

# Video Signal Generator

## VG-813

### Terminal Mode User's Manual

Part 1

Ver. 1.0.1

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<ASTRO DESIGN, INC.>





# Notes

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- We reserve the right to revise the content of this manual without prior notice.
- We cannot be held responsible for damage caused by improper connections or usage.

For information regarding this product, contact the place of purchase or our company at the address listed below.

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<b>Chapter 1 Terminal Mode Overview</b> .....	<b>1</b>
<b>Chapter 2 Interface Specifications</b> .....	<b>1</b>
2·1 RS-232C Specifications .....	1
2·2 RS-232C Connector .....	1
<b>Chapter 3 Diagram of Connections</b> .....	<b>2</b>
<b>Chapter 4 Data Flow Chart</b> .....	<b>2</b>
<b>Chapter 5 Setup Data</b> .....	<b>3</b>
5·1 Glossary of Terms .....	3
5·2 Timing and Output Condition Settings.....	4
5·3 Patterns.....	5
5·3·1 Characters .....	5
5·3·2 Cross Hatch .....	6
5·3·3 Dots .....	6
5·3·4 Circles .....	7
5·3·5 Color Bars.....	8
5·3·6 Gray Scales.....	8
5·3·7 Bursts.....	9
5·3·8 Windows .....	10
<b>Chapter 6 Transmission Data</b> .....	<b>0</b>
6·1 Transmission Control Characters .....	0
6·2 Control Commands .....	1
6·3 Graphic Commands .....	2
6·4 Data and Error Commands.....	2
6·5 Key Code Table .....	2
<b>Chapter 7 Starting Up and Transfer Formats</b> .....	<b>3</b>
7·1 Starting Up in Terminal Mode .....	3
7·2 Command and Parameter Transfer Formats.....	4

# Chapter 1 Terminal Mode Overview

The terminal mode is a function for controlling VG-813 from an external computer such as a PC. The sending and receiving of commands and data is conducted through the units RS-232C serial input/output port. The terminal mode provides you with nearly the same level of control available manually including program data entry, program execution, and turning of patterns on and off. It also supports graphic commands for writing straight lines, circles, and dots.

# Chapter 2 Interface Specifications

## 2.1 RS-232C Specifications

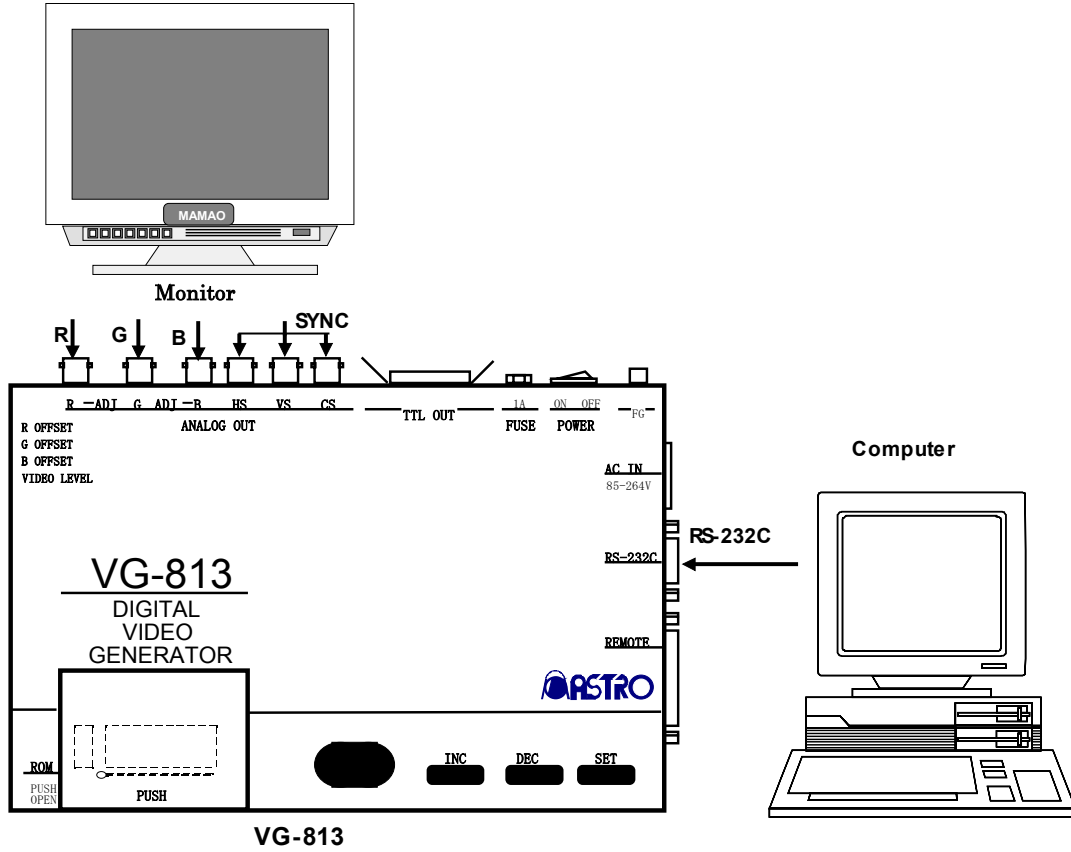
Communication method	調歩同期式
Transmission speed (baud rate)	9600 bps
I/O level	E2A-RS-232C
Data format	Start bit → 1 bit
	Data pit → 7 bit
	Stop bit → 1 bit
	Parity check → None
Error control method	None

## 2.2 RS-232C Connector

Pin Number	Signal Name
2	TXD (send data)
3	RXD (receive data)
5	GND (ground)
7	CTS (can send)
8	RTS(request send)

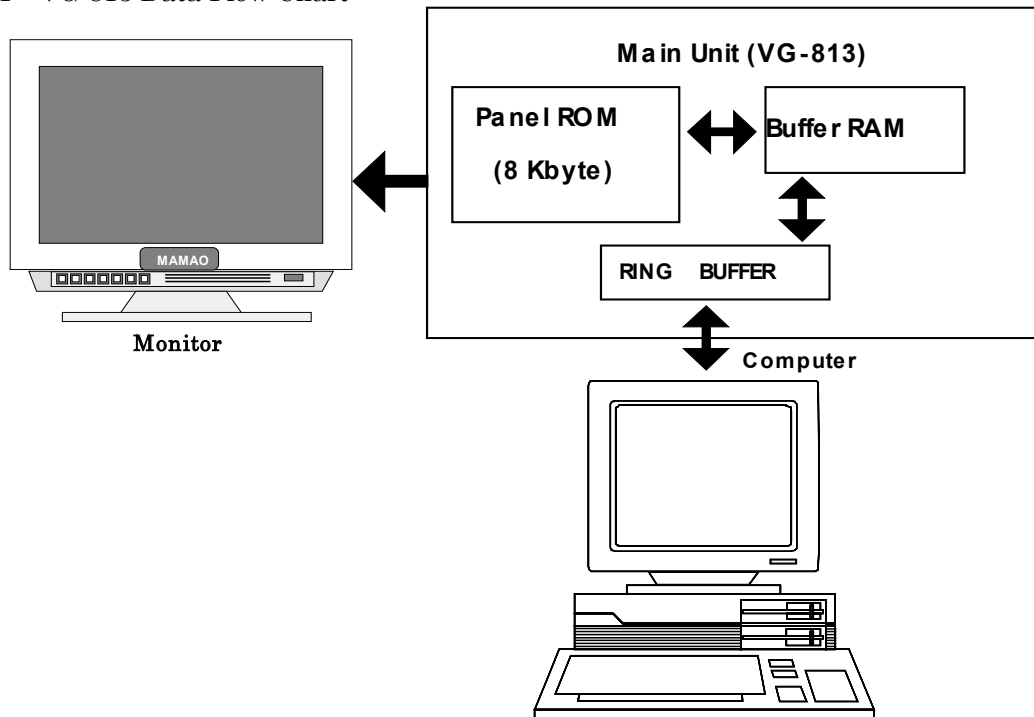
# Chapter 3 Diagram of Connections

Figure 3-1



# Chapter 4 Data Flow Chart

Figure 4-1 VG-813 Data Flow Chart



# Chapter 5 Setup Data

## 5·1 Glossary of Terms

### · Auto display data

When operating VG-813 in auto display, you specify parameters for the time between pattern output and the next program execution and parameters for the sequence in which programs will execute. Program numbers can be specified in blocks of three. For example, after outputting program no. 01, 02, and 03, you could have the unit continue on to 07, 08, and 09, or when repeating from 01, specify block 1 as 01 to 03, block 2 as 07 to 09, and block 3 as 00 to 00.

### · Pattern select data

When operating VG-813 in direct display or auto display, this data is for selecting which pattern to output when running a program. Make sure you enter R, G, and B in the data. If you do not do this, the data will be entered without any color.

### · Buffer RAM

VG-813 calls ROM programs once in execution RAM, and then displays their content. Buffer RAM refers to this type of RAM.

### · Unified program data

H timing, V timing, output conditions, pattern select, and pattern data are all combined in a single program.

### · User characters

Users can create and enter up to four characters in a single panel ROM. Characters are 64×64 dots.

### · Graphic plane

This plane draws characters, cross hatches, dots, circles, squares, +, ×, and burst patterns.

### · Color bar plane

Plane for drawing color bars, gray scales, and window patterns.

Note: 5·3 describes settings for H timing, V timing, and output conditions data. Refer to 5·4 for a detailed description for setting pattern data.



## 5.2 Timing and Output Condition Settings

H timing can be input using  $\mu$  s (time) or dots. Set MODE, Dot Clock, and then either  $\mu$  s or Dot.

Table 1-1

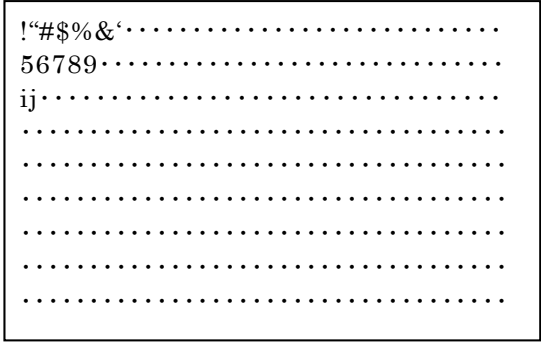
Horizontal timing	Input Mode(0,1) Dot Clock	0 : $\mu$ s    1 : dot <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> MHz
	H period	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> $\mu$ sec <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> dot
	H disp	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> $\mu$ sec <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> dot
	H sync	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> $\mu$ sec <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> dot
	H backp	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> $\mu$ sec <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> dot
	HD start HD width	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> $\mu$ sec <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> dot <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> $\mu$ sec <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> dot
Vertical timing	Scan Mode (0 to 2)	0 : NON INTERLACE 1 : INTERLACE & SYNC 2 : INTERLACE & VIDEO
	V total	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> H
	V disp	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> H
	V sync	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> H
	V backp	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> H
	EQP fp	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> H
	EQP bp	<input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> H
	Serration (0 to 3) EQP (0,1)	0 : OFF    1 : 0.5H    2 : 1H    3 : XOR 0 : OFF    1 : ON
VD start VD line	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> H <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> H	
Output conditions	Output Mode (0,1) NRZ/RZ (0,1)	0 : ANALOG    1 : TTL 0 : NRZ    1 : RZ
	CV (0 to 7)	0 : None    1 : R    2 : G    3 : RG 4 : B    5 : RB    6 : GB    7 : RGB
	HS	0 : Nega    1 : Posi
	VS	0 : Nega    1 : Posi
	CS	0 : Nega    1 : Posi
	HD	0 : Nega    1 : Posi
	VD	0 : Nega    1 : Posi
	RGB	0 : Nega    1 : Posi
	RGB HT	0 : Nega    1 : Posi
	C	0 : Nega    1 : Posi
	Video Set up Sync	<input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/> V 0 : OFF    1 : ON Fixed RS-343A

# 5.3 Patterns

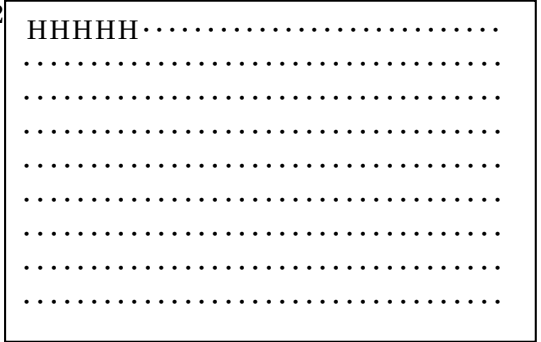
## 5.3.1 Characters

Select a format between 0 and 2.

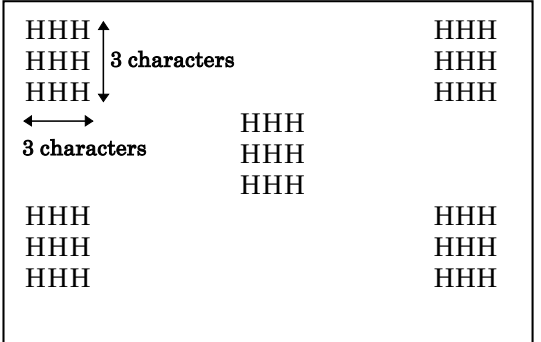
0..... Character list      Figure 5-1



1..... All the same character      Figure 5-2

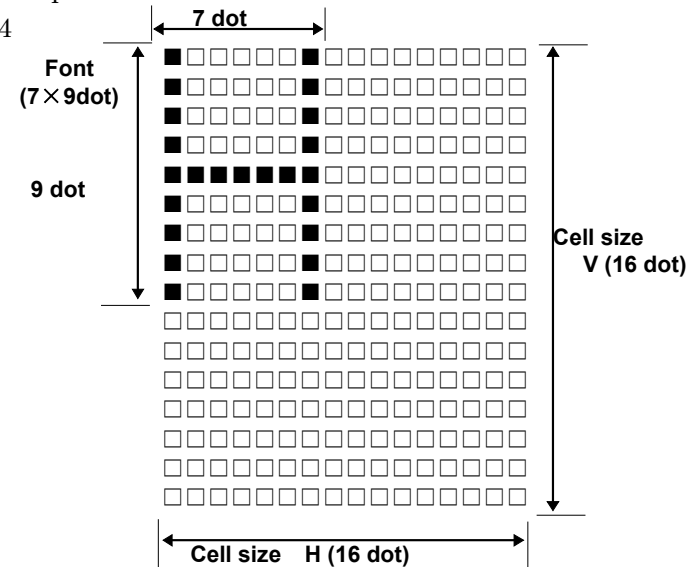


2..... Corner and center      Figure 5-3



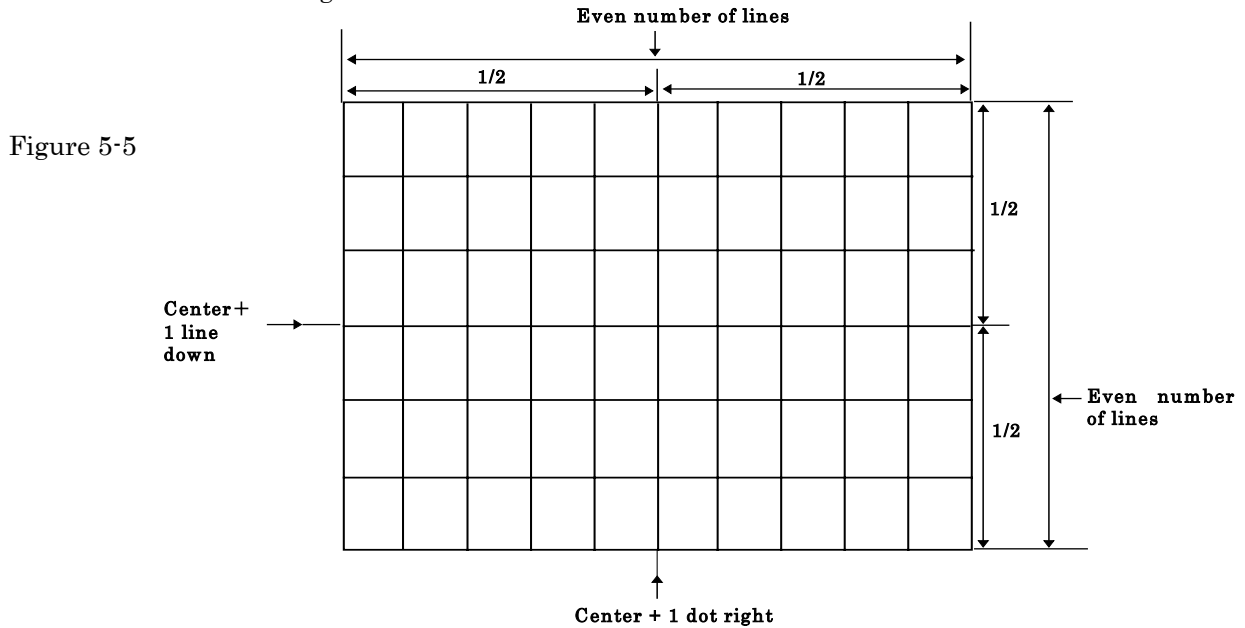
\*The following shows the relationship between the font and cell size.

Font: 7x9, cell size:16x16      Figure 5-4

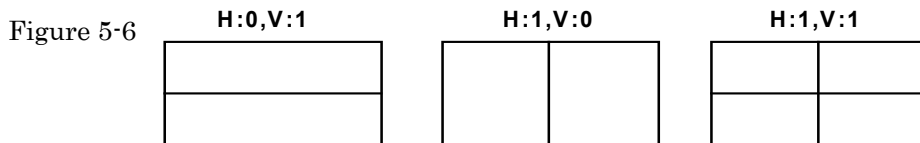


### 5·3·2 Cross Hatch

Cross hatch patterns are always displayed calculated from the center of the screen. If the number of display dots and display lines are set to odd values, the center of the screen can be calculated, but if they are set to even values, the center of the screen will shift one line down and one dot to the right of the center.



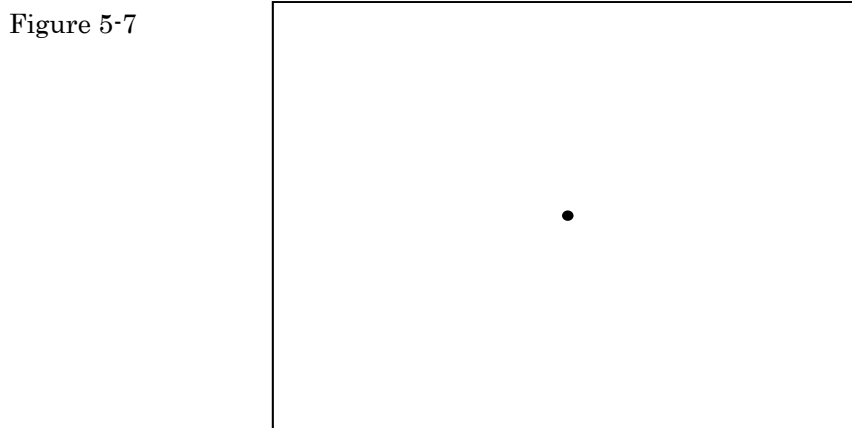
\*The following is an example of setting H: and V: to [0, 1], [1, 0], and [1, 1].



### 5·3·3 Dots

Similar to cross hatches, dot patterns also are drawn calculated from the center.

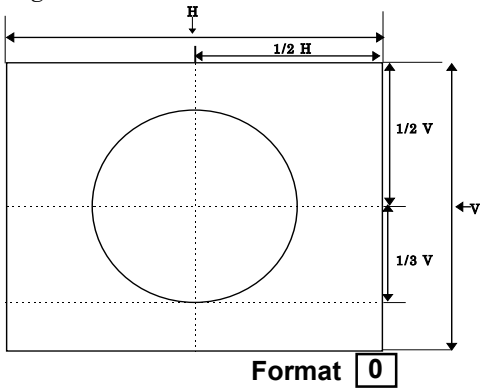
\*When H: and V: are both "1," the following image will result.



# 5·3·4 Circles

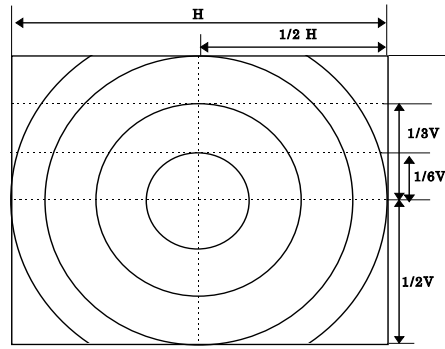
Select a format between 0 and 4.

Figure 5-8



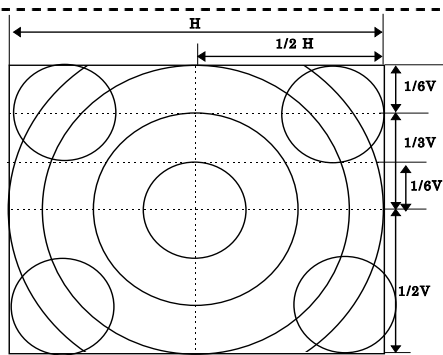
Format **0**

**Single circle**  
**Center: 1/2 H, 1/2 V**  
**Radius: 1/3 V**



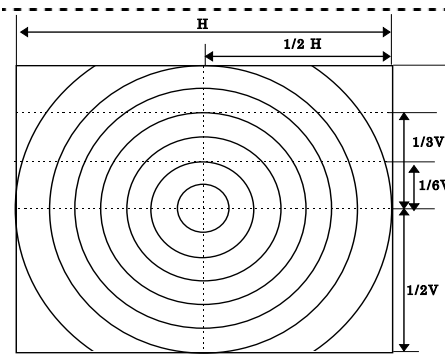
Format **1**

**Concentric circles (1)**  
**Center: 1/2 H, 1/2 V**  
**Radius: (from center)**  
 ... 1/6 V, 1/3 V 1/2 V, 1/2 H



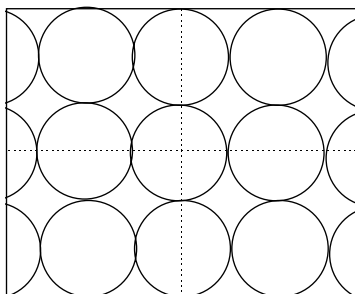
Format **2**

Format **1** + (1/6 V radius circle × 4)



Format **3**

**Concentric circles (2)**  
**Center: 1/2 H, 1/2 V**  
**Radius (from center)**  
 ... Adds another circle in the center of circle at 1/6 V, 1/3 V 1/2 V



**Continuous 1/6 V radius circles**  
**Displayed symmetrically up and down with the center (1/2 H, 1/2 V) as the base.**

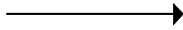
### 5·3·5 Color Bars

Color bars are always drawn starting from the upper left corner (when facing the screen) according to the applied interval.

Select 0 to 3 for the direction of the array.

Figure 5-9

0.....Horizontal direction



CO	1	2	~	F	CO
----	---	---	---	---	----

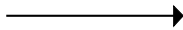
The specified color "CO to F" is repeated horizontally. The V interval is ignored.

1.....Vertical direction

	CO
↓	1
↓	2
↓	~
	F
	CO

The specified color "CO to ~F" is repeated vertically. The H interval is ignored.

2.....Horizontal direction



CO	1	2	~	F	CO
1	2	3	~	CO	1
2	3	4	~	1	2
3	4	5	~	2	3
4	5	6	~	3	4
5	6	7	~	4	5

Once the specified pattern "CO to F" is repeated horizontally to the corner, it will continue to the next line that was cut by the V interval.

