SP-8028

Instruction Manual

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ASTRO

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Before Operation

Foreword

Thank you very much for purchasing the VG-863.

This manual describes the operations, precautions and checkpoints to be observed when using the SP-8028 as a VG-863 application.

Improper handling may result in malfunctioning. Before use, therefore, please make a point of reading through these instructions to ensure that you will operate the SP-8028 correctly.

After reading through the manual, keep it in a safe place for future reference.

Safety precautions

⚠ WARNING

Concerning foreign matter

- Do not spill liquids onto the product or drop inflammable objects or metal parts onto it. Use under these conditions may cause a fire, electrical shock or malfunctioning.

⚠ CAUTION

Concerning the installation and operating locations

- Install this product in a stable place.

- Before installation, be absolutely sure to turn off the power of the computer and disconnect the power cord.

- Before handling the board, release any static stored in your body by touching a metal object or taking other such action. (Failure to do this may cause malfunctioning.)

Concerning impact

- This is a precision piece of equipment and, as such, subjecting it to impact may cause malfunctioning. Take special care when moving the product.

1 Concerning the SP-8028

1.1. Introduction

The SP-8028 is an application software program for operating the VG-863, and it is designed to be run in Windows 98/2000/XP. It enables the statuses of the VG-863 to be captured and its settings to be changed. It can also generate data and execute the data generated.

All operations are conducted at the personal computer, and the generated data can be stored as files.

> **Caution**
>
> With Windows 98, more than one VG board (VG-860, VG-861 and/or VG-862) cannot be installed and used at the same time.

1.2. Features

(1) Software program compatible with Windows 98/2000/XP

This program enables data to be edited in Windows 98/2000 and signals to be output. The pattern data editing functions enable the execution of pattern preparation functions which use the GUI and have a much greater degree of freedom than in the past, and they enable JPEG/BMP and other natural images (256 colors) to be displayed.

(2) Simple data control functions with a higher degree of freedom

Timing data and pattern data can be organized separately in their own files. Control over this data can easily be exercised by such features as the list display, sort function and naming function.

(3) Sample data

Different kinds of data are copied as sample data when the program is installed, and this data can be combined as desired and the resulting signals can be output. The sample data copy function can be used when data is to be edited.

1.3. Installing the software (Windows 98/2000/XP)

Described here is the method used to install the files for running SP-8028 in Windows 98 or Windows 2000 and WondowsXP.

This description supplements what is provided on the following disk.

Windows 98/2000/XP version SP-8028 installation CD

1.3.1. Installing the drivers

The first step is to install the drivers.

(1) When the VG-863 is to operated for the first time

● **When Windows 98/2000 is used**

1) After Windows has started up, the system recognizes the VG-863, and the "Add New Hardware" dialog box appears. Follow the on-screen instructions, and press [Next].

2) The "Install Hardware Device Driver" dialog box is now opened. Check "Search the optimum driver for device," and press [Next].

3) The "Specify Driver File" dialog box is now opened. Insert the SP-8028 installation CD into the drive, check "CD-ROM drive" or "Designate the place," then select the driver file in the folder of "98" or "2000", and press [Next].

4) Upon completion of the installation, the system restart confirmation dialog box appears. Select [Yes] to restart the system.

● **When Windows XP is used**

1) After Windows has started up, the system recognizes the VG-863, and the "Add New Hardware" dialog box appears. Follow the on-screen instructions, and press [Next].

2) The "Install Hardware Device Driver" dialog box is now opened. Check "Search the optimum driver for device," and press [Next].

3) The "Specify Driver File" dialog box is now opened. Insert the SP-8028 installation CD into the drive, check "CD-ROM drive" or "Designate the place," then select the driver file in the folder of "XP," and press [Next].

4) Install SP-8028 searching the driver.   The below dialog appears asking the Microsoft certification, select "continue."
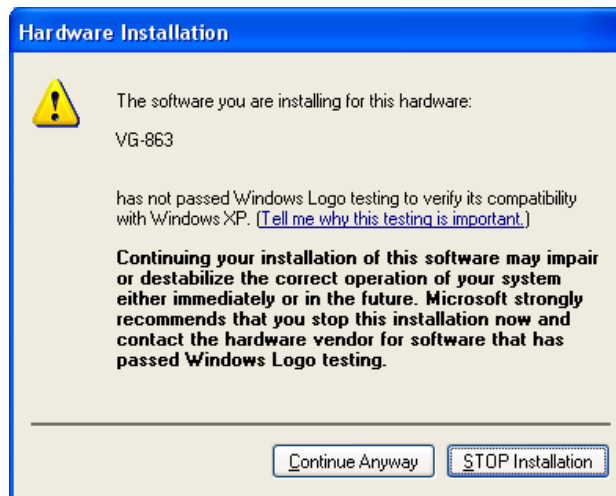
5) Upon completion of the installation, the system restart confirmation dialog box appears. Select [Yes] to restart the system.

Caution

Plug & play is supported for the PCI bus devices in Windows 2000 as a standard feature. However, since the drivers in this library are not plug & play compatible, the steps described above which are non-standard steps must be taken.
Furthermore, these drivers are not recognized by Windows 2000 as standard devices.
The drivers are registered as problematic devices by the System Information tool which is accessed by selecting Accessories from the Program menu followed by System Tools, but this does not impede operation in any way.

Caution

Since, when Windows 2000 is used, SP-8028 is installed along with the drivers at this point, ignore the instructions given in section "2.3.2 Installing the SP-8028" which follows.

1.3.2. Installing the SP-8028

Next, install the SP-8028 application software.

(1) Insert the SP-8028 installation CD into the CD drive, and in Windows select [Start] - [Settings] - [Control Panel] - [Add/Remove Programs] - [Install...]. The installer now starts up, and setup commences.

(2) First, the "Welcome" dialog box appears. If the [Next] button is clicked, setup advances to the next step; if the [Back] button is clicked, it returns to the previous step. Press the [Cancel] button to abort the setup.

Click the [Next] button.

(3) Select the copy destination directory on the "Select Installation Destination" dialog box. As the default, a directory known as "ASTRO¥SP-8028" is created in the root directory of drive C, and the files are copied into this directory. The copy destination directory can be changed to the one designated by the user at this point. Click [Browse], and set the directory.

(4) Select the [Next] button. The "Start Copying Files" dialog box appears. File copying starts when the [Next] button is selected.

(5) This completes the setup.
Restart the computer.
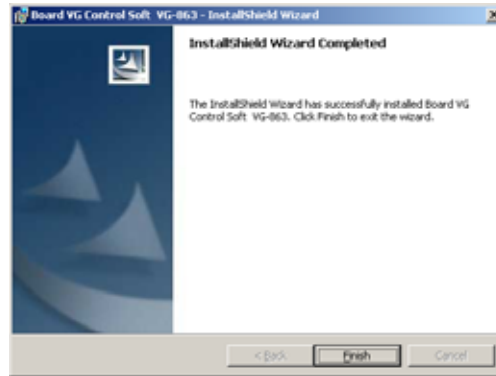
(6) The dialog for restart appears
after pressing "complete."
Restart the computer here.

(7) After the computer has been restarted, the SP_8028.bat file is run only once, and the files inside the SampleData directory are changed to read-only properties.

(8) The installation is now completed. In Windows, select [Start] - [Programs] - [SP-8028] - [Guide Help], and read the information given. Then select [Start] - [Programs] - [SP-8028] - [Sequence Editor], and start [Sequence Editor].

1.3.3. How to uninstall SP-8028

In Windows 98 or 2000, select [Start] - [Settings] - [Control Panel] - [Add/Remove Programs], and select and delete SP-8028.

To reinstall SP-8028, first delete the files and registry settings by following the uninstallation procedure, and then proceed with the reinstallation. If any of the previous files are left, the SP-8028 may not operate properly. (It is no problem even there remains data file in the SampleData directry.)

The data files in the SampleData directory are read-only files and, as such, they will not be deleted by uninstallation. Delete them separately. Neither will the drivers be deleted by uninstallation so delete them separately as well.

2 Concerning PC cards

2.1. Concerning the data of the SP-8028

The sample data is copied when the SP-8028 program is installed.
This data can be used as the source data for execution, editing or copying.
Data can be executed or edited after copying this data.

2.2. Data configuration

The SP controls the data to be executed by the VG in the form of sequence data.
Sequence data consists of combinations of the timing data, pattern data, palette set data, action data and interval data. All the data (that is to say, the timing data, pattern data, palette set data and action data) except for the interval data is controlled in separate files.
Sequence data is created by specifying which files are to be used.

Sequence data	This data consists, of combinations of the timing data, pattern data, palette set data, action data, interval data and Bit Swap data. Offset (X, Y) and size (H, V) are added to the pattern data as additional information. The interval data (number of seconds during the auto execution of the sequence data) is controlled as part of the sequence data. When the sequence data is executed, the timing data, pattern data, palette set data, action data are sent to the VG and time monitoring is performed. The sequence data is created by the sequence editor. In the PC, the sequence data is controlled in the form of sequence files.
Timing data	This data defines the H/V timing and output conditions. It is created by the timing editor. In the PC, it is controlled in the form of timing data files.
Pattern data	There are three types of pattern data: graphic patterns, bitmap patterns and optional patterns which are created by the graphic pattern editor, image converter and optional pattern editor, respectively. In the PC, it is controlled in the form of pattern data files.
Palette set data	This data defines the LUT data among the 1,073,740,000 colors; it is generated by the palette set editor; and it is controlled in the PC as palette set files.
Action data	This data defines the flickering of the designated palette number, auto scrolling of the palettes and other such operations. It is created by the action editor. In the PC, it is controlled in the form of action data files.
Font set data	This is registered in the VG and executed on the basis of the graphic pattern data. Font set data is created by the font set editor. In the PC, it is controlled in the form of font set data.
User character data	This is registered in the VG and executed on the basis of the graphic pattern data. Character data is created by the character editor. In the PC, it is controlled in the form of character files.
Bit swap data	This data defines the LVDS output LUT bits; it is generated by the bit swap editor; and it is controlled in the PC as bit swap files.

3 SP-8028 Program Configuration and Operation

3.1. SP-8028 program configuration

The SP-8028 consists of a program which edits the sequence data and programs which edit the data registered in the sequence data. (See section 2-2 for further details on the data.)

The sequence editor is the main program of the SP-8028. It edits the sequence data and executes the VG operations. The other data editing programs are started from the sequence editor.

3.2. Names of screen parts common to all windows
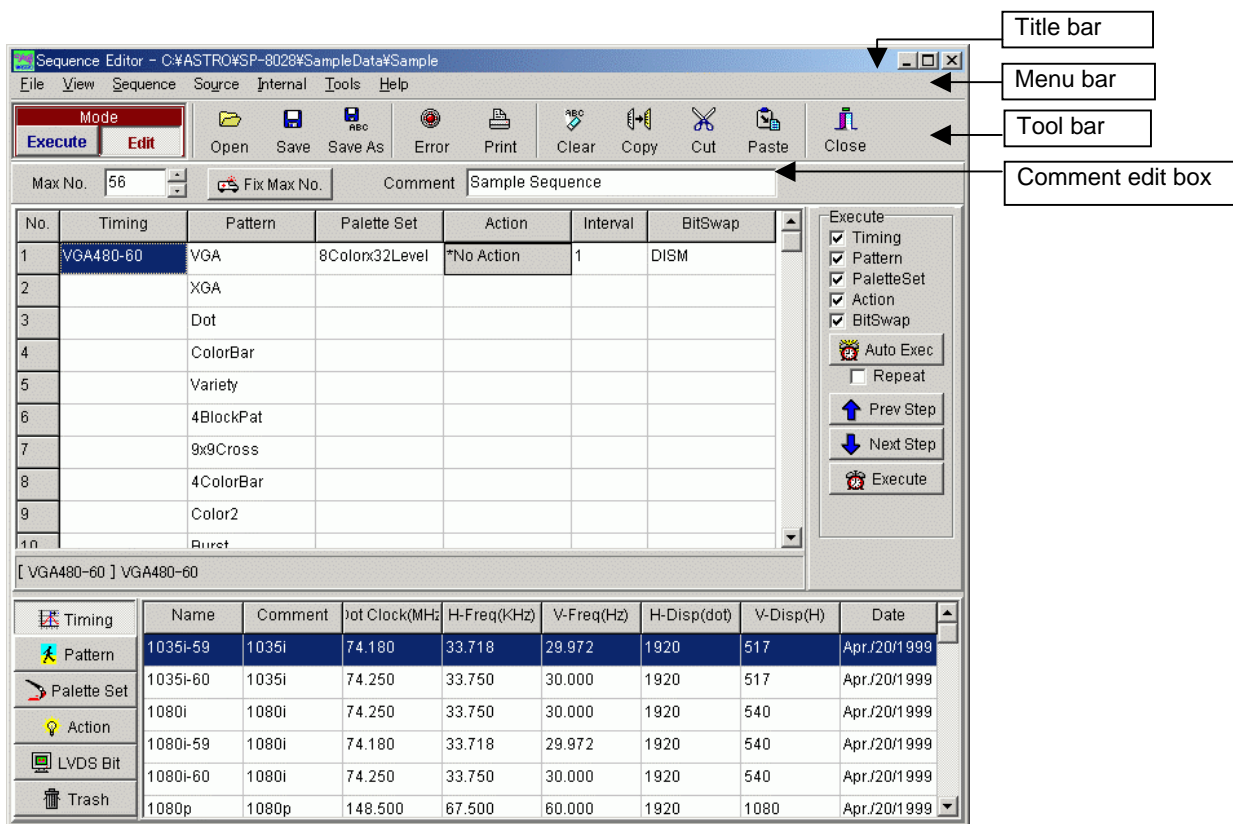
Fig. 3-2-1 Common setting item

Title bar

The name of the currently open sequence file appears here.

Menu bar

The menu appears here.

Tool bar

This contains the buttons which correspond to the commands used relatively frequently to enable one of these commands to be started up at the push of a button.

Comment edit box

Comments for files can be input here.
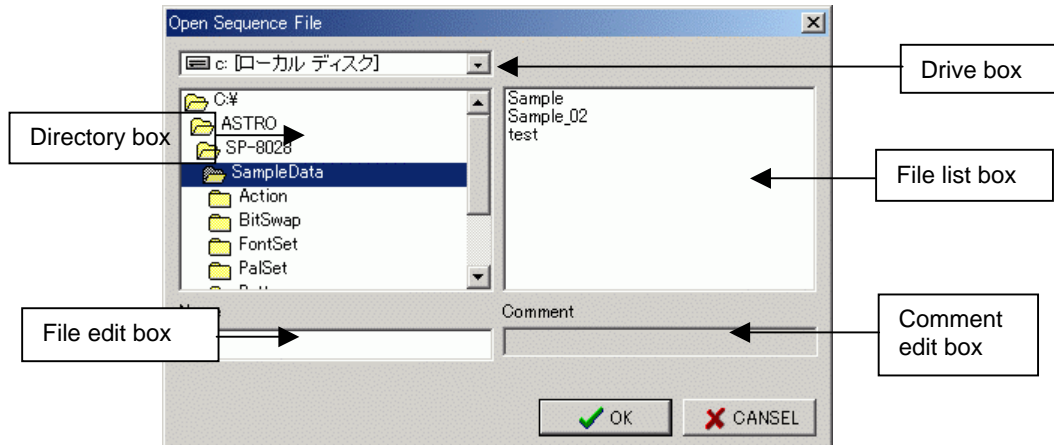
Drive box
The drive is designated here.

Select the drive from the drop-down list.

Directory box
The directory is selected here.

Caution

If the folder name has more than 8 letters, it may not be shown correctly in Windows2000.

File list box
The files (which are displayed without their extensions) are selected here.

File edit box
The files (which are displayed without their extensions) are input here.

Comment edit box
The comment appears here. (No editing is possible.)

4 Operationg procedures for each program

4.1. About a program

The SP-8028 comes with the following data editing programs.

1. Board initialization program
2. Sequence editor
3. Timing editor
4. Graphic editor
5. Optional pattern editor
6. Image converter
7. Palette set editor
8. Action editor
9. DDC editor
10. Execution program for manufaturing

Caution

Do not start up or use any applications other than the SP-8028 while the SP-8028 is running, and do not start up more than one of the SP-8028 editors at the same time. This may result in not enough resources being made available and instability in the SP-8028 operations.

4.2. Board initialization program (Windows 98 only)

Before it is used, the VG-863 must be initialized without fail.
The VGInit.exe (initializing program) must be executed without fail at some point after the PC has been started and before the application is run.
Since the dot clock, timing and other data will also be initialized when VGInit.exe is executed, take care not to execute it while an application is running.
Adding VGInit.exe to the startup procedure saves time and effort.

4.3. Sequence editor

This section describes, how to set the sequence editor which is run by the programmable video signal generator (hereafter abbreviated to "VG"). Using the sequence editor in Windows, how to register data in the VG and execute it by means of this program will also be described.

4.3.1. Startup method

In Windows 98 or 2000, select [Start] - [Programs] - [SP-8028] - [Sequence Editor], and start [Sequence Editor]. When the program is started up, the sequence file opened last when the program was previously started up appears, and the execution mode is established.

However, it will start up with nothing displayed when the program is started up for the first time after installation or if "Open sequence file at startup" has been set to off for the environment setting.

The output condition dialog box also appears but only if this dialog box was displayed when the program was previously started up.

(1) Startup for the first time after installation

1) Select the [New Sequence] menu item on the [File] menu.

2) Input the name of the sequence to be created and the directory name.
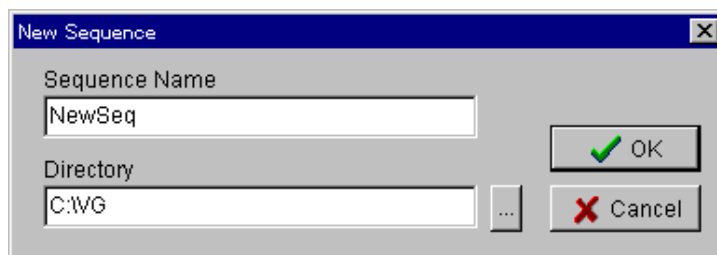
Fig. 4-3-1 Sequence name input screen

[Sequence Name]

Input the name of the sequence to be created.

This name will serve as the sequence filename (extension .seq).

Wild cards cannot be used.

[Directory]

Input the name of the directory where the sequence data is to be created.

If a nonexistent directory is designated, the directory is created automatically. Wild cards cannot be used.

It is now assumed that, as shown in the figure, NewSeq has been input as the sequence name and C:¥VG as the directory name.

When the OK button is pressed, the C:¥VG directory is created under which the timing, pattern, palette set and action directories (collectively referred to henceforth as the "source directories") are created.

The data files are stored in these source directories.

3) Select where to copy the source files from.

The files in the source directory at the bottom layer are referenced for the sequence files created in the C:¥VG directory.

Timing files are stored in the Timing directory among the source directories.
Similarly, pattern files are stored in the Pattern directory, palette set files in the Palette Set directory, and action files in the Action directory.
Therefore, sequence files cannot be created unless sources files exist in the source directory.
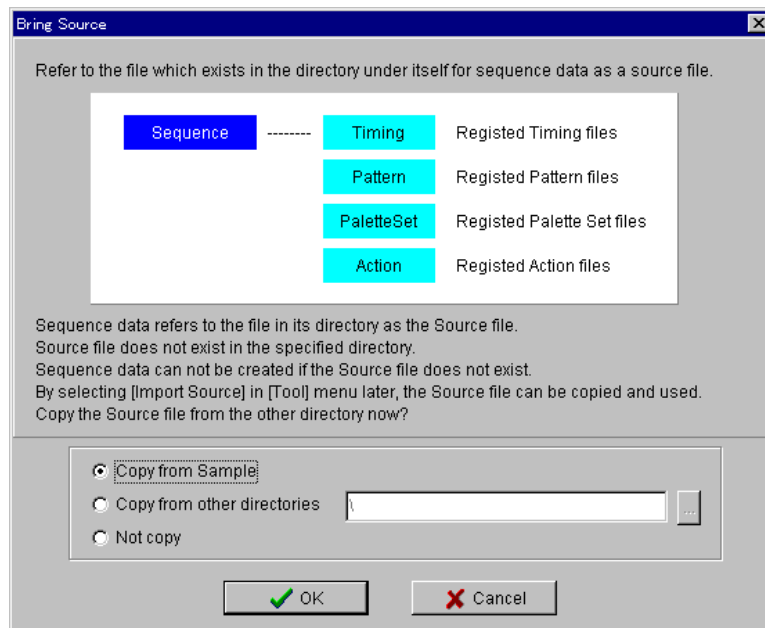
Fig. 4-3-2 Sample file copy screen

When a new sequence file is created in a new directory, no source files exist in the source directory. In a first-time case, it is recommended that source files be copied from the sample files.
Source files can also be copied and brought by selecting [Import Source] on the [Tools] menu at a later time.
When the OK button is pressed, the designated source files are copied into the source directory. This completes the preparations for editing the sequence list.

(2) Startup for the second and subsequent times after installation

Open the sequence file.
When a new file is to be created, follow the same procedure as that described in "Startup for the first time after installation."
However, a source file will not be copied when a new file is created in a directory where the sequence file has already been created. To copy a source file, select the [Import Source] menu item on the [Tools] menu at a later time.
Create the source file and register it on the sequence list as needed. The execution mode is established immediately after startup. To perform editing, switch to the editing mode.

4.3.2. Window screen and names
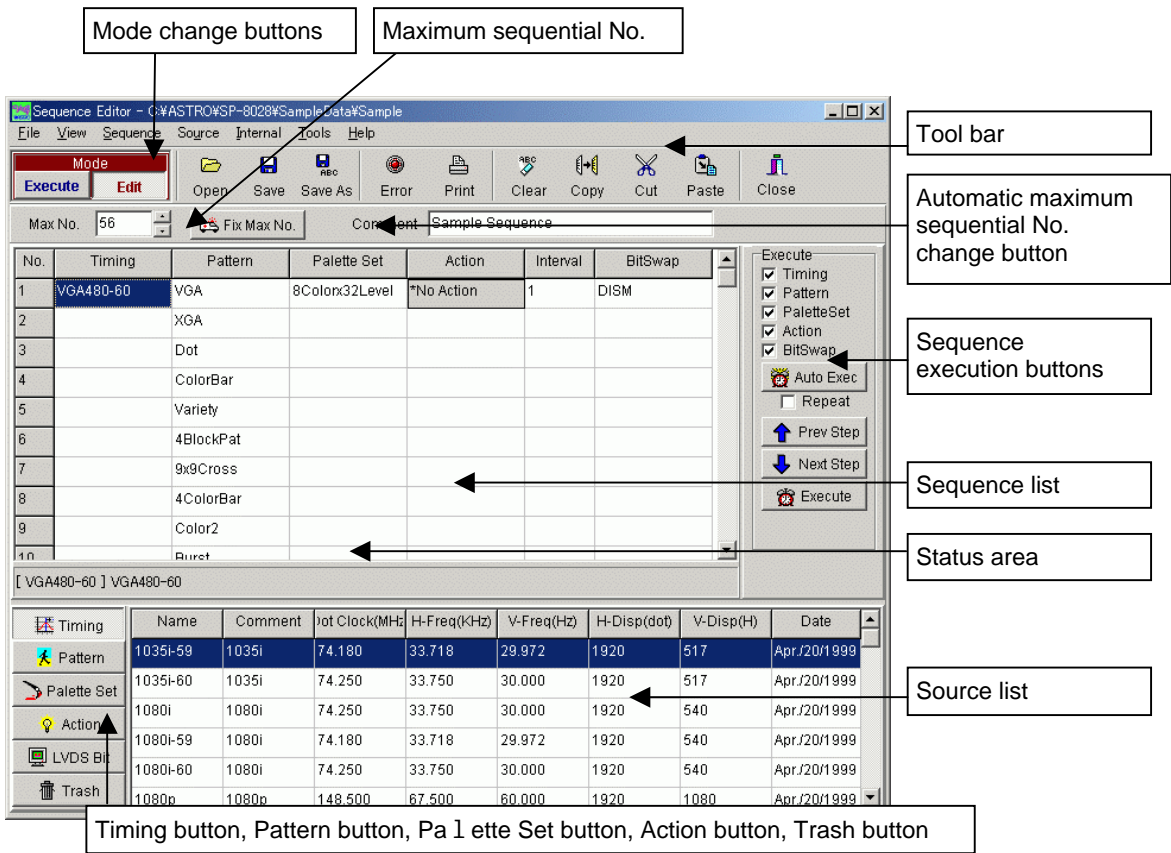
Fig. 4-3-3 Sequence editor screen

(1) Sequence list

This is the area where the sequence data is prepared.

Combinations of sequential numbers, timing names, pattern names, palette set names, action names and intervals make up the sequence data.

When No. is selected, selection is performed in line increments; otherwise, selection is performed in cel1 increments.

When the mouse's left button is clicked while holding down the shift key, the cells from the original cursor position to the position clicked by the mouse can be selected in one go.

