CHAPTER 11

BASIC MAINTENANCE

As almost any good mechanic will tell you, dust and heat are prime enemies of any mechanism, and SG-10/15 is no exception. The best maintenance is *preventive*. So, to start with, we hope you've found a clean, dust-free location with a comfortable temperature range for both you and your computer/printer system. Chapter 1 gives you further tips on locating SG-10/15.

CLEANING SG-10/15

The second rule for long life is *periodic cleaning*. Both inside and outside of the case and covers respond gratefully to periodic cleaning with a damp rag and alcohol. Do this whenever the case appears to be getting dirty, always being careful to avoid dripping alcohol on the printer mechanism.

To remove dust and paper lint from inside the printer areas, it's best to use a soft brush, *but,* be very, very careful not to bend or injure any electronic parts or wiring, as they are vulnerable to a heavy-handed touch.

Besides the periodic cleanings, the only other maintenance you'll likely encounter will be replacing a blown fuse, or replacement of the print head after a long period of use.

REPLACING A FUSE

How can you tell when you've blown a fuse? Well, when the printer won't operate and the power lamp on the control panel isn't lit, even though you're sure that the power switch is *on* and the printer is plugged in — it's likely a blown fuse.

To check the fuse, you start by turning the power switch *off* and unplugging the power cord.

Warning: There is an extreme shock hazard inside SG-10/15. To avoid serious injury, it is important the power cord is disconnected.

Next, remove the upper case by pulling off the platen knob. ***Caution:*** Don't twist or turn the platen knob; pull it *straight* off.

Then remove the fastening screws along the back side. Lift the back edge of the cover and at the same time, pull it slightly forward to release the front of the case. Lift it all the way off, being careful not to pull the wires which connect the cover to the case.

When the case is off, check Figure 11-1 for location of the fuse, which you'll find held by its clamps close to the power switch.

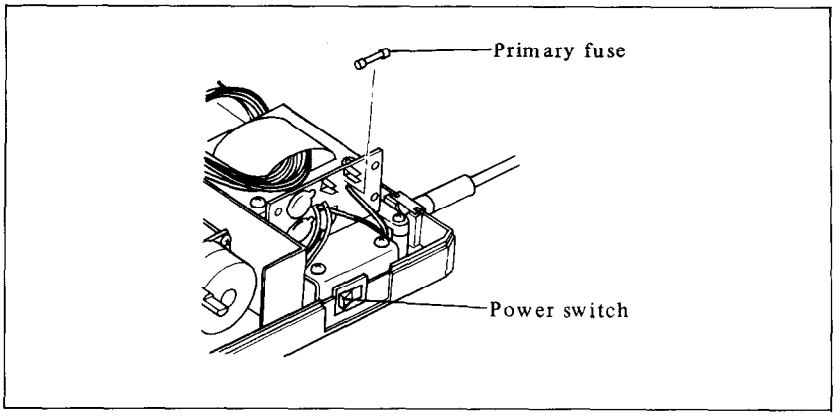


Figure 11-1. After removing the screws, pull the upper case slightly forward and lift it off the printer. The fuse is located near the power switch.

The fuse is a commonly used type, with a metal strip suspended in a glass and metal case. If the strip is broken, the fuse is blown. Replace this fuse with a 1.25A/125V slow-blow type fuse (Bell 5MT1.25 or equivalent) for 120V version, or a 630mA/250V slow-blow type fuse for 220V/240V versions. Now reassemble SG-10/15 and test-run it. If the printer still isn't working, call on your SG-10/15 dealer/service center for help.

REPLACING THE PRINT HEAD

The dot matrix print head has a remarkably long life, printing perhaps 100,000,000 characters before it wears out. You'll know

when that happens when the printout is too faint for your taste even after replacing the ink ribbon.

Warning: The print head gets hot during operation, so let it cool off for awhile, if necessary, to avoid burning your fingers.

To replace the print head, start by turning the power switch *off* and unplugging the power cord.
Then, in sequence:

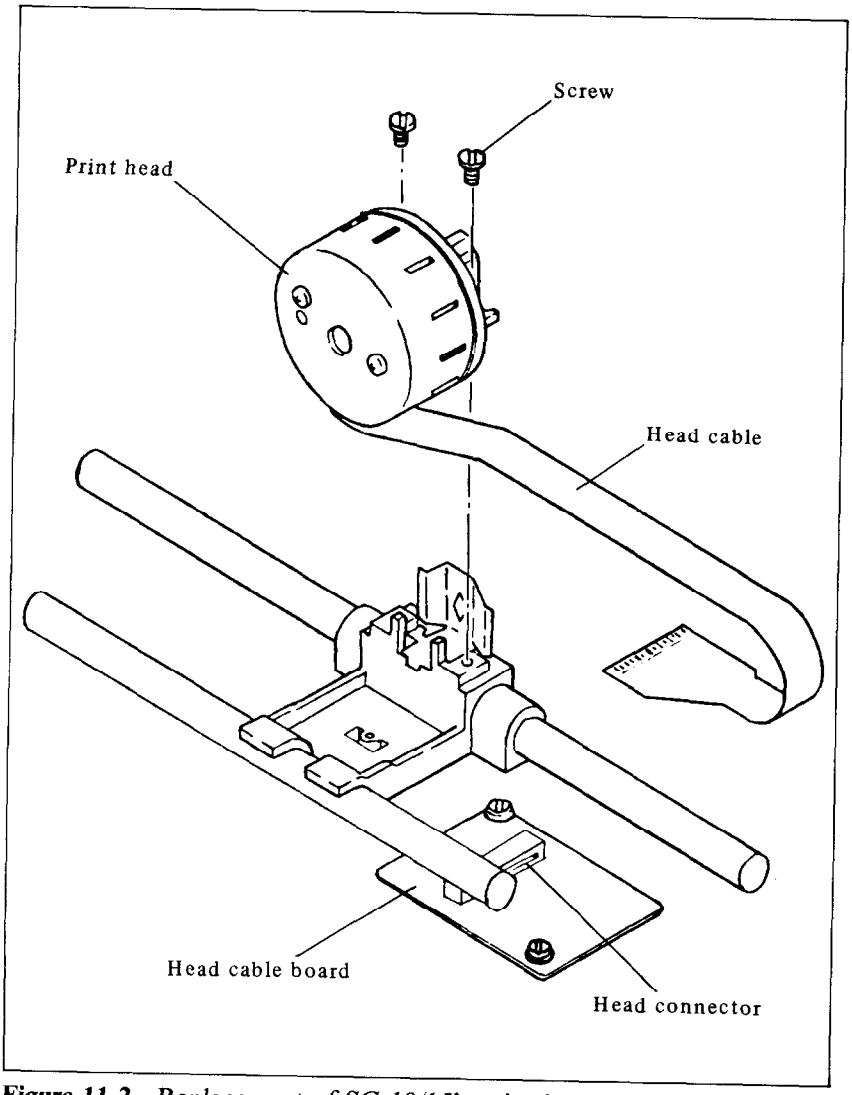


Figure 11-2. Replacement of SG-10/15's print head is simple.

1. Remove the printer cover and the ink ribbon.
2. Remove the two screws fastening the print head.
3. While holding the print head, pull off the head cable while holding down the head cable board.
4. Insert the head cable to the head cable board and fasten with the same two screws.
5. Apply "screw lock," (an adhesive available at hardware stores) to the heads of the screws.

Be absolutely sure that you've made a good solid connection between the print head and its cable connector, or it could cause problems.

APPENDIX A

DIP SWITCH SETTINGS

The DIP (dual in-line package) switches control some of the functions of SG-10/15. A DIP switch actually contains several individual switches. SG-10/15 has one DIP switch with 8 individual switches in it, and one DIP switch with 4 individual switches. Figure A-1 is a drawing of a typical DIP switch.

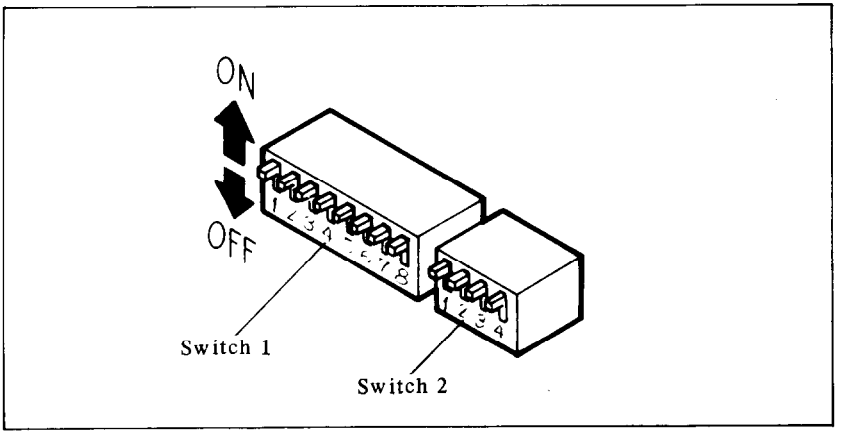


Figure A-1. A DIP switch is actually a series of several small switches.

All two DIP switches are readily accessible from the side. They are located on the left side of the control logic board, and can be seen on the left side of the printer. To change the setting of a switch, use a ballpoint pen or a similar object. The "on" position for a switch is upwards of the printer;"off" is downwards.

Never change the settings of any of the DIP switches when the power is on. Turn off both the printer and your computer.

The individual switches on DIP switch 1 are called 1-1 through 1-8; those on switch 2 are 2-1 through 2-4.

Table A-1 summarizes the functions of DIP switches 1 and 2.

Table A-1
DIP switch settings

Switch	ON	OFF
Switch 1		
1-1	11" page length	12" page length
1-2	Normal (STAR mode) Character Set #1 (IBM mode)	Italic (STAR mode) Character Set #2 (IBM mode)
1-3	10 CPI (pica pitch)	17 CPI (condensed pitch)
1-4	Normal	NLQ
1-5	Ignore download characters	Enabe download characters
1-6	International character set selection – see Table A-2	
1-7		
1-8		
Switch 2		
2-1	Paper-out detector on	Ignore paper-out
2-2	STAR mode	IBM mode
2-3	LF must be from host	Auto LF with CR
2-4	Standard buffer	Optional Buffer

Note: Switch 2-4 is not used for SG-15.

DIP switch 1 controls the default settings for printing functions. DIP switch 2 controls the interface.

SWITCH FUNCTIONS

Switch **Function**

1-1 Switch 1-1 sets the default page length for SG-10/15. If switch 1-1 is ON, the page length is set to 11″. When switch 1-1 is OFF the page length is set to 12″. This switch is set ON at the factory.

1-2 This switch selects the default character set according to the condition of DIP switch 2-2. If this switch is ON then the default character set is Normal characters (STAR mode) or Character Set #1 (IBM mode). If this switch is OFF then the default character set is Italic characters (STAR mode) or Character Set #2 (IBM mode). This switch is set ON at the factory.

1-3 This switch selects the default character pitch. If this switch is ON the default pitch is 10 CPI. If this switch is OFF the default pitch is 17 CPI. This switch is set ON at the factory. This switch has no effect if switch 1-4 is off.

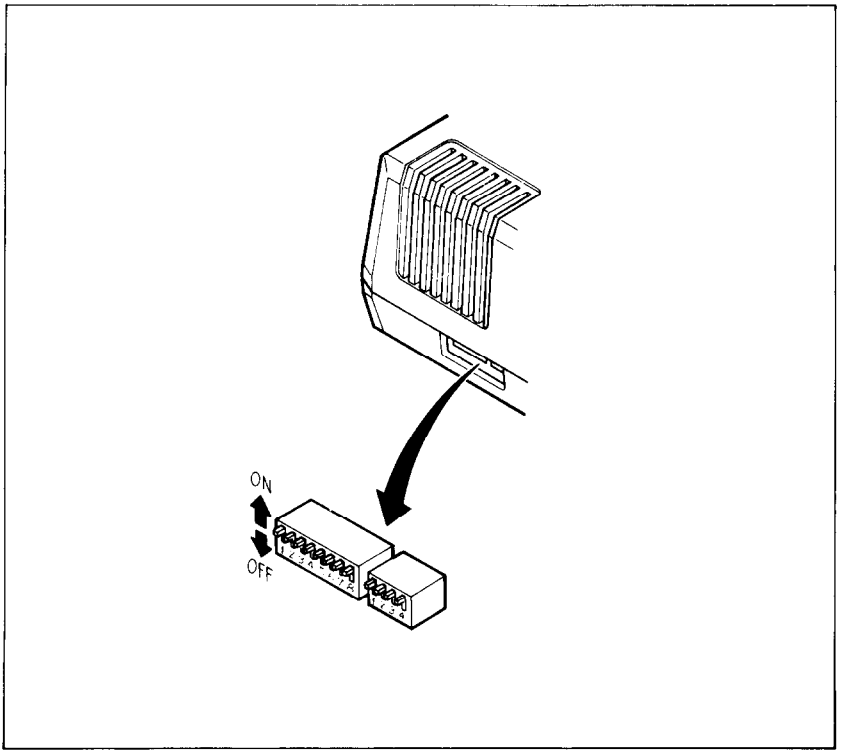


Figure A-2. SG-10/15's DIP switches are located on the left side of the printer.

1-4 Switch 1-4 selects the default character style. If this switch is ON then the default character style is normal characters. If this switch is OFF then the default character style is near letter quality. If this switch is OFF then switches 1-2 and 1-3 have no effect. This switch is set ON at the factory.

1-5 This switch controls the RAM condition. When this switch is ON the download character definitions are ignored and the RAM is used as the print buffer. When this switch is OFF the download character definitions are enable to use and the print buffer is set to one line buffer. This switch is set ON at the factory.

1-6 ~ 1-8 These three switches 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

Switch	USA	France	Germany	England	Denmark	Sweden	Italy	Spain
1-6	ON	OFF	ON	OFF	ON	OFF	ON	OFF
1-7	ON	ON	OFF	OFF	ON	ON	OFF	OFF
1-8	ON	ON	ON	ON	OFF	OFF	OFF	OFF

2-1 This switch disables the paper-out detector. If this switch is ON the printer will signal the computer when it runs out of continuous paper and will stop printing. 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.

2-2 This switch selects the active control codes. Turn this switch ON to use the "STAR" mode, and to set the minimum line feed value to 1/144 inch. Turn this switch OFF to use the "IBM" mode, and to set the minimum line feed value to 1/216 inch. This switch is set ON at the factory.

2-3 When this switch is ON, the computer must send a line feed command every time the paper is to advance. When this switch is OFF, SG-10/15 will automatically advance the paper one line every time it receives a carriage return. (Most BASICs send a line feed with every carriage return, therefore, this switch should usually be on.) This switch is set ON at the factory.

2-4 This switch controls the buffer status. When SG-10 has only the standard board, turn this switch ON. When SG-10 has either an optional buffer board or an optional serial buffer board, turn this switch OFF. This switch is set ON at the factory. (This switch is not used for SG-15.)

APPENDIX B

ASCII CODES

■ Standard characters

Decimal	STAR mode	IBM#1mode	IBM#2mode	Function
0	NUL	NUL	NUL	End tab settings
3			♥	
4			♦	
5			♣	
6			♠	
7	BEL	BEL	BEL	Bell
8	BS	BS	BS	Backspace
9	HT	HT	HT	Horizontal tab
10	LF	LF	LF	Line feed
11	VT	VT	VT	Vertical tab
12	FF	FF	FF	Form feed
13	CR	CR	CR	Carriage return
14	SO	SO	SO	Expanded print on
15	SI	SI	SI	Condensed print on
17	DC1	DC1	DC1	On line
18	DC2	DC2	DC2	Pica pitch
19	DC3	DC3	DC3	Off line
20	DC4	DC4	DC4	Expanded print off
21			§	
24	CAN	CAN	CAN	Cancel line
27	ESC	ESC	ESC	Escape
30	RS	RS	RS	End macro
32				Space
33	!	!	!	
34	"	"	"	
35	#	#	#	*
36	$	$	$	
37	%	%	%	
38	&	&	&	

*This character may be different if you are using an international character set other than the USA set. The characters for each set are shown on page 132.

Decimal	STAR mode	IBM#1mode	IBM#2mode	Function
39	'	'	'	Apostrophe
40	(	(	(	
41	)	)	)	
42	*	*	*	
43	+	+	+	
44	,	,	,	Comma
45	-	-	-	Hyphen
46	.	.	.	Period
47	/	/	/	
48	0	0	0	
49	1	1	1	
50	2	2	2	
51	3	3	3	
52	4	4	4	
53	5	5	5	
54	6	6	6	
55	7	7	7	
56	8	8	8	
57	9	9	9	
58	:	:	:	
59	;	;	;	
60	<	<	<	
61	=	=	=	
62	>	>	>	
63	?	?	?	
64	@	@	@	*
65	A	A	A	
66	B	B	B	
67	C	C	C	
68	D	D	D	
69	E	E	E	
70	F	F	F	
71	G	G	G	
72	H	H	H	
73	I	I	I	
74	J	J	J	
75	K	K	K	
76	L	L	L	
77	M	M	M	
78	N	N	N	
79	O	O	O	
80	P	P	P	

*This character may be different if you are using an international character set other than the USA set. The characters for each set are shown on page 132.

Decimal	STAR mode	IBM#1mode	IBM#2mode	Function
81	Q	Q	Q	
82	R	R	R	
83	S	S	S	
84	T	T	T	
85	U	U	U	
86	V	V	V	
87	W	W	W	
88	X	X	X	
89	Y	Y	Y	
90	Z	Z	Z	
91	[	[	[	*
92	\	\	\	*
93	]	]	]	*
94	^	^	^	*
95	_	_	_	
96	`	`	`	*
97	a	a	a	
98	b	b	b	
99	c	c	c	
100	d	d	d	
101	e	e	e	
102	f	f	f	
103	g	g	g	
104	h	h	h	
105	i	i	i	
106	j	j	j	
107	k	k	k	
108	l	l	l	
109	m	m	m	
110	n	n	n	
111	o	o	o	
112	p	p	p	
113	q	q	q	
114	r	r	r	
115	s	s	s	
116	t	t	t	
117	u	u	u	
118	v	v	v	
119	w	w	w	
120	x	x	x	
121	y	y	y	
122	z	z	z	

*These characters may be different if you are using an international character set other than the USA set. The characters for each set are shown on the next page.

Decimal	STAR mode	IBM#1mode	IBM#2mode	Function
123	{	{	{	*
124	|	|	|	*
125	}	}	}	*
126	~	~	~	*
127	DEL	DEL	DEL	Delete

*These characters may be different if you are using an international character set other than the USA set. The characters for each set are shown below.