3.....Vertical direction

	CO	1	2	3	4	5
↓	1	2	3	4	5	6
↓	2	3	4	5	6	7
↓	~	~	~	~	~	~
	F	CO	1	2	3	4
	CO	1	2	3	4	5

Once the specified pattern "CO toF" is repeated vertically to the corner, it will continue to the next line that was cut by the H interval.

### 5·3·6 Gray Scales

Similar to color bars, gray scales are drawn starting from the upper left corner. However, the interval references the color bar settings, and the array is limited to types 0, 1, and 2.

0	.....Horizontal (Same principle as direction 2 of the color bar)
1	.....Vertical (Same principle as direction 2 of the color bar)

## 5·3·7 Bursts

Sets the draw origin for formats 0 to 3, and then sets the step (thickness increment) and interval (number of lines of same thickness).

Format		
0	.....	Increased left to right
1	.....	Increased right to left
2	.....	Increased from the center left to right
3	.....	Increased to the center left to right

- Step refers to the increment of vertical line thickness.
- Interval refers to the number vertical lines of the same thickness.

Example setting:

Format 0, step 1, and interval 5

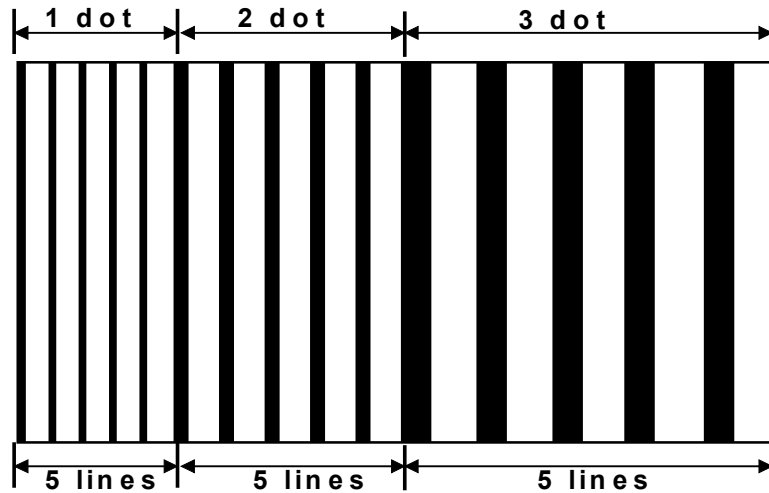


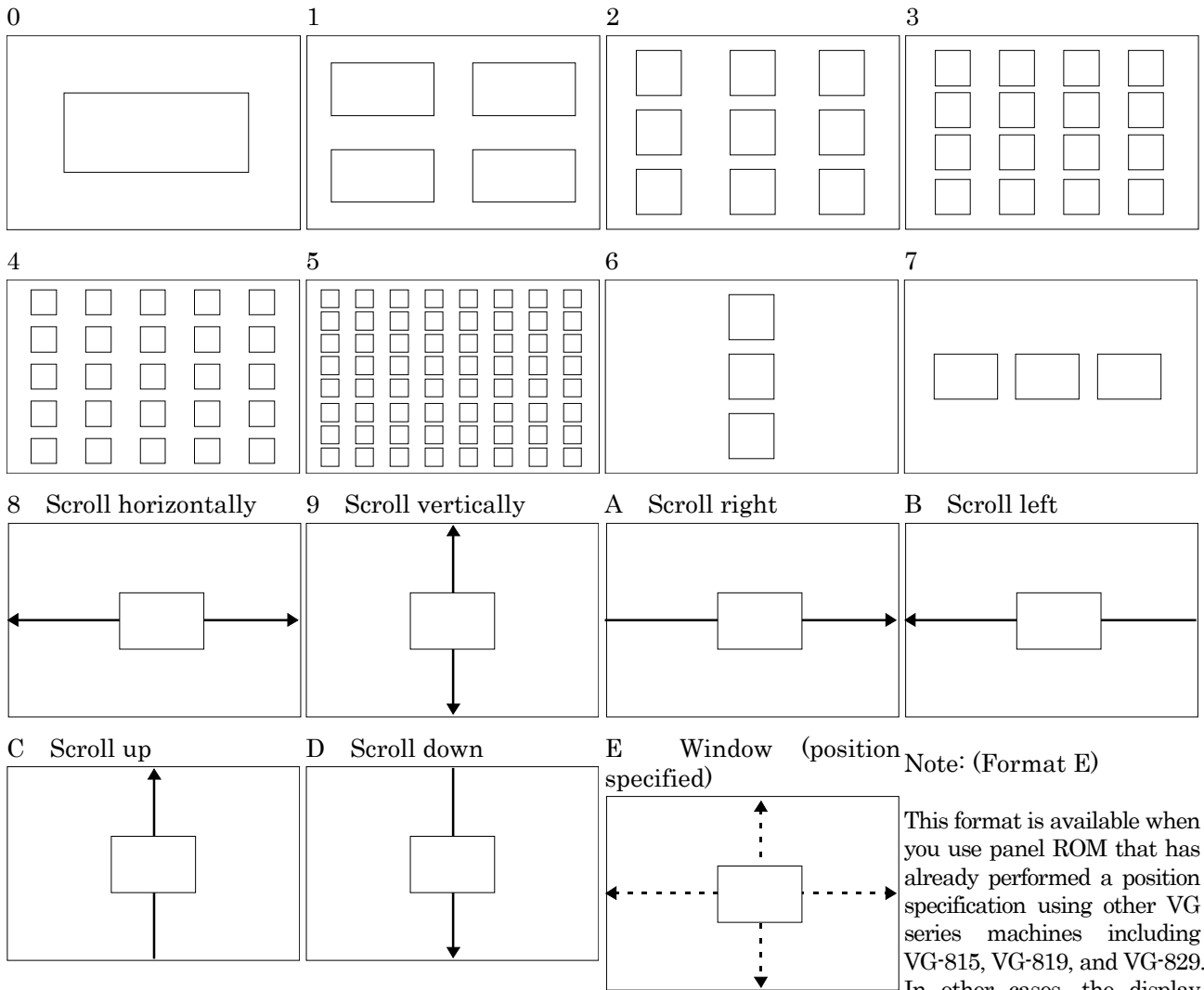
Figure 5-10

### 5.3.8 Windows

You can select the number of windows and such using the format 0 to E. Select speed (format 0 to 7) using the flicker interval. Also, select the scroll speed (format 8 to E).

Note: VG-813 displays format F the same as format 0.

Figure 5-11



- Selecting the flicker interval

	Window Format 0 to 7	Window Format 8 to D (Scroll)
0	No flicker	Scrolls 1 dot every V cycle
1	Flickers with each V cycle	Scrolls 2 dots every V cycle
2	Flickers every 2 V cycles	Scrolls 3 dot severy V cycle
3	Flickers every 4 V cycles	Scrolls 4 dots every V cycle
4	Flickers every 8 V cycles	Scrolls 4 dots every V cycle
5	Flickers every 16 V cycles	Scrolls 4 dots every V cycle
6	Flickers every 32 V cycles	Scrolls 4 dots every V cycle
7	Flickers every 64 V cycles	Scrolls 4 dots every V cycle

# Chapter 6      Transmission Data

## 6.1    Transmission Control Characters

The following table contains transmission control codes for operating VG-813 and your computer in terminal mode.

NO	Character	HEX Code	DEC Code	Description
1	ENQ	05H	5	Requests start of terminal mode
2	EOT	04H	4	Requests end of terminal mode
3	ACK	06H	6	Acknowledgement character
4	NAK	15H	21	Negative acknowledgement character
5	STX	02H	2	Start text transmission (command)
6	ETB	17H	23	End text transmission (data)
7	ETX	03H	3	End text transmission (command and data)



## 6.2 Control Commands

The following table contains command groups for changing program data and selecting patterns/signals.

N0	Character	HEX code	DEC code	Description
1	PED	30H	48	Enables or disables specified program number.
2	LAT	40H	64	Sends auto display data in panel ROM from VG-813.
3	LPTS	41H	65	Sends pattern select data of specified program no. from VG-813.
4	LHT	42H	66	Sends H timing data of specified program no. from VG-813.
5	LVT	43H	67	Sends H timing data of specified program no. from VG-813.
6	LOT	44H	68	Sends output condition data of specified program no. from VG-813.
7	LPT	45H	69	Sends pattern select data of specified program no. from VG-813.
8	SAT	46H	70	Writes auto display data to VG-813 panel ROM.
9	SPTS	47H	71	Writes pattern select data of specified program no. to either VG-813 panel ROM or buffer RAM.
10	SHT	48H	72	Writes H timing data of specified program no. to either VG-813 panel ROM or buffer RAM.
11	SVT	49H	73	Writes V timing data of specified program no. to either VG-813 panel ROM or buffer RAM.
12	SOT	4AH	74	Writes output condition data of specified program no. to either VG-813 panel ROM or buffer RAM.
13	SPT	4BH	75	Writes pattern data of specified program no. to either VG-813 panel ROM or buffer RAM.
14	LPD	4CH	76	Sends program data of specified program no. from VG-813.
15	SPD	4DH	77	Writes program data of specified program no. to VG-813 panel ROM or buffer RAM.
16	LCH	4EH	78	Sends data for the specified user character from VG-813. (64×64 and E0 to E3)
17	SCH	4FH	79	Writes data for the specified user character to VG-813 panel ROM or buffer RAM. (64×64 and E0 to E3)
18	EXPPN	07H	7	Runs program no. in specified panel ROM.
19	EXPBN	08H	8	Sends data for one program to VG-813, which then runs it. (Does not write to panel ROM.)
20	EXPDN	09H	9	Specifies and runs a direct display number.
21	EXPON	0EH	14	Runs specified pattern and turns signal on.
22	EXPOFF	0FH	15	Runs specified pattern and turns signal off.
23	DISPON	21H	33	Turns CRT display on.
24	DISPOFF	22H	34	Turns CRT display off.
25	DISPHV	28H	40	Sends number of display dots for a graphic plane.
26	INDC	29H	41	Increments or decrements direct display number by one.
27	EXBN	0CH	12	Runs the content of buffer RAM.
28	EXSGON	0BH	11	Turns R, G, B, RHT, GHT, and BHT on and off.
29	PNames	3EH	62	Writes program name of specified program no. to VG-813 panel ROM.
30	PNameR	50H	80	Sends program name of specified program no. from VG-813.
31	EXSYNC	51H	81	Turns HS, VS, and CS on and off.
32	SGROUP	52H	82	Writes group data of specified group no. to VG-813 panel ROM.
33	LGROUP	53H	83	Sends group data of specified group no. from VG-813.
34	PRGENTRY	2BH	43	Enters in VG-813 programs no. 1 to 4 for rapid program switching.
35	PRGEXE	2CH	44	Runs program no. entered by PRGENTRY.

## 6.3 Graphic Commands

These commands are only available in terminal mode. Using the following command groups allows you to create a much wider variety of patterns than possible when operating the unit from its front panel.

No	Character	HEX Code	DEC Code	Description
1	GCIRC	18H	24	Draws a circle in graphic plane.
2	CCIRC	12H	18	Clears circle in graphic plane.
3	GLINE	19H	25	Draws straight line in graphic plane.
4	CLINE	13H	19	Clears straight line in graphic plane.
5	GPSET	1BH	27	Draws one dot in graphic plane.
6	CPSET	14H	20	Clears one dot in graphic plane.
7	ACLR	23H	35	Clears entire screen.
8	COCLR	24H	36	Clears color plane.
9	GCLR	25H	37	Clears graphic plane.
10	COLOR	26H	38	Displays 256 colors (H16×V16)
11	GCHAR	27H	39	Displays a character.
12	GSQPA	31H	49	Draws painted box in graphic plane.
13	CSQPA	32H	50	Clears painted box in graphic plane.
14	GRPHCL	3BH	59	Sets graphic color.
15	WINDW	3CH	60	Draws window.
16	CWIND	2AH	42	Clears window.
17	WINDCL	3DH	61	Sets window color.

## 6.4 Data and Error Commands

Error statuses are returned for errors that occur when commands are sent to VG-813. They are also transferred during the sending or receiving of requests.

No	Character	HEX Code	DEC Code	Description
1	TRDT	10H	16	Sets data to the start of the block and sends it.
2	ESTS	11H	17	When sending error status, sends the following error no. to the front of this command.

## 6.5 Key Code Table

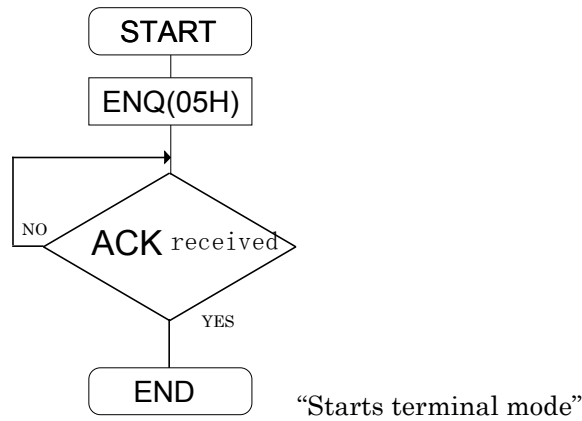
NO	Key Name	HEX Code	DEC Code
1	CHARA	50H	80
2	CROSS	51H	81
3	DOTS	52H	82
4	CIRCLE	53H	83
5	+	54H	84
6	□	55H	85
7	×	56H	86
8	COLOR	57H	87
9	GRAY	58H	88
10	BURST	59H	89
11	WINDOW	5AH	90
12	OPTION 1	5BH	91

NO	Key Name	HEX Code	DEC Code
13	OPTION 2	5CH	92
14	R	5EH	94
15	G	5FH	95
16	B	60H	96
17	HALF-TONE	61H	97
18	INV	62H	98
19	▲	63H	99
20	▼	64H	100
21	RH	65H	101
22	GH	66H	102
23	BH	67H	103
24	CHAR EDIT	5DH	93

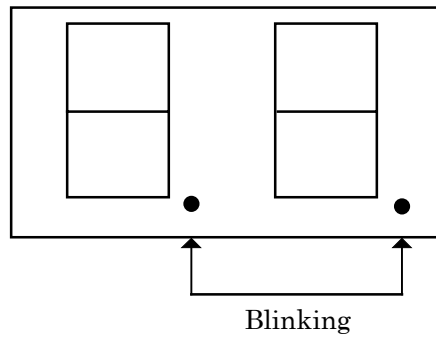
- Use to select pattern or output keys.
- Keys ▲ and ▼ of no. 19 and 20 are only used to update the direct display.

# Chapter 7 Starting Up and Transfer Formats

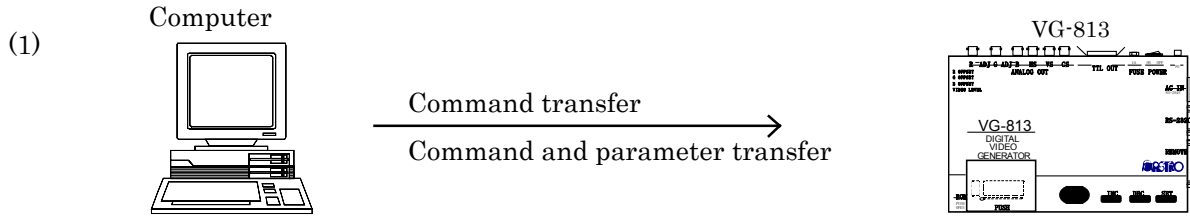
## 7.1 Starting Up in Terminal Mode



Note: After terminal mode starts, the periods of the seven segment LED will blink.

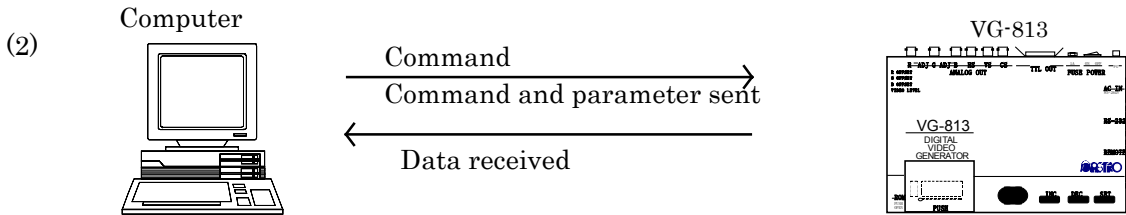
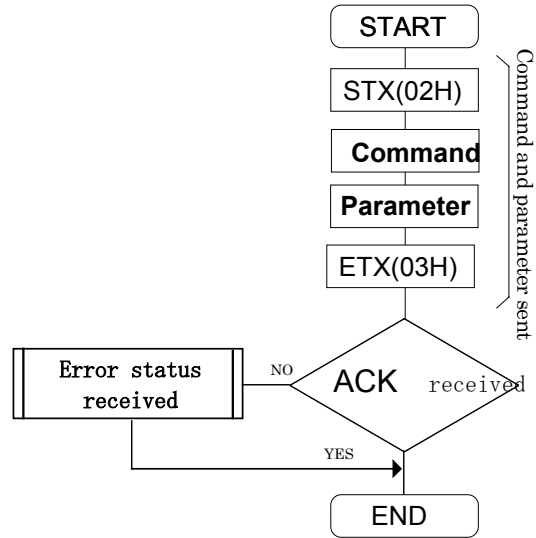
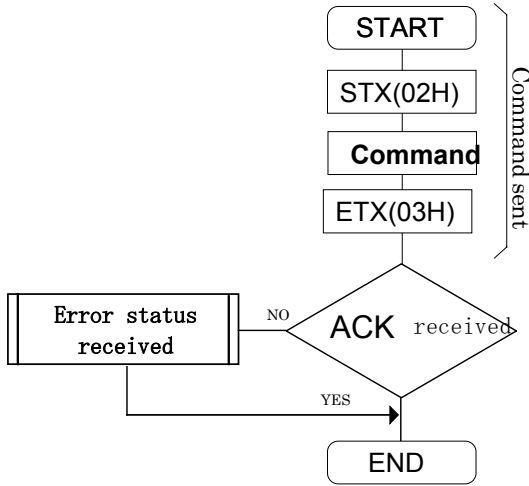