When the mouse's right button is clicked on the sequence list, the menu is opened. The menu items differ according to the selected cells.

(2) Status area

This area is for displaying details of the cells selected by the sequence list. Nothing is displayed when more than one cell has been selected by the sequence list.

(3) Source list

The source files which can be registered on the sequence list are displayed in this area.

The display is switched between different types of source files by pressing one of buttons at the left end.

Timing button	A list of the timing data files (with extension .tim) in the "Timing" directory is displayed.
Pattern button	A list of the pattern data files (with extension .gpc, .vbm or .mo) in the "Pattern" directory is displayed.
Palette Set button	A list of the palette set data files (with extension .pal) in the "PalSet" directory is displayed.
Action button	A list of the action data files (with extension .act) in the "Action" directory is displayed.
Trash button	A list of all the files in the "Trash" directory (trash box directory) is displayed. The "Trash" directory is automatically created at the bottom level of the directory in which SP is installed, and it cannot be changed. All the deleted source files are deposited in the trash box. Any of the source files which have once been deleted and which are now in the trash box can be revived by moving them to a source directory. When source files are deleted in the trash box, they are deleted for good and cannot be revived.

When the left mouse button is clicked while the Shift key is held down, all the lines from the original cursor position to the position clicked by the mouse can be selected altogether.

Sorting can be initiated by pressing the respective column headers on the list. When the right mouse button is clicked on the source list, the menu is opened.

(4) Mode change buttons

These buttons are used to switch between the Execute mode and Edit mode.

In the Execute mode, execution alone is possible; in the Edit mode, both editing and execution are possible.

(5) Maximum sequential No.

The maximum sequential No. registered on the sequence list is displayed and changed in this area. When this value is changed, the number of sequence list lines changes.

(6) Automatic maximum sequential No. change button

This is used to delete the unregistered lines from the end of the lines registered on the sequence list. Processing is ended where the registration location was found.

(7) Sequence execution settings

Execution data type check box

The type of data to be executed here when an execution button pressed is checked. This check box is valid only when one of the execution buttons has been pressed.

Execution buttons

These buttons are used to execute the type of data which has been checked in the execution data type check box.

Execution commences from the sequential No. selected on the sequence list (hereafter referred to as the "current sequential No.").

Multiple numbers selected on the sequence list will be ignored. In this case, execution will start from the highest No. selected.

Auto Exec button ------ Auto execution

This is used to execute the current sequential No. after which there is a wait for the number of seconds in each interval

After this, the current sequence No. is incremented by I and that sequence No. is executed after which there is a wait for the number of seconds in each interval.

When the Repeat check box has been checked, execution returns to No.1 after the final No.

This is repeated until the button is pressed again.

If the box has not been checked, auto execution is ended as soon as the last No. is executed.

Prev Step button ------- Manual execution

This steps the current sequential No. back to the previous No. and executes it.

Next Step button ------- Manual execution

This steps the current sequential No. forward to the next No. and executes it.

Execute button ------ Manual execution

This executes the current sequential No.

4.3.3. Menus

(1) [File] menu

Menu command	Function
New Sequence	Creates a new sequence list.
Open Sequence	Opens the sequence file.
Reopen Sequence	Opens the sequence file already created.
Save Sequence	Saves the sequence in the sequence file while overwriting the existing sequence in that file.
Save Sequence As	Changes the sequence filename and saves the sequence in that file.
Close Sequence	Ends the sequence file editing.
Properties	Displays the sequence file properties.
Print	Prints the display data.
Exit SP-8028	Exits the program.

(2) [View] menu

This is used to change the display mode of the sequence editor.

Menu command	Function
Source	Displays the source list when Source is selected.
Output Control	Sets the output conditions

(3) [Sequence] menu

This is used to register the source files on the sequence list.

Menu command	Function
Execute	Executes the cells selected on the sequence list.
Undo	Undoes the last operation.
Select	Selects the file to be registered on the sequence list from the selection dialog box.
Edit	Starts the editor which will edit the source files registered in the selected cells.
Clear	Clears the data in the selected cell range. Data can be undone.
Copy	Copies the selected cell range.
Cut	Cuts out the selected cell range on the clipboard.
Paste	Pastes the selected cell range from the clipboard.
All Select	Selects all the cell data on the sequence list.
Insert-Up	Adds the cell (or line) immediately above the selected cell (or line).
Insert-Down	Adds the cell (or line) immediately below the selected cell (or line).
Delete	Deletes the selected cell (or line) and carries the data forward. Deleted data cannot be undone.
Find	Initiates a search.
Replace	Initiates replacement.
Find from Source	Finds the registered source file from the source list.
Change Pattern Offset/ Size	Changes the pattern offset/size.
Toggle Action/No Action	Sets "No action" in a blank cell. The setting of the "No action" cell is released, and the cell becomes blank.

(4) [Source] menu

This is used to create source files for registration on the sequence list.

Menu command	Function
Execute	Executes the source file selected from the source list.
Update All Source	Reconstructs the source list.
All Select	Selects all the files on the source list.
New	Creates a new source file.
Edit	Edits a source file.
Copy As	Copies a source file.
Rename As	Renames a source file.
Delete	Deletes the selected source file.
Find	Searches a source file from the source list.
Find from Sequence	Searches a source file from the sequence list.
Revive from Trash	Revives the source file in the trash box.
Empty Trash	Empties the trash box.

(5) [Internal] menu

User characters and font sets can be registered in the board VG.
Graphic patterns and optional patterns are referenced for the user characters and font sets which have been registered.
Since the execution mode is established immediately after startup, change to the editing mode. When new creation has been selected, the editing mode is selected automatically.

Menu command	Function
User Character Editor	The character editor starts up.
Font Set Editor	The font editor starts up.

(6) [Tools] menu

This is used to adjust the sequence editor environment.

Menu command	Function
Environment Options	Establishes the environment settings.
Error Check	Checks for errors on the sequence list which has been created.
Import Source	Enables source files to be imported from other directories.
Export Source	Enables source files to be exported to other directories.
Find Source from Other Sequence	Finds out whether the source file is being used by another sequence file.

(7) [Help] menu

Menu command	Function
Contents	Displays the help contents.
About	Displays the version information.

4.3.4. Source list editing function

(1) Creating a source file

Source files can be created for registration on the sequence list. Since the execution mode is established immediately after startup, switch to the editing mode. The editing mode is selected automatically, however, when creating a new file is selected.
Source files are displayed in the bottom half of the screen.
If they are not displayed, check that the editing mode is established, and then check that [Source] on the [View] menu has a check mark.

(2) How to create a new source file

.To create a new timing source file, select the Timing button on the source list to display a list of the timing source files. Similarly, the source lists are also displayed for pattern, palette set and action source files.
.Select the [New] menu item on the [Source] menu.
The graphic pattern/bitmap pattern/option pattern selection dialog box is displayed with pattern files only.
Select the pattern to be created and press the OK button.
.The editing program now starts up. Proceed with editing, provide the file with a filename and save the data in the file.
• When a new file has been created, its name is added to the source list.
• When an existing file has been overwritten, the display of the file concerned on the source list is updated.

For details on how to operate the editing program, refer to the item for the type of editing program concerned.

(3) How to edit an existing source file

On the source list, select one source file to be edited. More than one source file cannot be selected.
Select the [Edit] menu item on the [Source] menu.
The editing program now starts up, and the contents of the source file are displayed.
• When the data of an existing file has been edited and saved by overwriting the pre-edited data, the display of that file on the source list is updated.
• When a new file has been created and its data saved under another filename, the filename of that file is added to the source list.
• When the data of an existing file has been overwritten and its data saved under another filename, the display of that file on the source list is updated.
The same function is executed by double-clicking.

(4) How to delete an existing source file

Move the source file to the trash box directory.
On the source list, select one or more source files to be deleted.
Select the [Delete] menu item on the [Source] menu.
The same function is executed by pressing the Delete key.
It is also executed by dragging & dropping to the Trash button.

(5) How to revive a source file deposited in the trash box

A source file can be returned from the trash box to the source directory. Select the trash box button, and display
a list of the source files in the trash box. Select one or more source files to be revived.
Select the [Revive from Trash] menu item on the [Source] menu.
In the case of timing source files, this same function is executed by dragging & dropping to the Timing button.
It is also executed by dragging & dropping to the Pattern box for pattern source files, to the Palette Set button
for palette set source files and to the Action button for action source files.

(6) How to delete a source file deposited in the trash box

A selected source file can be completely deleted.
Once deleted, it cannot be revived.
Select the trash box button, and display a list of the source files in the trash box. Select one or more source files
to be deleted.

Select the [Delete] menu item on the [Source] menu.
The delete confirmation message appears. Select YES.
The same function is executed by pressing the Delete key.

It is also executed by dragging & dropping to the Trash button.
To delete all the source files in the trash box, select the [Empty Trash] menu item on the [Source] menu.

(7) Copying source files

An existing source file can be copied to create a source file under another name.
Select one source file serving as the copy source.
More than one source file cannot be selected.
Select the [Copy As] menu item on the [Source] menu.
Input the filename serving as the copy destination.
An error results if the selected source filename already exists.

(8) Renaming source files

An existing source file can be renamed.
Select the line where the filename is to be changed.
More than one source filename cannot be selected.
Select the [Rename As] menu item on the [Source] menu.
Input the new filename.
An error results if the selected source filename already exists.

(9) Searching

Character strings can be searched from the displayed list.

Display the source list to be searched.

Select the [Find] menu item on the [Source] menu.

The same function is executed by pressing the F key while holding down the Ctrl key.

(10) Finding source files from the sequence list.

Character strings can be searched from the sequence list.

Select one cell to be found from the sequence list.

More than once cell cannot be selected.

Select the [Find from Sequence] menu item on the [Source] menu.

(11) Selecting all source files

The displayed list can be set to the all select status.

1. Display the source list with all the files to be selected.

2. Select the [All Select] menu item on the [Source] menu.

The same function is executed by pressing the A key while holding down the Ctrl key.

(12) Updating the source list

All the source lists can be updated.

Select the [Update All Source] menu item on the [Source] menu.

When a sequence file is to be opened, the sequence editor loads the source files under the filenames in the source directory into the memory.

When source files in the source directory have been deleted using the MS-DOS command or Explorer with the sequence file opened, the source list will be at variance from the contents of the sequence editor's memory. In a case like this, execute the source list update command.

(13) How to execute source files

1. Select the line with the file to be executed. More than one source file cannot be executed.

2. Select the [Execute] menu item on the [Source] menu.

In the execution mode, the same function is executed by double-clicking.

4.3.5. Sequence list editing function

(1) Registering source files on the sequence list

Source files can be registered on the sequence list.

Since the execution mode is established immediately after startup. switch to the editing mode. The editing mode is selected automatically, however, when creating a new file is selected.

A blank (unregistered) cell on the sequence list is considered to contain the same data as the data which has been registered in the cell immediately above. If the cell immediately above is also blank, the cell above this cell is searched, and the blank cell is considered to contain the same data as the registered data which is found first.

For this reason, sequential No.1, which is the top-most cell, must be registered without fail. An error display will appear if an attempt is made to execute a cell which is not registered.

When selecting in line increments, select the No. cell.

When selecting cells, make a selection other than the No. cell (Timing cell, Pattern cell, Palette Set cell, Action cell or Interval cell).

Cells spanning different types (such as a Timing cell and a Pattern cell) cannot be selected.

When the mouse's left button is clicked while holding down the Shift key, the same type of cells from the original cursor position to the position clicked by the mouse can be selected altogether.

How to register timing, pattern, palette set and action names

Dragging & dropping from the source list

[Select] on the [Sequence] menu

Inputting data names from the keyboard

(2) Dragging & dropping from the source list

The data names selected on the source list can be registered by dragging the data name from the source list and dropping it on the sequence list.

The drop destination area is displayed in green at this time.

The dropping operation differs depending on the combination of two factors: whether one or more data is selected on the source list and whether one or more data is selected on the sequence list.

[When one data has been selected on both the source list and sequence list]

The data selected on the source list is registered in one drop destination cell on the sequence list.

[When more than one data has been selected on the source list and one data has been selected on the sequence list]

The data selected on the source list equivalent to the number selected on the source list starting with the drop destination cells on the sequence list is registered in sequence.

[When one data has been selected on the source list and more than one data has been selected on the sequence list]

If the drop destination on the sequence list is not the selected cell, the data selected on the source list is registered in one drop destination cell on the sequence list.
If the drop destination on the sequence list is the selected cell, the data selected on the source list is registered in all the selected cells on the sequence list.

[When more than one data has been selected on both the source list and sequence list]

Multiple selections on the sequence list are ignored.
The data selected on the source list equivalent to the number selected on the source list starting with the drop destination cells on the sequence list is registered in sequence.

(3) [Select] on the [Sequence] menu

The list of the source files which can be registered is displayed by selecting one or more cells to be used for the registration and then selecting [Select] on the [Sequence] menu.
When one cell is selected and the OK button is pressed, the source file selected is registered in the cell selected on the sequence list.
When more than one cell has been selected on the sequence list, the same data is registered in all the cells.

(4) Inputting data names from the keyboard

Data names can be registered directly by selecting one or more cells to be used for the registration and then inputting the data names from the keyboard.
Only with pattern data does the pattern type (Graphic pattern, Bitmap pattern, Option pattern) selection dialog box appear. When more than one cell has been selected on the sequence list, the same data name is registered in all the cells.

(5) How to register intervals

Intervals can be registered directly by selecting one or more cells to be used for the registration and then inputting a number from the keyboard.
When more than one cell has been selected, the same number is registered in all the cells.

4.3.6. Sequence list and other editing functions

(1) Clearing the selected cell range

1. Select one or more cells to be cleared.

2. Select the [Clear] menu item on the [Sequence] menu.

When cells are cleared, the cells themselves are not deleted but are simply left blank.

(2) Deleting the selected cell range

1. Select one or more cells to be deleted.

2. Select the [Delete] menu item on the [Sequence] menu.

The same function is executed by pressing the Delete key while holding down the Ctrl key. When cells are deleted, the cells themselves are deleted. Once they have been deleted by selecting [Delete], cells cannot be revived by Undo.

(3) Moving the selected cell range to the clipboard

1. Select one or more cells to be moved.

2. Select the [Cut] menu item on the [Sequence] menu.

The same function is executed by pressing the X key while holding down the Ctrl key.

It is also executed by pressing the Cut button on the toolbar.

(4) Copying the selected cell range to the clipboard

1. Select one or more cells to be moved.

2. Select the [Copy] menu item on the [Sequence] menu.

The same function is executed by pressing the C key while holding down the Ctrl key.

It is also executed by pressing the Copy button on the toolbar.

(5) Pasting the selected cell range from this clipboard

1. Select the lead cell to be pasted.

2. Select the [Paste] menu item on the [Sequence] menu.

Pasting in line increments takes the form of insertion above the selected cell.

Pasting in cell increments takes the form of overwriting the selected cell.

With pasting in cell increments, the pasting operation differs depending on the combination of two factors: whether one or more data is stored on the clipboard and whether one or more cells are selected on the sequence list.

[When one data is stored on the clipboard and one cell is selected on the sequence list]

The data on the clipboard is pasted on the selected cell on the sequence list.

[When more than one data is stored on the clipboard and one cell is selected on the sequence list]

The data on the clipboard equivalent to the number of data on the clipboard starting with the selected cell on the sequence list is pasted in sequence.

[When one data is stored on the clipboard and more than one cell is selected on the sequence list]

The data on the clipboard clipboard is pasted in sequence on all the selected cells on the sequence list.

[When more than one data is stored on the clipboard and more than one cell is selected on the sequence list]

If the number of data selected on the clipboard differs from the number of data selected on the sequence list, an error message appears, and the data cannot be pasted.

The data on the clipboard equivalent to the number selected starting with the selected cells on the sequence list is pasted in sequence.

If the rows of the cells stored on the clipboard differ from the rows of the cells to be pasted, an error message appears, and the cells cannot be pasted.

The same function is executed by pressing the V key while holding down the Ctrl key. It is also executed by pressing the Paste button on the toolbar.

(6) Inserting lines

1. To insert one line, select the No. cell in the line immediately below where the line is to be inserted.

To insert more than one line, select the cells spanning the same number of lines as the number of lines to be inserted starting with the No. cell immediately below where the lines are to be inserted.

2. Select the [Insert-up] menu item on the [Sequence] menu.

The same function is executed by pressing the I key while holding down the Ctrl key.

(7) Inserting cells

1. To insert one cell, select a cell in the line immediately below where the cell is to be inserted. To insert more than one cell, select the cells spanning the same number of cells as the number of cells to be inserted starting with the cell immediately below where the cells are to be inserted.

2. Select the [Insert-up] menu item on the [Sequence] menu.

The same function is executed by pressing the I key while holding down the Ctrl key.

(8) Adding lines

1. To add one line, select the No. cell in the line immediately above where the line is to be added.

To add more than one line. select the cells spanning the same number of lines as the number of lines to be added starting with the No. cell immediately above where the lines are to be added.

2. Select the [Insert-down] menu item on the [Sequence] menu.

(9) Adding cells

1. To add one cell, select the cell in the line immediately above where the cell is to be added.

To add more than one cell, select the cells spanning the same number of cells as the number of cells spanning the same number of cells as the number of cells to be added starting with the cell immediately above where the cells are to be added.

2. Select the [Insert-down] menu item on the [Sequence] menu.

(10) Searching cells

This is for searching character strings from selected strings.

1. Select the cell to be searched. Operation is the same even when more than one cell is selected.

2. Select the [Find] menu item on the [Sequence] menu.

The same function is executed by pressing the F key while holding down the Ctrl key.

(11) Replacing cells

1. Select the cell to be replaced. Operation is the same even when more than one cell is selected.

2. Select the [Replace] menu item on the [Sequence] menu.

This is for searching character strings and replacing them from selected strings. The same function is executed by pressing the R key while holding down the Ctrl key.

(12) Finding a registered source file from the source list

1. Select the cell to be found from the source list.

More than one cell cannot be selected.

2. Select the [Find from Source] menu item on the [Sequence] menu.

The focus moves to the source file which has been found.

This command cannot be executed when the source list is not displayed.

(13) Changing the pattern offset/size

1. Select one cell or a multiple number of cells that will change the "pattern."

2. Select [Change Pattern Offset/Size] on the [Sequence] menu.

3.The current value is now displayed. If a multiple number of cells have been selected and the value differs, a gray display will appear. Change the value, and select the OK button.

* When the offset has been changed and displayed, the screen will be scrolled and the pattern display as shown below.

Example: When the pattern offset has been set as XY (100,100) and its size as HV (200,200)
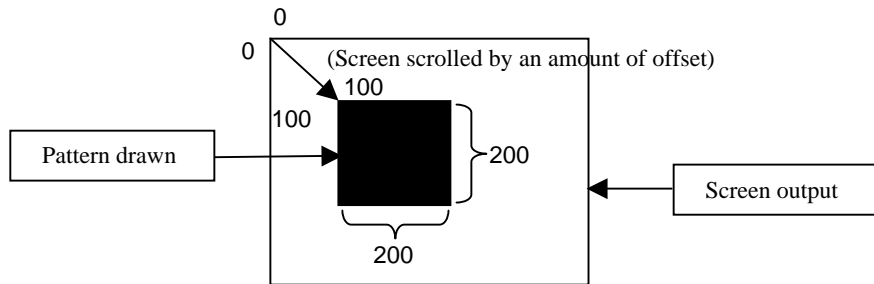
(14) Changing Action/No Action

1. Select one or more cells to be changed.

2. Select the [Toggle Action/No Action] menu item on the [Sequence] menu.

No Action is set in the blank cell. The cell which has been set appears in gray. A cell with the No Action setting has its setting cleared and goes blank.

(15) Selecting all cells

1. Select one row in which all the cells are to be set to the all select status.

2. Select the [All Select] menu item on the [Sequence] menu.

A11 the cells in the selected row are set to the selected status.

The same function is executed by pressing the A key while holding down the Ctrl key.

(16) Undoing the last operation

Select the [Undo] menu item on the [Sequence] menu.

This is for undoing the last operation.

If the last operation cannot be undone. [Undo] on the [Sequence] menu appears in gray and cannot be selected.

The same function is executed by pressing the Z key while holding down the Ctrl key.

Operations which can be undone are listed below:

• Dragging & dropping from the source list

• [Select] on the [Sequence] menu

• Inputting data from the keyboard

• Clearing the selected cell range

• Moving the selected cell range to the clipboard

• Pasting the selected cell range from the clipboard (except for pasting in line increments)

• Changing the pattern offset/size

• Changing Action/No action

Undo does not work (a gray display appears) for the following operations (accompanied by line shifts):

• Deleting the selected cell range

• Inserting lines

• Inserting cells

• Pasting lines from the clipboard (except for pasting in cell increments)

• Adding lines

• Adding cells

(17) Executing sequence lists in cell increments

1. Select the cell to be executed.

More than one cell cannot be selected.

2. Select the [Execute] menu item on the [Sequence] menu.

In the execution mode, the same function is executed by double-clicking.

In the execution mode, this functions in the same way as with double-clicking.

(18) Executing the sequence list using the Execute button

1. Select the cell where execution is to commence.

The selection of more than one cell is ignored. In this case, execution starts from the highest of the numbers selected.

2. Check the type of data to be executed in the execution data type check box.

Select the execute button.

Auto Exec button	Used for auto execution	Auto execution executes the current sequential No. and waits for the number of seconds in each interval. It then advances to the next sequential No., executes it, and waits for the number of seconds in the interval. If the repeat check box is checked, it returns to No.1 after the last No. Auto execution is repeated until the button is pressed again. If the repeat check box is not checked, auto execution is terminated when the last No. has been executed.
Prev Step button	Used for manual execution	This is to return to the previous sequential No. and execute it.
Next Step button	Used for manual execution	This is to advance to the next sequential No. and execute it.
Execute button	Used for manual execution	This is to execute the current sequential No.

When the Execute button is used, the data executed is all the data items checked in the execution data type check box. Only the data in the selected cell is executed if [Execute] on the mouse's right-click menu is used. Bear in mind that the data which is sent will differ.

(19) How to edit registered source files

The contents of a source file registered in the sequence list can be changed.

This is virtually the same function as the one used to edit source files from the source list. It differs in that a message appears asking whether the sequence list is also to be changed when the file has been saved under a different name by the editing program.

1. On the sequence list, select the source file to be edited.
More than one source file cannot be selected.

2. Select the [Edit] menu item on the [Sequence] menu.
In the editing mode, the same function is executed by double-clicking.
When the selected cell is blank, a dialog box appears asking whether an existing registered source file is to be edited in the cell above or a new source file is to be created. The cell being edited is displayed in red.

3. The editing program starts up.
When the file is now saved under a different name, a new source file can be created or an existing source file can be overwritten.
When the file is to be saved under a different name, a confirmation message appears asking whether the registered name of the cell on the sequence list (the one displayed in red) is also to be changed.
Select YES to change it; otherwise, select NO.

(20) How to register user characters

1. Select the [User Character Editor] menu item on the [Internal] menu.
2. The character editor starts up.
Refer to the section on the character editor for details on the editing program operations.

(21) How to register font sets

1. Select the [Font Set Editor] menu item on the [Internal] menu.

The font editor starts up.

2. Refer to the section on the font editor for details on the editing program operations.

(22) Environment settings

The following settings can be established.

• At startup, open or do not open the sequence file which was last opened by the last startup

• Sound or do not sound the buzzer when file loading, saving or executing files or registering files in the VG is successful

1. Select the [Environment Options] menu item on the [Tools] menu.

2. The environment settings dialog box appears.

(23) Error check

This is for checking the created sequence list for errors.

An error results in the following cases:

• When an unregistered cell is present at sequential No. l

• When the registered source file does not exist

Either press the Error button on the toolbar or select the [Error Check] menu item on the [Tools] menu.

The error dialog box appears, and the error locations are displayed.

(24) Importing source files

Source files can be imported (copied) from another directory.

Since the execution mode is established immediately after startup, change to the editing mode. When new creation has been selected, however, the mode is switched to editing automatically.

1. Select the [Import Source] menu item on the [Tools] menu.

2. The copy source selection dialog box appears.

Select the sample file or existing (user-created) file.

3. The importable source files are displayed.

At the outset, check marks are entered for all the source files.

To import some source files and not others, enter the check mark only for those files which are to be imported.

4. Select the Import button.

The number of source files to be imported and a confirmation message are displayed.

Source file importing is commenced when the OK button is pressed.

(25) Exporting source files

Source files can be exported (copied) to another directory.

Since the execution mode is established immediately after startup, change to the editing mode. When new creation has been selected, however, the mode is switched to editing automatically.

1. Select the [Export Source] menu item on the [Tools] menu.

2. The copy destination selection dialog box appears.
Select the copy destination directory.

3. The exportable source files are displayed.
At the outset, check marks are entered for all the source files.
To export some source files and not others, enter the check mark only for those files which are to be exported.