■ International character sets

Decimal	USA	France	Germany	England	Denmark	Sweden	Italy	Spain
35	#	£	#	£	#	#	#	#
64	@	à	§	@	@	É	§	@
91	[	°	Ä	[	Æ	Ä	°	¡
92	\	ç	Ö	\	Ø	Ö	ç	Ñ
93	]	§	Ü	]	Å	Å	é	¿
94	^	^	^	^	^	Ü	^	^
96	`	`	`	`	`	é	ù	`
123	{	é	ä	{	æ	ä	à	°
124	|	ù	ö	|	ø	ö	ò	ñ
125	}	è	ü	}	à	å	è	}
126	~	¨	ß	~	~	ü	ì	~

■ Special and block graphics characters

Decimal	STAR mode	IBM#1mode	IBM#2mode	Function
128	NUL	NUL	Ç	End tab settings
129			ü	
130			é	
131			ã	
132			ä	
133			à	
134			á	
135	BEL	BEL	ç	Bell
136	BS	BS	ê	Backspace
137	HT	HT	ë	Horizontal tab
138	LF	LF	è	Line feed
139	VT	VT	ï	Vertical tab
140	FF	FF	î	Form feed
141	CR	CR	ì	Carriage return
142	SO	SO	Ä	Expanded print on
143	SI	SI	Å	Condensed print on
144			É	
145	DC1	DC1	æ	On line

Decimal	STAR mode	IBM#1mode	IBM#2mode	Function
146	DC2	DC2	Æ	Pica pitch
147	DC3	DC3	ô	Off line
148	DC4	DC4	ö	Expanded print off
149			ò	
150			û	
151			ù	
152	CAN	CAN	ÿ	Cancel text
153			Ö	
154			Ü	
155	ESC	ESC	¢	Escape
156			£	
157			¥	
158	RS	RS	₧	End macro
159			ƒ	
160	SP	á	á	
161	¬	í	í	
162	½	ó	ó	
163	¼	ú	ú	
164	←	ñ	ñ	
165	↓	Ñ	Ñ	
166	←	ª	ª	
167	→	º	º	
168	○	¿	¿	
169	↔	⌐	⌐	
170	▲	¬	¬	
171	▷	½	½	
172	◁	¼	¼	
173	◇	¡	¡	
174	◆	«	«	
175	□	»	»	
176	₧	▒	▒	
177	Å	▒	▒	
178	∅	▓	▓	
179	Θ	│	│	
180	∟	┤	┤	
181	⊨	┤	┤	
182	Ω	┤	┤	
183	∂	┐	┐	
184	Σ	┐	┐	
185	σ	┤	┤	
186	∞	│	│	
187	π	┐	┐	

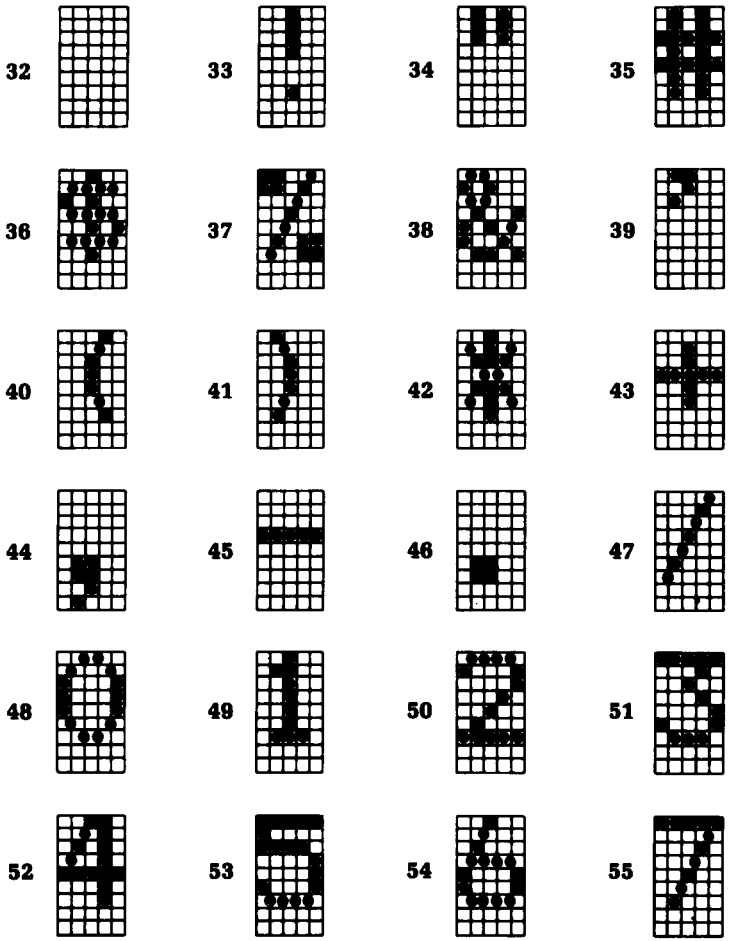
Decimal	STAR mode	IBM#1mode	IBM#2mode	Function
188	±	┘	┘	
189	▯	┘	┘	
190	×	┘	┘	
191	÷	┐	┐	
192	Ā	└	└	
193	ā	┴	┴	
194	°	┬	┬	
195	£	├	├	
196	ā	─	─	
197	µ	┼	┼	
198	°	├	├	
199	˙	├	├	
200	†	└	└	
201	§	┌	┌	
202	Ē	┴	┴	
203	◙	┬	┬	
204	¼	├	├	
205	▒	─	─	
206	½	┼	┼	
207	‖	┴	┴	
208	¥	┴	┴	
209	Ā	┬	┬	
210	Ō	┬	┬	
211	Ū	└	└	
212	¢	└	└	
213	Ñ	┌	┌	
214	ä	┌	┌	
215	ö	┼	┼	
216	ü	┼	┼	
217	ß	┘	┘	
218	ē	┌	┌	
219	é	▉	▉	
220	ū	▄	▄	
221	è	▌	▌	
222	ñ	▌	▌	

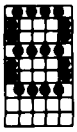
Decimal	STAR mode	IBM#1mode	IBM#2mode	Function
223				
224				
225				
226				
227				
228				
229				
230				
231				
232				
233				
234				
235				
236				
237				
238				
239				
240				
241				
242				
243				
244				
245				
246				
247				
248				
249				
250				
251				
252				
253				
254				
255				Space

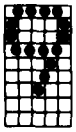
APPENDIX C

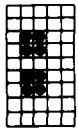
CHARACTER STYLE CHARTS

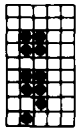
■ Standard Characters

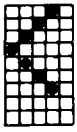


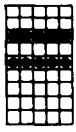
56 

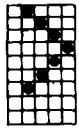
57 

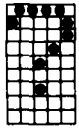
58 

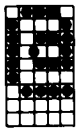
59 

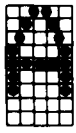
60 

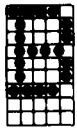
61 

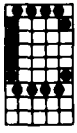
62 

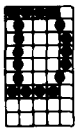
63 

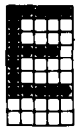
64 

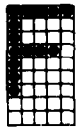
65 

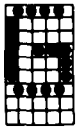
66 

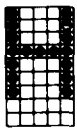
67 

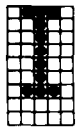
68 

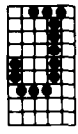
69 

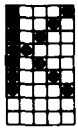
70 

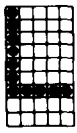
71 

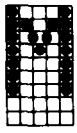
72 

73 

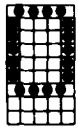
74 

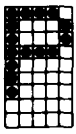
75 

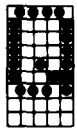
76 

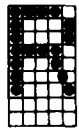
77 

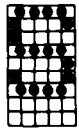
78

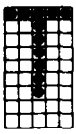
79 

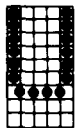
80 

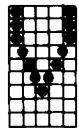
81 

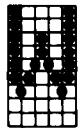
82 

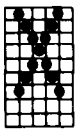
83 

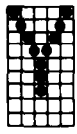
84 

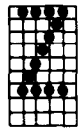
85 

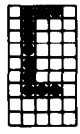
86 

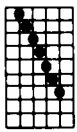
87 

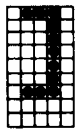
88 

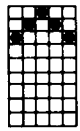
89 

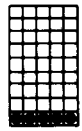
90 

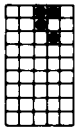
91 

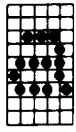
92 

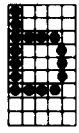
93 

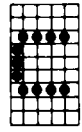
94 

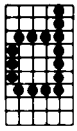
95 

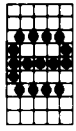
96 

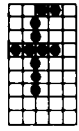
97 

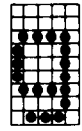
98 

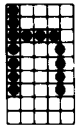
99 

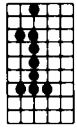
100 

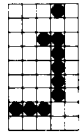
101 

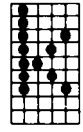
102 

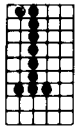
103 

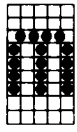
104 

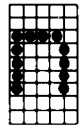
105 

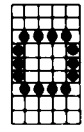
106 

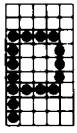
107 

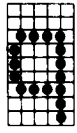
108 

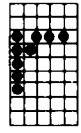
109 

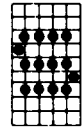
110 

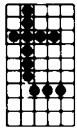
111 

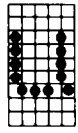
112 

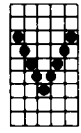
113 

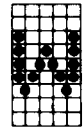
114 

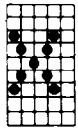
115 

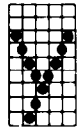
116 

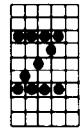
117 

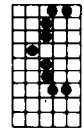
118 

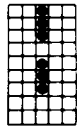
119 

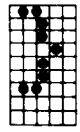
120 

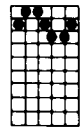
121 

122 

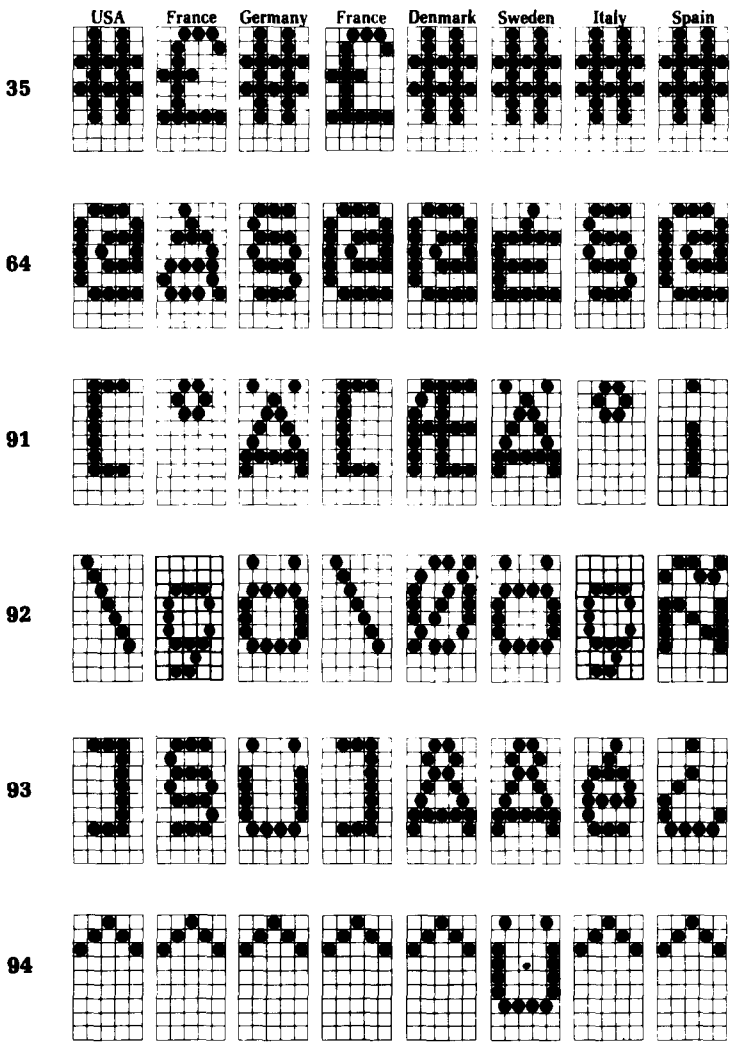
123 

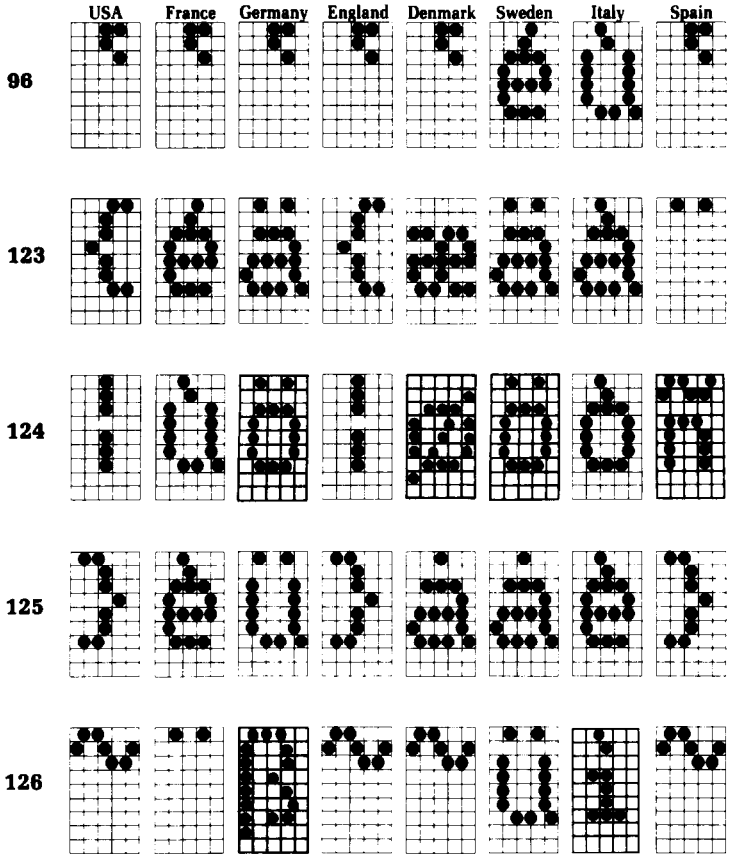
124 

125 

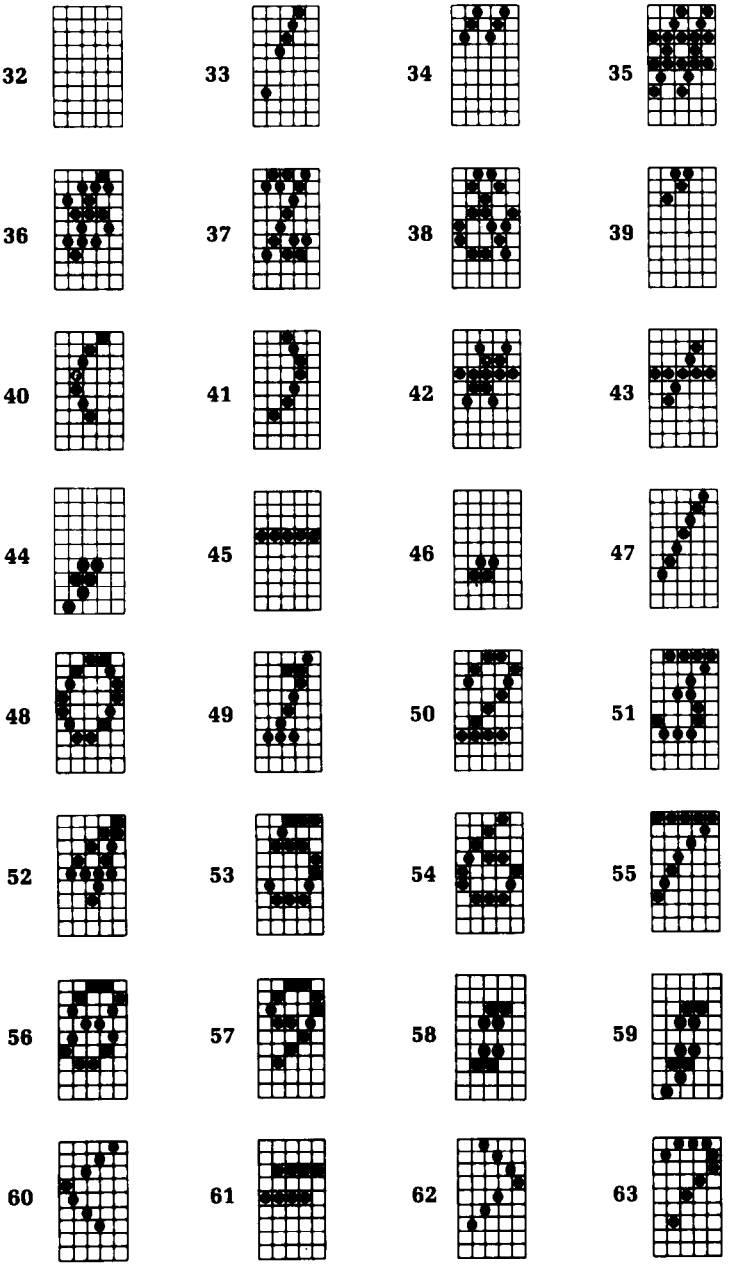
126 

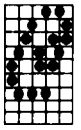
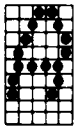
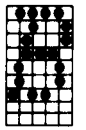
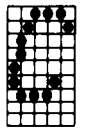
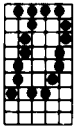
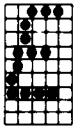
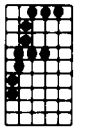
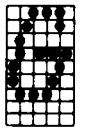
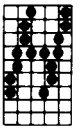
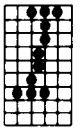
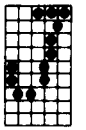
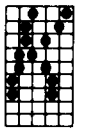
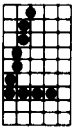
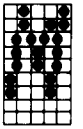
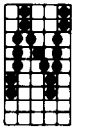
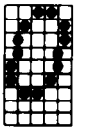
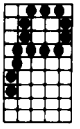
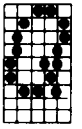
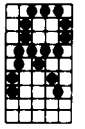
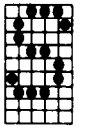
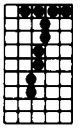
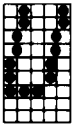
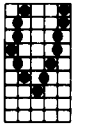
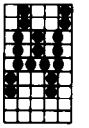
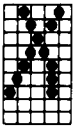
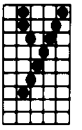
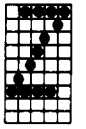
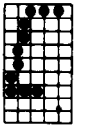
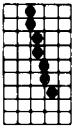
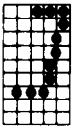
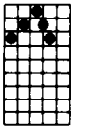
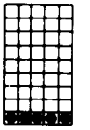
■ International Characters

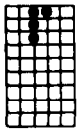


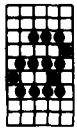

USA
France
Germany
England
Denmark
Sweden
Italy
Spain
96
123
124
125
126

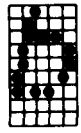
■ Italic Characters

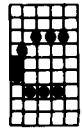


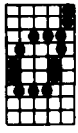
64 
65 
66 
67 
68 
69 
70 
71 
72 
73 
74 
75 
76 
77 
78 
79 
80 
81 
82 
83 
84 
85 
86 
87 
88 
89 
90 
91 
92 
93 
94 
95 