## 7.2 Command and Parameter Transfer Formats

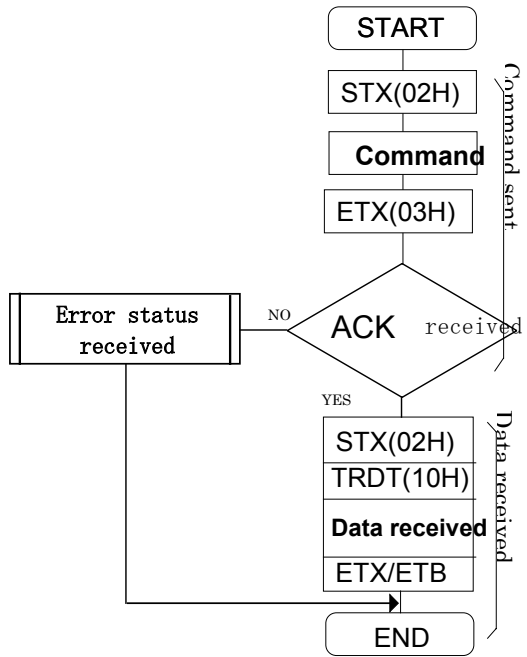


Command Only

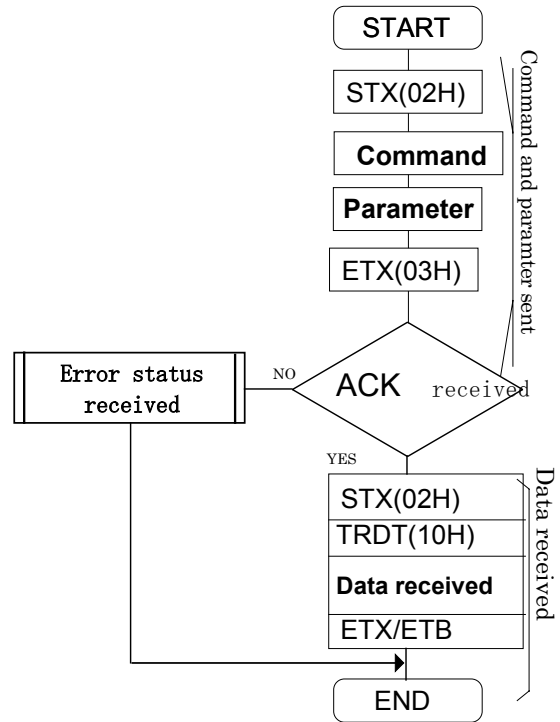
Command and Parameter

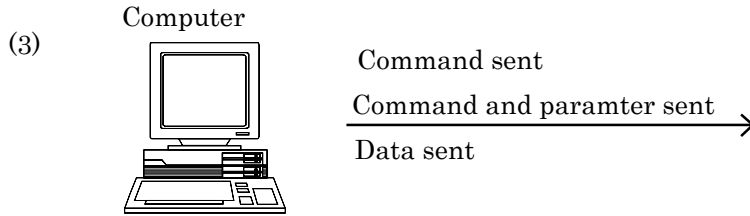


### Sending Commands and Receiving Data

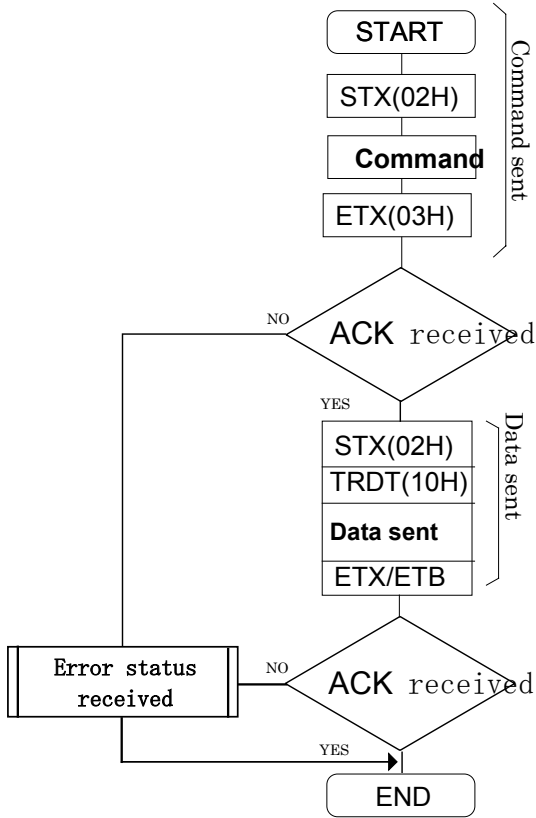


### Sending Commands and Parameters and Receiving Data

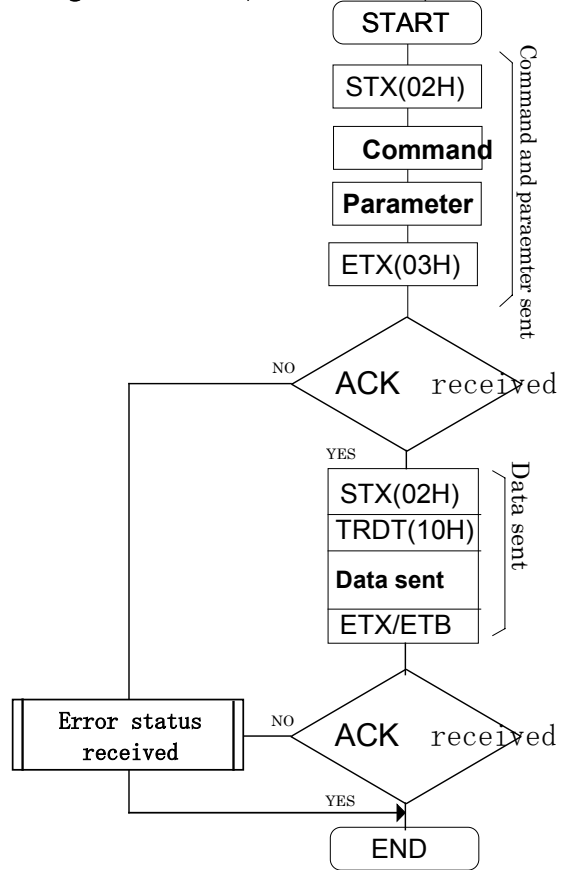




**Sending Commands and Data**



**Sending Commands, Parameters, and Data**



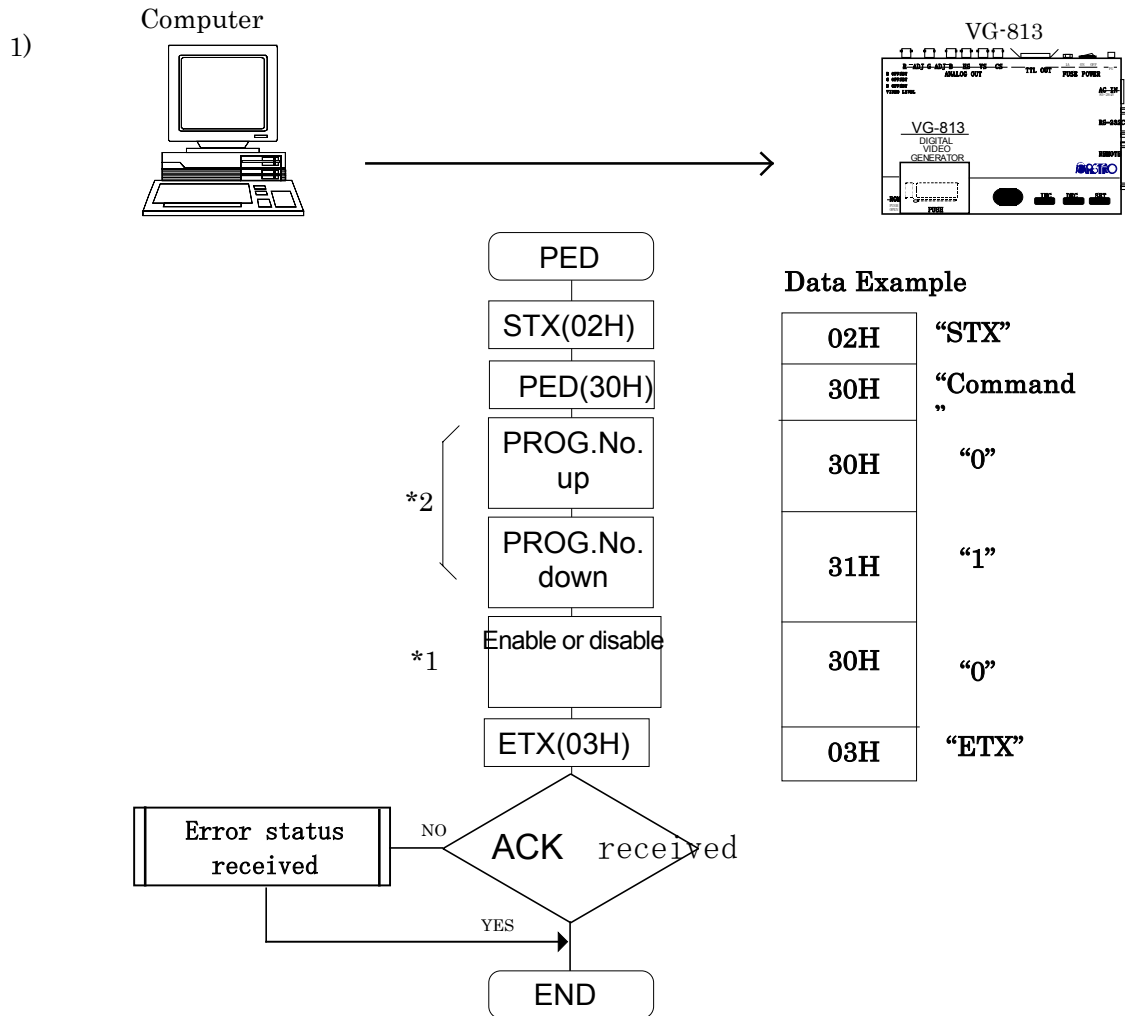
<b>Chapter 8 Control Command Functions</b> .....	<b>18</b>
8·1 [PED](30H) .....	18
8·2 [LAT](40H)·[SAT](46H) .....	19
8·3 [LPTS](41H)·[SPTS](47H) .....	21
8·4 [LHT](42H)·[SHT](48H).....	22
8·5 [LVT](43H)·[SVT](49H) .....	24
8·6 [LOT](44H)·[SOT](4AH) .....	26

# Chapter 8 Control Command Functions

## 8.1 [PED](30H)

This command enables or disables programs in panel ROM. Its parameters send data for selecting program no. (01 to 40) and for enabling or disabling them.

\*All parameters are in ASCII code.



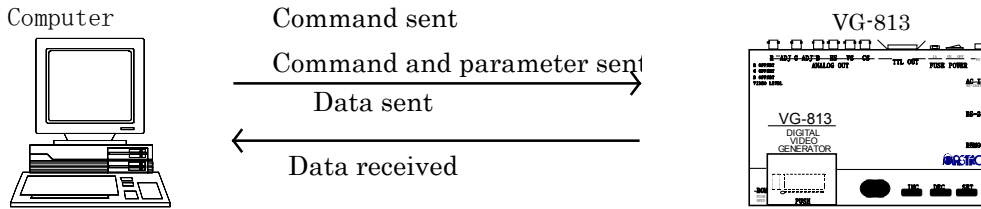
\*1 "0" when enabled  
 "1" when disabled  
 Note: Enables program "01".

\*2 3 digit specification when using AH-3000.  
 Program no. (001 to 040) and (500 to 779)

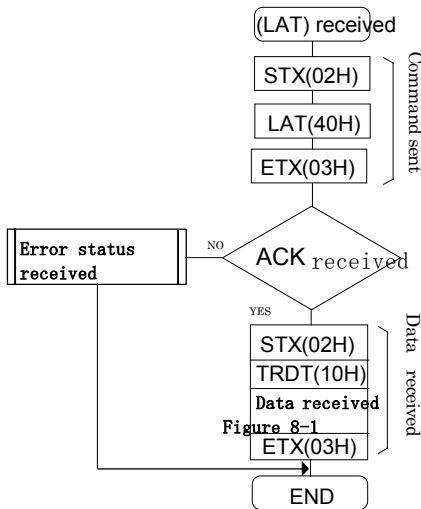
## 8·2 [LAT](40H)·[SAT](46H)

Command for sending or receiving parameters for running auto display. The data sent is written to panel ROM. Parameters that are sent and received are program numbers comprised of an interval (time) and 3 blocks.

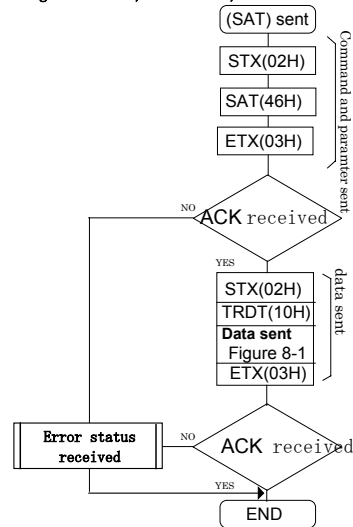
\*All parameters are in ASCII code.



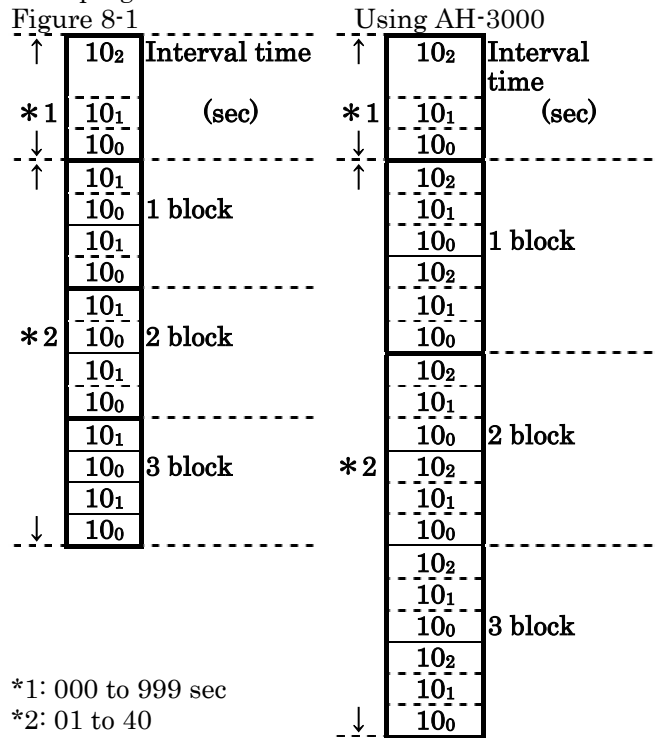
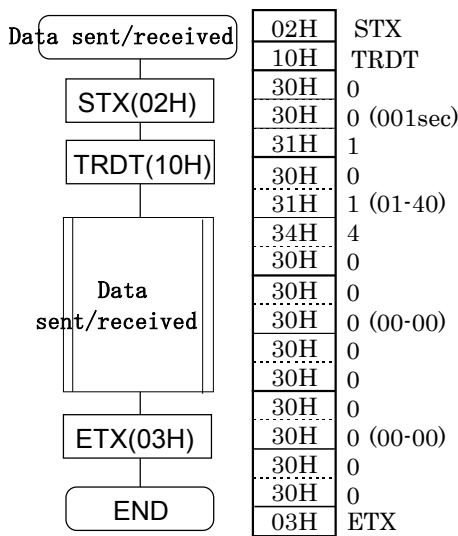
Sending Commands and Receiving Data



Sending Commands, Parameters, and Data



- Format consists of an interval (time) and a 3 block program number.



Note: Fixed at 18 bytes.

\*1: 000 to 999 sec

\*2: 01 to 40

When using AH-3000, 001 to 040 and 500 to 779.

Note: When using only block 1, set block 2 and 3

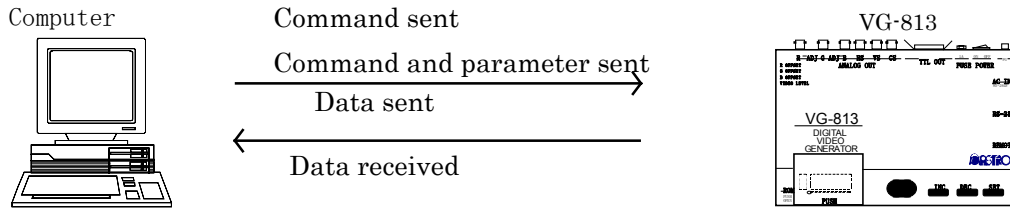


to "0".

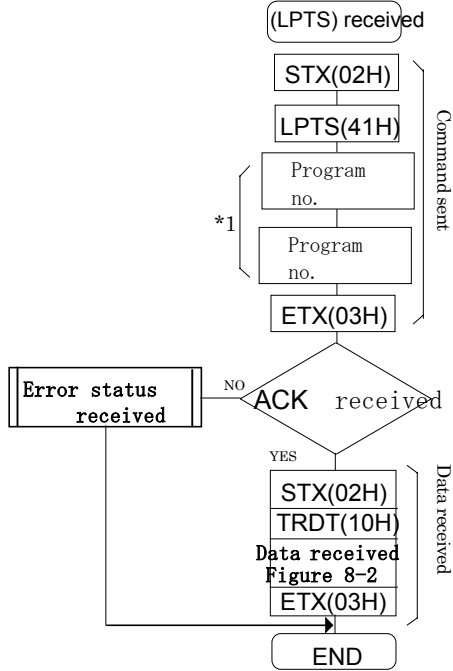
## 8.3 [LPTS](41H)·[SPTS](47H)

Commands for sending or receiving pattern select data for the specified program no. The data sent is written to buffer RAM when the program no. is 0, and written to panel ROM when the program no. is 01 to 40. The parameter sent and received is the pattern key.

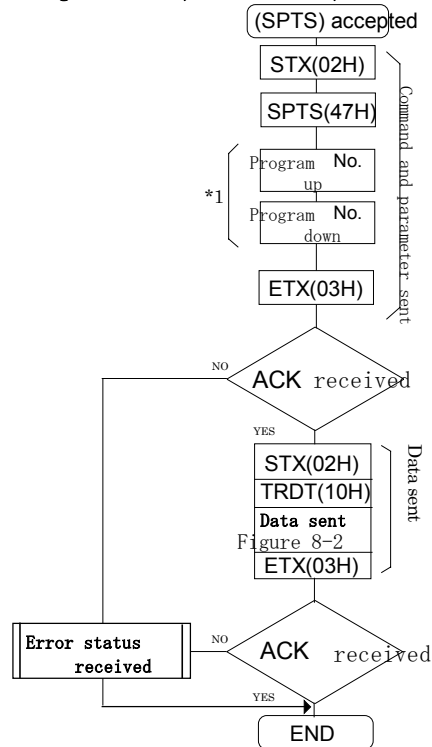
\*All parameters are in ASCII code.



Sending Commands and Receiving Data



Sending Commands, Parameters, and Data



\*1: 3 digit specification when using AH-3000.  
Program no. (001 to 040) and (500 to 779)

- Format for pattern select data

Data sent/received

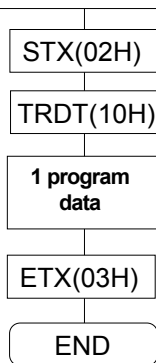


Figure 8-2

CHARA(50H)
CROSS(51H)
COLOR(57H)
.
.
R(5EH)
G(5FH)
B(60H)

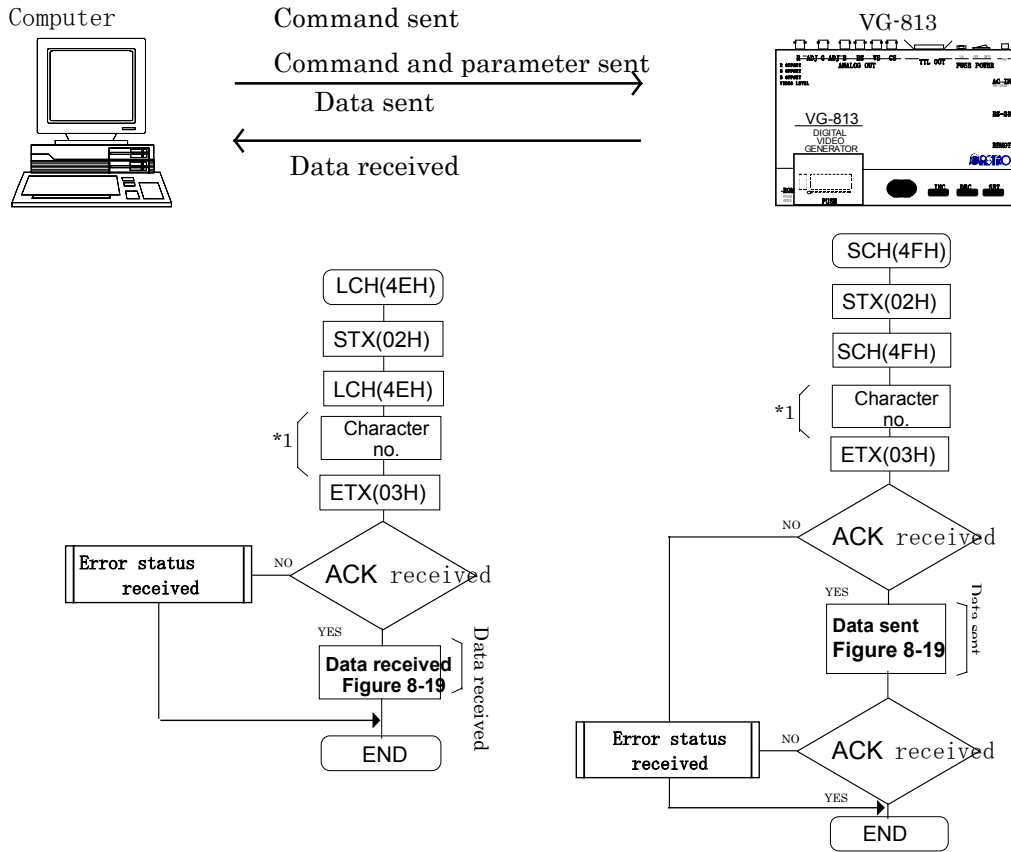
\*1: Data is variable length.

Note: Refer to 6.5 "Key Code Table" regarding pattern or output keys.

## 8.4 [LHT](42H)·[SHT](48H)

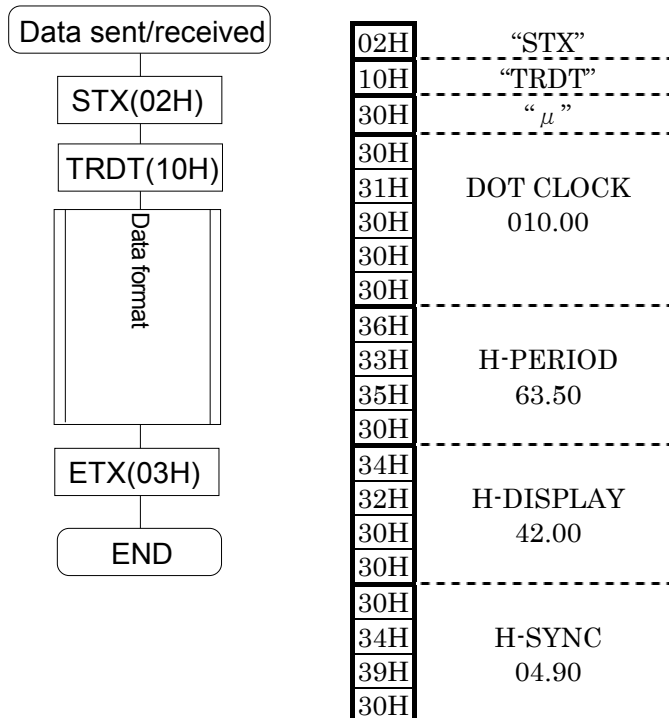
Commands for sending or receiving H timing for the specified program no. The data sent is written to buffer RAM when the program no. is 0, and written to panel ROM when the program no. is 01 to 40. The parameter sent and received is the pattern key.

\*All parameters are in ASCII code.



\*1: 3 digit specification when using AH-3000.  
Program no. (001 to 040) and (500 to 779)

- Format for H timing data



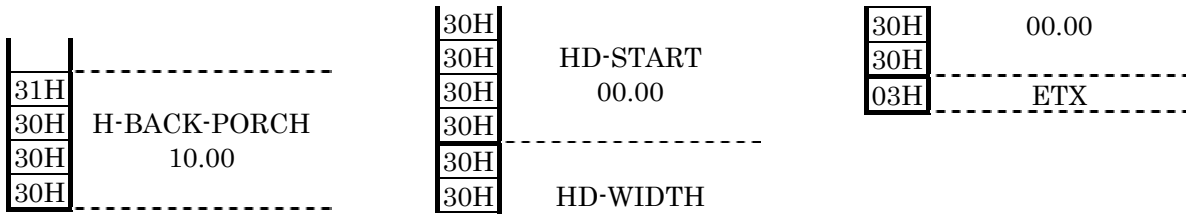


Figure 8-3

* 1	$\mu$ / (dot)	MODE( $\mu$ / dot)
	$10^2$	DOT CLOCK
	$10^1$	
	$10^0$	
	$10^{-1}$	
	$10^{-2}$	
	$10^1(10^3)$	H-PERIOD
	$10^0(10^2)$	
	$10^{-1}(10^1)$	
	$10^{-2}(10^0)$	
	$10^1(10^3)$	H-DISPLAY
	$10^0(10^2)$	
	$10^{-1}(10^1)$	
	$10^{-2}(10^0)$	
	$10^1(10^3)$	H-SYNC
	$10^0(10^2)$	
	$10^{-1}(10^1)$	
	$10^{-2}(10^0)$	

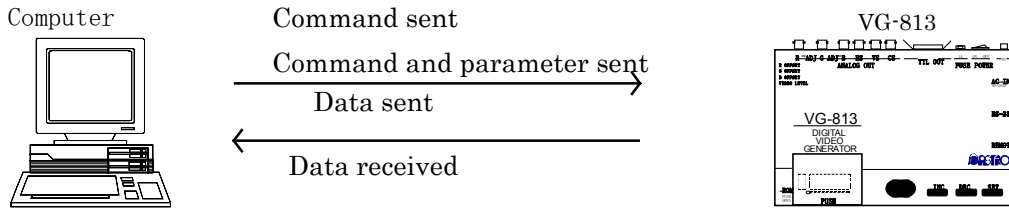
$10^1(10^3)$	H-BACK-PORCH
$10^0(10^2)$	
$10^{-1}(10^1)$	
$10^{-2}(10^0)$	
$10^1(10^3)$	HD-START
$10^0(10^2)$	
$10^{-2}(10^0)$	
$10^1(10^3)$	HD-WIDTH
$10^0(10^2)$	
$10^{-2}(10^0)$	

\*1 "0"= $\mu$   
 "1"=dot

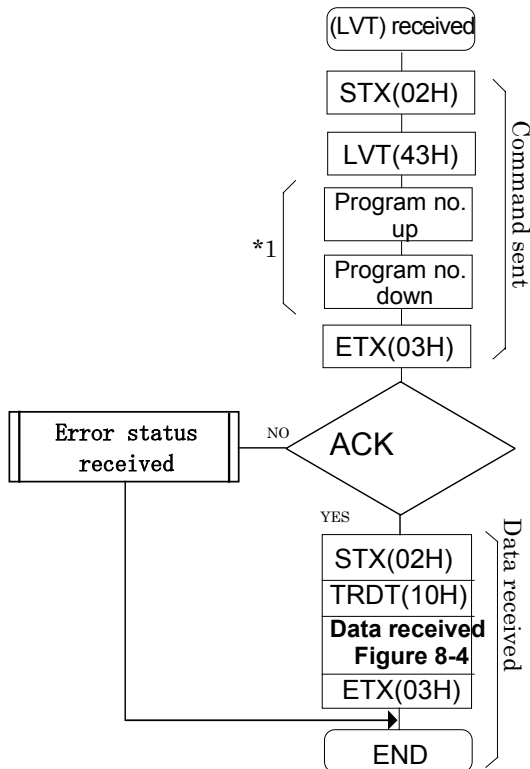
## 8.5 [LVT](43H)·[SVT](49H)

These commands send and receive V timings for the specified program no. The data sent is written to buffer RAM when the program no. is 0, and written to panel ROM when the program no. is 01 to 40.