4. Select the Export button.
The number of source files to be exported and a confirmation message are displayed.
Source file exporting is commenced when the OK button is pressed.

(26) Checking whether a source file has been used by another sequence file

It is possible to check whether a source file has been used by another sequence file.
Since the execution mode is established immediately after startup, change to the editing mode. When new creation has been selected, however, the mode is switched to editing automatically.

1. Select the [Find Source from Other Sequence] menu item on the [Tools] menu.

2. Select one source to check as to whether it has been used by another sequence file.

3. Select the sequence file where the search is to begin.
At the outset, check marks are entered for all the sequence files.
To search some sequence files and not others, enter the check mark only for those files which are to be searched.

4. Select the Find button. The number of sequence files to be searched and a confirmation message are displayed. The search is commenced when the OK button is pressed.

(27) Opening an existing sequence file

An existing sequence file can be opened.
1. Either press the Open button or select the [Open Sequence] menu item on the File] menu.
2. The file selection dialog box opens. Select the file.

(28) Saving data in a sequence file

The data in the currently open file can be saved while overwriting the existing data in that file. Either press the Save button or select the [Save Sequence] menu item on the [File] menu.

(29) Saving data in a sequence file under another filename

Data in the currently open sequence file can be saved under another filename.

1. Either press the Save As button or select the [Save As Sequence] menu item on the [File] menu.

2. The file selection dialog box opens. Input the filename.

(30) Reopening a sequence file

An existing sequence file can be opened.

• Select the file to be opened from among the files registered in [Reopen Sequence] on the [File] menu.

(31) Closing a sequence file

The sequence editor can be exited.

• Either select the [Close Sequence] menu item on the [File] menu or select closing the control menu.

(32) Printing the display data

The data being edited can be printed.

• Either select the [Print] menu item on the [File] menu or select the [Print] button from the tool buttons.

(33) Output control

The VG output condition settings can be displayed in real time. These conditions are set using timing editor Output.
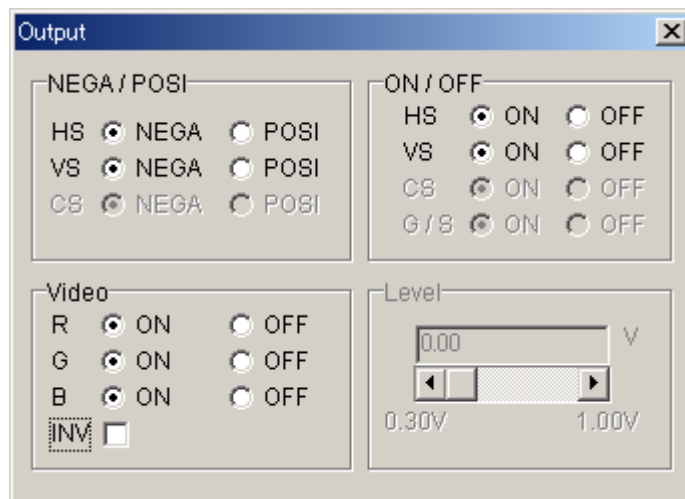

Fig. 4-3-4 Output setting screen

(34) Sorting

The sequence in which the source files are listed on the source list can be sorted. Sorting is executed by pressing the column header in the list.

(35) Sequence list mouse right click menu (Timing)

When the mouse's right button is clicked on the sequence list, the following menu appears.

Execute	Executes only the selected timing data file.
Select	Sets the file in the selected cell. More than one cell can be selected but only one file can be set.
Edit	Loads the timing data file registered in the selected cell and starts up the timing editor.
Clear	Clears the data in the selected cell range. This data can be restored by undoing the clearing.
Copy	Copies the selected cell range.
Cut	Cuts out the selected cell range on the clipboard.
Paste	Pastes the selected cell range from the clipboard.
All Select	Selects all the cell data in the selected row of the sequence list.
Insert-up	Adds a cell (or line) immediately above the selected cell (or line).
Insert-down	Adds a cell (or line) immediately below the selected cell (or line).
Delete	Deletes the selected cell (or line) and carries the data forward. Deleted data cannot be undone.
Find	Searches.
Replace	Replaces.
Find from Source	Finds registered source files from the source list.

(36) Sequence list mouse right click menu (Pattern)

When the mouse's right button is clicked on the sequence list, the following menu appears.

Execute	Executes only the selected pattern data file.
Select	Sets the file in the selected cell. More than one cell can be selected but only one file can be set.
Edit	Edits the file registered in the selected cell, and starts up the editor
Clear	Clears the data in the selected cell range. This data can be restored by undoing the clearing.
Copy	Copies the selected cell range.
Cut	Cuts out the selected cell range on the clipboard.
Paste	Pastes the selected cell range from the clipboard.
All Select	Selects all the cell data in the selected row of the sequence list.
Insert-up	Adds a cell (or line) immediately above the selected cell (or line).
Insert-down	Adds a cell (or line) immediately below the selected cell (or line).
Delete	Deletes the selected cell (or line) and carries the data forward. Deleted data cannot be undone.
Find	Searches.
Replace	Replaces.
Find from Source	Finds registered source files from the source list.
Change Pattern Offset/Size	Changes the pattern offset/size.

(37) Sequence list mouse right click menu (Palette Set)

When the mouse's right button is clicked on the sequence list, the following menu appears.

Execute	Executes only the selected palette set file.
Select	Sets the file in the selected cell. More than one cell can be selected but only one file can be set.
Edit	Loads the palette set file registered in the selected cell, and starts the timing editor.
Clear	Clears the data in the selected cell range. This data can be restored by undoing the clearing
Copy	Copies the selected cell range.
Cut	Cuts out the selected cell range on the clipboard.
Paste	Pastes the selected cell range from the clipboard.
All Select	Selects all the cell data in the selected row of the sequence list.
Insert-up	Adds a cell (or line) immediately above the selected cell (or line)
Insert-down	Adds a cell (or line) immediately below the selected cell (or line)
Delete	Deletes the selected cell (or line) and carries the data forward. Deleted data cannot be undone.
Find	Searches.
Replace	Replaces.
Find from Source	Finds registered source files from the source list.

(38) Sequence list mouse right click menu (Action)

When the mouse's right button is clicked on the sequence list, the following menu appears.

Execute	Executes only the selected action data file.
Select	Sets the file in the selected cell. More than one cell can be selected but only one file can be set.
Edit	Loads the file registered in the selected cell, and starts up the action editor.
Clear	Clears the data in the selected cell range. This data can be restored by undoing the clearing.
Copy	Copies the selected cell range.
Cut	Cuts out the selected cell range on the clipboard.
Paste	Pastes the selected cell range from the clipboard.
All Select	Selects all the cell data in the selected row of the sequence list.
Insert-up	Adds a cell (or line) immediately above the selected cell or line).
Insert-down	Adds a cell (or line) immediately below the selected cell (or line).
Delete	Deletes the selected cell (or line) and carries the data forward. Deleted data cannot be undone.
Find	Searches.
Replace	Replaces.
Find from Source	Finds registered source files from the source list.
Toggle Action/ No Action	Establishes the No Action setting in the blank cell. The setting for a No Action cell is released, and the cell goes blank.

(39) Sequence list mouse right click menu (Interval)

When the mouse's right button is clicked on the sequence list, the following menu appears.

Edit	Establishes the input mode for the cell.
Clear	Clears the data in the selected cell range. This data can be restored by undoing the clearing.
Copy	Copies the selected cell range.
Cut	Cuts out the selected cell range on the clipboard.
Paste	Pastes the selected cell range from the clipboard.
All Select	Selects all the cell data in the selected row of the sequence list.
Insert-up	Adds a cell (or line) immediately above the selected cell (or line).
Insert-down	Adds a cell (or line) immediately below the selected cell (or line).
Delete	Deletes the selected cell (or line) and carries the data forward. Deleted data cannot be undone.
Find	Searches.
Replace	Replaces.

(40) Source list mouse right click menu

When the mouse's right button is clicked on the source list, the following menu appears.

Execute	Executes the selected source file.
Update All Source	Updates the source list.
All Select	Selects all the files.
New	Starts up the editor and creates a new source file.
Edit	Starts up the editor and edits the selected file.
Copy As	Copies the selected file into a file under another name.
Rename As	Updates the filename.
Delete	Moves the file from the source list to the trash box.
Find	Searches the source list.
Find from Sequence	Searches the sequence list.

(41) List of shortcuts

Shortcuts using action keys

F9 key	Executes the selected cell.
F10 key	Selects the menu bar.

Press the applicable key while holding down the Ctrl key.

Key operation	Objective
Ctrl + A keys	Selects all the cells on the selected row. The same function is executed by [All Select] on the Sequence menu.
Ctrl + C keys	Copies the selected cell. The same function is executed by [Copy] on the [Sequence] menu
Ctrl + F keys	Selects all the cells on the selected row. The same function is executed by [Source Find] on the [Sequence] menu.
Ctrl + I keys	Adds a cell (or line) immediately above the selected cell (or line). The same function is executed by [Insert-Up] on the [Sequence] menu.
Ctrl + R keys	Replaces. The same function is executed by [Replace] on the [Sequence] menu.
Ctrl + V keys	Pastes the selected cell range from the clipboard. The same function is executed by [Paste] on the [Sequence] menu.
Ctrl + X keys	Cuts out the selected cell range on the clipboard. The same function is executed by [Cut] on the [Sequence] menu.
Ctrl + Z keys	Undoes the last operation. The same function is executed by [Undo] on the [Sequence] menu.
Ctrl + Delete keys	Deletes the selected cell. The same function is executed by [Delete] on the [Sequence] menu.

4.3.7. Exiting the program

The sequence editor can be exited by one of the following methods.
- Select "Exit SP-8028" on the [File] menu.
- Select "Exit" on the toolbar.

4.4. Timing editor

How to set the timing data of the programmable video signal generator (referred to henceforth as the "VG") is described in this section. This program enables timing data for the VG to be edited in Windows and edited timing data to be sent to the VG and executed.

4.4.1. Startup method

The timing editor is started up from the sequence editor. Double-click on any timing data area on the source list (or sequence list) of the sequence editor.

Alternatively, start up the timing editor by selecting "New--Timing" or "Edit" on the right-click menu in the source list area. When the timing editor is started up, the timing data setting screen is displayed. Furthermore, the timing data registered on the selected sequence list or the timing data displayed on the selected source list is loaded.

4.4.2. Window screen and names

(1) When the timing settings have been selected.
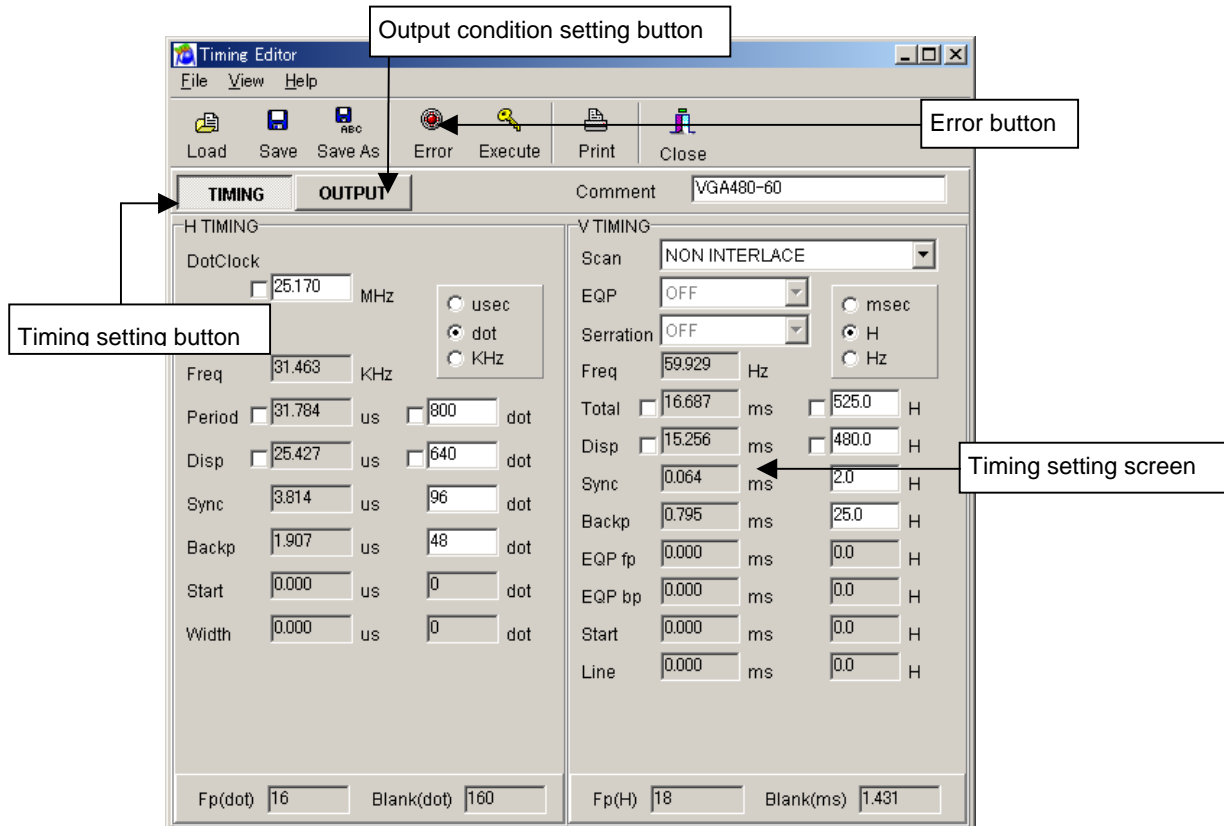
Fig. 4-4-1 Timing setting screen

(2) Timing data setting operations

[Data setting]

• Place the mouse cursor on the data to be changed, and click. New data can now be keyed in.

[Input mode setting]

• Select usec or dot for the horizontal timing (H TIMING) and msec, H or Hz for the vertical timing (V TIMING). The check box enabling input now changes.

[Fixed mode setting]

• The fixed mode ensures that the DotClock, Period and Disp horizontal timing (H TIMING) data and Total and Disp vertical timing (V TIMING) data remains unchanged as a result of changes made to other data (such as DotClock and Period). Check the fixed mode when the data is not to be changed.

(3) When the output condition settings have been selected
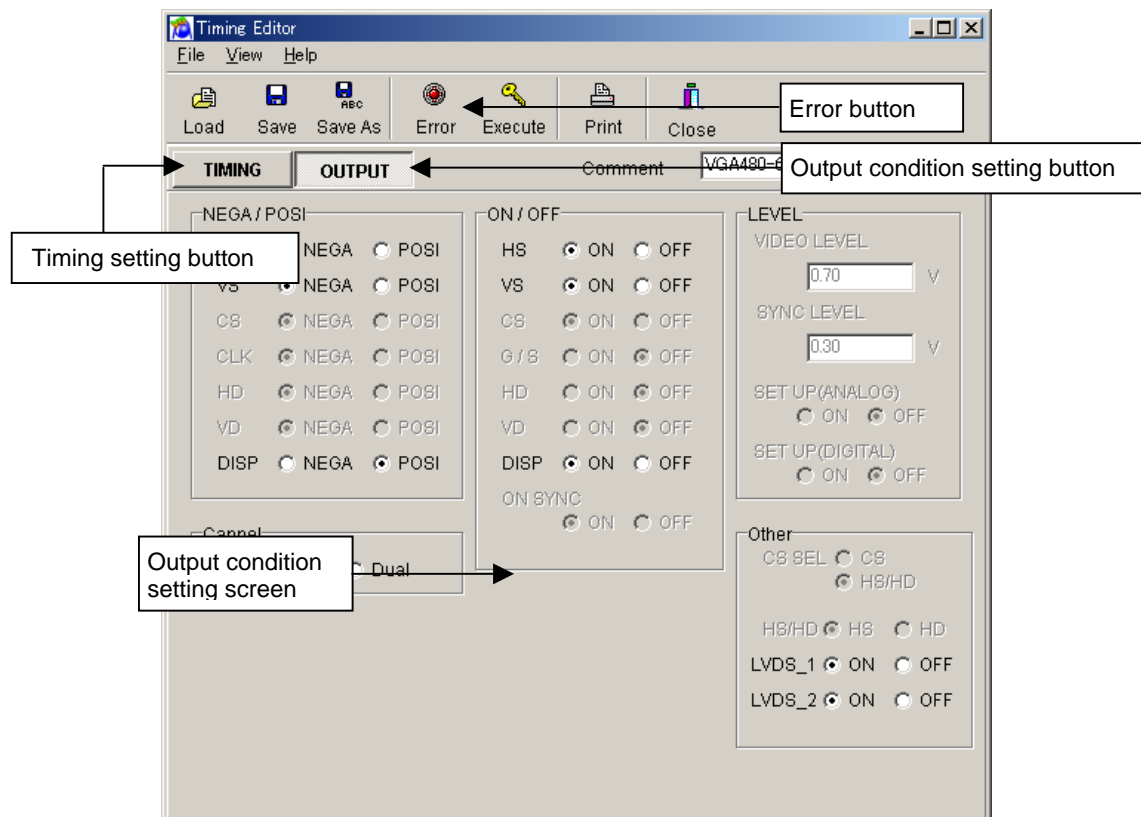
Fig. 4-4-2 Output setting screen

(4) Output condition setting operations

   [Data setting]

   • Set the items on the left side. Select the radio buttons.

   • In the case of the edit box, place the mouse cursor on the data to be changed, and click.

   New data can now be keyed in.

(5) Error button

The error window appears when the ⊙ Error button is clicked. Check the values of the data set. If any values which have been input are outside the setting range, the error locations will be displayed on the error display screen.

The error window also appears when [Error Window] is selected on the [View] menu.
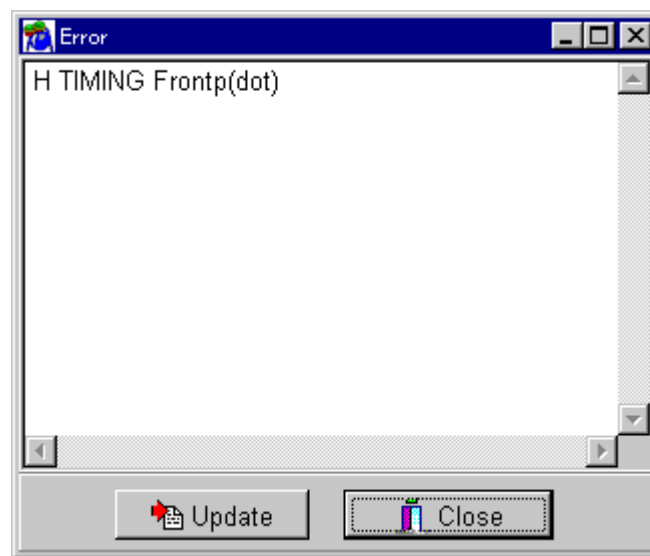
Fig. 4-4-3 Error display screen

Error display screen

The error locations are displayed on this screen.

Update

This is used for updating to the latest information.

Close

This is used to exit the error display.

4.4.3. Timing data settings

(1) Timing data setting ranges

[Frequencies]

Dot clock frequency	Singl:20MHz to 90MHz Dual:40MHz to 180MHz (20 to 90MHz for each 1ch)
Horizontal sync frequency	10.000 to 300.000KHz
Vertical sync frequency	15.600 to 200.000Hz

[Horizontal timing data]

H Period	0.000 to 99.999μsec	68 to 4096 dot	2-dot increments
H Disp	0.000 to 99.999μsec	26 to 2048 dot	2-dot increments
H Sync	0.000 to 99.999μsec	2 to 4088 dot	2-dot increments
H Backp	0.000 to 99.999μsec	0 to 4084 dot (Note 2)	2-dot increments
H Frontp			
H Blanking	Calculated automatically	42 to 4096 dot	2-dot increments

Note 1:Even when settings are made in μsec units, the setting range for the number of dots given above must be satisfied.

Note 2:Although 0 can be set as the minimum value, with this setting the data cannot be output properly due to the limitations of the chip performance.

[Vertical timing data]

V Total	0.000 to 99.999msec	100.0 to 4096 H	1H increments
V Disp	0.000 to 99.999msec	1.0 to 2048 H	1H increments
V Backp	0.000 to 99.999msec	0.0 to 2048 H	1H increments
V Sync	0.000 to 99.999msec	1.0 to 2048 H	0.5H increments

Note 3:Even when settings are made in msec units, the setting range for the H number given above must be satisfied.

(2) Horizontal timing data

Concerning differences in operation based on the input mode

1. In the dot input mode

The μsec items are recalculated without changing the dot items of the data.

Input of dot clock	The μsec items are recalculated without changing the dot items of the data.
Input of other items	The μsec items are recalculated on the basis of the dot items of the input data.

2. In the μsec input mode

Basically, the dot items are calculated in such a way that the μsec items of the data are not changed. Based on the calculated number of dots and dot clock data, the μsec items are then recalculated.

Input of dot clock	The number of dots for each item is calculated in such a way that the data in μsec units for each item is not changed. Based on the calculated number of dots, the μsec figure for each item is recalculated. (The dot clock data is compensated in such a way that the μsec figures of H period are not changed.)
Input of other items	The corresponding dot items are calculated on the basis of the μsec items of the input data. Based on the calculated dot items, the μsec items are recalculated. (For H period and H disp, the dot clock data is compensated so as to optimize with the input μsec data.)

3. In the KHz input mode

Operation is basically the same as for the μsec items, but the dot clock data is compensated in such a way that Freq is not changed.

(3) Vertical timing data

Concerning differences in operation based on the input mode

1. In the H input mode

msec and Freq are recalculated without changing the H items of the data.

2. In the msec input mode

Basically, the H items are calculated in such a way that the msec items of the data are not changed. Based on the calculated number of H and horizontal period, the msec and Freq are then recalculated.

3. In the Hz input mode

Operation is basically the same as for the msec items, but Total is compensated in such a way that Freq is not changed.

(4) Output condition settings

These are for setting the output conditions.

NEGA/POSI	HS	For selecting the HS polarity.	
	VS	For selecting the VS polarity.	
	CS	For selecting the CS polarity.	(Not used)
	Clock	For selecting the clock.	(Not used)
	HD	For selecting the HD polarity.	(Not used)
	VD	For selecting the VD polarity.	(Not used)
	DISP	For selecting the DISP polarity.	
ON/OFF	HS	For selecting ON or OFF for HS.	
	VS	For selecting ON or OFF for VS.	
	CS	For selecting ON or OFF for CS.	(Not used)
	G/S	For selecting G/S.	(Not used)
	HD	For selecting ON or OFF for HD.	(Not used)
	VD	For selecting ON or OFF for VD.	(Not used)
	DISP	For selecting ON or OFF for DISP.	
	ON SYNC	For selecting ON or OFF for ON SYNC.	(Not used)
Other	CS SEL	For selecting CS or HS/HD.	(Not used)
	HS/HD	For selecting either HS or HD.	(Not used)
	LVDS 1CH	For selecting ON or OFF for LVDS 1CH.	
	LVDS 2CH	For selecting ON or OFF for LVDS 2CH.	
Level	Video Level	For setting the Video Level between 0.3 and 1.0V. (Not used)	
	Sync Level	For setting the Sync Level between 0.15 and 0.5V. (Not used)	
	SETUP (analog)	For selecting ON or OFF for SETUP (analog) . (Not used)	
	SETUP (digital)	For selecting ON or OFF for SETUP (digital) . (Not used)	

4.4.4. Menus

(1) [File] menu

Menu command	Function
Load	Loads data from a file.
Load Sample	Loads the sample data from a sample file.
Save	Saves the data in a file.
Save As	Changes the data filename and saves the data in that file.
Execute	Executes the display data.
Properties	Displays the file properties.
Print	Prints the display data.
Exit Timing Editor	Exits the program.

(2) [View] menu

Menu command	Function
Timing	Displays the timing data setting screen.
Output	Displays the output setting screen.
Error Window	Displays the error window.

(3) [Help] menu

Menu command	Function
Contents	Displays the help contents.
Index	Enables help topics to be searched.
About	Displays the version information.

4.4.5. Operating procedure

(1) Error window

The values of the data set are checked on this window.

If any values are outside the setting range, the error locations will be displayed on the error display screen.

• Either select the [Error Window] menu item on the [View] menu or select the

button from the tool buttons.

(2) Loading data

The data of the selected file can be loaded.

The same filename as at startup is retained.

• Either select the [Load] menu item on the [File] menu or select the button from the tool buttons.

(3) Loading sample data

The data can be loaded from the sample file in the sample directory.

The same filename as at startup is retained.

• Select the [Load Sample] menu item on the [File] menu.

(4) Saving data

The edited data can be saved in the file while overwriting the existing data in that file.

• Either select the [Save] menu item on the [File] menu or select the button from the tool buttons.

(5) Saving data as

A new filename can be created and the data saved in that file. The name on the sequence list of the sequence editor is also changed to the new filename. The source file which has now been created is saved in the source directory which was set when the sequence editor was started up.