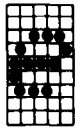
96 

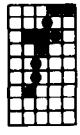
97 

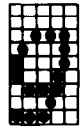
98 

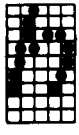
99 

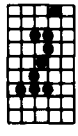
100 

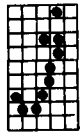
101 

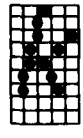
102 

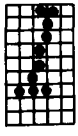
103 

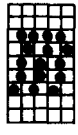
104 

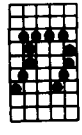
105 

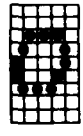
106 

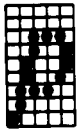
107 

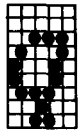
108 

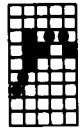
109 

110 

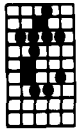
111 

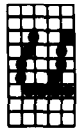
112 

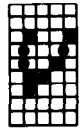
113 

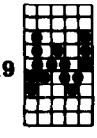
114 

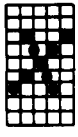
115

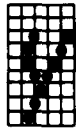
116 

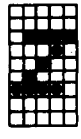
117 

118 

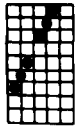
119 

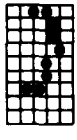
120 

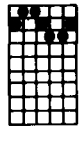
121 

122 

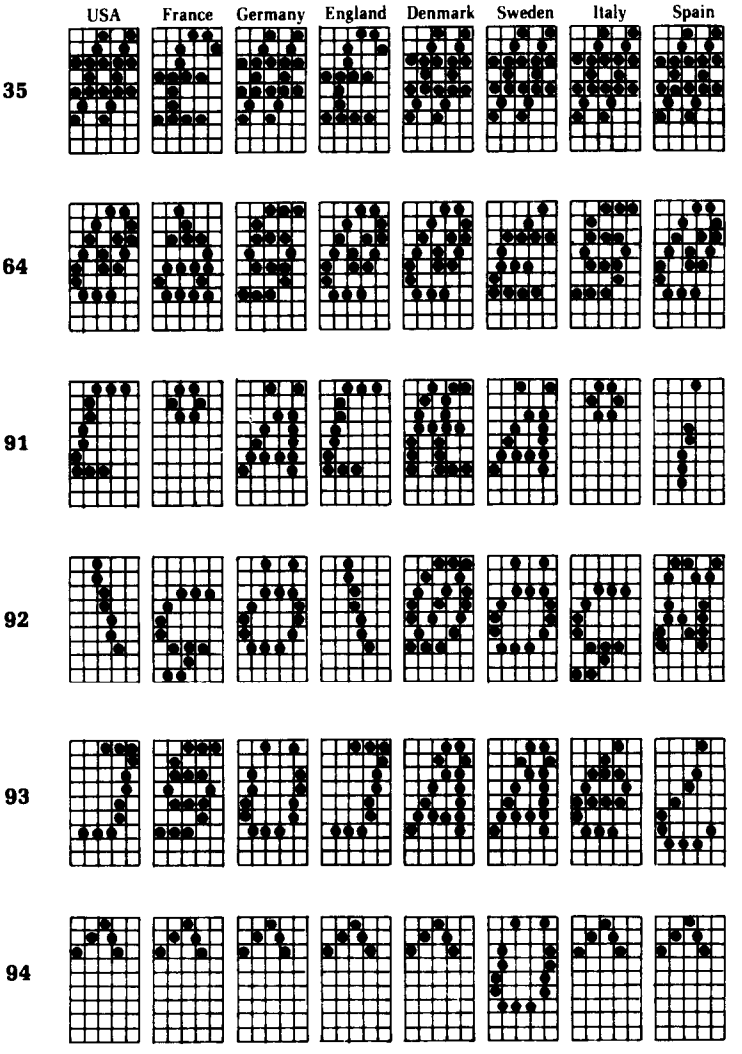
123

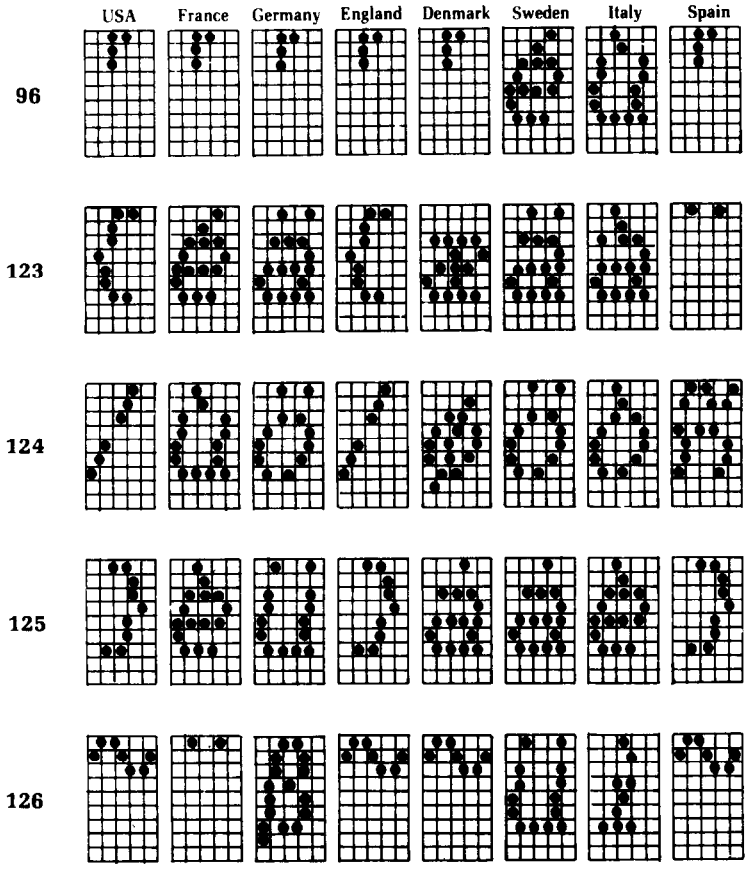
124 

125 

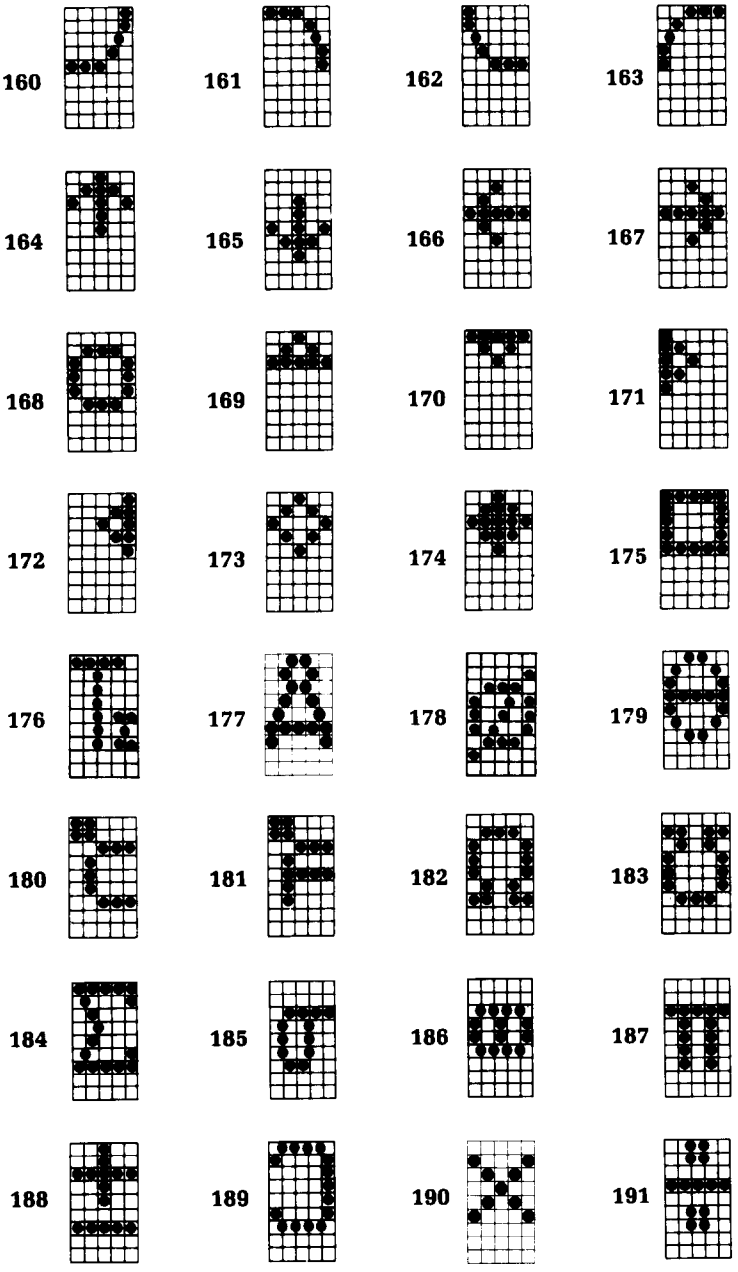
126 

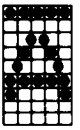
Italic International Characters

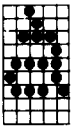


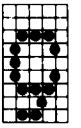

USA
France
Germany
England
Denmark
Sweden
Italy
Spain
96
123
124
125
126

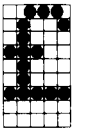
■ Special Characters (for STAR mode)

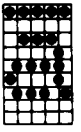


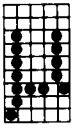
192 

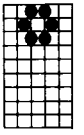
193 

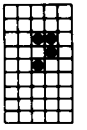
194 

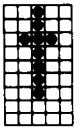
195 

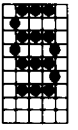
196 

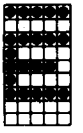
197 

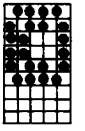
198 

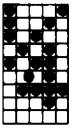
199 

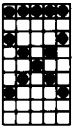
200 

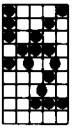
201 

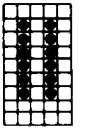
202 

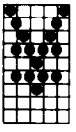
203 

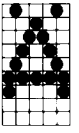
204 

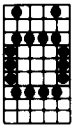
205 

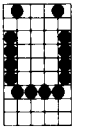
206 

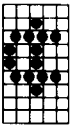
207 

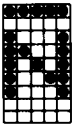
208 

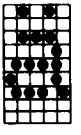
209 

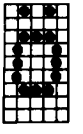
210 

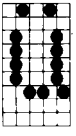
211 

212 

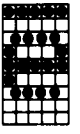
213 

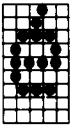
214 

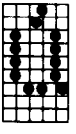
215 

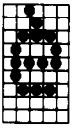
216 

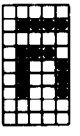
217

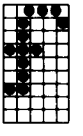
218 

219 

220 

221 

222 

223 

224
225
226
227

228
229
230
231

232
233
234
235

236
237
238
239

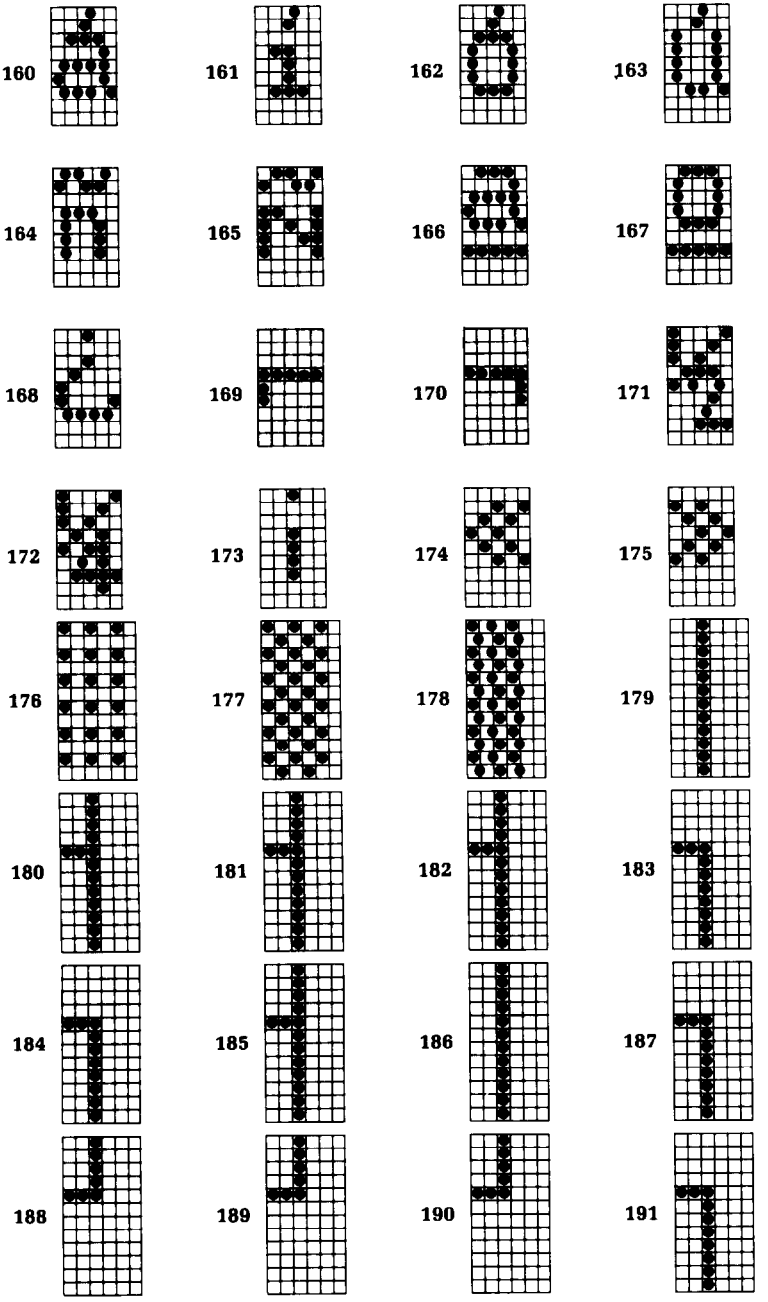
240
241
242
243

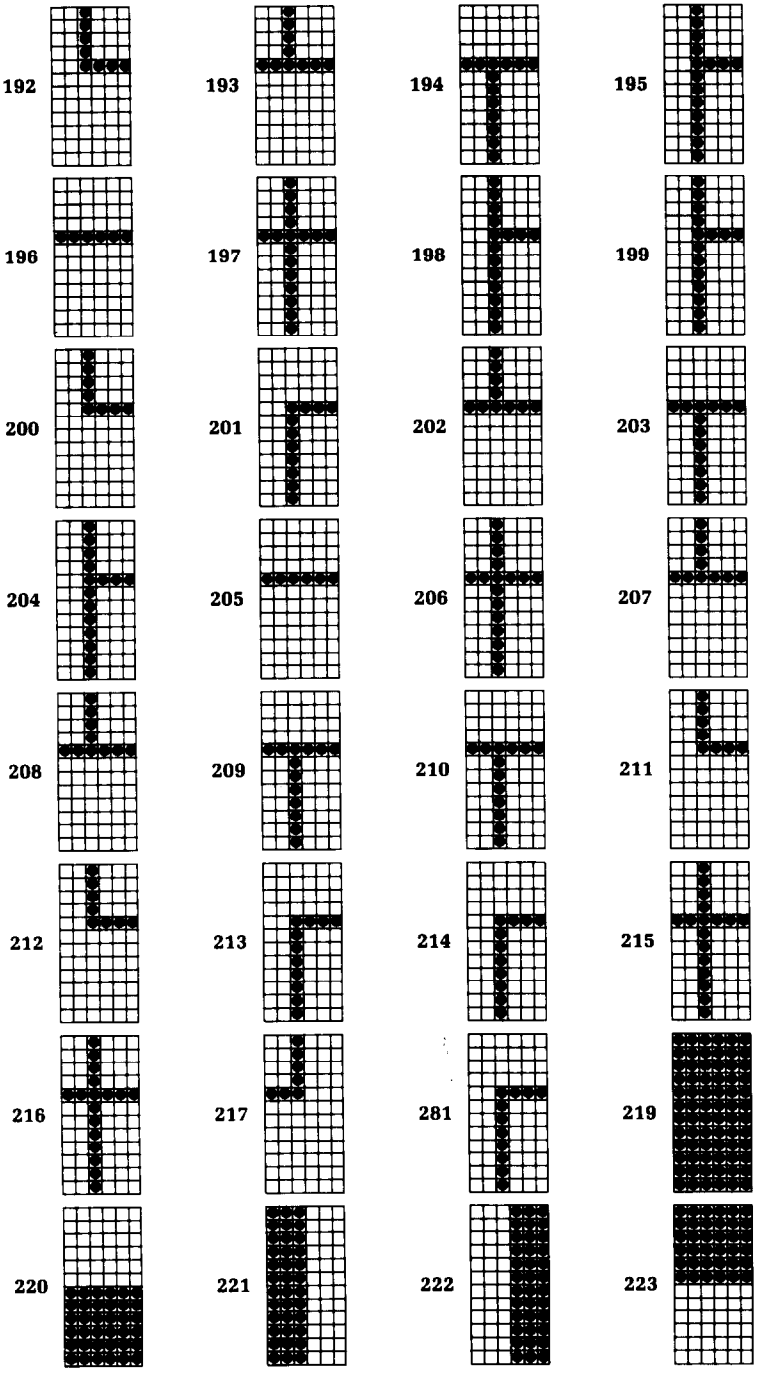
244
245
246
247

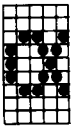
248
249
250
251

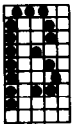
252
253
254

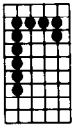
■ Special Characters (for IBM mode)

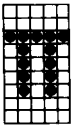


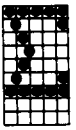

192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
281
219
220
221
222
223

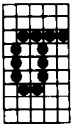
224 

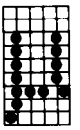
225 

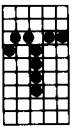
226 

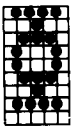
227 

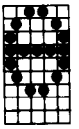
228 

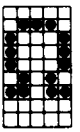
229 

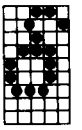
230 

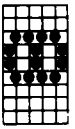
231 

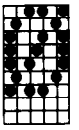
232 

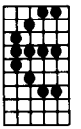
233 

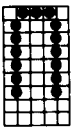
234 

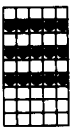
235 

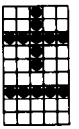
236 

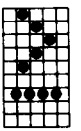
237 

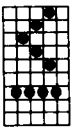
238 

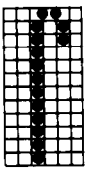
239 

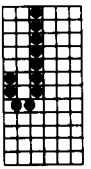
240 

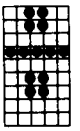
241 

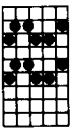
242 

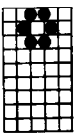
243 

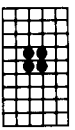
244 

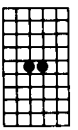
245 

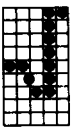
246 

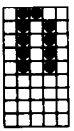
247 

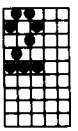
248 

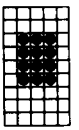
249 

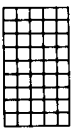
250 

251 

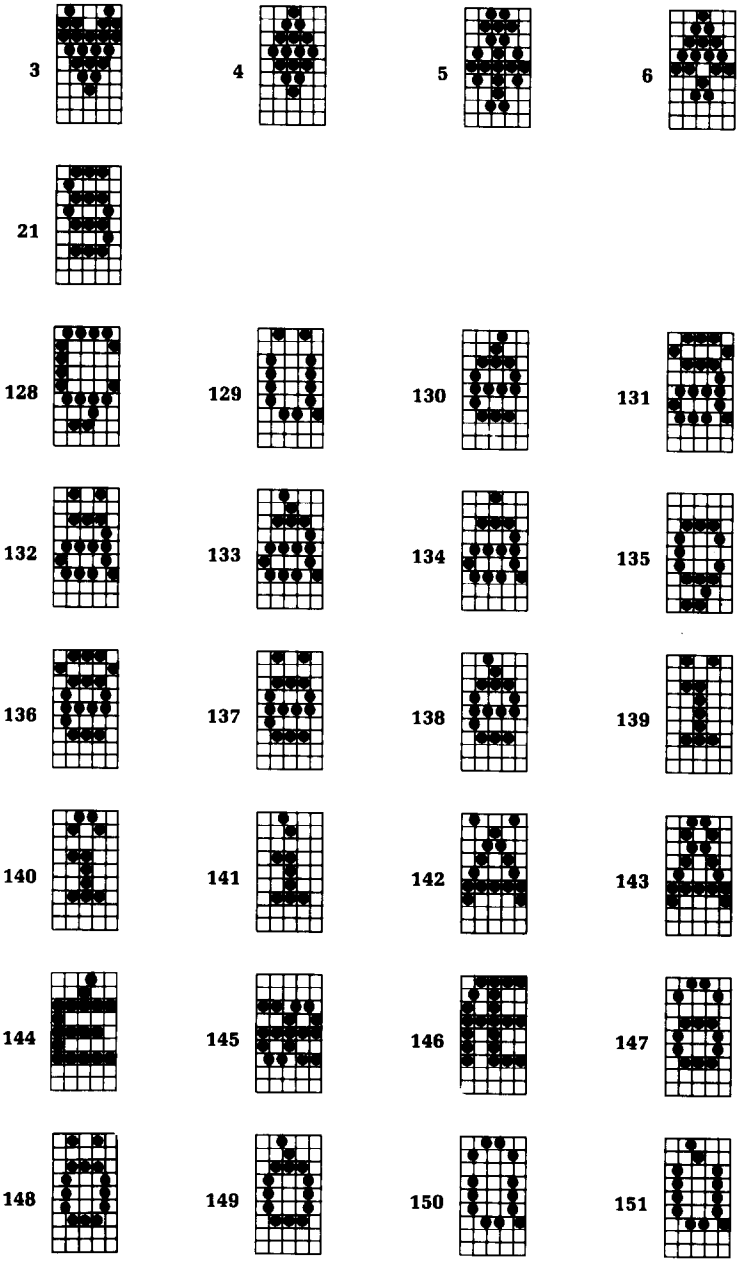
252 

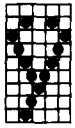
253 

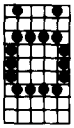
254 

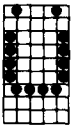
255 

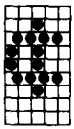
■ Special Characters (for IBM character set #2)