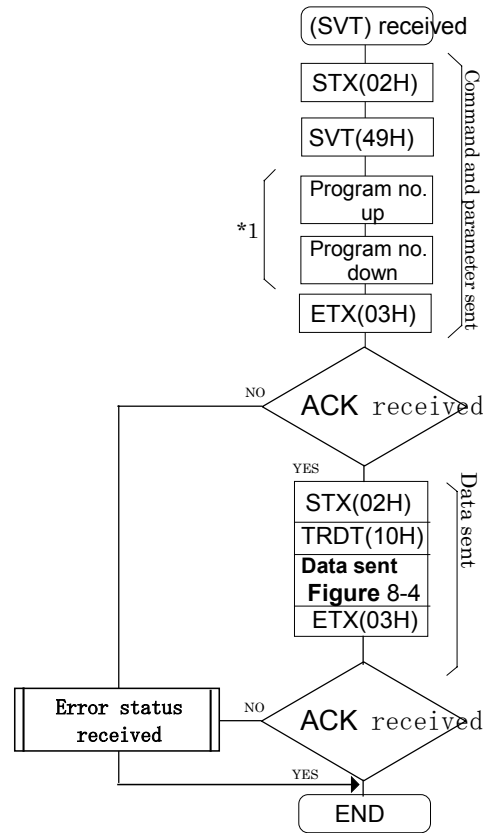
\*All parameters are in ASCII code.



**Sending Commands and Receiving Data**



**Sending Commands, Parameters, and Data**



\*1: 3 digit specification when using AH-3000.  
Program no. (001 to 040) and (500 to 779)

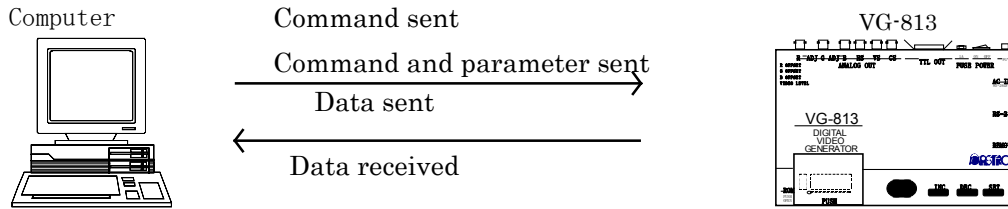
- Format for V timing data



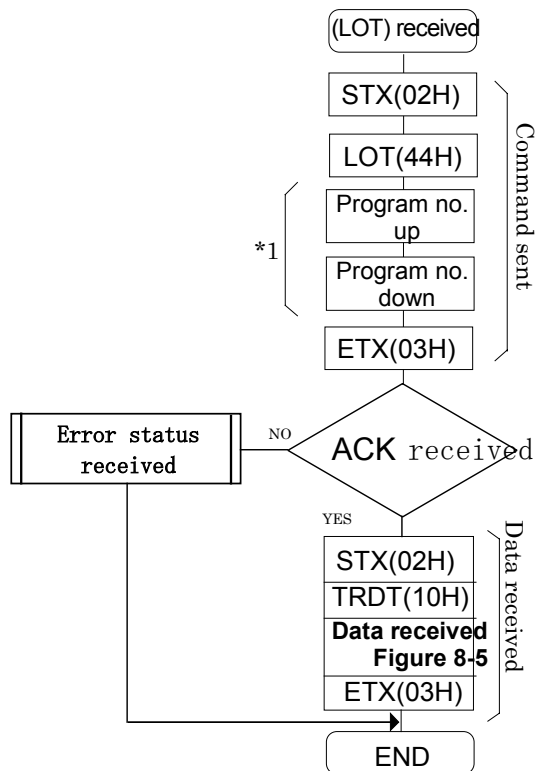
## 8·6 [LOT](44H)·[SOT](4AH)

These commands send and receive output conditions for the specified program no. The data sent is written to buffer RAM when the program no. is 0, and written to panel ROM when the program no. is 01 to 40.

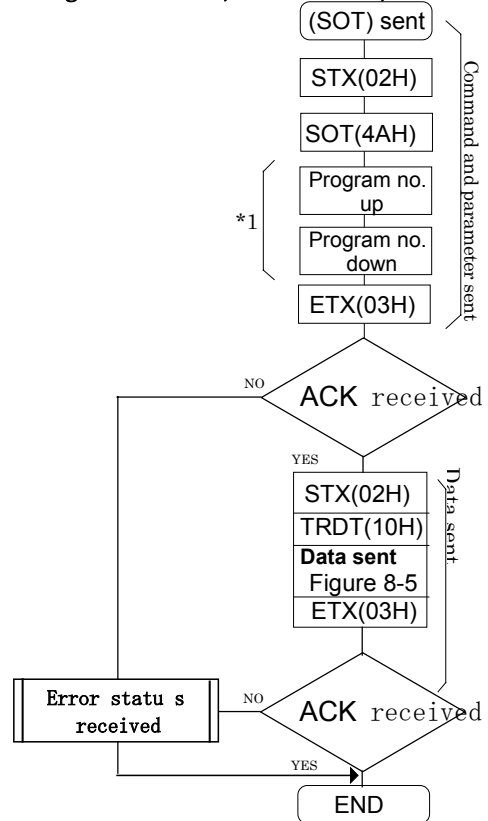
\*All parameters are in ASCII code.



**Sending Commands and Receiving Data**

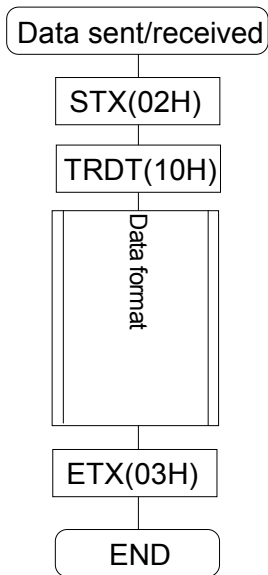


**Sending Commands, Parameters, and Data**



\*1: 3 digit specification when using AH-3000.  
Program no. (001 to 040) and (500 to 779)

- Format for output condition data



02H	"STX"
10H	"TRDT"
30H	"Analog"
30H	"NEGA"
30H	"NEGA"
30H	"NEGA"
31H	"POST"
31H	"POST"
31H	"POST"
31H	"POST"
37H	"RGB"
30H	"NRZ"
31H	"POST"
31H	
30H	1.00V
30H	
30H	
32H	0.25V
35H	
30H	
33H	0.30V
30H	
03H	ETX

Figure 8-5

* 1	OUT PUT	
* 2	HS	
	VS	
* 3	CS	
	HD	
* 4	VD	
	R G B	
	RH GH BH	
* 5	V/S	
* 6	RZ/NRZ	
* 2	CLOCK	
	10 <sup>0</sup>	VIDEO LEVEL
	10 <sup>-1</sup>	
	10 <sup>-2</sup>	
	10 <sup>0</sup>	SET UP
	10 <sup>-1</sup>	
	10 <sup>-2</sup>	
	10 <sup>0</sup> 30H	Dummy data
	10 <sup>-1</sup> 30H	
	10 <sup>-2</sup> 30H	

- \* 1 "0"=analog, "1"=TTL
- \* 2 "0"=NEGA, "1"=POSTI, "2"=OFF
- \* 3 "0"=NEGA, "1"=POSTI, "2"=OFF, "3"=HS, "4"=VS
- \* 4 "0"=NEGA, "1"=POSTI
- \* 5 "0"=none, "1"=R, "2"=G, "3"=RG, "4"=B, "5"=RB, "6"=GB, "7"=RGB
- \* 6 "0"=NRZ, "1"=RZ



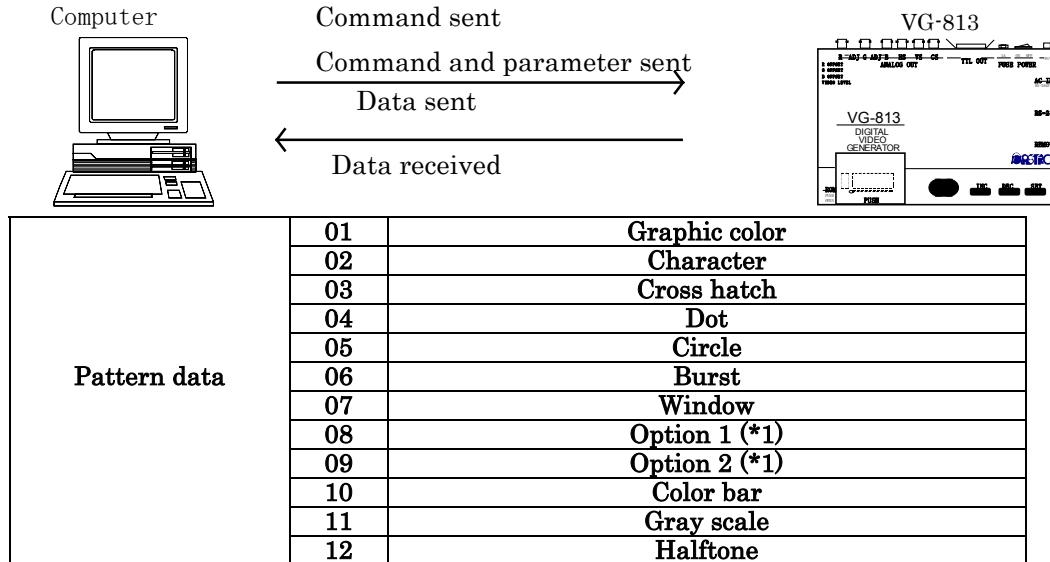
8·10	[EXPPN](07H) .....	39
8·11	[EXPBN](08H) .....	39
8·12	[EXPDN](09H) .....	39
8·13	[EXPON](0EH)·[EXPOFF](0FH) .....	41
8·14	[DISPON](21H)·[DISPOFF](22H) .....	42
8·15	[DISPHV](28H) .....	42
8·16	[INDC](29H) .....	42
8·17	[EXBN](0CH) .....	44
8·18	[EXSGON](0BH) .....	44
8·19	[PNAMES](3EH) .....	45
8·20	[PNAMER](50H) .....	45
8·21	[EXSYNC](51H) .....	46
8·22	[SGROUP](52H) .....	47
8·23	[LGROUP](53H) .....	47
8·24	[PRGENTRY](2BH) .....	49
8·25	[PRGEXE](2CH) .....	0

8·7	[LPT](45H),[SPT](4BH) .....	28
8·8	[LPD](4CH)·[SPD](4DH).....	36
8·9	[LCH](4EH)·[SCH](4FH) .....	38

## 8.7 [LPT](45H),[SPT](4BH)

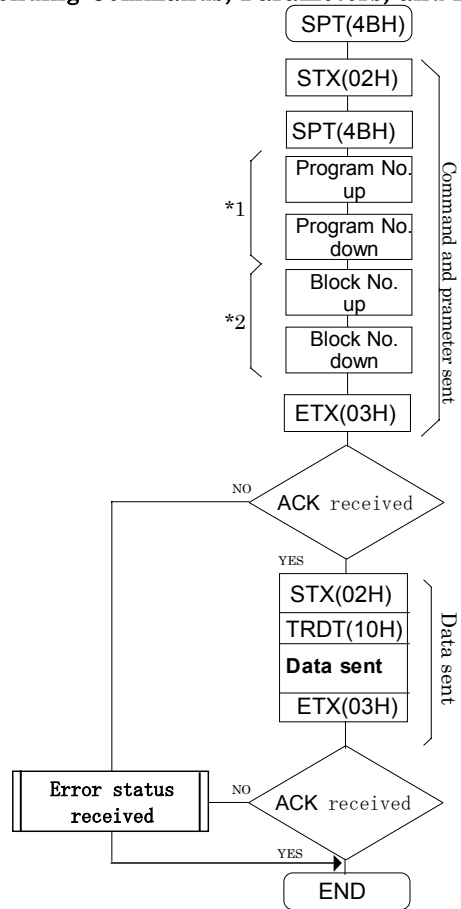
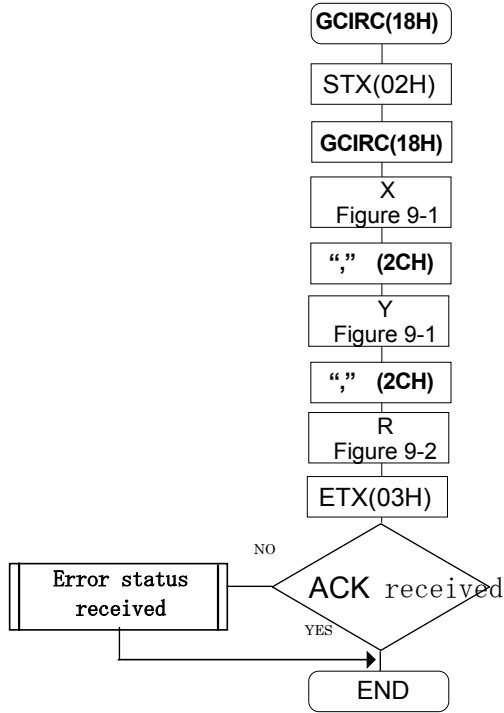
Commands for sending or receiving pattern select data for the specified program no. The data sent is written to buffer RAM when the program no. is 0, and written to panel ROM when the program no. is 01 to 40. The pattern data is sent and received by dividing it up into 12 blocks.

\*All parameters are in ASCII code.



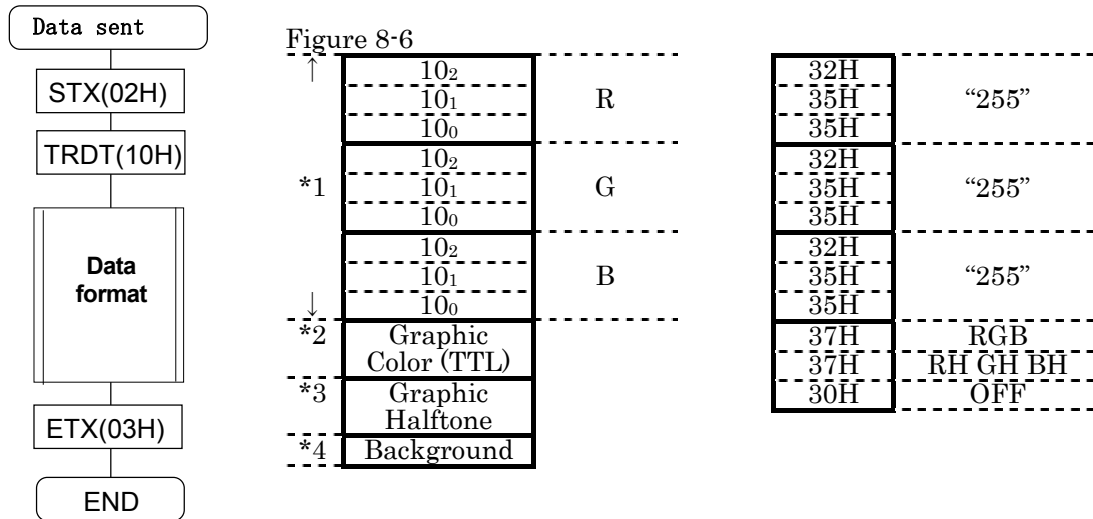
- \*1. Since you cannot use the [LPT] and [SPT] commands when specifying option pattern codes with 2 digits (00 to 1F), you should use the [LPT2] (55H) and [SPT2] (5BH) commands. Usage for option pattern codes besides those with 1 or 2 digits is the same.

**Sending Commands, Parameters, and Data**



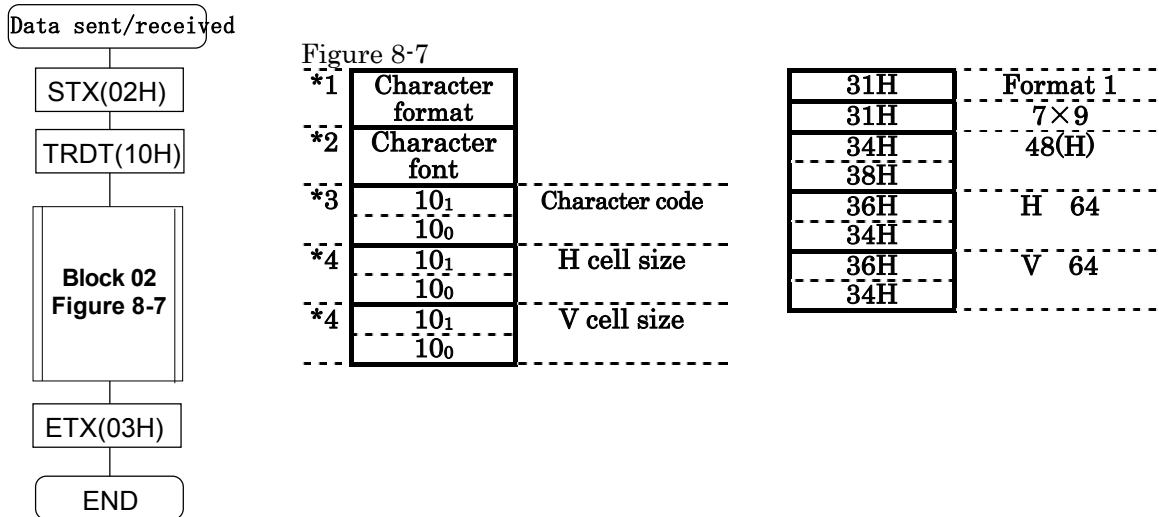
- \*1 "00" to "40"(ASCII code) "001" to "040" and "500" to "779" when using AH-3000
- \*2 "01"~"12"(ASCII code)

## Program No.[01] Format for Graphic Color Data



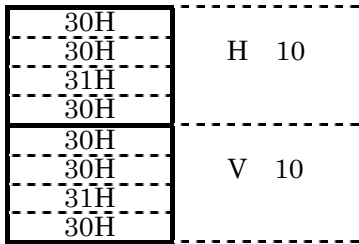
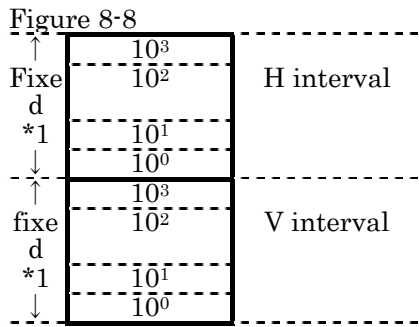
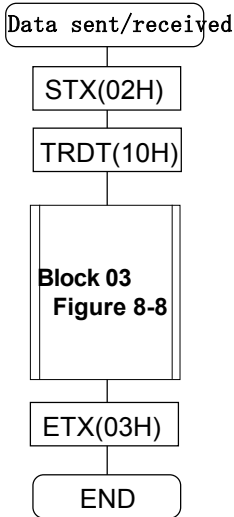
- \*1 Analog specification. (000 to 255)
  - \*2 Color specification for TTL.  
"0"=none, "1"=R, "2"=G, "3"=RG, "4"=B, "5"=RB, "6"=GB, "7"=RGB
  - \*3 Halftone color specification for TTL.  
"0"=none, "1"=RH, "2"=GH, "3"=RHGH, "4"=BH, "5"=RHBH, "6"=GHBH, "7"=RHGHBH
  - \*4 "0"=OFF, "1"=ON
- Note: Fixed at 12 bytes

## Program No.[02] Format for Character Data



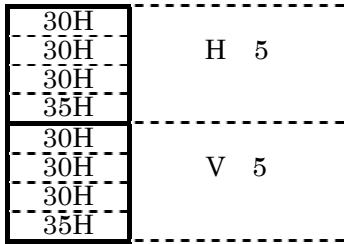
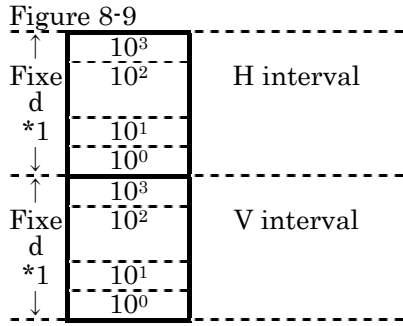
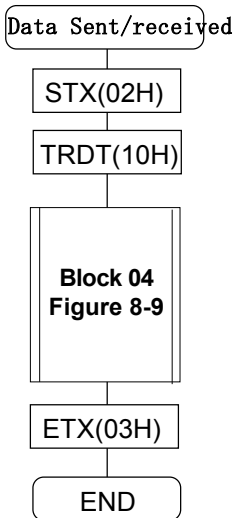
- \*1 "0"=format0, "1"=format1 "2"=format2
  - \*2 "0"=5×7, "1"=7×9 "2"=16×16
  - \*3 "20" to "E3" "20" to "EF" when using AH-3000
  - \*4 "01" to "64"
- Note: Fixed at 8 bytes

**Block No.[03] Format of Cross hatch Data**



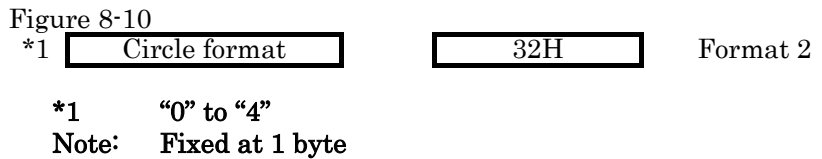
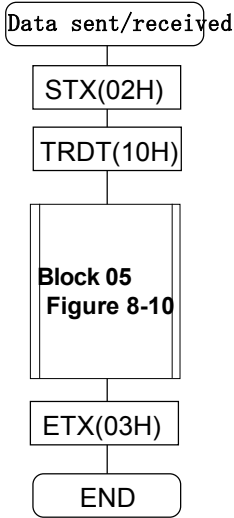
\*1 "0000" to "9999"  
Note: Fixed at 8 bytes

**Block No.[04] Format of Dot Data**



\*1 "0000" to "9999"  
Note: Fixed at 8 bytes

**Block No.[05] Format of Circle Data**



**Block No.[06] Format of Burst Data**

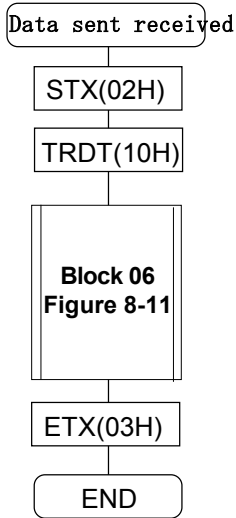
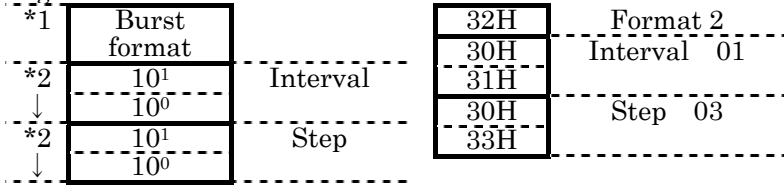