• Either select the [Save As] menu item on the [File] menu or select the button from the tool buttons.

(6) Executing data

The data being edited can be sent to the VG and executed.

• Either select the [Execute] menu item on the [File] menu or select the button from the tool buttons.

Caution

This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(7) Printing the displayed data

The displayed data can be printed.

• Either select the [Print] menu item on the [File] menu or select the Print button from the tool buttons.

(8) Exiting the program

The program can be exited.

• Select the [Exit Timing Editor] menu item on the [File] menu.

• Select the "Exit" tool button.

4.5. Graphic editor

The graphic pattern editor program enables the rendition of images displayed on the VG to be edited using the graphical user interface.

4.5.1. Startup method

The graphic editor is started up from the sequence editor. Double-click on any graphic pattern data area on the source list (or sequence list) of the sequence editor.

Alternatively, start up the graphic editor by selecting "Graphic" from the dialog box which is started by "New--Timing" on the right-click menu or by selecting "Edit" on the right-click menu in the source list area.

When the graphic editor is started up, the graphic pattern data registered on the selected sequence list or the graphic pattern data displayed on the selected source list is loaded.

4.5.2. Window screen and names
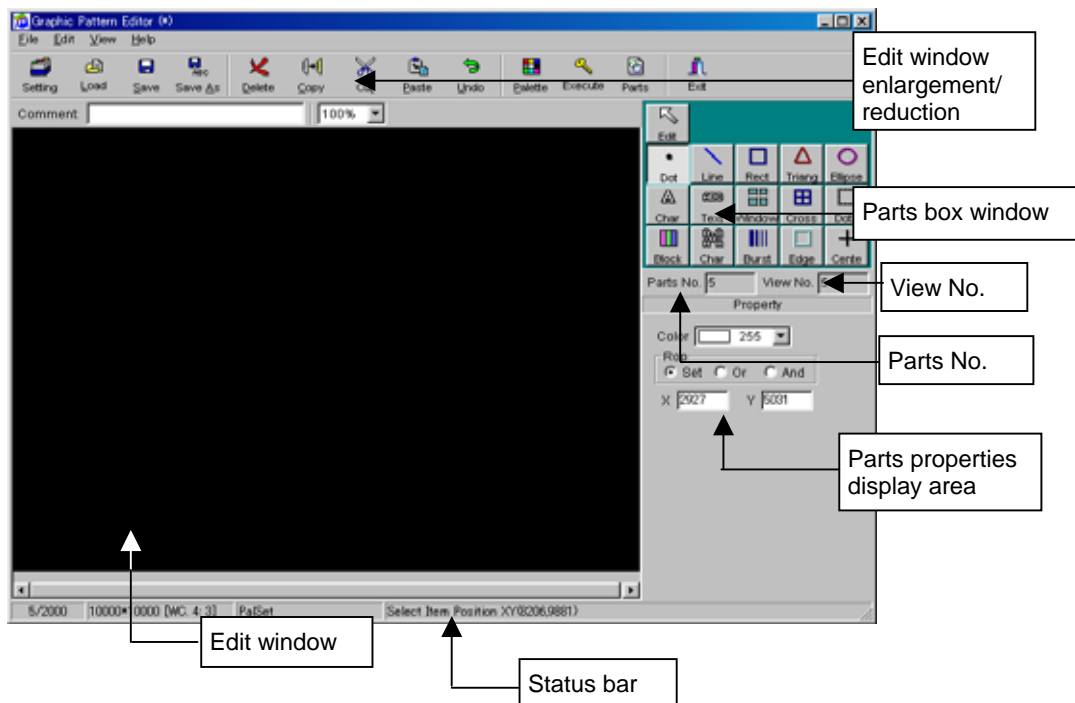
Fig. 4-5-1 Graphic pattern setting screen

Edit window enlargement/reduction

The display on the edit window can be enlarged or reduced. The magnification factor is 10, 20, 50, 75, 100, 150, 200, 400, 800% or 1:1 (original size).

Edit window

This is the area in which the parts are placed and the data is created. The screen size can be changed using Data Properties.
Either select the [Data Property] menu item on the [Edit] menu or select `Setting` button on the toolbar.

Parts box window

This is for displaying a list of the graphic parts.

When a part is selected (when the corresponding part is clicked) and clicked on the edit window, a graphic part is added.

Parts properties display area

This is for displaying the properties of the graphic part now being selected on the parts box window. The properties change depending on the part type, and are set as required.

Status bar

This is for displaying the number of parts, screen size, types of parts and cursor position.

Parts No.

This is for displaying the parts number.

The parts are numbered in the sequence in which they were added.

View No.

This is for displaying the sequence in which the parts are rendered.

The display numbers are normally in the sequence in which the parts were added, but they are changed when the parts are moved to the front of the screen or back of the screen.

4.5.3. Menus

(1) [File] menu

Load	Loads data from a file
Load Sample	Loads the sample data from a sample file.
Save	Saves the data in a file.
Save As	Changes the data filename and saves the data in that file.
Execute	Executes the display data.
Select Parts Save	Saves the selected parts.
Property	Displays the file properties.
Print	Prints the display data.
Print Invert	Prints the inverted display data.
Exit Gpc Editor	Exits the program.

(2) [Edit] menu

Undo	Undoes (restores) the last operation.
Copy	Copies the selected parts.
Cut	Cuts the selected parts.
Paste	Pastes the cut or copied parts.
Delete	Deletes the selected parts.
Group On	Groups together multiple selected parts.
Group Off	Ungroups parts.
Insert	Inserts the parts data of another file.
All Clear	Clears all the parts.
Data Property	Opens the pattern data properties dialog box.

(3) [View] menu

Palette View	Displays the palette settings.
Display Grid	Displays the grid.
Snap to Grid	Aligns the parts with the grid position.
Parts List	Displays the registered parts lists on the edit window.
Full View	Displays the edit window on the full screen.

(4) [Help] menu

Contents	Displays the help contents.
Index	Enables help topics to be searched.
About	Displays the version information.

(5) Right-click menu

When the mouse is right-clicked on the edit window while parts are being selected, the right-click menu appears.

Front Move	Moves the parts to the front of the screen.
Back Move	Moves the parts to the back of the screen.
Group On	Groups the parts together.
Group Off	Ungroups the parts.
Copy	Copies the parts.
Cut	Cuts the parts.
Paste	Pastes the parts.
Delete	Deletes the parts.

4.5.4. Operating procedure

(1) Loading data

The data of the selected file can be loaded.

• Either select the [Load] menu item on the [File] menu or select the [Load] button from the tool buttons.

Drive box

This is where the drive is designated.

It is selected on the drop-down list.

Directory box

This is where the directory is selected.

File list box

This is where the files (which are
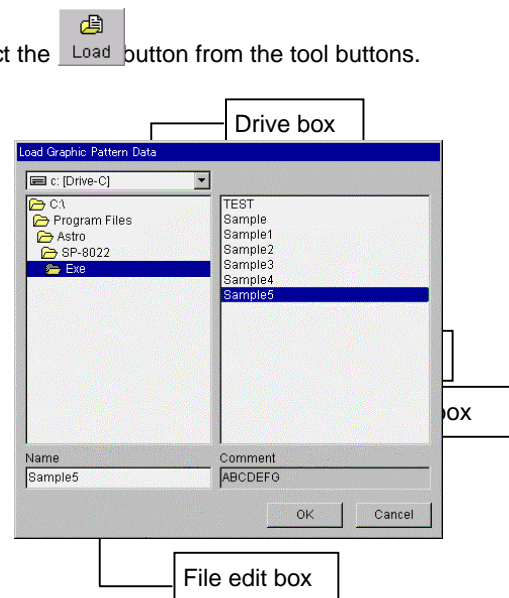
displayed without their extensions)

are selected.

Drive box

ox

File edit box

Fig. 4-5-2 File selection screen

File edit box

> This is where the filenames (which are
>
> displayed without their extensions) are input.

Comment edit box

> This is where the comments (which cannot be edited) are displayed.

(2) Loading sample data

Data can be loaded from a sample file in the sample directory. The same filename as at startup is retained.

(3) Saving data Save

The displayed data can be saved in a file.

When the program was started up from the source list of the sequence editor, the data is saved under the filename used at startup.

(4) Saving data as Save As

A new filename can be created and the data saved in that file.

The name on the source list of the sequence editor is also changed to the new filename.

(5) Exiting the program

The program can be exited.

When the program was started up from the source list of the sequence editor, the filename at exiting is registered on the source list.

(6) Deleting parts Delete

While selecting the part on the editing window, press [Ctrl] + [DEL] or select [Delete] on the [Edit] menu, or select the part concerned and select [Delete] on the right click menu.

(7) Copying parts Copy

The part being selected can be copied onto the clipboard or onto the place equivalent to the clipboard.

To proceed, select [Copy] on the [Edit] menu or select the part concerned and select [Copy] on the right click menu.

(8) Cutting parts Cut

The part being selected can be moved to the clipboard or to the place equivalent to the clipboard. To proceed, select [Cut] on the [Edit] menu or select the part concerned and select [Cut] on the right click menu.

(9) Pasting parts

The cut or copied data can be pasted on the edit window. This command cannot be used if no data has been cut or copied.

To proceed, select [Paste] on the [Edit] menu or select the part concerned and select [Paste] on the right click menu.

(10) Undoing (restoring the original)

The last operation conducted on the edit window can be undone.

Operations which can be undone include adding a part, deleting a part, editing the properties of a part, grouping parts together, ungrouping parts, positioning and all clear. Eight operations can be undone.

Select [Undo] on the [Edit] menu.

(11) Displaying the palette

The settings of the palette which was set by data properties can be displayed.
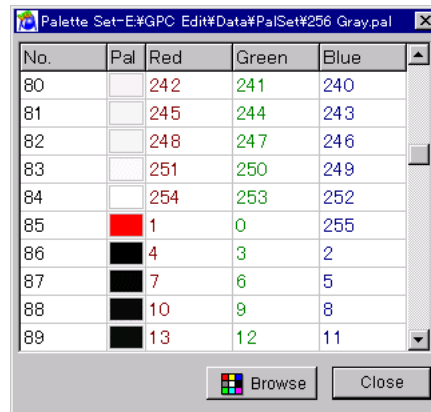
Fig. 4-5-3 Palette display screen

No.	The palette numbers are displayed here.
Pal	The palette colors are displayed here.
RGB	The elements (0 to 1023) of the colors configuring the palette are displayed here.
Browse button	This opens the palette data reference dialog box.

(12) Data properties   Setting

The pattern data properties (coordinate-related settings and palette selection) can be changed.
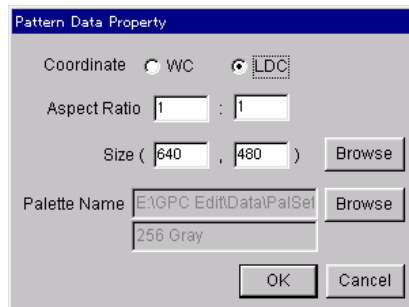

Fig. 4-5-4 Data property setting screen

WC (World Coordinate)	The aspect ratio of the screen must be set with a number 0 to 10000 for ranges X and Y, and this ratio is used to align the display image.
LDC (Logical Device Coordinate)	This is for designating the home point on the physical device when patterns are created.
Aspect Ratio	The aspect ratio is set here.
Size	The screen size is set here. The timing data reference dialog box opens when the Browse button is pressed.
Palette Name	The palette to be used is set here. The palette data reference dialog box opens when the Browse button is pressed.

(13) Executing data   Execute

What has been currently edited can be sent to the VG and drawn.

> **Caution**
> This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(14) Displaying the parts list 🔲 Parts

A list of the parts which have been registered can be displayed in the edit window.

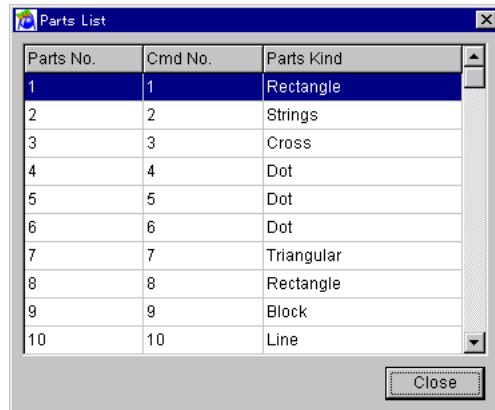When a parts list is selected, the corresponding parts on the edit window are selected.

Fig. 4-5-5 Parts list display screen

Parts Kind	The parts names are displayed here. When the item button is right-clicked, names can be masked by individual part.
Cmd No.	The command are displayed here. When the item button is right-clicked, the numbers can be changed in ascending or descending order.
Parts No.	The parts numbers are displayed here. When the item button is right-clicked, the numbers can be changed in ascending or descending order.

(15) Exiting the editor 🔲 Exit

The graphic editor is exited.

4.5.5. Parts preparation

(1) Clearing all parts
All the parts can be cleared and the edit window cleared.
Select the [All Clear] menu item on the [Edit] menu.

(2) Adding parts
A part can be selected from the parts box window and clicked on the edit window.

Dot	Dot	This is for drawing a dot.
Line	Line	This is for drawing a straight line.
Rect	Rectangle	This is for drawing a rectangle.
Triang	Triangle	This is for drawing a triangle.
Ellipse	Ellipse	This is for drawing an ellipse.
Chara	Character	This is for drawing a character.
Text	Character string	This is for drawing a character string.
Window	Window	This is for drawing a window.
Cross	Crosshatch pattern	This is for drawing a crosshatch pattern.
Dots	Dot pattern	This is for drawing a dot pattern.
Block	Block pattern	This is for drawing a block pattern.
Char	Character pattern	This is for drawing a character pattern.
Burst	Burst pattern	This is for drawing a burst pattern.
Edge	Edge mark pattern	This is for drawing an edge mark pattern (rectangle of the whole display area).
Cente	Center mark pattern	This is for drawing a center mark pattern (a cross in the center of the display area)

(3) Selecting parts

Select the [Edit] button on the parts box window.

When a part is clicked on the edit window, the part is set to the selected status, and detailed information is displayed in the properties display area.

Multiple parts can be selected by [Ctrl] + [click].

When a part is right-clicked while it is being selected, the right-click menu appears. The necessary command can now be executed by clicking.

(4) Editing parts

Moving, enlarging/reducing, changing the color and other editing operations can be performed by editing the properties in the properties display area.

Select the part on the edit window, and change the settings in the properties display area.

(5) Grouping parts and ungrouping parts

The parts grouping command groups multiple selected parts together. Grouped parts can be cut, copied, moved or deleted altogether.

Parts can be grouped together when the multiple parts are selected on the edit window and the [Group On] menu item on the [Edit] menu is selected. (They can also be grouped together using [Group On] on the right-click menu.)

To ungroup the parts, select the parts which have been grouped together, and select the [Group Off] menu item on the [Edit] menu.

(They can also be ungrouped using [Group Off] on the right-click menu.)

(6) Changing the parts drawing sequence

The parts drawing sequence can be rearranged using the right-click menu.

The parts move to the front of the screen when the parts are selected on the edit window and [Front Move] on the right-click menu is selected. They move to the back of the screen when [Back Move] is selected.

(7) Adding dots

1. Select the [Dot] button on the parts box window.
2. Set the properties in the parts properties display area.
3. A part is added when it is clicked on the edit window.
4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.

Fig. 4-5-6 Dot part setting screen

Color	The drawing color (palette No.) is set here.
Rop	The drawing mode (Set, Or, And) is set here.
X, Y	The XY coordinates (LDC or WC) are set here

(8) Adding lines

1. Select the Line button on the parts box window.
2. Set the properties in the parts properties display area.
3. A part is added when it is clicked on the edit window.
4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.

Fig. 4-5-7 Line part setting screen

Color	The drawing color (palette No.) is set here.
Rop	The drawing mode (Set, Or, And) is set here.
TX, TY	The XY coordinates (LDC or WC) for the start point are set here.
EX, EY	The XY coordinates (LDC or WC) for the end point are set here.

(9) Adding rectangles

1. Select the Rect button on the parts box window.
2. Set the properties in the parts properties display area.
3. A part is added when it is clicked on the edit window.
4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.

Fig. 4-5-8 Rectangles part setting screen

Color	The drawing color (palette No.) is set here.
Rop	The drawing mode (Set, Or, And) is set here.
Fill	Filling (filling or no filling) is set here.
Left, Top, Right, Bottom	The coordinates (LDC or WC) and the horizontal and vertical direction coordinates are set here.

(10) Adding triangles

1. Select the Triang button on the parts box window.
2. Set the properties in the parts properties display area.
3. A part is added when it is clicked on the edit window.
4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.
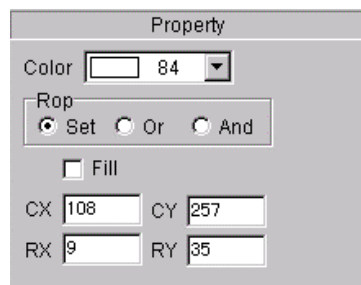
Fig. 4-5-9 Triangles part setting screen

Color	The drawing color (palette No.) is set here.
Rop	The drawing mode (Set, Or, And) is set here.
Fill	Filling (filling or no filling) is set here.
X1, Y1, X2, Y2 , X3, Y3	The triangular coordinates as the XY coordinates (LDC or WC) are set here.

(11) Adding ellipses

1. Select the Ellipse button on the parts box window.
2. Set the properties in the parts properties display area.
3. A part is added when it is clicked on the edit window.
4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.
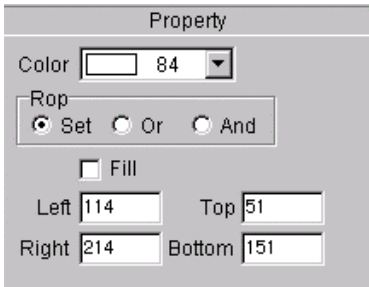
Fig. 4-5-10 Ellipses part setting screen

Color	The drawing color (palette No.) is set here.
Rop	The drawing mode (Set, Or, And) is set here.
Fill	Filling (filling or no filling) is set here.
CX, CY	The XY coordinates (LDC or WC) for the center are set here.
RX, RY	The XY coordinates (LDC or WC) for the radius are set here.

(12) Adding characters

1. Select the [Chara] button on the parts box window.
2. Set the properties in the parts properties display area.
3. A part is added when it is clicked on the edit window.
4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.
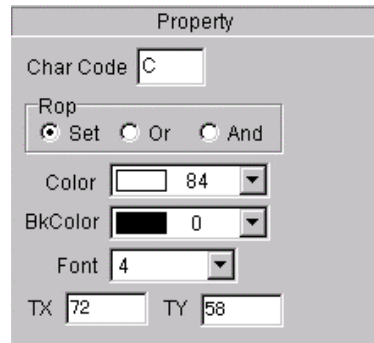
Fig. 4-5-11 Characters part setting screen

Char Code	The character code is input here. ('C': default)
Rop	The drawing mode (Set, Or, And) is set here.
Color	The drawing color (palette No.) is set here.
BkColor	The character background color (palette No.) is set here.
Font	The font size is set here.
TX, TY	The XY coordinates (LDC or WC) for the start point are set here.

(13) Adding character strings

1. Select the [ABC Text] button on the parts box window

2. Set the properties in the parts properties display area.

3. A part is added when it is clicked on the edit window.

4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.

Fig. 4-5-12 Characters Strings part setting screen

Alignment	Left- or right-justifying the character strings is set here.
Rop	The drawing mode (Set, Or, And) is set here.
Color	The drawing color (palette No.) is set here.
BkColor	The character background color (palette No.) is set here.
TX, TY	The XY coordinates (LDC or WC) for the start point are set here.
h_cell, v_cell	The character interval (h_cell) and line interval (v_cell) are set here.
Edit Box	The character strings are input here. Up to 256 digits can be input.

(14) Adding windows

1. Select the [Window] button on the parts box window.

2. Set the properties in the parts properties display area.

3. A part is added when it is clicked on the edit window.

4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.

Caution

Multiple windows cannot be drawn. To draw a window at a new position, either change or delete the window which has been drawn.
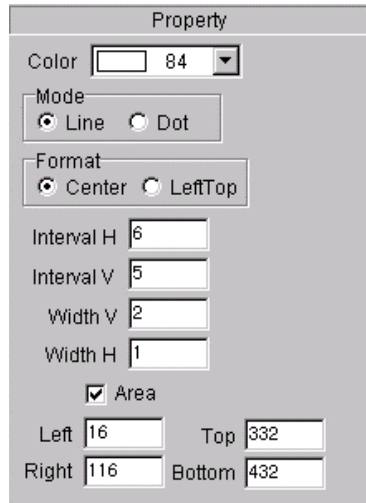
Fig. 4-5-13 Windows part setting screen

Set	The drawing operation is set here.
Left, Top, Right, Bottom	The coordinates (LDC or WC) and the horizontal and vertical direction coordinates are set here.

(15) Adding crosshatch patterns

1. Select the ⊞ Cross button on the parts box window.

2. Set the properties in the parts properties display area.

3. A part is added when it is clicked on the edit window.

4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.


Fig. 4-5-14 Crosshatch Patterns part setting screen

Color	The drawing color (palette No.) is set here.
Mode	The display mode (line number designation or dot designation) is set here.
Format	The display method (from the center or from the top left) is set here.
Interval H, Interval V	The horizontal and vertical intervals (number of lines with the line designation or line interval with the dot designation) are set here.
Width H, Width V	The horizontal and vertical line widths are set here.
Area	The display area (whole display area or limited area designation) is set here.
Left, Top, Right, Bottom	The coordinates (LDC or WC) and the horizontal and vertical direction coordinates are set here.

(16) Adding dot patterns

1. Select the [Dots] button on the parts box window.

2. Set the properties in the parts properties display area.

3. A part is added when it is clicked on the edit window.

4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.
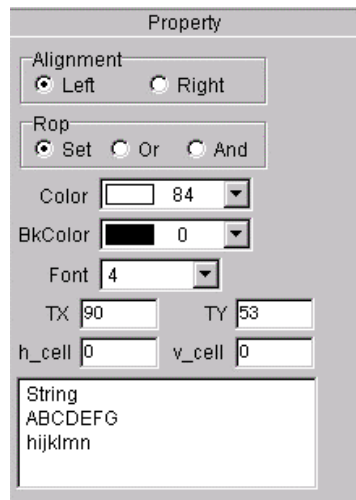
Fig. 4-5-14 Dot Patterns part setting screen

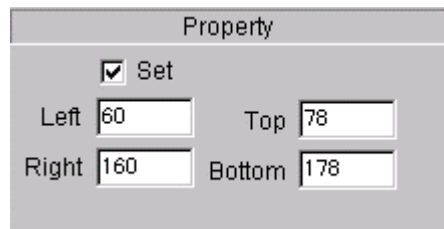| Color	The drawing color (palette No.) is set here.
Area	The display area (whole display area or limited area designation) is set here.
Mode	The display mode (line number designation or dot designation) is set here.
Format	The display method (from the center or from the top left) is set here.
Interval H, Interval V	The horizontal and vertical intervals (number of lines with the line designation or line interval with the dot designation) are set here.
Size	The dot size (diameter) is set here.
Figure	The dot shape (round or square) is set here. (Square when a check mark is used.)
Left, Top, Right, Bottom	The coordinates (LDC or WC) and the horizontal and vertical direction coordinates are set here.

(17) Adding block patterns

1. Select the ▐▐ Block button on the parts box window.

2. Set the properties in the parts properties display area.

3. A part is added when it is clicked on the edit window.

4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.

Fig. 4-5-15 Block Patterns part setting screen

Area	The display area (whole display area or limited area designation) is set here.
Mode	The display mode (line number designation or dot designation) is set here.
Dir	The display direction is set here. (Horizontal, vertical, horizontal & V, vertical & H, top left → bottom right, bottom left → top right, top right → bottom left, bottom right → top left)
Interval H, Interval V	The horizontal and vertical intervals (number of lines with the line designation or line interval with the dot designation) are set here.
Color Detail	The display colors are designated here. Up to 256 colors can be designated.
Left, Top, Right, Bottom	The coordinates (LDC or WC) and the horizontal and vertical direction coordinates are set here.

(18) Color detail

This is used to designate the display colors.

Up to 1024 colors can be designated.

Pattern Select

This is used to set the colors

individually.