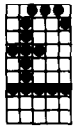


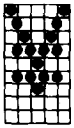
152 

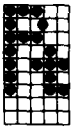
153 

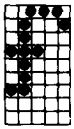
154 

155 

156 

157 

158 

159 

APPENDIX D

FUNCTION CODE REFERENCE

The purpose of this Appendix is to provide a quick reference for the various functions available on the SG-10 and SG-15.The descriptions of the codes appear in the following format:

PURPOSE:	**Tells what the function code does.**
CODE: (decimal ASCII) (hex ASCII)	Control code mnemonic ASCII decimal equivalent Hexadecimal equivalent
REMARKS:	Details how the command is used.
REFERENCE:	Tells which chapter of the manual describes the command in greater detail

There are several commands that require that you specify a value (or values) to SG-10/15. In these cases, we have used an italic "*n*" or "*m*" to indicate a variable. You should insert the ASCII code for 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: **Select the standard character set.**

CODE:

STAR mode	< ESC >	"5"	
(decimal ASCII)	27	53	
(hex ASCII)	1B	35	
IBM mode	< ESC >	"I"	0
(decimal ASCII)	27	73	0
(hex ASCII)	1B	49	00

REMARKS: This command causes the printer to cancel the italic character set and select instead the standard character set. You can select the standard character set as the power-on default by turning DIP switches 1-2 and 2-2 on.
NOTE: The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

REFERENCE: Chapter 5

PURPOSE: **Select the italic character set.**

CODE:

STAR mode	< ESC >	"4"	
(decimal ASCII)	27	52	
(hex ASCII)	1B	34	
IBM mode	< ESC >	"I"	1
(decimal ASCII)	27	73	1
(hex ASCII)	1B	49	01

REMARKS: This command selects the italic character set. You can select the italic character set as the power-on default by turning DIP switch 1-2 off and DIP switch 2-2 on.
NOTE: The character "1" (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

REFERENCE: Chapter 5

PURPOSE: **Select the character set #1.**

CODE:

STAR mode	(N/A)	
IBM mode	<ESC>	"7"
(decimal ASCII)	27	55
(hex ASCII)	1B	37

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

REFERENCE: Chapter 8

PURPOSE: **Select #2 character set.**

CODE:

STAR mode	(N/A)	
IBM mode	<ESC>	"6"
(decimal ASCII)	27	54
(hex ASCII)	1B	36

REMARKS: This command selects character set #2. You can select character set #2 as the power-on default by turning DIP switches 1-2 and 2-2 off.

REFERENCE: Chapter 8

PURPOSE: **Select an international character set.**

CODE:

STAR mode	< ESC >	"7"	*n*
(decimal ASCII)	27	55	*n*
(hex ASCII)	1B	37	*n*
IBM mode	< ESC >	"R"	*n*
(decimal ASCII)	27	82	*n*
(hex ASCII)	1B	52	*n*

REMARKS: This command causes the printer to select an international character set determined by the value of *n* as shown in the table below:

n	Character set	*n*	Character set
0	U.S.A.	4	Denmark
1	France	5	Sweden
2	Germany	6	Italy
3	England	7	Spain

You can select a particular international character set as a power-on default by adjusting the settings of DIP switches 1-6, 1-7, and 1-8.

REFERENCE: Chapter 8

PURPOSE: **Select the NLQ (Near Letter Quality) character set.**

CODE:

STAR mode	< ESC >	"B"	4
(decimal ASCII)	27	66	4
(hex ASCII)	1B	42	04
IBM mode	< ESC >	"4"	
(decimal ASCII)	27	52	
(hex ASCII)	1B	34	

REMARKS: This command causes all subsequent printing to be done with the NLQ (Near Letter Quality) character set. This character set cannot be used in conjunction with other font styles or special print modes except for underlining. You can set NLQ characters as the power-on default by turning DIP switch 1-4 off.

REFERENCE: Chapter 5

PURPOSE: **Cancel the NLQ character set.**

CODE:

STAR mode	< ESC >	"B"	5
(decimal ASCII)	27	66	5
(hex ASCII)	1B	42	05
IBM mode	< ESC >	"5"	
(decimal ASCII)	27	53	
(hex ASCII)	1B	35	

REMARKS: This command causes the printer to cancel the NLQ character set and return to the standard (also known as "draft") character set.

REFERENCE: Chapter 5

■ Font pitch controls

PURPOSE: **Set the print pitch to pica (10 characters/inch).**

CODE:

STAR mode	< ESC >	"B"	1
(decimal ASCII)	27	66	1
(hex ASCII)	1B	42	01
IBM mode	< ESC >	"P"	
(decimal ASCII)	27	80	
(hex ASCII)	1B	50	

REMARKS: This command causes all subsequent printing to be done in pica type. This command also sets the maximum number of print columns to 80 on the SG-10 and 136 on the SG-15. You can select pica type as the power-on default by turning DIP switch 1-3 on.

REFERENCE: Chapter 5

PURPOSE: **Set the print pitch to elite (12 characters/inch).**

CODE:

STAR mode	< ESC >	"B"	2
(decimal ASCII)	27	66	2
(hex ASCII)	1B	42	02
IBM mode	< ESC >	"M"	
(decimal ASCII)	27	77	
(hex ASCII)	1B	4D	

REMARKS: This command causes all subsequent printing except NLQ characters to be done in elite type. This command also sets the maximum number of print columns to 96 on the SG-10 and 163 on the SG-15.

REFERENCE: Chapter 5

PURPOSE: **Set the print pitch to condensed (17 characters/inch).**

CODE:

STAR mode	< ESC >	< SI >
(decimal ASCII)	27	15
(hex ASCII)	1B	0F
IBM mode	< ESC >	< SI >
(decimal ASCII)	27	15
(hex ASCII)	1B	0F

REMARKS: This command causes all subsequent printing except NLQ characters to be done in condensed type of 17 characters per inch. This command also sets the maximum number of print columns to 136 on the SG-10 and 233 on the SG-15. You can select condensed type as the power-on default by turning DIP switch 1-3 off.

REFERENCE: Chapter 5

PURPOSE: **Set the print pitch to pica (10 characters/inch).**

CODE:

STAR mode	<DC2>
(decimal ASCII)	18
(hex ASCII)	12
IBM mode	<DC2>
(decimal ASCII)	18
(hex ASCII)	12

REMARKS: This command is the same as <ESC> "B" 1 in STAR mode or <ESC> "P" in IBM mode, but can be used in applications where a single-character command is required.

REFERENCE: Chapter 5

PURPOSE: **Set the print pitch to condensed (17 characters/inch).**

CODE:

STAR mode	<SI>
(decimal ASCII)	15
(hex ASCII)	0F
IBM mode	<SI>
(decimal ASCII)	15
(hex ASCII)	0F

REMARKS: This command is the same as <ESC> <SI>, but can be used in applications where a single-character command is required.

REFERENCE: Chapter 5

PURPOSE: **Set the print pitch to condensed (17 characters/inch).**

CODE:

STAR mode	<ESC>	"B"	3
(decimal ASCII)	27	66	3
(hex ASCII)	1B	42	03
IBM mode	(N/A)		

REMARKS: Same as <ESC> <SI>, above.

REFERENCE: Chapter 5

PURPOSE: **Set the print pitch to proportional**

CODE:

STAR mode	<ESC>	"p"	1
(decimal ASCII)	112	112	1
(hex ASCII)	1B	70	01
IBM mode	<ESC>	"p"	1
(decimal ASCII)	27	112	1
(hex ASCII)	1B	70	01

REMARKS: This command causes all subsequent printing except NLQ characters to be done with proportional spacing.
NOTE: The character "1" (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

REFERENCE: Chapter 5

PURPOSE: **Cancel the proportional spacing**

CODE:

STAR mode	<ESC>	"p"	0
(decimal ASCII)	27	112	0
(hex ASCII)	1B	70	00
IBM mode	<ESC>	"p"	0
(decimal ASCII)	27	112	0
(hex ASCII)	1B	70	00

REMARKS: This command cancels the proportional spacing and returns the print pitch to the previous set.
NOTE: The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

REFERENCE: Chapter 5

PURPOSE: **Set the printer to expanded print.**

CODE:

STAR mode	< ESC >	"W"	1
(decimal ASCII)	27	87	1
(hex ASCII)	1B	57	01
IBM mode	< ESC >	"W"	1
(decimal ASCII)	27	87	1
(hex ASCII)	1B	57	01

REMARKS: This command causes all subsequent printing except NLQ characters to be in expanded type. The size of the type is determined by the normal type size at the time the command is sent:

	Normal	Expanded
Pica	10 CPI	5CPI
Elite	12 CPI	6 CPI
Condensed	17 CPI	8.5 CPI

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

REFERENCE: Chapter 5

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

CODE:

STAR mode	< SO >
(decimal ASCII)	14
(hex ASCII)	0E
IBM mode	< SO >
(decimal ASCII)	14
(hex ASCII)	0E

REMARKS: This command causes the printer to print expanded characters until a carriage return is sent. It can also be cancelled with < DC4 >. The character widths are shown above in the description of < ESC > "W" 1 command.

REFERENCE: Chapter 5

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

CODE:

STAR mode	<ESC>	<SO>
(decimal ASCII)	27	14
(hex ASCII)	1B	0E
IBM mode	<ESC>	<SO>
(decimal ASCII)	27	14
(hex ASCII)	1B	0E

REMARKS: Same as <SO>, above.

REFERENCE: Chapter 5

PURPOSE: **Cancels expanded print.**

CODE:

STAR mode	<ESC>	"W"	0
(decimal ASCII)	27	87	0
(hex ASCII)	1B	57	00
IBM mode	<ESC>	"W"	0
(decimal ASCII)	27	87	0
(hex ASCII)	1B	57	00

REMARKS: This command resets the print size to whatever it was before being set to expanded print. NOTE: The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

REFERENCE: Chapter 5

PURPOSE: **Cancels expanded print.**

CODE:

STAR mode	<DC4>
(decimal ASCII)	20
(hex ASCII)	14
IBM mode	<DC4>
(decimal ASCII)	20
(hex ASCII)	14

REMARKS: This command cancels one line expanded printing set with <SO>.

REFERENCE: Chapter 5

■ Special print modes

PURPOSE: **Select double-strike printing.**

CODE:

STAR mode	< ESC >	"G"
(decimal ASCII)	27	71
(hex ASCII)	1B	47
IBM mode	< ESC >	"G"
(decimal ASCII)	27	71
(hex ASCII)	1B	47

REMARKS: This command causes all subsequent characters except NLQ characters to be printed in double-strike. Double-strike causes all characters to be printed once, the paper moved up 1/144 inch, the characters reprinted. Shifting in and out of double-strike mode on the same line can cause the line to slant slightly.

REFERENCE: Chapter 5

PURPOSE: **Cancel double-strike printing.**

CODE:

STAR mode	< ESC >	"H"
(decimal ASCII)	27	72
(hex ASCII)	1B	48
IBM mode	< ESC >	"H"
(decimal ASCII)	27	72
(hex ASCII)	1B	48

REMARKS: This command cancels double-strike printing and returns the printer to its previous print style.

REFERENCE: Chapter 5

PURPOSE: **Select emphasized printing.**

CODE:

STAR mode	< ESC >	"E"
(decimal ASCII)	27	69
(hex ASCII)	1B	45
IBM mode	< ESC >	"E"
(decimal ASCII)	27	69
(hex ASCII)	1B	45

REMARKS: This command causes all subsequent characters except NLQ characters to be printed in emphasized print. Emphasized print can only be used with pica-sized characters, or enlarged pica-sized characters (10 CPI and 5 CPI), and cannot be used with superscripts or subscripts.

REFERENCE: Chapter 5

PURPOSE: **Cancel emphasized printing.**

CODE:

STAR mode	< ESC >	"F"
(decimal ASCII)	27	70
(hex ASCII)	1B	46
IBM mode	< ESC >	"F"
(decimal ASCII)	27	70
(hex ASCII)	1B	46

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

REFERENCE: Chapter 5

PURPOSE: **Select underlining.**

CODE:

STAR mode	<ESC>	"–"	1
(decimal ASCII)	27	45	1
(hex ASCII)	1B	2D	01
IBM mode	<ESC>	"–"	1
(decimal ASCII)	27	45	1
(hex ASCII)	1B	2D	01

REMARKS: This command causes all subsequent characters printed to be automatically underlined. Spaces are also underlined.
NOTE: The character "1"(decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

REFERENCE: Chapter 5

PURPOSE: **Cancel underlining.**

CODE:

STAR mode	<ESC>	"–"	0
(decimal ASCII)	27	45	0
(hex ASCII)	1B	2D	00
IBM mode	<ESC>	"–"	0
(decimal ASCII)	27	45	0
(hex ASCII)	1B	2D	00

REMARKS: This command cancels underlining and returns the printer to its previous print style.
NOTE: The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

REFERENCE: Chapter 5

PURPOSE: **Select superscripts.**

CODE:

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

REMARKS: This command causes all subsequent characters to be printed as superscripts. While in superscript mode, the normal bi-directional printing is cancelled and replaced with unidirectional printing. Printing is also set to double-strike mode. Superscripts may be used in conjunction with the italic font, and in pica, elite, and condensed pitches. It may not, however, be used in conjunction with emphasized print, enlarged print, or NLQ characters.
NOTE: The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

REFERENCE: Chapter 5

PURPOSE: **Select subscripts.**

CODE:

STAR mode	<ESC>	"S"	1
(decimal ASCII)	27	83	1
(hex ASCII)	1B	53	01
IBM mode	<ESC>	"S"	1
(decimal ASCII)	27	83	1
(hex ASCII)	1B	53	01

REMARKS: This command causes all subsequent characters to be printed as subscripts. The same conditions and restrictions apply for subscripts as do for superscripts.
NOTE: The character "1"(decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

REFERENCE Chapter 5

PURPOSE: **Cancel superscripts and subscripts.**

CODE:

STAR mode	< ESC >	"T"	
(decimal ASCII)	27	84	
(hex ASCII)	1B	54	
IBM mode	< ESC >	"T"	
(decimal ASCII)	27	84	
(hex ASCII)	1B	54	

REMARKS: This command cancels either superscript or subscript mode. It also cancels the uni-directional printing and double-strike which the mode had set.

REFERENCE: Chapter 5

PURPOSE: **Select master print mode**

CODE:

STAR mode	< ESC >	"?"	*n*
(decimal ASCII)	27	63	*n*
(hex ASCII)	1B	3F	*n*
IBM mode	< ESC >	"!"	*n*
(decimal ASCII)	27	33	*n*
(hex ASCII)	1B	21	*n*

REMARKS: This command selects one of sixteen unique print mode combinations, determined by the value of *n*, which must be between 0 and 255. See Master Print Chart (Table 5-8) for *n* values.

REFERENCE: Chapter 5

COMMANDS TO CONTROL VERTICAL POSITION OF PRINT HEAD

These commands are used to move the paper relative to the location of the print head. By moving the paper up, the print head, in effect, moves down the page.

■ Line feed controls

PURPOSE: **Advance the paper one line (Line Feed).**

CODE:

STAR mode	< LF >
(decimal ASCII)	10
(hex ASCII)	0A
IBM mode	< LF >
(decimal ASCII)	10
(hex ASCII)	0A

REMARKS: The actual distance advanced by the line feed is set through various codes which can be sent (see below). When DIP switch 2-3 is "off" a line feed is automatically generated whenever the printer receives a carriage return.

REFERENCE: Chapter 6

PURPOSE: **Change the line spacing to 1/8 inch.**

CODE:

STAR mode	< ESC >	"0"
(decimal ASCII)	27	48
(hex ASCII)	1B	30
IBM mode	< ESC >	"0"
(decimal ASCII)	27	48
(hex ASCII)	1B	30

REMARKS: This command sets the distance the paper advances during all subsequent line feeds to 1/8 inch.

REFERENCE: Chapter 6

PURPOSE: **Change the line spacing to 7/72 inch.**

CODE:

STAR mode	< ESC >	"1"
(decimal ASCII)	27	49
(hex ASCII)	1B	31
IBM mode	< ESC >	"1"
(decimal ASCII)	27	49
(hex ASCII)	1B	31

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

REFERENCE: Chapter 6

PURPOSE: **Change the line spacing to 1/6 inch.**

CODE:

STAR mode	< ESC >	"2"
(decimal ASCII)	27	50
(hex ASCII)	1B	32
IBM mode	(N/A)	

REMARKS: This command sets the actual distance the paper advances during all subsequent line feeds to 1/6 inch.

REFERENCE: Chapter 6

PURPOSE: **Change the line spacing to *n*/72 inch.**

CODE:

STAR mode	< ESC >	"A"	*n*
(decimal ASCII)	27	65	*n*
(hex ASCII)	1B	41	*n*
IBM mode	(N/A)		

REMARKS: This command sets the distance the paper advances during all subsequent line feeds to *n*/72 inch. The value of *n* must be between 0 and 255.

REFERENCE: Chapter 6

PURPOSE: **Define the line spacing to *n*/72 inch.**

CODE:

STAR mode	(N/A)		
IBM mode	<ESC>	"A"	*n*
(decimal ASCII)	27	65	*n*
(hex ASCII)	1B	41	*n*

REMARKS: This command defines the distance the paper advances during all subsequent line feeds to *n*/72 inch. The value of *n* must be between 0 and 255. This command must be used in conjunction with <ESC> "2" which activates the <ESC> "A" definition.

REFERENCE Chapter 6

PURPOSE: **Use <ESC> "A" definition.**

CODE:

STAR mode	(N/A)	
IBM mode	<ESC>	"2"
(decimal ASCII)	27	50
(hex ASCII)	1B	32

REMARKS: This command activates the line spacing defined in the <ESC> "A" *n* command. If the <ESC> "A" command has not been defined, the line spacing is changed to 1/6 inch.

REFERENCE Chapter 6

PURPOSE: **Change the line spacing to *n*/144 inch.**

CODE:

STAR mode	<ESC>	"3"	*n*
(decimal ASCII)	27	51	*n*
(hex ASCII)	1B	33	*n*
IBM mode	(N/A)		

REMARKS: This command sets the actual distance the paper advances during all subsequent line feeds to *n*/144 inch. The value of *n* must be between 0 and 255.