Figure 8-11



- \*1 "0" to "3"
- \*2 "01" to "99"
- Note: Fixed at 5 bytes

**Block No.[07] Format of Window Data**

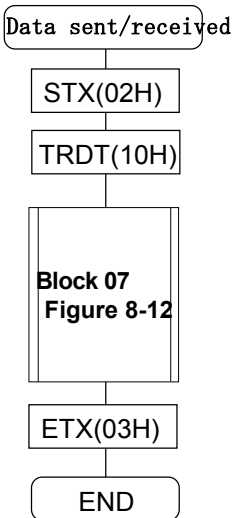
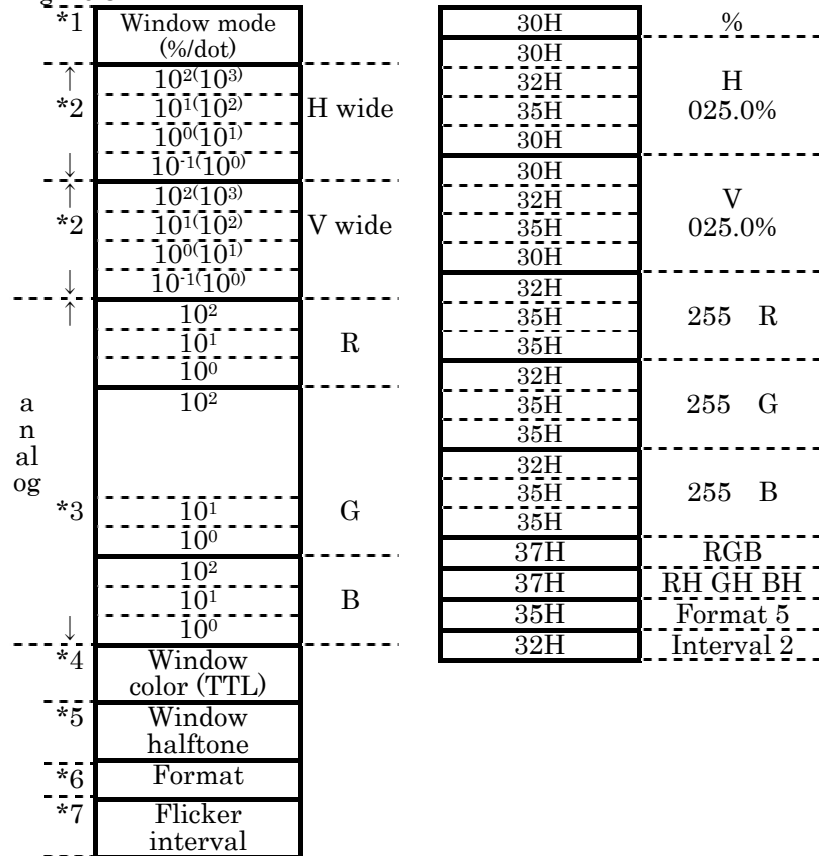


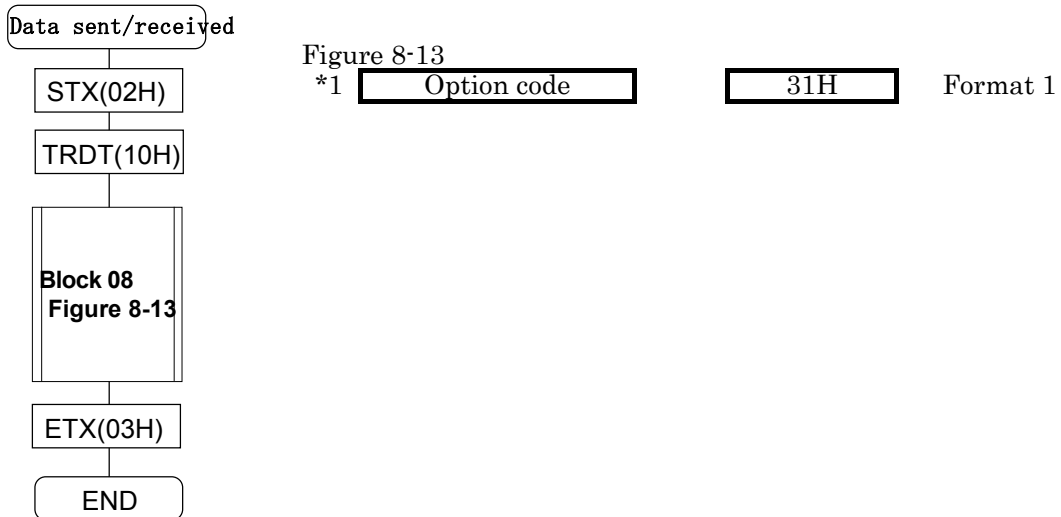
Figure 8-12



- \*1 "0"=% "1"=dot
- \*2 "0001" to "1000"%, "0002" to "display" dot
- \*3 "000" to "255"
- \*4 "0"=none, "1"=R, "2"=G, "3"=RG, "4"=B, "5"=RB, "6"=GB, "7"=RGB
- \*5 "0"=none, "1"=RH, "2"=GH, "3"=RHGH, "4"=BH, "5"=RHBH, "6"=GHBH, "7"=RHGHBH
- \*6 "0"~"F"
- \*7 "0"~"7"

Note: Refer to 5·3 "Flicker Interval of Patterns" regarding flicker intervals.  
 Note: Fixed at 22 bytes

## Block No.[08] Format of Option 1 Data

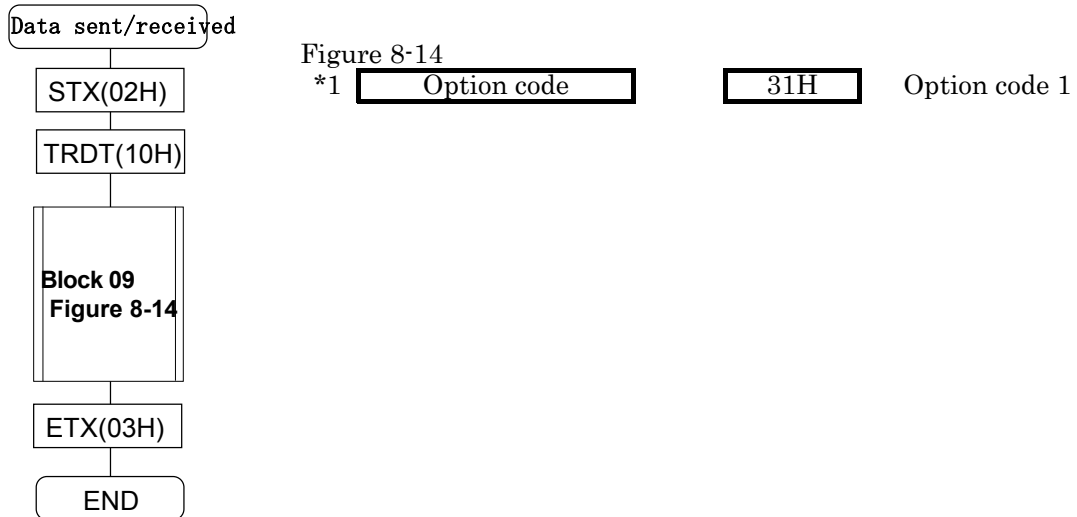


\*1 "0" to "F"("0" to "9", "A" to "F")

Note: Fixed at 1 byte

"00" to "1F" when specifying option pattern codes with 2 digits. Use the commands [LPT2], [SPT2], [LPD2], [SPD2], and [EXPBN2] when sending and receiving.

## Block No.[09] Format of Option Data 2



\*1 "0" to "F"("0" to "9", "A" to "F")

Note: Fixed at 1 byte

"00" to "1F" when specifying option pattern codes with 2 digits. Use the commands [LPT2], [SPT2], [LPD2], [SPD2], and [EXPBN2] when sending and receiving.



# Block No.[10] Format of Color Bar Data

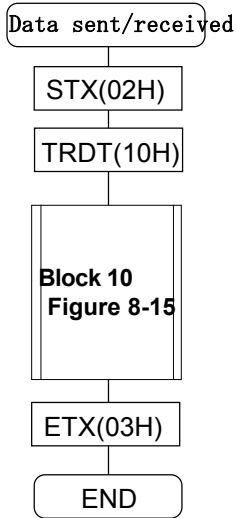
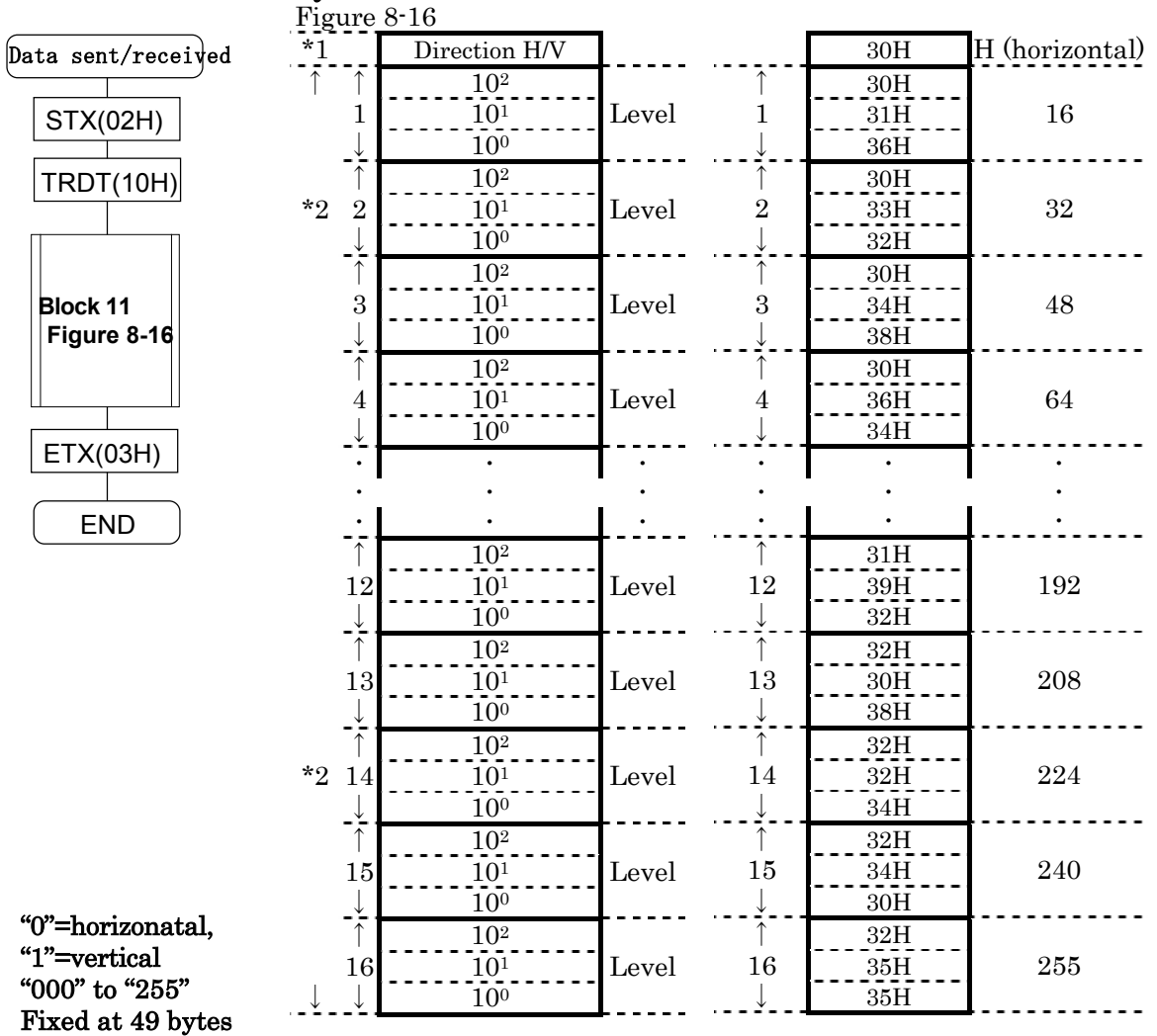


Figure 8-15

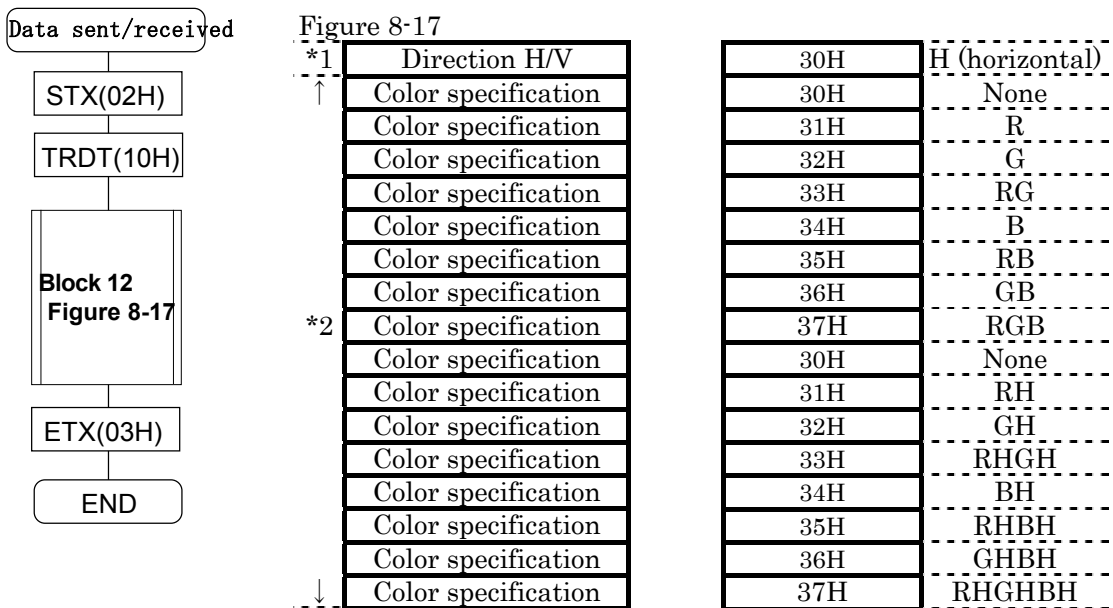
*1	Mode (%/dot)	30H	%
↑	10 <sup>2</sup> (10 <sup>3</sup> )	30H	
*2	10 <sup>1</sup> (10 <sup>2</sup> )	30H	
	10 <sup>0</sup> (10 <sup>1</sup> )	36H	6.3%
↓	10 <sup>-1</sup> (10 <sup>0</sup> )	33H	
↑	10 <sup>2</sup> (10 <sup>3</sup> )	30H	
*2	10 <sup>1</sup> (10 <sup>2</sup> )	31H	12.5%
	10 <sup>0</sup> (10 <sup>1</sup> )	32H	
↓	10 <sup>-1</sup> (10 <sup>0</sup> )	35H	
*3	Direction H/V	30H	H
↑	Color specification	30H	None
	Color specification	31H	R
	Color specification	32H	G
	Color specification	33H	RG
	Color specification	34H	B
	Color specification	35H	RB
	Color specification	36H	GB
*4	Color specification	37H	RGB
	Color specification	30H	None
	Color specification	31H	R
	Color specification	32H	G
	Color specification	33H	RG
	Color specification	34H	B
	Color specification	35H	RB
	Color specification	36H	GB
↓	Color specification	37H	RGB

- \*1 "0"=% "1"=dot
  - \*2 "0000" to "1000"% , "0002" to "display" dot
  - \*3 "0"=horizontal, "1"=vertical, "2"=horizontal repeat, "3"=vertical repeat
  - \*4 "0"=none, "1"=R, "2"=G, "3"=RG, "4"=B, "5"=RB, "6"=GB, "7"=RGB
- Note: Fixed at 26 bytes

### Block No.[11] Format of Gray Scale Data



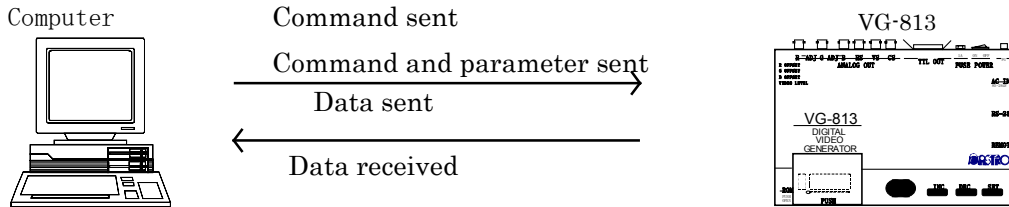
### Block No.[12] Format of Halftone Data



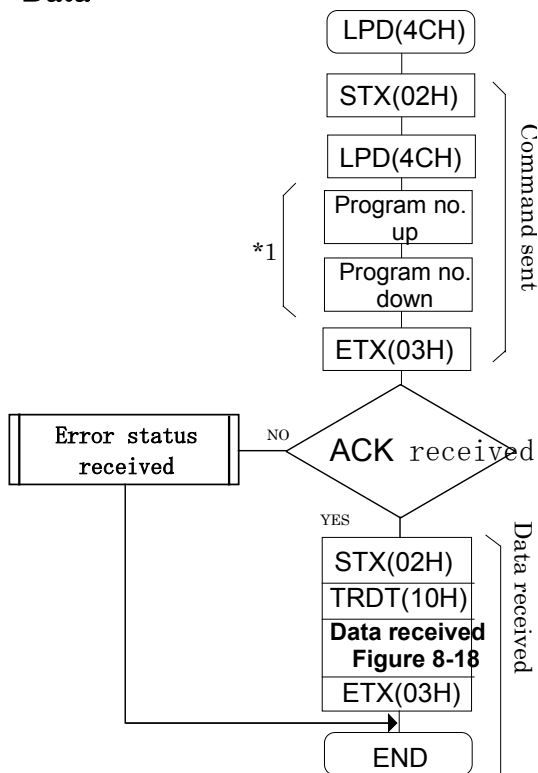
## 8.8 [LPD](4CH)·[SPD](4DH)

Commands for sending or receiving all data for the specified program no. The data sent is written to buffer RAM when the program no. is 0, and written to panel ROM when the program no. is 01 to 40.

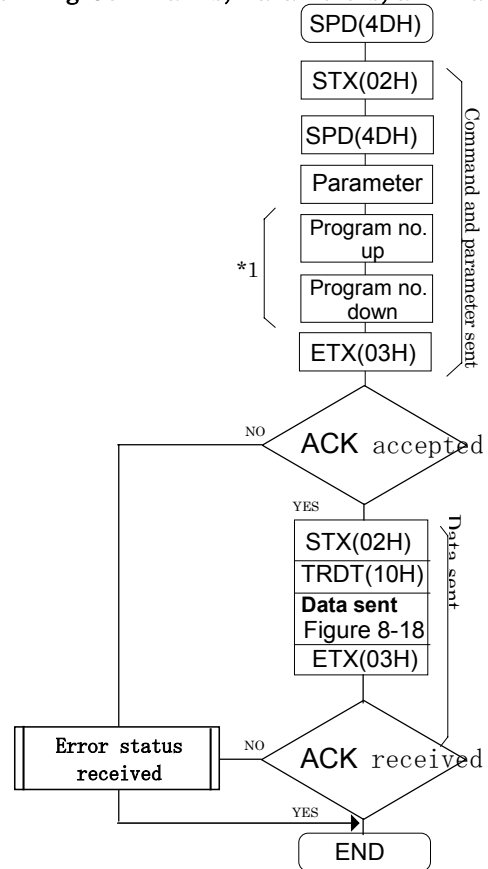
\*All parameters are in ASCII code.



### Sending Commands and Receiving Data



### Sending Commands, Parameters, and Data



\*1 3 digit specification when using AH-3000.

Program no. (001 to 040), (500 and 779)

Since you cannot use the [LPD] and [SPD] commands when specifying option pattern codes using 2 digits ("00"~"1F"), use the commands [LPD2](5CH) and [SPD2](5DH) when sending and receiving. Usage for option pattern codes besides those with 1 or 2 digits is the same.

- Format for pattern select data

Data sent/received

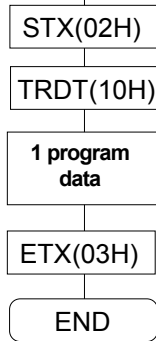


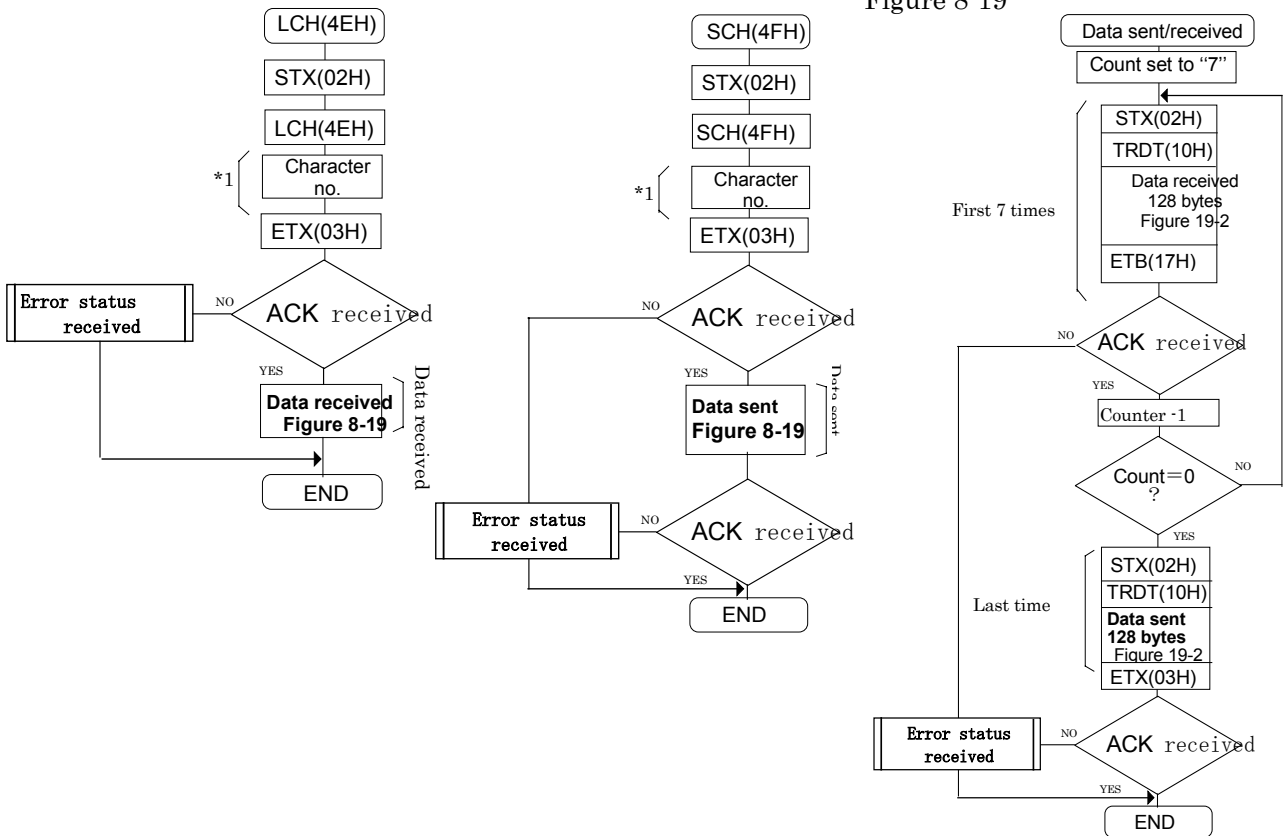
Figure 8-18

Horizontal timing Figure 8-3 (2CH)	“” delimited
Vertical timing Figure 8-4 (2CH)	“” delimited
Output conditions Figure 8-5 (2CH)	“” delimited
Block Figure 8-6 01 pattern color	
Block Figure 8-7 02 character	
Block Figure 8-8 03 cross hatch	
Block Figure 8-9 04 dot	
Block Figure 8-10 05 circle	
Block Figure 8-11 06 burst	
Block Figure 8-12 07 window	
Block Figure 8-13 08 option 1	
Block Figure 8-14 09 option 2 (2CH)	“” delimited
Block Figure 8-15 10 color bar (2CH)	“” delimited
Block Figure 8-16 11 gray scale (2CH)	“” delimited
Block Figure 8-17 12 halftone	

# 8.9 [LCH](4EH)·[SCH](4FH)

Commands for sending and receiving specified character No. (E0H to E3H).