Multi Select

This is used to select and set a

range of colors.
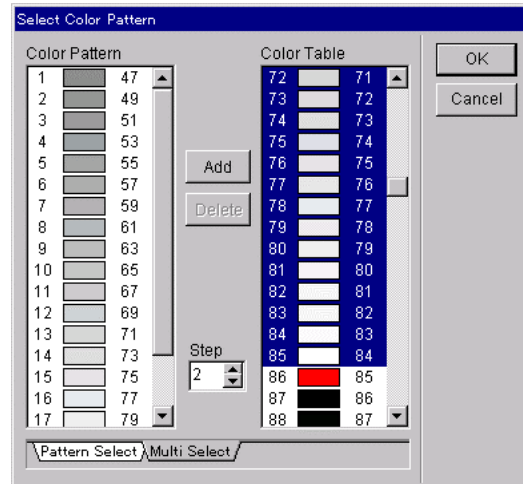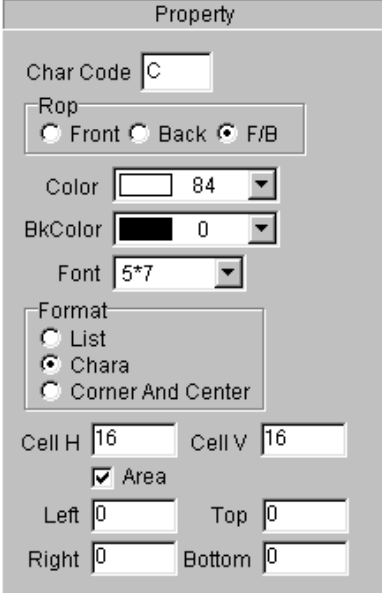
Fig. 4-5-16 Color detail setting screen

Color Pattern	This is where the colors (actually used) which were added from the color table are displayed.
Color Table	This is where the colors (1 to 1023) of the palette which has been set using the data properties is displayed.
Add	This is for adding colors.
Delete	This is for deleting the added colors.
Step	This is for setting the number of colors to be stepped by Color Pattern.
Arrow	This is for moving the colors selected by Color Pattern up or down.

(19) Adding character patterns

1. Select the [Char] button on the parts box window.

2. Set the properties in the parts properties display area.

3. A part is added when it is clicked on the edit window.

4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.

Fig. 4-5-17 Character patterns part setting screen

| Char Code	The character code is input here. ('C': default)
Rop	The drawing mode (Set, Or, And) is set here.
Color	The drawing color (palette No.) is set here.
BkColor	The character background color (palette No.) is set here.
Font	The font size is set here.
Format	The character format (list, character, corner & center) is set here.
Cell H, Cell V	The character interval (cell H) and line interval (cell V) are set here.
Area	The display range (whole display area or area designation) is set here.
Left, Top, Right, Bottom	The coordinates (LDC or WC) and the horizontal and vertical direction coordinates are set here.

(20) Adding burst patterns

1. Select the **Burst** button on the parts box window.

2. Set the properties in the parts properties display area.

3. A part is added when it is clicked on the edit window.

4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.
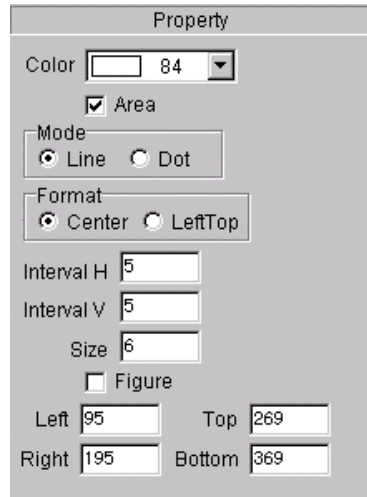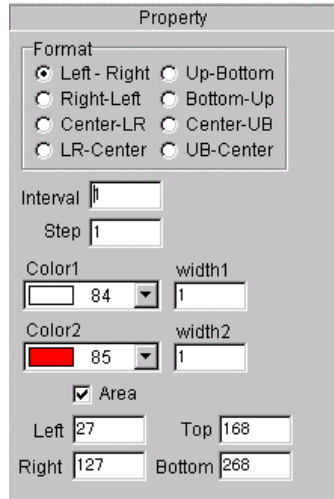

Fig. 4-5-18 Burst patterns part setting screen

Format	The display format is set here. (Left→right, right→left, center→left/right, left/right→center, up→down, down→up, center→up/down, up/down→center)
Interval	The number of lines (0 to 255) to be repeated for the same line width is set here.
Step	The line width increment (0 to 255) is set here.
Color1, width1	The #1 display color (palette No.) and line width (0 to 255) are set here.
Color2, width2	The #2 display color (palette No.) and line width (0 to 255) are set here.
Len H, Len V	The horizontal and vertical line lengths are set here. When the figures are changed, the line lengths change.
Left, Top, Right, Bottom	The coordinates (LDC or WC) and the horizontal and vertical direction coordinates are set here.

(21) Adding edge marks

1. Select the [Edge] button on the parts box window.
2. Set the properties in the parts properties display area.
3. A part is added when it is clicked on the edit window.
4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.
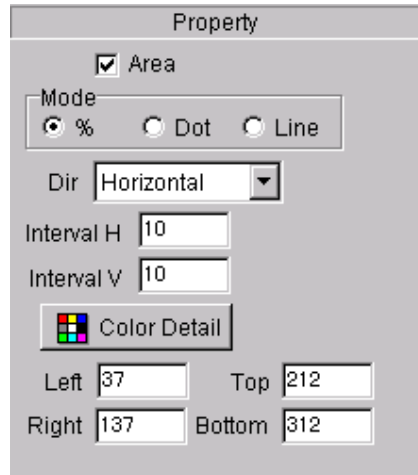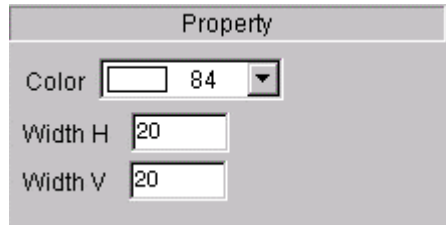

Fig. 4-5-19 Edge marks part setting screen

Color	The drawing color (palette No.) is set here.
Width H, Width V	The horizontal and vertical line widths are set here.

(22) Adding center marks

1. Select the [Cente] button on the parts box window.
2. Set the properties in the parts properties display area.
3. A part is added when it is clicked on the edit window.
4. To change the properties of a part which has already been added, select the part to be edited, and change the properties in the parts properties display area.
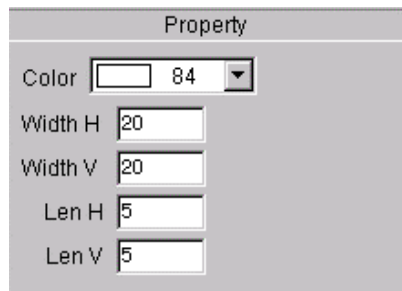
Fig. 4-5-20 Center marks part setting screen

Color	The drawing color (palette No.) is set here.
Width H, Width V	The horizontal and vertical line widths are set here.
Len H, Len V	The horizontal and vertical line lengths are set here. When the figures are changed, the line lengths change.

(23) Saving selected parts

Selected parts (including the selections of multiple parts) can be saved in a file.

• Select the [Select Parts Save] menu item on the [File] menu.

To load selected parts, use the inserting parts function.

(24) File properties

The file properties (file type, size, properties, etc.) can be displayed.

• Select the [Property] menu item on the [File] menu.

(25) Inserting parts

Selected parts which were saved can be loaded.

• Select the [Insert] menu item on the [Edit] menu.

(26) Displaying the grid

The positioning grid on the edit window can be displayed.

• Select the [Grid View] menu item on the [View] menu.

(27) Positioning the grid

The parts positions can be aligned with the grid.

• Select the [Grid Positioning] menu item on the [View] menu.

(28) Displaying the full screen

The edit window on the full screen can be displayed.

• Select the [Full View] menu item on the [View] menu.

4.6. Optional pattern editor

This section describes how to set the optional pattern data (referred to henceforth as the "optional patterns") of the programmable video signal generator (referred to henceforth as the "VG"). The program enables optional patterns to be edited in Windows and edited palette data to be sent to the VG and executed.

4.6.1. Startup method

The option editor is started up from the sequence editor. Double-click on any option pattern data area on the source list (or sequence list) of the sequence editor.

Alternatively, start up the option editor by selecting "Option" from the dialog box which is started by "New--Pattern" on the right-click menu or by selecting "Edit" on the right-click menu in the source list area.

When the option editor is started up, the option data registered on the selected sequence list or the option data displayed on the selected source list is loaded.

When the option editor is started up, the option data registered on the selected sequence list or the option data displayed on the selected source list is loaded.

4.6.2. Window screen and names
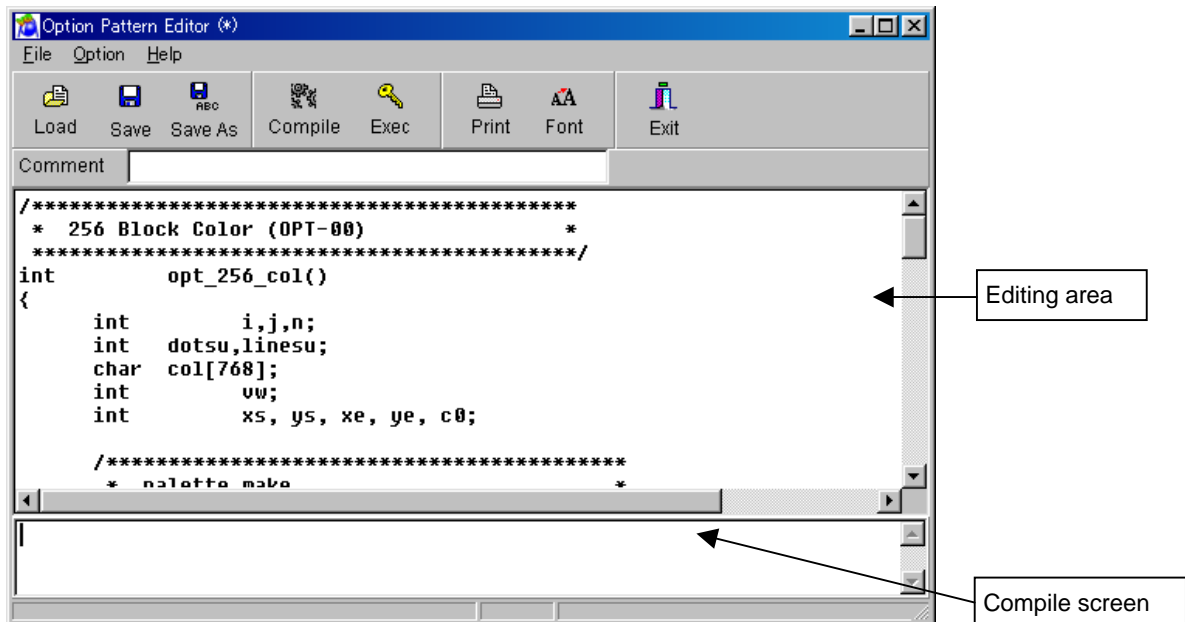
Fig. 4-6-1 Option pattern setting screen

Editing area

The source codes (*.mc files) of the optional patterns are created, revised and displayed on this screen.

Compile

This is for compiling the source codes of the optional patterns and creating the optional pattern data which is the intermediate language.

Compile screen

The messages accompanying the compiling operations appear on this screen.

4.6.3. Optional pattern data

This is the data which is created in the form of an intermediate language from compiling the source codes of the optional patterns and which can be used by the VG. It is the data that is sent to and received from the VG.

4.6.4. Menus

(1) [File] menu

Menu command	Function
Load	Loads data from a file.
Load Sample	Loads the sample data from a sample file.
Save	Saves the data in a file.
Save As	Changes the data filename and saves the data in that file.
Compile	Compiles the data which has been saved.
Execute	Executes the display data.
Properties	Displays the file properties.
Print	Prints the display data.
Exit Option Pattern Editor	Exits the program.

(2) [Option] menu

Menu command	Function
Font	Changes the font which displays the source codes.

(3) [Help] menu

Menu command	Function
Contents	Displays the help contents.
Index	Enables help topics to be searched.
About	Displays the version information.

4.6.5. Operating procedure

(1) Creating optional patterns

1. Write the source codes in the editing area. (Alternatively, load a *.mc file which has been created (load the optional source code.). For details on creating optional patterns, refer to "Chapter 5 How to create user optional patterns" or make_opt.txt or Help on creating optional patterns.

2. Save the source code which was written in the editing area in the file,

and proceed with compiling. Select the Compile button.

Alternatively, simply press the Compile button without saving the source code. The save dialog box now opens. Unless a new file is involved, the data will be saved in the file by overwriting the existing data so press the OK button.

3. Compiling is completed normally when the "Compile OK." message appears on the compile screen. The optional pattern language, which is an intermediate language, has now been created from the source codes.

(2) Changing the font

The font can be changed. The font change dialog box appears. The new setting is saved and used from the next time also. Only the printing font and display font in the editing area are affected by this setting.

• Either select the [Font] menu item on the [Option] menu or select the Font button from the tool buttons.

(3) Loading data

The data of a selected file can be loaded.

The same filename as at startup is retained.

• Either select the [Load] menu item on the [File] menu or select the Load button from the tool buttons.

(4) Loading sample data

Data can be loaded from the sample file in the sample directory. The same filename as at startup is retained.

• Select the [Load Sample] menu item on the [File] menu.

(5) Saving data

Edited data can be saved in a file while overwriting the existing data in that file.

• Either select the [Save] menu item on the [File] menu or select the Save button from the tool buttons.

(6) Saving data as

A new filename can be created and the data saved in that file. The name on the sequence list of the sequence editor is also changed to the new filename. The source file which has now been created is saved in the source directory which was set when the sequence editor was started up.

• Either select the [Save As] menu item on the [File] menu or select the Save As button from the tool buttons.

(7) Executing data

The data being edited can be sent to the VG and executed.

• Either select the [Execute] menu item on the [File] menu or select the Exec button from the tool buttons.

Caution

This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(8) Printing the display data

The display data can be printed.

• Either select the [Print] menu item on the [File] menu or select the Print button from the tool buttons.

(9) Exiting the program

The step below is followed to exit the program.

• Select the [Exit Option Editor] menu item on the [File] menu.

• Select the "Exit" tool button.

4.7. Image converter

This section describes how to set the image data of the programmable video signal generator (referred to henceforth as the "VG"). Using this program, BMP data and JPG data can be converted into VBM data in Windows, executed by the VG and saved in files.

4.7.1. Startup method

The graphic editor is started up from the sequence editor. Double-click on any VBM pattern data area on the source list (or sequence list) of the sequence editor.

Alternatively, start up the graphic editor by selecting "Bitmap" from the dialog box which is started by "New--Pattern" on the right-click menu or by selecting "Edit" on the right-click menu in the source list area.

When the graphic editor is started up, the image data registered on the selected sequence list or the image data displayed on the selected source list is loaded.

4.7.2. Concerning graphic data

BMP data:

An image format (extension *.bmp) often handled in Windows

JPG data:

Another image format (extension *.jpg) often handled in Windows

VBM data:

BMP data and JPG data cannot be used by the VG. It must be changed into data which is supported by the VG.

The image conversion program converts the BMP data and JPG data into VBM data (extension *.vbm) supported by the VG.

4.7.3. Window screen and names

Fig. 4-7-1 Image data display screen

Filename

    This is where the name of the file containing the image data now displayed is indicated.

Image data display area

    This is where the selected image data is displayed.

Image type

    This is where the type (VBM, BMP or JPG) of the image data now displayed is indicated.

Image size

    This is where the size of the image data now displayed is indicated.

Color count

    This is where the number of colors of the image data now displayed is indicated.

4.7.4. Operating procedure

(1) Converting data

Load the data from the BMP files, JPG files or VBM files or load the sample data. The data in the BMP files and JPG files will have been converted into VBM data by the time it is displayed on the image converter.

When a BMP data file or JPG data file is loaded by the image converter, the data is first converted into VBM data before it is displayed. When it is saved as it stands, it will be saved as a VBM data file.

(2) Loading data

The selected image file can be converted into VBM data and loaded. The same filename as at startup is retained.

• Select the Load button from the tool buttons.

(3) Saving data as

A new filename can be created and the data saved in that file. The name on the sequence list of the sequence editor is not changed to the new filename. The source file which has now been created is saved in the source directory which was set when the sequence editor was started up.

• Select the Save As button from the tool buttons.

(4) Executing data

The image data displayed can be sent to the VG and executed.

• Select the Execute button from the tool buttons.

> **Caution**
> This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(5) Printing display data

The display data can be printed.

• Select the Print button from the tool buttons.

(6) Exiting the program

The step below is followed to exit the program.

• Select the Close button from among the tool buttons.

4.8. Palette set editor

This sections describes how to set the palette set data (referred to henceforth as "palette data") of the programmable video signal generator (referred to henceforth as the "VG"). VG palette editing is possible in Windows using this program.

4.8.1. Start Up method

The palette set editor is started up from the sequence editor. Double-click on any palette data area on the source list (or sequence list) of the sequence editor.

Alternatively, start up the palette set editor by selecting "New--Paletset" or "Edit" on the right-click menu in the source list area.

When the palette set editor is started up, the palette data registered on the selected sequence list or the palette data displayed on the selected source list is loaded.

4.8.2. Window screen and names
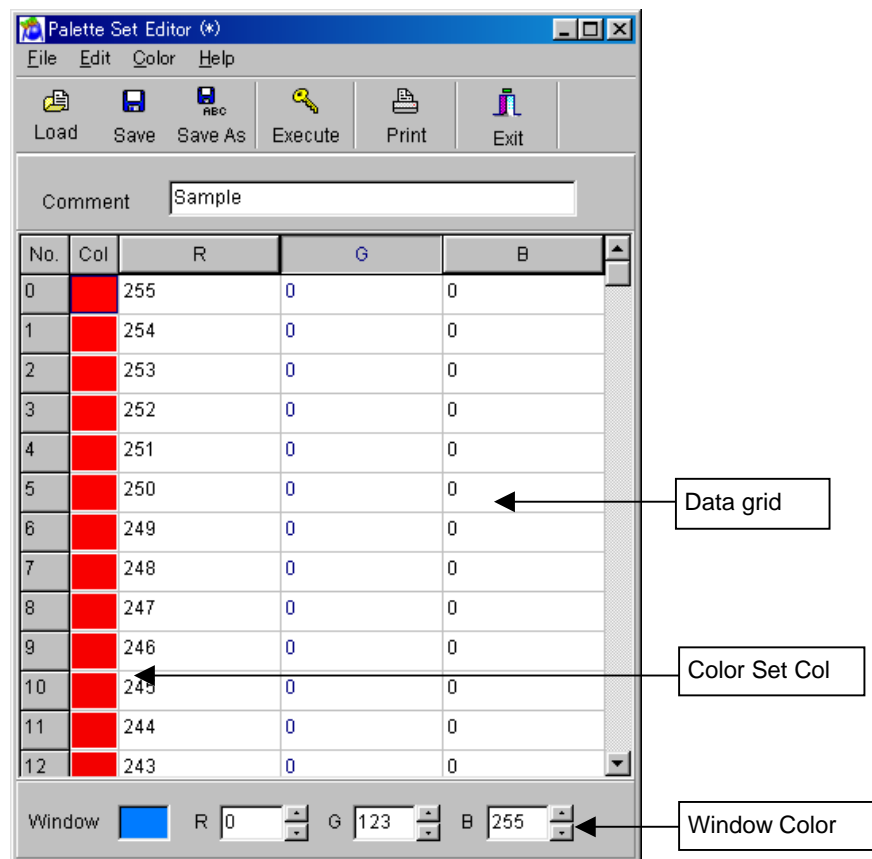
Fig. 4-8-1 Palette display screen

Data grid

This is for setting the palette RGB data.

Color setting Col

The colors which are to be shown by the data of the RGB cell in the same row are displayed here. When the cell is clicked, the color setting dialog box appears, and the color data selected in the dialog box is set to the RGB cell in the same row.

Window Color

This is for setting the background color of the VG's window.

4.8.3. Data setting ranges

The RGB data setting range is 0 to 255. A value from 0 to 255 is also set for the window color RGB data.

4.8.4. Menus

(1) [File] menu

Menu command	Function
Load	Loads data from a file.
Load Sample	Loads the sample data from a file.
Save	Saves the data in a file.
Save As	Changes the data filename and saves the data in that file.
Execute	Executes the display data.
Properties	Displays the file properties.
Print	Prints the display data.
Exit Palette Set Editor	Exits the program.

(2) [Edit] menu

Menu command	Function
Color Set	Captures the color data values from the Windows [Color setting] dialog box. Move the cursor to the cell with the data to be changed, and select Color Set. The Windows color setting dialog box now appears. Select the color to which it is to be changed. The color indicated on the Col display and the color data of the selected cell are changed.
Data Change	Selects the data line (RGB) to which the change is to be made when any of the [Color] menu commands are used. These commands cannot be used if Data Change has not been selected.
Toggle All Select/ No Select	Sets all the RGB data to the selected status (the characters turn a dark blue color) if no data has been selected; releases the selection status if there is a data line (RGB) which has been selected.

(3) [Color] menu

To select any [Color] menu commands except All Clear, select [Toggle All Select/No Select] on the [Edit] menu.

(First, click the RGB title button on the grid, and select the row in which the data is to be set.)

Menu command	Function
Positive	Sets the data for the selected data line (RGB) to a positive pattern.
Negative	Sets the data for the selected data line (RGB) to a negative pattern.
Posterize	Sets the data for the selected data line (RGB) to a gradation up to 256 colors.
Gamma	Sets the data for the selected data line (RGB) to gamma data.
Liner	Sets the data for the selected data line (RGB) by applying an equation (y= ax + b) expressing a straight line.
Liner 2	Sets the data for the selected data line (RGB) to data which is incremented or decremented by the difference between two points designated on the plane.
Fill	Sets the data for the selected data line (RGB) to the same data which has been set.
All Clear	Clears all the data to zero.

(4) [Help menu]

Menu command	Function
Contents	Displays the help contents.
Index	Enables help topics to be searched.
About	Displays the version information.

4.8.5. Operating procedure

(1) Creating data

Set the 10-bit RGB color data (0 to 1023) from No. 0 to 1023 on the grid. After either selecting [Toggle All Select/No Select] on the [Edit] menu or clicking R, G and B of [RGB title Row] to set [RGB Data Grid] to the selection status, select a command from the [Color] menu, and input the data.

(2) Loading data

The data of the selected file can be loaded. The same filename as at startup is retained.

• Either select the [Load] menu item on the [File] menu or select the ⬚ Load buttons from the tool buttons.

(3) Loading sample data

Data can be loaded from the sample file in the sample directory.

• Select the [Load Sample] menu item on the [File] menu.

(4) Saving data

The edited data can be saved in a file while overwriting the existing data in that file.

• Either select the [Save] menu item on the [File] menu or select the ⬚ Save button from the tool buttons.

(5) Saving data as

A new filename can be created and the data saved in that file. The name on the sequence list of the sequence editor is also changed to the new filename. The source file created is saved in the source directory which was set when the sequence editor was started up.

• Either select the [Save As] menu item on the [File] menu or select the ⬚ Save As button from the tool buttons.

(6) Executing data

The data being edited can be sent to the VG and executed.

• Either select the [Execute] menu item on the [File] menu or select the ⬚ Execute button from the tool buttons.

Caution

This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(7) Printing display data

The display data can be printed.

• Either select the [Print] menu item on the [File] menu or select the ⬚ Print button from the tool buttons.

(8) Exiting the program

The step below is followed to exit the program.

• Select the [Exit Palette Set Editor] menu item on the [File] menu or select the ⬚ Exit button from among the tool buttons.

4.9. Action editor

This section describes how to set the action data of the programmable video signal generator (referred to henceforth as the "VG"). This program enables VG action data to be edited in Windows and edited action data to be sent to the VG and executed.

4.9.1. Startup method

The action editor is started up from the sequence editor. Double-click on any action data area on the source list (or sequence list) of the sequence editor.

Alternatively, start up the action editor by selecting "New--Action" or "Edit" on the right-click menu in the source list area.

When the action editor is started up, the action data registered on the selected sequence list or the action data displayed on the selected source list is loaded.

4.9.2. Window screen and name
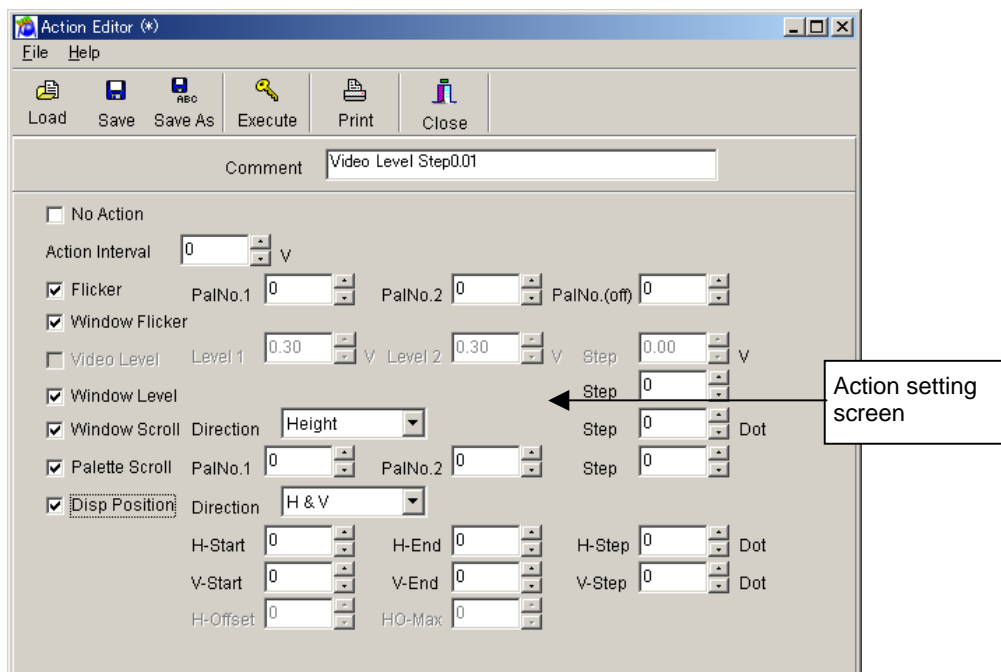
Fig. 4-9-1 Action display screen

Action setting screen

The action data is set on this screen.