REFERENCE: Chapter 6

PURPOSE: **Change the line spacing to *n*/216 inch.**

CODE:

STAR mode	(N/A)		
IBM mode	< ESC >	"3"	*n*
(decimal ASCII)	27	51	*n*
(hex ASCII)	1B	33	*n*

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

REFERENCE: Chapter 6

PURPOSE: **Send a one-time line feed of *n*/144 inch.**

CODE:

STAR mode	< ESC >	"J"	*n*
(decimal ASCII)	27	74	*n*
(hex ASCII)	1B	4A	*n*
IBM mode	(N/A)		

REMARKS: This command causes the printer to advance the paper *n*/144 inch. It does not change the current value of the line spacing. The value of *n* must be between 0 and 255.

REFERENCE: Chapter 6

PURPOSE: **Send a one-time line feed of *n*/216 inch.**

CODE:

STAR mode	(N/A)		
IBM mode	< 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 the line spacing. The value of *n* must be between 0 and 255.

REFERENCE: Chapter 6

■ Form feed controls

PURPOSE: **Advance paper to top of next page (Form Feed).**

CODE:

STAR mode	< FF >	
(decimal ASCII)	12	
(hex ASCII)	0C	
IBM mode	< FF >	
(decimal ASCII)	12	
(hex ASCII)	0C	

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

REFERENCE: Chapter 6

PURPOSE: **Set page length to *n* lines.**

CODE:

STAR mode	< ESC >	"C"	*n*
(decimal ASCII)	27	67	*n*
(hex ASCII)	1B	43	*n*
IBM mode	< ESC >	"C"	*n*
(decimal ASCII)	27	67	*n*
(hex ASCII)	1B	43	*n*

REMARKS: This command sets the length of all subsequent pages to *n* lines. The value of *n* must be between 1 and 127.

REFERENCE: Chapter 6

PURPOSE: **Set page length to *n* inches.**

CODE:

STAR mode	<ESC>	"C"	0	*n*
(decimal ASCII)	27	67	0	*n*
(hex ASCII)	1B	43	00	*n*
IBM mode	<ESC>	"C"	0	*n*
(decimal ASCII)	27	67	0	*n*
(hex ASCII)	1B	43	00	*n*

REMARKS: This command sets the length of all subsequent pages to *n* inches. The value of *n* must be between 1 and 32. You can select a power-on default form length of 11 inches or 12 inches by setting DIP switch 1-1.

REFERENCE: Chapter 6

PURPOSE: **Set the top margin.**

CODE:

STAR mode	<ESC>	"R"	*n*
(decimal ASCII)	27	82	*n*
(hex ASCII)	1B	52	*n*
IBM mode	<ESC>	"r"	*n*
(decimal ASCII)	27	114	*n*
(hex ASCII)	1B	72	*n*

REMARKS: This command sets the margin at the top of the page to *n*-1 lines. Printing will start on line *n*. The default value for *n* upon power-on is 1. The value of *n* must be between 1 and 16.

REFERENCE: Chapter 6

PURPOSE: **Set the bottom margin.**

CODE:

STAR mode	<ESC>	"N"	*n*
(decimal ASCII)	27	78	*n*
(hex ASCII)	1B	4E	*n*
IBM mode	<ESC>	"N"	*n*
(decimal ASCII)	27	78	*n*
(hex ASCII)	1B	4E	*n*

REMARKS: This command sets the margin at the bottom of the page to *n* lines. The printer will automatically execute a form feed when the number of lines left on a page is equal to *n*. The value of *n* must be between 1 and 127. This command is sometimes referred to as "skip-over-perforation."

REFERENCE: Chapter 6

PURPOSE: **Cancel top and bottom margins.**

CODE:

STAR mode	<ESC>	"O"
(decimal ASCII)	27	79
(hex ASCII)	1B	4F
IBM mode	<ESC>	"O"
(decimal ASCII)	27	79
(hex ASCII)	1B	4F

REMARKS: This command cancels both the top margin set by <ESC> "R" *n*, or by <ESC>"r" *n* and bottom margin set by <ESC> "N" *n*.

REFERENCE: Chapter 6

■ Vertical tabs

PURPOSE: **Advance paper to the next vertical tab position.**

CODE:

STAR mode	< VT >
(decimal ASCII)	11
(hex ASCII)	0B
IBM mode	< 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 it finds first. The vertical tab positions are not set upon power on.

REFERENCE: Chapter 7

PURPOSE: **Set vertical tab positions.**

CODE:

STAR mode	< ESC >	"P"	*n1 n2 n3...*	0
(decimal ASCII)	27	80	*n1 n2 n3...*	0
(hex ASCII)	1B	50	*n1 n2 n3...*	00
IBM mode	< ESC >	"B"	*n1 n2 n3...*	0
(decimal ASCII)	27	66	*n1 n2 n3...*	0
(hex ASCII)	1B	42	*n1 n2 n3...*	00

REMARKS: This command cancels all current vertical tab positions and sets those defined at lines *n1, n2, n3,* etc. The maximum number of vertical tab positions allowed is 20. The ASCII 0 character is used as a command terminator. Each vertical tab position must be between 1 and 255, and they must be specified in ascending order.

REFERENCE: Chapter 7

PURPOSE: **Advance the paper *n* lines.**

CODE:

STAR mode	< ESC >	"a"	*n*
(decimal ASCII)	27	97	*n*
(hex ASCII)	1B	61	*n*
IBM mode	< ESC >	"a"	*n*
(decimal ASCII)	27	97	*n*
(hex ASCII)	1B	61	*n*

REMARKS: This command causes the printer to advance the paper *n* lines. It does not, however, change the current value of the vertical tab positions. The value of *n* must be between 1 and 255.

REFERENCE: Chapter 6, Chapter 7

COMMANDS TO CONTROL HORIZONTAL POSITION OF PRINT HEAD

PURPOSE: **Return print head to home position (Carriage Return).**

CODE:

STAR mode	< CR >
(decimal ASCII)	13
(hex ASCII)	0D
IBM mode	< CR >
(decimal ASCII)	13
(hex ASCII)	0D

REMARKS: This command returns the print head to the home position (the left margin). If DIP switch 2-3 has been set off, then 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.

REFERENCE: Chapter 6

PURPOSE: **Set the left print margin.**

CODE:

STAR mode	< ESC >	"M"	*n*
(decimal ASCII)	27	77	*n*
(hex ASCII)	1B	4D	*n*
IBM mode	< ESC >	"l"	*n*
(decimal ASCII)	27	108	*n*
(hex ASCII)	1B	6C	*n*

REMARKS: This command sets the home position returned to during the execution of all subsequent carriage returns to be print position $n + 1$. The power on default for *n* is 0. The value of *n* must be between 0 and 255. For SG-10 the maximum print position for pica pitch is 80, for elite is 96, and for condensed pitch is 136. For SG-15 the maximum print position for pica pitch is 136, for elite is 163, and for condensed pitch is 233.

REFERENCE: Chapter 7

PURPOSE: **Set the right print margin.**

CODE:

STAR mode	< ESC >	"Q"	*n*
(decimal ASCII)	27	81	*n*
(hex ASCII)	1B	51	*n*
IBM mode	< ESC >	"Q"	*n*
(decimal ASCII)	27	81	*n*
(hex ASCII)	1B	51	*n*

REMARKS: This command sets the right hand print margin to print position *n*. 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 for *n* must be between 1 and 255.

REFERENCE: Chapter 7

PURPOSE: **Move the print head to the next horizontal tab position.**

CODE:

STAR mode	< HT >
(decimal ASCII)	9
(hex ASCII)	09
IBM mode	< HT >
(decimal ASCII)	9
(hex ASCII)	09

REMARKS: 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).

REFERENCE: Chapter 7

PURPOSE: **Set horizontal tab positions.**

CODE:

STAR mode	< ESC >	"D"	*n1 n2 n3...*	0
(decimal ASCII)	27	68	*n1 n2 n3...*	0
(hex ASCII)	1B	44	*n1 n2 n3...*	00
IBM mode	< ESC >	"D"	*n1 n2 n3...*	0
(decimal ASCII)	27	68	*n1 n2 n3...*	0
(hex ASCII)	1B	44	*n1 n2 n3...*	00

REMARKS: This command cancels all current horizontal tab positions and sets those defined at print positions *n1, n2, n3,* etc. The maximum number of horizontal tab positions allowed is 255. The ASCII 0 character is used as a command terminator. Each horizontal tab position must be between 1 and 255, and they must be specified in ascending order.

REFERENCE: Chapter 7

PURPOSE: **Skip *n* print positions.**

CODE:

STAR mode	< ESC >	"b"	*n*
(decimal ASCII)	27	98	*n*
(hex ASCII)	1B	62	*n*
IBM mode	< ESC >	"b"	*n*
(decimal ASCII)	27	98	*n*
(hex ASCII)	1B	62	*n*

REMARKS: This command causes the print head to advance *n* print positions to the right. It does not, however, change the current value of the horizontal tab positions. The value of *n* must be between 1 and 255.

REFERENCE: Chapter 7

PURPOSE: **Move the print head back one print position (backspace).**

CODE:

STAR mode	< BS >
(decimal ASCII)	8
(hex ASCII)	08
IBM mode	< 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 home position, the command is ignored. This command can be used to overstrike characters.

REFERENCE: Chapter 8

DOWNLOAD CHARACTER COMMANDS

PURPOSE: **Define download characters into RAM**

CODE:

STAR mode	< ESC >	"*"	1	*n1 n2 m0 m1 m2.... m11*
(decimal ASCII)	27	42	1	*n1 n2 m0 m1 m2.... m11*
(hex ASCII)	1B	2A	01	*n1 n2 m0 m1 m2.... m11*
IBM mode	< ESC >	"&"	0	*n1 n2 m0 m1 m2.... m11*
(decimal ASCII)	27	38	0	*n1 n2 m0 m1 m2.... m11*
(hex ASCII)	1B	26	00	*n1 n2 m0 m1 m2.... m11*

REMARKS: This command is used to set up one or more user-defined characters and 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 except the defined control codes. Following *n2* SG-10/15 expects twelve 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 character (starting and ending dot columns are defined by the low order seven bits). *m1* through *m11* determine which dots form the character.

NOTE: This command is ignored when the DIP switch 1-5 is set ON.

REFERENCE: Chapter 9

PURPOSE: **Copy standard character ROM font into RAM**

CODE:

STAR mode	< ESC >	"*"	0		
(decimal ASCII)	27	42	0		
(hex ASCII)	1B	2A	00		
IMB mode	< 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 code range.

REFERENCE: Chapter 9

PURPOSE: **Select download character set**

CODE:

STAR mode	< ESC >	"$"	1	
(decimal ASCII)	27	36	1	
(hex ASCII)	1B	24	01	
IBM mode	< ESC >	"%"	1	0
(decimal ASCII)	27	37	1	0
(hex ASCII)	1B	25	01	00

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

REFERENCE: Chapter 9

PURPOSE: **Cancel download character set**

CODE:

STAR mode	< ESC >	"$"	0	
(decimal ASCII)	27	36	0	
(hex ASCII)	1B	24	00	
IBM mode	< ESC >	"%"	0	0
(decimal ASCII)	27	37	0	0
(hex ASCII)	1B	25	00	00

REMARKS: This command cancels the download character set and selects the standard character set.

REFERENCE: Chapter 9

COMMANDS TO CONTROL GRAPHICS

PURPOSE: **Print normal-density graphics.**

CODE:

STAR mode	<ESC>	"K"	*n1 n2 m1 m2 m3...*
(decimal ASCII)	27	75	*n1 n2 m1 m2 m3...*
(hex ASCII)	1B	4B	*n1 n2 m1 m2 m3...*
IBM mode	<ESC>	"K"	*n1 n2 m1 m2 m3...*
(decimal ASCII)	27	75	*n1 n2 m1 m2 m3...*
(hex ASCII)	1B	4B	*n1 n2 m1 m2 m3...*

REMARKS: This command selects 60 dots-per-inch, column-scan, bit-image graphics mode. The values of *n1* and *n2* represent the number of graphics characters to be printed, where the total number of characters = *n2* times 256 + *n1*. The correct number of graphic data bytes (*m1, m2,* etc.) must follow *n2*. The ASCII value of these characters determine which pins are fired for each character.

REFERENCE: Chapter 10

PURPOSE: **Print double-density graphics.**

CODE:

STAR mode	<ESC>	"L"	*n1 n2 m1 m2 m3...*
(decimal ASCII)	27	76	*n1 n2 m1 m2 m3...*
(hex ASCII)	1B	4C	*n1 n2 m1 m2 m3...*
IBM mode	<ESC>	"L"	*n1 n2 m1 m2 m3...*
(decimal ASCII)	27	76	*n1 n2 m1 m2 m3...*
(hex ASCII)	1B	4C	*n1 n2 m1 m2 m3...*

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 graphic data bytes (*m1, m2,* etc.) must follow *n2*. The ASCII value of these characters determine which pins are fired for each character.

REFERENCE: Chapter 10

PURPOSE: **Print double-density graphics with double-speed**

CODE:

STAR mode	<ESC>	"y"	*n1 n2 m1 m2 m3...*
(decimal ASCII)	27	121	*n1 n2 m1 m2 m3...*
(hex ASCII)	1B	79	*n1 n2 m1 m2 m3...*
IBM mode	<ESC>	"Y"	*n1 n2 m1 m2 m3...*
(decimal ASCII)	27	89	*n1 n2 m1 m2 m3...*
(hex ASCII)	1B	59	*n1 n2 m1 m2 m3...*

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

REFERENCE: Chapter 10

PURPOSE: **Print quadruple-density graphics.**

CODE:

STAR mode	<ESC>	"z"	*n1 n2 m1 m2 m3...*
(decimal ASCII)	27	122	*n1 n2 m1 m2 m3...*
(hex ASCII)	1B	7A	*n1 n2 m1 m2 m3...*
IBM mode	<ESC>	"Z"	*n1 n2 m1 m2 m3...*
(decimal ASCII)	27	90	*n1 n2 m1 m2 m3...*
(hex ASCII)	1B	5A	*n1 n2 m1 m2 m3...*

REMARKS: This command selects 240 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 graphic data bytes (*m1, m2,* etc.) must follow *n2*. The ASCII value of these characters determine which pins are fired for each character.

REFERENCE: Chapter 10

PURPOSE: **Select graphics modes**

CODE:

STAR mode	< ESC >	"g"	*n0 n1 n2 m1 m2 m3...*
(decimal ASCII)	27	103	*n0 n1 n2 m1 m2 m3...*
(hex ASCII)	1B	67	*n0 n1 n2 m1 m2 m3...*
IBM mode	< ESC >	"*"	*n0 n1 n2 m1 m2 m3...*
(decimal ASCII)	27	42	*n0 n1 n2 m1 m2 m3...*
(hex ASCII)	1B	2A	*n0 n1 n2 m1 m2 m3...*

REMARKS: This command selects one seven possible graphics modes, depending on the decimal or ASCII value of "*n0*". 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 value of these characters determine which pins are fired for each character. The value of *n0* must be between 0 and 6. See the Dot Graphics Chart (Table 10-2) for *n0* modes.

REFERENCE: Chapter 10

MACRO INSTRUCTION COMMANDS

PURPOSE: **Define macro instruction.**

CODE:

STAR mode	< ESC >	"+"	...	< RS >
(decimal ASCII)	27	43	...	30
(hex ASCII)	1B	2B	...	1E
IBM mode	< ESC >	"+"	...	< RS >
(decimal ASCII)	27	43	...	30
(hex ASCII)	1B	2B	...	1E

REMARKS: This command cancels any existing macro instruction, and replaces it with the instruction defined. The maximum number of characters allowed in the macro instruction is 16. The < RS > character marks the end of the macro definition.
NOTE: This command is ignored when the DIP switch 1-5 is set ON.

REFERENCE: Chapter 8

PURPOSE: **Execute macro instruction.**

CODE:

STAR mode	< ESC >	"!"
(decimal ASCII)	27	33
(hex ASCII)	1B	21
IBM mode	< ESC >	"?"
(decimal ASCII)	27	63
(hex ASCII)	1B	3F

REMARKS: This command executes a macro instruction that was previously defined.

REFERENCE: Chapter 8

OTHER COMMANDS

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

CODE:

STAR mode	< ESC >	" > "
(decimal ASCII)	27	62
(hex ASCII)	1B	3E
IBM mode	< 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.

REFERENCE: Chapter 8

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

CODE:

STAR mode	<ESC>	"="
(decimal ASCII)	27	61
(hex ASCII)	1B	3D
IBM mode	<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 codes.

REFERENCE: Chapter 8

PURPOSE: **Accept the value of the eighth data bit as is.**

CODE:

STAR mode	<ESC>	"#"
(decimal ASCII)	27	35
(hex ASCII)	1B	23
IBM mode	<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.

REFERENCE: Chapter 8

PURPOSE: **Print "zero" with slash**

CODE:

STAR mode	< ESC >	"\"	1
(decimal ASCII)	27	92	1
(hex ASCII)	1B	5C	01
IBM mode	< ESC >	"\"	1
(decimal ASCII)	27	92	1
(hex ASCII)	1B	5C	01

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

REFERENCE: Chapter 8

PURPOSE: **Print "zero" without slash**

CODE:

STAR mode	< ESC >	"\"	0
(decimal ASCII)	27	92	0
(hex ASCII)	1B	5C	00
IBM mode	< ESC >	"\"	0
(decimal ASCII)	27	92	0
(hex ASCII)	1B	5C	00

REMARKS: This command cancels to print the "slashed zero" and return to print the "normal zero".
NOTE: The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

REFERENCE: Chapter 8

PURPOSE: **Delete the last character sent.**

CODE:

STAR mode	<DEL>
(decimal ASCII)	127
(hex ASCII)	7F
IBM mode	<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.

REFERENCE: Chapter 8

PURPOSE: **Cancel line.**

CODE:

STAR mode	<CAN>
(decinal ASCII)	24
(hex ASCII)	18
IBM mode	<CAN>
(decimal ASCII)	24
(hex ASCII)	18

REMARKS: This command deletes the last line in the print buffer at the time the command is used.

REFERENCE: Chapter 8

PURPOSE: **Set printer off line.**

CODE:

STAR mode	< DC3 >
(decimal ASCII)	19
(hex ASCII)	13
IBM mode	< DC3 >
(decimal ASCII)	19
(hex ASCII)	13

REMARKS: This command causes the printer to set itself off line, disregarding all subsequent characters and function codes, with the exception of < DC1 >, which will return the printer to an on line state. This is not the same as pushing the ON-LINE button. When the ON-LINE light is out the printer will not respond to < DC1 >.

REFERENCE: Chapter 8

PURPOSE: **Set printer on line.**

CODE:

STAR mode	< DC1 >
(decimal ASCII)	17
(hex ASCII)	11
IBM mode	< DC1 >
(decimal ASCII)	17
(hex ASCII)	11

REMARKS: This code resets the printer to an on line state, thus allowing it to receive and process all subsequent characters and function codes. This is not the same as pushing the ON-LINE button. When the ON-LINE light is out the printer will not respond to < DC1 >.

REFERENCE: Chapter 8

PURPOSE: **Sound printer bell.**

CODE:

STAR mode	< BEL >		
(decimal ASCII)	7		
(hex ASCII)	07		
IBM mode	< BEL >		
(decimal ASCII)	7		
(hex ASCII)	07		

REMARKS: This command causes the printer tone to sound for approximately one-fourth second.