Figure 8-19



\*1 "0"=E0H "1"=E1H "2"=E2H "3"=E3H  
Specify "0" to "F" when using AH-3000.

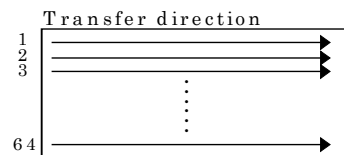
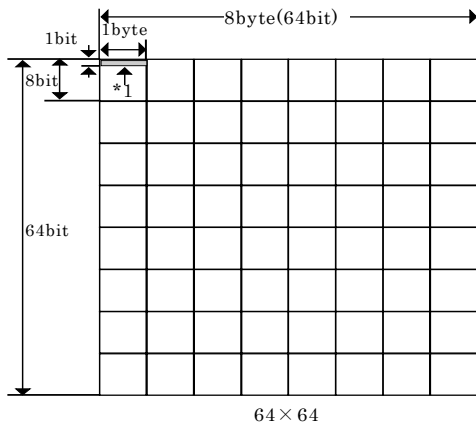
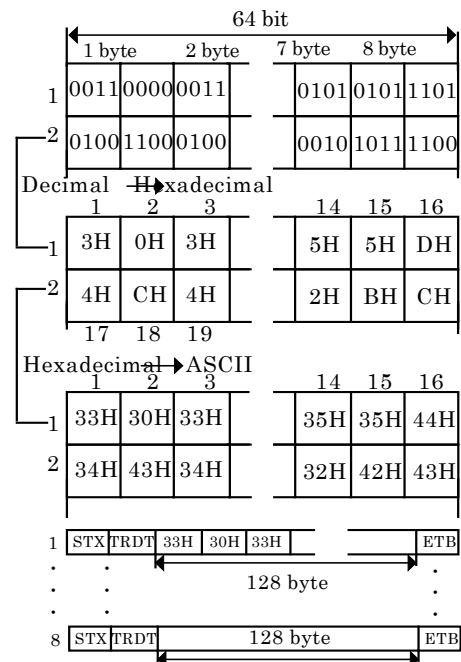
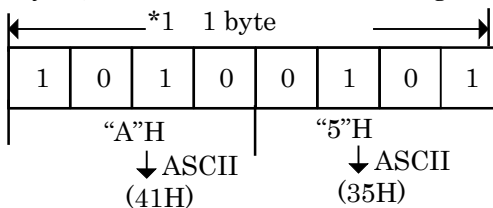


Figure 19-2

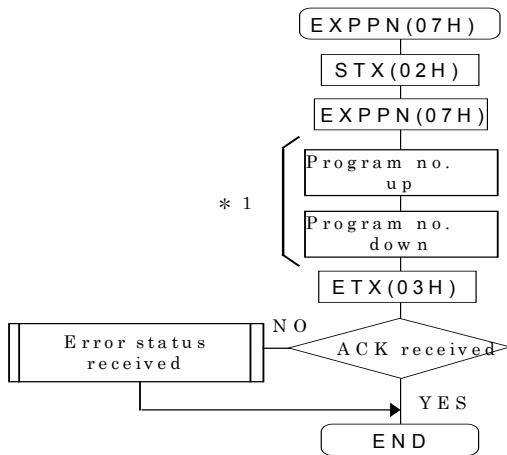


8 byte × 64 = 512 bytes  
 512 byte × 2 = 1024 bytes (ASCII)  
 1024 bytes ÷ 128 bytes = 8  
 Since the amount of each data transmission is fixed at 128 bytes, data is sent and received eight times.



## 8.10 [EXPPN](07H)

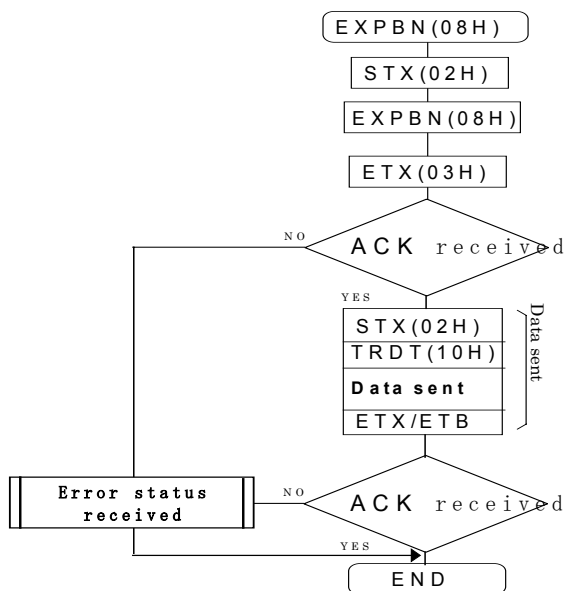
Runs specified program no. 01 to 40.



\*1 3 digit specification when using AH-3000.  
Program no. (001 to 040) and (500~779)

## 8.11 [EXPBN](08H)

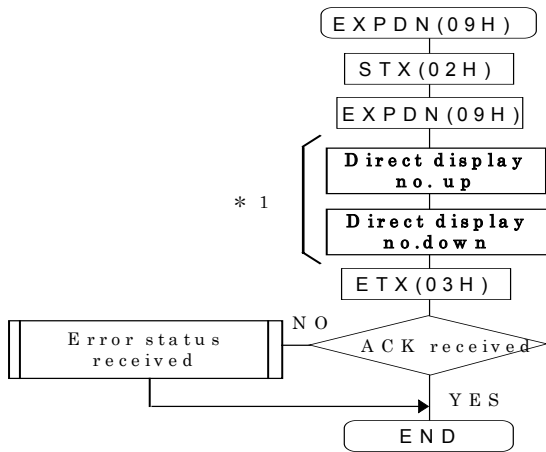
Sends data for one program to VG-813 and runs it. Data is not written to panel ROM. The data format is the same as [SPD].



Note: Use [EXPBN2](58H) when specifying option pattern codes with 2 digits (00~1F). Usage is the same for option pattern codes with more than 1 or 2 digits.

## 8.12 [EXPDN](09H)

Specifies and executes direct display no. (01 to 40).

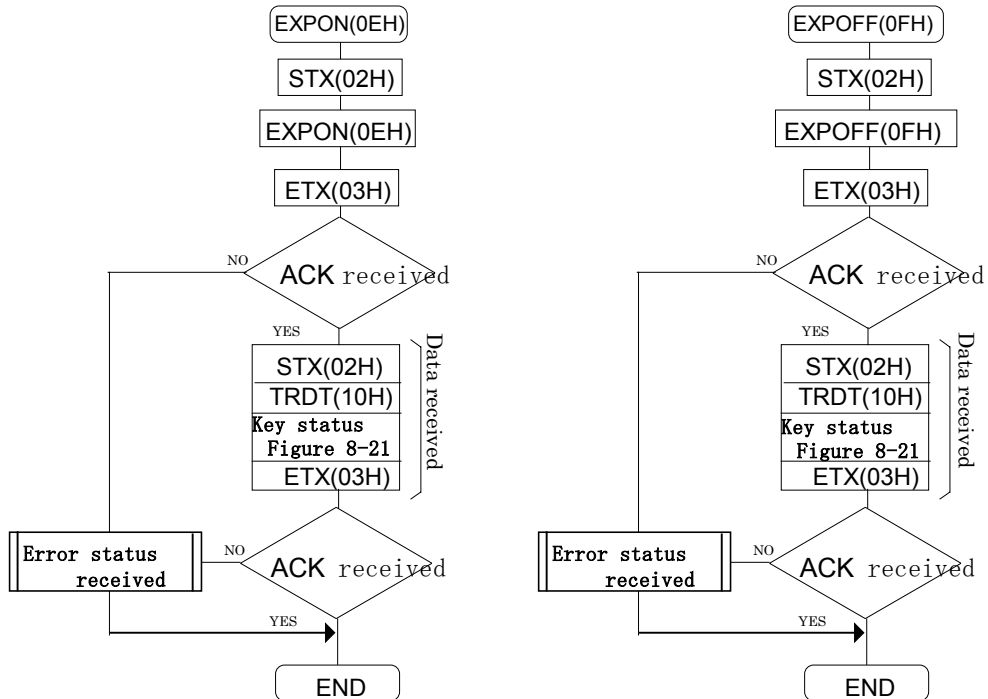


**\*1**

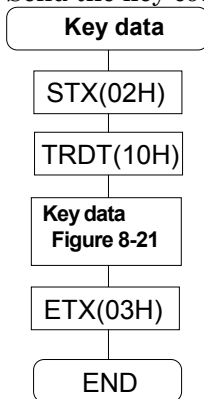
**3 digit specification when using AH-3000.  
Program no. (001 to 040) and (500 to 779)**

## 8·13 [EXPON](0EH)·[EXPOFF](0FH)

Commands for switching the specified pattern and signal on and off.



Send the key code that you want to turn on or off.  
Figure 8-21



Key code
Key code
Key code
.
.
.
Key code
Key code
Key code
Key code

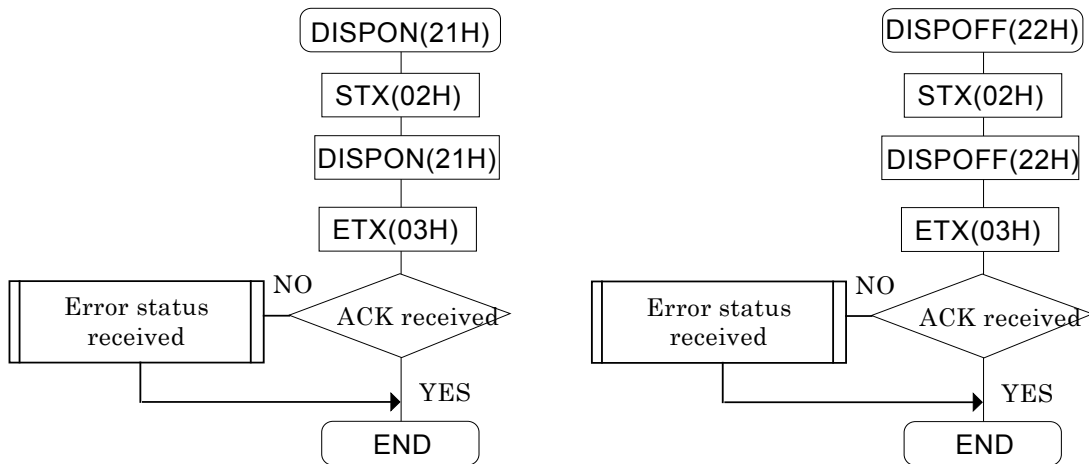
50H	CHARA
53H	CIRCLE
54H	+
56H	×
57H	COLOR
5EH	R
5FH	G
60H	B

Note: Refer to 6·5 “Key Codes” for details. Selecting on for option 1 will only output option 1.



## 8·14 [DISPON](21H)·[DISPOFF](22H)

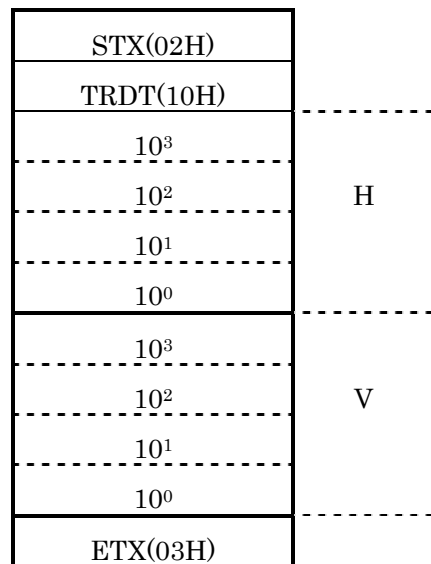
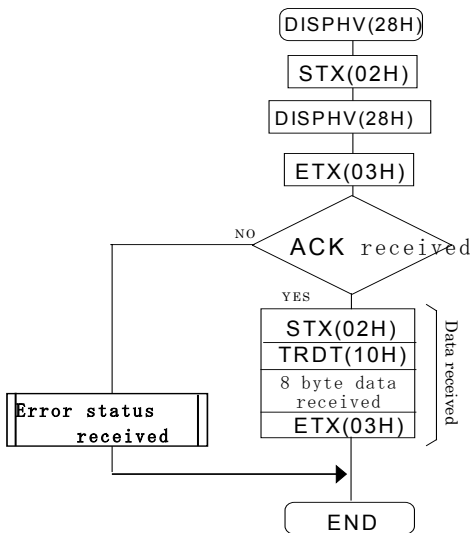
Command for turning a CRT display on or off.



## 8·15 [DISPHV](28H)

Receives the number of dots displayed on the graphic plane.

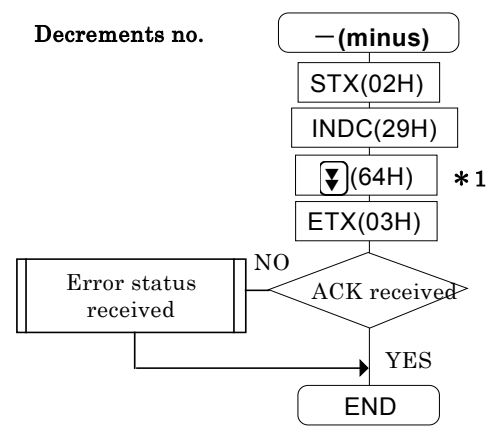
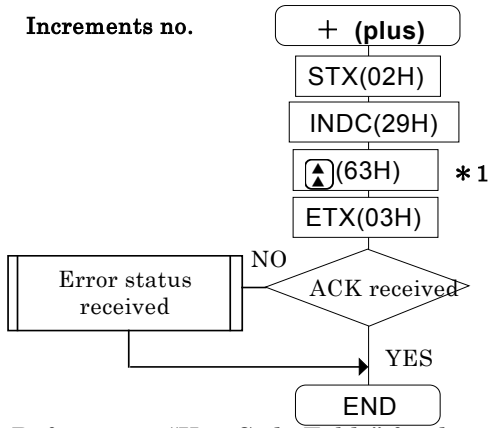
\* No parameters.



Note: H and V data is fixed at 8 bytes.

## 8·16 [INDC](29H)

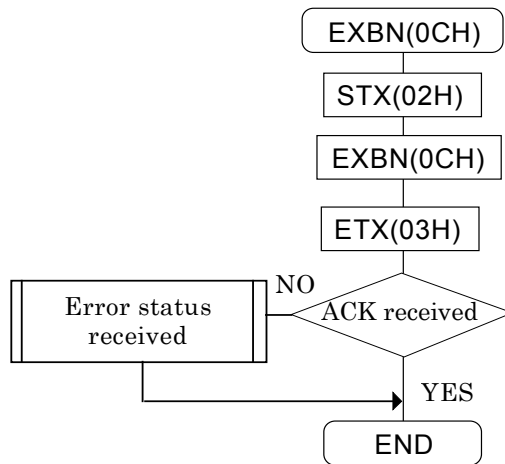
Increments and decrements the direct display no. Runs numbers entered as enabled.



Note: Refer to 6·5 “Key Code Table” for details.

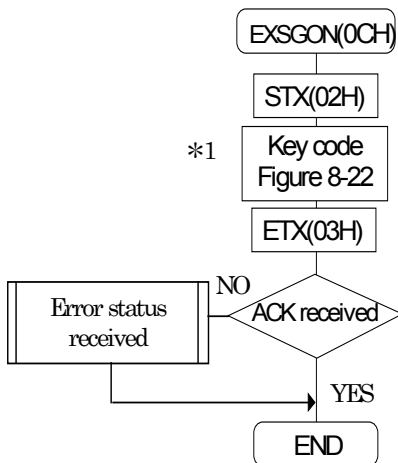
## 8·17 [EXBN](0CH)

Runs the content of buffer RAM. There are no parameters.



## 8·18 [EXSGON](0BH)

Turns the signals R, G, B, RHT, and GHT on and off. Parameters specify the key code to turn on. Key codes that are not specified are turned off.



\*1

Key Name	HEX Code
R	5EH
G	5FH
B	60H
RH	65H
GH	66H
BH	67H

Figure 8-22

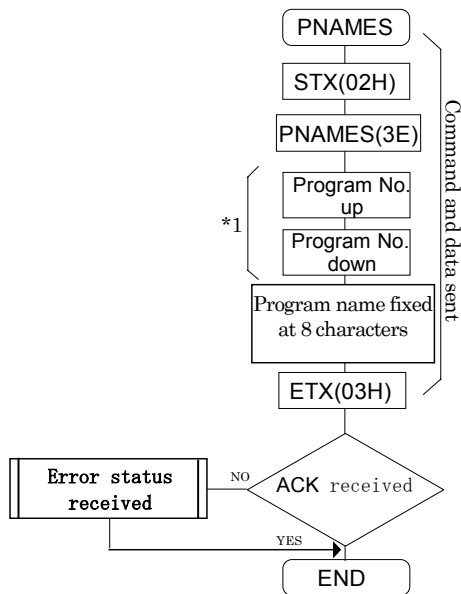
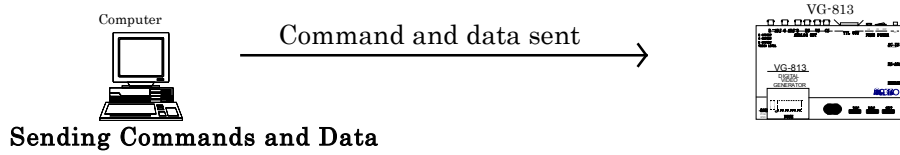
5EH	R
60H	B
66H	GH

R, B, and GH are on.

## 8·19 [PNAMES](3EH)

Command for sending the program name of the specified program number. The data sent is written to panel ROM.

\*All parameters are in ASCII code.



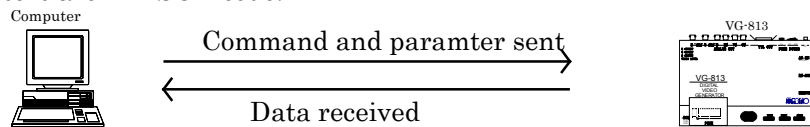
\*1 3 digit specification when using AH-3000.

Program number. (001 to 040) and (500 to 779)

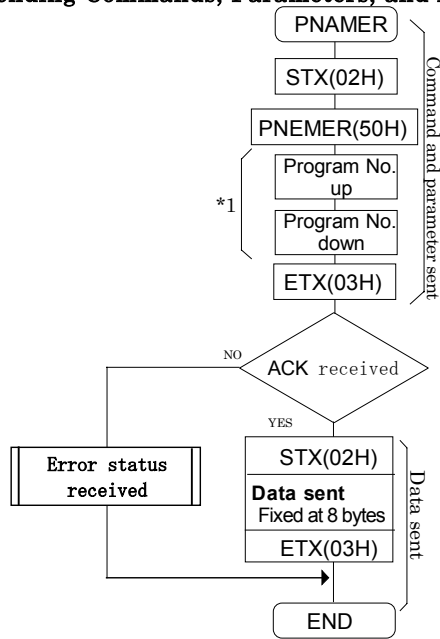
## 8·20 [PNAMER](50H)

Command for receiving program name of specified program number.

\*All parameters are in ASCII code.



**Sending Commands, Parameters, and Data**

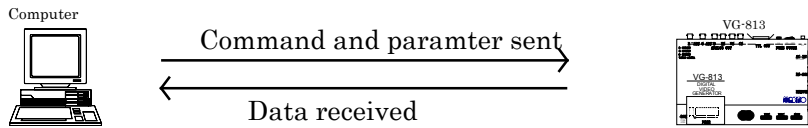


\*1 3 digit specification when using AH-3000.  
Program number. (001 to 040) and (500 to 779)

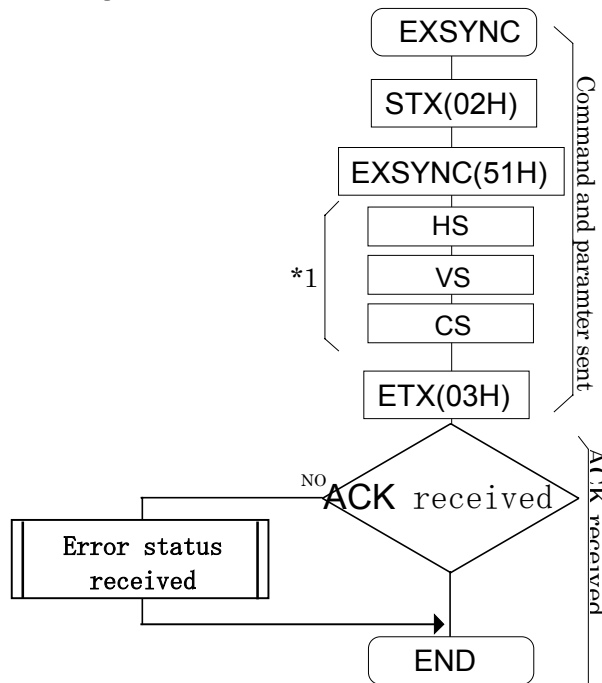
**8·21 [EXSYNC](51H)**

Command for turning separate sync for HS, VS, and CS on and off.

\*All parameters are in ASCII code.



**Sending Commands and Parameters and Receiving ACK**

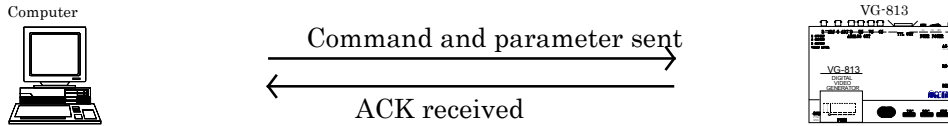


\*1 "0"=OFF "1"=ON

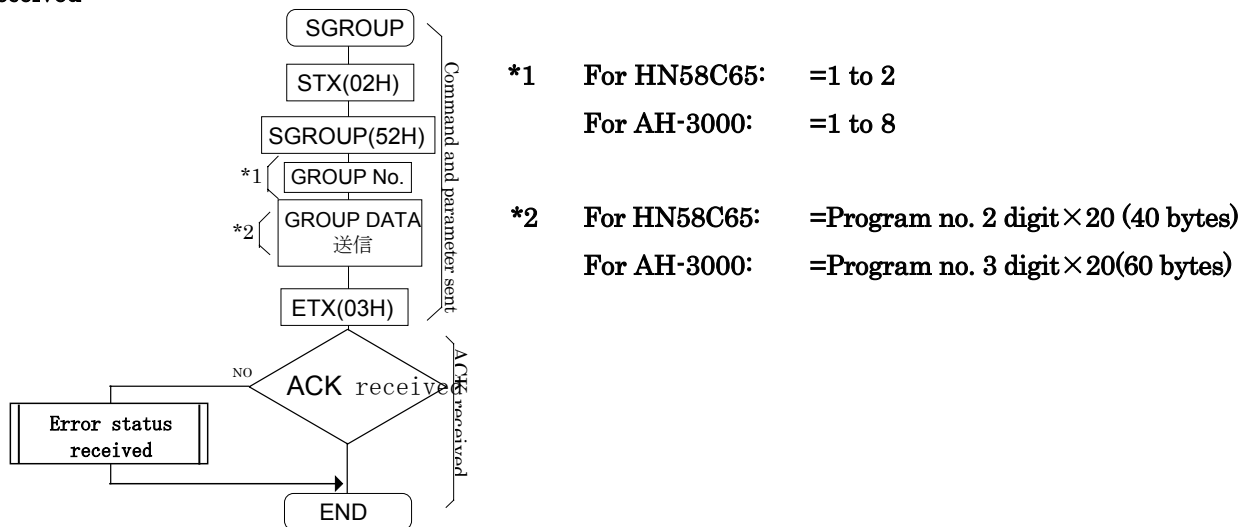
## 8.22 [SGROUP](52H)

Stores data for the specified group no. in panel ROM.