4.9.3. Data setting ranges

Action Interval		0 to 9999 V
Flicker		ON/OFF
	PalNo. 1	0 to 255
	PalNo. 2	0 to 255
	PalNo. (off)	0 to 255
Window Flicker		ON/OFF
Video Level	Level 1	(It uncorresponds in VG-863.)
	Level 2	(It uncorresponds in VG-863.)
	Step	(It uncorresponds in VG-863.)
Window Level		ON/OFF
	Step	-128 to 127
Window Scroll		ON/OFF
	Direction	Height, Width, Left, Right, Up, Down, Left Up, Left Down, Right Up, Right Down
	Step	0 to 255 dots
Palette Scroll		ON/OFF
	PalNo. 1	0 to 255
	PalNo. 2	0 to 255
	Step	-128 to 127
Disp Position		ON/OFF
	Direction	H&V, H...H → V, V...V → H
	H-Start	0 to 8184 Note 1)
	H-End	0 to 8184 Note 1)
	H-Step	-8184 to 8184 dots Note1)
	V-Start	0 to 4095
	V-End	0 to 4095
	V-Step	-4095 to 4095 dots

Note 1: Only multiples of 8 can be input as data. Otherwise, the data will be rounded up or rounded down.

Note 2: When the display cannot be rounded off to the nearest increment of 4 dots, the scroll function rounds up the fractions for scrolling.

Example: When Disp is 41 dots

Scrolling takes the form of graphic 41 dots + black 3 dots.

4.9.4.Menus

(1) [File] menu

Menu command	Function
Load	Loads data from a file.
Load Sample	Loads the sample data from a file.
Save	Saves the data in a file.
Save As	Changes the data filename and saves the data in that file.
Execute	Executes the display data.
Properties	Displays the file properties.
Print	Prints the display data.
Exit Action Editor	Exits the program.

### (2) [Help] menu

Menu command	Function
Contents	Displays the help contents.
Index	Enables help topics to be searched.
About	Displays the version information.

4.9.5. Operating procedure

(1) Selecting the action type

Data for no other action type can be set when the "No Action" is selected for the action type. To set the data, select the action type of the setting items. The data items which can be set are now enabled.

No Action	The action data is not set.
Flicker	This causes the palettes from PalNo. 1 to PalNo. 2 to flicker at the designated intervals (V number). PalNo. (off) selects the palettes when the display is OFF.
Window Flicker	The window display is turned ON and OFF at the designated intervals (V number).
Video Level	This causes the video (DAC) output level to be changed from Level 1 to Level 2 at the designated step and at the designated intervals (V number).
Window Level	This causes the window level to be changed at the designated step and at the designated intervals (V number). The window level is changed by the palette set data. It changes at a step from 0 to 255 based on the window color of the palette set data.
Window Scroll	This causes the window to move in the designated direction at the designated step and at the designated intervals (V number).
Palette Scroll	This causes the palettes from PalNo. 1 to PalNo. 2 to be scrolled (rotated) at the designated step and at the designated intervals (V number).
Disp Position	This causes the display position to move in the designated direction at the designated step and at the designated intervals (V number).

1. When H&V is selected:

The display position is moved at the designated step from Start to End for both H and V. Designate V_Step=0 if it is to be moved only horizontally; designate H_Step=0 if it is to be moved only vertically.

2. When H→H is selected:

The display position is repeatedly moved at the designated step from H_Start to H_End horizontally.

3. When V→V   is selected:

The display position is repeatedly moved at the designated step from V_Start to V_End vertically.

(2) Loading data

The data of the selected file can be loaded.

The same filename as at startup is retained.

• Either select the [Load] menu item on the [File] menu or select the Load button from the tool buttons.

(3) Loading sample data

Data can be loaded from the sample file in the sample directory. The same filename as at startup is retained.

• Select the [Load Sample] menu item on the [File] menu.

(4) Saving data

The edited data can be saved in a file while overwriting the existing data in that file.

• Either select the [Save] menu item on the [File] menu or select the Save button from the tool buttons.

(5) Saving data as

A new filename can be created and the data saved in that file. The name on the sequence list of the sequence editor is also changed to the new filename. The source file created is saved in the source directory which was set when the sequence editor was started up.

• Either select the [Save As] menu item on the [File] menu or select the Save As from the tool button.

(6) Printing display data

The data which is being edited can be printed.

• Either select the [Print] menu item on the [File] menu or select the Print button from the tool buttons.

(7) Executing data

The data being edited can be sent to the VG and executed.

• Either select the [Execute] menu item on the [File] menu or select the Exec button from the tool buttons.

Caution

This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(8) Exiting the program

The step below is followed to exit the program.

• Select the [Exit Action Editor] menu item on the [File] menu or select the Exit button from among the tool buttons.

4.10. DDC editor

How to set the DDC data of the programmable video signal generator (referred to henceforth as the "VG") is described in this section. This program enables the DDC data of the monitor that supports DDC to be sent, received and edited in Windows.

4.10.1. Startup method

In Windows 98 or 2000, select [Start] - [Programs] - [SP-8028] - [DDC Editor], and start [DDC Editor].
The DDC editor starts up with nothing displayed on the screen.

4.10.2.Window screen and names
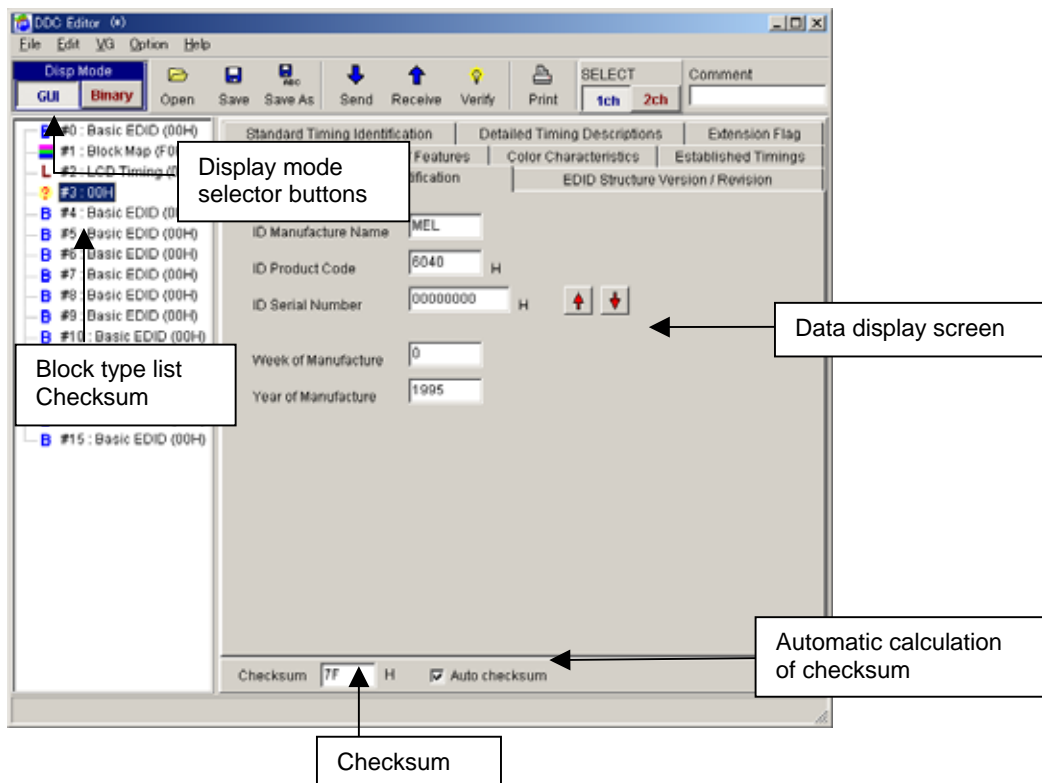
Fig. 4-10-1 DDC display screen

DispMode selector buttons

These are used to select the GUI display mode and binary display mode.

• GUI display mode

The data is displayed on the screen in an easy to read graphical format suitable for the block type concerned. For block types which are not supported, the data is displayed in a binary format.

• Binary display mode

The data is displayed in a 128-byte binary format.

Digital and analog selector buttons

These are used to switch between digital and analog.

Block type list

A list of the block types appears here, and the block number and block type (block code of first byte) are displayed for one block.

Data display screen

The data of the block selected on the block type list at the left is displayed here.

Checksum

The checksum value is displayed here.

The checksum is the value of the last byte in the block.

When "Auto checksum" is checked, the checksum is automatically updated each time the data is changed.

Auto checksum (automatic calculation of checksum)

When this is checked, the checksum value is automatically updated each time the data is changed.

4.10.3. Menus

(1) [File] menu

Menu command	Function
New	Creates a new data file.
Open	Opens a file.
Load One-Block	Loads the data from a file in block increments.
Save	Saves the data in a file.
Save As	Changes the data filename and saves the data in that file.
Close	Closes a file.
Properties	Displays the file properties.
Print	Prints the display data.
Exit DDC Editor	Exits the program.

(2) [Edit] menu

Menu command	Function
Insert-up Block	Forward inserts a new block.
Insert-down Block	Backward inserts a new block.
Delete Block	Deletes a block.
Copy Block	Copies a block.
Move Block	Moves a block.
Change Block Type	Changes the block type.

(3) [VG] menu

Menu command	Function
Send to VG	Sends the DDC data being edited to the monitor.
Receive from VG	Receives the DDC data from the monitor.
Verify	Compares the contents of the monitor ROM with the DDC data being edited.

(4) [Option] menu

Menu command	Function
Binary Byte (1 byte)	Displays the data that is delimited byte by byte when the data is displayed in the binary format.
binary Short (2 byte)	Displays the data that is delimited every other byte when the data is displayed in the binary format.
Binary Long (4 byte)	Displays the data that is delimited every 4 bytes when the data is displayed in the binary format.
DDC2B	Communicates using DDC2B.
DDC1	Communicates using DDC1.

(5) [Help] menu

Menu command	Function
Contents	Displays the help contents.
Index	Enables help topics to be searched.
About	Displays the version information.

4.10.4.Operating procedure

(1) Creating new DDC data

1. Click [New] on the [File] menu.

The dialog box for selecting the number of blocks to be created (ROM size of monitor) now appears.

2. Select the number of blocks to be created in accordance with the ROM size of the monitor, and press the [OK] button. The specified number of blocks are created. The initial value for all the data is 0.

Point

The number of blocks can be changed even after new data has been created

(2) Opening a file

A file which has been saved can be opened and the DDC data loaded into it.

1. Select the [Open] menu item on the [File] menu or select the [Open] button from among the tool buttons.

2. Select the file, and press the [OK] button.

3. The selected file is now opened, and the DDC data is displayed.

(3) Loading data in a specific block from a file

DDC data in a specified block can be loaded from a file.

1. Select the block whose DDC data is to be loaded.

2. Click [Load One-Block] on the [File] menu.

The file selection dialog box appears.

3. Select the file, and press the [OK] button.

Next, the block selection dialog box appears.

4. Select the block whose data is to be loaded, and press the [OK] button.

5. The DDC data in the selected block is loaded and displayed.

(4) Editing the DDC data

The block type is decided on first, and then the data is edited.

1. Decide on the block type.

Select the block to be edited, and then click [Change Block Type] on the [Edit] menu.

The block type selection dialog box now appears.

Select the target block type, and press the [OK] button.

2. In the GUI display mode, the display format is switched depending on the block type.

In the binary display mode, 128 bytes are dumped and displayed.

For details of the data, refer to the reference documentation.

(5) Saving a file

The data displayed on the screen can be saved in a file.

1. When the [Save] menu item is selected on the [File] menu or the ⊟ Save button is selected from among the tool buttons, the data in the selected file will be overwritten and the data displayed on the screen will be saved in its place.

2. When the [Save As] menu item is selected on the [File] menu or the Save As button is selected from among the tool buttons, the file selection dialog box appears.
Input the filename, and press the [OK] button. The displayed characters are saved in the new file.

(6) Sending the data to the monitor

DDC data can be saved in the monitor ROM.

1. When the [Send] menu item is selected on the [VG] menu or the Send button is selected from among the tool buttons, the send data dialog box appears.

2. Select DDC1 or DDC2B and decide on the numbers of the blocks to be sent (from block #0 to the selected block #).

When the [Fix Monitor] button is pressed, communication with the monitor is initiated, and the data can be matched with the maximum size of the monitor ROM.

3. When the [OK] button is pressed, the DDC data is sent.

Caution

This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(7) Receiving the data from the monitor

DDC data can be received from the monitor ROM.

1. Wen the [Receive] menu item is selected on the [VG] menu or the Receive button is selected from among the tool buttons, the receive data dialog box appears.

2. Select DDC1 or DDC2B and decide on the numbers of the blocks to be received (from block #0 to the selected block #).
When the [OK] button is pressed, the DDC data is received.

3. The received DDC data now appears on the screen.

Caution

This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(8) Verifying the data being edited against the monitor ROM data

DDC data can be loaded from the monitor ROM, and compared with the DDC data which is being edited.

1. When the [Verify] menu item is selected on the [VG] menu or the Verify button is selected from among the tool buttons, the verify data dialog box appears.

2. Select DDC1 or DDC2B and decide on the numbers of the blocks to be compared (from block #0 to the selected block #) and the mask setting.

The mask setting can be selected only for Basic EDID product codes and serial numbers. When it is checked, its items are not compared.

When the [Fix Monitor] button is pressed, communication with the monitor is initiated, and the data can be matched with the maximum size of the monitor ROM.

When the [OK] button is pressed, the DDC data verification is commenced.

(9) Printing the DDC data

The DDC data displayed can be printed in a binary format.

1. Select the [Print] menu item on the [File] menu or select the Print button from among the tool buttons.

2. The print dialog box now appears. Set here the numbers of the blocks to be printed and the margins.

3. When the [OK] button is pressed, the DDC data displayed is printed in a binary format.

4. To change the printer which has been set, select the Set Printer... button.

5. The printer setting dialog box now appears.

Proceed with the settings. For details on the operating procedure of this dialog box, refer to the instructions for Windows or the printer used.

4.10.5. Block operations

(1) Forward inserting a block

Click the block immediately below the position where the block is to be inserted.
Click [Insert-up Block] on the [Edit] menu.

(2) Backward inserting a block

Click the block immediately above the position where the block is to be inserted.
Click [Insert-down Block] on the [Edit] menu.

(3) Deleting a block

Click the block to be deleted.
Click [Delete Block] on the [Edit] menu.

(4) Copying a block

Click the block to be copied.
Click [Copy Block] on the [Edit] menu.

(5) Moving a block

Click the block to be moved.
Click [Move Block] on the [Edit] menu.

(6) Changing the block type

Click the block whose type is to be changed.
Click [Change Block Type] on the [Edit] menu.

4.11. Character editor

How to set the user characters of the programmable video signal generator (referred to henceforth as the "VG")
is described in this section. This program enables the characters of the VG to be edited in Windows, and the
edited characters to be sent to the VG and executed.

4.11.1.Startup method

Start up the character editor from the sequence editor. Select [User Character Editor] on the [Internal] menu.
(For details, refer to the section on the sequence editor.)
When the editor starts up, it starts up in the "new" status.

4.11.2.Window screen and names
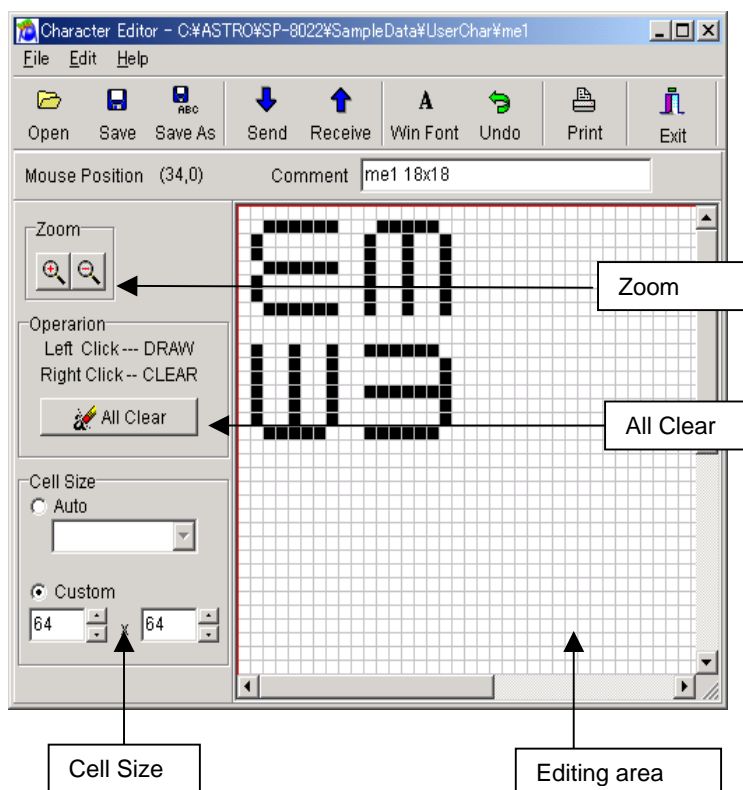
Fig. 4.11-1 Character display screen

All Clear

This is used to clear all the characters in the editing area.

Editing area

When the mouse cursor is placed in the editing area and the mouse is right-clicked, the mouse cursor position is filled in with black. When the mouse is left-clicked, it is filled in with white. This corresponds to one dot of the character font. In this way, characters can be created visually.

Cell Size

This enables the cell size in the editing area to be set. Select the size from the Auto radio button or set the size using Custom.

Zoom

These buttons are used to enlarge or reduce the display inside the editing area.

: This enlarges the data display inside the editing area.

: This reduces the data display inside the editing area.

Mouse Position

The mouse position inside the editing area is displayed here.

4.11.3. Data setting ranges

The setting ranges for Cell Size are as follows.
When Auto is set: 8x8, 16x16, 32x32, 32x64, 64x32
When Custom is set: Max. 4096 dots (XxY)

4.11.4. Menus and toolbar

(1) [File] menu

Menu command	Function
Open	Opens a file.
Load	Loads the data from a file.
Load Sample	Loads the data from a sample file.
Save	Saves the data in a file.
Save As	Changes the data filename and saves the data in that file.
Send	Sends data to the VG.
Receive	Receives data from the VG.
Properties	Displays the file properties.
Print	Prints the display data.
Exit Character Editor	Exits the program.

(2) [Edit] menu

Menu command	Function
Zoom Up	Enlarges the data display in the editing area.
Zoom Down	Reduces the data display in the editing area.
All Clear	Clears all the data in the editing area.
Windows Font	Selects the font type.
Undo	Undoes the operation performed last.

(3) [Help] menu

Menu command	Function
Contents	Displays the help contents.
Index	Enables help topics to be searched.
About	Displays the version information.

4.11.5. Operating procedure

(1) Creating and editing characters

The characters in the editing area can be edited.

Set the cell size. Select it from Cell Size Auto or set it using Custom. (Up to 64 dots can be set.)

One grid point in the editing area corresponds to one dot of the character font.

1. When the mouse cursor is positioned over a grid point in the editing area and the mouse is left-clicked, the point is set to ON; when the mouse is right-clicked, it is set to OFF. A point in the editing area set to ON appears black; a point set to OFF appears white.

2. To continuously set a multiple number of dots, drag the cursor, and all the characters along the line of the cursor movement will be set to ON when the mouse is left-clicked or OFF when it is right-clicked.

3. To clear all the characters which were created in the editing area, click the [All Clear] button.

The cursor position in the editing area is displayed at Mouse Position.

(2) Opening a file

The selected file can be opened.

The filename is changed to the name of the opened file.

Select the [Open] menu item on the [File] menu or select the [Open] button from among the tool buttons.

(3) Loading the data

The data of the selected file can be loaded.

The filename remains unchanged from startup.

Select the [Load] menu item on the [File] menu.

(4) Loading data from a sample file

Data from a sample file in the sample directory can be loaded.

The filename remains unchanged from startup.

Select the [Load Sample] menu item on the [File] menu.

(5) Saving the data

The edited data can be written over the existing data in a file.

Select the [Save] menu item on the [File] menu or select the [Save] button from among the tool buttons.

(6) Setting a filename and saving the data in that file

A file with a new name can be created and the data saved in that file.

Select the [Save As] menu item on the [File] menu or select the [Save As] button from among the tool buttons.

(7) Printing the displayed data

The displayed data can be printed out.

Select the [Print] menu item on the [File] menu or select the [Print] button from among the tool buttons.

(8) Receiving data from the VG

Data registered in the VG can be received from the VG.

Select the [Receive] menu item on the [File] menu or select the [Receive] button.

> **Caution**
>
> This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(9) Sending data to the VG

Character data can be sent to the VG.

Select the [Send] menu item on the [File] menu or select the [Send] button.

> **Caution**
>
> This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(10) Changing the fonts

Fonts can be changed and displayed in the editing area.

Select the [Windows Font] menu item on the [File] menu or select the [Win Font] button.

(11) Undoing the operation executed last

The operation executed last can be undone.

Select the [Undo] menu item on the [File] menu or select the ⤺ Undo button.

(12) Exiting the program

The program can be exited.

Select the [Exit Character Editor] menu item on the [File] menu or select the Exit button from among the tool buttons.

4.11.6. Execution method

The "Add Character" facility of the graphic editor is used to display on the screen the character patterns which have been created or edited using the character editor.

(1) Press the "Send" tool button of the character editor to display the "Send to VG" dialog box.

(2) Save the created or edited character pattern in one of the E0 to FF character codes.

(3) Exit the character editor and start the graphic editor.

(4) Select "Add Character" from the parts on the right side, and set the "Char Code" portion of Properties as the character code in the "¥xE0" to "¥xFF" format range. Example: "¥xE8"

(5) Create the pattern on the editing screen, and press "Execute" to execute it.

4.12. Font editor

How to set the font sets (referred to henceforth as the "fonts") of the programmable video signal generator (referred to henceforth as the "VG") is described in this section. This program enables VG fonts to be edited in Windows, edited fonts to be sent to the VG and fonts to be received from the VG.

4.12.1. Startup method

Start up the font editor from the sequence editor. (For details, refer to the section on the sequence editor.)
When the editor starts up, it starts up in the "new" status.

4.12.2. Window screen and names
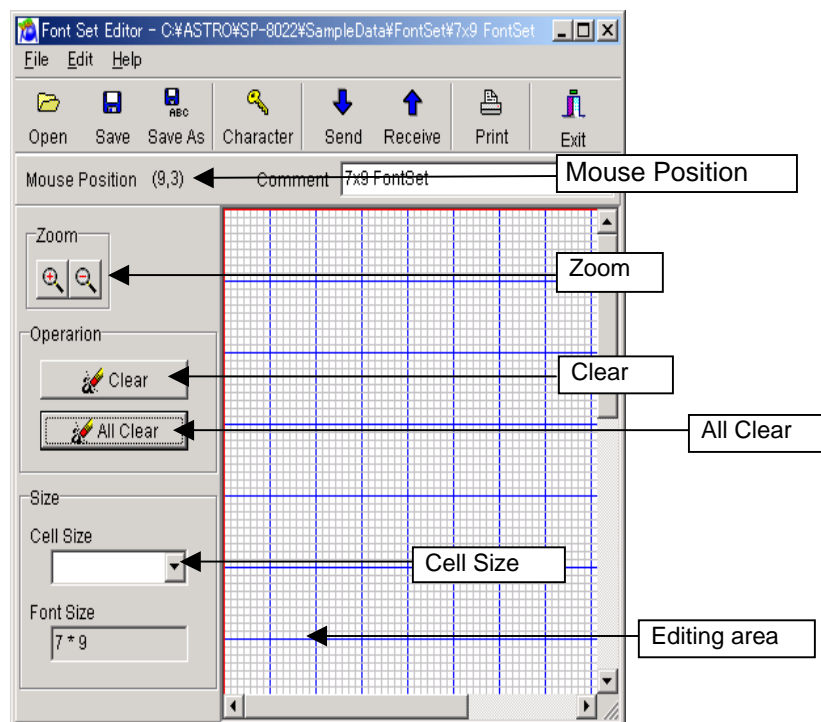
Fig. 4-12-1 Font display screen

Clear

This is used to clear fonts equivalent to one character in the editing area.