REFERENCE: Chapter 8

PURPOSE: **Disable the printer bell.**

CODE:

STAR mode	< ESC >	"Y"	0
(decimal ASCII)	27	89	0
(hex ASCII)	1B	59	00
IBM mode	< ESC >	"y"	0
(decimal ASCII)	27	121	0
(hex ASCII)	1B	79	00

REMARKS: This command causes the printer to ignore the < BEL > character.
NOTE: The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

REFERENCE: Chapter 8

PURPOSE: **Enable the printer bell.**

CODE:

STAR mode	< ESC >	"Y"	1
(decimal ASCII)	27	89	1
(hex ASCI)	1B	59	01
IBM mode	< ESC >	"y"	1
(decimal ASCII)	27	121	1
(hex ASCII)	1B	79	01

REMARKS: This command causes the printer to respond to the < BEL > character normally by sounding the printer bell.
Note: The character "1" (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

REFERENCE: Chapter 8

PURPOSE: **Disable paper-out detector.**

CODE:

STAR mode	< ESC >	"8"
(decimal ASCII)	27	56
(hex ASCII)	1B	38
IBM mode	< 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 2-1 can also be set to disable the paper-out detector.

REFERENCE: Chapter 8

PURPOSE: **Enable paper-out detector.**

CODE:

STAR mode	< ESC >	"9"
(decimal ASCII)	27	57
(hex ASCII)	1B	39
IBM mode	< ESC >	"9"
(decimal ASCII)	27	57
(hex ASCII)	1B	39

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

REFERENCE: Chapter 8

PURPOSE: **Select uni-directional printing.**

CODE:

STAR mode	< ESC >	"U"	1
(decimal ASCII)	27	85	1
(hex ASCII)	1B	55	01
IBM mode	< ESC >	"U"	1
(decimal ASCII)	27	85	1
(hex ASCI)	1B	55	01

REMARKS: This command causes all subsequent lines to be printed in unidirectional printing. Unidirectional printing is useful in printing tables or charts, since it ensures that vertical columns of characters will be in alignment.
NOTE: The character "1" (decimal code 49, hexadecimal code 31) can be used instead of ASCII 1.

REFERENCE: Chapter 8

PURPOSE: **Cancel uni-directional printing.**

CODE:

STAR mode	< ESC >	"U"	0
(decimal ASCII)	27	85	0
(hex ASCII)	1B	55	00
IBM mode	< ESC >	"U"	0
(decimal ASCII)	27	85	0
(hex ASCII)	1B	55	00

REMARKS: This command cancels unidirectional printing and returns to the standard bidirectional printing, which is considerably faster.
NOTE: The character "0" (decimal code 48, hexadecimal code 30) can be used instead of ASCII 0.

REFERENCE: Chapter 8

PURPOSE: **Select one-line unidirectional printing.**

CODE:

STAR mode	< ESC >	"<"
(decimal ASCII)	27	60
(hex ASCII)	1B	3C
IBM mode	< ESC >	"<"
(decimal ASCII)	27	60
(hex ASCII)	1B	3C

REMARKS: This command immediately returns the printhead to the left margin. The remainder of the line is printed from left to right. Normal (bidirectional) printing resumes following a carriage return.

REFERENCE: Chapter 8

PURPOSE: **Initialize printer.**

CODE:

STAR mode	<ESC>	"@"
(decimal ASCII)	27	64
(hex ASCII)	1B	40
IBM mode	<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 pitch, character set, line feed pitch, 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 is that download character RAM and the macro instruction are preserved with this command.

APPENDIX E

COMMAND SUMMARY IN NUMERIC ORDER

Mode	Control code	Function
	CHR$(0)	Ends tab settings
	CHR$(7)	Sounds bell
	CHR$(8)	Backspace
	CHR$(9)	Horizontal tab
	CHR$(10)	Line feed
	CHR$(11)	Vertical tab
	CHR$(12)	Form feed
	CHR$(13)	Carriage return
	CHR$(14)	One line expanded print
	CHR$(15)	Condensed print
	CHR$(17)	On line
	CHR$(18)	Pica print
	CHR$(19)	Off line
	CHR$(20)	Cancels one line expanded print
	CHR$(24)	Cancel text in print buffer
	CHR$(27)	Escape **(indicated as <ESC> below)**
	CHR$(30)	Ends macro instruction definition
	CHR$(127)	Delete last character
	<ESC> CHR$(14)	One line expanded print
	<ESC> CHR$(15)	Condensed print
STAR	<ESC> "!"	Use macro
IBM	<ESC> "!" CHR$(*n*)	Master print mode select
	<ESC> "#"	Accept eighth bit as is
STAR	<ESC> "$" 0	Cancel download characters
STAR	<ESC> "$" 1	Use download characters
IBM	<ESC> "%" 0 0	Cancel download characters
IBM	<ESC> "%" 1 0	Use download characters
IBM	<ESC> "&" CHR$(0) *n1 n2 m0 m1 m2 ....m11*	Define download character
STAR	<ESC> "*" 0	Copy ROM characters to download RAM
IBM	<ESC> "*" *n0 n1 n2*	Master graphics mode select

	<ESC> "+" ...CHR$(30)	Define macro
	<ESC> "-" 0	Stop underlining
	<ESC> "-" 1	Start underlining
	<ESC> "0"	Set 1/8 inch line feed
	<ESC> "1"	Set 7/72 inch line feed
STAR	<ESC> "2"	Set 1/6 inch line feed
IBM	<ESC> "2"	Use <ESC> "A" definition
STAR	<ESC> "3" *n*	Set *n*/144 inch line feed
IBM	<ESC> "3" *n*	Set *n*/216 inch line feed
STAR	<ESC> "4"	Italic print
IBM	<ESC> "4"	Select NLQ characters
STAR	<ESC> "5"	Cancel italic print
IBM	<ESC> "5"	Cancel NLQ characters
IBM	<ESC> "6"	Select character set #2
STAR	<ESC> "7" *n*	Select an international character set
IBM	<ESC> "7"	Select character set #1
	<ESC> "8"	Ignore paper-out detector
	<ESC> "9"	Enable paper-out detector
IBM	<ESC> ":" 0 0 0	Copy ROM characters to download RAM
	<ESC> "<"	One-line unidirectional print
	<ESC> "="	Set eighth bit to 0
	<ESC> ">"	Set eighth bit to 1
STAR	<ESC> "?" CHR$(*n*)	Master print mode select
IBM	<ESC> "?"	Use macro
	<ESC> "@"	Reset the printer
STAR	<ESC> "A" *n*	Set *n*/72 inch line feed
IBM	<ESC> "A" *n*	Define *n*/72 inch line feed
STAR	<ESC> "B" CHR$(1)	Pica print
STAR	<ESC> "B" CHR$(2)	Elite print
STAR	<ESC> "B" CHR$(3)	Condensed print
STAR	<ESC> "B" CHR$(4)	Select NLQ characters
STAR	<ESC> "B" CHR$(5)	Cancel NLQ characters
IBM	<ESC> "B" ...CHR$(0)	Set vertical tabs
	<ESC> "C" *n*	Set page length to *n* lines
	<ESC> "C" CHR$(0) *n*	Set page length to *n* inches
	<ESC> "D" ...CHR$(0)	Set horizontal tabs
	<ESC> "E"	Select emphasized print
	<ESC> "F"	Cancel emphasized print
	<ESC> "G"	Select double-strike print
	<ESC> "H"	Cancel double-strike print
IBM	<ESC> "I" 0	Cancel italic print
IBM	<ESC> "I" 1	Italic print
STAR	<ESC> "J" *n*	Single line feed of *n*/144 inch
IBM	<ESC> "J" *n*	Single line feed of *n*/216 inch

	<ESC> "K" *n1 n2*	Print normal-density graphics
	<ESC> "L" *n1 n2*	Print double-density graphics
STAR	<ESC> "M" *n*	Set left margin at column *n*
IBM	<ESC> "M"	Elite print
	<ESC> "N" *n*	Set the bottom margin at *n* lines
	<ESC> "O"	Cancel top and bottom margins
STAR	<ESC> "P" ...CHR$(0)	Set vertical tabs
IBM	<ESC> "P"	Pica print
	<ESC> "Q" *n*	Set right print margin at column *n*
STAR	<ESC> "R" *n*	Set top margin at line *n*
IBM	<ESC> "R" *n*	Select an international character set
	<ESC> "S" 0	Select superscripts
	<ESC> "S" 1	Select subscripts
	<ESC> "T"	Cancel super and subscripts
	<ESC> "U" 0	Bidirectional print
	<ESC> "U" 1	Unidirectional print
	<ESC> "W" 0	Cancel expanded print
	<ESC> "W" 1	Select expanded print
STAR	<ESC> "Y" 0	Disable bell
STAR	<ESC> "Y" 1	Enable bell
IBM	<ESC> "Y" *n1 n2*	Print double-density graphics with doublespeed
IBM	<ESC> "Z" *n1 n2*	Print quadruple-density graphics
	<ESC> "\" 0	Print "zero" without slash
	<ESC> "\" 1	Print "zero" with slash
	<ESC> "a" *n*	Advance *n* line feeds
	<ESC> "b" *n*	Tab over n columns
STAR	<ESC> "g" *n0 n1 n2*	Master graphic mode select
IBM	<ESC> "l" *n*	Set left margin at column *n*
	<ESC> "p" 0	Cancel proportional spacing
	<ESC> "p" 1	Select proportional spacing
IBM	<ESC> "r" *n*	Set top margin at line *n*
STAR	<ESC> "y" *n1 n2*	Print double-density graphics with double-speed
IBM	<ESC> "y" 0	Disable bell
IBM	<ESC> "y" 1	Enable bell
STAR	<ESC> "z" *n1 n2*	Print Quadruple-density graphics

NOTE: In the item of "Mode" STAR indicates the "STAR mode" and IBM indicates the "IBM mode" only.

APPENDIX F

ASCII CODE CONVERSION CHART

Standard ASCII Codes				Character mode		
Decimal	Hexadecimal	Binary	Control Character	STAR	IBM#1	IBM#2
0	00	0000 0000	Ctrl-@	NUL	NUL	NUL
1	01	0000 0001	Ctrl-A			
2	02	0000 0010	Ctrl-B			
3	03	0000 0011	Ctrl-C			♥
4	04	0000 0100	Ctrl-D			♦
5	05	0000 0101	Ctrl-E			♣
6	06	0000 0110	Ctrl-F			♠
7	07	0000 0111	Ctrl-G	BEL	BEL	BEL
8	08	0000 1000	Ctrl-H	BS	BS	BS
9	09	0000 1001	Ctrl-I	HT	HT	HT
10	0A	0000 1010	Ctrl-J	LF	LF	LF
11	0B	0000 1011	Ctrl-K	VT	VT	VT
12	0C	0000 1100	Ctrl-L	FF	FF	FF
13	0D	0000 1101	Ctrl-M	CR	CR	CR
14	0E	0000 1110	Ctrl-N	SO	SO	SO
15	0F	0000 1111	Ctrl-O	SI	SI	SI
16	10	0001 0000	Ctrl-P			
17	11	0001 0001	Ctrl-Q	DC1	DC1	DC1
18	12	0001 0010	Ctrl-R	DC2	DC2	DC2
19	13	0001 0011	Ctrl-S	DC3	DC3	DC3
20	14	0001 0100	Ctrl-T	DC4	DC4	DC4
21	15	0001 0101	Ctrl-U			§
22	16	0001 0110	Ctrl-V			
23	17	0001 0111	Ctrl-W			
24	18	0001 1000	Ctrl-X	CAN	CAN	CAN
25	19	0001 1001	Ctrl-Y			
26	1A	0001 1010	Ctrl-Z			
27	1B	0001 1011		ESC	ESC	ESC
28	1C	0001 1100				
29	1D	0001 1101				
30	1E	0001 1110		RS	RS	RS
31	1F	0001 1111				

Standard ASCII Codes			Character mode		
Decimal	Hexadecimal	Binary	STAR	IBM#1	IBM#2
32	20	0010 0000	SP	SP	SP
33	21	0010 0001	!	!	!
34	22	0010 0010	"	"	"
35	23	0010 0011	#	#	#
36	24	0010 0100	$	$	$
37	25	0010 0101	%	%	%
38	26	0010 0110	&	&	&
39	27	0010 0111	'	'	'
40	28	0010 1000	(	(	(
41	29	0010 1001	)	)	)
42	2A	0010 1010	*	*	*
43	2B	0010 1011	+	+	+
44	2C	0010 1100	,	,	,
45	2D	0010 1101	-	-	-
46	2E	0010 1110	.	.	.
47	2F	0010 1111	/	/	/
48	30	0011 0000	0	0	0
49	31	0011 0001	1	1	1
50	32	0011 0010	2	2	2
51	33	0011 0011	3	3	3
52	34	0011 0100	4	4	4
53	35	0011 0101	5	5	5
54	36	0011 0110	6	6	6
55	37	0011 0111	7	7	7
56	38	0011 1000	8	8	8
57	39	0011 1001	9	9	9
58	3A	0011 1010	:	:	:
59	3B	0011 1011	;	;	;
60	3C	0011 1100	<	<	<
61	3D	0011 1101	=	=	=
62	3E	0011 1110	>	>	>
63	3F	0011 1111	?	?	?
64	40	0100 0000	@	@	@
65	41	0100 0001	A	A	A
66	42	0100 0010	B	B	B
67	43	0100 0011	C	C	C
68	44	0100 0100	D	D	D
69	45	0100 0101	E	E	E
70	46	0100 0110	F	F	F
71	47	0100 0111	G	G	G
72	48	0100 1000	H	H	H
73	49	0100 1001	I	I	I
74	4A	0100 1010	J	J	J
75	4B	0100 1011	K	K	K

Standard ASCII Codes			Character mode		
Decimal	Hexadecimal	Binary	STAR	IBM#1	IBM#2
76	4C	0100 1100	L	L	L
77	4D	0100 1101	M	M	M
78	4E	0100 1110	N	N	N
79	4F	0100 1111	O	O	O
80	50	0101 0000	P	P	P
81	51	0101 0001	Q	Q	Q
82	52	0101 0010	R	R	R
83	53	0101 0011	S	S	S
84	54	0101 0100	T	T	T
85	55	0101 0101	U	U	U
86	56	0101 0110	V	V	V
87	57	0101 0111	W	W	W
88	58	0101 1000	X	X	X
89	59	0101 1001	Y	Y	Y
90	5A	0101 1010	Z	Z	Z
91	5B	0101 1011	[	[	[
92	5C	0101 1100	\	\	\
93	5D	0101 1101	]	]	]
94	5E	0101 1110	^	^	^
95	5F	0101 1111	_	_	_
96	60	0110 0000	`	`	`
97	61	0110 0001	a	a	a
98	62	0110 0010	b	b	b
99	63	0110 0011	c	c	c
100	64	0110 0100	d	d	d
101	65	0110 0101	e	e	e
102	66	0110 0110	f	f	f
103	67	0110 0111	g	g	g
104	68	0110 1000	h	h	h
105	69	0110 1001	i	i	i
106	6A	0110 1010	j	j	j
107	6B	0110 1011	k	k	k
108	6C	0110 1100	l	l	l
109	6D	0110 1101	m	m	m
110	6E	0110 1110	n	n	n
111	6F	0110 1111	o	o	o
112	70	0111 0000	p	p	p
113	71	0111 0001	q	q	q
114	72	0111 0010	r	r	r
115	73	0111 0011	s	s	s
116	74	0111 0100	t	t	t
117	75	0111 0101	u	u	u
118	76	0111 0110	v	v	v
119	77	0111 0111	w	w	w

Standard ASCII Codes			Character mode		
Decimal	Hexadecimal	Binary	STAR	IBM#1	IBM#2
120	78	0111 1000	x	x	x
121	79	0111 1001	y	y	y
122	7A	0111 1010	z	z	z
123	7B	0111 1011	{	{	{
124	7C	0111 1100	|	|	|
125	7D	0111 1101	}	}	}
126	7E	0111 1110	~	~	~
127	7F	0111 1111	DEL	DEL	DEL
128	80	1000 0000	NUL	NUL	Ç
129	81	1000 0001			ü
130	82	1000 0010			é
131	83	1000 0011			â
132	84	1000 0100			ä
133	85	1000 0101			à
134	86	1000 0110			å
135	87	1000 0111	BEL	BEL	ç
136	88	1000 1000	BS	BS	ê
137	89	1000 1001	HT	HT	ë
138	8A	1000 1010	LF	LF	è
139	8B	1000 1011	VT	VT	ï
140	8C	1000 1100	FF	FF	î
141	8D	1000 1101	CR	CR	ì
142	8E	1000 1110	SO	SO	Ä
143	8F	1000 1111	SI	SI	Å
144	90	1001 0000			É
145	91	1001 0001	DC1	DC1	æ
146	92	1001 0010	DC2	DC2	Æ
147	93	1001 0011	DC3	DC3	ô
148	94	1001 0100	DC4	DC4	ö
149	95	1001 0101			ò
150	96	1001 0110			û
151	97	1001 0111			ù
152	98	1001 1000			ÿ
153	99	1001 1001			Ö
154	9A	1001 1010			Ü
155	9B	1001 1011	ESC	ESC	¢
156	9C	1001 1100			£
157	9D	1001 1101			¥
158	9E	1001 1110	RS	RS	₧
159	9F	1001 1111			ƒ
160	A0	1010 0000	SP	á	á
161	A1	1010 0001	¡	í	í
162	A2	1010 0010	¢	ó	ó
163	A3	1010 0011	£	ú	ú

Standard ASCII Codes				Character mode	
Decimal	Hexadecimal	Binary	STAR	IBM#1	IBM#2
164	A4	1010 0100			
165	A5	1010 0101			
166	A6	1010 0110			
167	A7	1010 0111			
168	A8	1010 1000			
169	A9	1010 1001			
170	AA	1010 1010			
171	AB	1010 1011			
172	AC	1010 1100			
173	AD	1010 1101			
174	AE	1010 1110			
175	AF	1010 1111			
176	B0	1011 0000			
177	B1	1011 0001			
178	B2	1011 0010			
179	B3	1011 0011			
180	B4	1011 0100			
181	B5	1011 0101			
182	B6	1011 0110			
183	B7	1011 0111			
184	B8	1011 1000			
185	B9	1011 1001			
186	BA	1011 1010			
187	BB	1011 1011			
188	BC	1011 1100			
189	BD	1011 1101			
190	BE	1011 1110			
191	BF	1011 1111			
192	C0	1100 0000			
193	C1	1100 0001			
194	C2	1100 0010			
195	C3	1100 0011			
196	C4	1100 0100			
197	C5	1100 0101			
198	C6	1100 0110			
199	C7	1100 0111			
200	C8	1100 1000			
201	C9	1100 1001			
202	CA	1100 1010			
203	CB	1100 1011			
204	CC	1100 1100			
205	CD	1100 1101			
206	CE	1100 1110			
207	CF	1100 1111			

Standard ASCII Codes Decimal	Hexadecimal	Binary	STAR	Character mode IBM#1	IBM#2
208	D0	1101 0000	¥	⊥	⊥
209	D1	1101 0001	Ä	⊤	⊤
210	D2	1101 0010	Ö	⊤	⊤
211	D3	1101 0011	Ü	└	└
212	D4	1101 0100	¢	└	└
213	D5	1101 0101	Ñ	┌	┌
214	D6	1101 0110	ä	┌	┌
215	D7	1101 0111	ö	┼	┼
216	D8	1101 1000	ü	┼	┼
217	D9	1101 1001	ß	┘	┘
218	DA	1101 1010	ē	┌	┌
219	DB	1101 1011	é	▉	▉
220	DC	1101 1100	ū	▉	▉
221	DD	1101 1101	è	▌	▌
222	DE	1101 1110	ī	▌	▌
223	DF	1101 1111	↑	▀	▀
224	E0	1110 0000		α	α
225	E1	1110 0001	▪	β	β
226	E2	1110 0010	▪	Γ	Γ
227	E3	1110 0011	▪	π	π
228	E4	1110 0100	▪	Σ	Σ
229	E5	1110 0101	▪	σ	σ
230	E6	1110 0110	▪	μ	μ
231	E7	1110 0111	▬	τ	τ
232	E8	1110 1000	▬	Φ	Φ
233	E9	1110 1001	▮	Θ	Θ
234	EA	1110 1010	▮	Ω	Ω
235	EB	1110 1011	◤	δ	δ
236	EC	1110 1100	◥	∞	∞
237	ED	1110 1101	◣	∅	∅
238	EE	1110 1110	◢	∈	∈
239	EF	1110 1111	■	∩	∩
240	F0	1111 0000	┌	≡	≡
241	F1	1111 0001	—	±	±
242	F2	1111 0010	¬	≥	≥
243	F3	1111 0011	┬	≤	≤
244	F4	1111 0100	├	⌠	⌠
245	F5	1111 0101	┤	⌡	⌡
246	F6	1111 0110	└	÷	÷
247	F7	1111 0111	┘	≈	≈
248	F8	1111 1000	┴	°	°
249	F9	1111 1001	┤	∙	∙
250	FA	1111 1010	+	·	·
251	FB	1111 1011	◤	√	√

Standard ASCII Codes				Character mode	
Decimal	Hexadecimal	Binary	STAR	IBM#1	IBM#2
252	FC	1111 1100		n	n
253	FD	1111 1101		2	2
254	FE	1111 1110		■	■
255	FF	1111 1111			

APPENDIX G

TECHNICAL SPECIFICATIONS

Printing

Printing method	Serial impact dot matrix
Printing speed	120 characters per second in 10 CPI
Print buffer	2K bytes (SG-10 only) (Expandable to 6K bytes with optional buffer board) 16 K bytes (SG-15 only)
Paper feed	12 lines/second (at 1/6 inch line spacing) Sprocket or friction feed
Printing direction	Bidirectional, logic seeking Unidirectional in bit image and NLQ modes
Character set	96 standard ASCII characters 88 standard international characters 96 italic characters 88 italic international characters 96 near letter quality (NLQ) characters 88 NLQ international characters 64 STAR special characters 83 IBM special characters 32 STAR block graphics characters 50 IBM block graphics characters 240 user-defined characters
Character matrix	Standard characters : 9 dot x 11 dot STAR block graphics : 6 dot x 6 dot IBM block graphics : 12 dot x 11 dot User defined : 8 dot x 4 to 11 dot Near letter quality : 17 dot x 11 dot Bit image modes : 8 dot x 60 dots/in. 8 dot x 72 dots/in. 8 dot x 80 dots/in. 8 dot x 90 dots/in. 8 dot x 120 dots/in. 8 dot x 240 dots/in.