\*All parameters are in ASCII code.



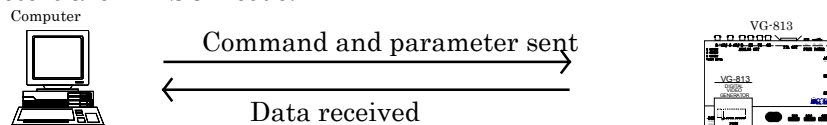
### Command and Parameter Sent and ACK Received



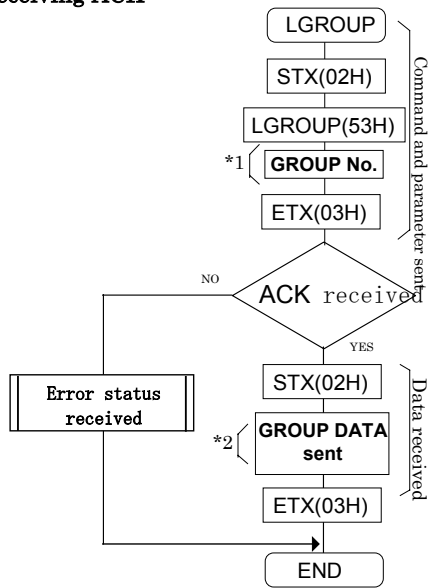
## 8.23 [LGROUP](53H)

Gets the data for the specified program no. from VG-813.

\*All parameters are in ASCII code.



**Sending Commands and Parameters and Receiving ACK**

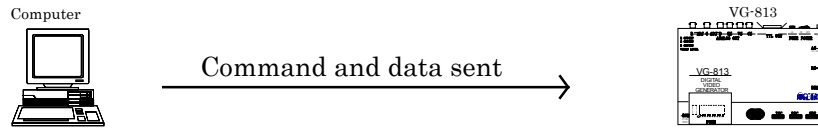


**\*1** For HN58C65: =1 to 2  
 For H-3000: =1 to 8

**\*2** For HN58C65: =Program no. 2 digit × 20 (40 bytes)  
 For AH-3000: =Program no. 3 digit × 20 (60 bytes)

# 8·24 [PRGENTRY](2BH)

Command for entering program no. 1 to 4 for performing rapid switching.



## Sending Commands and Data

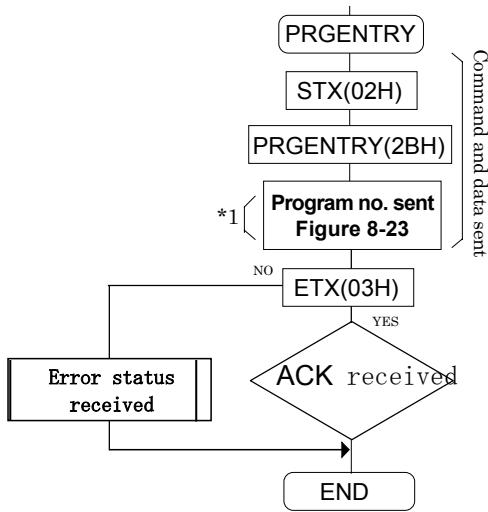
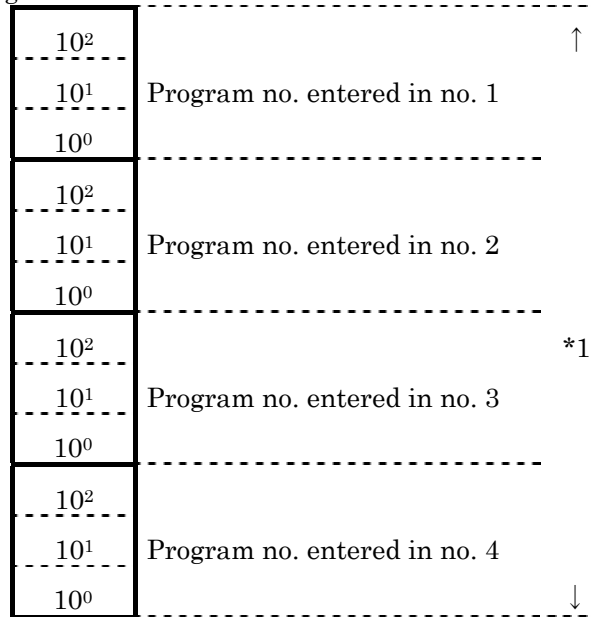


Figure 8-23

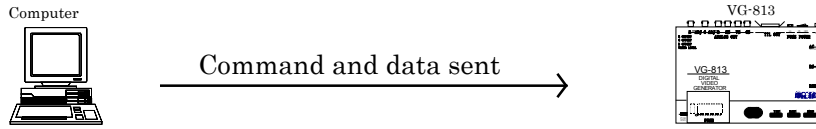


\*1 3 digit specification when using AH-3000.  
Program no. (001 to 040) and (500 to 779)

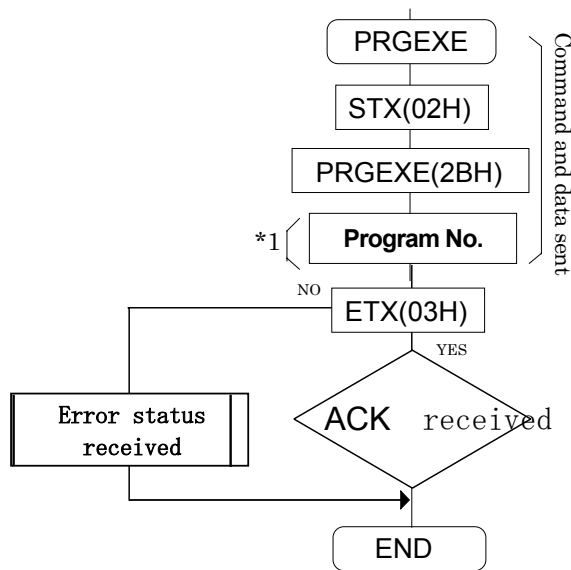


## 8·25 [PRGEXE](2CH)

Command for running program no. entered by the PRGENTRY command. This command allows you to rapidly switch programs with the EXPDN (direct display execution) command.



**Sending Commands and Data**



\*1 Specify programs no. "1" to "4" to run.

<b>Chapter 9 Graphic Command Functions</b> .....	<b>44</b>
9·1 [GCIRC](18H),[CCIRC](12H) .....	44
9·2 [GLINE](19H),[CLINE](13H) .....	45
9·3 [GPSET](1BH),[CPSET](14H) .....	45
9·4 [ACLR](23H) .....	46
9·5 [COCLR](24H) .....	46
9·6 [GCLR](25H) .....	46
9·7 [COLOR](26H) .....	47
9·8 [GCHAR](27H) .....	48
9·9 [GSQPA](31H),[CSQPA](32H) .....	49
9·10 [WINDW](3CH),[CWIND](2AH) .....	50
9·11 [WINDCL](3DH) .....	51
9·12 [GRPHCL](3BH) .....	51
<b>Chapter 10 Sample Program</b> .....	<b>52</b>
<b>Chapter 11 Format of Error Status</b> .....	<b>53</b>

# Chapter 9 Graphic Command Functions

## 9.1 [GCIRC](18H),[CCIRC](12H)

Draws a circle in the graphic plane. Parameters specify the x, and y coordinates, and radius R for the center of the circle. Data is variable length (1 to 4 digits) and delimited by commas. The center coordinates can be set between -2,048 and 4,095, and the radius between 1 and 4,095.

- \* A sine code is appended to the center coordinate.
- \* Run after setting a sync code.

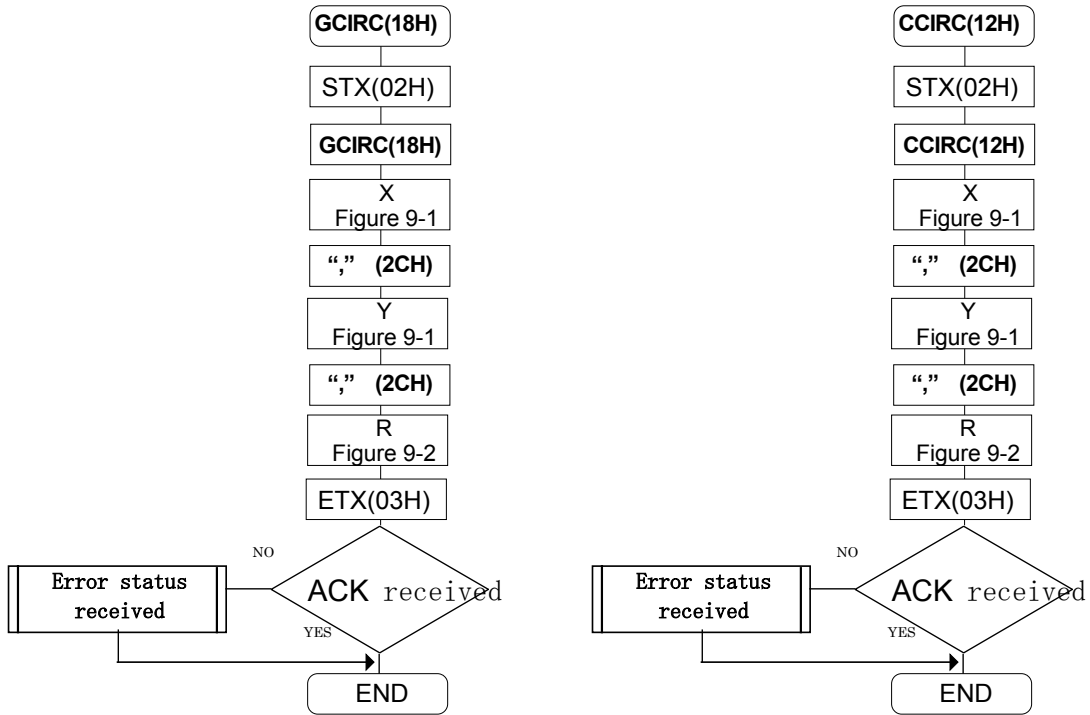


Figure 9-1  
Has sine code

Sine Code	*1
10 <sup>3</sup>	Data (1 to 4 digits, variable length)
10 <sup>2</sup>	
10 <sup>1</sup>	
10 <sup>0</sup>	

Figure 9-2  
No sine code

10 <sup>3</sup>	Data (1 to 4 digits, variable length)
10 <sup>2</sup>	
10 <sup>1</sup>	
10 <sup>0</sup>	

\*1 "0" = +, ~"1" = -

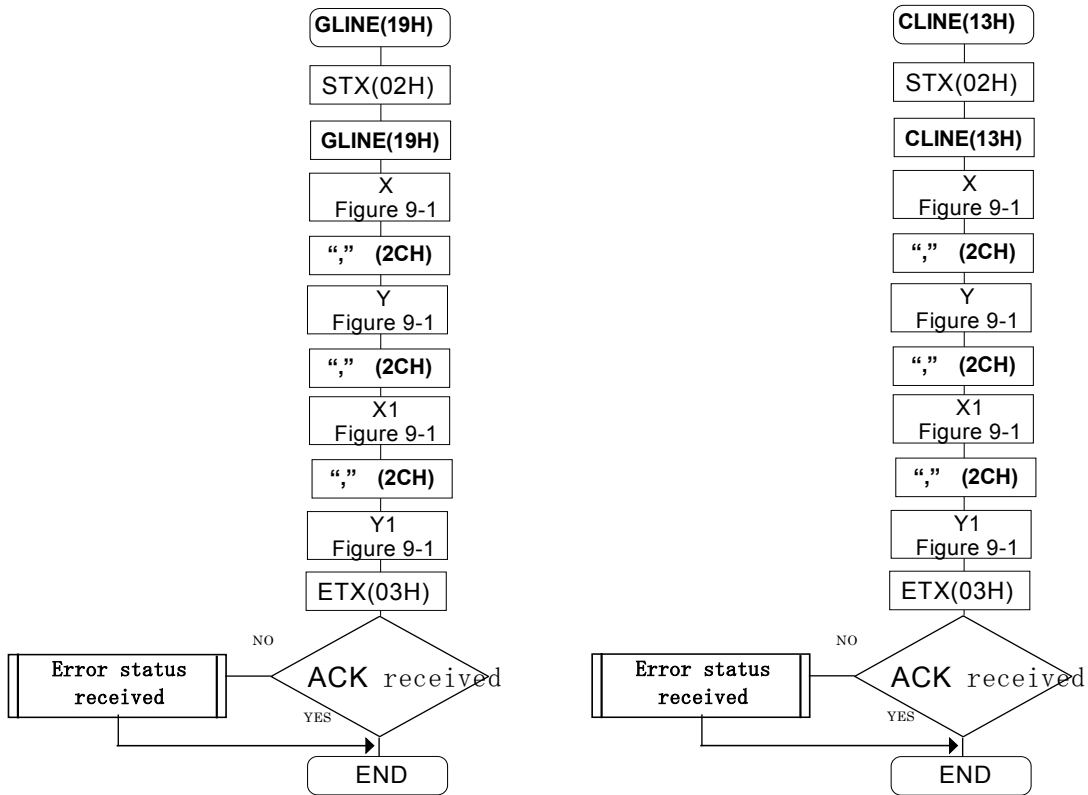
Sine code	-100
"1"	31H
"0"	30H
"0"	30H

Sine code	+100
"1"	30H
"0"	31H
"0"	30H

## 9.2 [GLINE](19H),[CLINE](13H)

Draws a straight line in the graphic plane. Specify the starting and ending x and y coordinates. Data is variable length (1 to 4 digits) and is delimited by commas. The center coordinates can be set between -2,048 and 4,095.

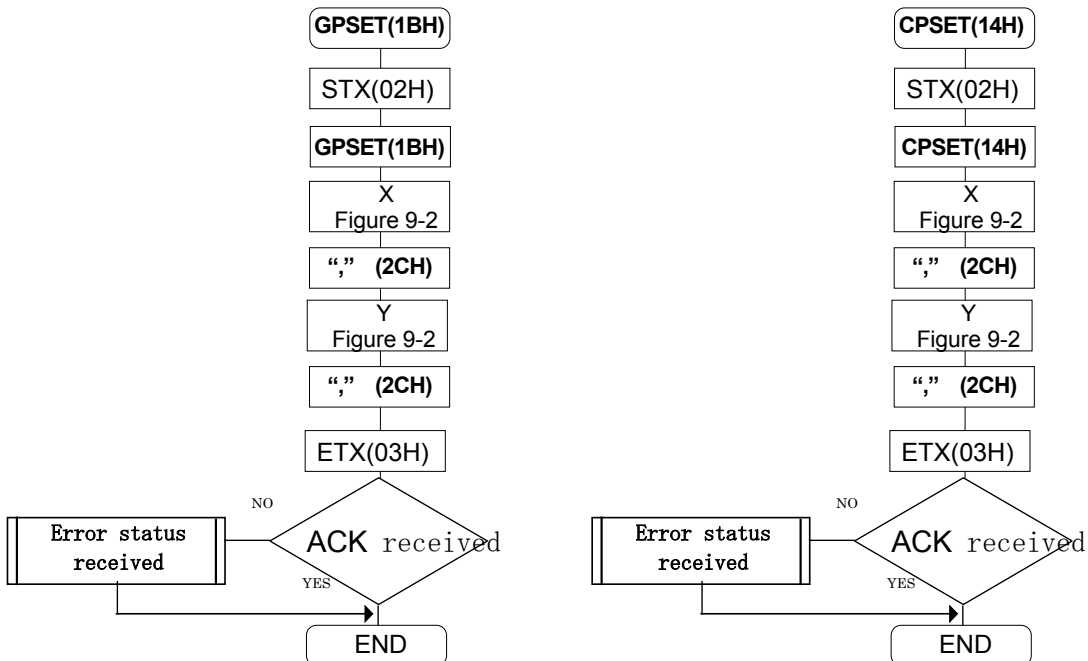
\*Sine code is appended.



## 9.3 [GPSET](1BH),[CPSET](14H)

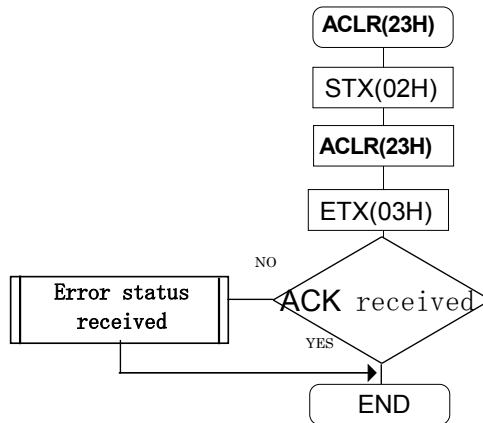
Displays one dot in the graphic plane. Specify parameters for the x and y coordinates. Data is variable length (1 to 4 digits) and is delimited by commas.

\*Sine code is appended.



## 9.4 [ACLR](23H)

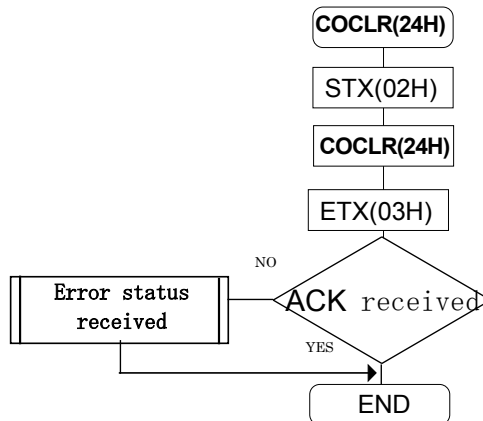
Clears the graphic plane and color bar plane. There are no parameters.



---

## 9.5 [COCLR](24H)

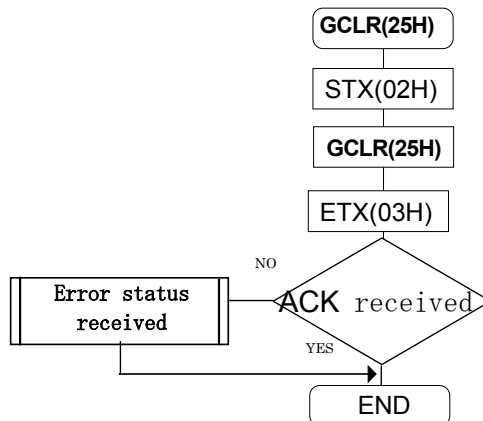
Clears the color bar plane. There are no parameters.



---

## 9.6 [GCLR](25H)

Clears the graphic plane. There are no parameters.



# 9.7 [COLOR](26H)

Displays 256 colors in the color plane. The color plane is divided into 16 colors horizontally and 16 colors vertically.

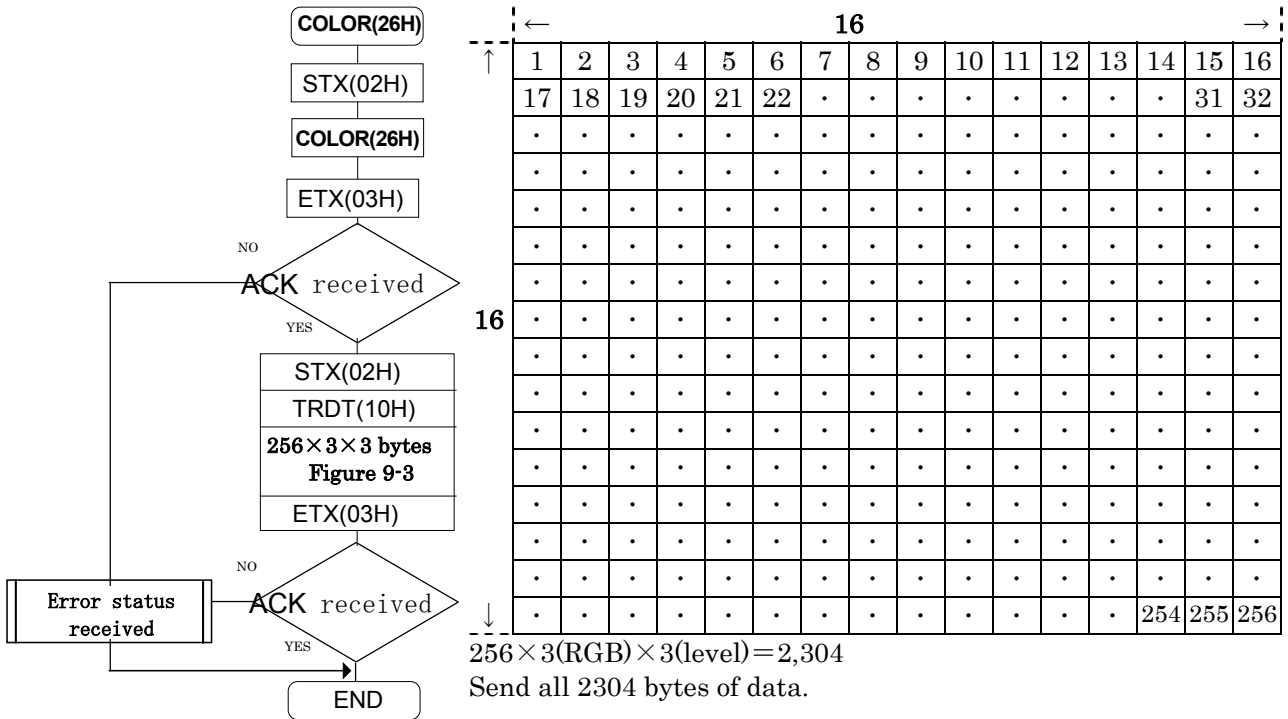
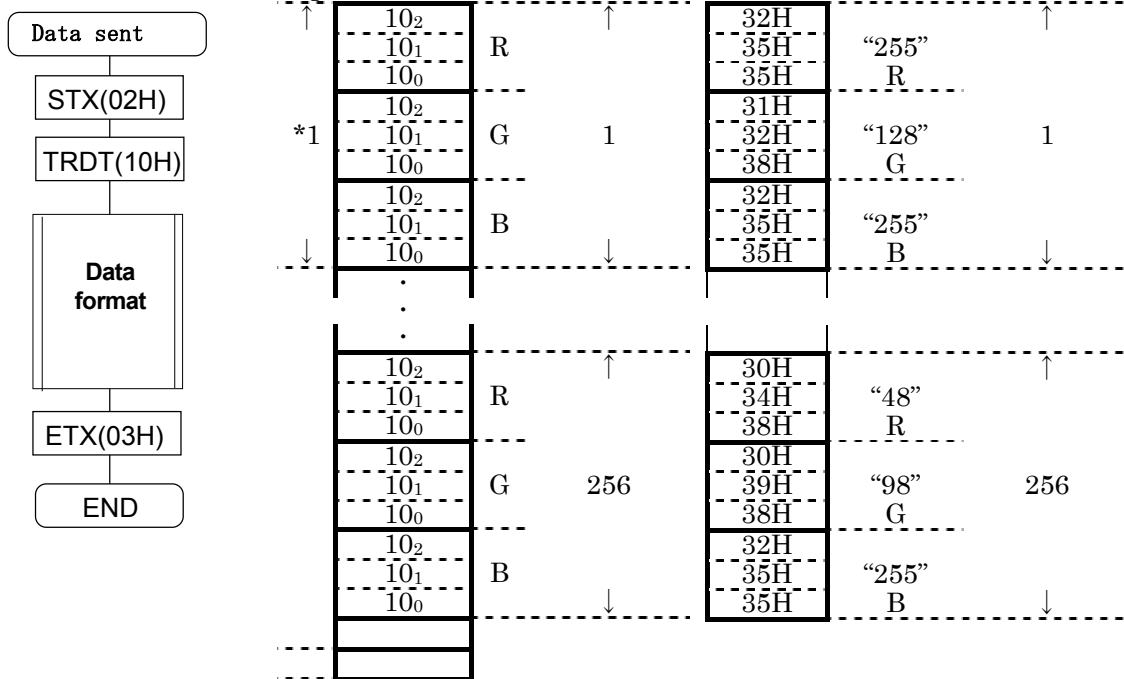


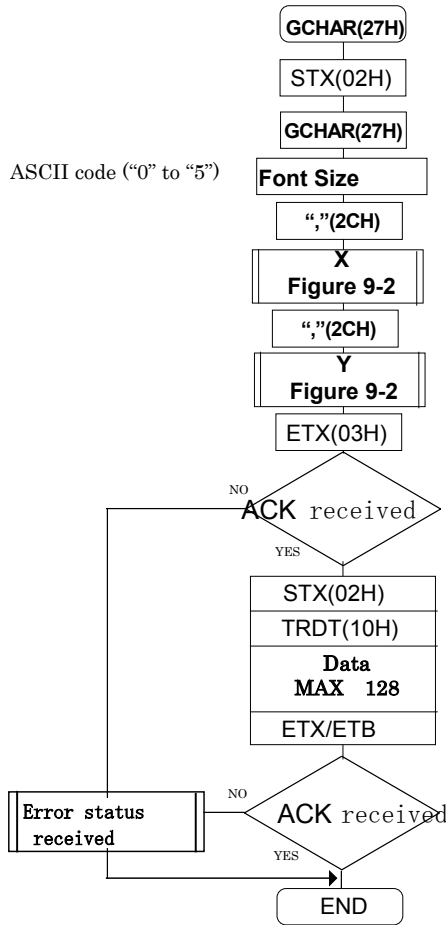
Figure 9-3



\*Note: Fixed at 3 bytes ("000" to "255")

## 9.8 [GCHAR](27H)

Writes the point specified on the graphic plane as a character. Specify parameters for font size and display coordinates x, and y.



