
  
- Feeding paper, 11, 14
  - <FF>, 43, 132
- Font pitch commands, 119
- Font style commands, 116
- Foreign language characters, 70, 102, 117
- Form feed, 43, 132
- Form feed commands, 132
- Form feed, reverse, 44
- Forward micro-feed, 10
  
- Gap, adjusting, 16
- Graphics, 66, 90
- Grid for download characters, 82, 87
  
- Hex dump, 76
- Hexadecimal, 21, 76
- Higher resolution graphics, 92
- Horizontal position commands, 136
- Horizontal tabs, 49, 138, 139
  - <HT>, 49, 138
  
- IBM mode, 40, 66, 102, 117, 118, 130
- Immediate print, 62, 158, 159
- Indicator, NLQ, 9
  - on line, 9, 153
  - power, 9
- Initialize printer, 60, 159
- Ink ribbon cartridge, 4, 95
- Interface connector, 7
- Interface, parallel, 169
- International characters, 70, 102, 117
- Italics, 25, 35, 116
  
- Key, NLQ, 9, 76
  - on line, 9, 153
  - paper feed, 9, 76
  
- Lever, clamp, 12, 14
  - release, 11, 14
- <LF>, 37, 128
- Line feed, 37, 102, 128, 131
- Line feed commands, 128
- Line feed, reverse, 38, 128
- Line spacing, 39, 129, 131
- Listing programs, 20
- LLIST, 20
- Loading paper, 11, 14
  
- Location, 1
- LPRINT, 20
  
- Macro instruction, 60, 74, 159
- Macro instruction commands, 149
- Maintenance, 95
- Margins, left and right, 48, 137
  - top and bottom, 45, 133
- Master print mode, 124
- Master reset code, 60, 159
- Micro-feed, forward, 10
  - reverse, 10
- Mixing print modes, 35
  
- NLQ download characters, 87
- NLQ indicator, 9
- NLQ key, 9, 76
- Near Letter Quality (NLQ) characters, 10, 24, 118
- Normal density graphics, 144
- Normal zero, 152
  
- Off line, 60, 153
- On line, 60
- On line indicator, 9
- On line key, 9, 153
- One line expanded print, 30, 123
- One-time tab, 51, 54
- One-time uni-directional print, 64, 156
  
- Packing tube, 3
- Page length, 44, 102, 132, 133
- Panel mode, 10, 25, 60, 118, 119
- Paper bail, 11, 12
- Paper feed key, 9, 76
- Paper feeding, 11, 14
- Paper gap, adjusting, 16
- Paper separator, 7, 15
- Paper thickness, adjustment, 16
- Paper-out, 102
- Paper-out detector, 60
- Parallel interface, 169
- Pica pitch, 28, 119
- Pitch, 28, 119
- Platen, 7
- Platen knob, 11
- Power cord, 7
- Power indicator, 9
- Power switch, 11
- Print head, 7, 98
- Print position, 141

- Print start position, 10
- Print style commands, 116
- Printable area, 157
- Printer cover, 2, 7, 13
- Printer initialization, 60, 159
- Printing download characters, 85, 88, 143
- Programs, listing, 20
- Proportional print, 32, 35, 121
- Protective tube, 4
  
- Quadruple density graphics, 92, 146
  
- RAM characters, 81
- Redefine dot graphics, 148
- Relative tab, 51, 140
- Release lever, 11, 14
- Reset code, 60, 159
- Reverse form feed, 44, 132
- Reverse line feed, 38, 128
- Reverse micro-feed, 10
- Reverse paper, 38, 44, 128, 131, 132
- Ribbon cartridge, 4, 95
- ROM characters, 80
  
- Select printer, 153
- Self-test, 16
- Semi-double density graphics, 92
- Setting margins, 45, 48, 133, 137
- Setting tabs, 49, 53, 139
- Setup, 1
- Seven bit interface, 66, 150
- <SI>, 120
- Single sheets, 12
- Skip over perforation, 45
- Slash zero, 151
- <SO>, 123
- Space, adjusting, 63
  - character, 141
- Special symbols, 66
- Specifications, 165
- Sprocket covers, 14
- Sprocket feed paper, 7, 14
- Standard mode, 63, 102, 130, 141, 157
- Starting new line, 37
- Subscripts, 27, 127
- Superscripts, 27, 126
  - text, 61, 153
- Switch, power, 11
- Switches, DIP, 11, 38, 40, 63, 66, 101, 128, 132, 136, 154, 159
- Syntax, command, 23
  
- Tab channel, 55
- Tab, absolute, 51, 140
  - relative, 51, 140
- Tabs, horizontal, 49, 138, 139
  - vertical, 52, 134
- Testing printer, 16
- Thickness, adjusting gap, 16
- Tractor feed unit, 7
  
- Underlining, 26, 35, 125
- Uni-directional print, 64, 155
- Unpacking, 1
- User-defined characters, 60, 79
  
- Vertical channels, 135
- Vertical positions commands, 128
- Vertical tab channels, 55
- Vertical tabs, 52, 134
- <VT>, 52, 134
  
- Zero, normal, 62, 152
  - slash, 62, 151