Line spacing	1/6, 1/8 inch or 7/72 inch standard *n* /72, *n* /144 or *n* /216 inch programmable	
Column width	SG-10	SG-15
Pica	80	136
Elite	96	163
Condensed	136	233
Pica expanded	40	68
Elite expanded	48	81
Condensed expanded	68	116
Special features	Near letter quality printing Short form tear-off Easy access format switches Self-test Hex dump Downloadable characters Macro instruction Continuous underlining Ultra hi resolution bit image graphics Vertical and horizontal tabs Skip over perforation 15.5″ carriage (SG-15 only)	

Paper

Paper type	SG-10	SG-15
Single sheets	5.5-8.5 in. wide	5.5-14.5 in. wide
Continuous paper	4 -10 in. wide	4 -15.5 in. wide
Thickness		
One-part forms	0.07-0.10 mm	0.07-0.10 mm
Max. 3-part forms	0.28 mm max.	0.28 mm max.

Printer

Dimension	SG-10	SG-15
Height	145 mm (5.7 in.)	145 mm (5.7 in.)
Width	392 mm (15.2 in.)	542 mm (21.3 in.)
Depth	315 mm (12.4 in.)	315 mm (12.4 in.)
Weight	7 kg (15.4 lb.)	10 kg (22 lb.)
Power	120 VAC ± 10% 60Hz, approx. 100W 220 VAC ± 10% 50/60Hz, approx. 100W 240 VAC ± 10% 50/60Hz, approx. 100W	
Ribbon	Star Mfg. P/M SF-02B, or Underwood ½ in. x 2 in. spools	

Parallel interface

Interface	Centronocs-compatible, 7 or 8 bit
Synchronization	By externally supplied strobe pulses
Handshaking	By ACK or BUSY signals
Logic level	TTL
Connector	57-30360 Amphenol

Serial interface (option)

Interface	Asynchronous RS-232C/20 mA current loop
Bit rate	300, 600, 1200, 2400, 4800, 9600, 19200 baud
Word length	1 start bit
	7 or 8 data bits
	Odd, even or no parity
	1 or 2 stop bits
Handshaking	Serial busy, 1 byte mode
	Serial busy, 1 block mode
	ACK mode
	XON/XOFF mode

APPENDIX H

THE PARALLEL INTERFACE

SG-10/15 has a parallel interface to communicate with the computer that it is connected to. 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 STROBE pulses
Handshaking:	ACK and BUSY signals
Logic level:	Compatible with TTL level

SG-10/15's 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 H-1.

■ Functions of the Connector Signals

Communications between the computer and the SG-10/15 use many of the pins of the connector. To understand how the system of communications works we need to 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 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 SG-10/15 has successfully received the byte of data from the computer it sets pin 10 low for approximately 9 micro-

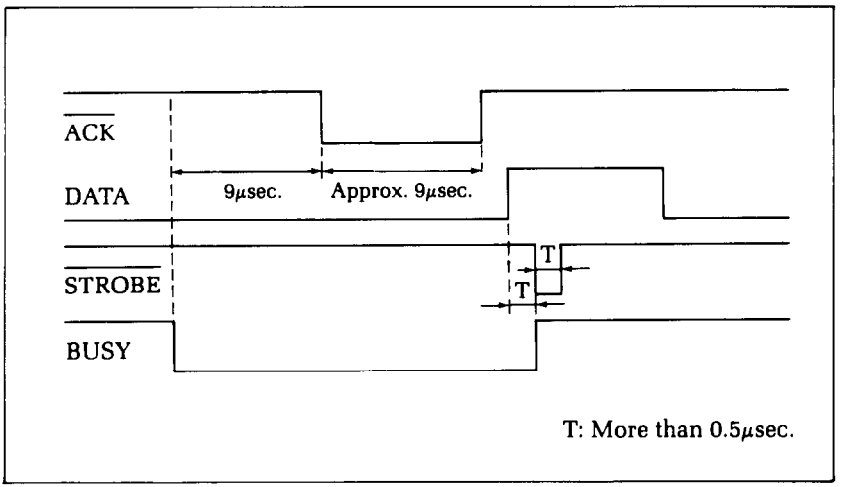


Figure H-1. SG-10/15 interface timing diagram.

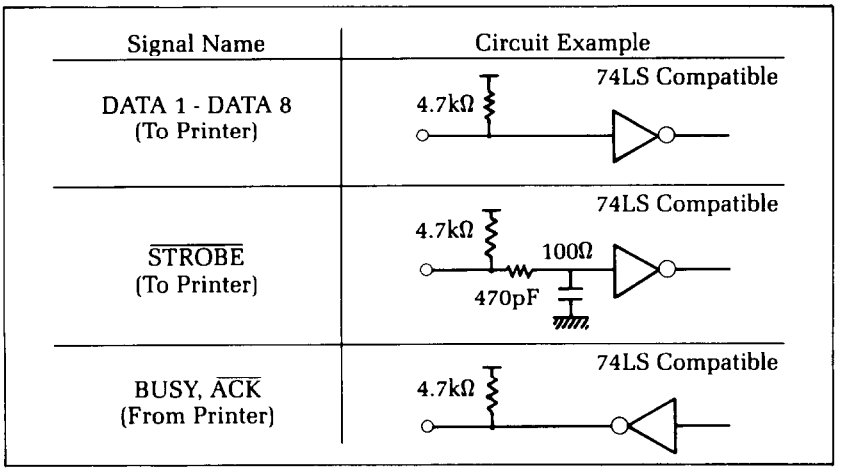


Figure H-2. Typical interface circuit.

seconds. This signal acknowledges the receipt of the data and so is called the ACK (for "acknowledge") signal.

Pin 11 reports when the SG-10/15 is not able to receive data. The signal is called BUSY. When this signal is high, SG-10/15 cannot receive data. This signal will be high during data transfer, when the printer is off-line and when an error condition exists.

SG-10/15 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 2-1 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, and 34-36 are not used, while pins 16, 17, 19-30

Table H-1
Parallel interface pin functions

Pin No.	Signal Name	Direction	Function
1	$\overline{\text{STROBE}}$		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	$\overline{\text{ACK}}$	OUT	A 9 microsecond 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 SG-10/15 runs out of paper. This signal can be held LOW permanently by turning DIP switch 2-1 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	$\overline{\text{RESET}}$	IN	When this signal goes LOW the printer is reset to its power-on condition.
32	$\overline{\text{ERROR}}$	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.

and 33 are grounded. Pin 18 is connected to the + 5VDC supply is 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.

APPENDIX I

SERIAL INTERFACE SPECIFICATIONS

SG-10/15 provides a very flexible RS232C serial interface as an option. It can communicate at rates from 150 to 19,200 baud (bits per second) and supports four different kinds of *handshaking*. This interface can also function as a 20mA current loop interface. The operating specifications of the interface are as follows:

Data transfer rate:	150-19200
Word length:	1 start bit
	7 or 8 data bits
	Odd, even or no parity
	1 or 2 stop bits
Signal levels:	Mark or logical 1, -3 to -15 volts or current ON
	Space or logical 0, +3 to +15 volts or current OFF
Handshaking:	Serial busy, 1 byte mode
	Serial busy, 1 block mode
	ACK mode
	XON/XOFF mode

Note: 19200 baud can be used only with an RS232C interface; it cannot be used with a 20mA current loop interface.

SG-10/15 has a DB-25 female connector to connect to a computer. The functions of the pins are summarized in Table I-1

CONFIGURING THE SERIAL INTERFACE

DIP switch on the serial interface board controls the configuration of the serial interface. Table I-2 describes the functions of the individual switches in DIP switch.

Table I-1
Serial interface pin functions

Pin No	Signal Name	Direction	Function
1	GND	—	Printer's chassis ground.
2	TXD	OUT	This pin carries data from the printer.
3	RXD	IN	This pin carries data to the printer.
4	RTS	OUT	This is ON when the printer is ready to receive data.
5	CTS	IN	This pin is ON when the computer is ready to send data.
6	DSG	IN	This pin is ON when the computer is ready to send data. SG-10/15 does not check this pin.
7	GND	—	Signal ground.
8	DCD	IN	This pin is ON when the computer is ready to send data. SG-10/15 does not check this pin.
9	TTY TXDR	—	This pin is the return path for data transmitted from the printer on the 20mA current loop.
10	TTY TXD	OUT	This pin carries data from the printer on the 20mA current loop.
11	RCH	OUT	This is the signal line for the serial busy protocols. This pin goes OFF when SG-10/15's buffer fills, and ON when SG-10/15 is ready to receive data. In the busy protocols this line carries the same signal as pin 20.
12	N/C		Unused.
13	GND	—	Signal ground.
14-16	N/C		Unused.
17	TTY TXDR	—	This pin is the return path for data transmitted from the printer on the 20mA current loop.
18	TTY RXDR	—	This pin is the return path for data transmitted to the printer on the 20mA current loop.
19	TTY RXD	IN	This pin carries data to the printer on the 20mA current loop.
20	DTR	OUT	SG-10/15 turns this pin ON when it is ready to receive data.
21-22	N/C		Unused.
23	TTY RXDR	—	This pin is the return path for data transmitted to the printer on the 20mA current loop.
24	TTY TXD	OUT	This pin carries data from the printer on the 20mA current loop.
25	TTY RXD	IN	This pin carries data to the printer on the 20mA current loop.

Table I-2
DIP switch on the serial board

Switch	ON	OFF
1	7 data bits	8 data bits
2	Parity checked	No parity
3	Handshaking protocols—see Table I-3	
4		
5	Odd parity	Even parity
6	Data transfer rate—see Table I-4	
7		
8		

Table I-3
Handshaking protocols

Protocol	Switch 3	Switch 4
Serial busy, 1 byte mode	OFF	OFF
Serial busy 1 block mode	ON	OFF
ACK mode	OFF	ON
XON/XOFF mode	ON	ON

Table I-4
Data transfer rates

Baud rate	Switch 6	Switch 7	Switch 8
150	OFF	OFF	OFF
300	OFF	OFF	ON
600	OFF	ON	OFF
1200	OFF	ON	ON
2400	ON	OFF	OFF
4800	ON	OFF	ON
9600	ON	ON	OFF
19200	ON	ON	ON

SG-10/15'S SERIAL PROTOCOLS

SG-10/15 has four serial protocols selected by DIP switches 3-4 and 3-5. Figure I-1 shows a typical byte of serial data and Figure I-2 shows timing charts for the 4 protocols.

■ Serial busy protocols

In the serial busy protocols, SG-10/15 uses DTR (pin 20) and RCH (pin 11) to signal to the computer when it is able to accept

data. These two pins go ON when SG-10/15 is ready to accept data. In the 1 byte mode they go OFF after each character is received. In the 1 block mode they only go OFF when SG-10/15's buffer approaches capacity. In both cases they will stay OFF if the buffer is too full to accept more data.

■ XON/XOFF protocol

The XON/XOFF protocol uses the ASCII characters < DC1 > and < DC3 > (sometimes called XON and XOFF, respectively) to communicate with the computer. When SG-10/15's buffer approaches capacity SG-10/15 will send a DC3 (ASCII 19) on TXD (pin 2) to tell the computer that it must stop sending data. When SG-10/15 is able to receive more data it sends a DC1 (ASCII 17) on TXD. The computer can then send more data until SG-10/15 sends another DC3.

■ ACK protocol

In the ACK protocol, SG-10/15 sends an ACK (ASCII 6) on TXD (pin 2) each time that it is prepared to receive a byte of data.

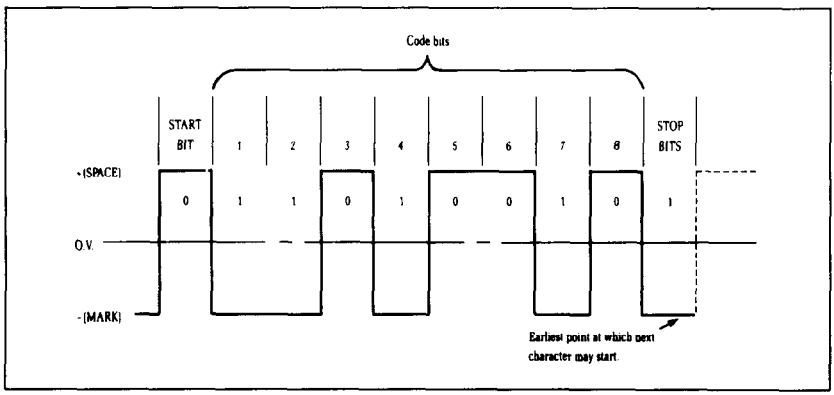


Figure I-1. Typical data byte on the serial interface.

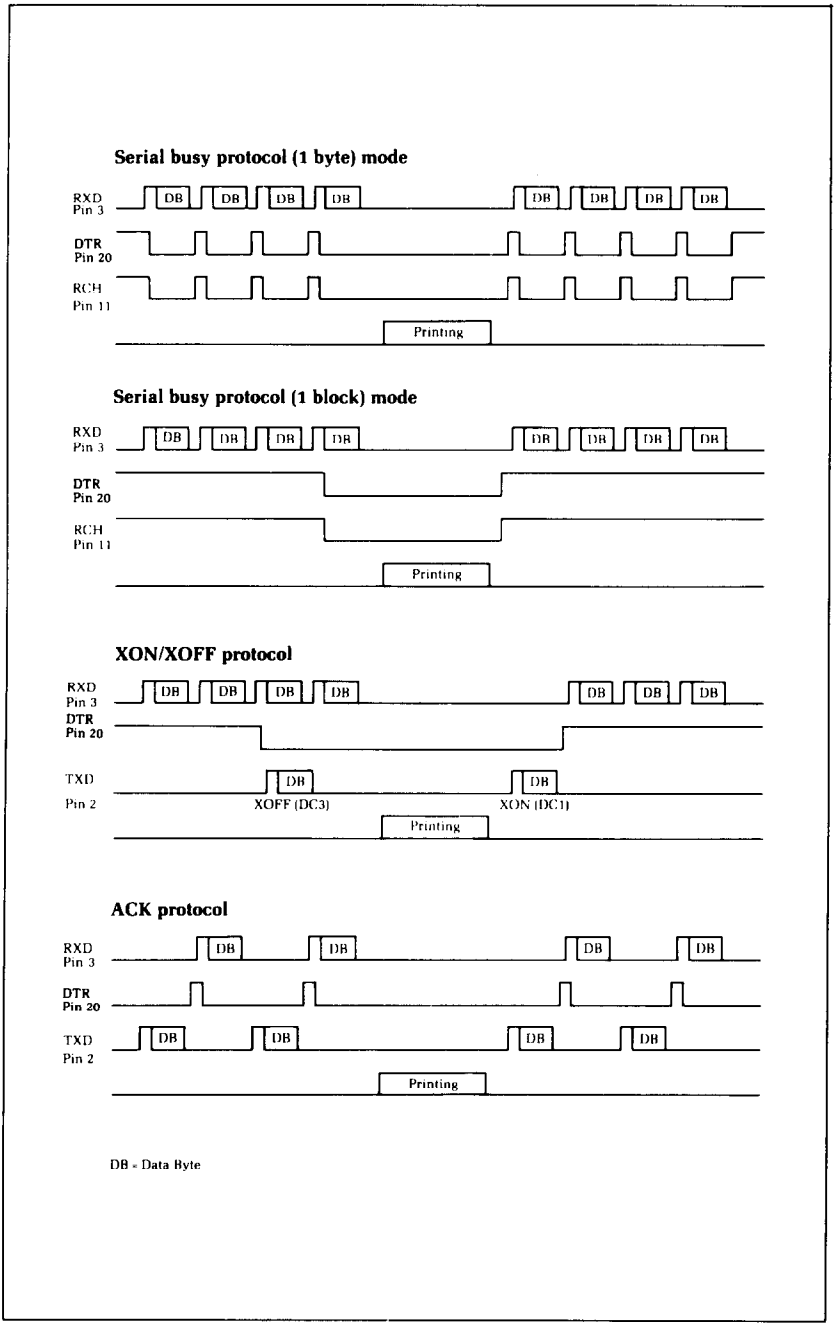


Figure I-2. Serial protocol timing charts.

APPENDIX J

CONNECTING WITH COMPUTER

In this appendix, we'll show you how to connect with various computers.

If you cannot find out the name of your computer, your Star dealer will give you advice on connecting SG-10/15 to your computer.

CONNECTING WITH IBM-PC AND COMPAQ

Both the IBM Personal Computer and the Compaq computer function the same when connected to SG-10/15. We will discuss the IBM-PC, knowing that all we say works just as well as for the Compaq.

You only need a cable to connect SG-10/15 to your IBM-PC. Your Star dealer can furnish this cable, or you can use a standard IBM-PC parallel printer cable for the parallel interface.

Table J-1
IBM-PC parallel cable

SG-10/15			IBM-PC Parallel	
Pin No.	**Function**		**Pin No.**	**Function**
1	STROBE	———	1	STROBE
2	D1	———	2	D0
3	D2	———	3	D1
4	D3	———	4	D2
5	D4	———	5	D3
6	D5	———	6	D4
7	D6	———	7	D5
8	D7	———	8	D6
9	D8	———	9	D7
10	ACK	———	10	ACK
11	BUSY	———	11	BUSY
12	PAPER END	———	12	PAPER END
13	SELECTED	———	13	SELECT
16	GROUND	———	18-25	GROUND
31	RESET	———	16	RESET
32	ERROR	———	15	ERROR

■ BASIC programming

All the programs in this manual are written in the BASIC used by the IBM-PC. That makes it easy to do the things that we show you. But when you start writing your own programs there are several things you should know.