Data	Font Size
“0”	5×7
“1”	5×7 inverse
“2”	7×9
“3”	7×9 inverse
“4”	16×16
“5”	16×16 inverse

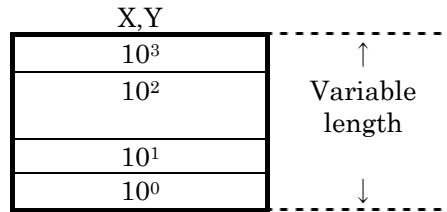
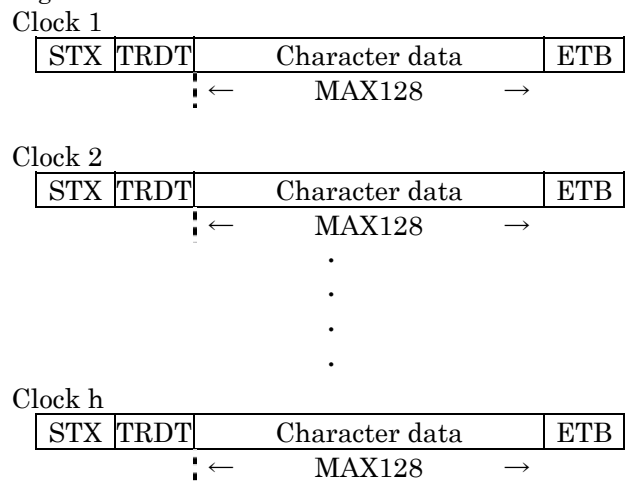
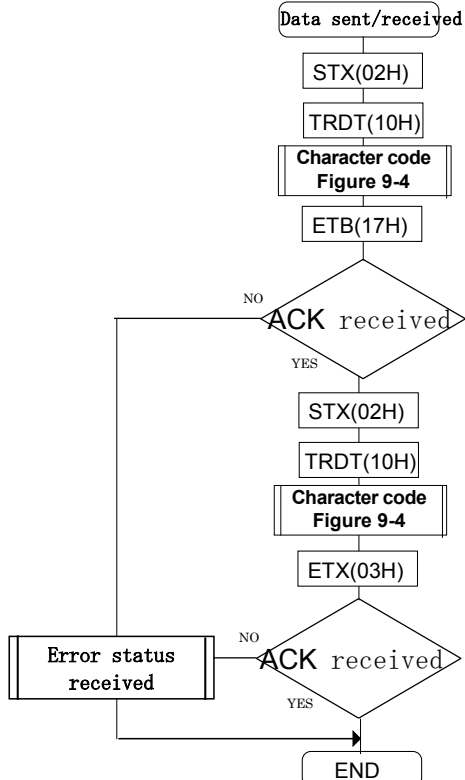


Figure 9-4



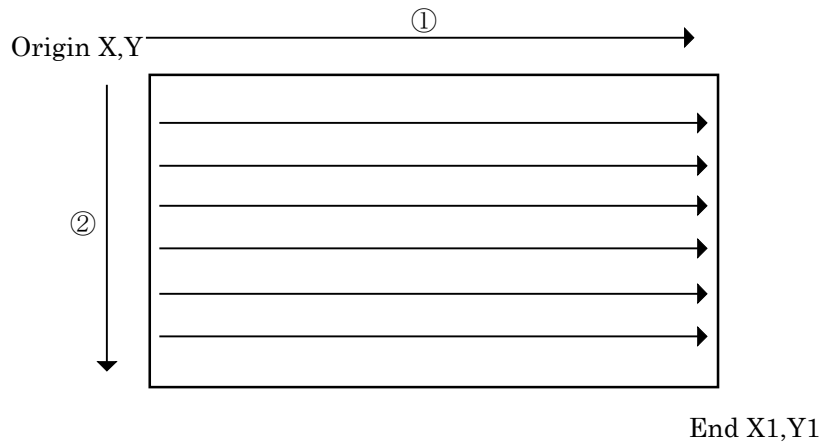
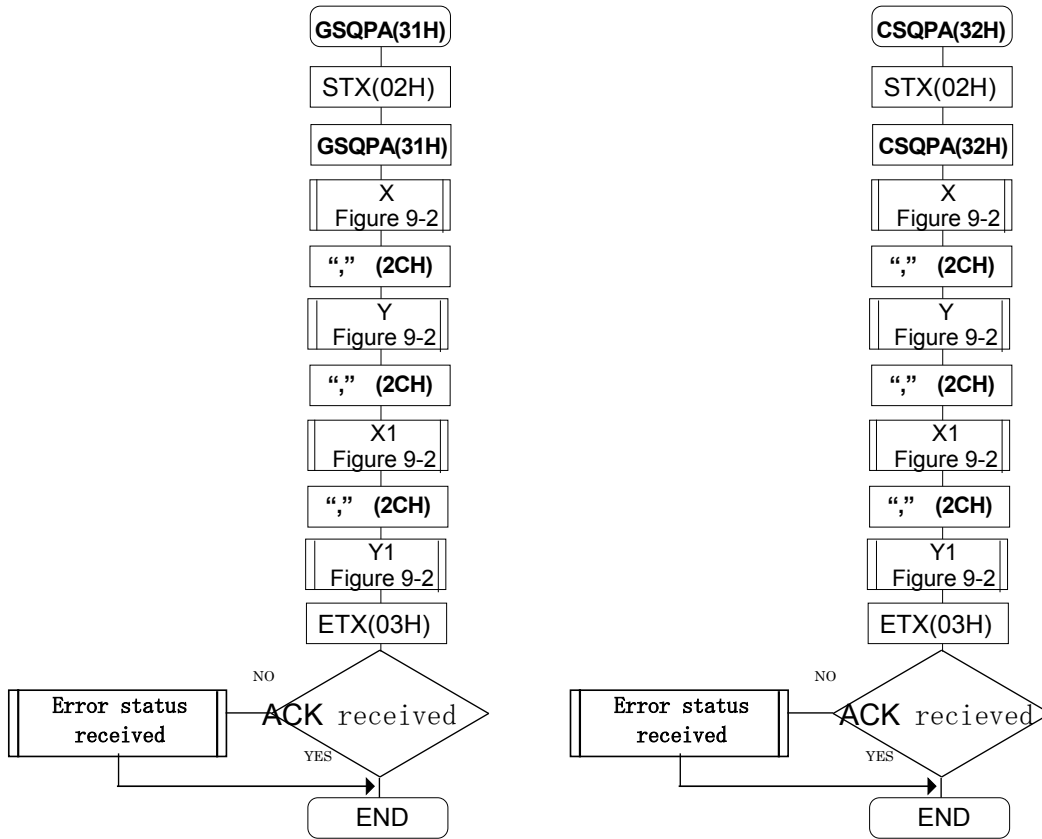
\*CR(0DH)

\*Reduces the display point by one digit and moves it to the left corner.

## 9.9 [GSQPA](31H),[CSQPA](32H)

Draws a painted box in the graphic plane. Specify the starting and ending x and y coordinates. Data is variable length (1 to 4 digits) and is delimited by commas. The center coordinates can be set between 0 and 2,048.

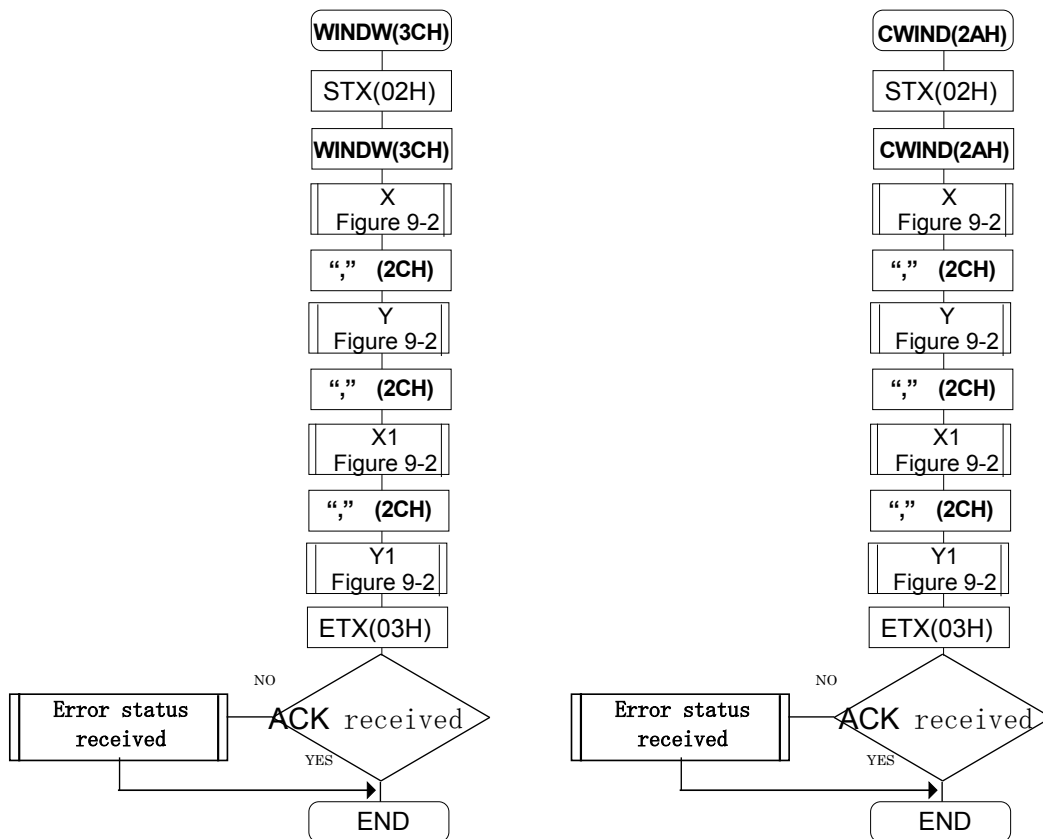
\*Sine code is appended.



\*Note: X<X1  
Y<Y1

## 9·10 [WINDW](3CH),[CWIND](2AH)

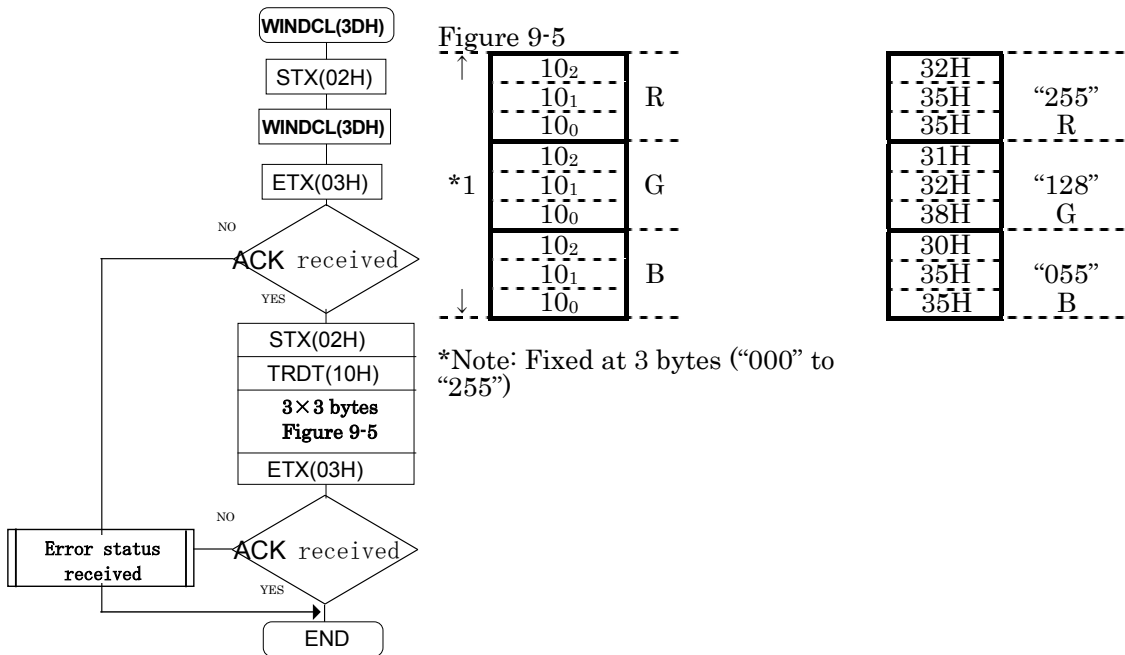
Commands for drawing windows. Specify the starting and ending x and y coordinates. Data is variable length (1 to 4 digits) and is delimited by commas. The center coordinates can be set between 0 and 2,048.





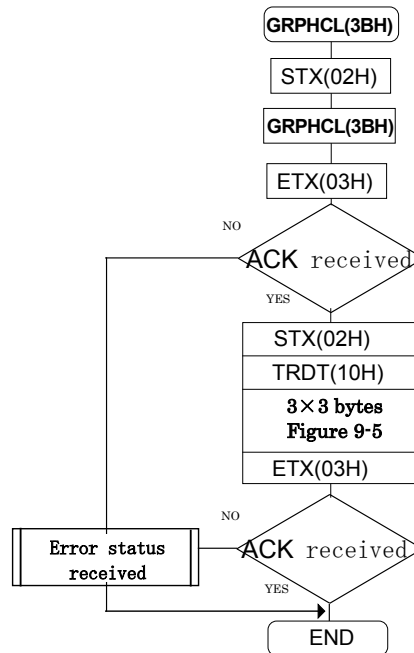
## 9·11 [WINDCL](3DH)

Command for setting the color of drawn windows. Specify the parameters R, G, and B (each fixed at 3 digits).



## 9·12 [GRPHCL](3BH)

Command for setting graphic colors. Specify the parameters R, G, and B (fixed at 3 digits each).



# Chapter 10 Sample Program

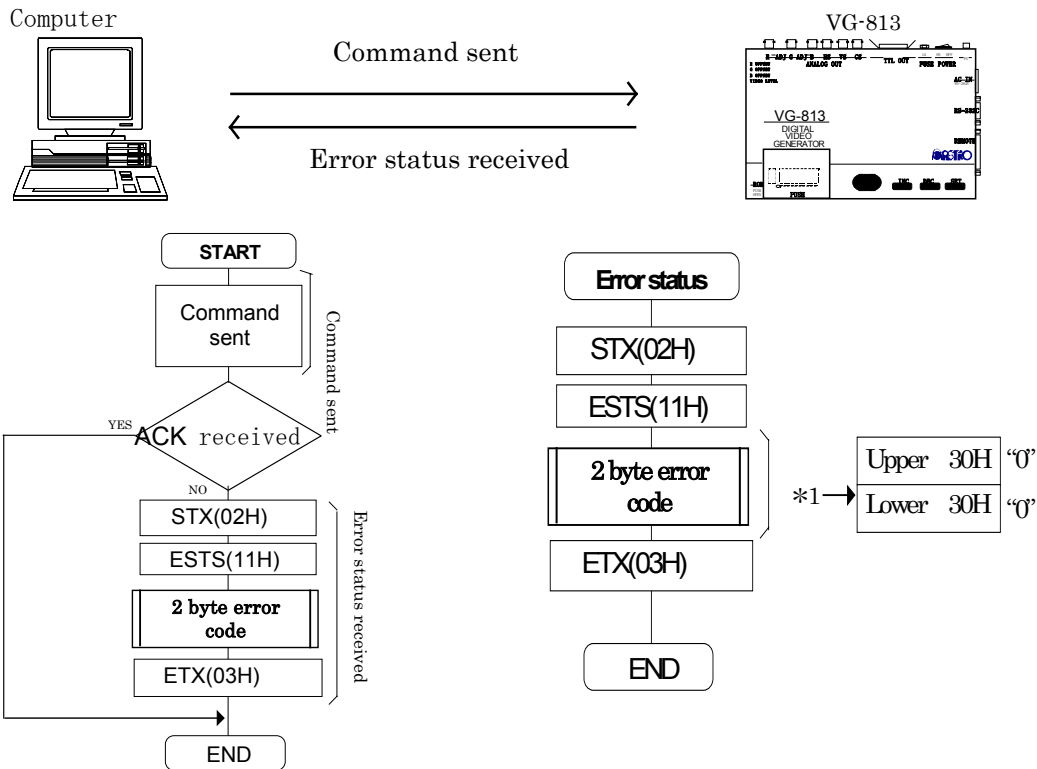
```

10 '*****
20 '      VG - 813 TERMINAL MODE
30 '*      SAMPLE PROGRAM
40 '*      RS-232C (Bps:9600 Data:7 Parity:NONE)
50 '*****
60 '
70 '***** CONTROL CODE *****
80 ENQ$=CHR$(5):EOT$=CHR$(4):ACK$=CHR$(6):NACK$=CHR$(21)
90 STX$=CHR$(2):ETB$=CHR$(23):ETX$=CHR$(3):TRDT$=CHR$(16)
100 '
110 '***** CONTROL COMAND *****
120 EXPPN$=CHR$(7):EXPON$=CHR$(14):EXSGON$=CHR$(11)
130 '
140 '***** KEY CODE *****
150 OPT1$=CHR$(91):R$=CHR$(94):G$=CHR$(95)
160 B$=CHR$(96):INV$=CHR$(98):COLB$=CHR$(87)
170 '
180 '----- TERMINAL MODE START -----
190 OPEN "COM1:N71NN" AS #1                'RS232C OPEN
200 PRINT #1,ENQ$::PRINT "ENQ SEND"
210 GOSUB *ACK:PRINT "ACK"                'RECEIVE ACK
220 '
230 '----- PROGRAM NO:1 -----
240 DT$=STX$+EXPPN$+"01"+ETX$            'PROGRAM NO:01 SEND
250 PRINT #1,DT$::PRINT "PROG 01"
260 GOSUB *ACK:PRINT "ACK"                'RECEIVE ACK
270 '
280 '----- PATERN & SIGNAL ON -----
290 DT$=STX$+EXPON$+ETX$                  '(PAT $ SIG) SEND
300 PRINT #1,DT$::PRINT "PAT & SIG"
310 GOSUB *ACK:PRINT "ACK"                'RECEIVE ACK
320 '
330 '----- PATERN DATA -----
340 DT$=STX$+TRDT$+COLB$+ETX$            'COLOR_BAR SEND
350 PRINT #1,DT$::PRINT "COLOR BAR"
360 GOSUB *ACK:PRINT "ACK"                'RECEIVE ACK
370 '
380 '----- SIGNAL ON R G B INV -----
390 DT$=STX$+EXSGON$+R$+G$+B$+INV$+ETX$  'SIGNAL ON
400 PRINT #1,DT$::PRINT "R G B INV"
410 GOSUB *ACK:PRINT "ACK"                'RECEIVE ACK
420 '
430 '----- SIGNAL ON R G B -----
440 DT$=STX$+EXSGON$+R$+G$+B$+ETX$      'SIGNAL ON
450 PRINT #1,DT$::PRINT "R G B"
460 GOSUB *ACK:PRINT "ACK"                'RECEIVE ACK
470 '
480 '----- EOT SEND -----
490 PRINT #1,EOT$::PRINT "EOT SEND"      'TERMINAL MODE END
500 END
510 '
520 '----- RECEIVE ACK -----
530 *ACK
540 ACK$=INPUT$(1,#1)
550 IF ACK$<>CHR$(6) THEN 540
560 FOR I=0 TO 3000
570 NEXT I
580 RETURN

```

# Chapter 11 Format of Error Status

(1) A 2 digit error code is sent to the computer when there is an error in data or a parameter.



\*1 When error code is "00".

(2) Error Code Table

NO	Error Code	Description
1	00	Error when EE-PROM is not inserted in panel ROM socket or it is inserted, but there is an error when trying to write data to it.
2	01	Error when the entered program no. is disabled during direct display or program execution.
3	02	Horizontal sync data when running a program or during direct display mode. Error when the range is not " $5.00\text{MHz} \leq \text{Dot Clock} \leq 150.00\text{MHz}$ ".
4	03	Horizontal sync data when running a program or during direct display mode. Error when the range is not " $H_{\text{period}} \geq H_{\text{sync}} + H_{\text{backp}} + H_{\text{disp(dot)}}$ ".
5	04	Horizontal sync data when running a program or during direct display mode. Error when the range is not " $H_{\text{period}} \geq H_{\text{sync}} + H_{\text{backp}} + H_{\text{disp(dot)}}$ ".
6	05	Horizontal sync data when running a program or during direct display mode. Error when the range is not " $H_{\text{period}} \geq HD_{\text{start}} + HD_{\text{width(dot)}}$ ".
7	06	Horizontal sync data when running a program or during direct display mode. Error when the range is not " $H_{\text{period}} \geq HD_{\text{start}} + HD_{\text{width}}(\mu S)$ ".
8	16	Error when <b>output conditions data</b> is improperly set.
9	17	Error when <b>character pattern data</b> is improperly set.
10	18	Error when <b>cross hatch pattern data</b> is improperly set.
11	19	Error when <b>dot pattern data</b> is improperly set.
12	20	Error when <b>circle pattern data</b> is improperly set.
13	21	Error when <b>burst pattern data</b> is improperly set.
14	22	Error when <b>window pattern data</b> is improperly set.

15	23	Error when <b>color pattern data</b> is improperly set.
16	24	Error in a <b>parameter</b> .
17	25	Error in <b>data</b> .
18	26	Error when a sync signal is not set.