All Clear

This is used to clear all the fonts in the editing area.

Editing area

When the editing area is clicked, a green line is displayed at the specified font size position. When the area is double-clicked, the character editor starts, and fonts can be edited in the specified font size. When the mouse cursor is placed in the editing area using the character editor and the mouse is left-clicked, the mouse cursor position is filled in with black. When the mouse is right-clicked, the position is filled in with white. One grid point in the editing area corresponds to one dot of the font. This enables fonts to be created visually.

Cell Size

This displays a blue line at the specified font size position in the editing area. It can be set only when characters have not been edited when new characters are created. No further changes can be made once files have been loaded or characters edited.

Zoom

These buttons are used to enlarge or reduce the display inside the editing area.

🔍: This enlarges the data display inside the editing area.

🔍: This reduces the data display inside the editing area.

Mouse Position

The mouse position inside the editing area is displayed here.

4.12.3. Menus

(1) [File] menu

Menu command	Function
Open	Opens a file.
Load	Loads the data from a file.
Load Sample	Loads the data from a sample file.
Save	Saves the data in a file.
Save As	Changes the data filename and saves the data in that file.
Send	Sends the display data to the VG.
Receive	Receives the font data from the VG.
Properties	Displays the file properties.
Print	Prints the display data.
Exit Font Editer	Exits the program.

(2) [Edit] menu

Menu command	Function
Zoom Up	Enlarges the data display in the editing area.
Zoom Down	Reduces the data display in the editing area.
All Clear	Clears all the fonts in the editing area.
Clear	Clears the selected data of the font in the editing area.
Edit Character	Starts the character editor to edit the selected data of the font in the editing area.

(3) [Help] menu

Menu command	Function
Contents	Displays the help contents.
Index	Enables help topics to be searched.
About	Displays the version information.

4.12.4. Data setting ranges

Select 5x7, 7x9 or 16x16 as the font size.

4.12.5. Operating procedure

(1) Creating and editing fonts

The fonts in the editing area can be edited.

Double-click the editing area or select the [Edit Character] menu item on the [Edit] menu. The character editor now starts, and character data can be created. (For details, refer to Help on the character editor.)

One grid point in the editing area corresponds to one dot of the font.

1. When the mouse cursor is positioned over a grid point in the editing area and the mouse is left-clicked, the point is set to ON; when the mouse is right-clicked, it is set to OFF.

   A point in the editing area set to ON appears black; a point set to OFF appears white.

2. To continuously set a multiple number of dots, drag the cursor, and all the fonts along the line of the cursor movement will be set to ON when the mouse is left-clicked or OFF when it is right-clicked.

3. To clear the selected font which was created in the editing area, click the [🖊 Clear] button.

4. To clear all the fonts which were created in the editing area, click the [🖊 Clear] button.

   Settings for 'Size' can be selected only when characters have not been edited when new characters are created. No further changes can be made once files have been loaded or characters edited.

   The cursor position in the entire editing area is displayed at Mouse Position.

(2) Opening a file

The selected file can be opened.

The filename is changed to the name of the opened file.

Select the [Open] menu item on the [File] menu or select the [📁 Open] button from among the tool buttons.

(3) Loading the data

The data of the selected file can be loaded.

The filename remains unchanged from startup.

Select the [Load] menu item on the [File] menu.

(4) Loading data from a sample file

Data from a sample file in the sample directory can be loaded.

The filename remains unchanged from startup.

Select the [Load Sample] menu item on the [File] menu.

(5) Saving the data

The edited data can be written over the existing data in a file.

Select the [Save] menu item on the [File] menu or select the [Open] button from among the tool buttons.

(6) Setting a filename and saving the data in that file

A file with a new name can be created and the data saved in that file.

Select the [Save As] menu item on the [File] menu or select the [Save As] button from among the tool buttons.

(7) Starting the character editor

The character editor is started in order to edit the selected character data of the font in the editing area. After selecting the data in the editing area, select the [Edit Character] menu item on the [Edit] menu or select the [Charcter] button from among the tool buttons.

(8) Printing the displayed data

The displayed data can be printed out.

Select the [Print] menu item on the [File] menu or select the [Print] button from among the tool buttons.

(9) Receiving data from the VG

Data registered in the VG can be received from the VG.

Select the [Receive] menu item on the [File] menu or select the [Receive] button.

Caution

This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(10) Sending data to the VG

Font data can be sent to the VG.

Select the [Send] menu item on the [File] menu or select the [Send] button.

Caution

This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(11) Exiting the program

The program can be exited.

Select the [Exit Font Editor] menu item on the [File] menu or select the button from among the tool buttons.

4.12.6. Execution method

The "Add Character" facility of the graphic editor is used to display on the screen the font data which has been created or edited using the font editor.

(1) Press the "Send" tool button of the font editor to display the "Send to VG" dialog box.

(2) Save the created or edited font data in one of the numbers from No.1 to No.8.

(3) Exit the font editor and start the graphic editor.

(4) Select "Add Character Pattern" from the parts on the right side, and select the number containing the data by the font editor from "Font" of Properties.

(5) Select List under "Format."

(6) Draw the font on the editing screen, and press "Execute" to execute it.

4.13. Bit swap editor

This is used to set the LVDS bits (hereafter "bits") of the VG generator. This program allows the LVDS output LUT bits to be edited in Windows.

Caution

> The DISM setting is the default. The bit swap processing initiated by the product enables any bits in the DISM setting to be swapped.

4.13.1. Startup method

The bit swap editor is started up from the sequence editor. Double-click on any bit swap area on the source list (or sequence list) of the sequence editor.

Alternatively, start up the bit swap editor by selecting "New--BitSwap" or "Edit" on the right-click menu in the source list area.

When the bit swap editor is started up, the bit swap data registered on the selected sequence list or the bit swap data displayed on the selected source list is loaded.

4.13.2. Window screen and names of its parts
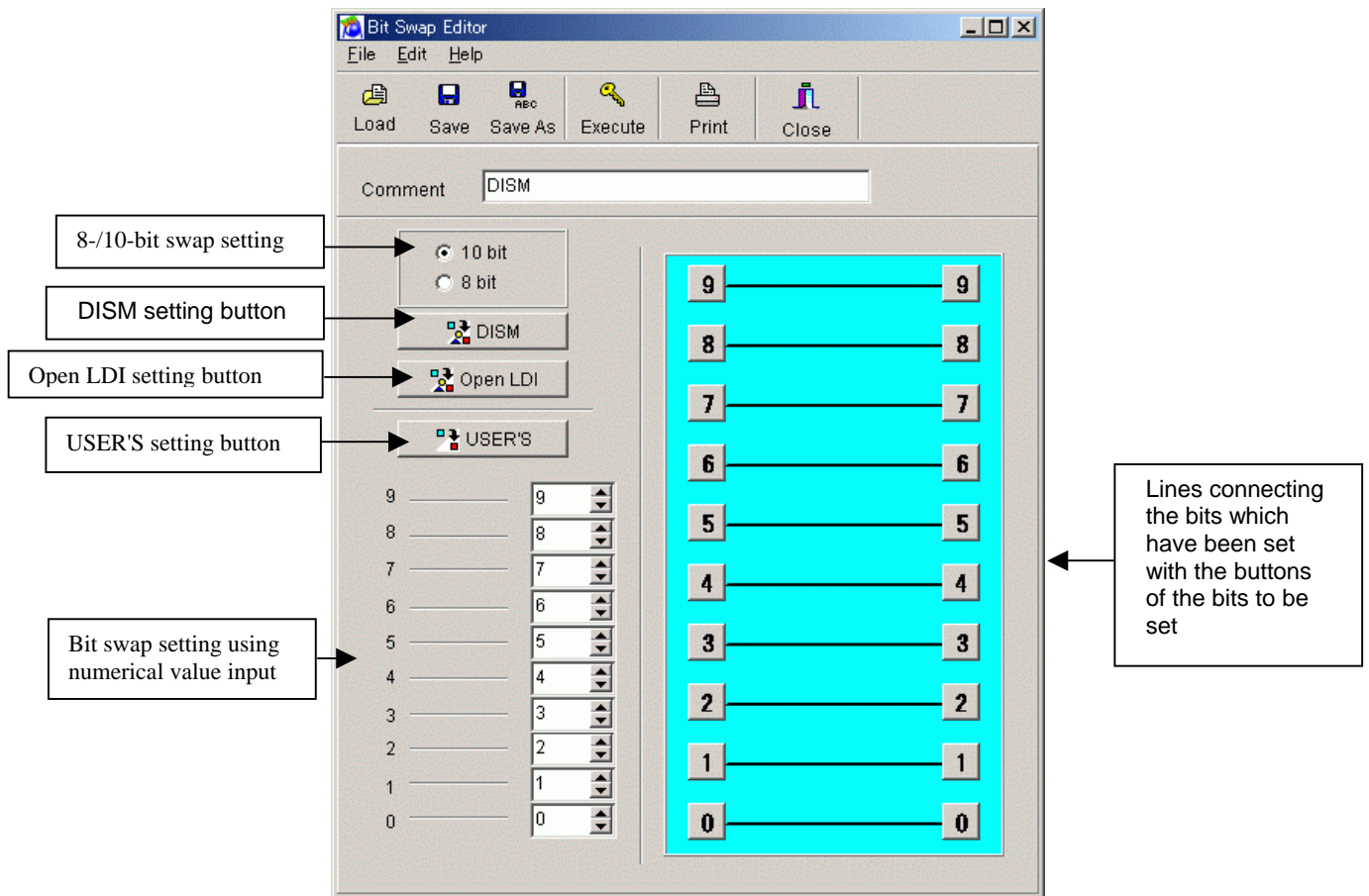
Fig. 4-13-1   LVDS bit setting screen

8-/10-bit swap setting

Use this to select whether to swap the bits using an 8-bit or 10-bit format. In the case of the 8-bit format, it is not possible to set numbers "0" and "1."

DISM setting button

Use this for the DISM setting. When this setting is selected, the USER'S area display also changes to the DISM setting.

Open LDI setting button

Use this for the Open LDI setting. When this setting is selected, the USER'S area display also changes to the Open LDI setting.

USER'S setting button

This enables the USER'S setting. When this button has not been pressed, the numerical value setting areas are canceled. The setting method consists of inputting the numerical values and of simply selecting each of the bits to be set.

Inputting the numerical value
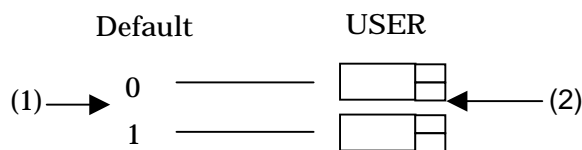
(1) Default bit number

This indicates bits 0 to 9 whose settings are to be changed.

(2) User setting edit box

The number of the bit to be changed is input either by the spin button or manually.

Setting the bit selection using the mouse

Select the bit number to be changed, and set it.

As shown in the figure below, set the bit number by selecting the desired bit button and also selecting the button of the change bit number for it to be changed to. The selected bit numbers are connected by a line.
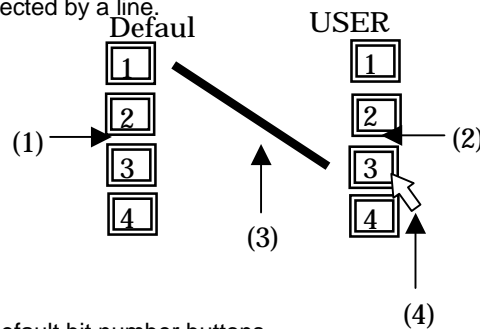
(1) Default bit number buttons

These are the buttons for bits 0 to 9 whose settings are to be changed.

(2) Change destination bit number buttons

These are the buttons for the bit numbers to be changed to.

(3) Line connecting the change bit and change destination bit

This connects the number of the bit to be changed and the number of the bit to be changed to.

(4) Mouse pointer

This is the mouse pointer.

Caution

The same point cannot be selected.

4.12.3. Menu

(1) [File] menu

Menu command	Function
Load	Loads the data from the file.
Save	Saves the data in the file.
Save As	Saves the data in a file under a different filename.
Execute	Executes the display data.
Close Bit Excharge Editor	Exits the program.

(2) [Select] menu

Menu command	Function
DISM	Establishes the output bit setting as the DISM setting.
OpenLDI	Establishes the output bit setting as the Open LDI setting.
USER'S	Enables the output bit setting on the GUI to be used.

(3) [Help] menu

Menu command	Function
Contents	Displays help.
Index	Enables help topics to be searched.
About	Displays the version information.

4.12.4. Operation

(1) Opening files

Open the selected file.
The filename is changed to the name of the opened file.

Either select the [Open] item on the [File] menu or select the [Open] button from among the tool buttons.

(2) Loading the data

Load the data of the selected file.

The filename remains unchanged from startup.
Select the [Load] item on the [File] menu.

(3) Saving the data

The edited data is written over the existing data in the file.

Either select the [Save] item on the [File] menu or select the [Save] button from among the tool buttons.

(4) Setting the filename and saving the data

Create a new filename and save the data in the file.

Either select the [Save As] item on the [File] menu or select the button from among the tool buttons.

(5) Executing the data

Send the currently edited data to the VG generator and execute it.

Caution

This step cannot be executed while the execution of the action function is underway. Shut down the action function first in the sequence editor, and then proceed to execute the step.

(6) Exiting the program

Exit the program.

Either select the [Close Font Editor] item on the [File] menu or select the button from among the tool buttons.

4.14.Execution program used for manufacture

This section describes the execution program used for manufacturing and designed to run on a programmable video signal generator (referred to henceforth as the "VG"). Using the sequence files created, this program sends the data to the VG and executes it through key operations. Create the data using the sequence editor and other editors.

4.14.1. Startup method

In Windows 98 or 2000, select [Start] - [Programs] - [SP-8028] - [Execution Program for Manufacturing], and start [Execution Program for Manufacturing].

When the program is started up, the function keys which were last opened by the previous startup are displayed.

If no sequence files have been set in the function keys, nothing will appear on the screen when the program is started up.

4.14.2. Window screen and names
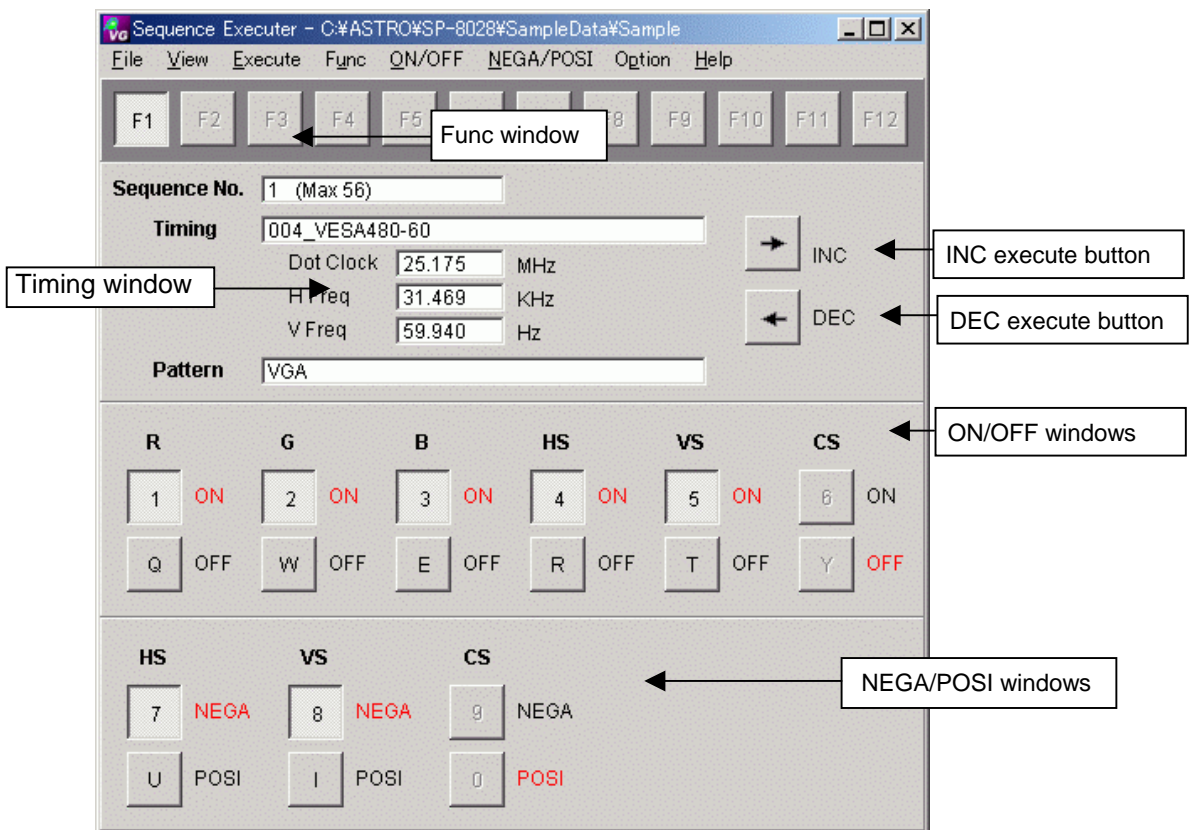
Fig. 4-13-1 The execution program setting screen for production

Func window

One sequence file can be registered in each function key, F I through F12, making a total of 12 files altogether which can be registered.

Files are registered in the function keys using [Func-Key Assign] on the [Option] menu.

By registering the files in the function keys, the sequence files can thereafter be switched simply by pressing the function keys.

Timing window

Displayed on this window are the name of the timing data, dot clock signal, horizontal and vertical frequencies and name of the pattern currently being executed.

ON/OFF windows

Displayed on these windows are the ON/OFF statuses of the outputs of the R/G/B signals and HS/VS signals currently being executed. Values can also be changed by pressing the shortcut keys. The shortcut keys are changed using [Key Assign] on the [Option] menu.

NEGA/POSI windows

Displayed on these windows are the NEGA/POSI statuses of the output of the HS/VS signals currently being executed. Values can also be changed by pressing the shortcut keys.

The shortcut keys are changed using [Key Assign] on the [Option] menu.

INC execute button

This is for incrementing the sequential No. being executed by l, and executing the next sequential No.

It is equivalent to pressing the → key.

DEC execute button

This is for decrementing the sequential No. being executed by l, and executing the previous sequential No.

It is equivalent to pressing the ← key.

4.14.3. Menus

(1) [File] menu

Menu command	Function
Exit Sequence Execute	Exits the program.

(2) [View] menu

Menu command	Function
Func window	Window on which the function keys are registered
Timing window	Window on which the timing data being executed is displayed
ON/OFF window	Window on which the ON/OFF status being executed is displayed
NEGA/POSI window	Window on which the NEGA/POSI status being executed is displayed

(3) [Execute] menu

Menu command	Function
INC Right	Increments the sequential No. being executed and executes the next No.
DEC Left	Decrements the sequential being executed and executes the previous No.

(4) [Func] menu

Enables sequence files to be selected from already registered function keys.

(5) [ON/OFF] menu

Enables the ON/OFF status of the signal output being executed to be set.

(6) [NEGA/POSI] menu

Enables the NEGA/POSI status of the data being executed to be set.

(7) [Option] menu

Func Key Assign	Registers the sequence files in the F1 through F12 keys.
Key Assign	Sets the shortcut keys for the ON/OFF window and NEGA/POSI window.

(8) [Help] menu

Contents	Displays help.
Index	Enables help topics to be searched.
About	Displays the version information.

4.14.4. Operating procedure

(1) Startup for the first time after installation

1.The sequence files must be registered in the function keys.

The registration sequence is as follows:

Select [Func-Key Assign] on the [Option] menu.

Register the sequence files in function keys F1 through F12.

2.Select one of the function keys F1 through F12 to open the sequence file. Sequential No.1 is executed as soon as the sequence file is opened. The information on the data being executed is displayed on the Timing window, ON/OFF window and NEGA/POSI window.

3.Select the INC or DEC execute button to execute the sequential No. thus selected.

(2) Startup for the second and subsequent times after installation

1.The sequence file which was opened last with the last startup is displayed. The sequential No. executed last is executed.

2.Select the INC or DEC execute button to execute the sequential No. thus selected.

(3) Exiting the program

Either of the following methods can be used to exit the manufacture execution program.
• Select exit on the [File] menu.
• Select close on the control menu.

(4) Execution

When the → key is pressed, the sequential No. currently being executed is incremented by one and the sequential No. thus selected is executed.

When the ← key is pressed, the sequential No. currently being executed is decremented by one and the sequential No. thus selected is executed.

The name of the timing data. dot clock signal, horizontal and vertical frequencies and name of the pattern currently being executed are displayed on the Timing window.

The ON/OFF statuses of the output of the R/G/B signals and HS/VS signals currently being executed are displayed on the ON/OFF window.

Output statuses can also be changed by pressing the shortcut keys.

The NEGA/POSI statuses of the output of the HS/VS signals currently being executed are displayed on the NEGA/POSI window.

Output statuses can also be changed by pressing the shortcut keys.

(5) Setting the function keys

Sequence files can be registered in the F1 through F12 keys.

1.Click [Func-Key Assign] on the [Option] menu.

2.The function key setting dialog box is displayed.

3.Register the sequence files in the F1 through F12 keys.

(6) Setting the shortcut keys

This is for setting the shortcut keys for the ON/OFF and NEGA/POSI statuses of the output of the R/G/B and HS/VS/CS signals.

1.Click [Key Assign] on the [Option] menu.

2.The shortcut key setting dialog box is displayed.

3.Register the shortcut key for each item.

5 How to create user Optional patterns

5.1. Introduction

Using the SP-8028, the VG-863 can create user optional patterns.
The following aspects of the procedures involved are described in this chapter.

1.User optional pattern creation/execution procedure
2.Concerning the VG-863 hardware
3.Description of syntax
4.Function reference

5.2. User optional pattern creation / execution procedure

User optional patterns are represented by the source codes which are described using a syntax similar to the one used with the C programming language. This data is compiled by SP-8028 and registered in files in the form of an intermediate language.

(1) Creating the source codes of user optional patterns

Source codes are described using a syntax similar to the one used with the C programming language.
For details on the syntax, refer to "Description of syntax" in 6-4.
Use the Windows standard "Notepad" or another text editor to create the source codes.
The extension for the source codes is ".mc."

(2) Compiling source codes of user optional patterns

Start [Optedit] from [SeqEdit] of SP-8028 (by selecting OptionPattern with Edit:Newdata), and click the Load button to load the source codes (.mc) which have been created. Next, click the Compile button to proceed with the compiling. An OK status is indicated if the "Compile OK" message appears. If there is an error, revise the source codes, and repeat the above steps.

(3) Executing the user optional patterns in the VG-863

If "Compile OK" is displayed in step 6.2.2., the user optional patterns can be executed by the VG-863 by clicking the Execute button.
Note: The maximum size of the data for one user optional pattern which can be executed is 64KB.

5.3. Concerning the VG-863 hardware

This section describes the VRAM (video memory) and LUT (palette) of the VG-863.

(1) 10 bits x 3 color palettes (1,073,740,000 color display)

With an LUT of 1024 gradations for each color, patterns can be displayed using 1,073,740,000 colors.

However, the number of color palettes which can be used by the optional pattern is 256. Each color palette can be set using 1024 gradations for each color.

(2) Display area

The video memory extends, and it has 10 bits x 3 data per pixel.

The display area is 2k x 2k.

Display in 1,073,740,000 colors is possible for VBM files and the optional ramp patterns.

The horizontal by vertical size displayed differs depending on the horizontal and vertical timing data.

LDC coordinate system   WC coordinate system

(0,0)=(org_x,org_y)   (0,0)=(org_x,org_y)

size-x   size-x

size-y   size-y

(size_x-I , size_y-I)   (10000, 10000)
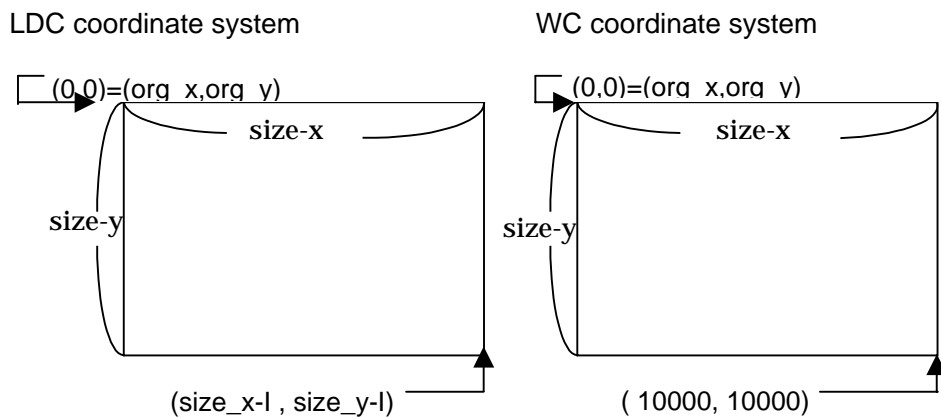
LDC and WC are set using the g8_LdcWc() function. (LDC is the default.)