IBM BASIC defaults to a printer width of 80. This means that it will automatically insert a carriage return and line feed after every 80 characters. If you want to print lines longer than 80 characters you will need to change the width of the printer. If you set the printer width to 255, then the IBM will *never* insert a line feed and carriage return, unless you start a new line. (This is what you want usually.) To set the width of the printer to 255, use this statement:

```
1ØØ WIDTH "LPT1:", 255
```

IBM BASIC has one other little trick that will mess up your graphics if you let it. IBM BASIC is very insistent about adding a line feed to a carriage return. This is fine if you are printing text, but if an ASCII 13 pops up in the middle of your graphics printout, IBM BASIC will *still* add a line feed to it. This will put strange things in the middle of your graphics, and leave you with extra characters at the end of your line.

There is an easy way to avoid this problem. You just open the printer as a random file. The following program shows how this is done.

```
1Ø OPEN "LPT1:" AS #1          ' RANDOM ACCESS
2Ø WIDTH #1, 255               ' SET WIDTH TO 255
3Ø PRINT #1, "TESTING"         ' PRINT A LINE
4Ø PRINT #1, CHR$(1Ø)          ' ADD YOUR OWN LF
```

■ Listing programs

To list programs on SG-10/15, make sure the program is in the IBM's memory and use the LLIST command. This directs the listing to the printer instead of the screen.

CONNECTING WITH APPLE II COMPUTERS

Apple II computers require an interface board (mounted inside the Apple II) and a cable to run SG-10/15. Star recommends that you use the **grafstar**™ interface for the Apple II, II +, and IIe. It comes complete with a cable and is easily installed. A unique

feature of the **grafstar** ™ makes it possible to do some fancy dot graphics programming.

You can, of course, use many of the available parallel interface boards for the Apple II, and an appropriate cable.

Table J-2
Apple parallel cable

SG-10/15			Apple Board	
Pin No.	**Function**		**Pin No.**	**Function**
25	SIG GND	———	1	SIG GND
26	SIG GND	———	2	SIG GND
27	SIG GND	———	3	SIG GND
1	STROBE	———	4	STROBE
28	SIG GND	———	5	N/C
2	DATA1	———	6	DATA1
3	DATA2	———	7	DATA2
4	DATA3	———	8	DATA3
5	DATA4	———	9	DATA4
6	DATA5	———	10	DATA5
7	DATA6	———	11	DATA6
8	DATA7	———	12	DATA7
9	DATA8	———	13	DATA8
10	ACK	———	14	ACK
29	SIG GND	———	15	SIG GND

■ Applesoft BASIC

The Apple II computer, using Applesoft BASIC, does not have different types of PRINT statements for the screen and printer. You must add commands to your programs that direct the output of the PRINT statements to the printer. To direct output to the printer (with the interface board in slot #1) you must use the PR#1 command. Depending on the version of Applesoft BASIC that you are using this command can take various forms. It is usually one of the following:

```
1Ø PR#1
or
1Ø PRINT "<Ctrl-D>PR#1"
or
1Ø PRINT CHR$(4) "PR#1"
```

To return output to the screen, the command is PR#0, in the same form that works for PR#1.

To allow line length longer than the Apple II usually uses you must add the following statement to your programs:

```
2Ø PRINT CHR$(9) "255N"
```

This allows lines of any length to be sent to the printer and is especially important for dot graphics. (The number 255 in the BASIC statement above could be replaced by any number from 0 to 255 and would set the line length to that value.)

Two codes are a particular problem on the Apple II: CHR$(7) and CHR$(9). The computer will not send these codes to SG-10/15. Try to avoid using these in dot graphics programs.

The Apple II computer uses CHR$(9) as a printer initialization code. It won't send it on to the printer. There is a way to bypass this problem, however. You can change the printer initialization code to a value other than CHR$(9) like this:

```
PR#1
PRINT CHR$(9); CHR$(1)
```

This makes CHR$(1) the printer initialization code (and transfers the problems to *that* code) and allows you to use SG-10/15's tabs.

There is one more way to sneak problem codes past the Apple II's operating system and that's to poke the codes directly to the output port. To send ASCII code 9, for example, you could do this:

```
1ØØ N = 9
11Ø IF PEEK(496Ø1)>127 THEN 11Ø
12Ø POKE 49296,N
```

Line 110 checks the printer's status, and when it's okay, line 120 pokes the code to the printer.

■ Listing programs

To make a listing of your BASIC programs on SG-10/15 from your Apple II computer you must take the following steps:

1. Be sure that the program that you wish to list is in the memory of the Apple II.
2. Direct the output to the printer by typing PR#1.
3. Type LIST to start the listing.
4. When the listing is finished, type PR#0 to redirect the output to the screen.

CONNECTING WITH TRS-80 COMPUTERS

All that's required to connect SG-10/15 to your TRS-80 is a cable. It is available at your Star dealer.

Table J-3
TRS-80 Model I parallel cable

SG-10/15			TRS-80 Model I	
Pin No.	Function		Pin No.	Function
1	STROBE	———	1	STROBE
2	D1	———	3	D1
3	D2	———	5	D2
4	D3	———	7	D3
5	D4	———	9	D4
6	D5	———	11	D5
7	D6	———	13	D6
8	D7	———	15	D7
9	D8	———	17	D8
11	BUSY	———	21	READY

Table J-4
TRS-80 Model II parallel cable

SG-10/15			TRS-80 Model II	
Pin No.	Function		Pin No.	Function
1	STROBE	———	1	STROBE
2	D1	———	3	D1
3	D2	———	5	D2
4	D3	———	7	D3
5	D4	———	9	D4
6	D5	———	11	D5
7	D6	———	13	D6
8	D7	———	15	D7
9	D8	———	17	D8
10	ACK	———	19	ACK
11	BUSY	———	21	BUSY

■ TRS-80 BASIC

You may have to initialize your Model II to direct LPRINT statements to the printer. Use the SYSTEM "FORMS" command to do it.

TRS-80 uses another version of Microsoft BASIC. Most of the programs in this book will work just as they are, but the TRS-80 does have a few unique "problem codes". They are 0, 10, 11, and 12. None of these are passed properly to the printer.

You can bypass the TRS-80's BASIC and send these codes directly to the printer with the following short routine. The

variable N must be set equal to the code that you wish to pass (in our example it's 0).

```
9Ø N = Ø
1ØØ IF PEEK(14312)<>63 THEN 1ØØ
11Ø POKE 14312,N
```

Or you can use this special printer driver that will solve all your problems. Just run this program first, and then any codes sent by a BASIC program will be sent directly to the printer. This program is for the TRS-80 Model III.

```
5 REM  DRIVER FOR TRS-8Ø III
1Ø AD=16571
2Ø FOR I=Ø TO 14
3Ø READ A:POKE AD+1,A
4Ø NEXT
5Ø POKE 16422,187
6Ø POKE 16423,64
7Ø DATA 33,232,55,2Ø3,126,32,252,33,17,
   Ø,57,126,211,251,2Ø1
8Ø END
```

And here is a version for the TRS-80 Model I.

```
5 REM  DRIVER FOR TRS-8Ø I
1Ø AD=16571
2Ø FOR I=Ø TO 15
3Ø READ A:POKE AD+1,A
4Ø NEXT I
5Ø POKE 16422,187
6Ø POKE 16423,64
7Ø DATA 33,232,55,2Ø3,126,32,252,33,17,
   Ø,57,126,5Ø,232,55,2Ø1
8Ø END
```

■ Listing programs

To list a BASIC program that is in your TRS-80's memory on SG-10/15, type LLIST. This directs the listing to the printer instead of the screen.

CONNECTING WITH KAYPRO, OSBORNE, AND OTHER CP/M COMPUTERS

All that you need to connect SG-10/15 to an Osborne 1 or Kaypro computer is a cable. Your Star dealer can provide the cable that you need.

Table J-5
Kaypro parallel cable

SG-10/15			Kaypro	
Pin No.	Function		Pin No.	Function
1	STROBE	———	1	STROBE
2	DATA1	———	2	DATA1
3	DATA2	———	3	DATA2
4	DATA3	———	4	DATA3
5	DATA4	———	5	DATA4
6	DATA5	———	6	DATA5
7	DATA6	———	7	DATA6
8	DATA7	———	8	DATA7
9	DATA8	———	9	DATA8
11	BUSY	———	11	BUSY
16	SIG GND	———	16	SIG GND

Table J-6
Osborne 1 parallel cable

SG-10/15			Osborne 1	
Pin No.	Function		Pin No.	Function
2	DATA1	———	1	DATA0
6	DATA5	———	2	DATA4
3	DATA2	———	3	DATA1
7	DATA6	———	4	DATA5
4	DATA3	———	5	DATA2
8	DATA7	———	6	DATA6
5	DATA4	———	7	DATA3
9	DATA8	———	8	DATA7
1	STROBE	———	11	STROBE
11	BUSY	———	15	BUSY
16	SIG GND	———	16	SIG GND

■ Using MBASIC

Many CP/M computers use Microsoft BASIC (called MBASIC). If you have a CP/M-80 computer that uses Microsoft BASIC the program listing given here should work with your computer also.

MBASIC is a very close relative of the IBM-Microsoft BASIC used in this book. The only difference is that MBASIC "interprets" CHR$(9) and substitutes a group of spaces to sim-

ulate a tab. You can send a horizontal tab to SG-10/15 by using CHR$(137) instead of CHR$(9).

Some versions of Microsoft BASIC will add a carriage return and line feed at the end of every 80 (or sometimes 132) characters. To print lines longer than 80 (or 132) characters (as when doing dot graphics) you must define a wider printer width. The following statement will prevent the computer from inserting unwanted codes.

```
1Ø WIDTH LPRINT 255
```

■ Listing programs

Microsoft BASIC uses the "L" prefix on several commands to direct them to the printer. To list programs on the printer, just type LLIST. To direct program output to the printer, use LPRINT in place of PRINT.

DIP Switch Quick Reference

DIP switch settings

Switch	ON	OFF	SETTING
DIP Switch 1			
1-1	11" page length	12" page length	
1-2	Normal (STAR mode) Character Set #1 (IBM mode)	Italic (STAR mode) Character Set #2 (IBM mode)	
1-3	10 CPI (pica pitch)	17 CPI (condensed pitch)	
1-4	Normal	NLQ	
1-5	Ignore download characters	Enabe download characters	
1-6 1-7 1-8	International character set selection – see below		
DIP Switch 2			
2-1	Paper-out detector on	Ignore paper-out	
2-2	STAR mode	IBM mode	
2-3	LF must be from host	Auto LF with CR	
2-4	Standard buffer	Optional Buffer	

International character sets

Switch	USA	France	Germany	England	Denmark	Sweden	Italy	Spain
1-6	ON	OFF	ON	OFF	ON	OFF	ON	OFF
1-7	ON	ON	OFF	OFF	ON	ON	OFF	OFF
1-8	ON	ON	ON	ON	OFF	OFF	OFF	OFF

Use the "setting" column to record the way the switches are set in your printer.

Command Quick Reference

■ For STAR mode

Commands to control print style

<ESC> "5"	Cancel italic print
<ESC> "4"	Italic print
<ESC> "7" *n*	Select international character set
<ESC> "B" CHR$(4)	Select NLQ (Near Letter Quality) characters
<ESC> "B" CHR$(5)	Cancel NLQ characters

Font pitch controls

<ESC> "B" CHR$(1)	Pica print
<ESC> "B" CHR$(2)	Elite print
<ESC> "B" CHR$(3)	Condensed print
<ESC> "p" 1	Proportional print
<ESC> "p" 0	Cancel proportional print
CHR$(18)	Pica print
CHR$(15)	Condensed print
<ESC> CHR$(15)	Condensed print
<ESC> "W" 1	Expanded printt
CHR$(14)	One line expanded print
<ESC> CHR$(14)	One line expanded print
<ESC> "W" 0	Cancel expanded print
CHR$(20)	Cancel one line expanded print

Special print modes

<ESC> "G"	Double-strike print
<ESC> "H"	Cancel double-strike print
<ESC> "E"	Emphasized print
<ESC> "F"	Cancel emphasized print
<ESC> "-" 1	Start underlining
<ESC> "-" 0	Stop underlining
<ESC> "S" 0	Superscript on
<ESC> "S" 1	Subscript on
<ESC> "T"	Cancel super and subscripts
<ESC> "?" *n*	Master print mode select

Commands to control vertical position of the print head

CHR$(10)	Line feed
<ESC> "0"	Set line feed to 1/8 inch
<ESC> "1"	Set line feed to 7/72 inch
<ESC> "2"	Set line feed to 1/6 inch
<ESC> "A" *n*	Set line feed to *n*/72 inch
<ESC> "3" *n*	Set line feed to *n*/144 inch
<ESC> "J" *n*	Single line feed of *n*/144 inches

Form feed controls

CHR$(12)	Form feed
<ESC> "C" *n*	Set page length to *n* lines
<ESC> "C" CHR$(0) *n*	Set page length to *n* inches
<ESC> "R" *n*	Set top margin at line *n*
<ESC> "N" *n*	Set bottom margin at *n* lines
<ESC> "O"	Cancel top and bottom margins

Vertical tabs

CHR$(11)	Vertical tab
<ESC> "P" ... CHR$(0)	Set vertical tabs
<ESC> "a" *n*	Advance *n* line feeds

Commands to control horizontal position of the print head

CHR$(13)	Carriage return
<ESC> "M" *n*	Set left margin at column *n*
<ESC> "Q" *n*	Set right margin at column *n*
CHR$(9)	Horizontal tab
<ESC> "D" ... CHR$(0)	Set horizontal tabs
<ESC> "b" *n*	Tab over *n* columns
CHR$(8)	Backspace

Download character commands

<ESC> "*" 1 *n1 n2 m0 m1 .....m11*	Define download characters
<ESC> "*" 0	Copy standard ROM characters to download RAM
<ESC> "$" 1	Use download characters
<ESC> "$" 0	Cancel download characters

Commands to control graphics

<ESC> "K" *n1 n2 m1 m2 .....*	Normal density graphics
<ESC> "L" *n1 n2 m1 m2 .....*	Double density graphics
<ESC> "y" *n1 n2 m1 m2 .....*	Double speed, double density graphics
<ESC> "z" *n1 n2 m1 m2 .....*	Quadruple density graphics
<ESC> "g" *n0 n1 n2 m1 m2 .....*	Master graphics select

Macro instruction commands

<ESC> "+" ... CHR$(30)	Define macro
<ESC> "!"	Use macro

Other function codes

<ESC> ">"	Set eighth bit to 1
<ESC> "="	Set eighth bit to 0
<ESC> "#"	Accept eighth bit as is
CHR$(127)	Delete last character
CHR$(24)	Cancel line
CHR$(19)	Off line
CHR$(17)	On line
CHR$(7)	Sounds bell
<ESC> "Y" 0	Disable bell
<ESC> "Y" 1	Enable bell
<ESC> "\" 1	Print "zero" with slash
<ESC> "\" 0	Print "zero" without slash
<ESC> "8"	Ignore paper-out signal
<ESC> "9"	Enable paper-out signal
<ESC> "U" 1	Unidirectional print
<ESC> "U" 0	Bidirectional print
<ESC> "<"	One line unidirectional print
<ESC> "@"	Reset the printer

■ For IBM mode

Commands to control print style

<ESC> "7"	Select character set #1
<ESC> "6"	Select character set #2
<ESC> "I" 1	Italic print
<ESC> "I" 0	Cancel italic print
<ESC> "R" *n*	Select interantional character set
<ESC> "4"	Select NLQ (Near Letter Quality) characters
<ESC> "5"	Cancel NLQ characters

Font pitch controls

<ESC> "P"	Pica pitch
<ESC> "M"	Elite pitch
<ESC> "p" 1	Proportional print
<ESC> "p" 0	Cancel proportional print
CHR$(18)	Pica pitch
CHR$(15)	Condensed pitch
<ESC> CHR$(15)	Condensed pitch
<ESC> "W" 1	Expanded print
CHR$(14)	One line expanded print
<ESC> CHR$(14)	One line expanded print
<ESC> "W" 0	Cancel expanded print
CHR$(20)	Cancel one line expanded print

Special print mode

<ESC> "G"	Double-strike print
<ESC> "H"	Cancel double-strike print
<ESC> "E"	Emphasized print
<ESC> "F"	Cancel emphasized print
<ESC> "-" 1	Start underlining
<ESC> "-" 0	Stop underlining
<ESC> "S" 0	Superscript on
<ESC> "S" 1	Subscript on
<ESC> "T"	Cancel super and subscripts
<ESC> "!" *n*	Master print mode select

Commands to control vertical position of the print head

CHR$(10)	Line feed
<ESC> "0"	Set line feed to 1/8 inch
<ESC> "1"	Set line feed to 7/72 inch
<ESC> "A" *n*	Define line feed to *n*/72 inch
<ESC> "2"	Change to line spacing defined by <ESC> "A"
<ESC> "3" *n*	Set line feed to *n*/216 inch
<ESC> "J" *n*	Single line feed of *n*/216 inches

Form feed controls

CHR$(12)	Form feed
<ESC> "C" *n*	Set page length to *n* lines
<ESC> "C" CHR$(0) *n*	Set page length to *n* inches
<ESC> "r" *n*	Set top margin at line *n*
<ESC> "N" *n*	Set bottom margin at *n* lines
<ESC> "O"	Cancel top and bottom margins

Vertical tabs

CHR$(11)	Vertical tab
<ESC> "B" ... CHR$(0)	Set vertical tabs
<ESC> "a" *n*	Advance *n* line feeds

Commands to control horizontal position of the print head

CHR$(13)	Carriage return
<ESC> "1" *n*	Set left margin at column *n*
<ESC> "Q" *n*	Set right margin at column *n*
CHR$(9)	Horizontal tab
<ESC> "D" ... CHR$(0)	Set horizontal tabs
<ESC> "b" *n*	Tab over *n* columns
CHR$(8)	Backspace

Download character commands

<ESC> "&" CHR$(0) *n1 n2 m0 m1 ....m11*	Define download characters
<ESC> ":" 0 0 0	Copy standard ROM characters to download RAM
<ESC> "%" 1 0	Use download characters
<ESC> "%" 0 0	Cancel download characters

Commands to control graphics

<ESC> "K" *n1 n2 m1 m2 ....*	Normal density graphics
<ESC> "L" *n1 n2 m1 m2 ....*	Double density graphics
<ESC> "Y" *n1 n2 m1 m2 ....*	Double speed, double density graphics
<ESC> "Z" *n1 n2 m1 m2 ....*	Quadruple density graphics
<ESC> "*" *n0 n1 n2 m1 m2 ....*	Master graphics select

Macro instruction commands

<ESC> "+" ... CHR$(30)	Define macro
<ESC> "?"	Use macro

Other function codes

<ESC> ">"	Set eighth bit to 1
<ESC> "="	Set eighth bit to 0
<ESC> "#"	Accept eighth bit as is
CHR$(127)	Delete last character
CHR$(24)	Cancel line
CHR$(19)	Off line
CHR$(17)	On line
CHR$(7)	Sounds bell
<ESC> "y" 0	Disable bell
<ESC> "y" 1	Enable bell
<ESC> "\" 1	Print "zero" with slash
<ESC> "\" 0	Print "zero" without slash
<ESC> "8"	Ignore paper-out signal
<ESC> "9"	Enable paper-out signal
<ESC> "U" 1	Unidirectional print
<ESC> "U" 0	Bidirectional print
<ESC> "<"	One line unidirectional print
<ESC> "@"	Reset the printer