* (size_x,size_y) are changed by the (h_disp,v_disp) of the timing data. They can also be changed when the pattern data is executed.

With the WC coordinate system, pattern data which is not dependent on this display size can be created.

5.4. Description of syntax

Before they are executed, user optional patterns are interpreted using a language processing system (MX interpreter) which has a syntax similar to the one used with the C programming language.

Outlined below are the differences from the C programming language.

(1) Functions deleted from the C programming language

The following functions of the C programming language are not available.

- **Preprocessor functions**

  Preprocessor commands starting with "#" (such as #define and #include) cannot be used.

- **Structures, unions, bit fields**

- **Pointers**

  The pointers cannot be used. However, the "&" operator for designating "reference" can be used as the argument of functions.

- **Arrays with two or more dimensions (only 1-dimensional arrays may be used)**

- **Type definition functions (typedef)**

- **"const", "volatile" modifiers**

- **Object size (sizeof ())**

- **Type cast designation**

  Type conversion is done automatically.

- **Register variables**

  "register" cannot be designated. "static" can be designated as the declaration of the memory class inside functions. "auto" cannot be designated expressly. If "static" is not designated, "auto" will be designated instead.

- **"extern" and "static" declarations outside functions**

  Since, as a general rule, one source text serves as one program, it is not possible to use either "extern" declarations or "static" declarations outside functions.

- **Argument definitions in conventional formats**

  For instance, arguments cannot be written in the following way.

  ```
  int Func (aa,bb)
  int aa;
  char bb;
  {
          …..
  }
  ```

  Instead, arguments must be written as follows.

  ```
  int Func (int aa, char bb)
  {
          …..
  }
  ```

- **Variable arguments (*...*)**

  Only the number which has been designated by the function declaration can be the number of function arguments, and no omissions are allowed. In other words, the number of arguments must match for function declarations and calls.

- **Initialization for declaration of automatic variables**

  Initialization can be described in the same way as in C programming in declarations of variables outside functions and of variables which were used to designate "static" inside functions.

  ```
  int aa=1;   /* OK */
  int Func ()
  {
          static int bb = 2;   /* OK */
          int        cc = 3;   /* Error */
          …..
  }
  ```

- **Increment, decrement operators (*++*, *--*)**

- **Arithmetic substitution (*+=*, -=, **=*, etc.)**

- **Conditional expressions (?:)**

(2) Differences from the C programming

- **Comments**

  Comments are written using comment /* */ or /$ $/. Comments can be contained (nesting is possible) inside other comments.

- **Reference**

  Pointers cannot be used with the MX interpreter. Although pointer type arguments were used in C programming when functions of multiple values were to be returned to the call side or array data was to be transferred, "reference" is used by the MX. This is the same as reference in C++, and it can be used only as a function argument.

  (Reference type variables cannot be declared, and neither can the & reference operator be used in regular expressions.)

  An example of a function using reference is shown below.

```
Int Func (int&aa, char&bb [ ] )
{
        aa = 100;
        bb[0] = A;
        bb[1] = B;
        return (200);
}

int main ()
{
        int        x,r;
        char       y[2];

        r = Func( &x, &y );
        /* r is 200, x is 100, y[0] is *A*, and y[1] is *B* */
}
```

  Literal character strings can be used for arguments as the "char" array reference.

```
int StrLen(char&str [ ] )
{
        int cnt;
        for (cnt = 0; str[cnt]; cnt = cnt + 1);
        return (cnt);
}

int main ()
{
        int len;
        len = StrLen("abcdefg");
}
```

- **Function declarations**

  Functions created by the user must always be declared before they are called. (Built-in functions need not be declared in the source text.) A function is declared either by declaring its prototype or by defining its function body. For instance, writing in the manner shown below will result in an error.

  ```
  int main()
  {
          sub();/$ An error results since neither the definition nor declaration has been made.$/
  }

  int sub()
  {
          .....
  }
  ```

  The error is avoided by first defining the function to be called, as shown below.

  ```
  int sub()
  {
          .....
  }

  int main()
  {
          sub(); /* OK since the function has already been defined. */
  }
  ```

  Alternatively, the error is avoided by making a prototype declaration as follows.

  ```
  Int sub(); /$ Prototype declaration $/
  Int main()
  {
          sub(); /$ OK since the declaration has already been made. $/
  }

  int sub()
  {
          .....
  }
  ```

- **Operation of signed and unsigned integers**

  In C programming, when operations are performed between signed integers and unsigned integers, signed integers are treated as if they were unsigned. With the MX interpreter, however, they are performed in such a way that the expressed values are saved as far as possible. Shown below is an example where this difference is present.

```
int foo( )
{
        int             i;
        unsigned int    u;

        i=-1;
        u= 1;
        if ( i < u ) {
            <This is executed by the MX interpreter.>
        } else {
            <This is executed by the C programming language.>
        }
}
```

(3) Other specifications

"int" is identical to "long."

The maximum number of cases in a switch statement is 127.

The maximum size of the code part and data part of an execute object after compiling is 64KB for each. The data part size is the total of the maximum sizes of the static variables and of the stack consumed during execution. The stack is consumed by the automatic variables within the functions when the functions are called. A dedicated stack different from the data stack is used for the return addresses from the functions.

The maximum number of levels in the function call hierarchy is 64.

With the MX interpreter as with the C programming language, there is a danger that other data will be destroyed by accessing outside the declaration range of the array. However, since a different stack is used for the return addresses of the functions, overrunning will not be caused by the destruction of return addresses. Further, a check is conducted to verify whether these addresses are inside the data part area so that other areas of the system will not be destroyed.

5.5. Function reference

The functions are grouped together as follows.

Coordinate system setting functions

- g8_LdcWc   : Used to set LDC or WC coordinate system.
- g8_cliparea   : Used to set the clip area.
- g8_clip_   : Used to set the clip ON or OFF.

8-bit VRAM graphics functions

- g8_allclr   : Used to clear all the graphic planes.
- g8_clr   : Used to clear the screen.
- g8_pset   : Used to draw dots.
- g8_line   : Used to draw lines.
- g8_sqre   : Used to draw squares (or rectangles).
- g8_sqpa   : Used to draw and fill squares (or rectangles).
- g8_tripa   : Used to draw and fill triangles.
- g8_crcl   : Used to draw circles.
- g8_crclpa   : Used to draw and fill circles.
- g8_elps   : Used to draw ellipses.
- g8_elpspa   : Used to draw and fill ellipses.
- g8_elps2   : Used to draw ellipses.
- g8_elpspa2   : Used to draw and fill ellipses.
- g8_bitblt2   : Used to copy areas 2 (copy in graphics planes).
- g8_putc   : Used to draw characters.
- g8_puts   : Used to draw character strings.

LUT setting functions.

- opt_setcolor   : Used to set LUT colors.
- opt_setcolor_liner   : Used to set LUT colors (white linear)
- opt_setcolor_default   : Used to set LUT colors (default).
- opt_setcolor_256   : Used to set LUT colors (256 colors).
- opt_setwndcolor   : Used to set the window color.

Display-related functions

- vs_InqDispSize   : Used to inquire about the display size.
- vs_InqStat   : Used to inquire about the status.

Window setting functions

- vs_InitWindow   : Used to initialize the window.
- vs_AddWindow   : Used to set the window data.

Pattern drawing functions

- ptn_char : Used to draw character patterns.
- ptn_cross : Used to draw crosshatch patterns.
- ptn_dot : Used to draw dot patterns.
- ptn_juuji : Used to draw "+" center mark patterns.
- ptn_waku : Used to draw "□" edge patterns.
- ptn_block : Used to draw block patterns.
- ptn_burst : Used to draw burst patterns.

Other standard functions

The following functions are compatible with the "clib" standard libraries.

- acos : double acos (double)
- asin : double asin (double)
- atan : double atan (double)
- atan2 : double atan2 (double x, double y)
- atof : double atof (char *)
- atoi : int atoi (char *)
- cos : double cos (double)
- sin : double sin (double)
- tan : double tan (double)
- sqrt : double sqrt (double)
- log : double log (double)
- log10 : double log10 (double)
- exp : double exp (double)
- pow : double pow (double)
- cosh : double cosh (double)
- sinh : double sinh (double)
- tanh : double tanh (double)
- strcat : void strcat (char *str1, char *str2)
- strcmp : int strcmp (char *str1, char *str2)
- strcpy : void strcpy (char *str1, char *str2)
- strlen : int strlen (char *str1)
- strncat : int strcat (char *str1, char *str2, int)
- strncmp : int strncmp (char *str1, char *str2, int)
- strncpy : void strncpy (char *str1, char *str2, int)

The following functions call sprintf(buf, str, data) internally.

- sPrintl : void sPrintl(char *buf, char *str, int data)
- sPrintF : void sPrintl(char *buf, char *str, double data)

(1) Coordinate system setting functions

1. Set LDC/WC

[Call]
void g8_LdcWc (int mod)

[Input]
mod : 0=LDC, 1=WC

[Output]
None

[Description]
This is used to set LDC or WC coordinate system.

2. Set clip area

[Call]
void g8_cliparea (int left, int top, int right, int bottom)

[Input]
left: Clip area left coordinate
top: Clip area top coordinate
right: Clip area right coordinate
bottom: Clip area bottom coordinate

[Output]
None

[Description]
This is used to set the clip to (left, top)-(right, bottom).

3. Set clip on/off

[Call]
void g8_clip_on (int sw)

[Input]
sw   : 0=clip OFF; 1=clip ON

[Output]
None

[Description]
When the clip has been set to ON, the area designated by the set clip area function is clipped.

(2) 8-bitVRAM graphics functions

1. Clear all planes

[Call]
void g8_allclr (int col, int mod)

[Input]
col   : color (0 to 255)
mod   : 1=set; 2=or set; 3=and set

[Output]
None

[Description]
This is used to clear or set all the graphic planes in the designated color.

2. Clear screen

[Call]
void g8_clr (int col, int mod)

[Input]
col   : color (0 to 255)
mod   : 1=set; 2=or set; 3=and set

[Output]
None

[Description]
With clip ON: The clip size screen is cleared or set from the start point XY coordinates using the specified colors.

With clip OFF: The entire graphic plane is cleared or set using the specified colors.

3. Draw dots

[Call]
void g8_pset (int x, int y, int col, int mod)

[Input]
x   : x coordinate
y   : y coordinate
col   : color (0 to 255)
mod   : 1=set; 2=or set; 3=and set

[Output]
None

[Description]
This is used to draw a dot at the designated coordinates.

4. **Draw lines**

    [Call]
    void g8_line (int xs, int ys, int xe, int ye, int col, int mod)

    [Input]
    xs   : start point x coordinate
    ys   : start point y coordinate
    xe   : end point x coordinate
    ye   : end point y coordinate
    mod   : 1=set; 2 =or set; 3=and set

    [Output]
    None

    [Description]
    This is used to draw a line from the start point to end point.

5. **Draw rectangles**

    [Call]
    void g8_sqre (int xs, int ys, int xe, int ye, int col, int mod)

    [Input]
    xs   : start point x coordinate
    ys   : start point y coordinate
    xe   : end point x coordinate
    ye   : end point y coordinate
    col   : color (0 to 255)
    mod   : 1=set; 2=or set; 3=and set

    [Output]
    None

    [**Description**]
    This is used to draw a square (or rectangle) whose apexes are the start and end points.

6. **Draw and fill rectangles**

    [Call]
    void g8_sqpa (int xs, int ys, int xe, int ye, int col, int mod)

    [Input]
    xs   : start point x coordinate
    ys   : start point y coordinate
    xe   : end point x coordinate
    ye   : end point y coordinate
    col   : color (0 to 255)
    mod   : 1=set; 2=or set; 3=and set

    [Output]
    None

    [Description]
    This is used to draw and fill a square (or rectangle) whose apexes are the start and end points.

7. **Draw and fill triangles**

   [Call]
   void g8_tripa (int x1, int y1 , int x2, int y2, int x3, int y3, int col, int mod)

   [Input]
   x1   : x coordinate
   y1   : y coordinate
   x2   : x coordinate
   y2   : y coordinate
   x3   : x coordinate
   y3   : y coordinate
   col   : color (0 to 255)
   mod : 1=set; 2=or set; 3=and set

   [Output]
   None

   [Description]
   This is used to draw and fill a triangle whose apexes are the designated three points.

8. **Draw circles**

   [Call]
   void g8_crcl (int xc, int yc, int r, int col, int mod)

   [Input]
   xc   : center x coordinate
   yc   : center y coordinate
   r   : radius
   col   : color (0 to 255)
   mod : 1=set; 2=or set; 3=and set

   [Output]
   None

   [Description]
   This is used to draw a circle whose center is (xc, yc) and whose radius is r.

9. **Draw and fill circles**

   [Call]
   void g8_crclpa (int xc, int yc, int r, int col, int mod)

   [Input]
   xc   : center x coordinate
   yc   : center y coordinate
   r   : radius
   col   : color (0 to 255)
   mod : 1=set; 2=or set; 3=and set

   [Output]
   None

   [Description]
   This is used to draw and fill a circle whose center is (xc, yc) and whose radius is r.

10. **Draw ellipses**

   [Call]
   void g8_elps (int xc, int yc, int rh, int rv, int col, int mod)

   [Input]
   xc   : center x coordinate
   yc   : center y coordinate
   rh   : x radius
   rv   : y radius
   col   : color (0 to 255)
   mod : 1=set; 2=or set; 3=and set)

   [Output]
   None

   [Description]
   This is used to draw an ellipse whose center is (xc, yc) and whose radii are (rh, rv).

11. **Draw and fill ellipses**

   [Call]
   void g8_elpspa (int xc, int yc, int rh, int rv, int col, int mod)

   [Input]
   xc   : center x coordinate
   yc   : center y coordinate
   rh   : x radius
   rv   : y radius
   col   : color (0 to 255)
   mod : 1=set; 2=or set; 3=and set

   [Output]
   None

   [Description]
   This is used to draw and fill an ellipse whose center is (xc, yc) and whose radii are (rh, rv).

12. **Draw ellipses**

   [Call]
   void g8_elps2 (int x1, int y1, int x2, int y2, int col, int mod)

   [Input]
   x1   : x coordinate
   y1   : y coordinate
   x2   : x coordinate
   y2   : y coordinate
   col   : color (0 to 255)
   mod : 1=set; 2=or set; 3=and set ,

   [Output]
   None

   [Description]
   This is used to draw an ellipse which inscribes a square (or rectangle) of (x1, y1)-(x2, y2).

13. **Draw and fill ellipses**

[Call]
void g8_elpspa2 (int x1 , int y1 , int x2, int y2, int col, int mod)

[Input]
x1   : x coordinate
y1   : y coordinate
x2   : x coordinate
y2   : y coordinate
col   : color (0 to 255)
mod   : 1=set; 2=or set; 3=and set

[Output]
None

[Description]
This is used to draw and fill an ellipse which inscribes a square (or rectangle) of (x1, y1)-(x2, y2).

14. **Copy area 2 (copy in graphics plane)**

[Call]
void g8_bitblt2 (int src_x, int src_y, int x_len, int y_len, int dst_x, int dst_y, int mod, int inv, int mirr)

[Input]
src_x   : transfer source start point (top left) x coordinate
src_y   : transfer source start point (top left) y coordinate
x len   : number of x dots
y_len   : number of y lines
dst_x   : transfer destination start point (top left) x coordinate
dst_y   : transfer destination start point (top left) y coordinate
mod   : 1=set; 2=or set
inv   : 0=normal; 1=inverted
mirr   : mirror
        0=no mirror; 1=left/right mirror
        2=top/bottom mirror; 3=top/bottom/left/right mirror

[Output]
None

[Description]
This is used to copy a square (or rectangle) area whose start (top left) point is (src_x, src_y) and whose size is (x_len, y_len) to an area whose start (top left) point is (dst_x, dst_y).

15. Draw characters

[Call]

void g8_putc (int fnt, int x, int y, unsigned char cod, int rop, int col, int bkcol)

[Input]

fnt   : font No. (0=5x7, 1=7x9, 2=16x16)
x   : start point (top left) x coordinate
y   : start point (top left) y coordinate
cod   : character (0x20 to 0xdf)
rop   : 1=drawn in foreground; 2=drawn in background;
          3=drawn in foreground/background
col   : character foreground color
bkcol : character background color

[Output]

None

[Description]

This is used to draw the designated character in the designated font with (x, y) as its top left point.

16. Draw character string

[Call]

void g8_puts (int fnt, int x, int y, unsigned char *str, int h_pitch, int v_pitch, int rop, int col, int bkcol, int pos)

[Input]

fnt   : font No. (0=5x7, 1=7x9, 2=16xl6)
x   : start point (top left) x coordinate
y   : start point (top left) y coordinate
str   : character string (terminated by null)
h_pitch: horizontal direction character interval
v_pitch: vertical/horizontal direction line interval
rop   : 1=drawn in foreground; 2=drawn in background;
          3=drawn in foreground/background
col   : character foreground color
bkcol : character background color
pos   : 0=left-justified; 1=right-justified

[Output]

None

[Description]

This is used to draw the designated character string in the designated font with (x, y) as its top left point.

(3) LUT setting functions

    1.   **Set LUT color**

[Call]
void opt_setcolor (int no, int r, int g, int b)

[Input]
no   : LUT number (0 to 255)
r   : r (0-255)
g   : g (0-255)
b   : b (0-255)

[Output]
None

[Description]
This is used to set the output colors.
The col drawing values (0 to 255) correspond to the LUT numbers (0 to 255).

    2.   **Set LUT color (white linear)**

[Call]
void opt_setcolor_liner ( )

[Input]
None

[Output]
None

[Description]
This is used to set the output colors of the VRAM to white linear (256 gradation of gray).

#00H $\rightarrow$ r=0   g=0   b=0
  :   :   :   :
#ffH $\rightarrow$ r=ffH   g=ffH   b=ffH

3. Set LUT color (default)

[Call]
void opt_setcolor_default ( )

[Input]
None

[Output]
None

[Description]
This is used to set the LUT colors as follows:
#00H-#07H   : 0/255 times (#f8H--#ffH)
#08H-#0fH   : 8/255 times (#f8H--#ffH)
#10H-#1fH   : 16/255 times (#f8H--#ffH)
   :   :   :   :
#f0H-#f7H   : 240/255 times (#f8H-#ffH)
#f8H $\rightarrow$ r=00H   g=00H   b=00H
#f9H $\rightarrow$ r=ffH   g=00H   b=00H
#faH $\rightarrow$ r=00H   g=ffH   b=00H
#tbH $\rightarrow$ r=ffH   g=ffH   b=00H
#fcH $\rightarrow$ r=00H   g=00H   b=ffH
#fdH $\rightarrow$ r=00H   g=ffH   b=ffH
#feH $\rightarrow$ r=ffH   g=00H   b=ffH
#ffH $\rightarrow$ r=ffH   g=ffH   b=ffH

4. Set LUT color (256 colors)

[Call]
void opt_setcolor_256 (unsigned char & col)

[Input]
col   :col [768] is provided. (x256 in order of R/G/B)

[Output]
None

[Description]
This is used to set the LUT colors as follows.
col [0]=R, col [1]=G, col [2]=B $\rightarrow$ palette #0
col [3]=R, col [4]=G, col [5]=B $\rightarrow$ palette #1
                    :
                    :

5. Set window color

[Call]
void opt_setwndcolor (int no, int r, int g, int b)

[Input]
no   : window number (0 only)
r   : R (0 to 255)
g   : G (0 to 255)
b   : B (0 to 255)

[Output]
None

[Description]
This is used to set the window color (R/G/B). Only #0 (1 color) can be designated for the window. (See window setting functions)

(4) Display-related functions

1. Inquire display size

[Call]
int vs_InqDispSize ( )

[Input]
None

[Output]
Return value   : Higher 16 bits=number of vertical display lines
                         Lower 16 bits=number of horizontal display dots

[Description]
This is used to return the horizontal/vertical display size.

2. Inquire status

[Call]
int vs_InqStat (int type)

[Input]
type   : type of inquiry
0=inquire about currently selected dot clock

[Output]
Return value : When type=0
DotClock   : 1000 times xxx.xxx MHz (in other words, kHz units)

(5) Window setting functions

1. Initialize window

[Call]
void vs_InitWindow ( )

[Input]
None

[Output]
None

[Description]
This is used to initialize the window line memory. The window is set using the
vs_AddWindow ( ) function that follows.

2. Set window data

[Call]
void vs_AddWindow (int wnd_no, int hs, int he, int vs, int ve)

[Input]
wnd_no   : window number (0 only), 3 = clear
hs   : window position/horizontal start position
he   : window position/horizontal end position
• Relative position within display period
vs   : window position/vertical start position
ve   : window position/vertical end position
• Relative position within display period

[Output]
None

[Description]
This is used to set the window (it is set in the window register). Only 0 (1 color) can be
designated for the window. (See opt_setwndcolor ( ))
The rectangular portion which is set in the horizontal and vertical directions appears as
the window.

```
Horizontal  ──────── hs ─ he ────────

            │
            │
            │
     vs     │
            │              0000000
            │
     ve     │              0000000
            │
            │
            │
            │
  Vertical
```
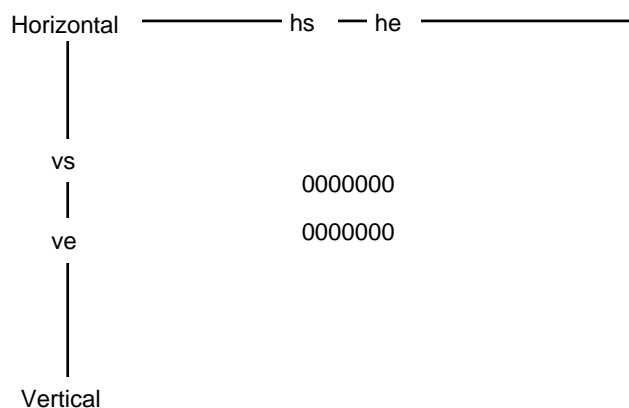
  0   : window color #0
  The window can be initialized by vs_InitWindow ( ) and set by vs_AddWindow ( ).

(6) Pattern drawing functions

l. Draw character pattern

[Call]
void ptn_char (int fomt, int font, int code, int hcell, int vcell, int col, int rop,
int bkcol, int area, int x1 , int y1 , int x2, int y2)

[Input]
fomt   : character format (0=list; 1=character; 2=corner & center)
              (9=corner only)
font   : font (0=5x7; 1=7x9; 2=16x16)
code   : code (20H to ffH)
hcell   : H cell size (1 to 255)
vcell   : V cell size (1 to 255)
col   : character foreground color (palette no: 0 to 255)
rop   : 1=drawn in foreground; 2=drawn in background;
              3=drawn in foreground/background
bkcol   : character background color (palette no: 0 to 255)
area   : 0 = entire display area; 1 = designated area
x1, y1, x2, y2 : coordinates (LDC or WC); ignored when entire display area is
                  designated.
The pattern is drawn inside the (x1,y1)-(x2-y2) rectangle when the area is designated.

[Output]
None

[Description]
This is used to draw character patterns.

2. Draw crosshatch pattern

[Call]
void ptn_cross (int mod, int fomt, int h_interval, int v_interval, int h_width,
int v_width int col, int area, int x1, int y1, int x2, int y2)

[Input]
mod   : mode (0=number of lines; 1=dots)
fomt   : format (0=from center; 1=from top left)
h_interval : H interval (0 to 9999 lines, 0 to 9999 dots)
v_interval : V interval (0 to 9999 lines, 0 to 9999 dots)
h_width   : H line width (1 to 15)
v_width   : V line width (1 to 15)
col   : drawing color (palette no: 0 to 255)
area   : 0=entire display area; 1=designated area
x1,y1,x2,y2   : coordinates (LDC or WC; ignored when entire display area is
                 designated.
The pattern is drawn inside the (x1, y1)-(x2-y2) rectangle when the area is designated.

[Output]
None

[Description]
This is used to draw crosshatch patterns.

3. Draw dot pattern

[Call]
void ptn_dot (int mod, int fomt,int h_interval, int v_interval, int size, int type,
int col, int area, int x1 , int y1, int x2, int y2)

[Input]
mod   :mode (0=number of lines; 1=dots)
fomt   : format (0=from center; 1=from top left)
h_interval : H interval (0 to 9999 lines, 0 to 9999 dots)
v_interval : V interval (0 to 9999 lines, 0 to 9999 dots)
size   : size (1 to 15)
type   : shape (0=round; 1=angular)
col   : drawing color (palette no: 0 to 255)
area   : 0=entire display area; 1=designated area
x1, y1, x2, y2 : coordinates (LDC or WC); ignored when entire display area is
                         designated.
The pattern is drawn inside the (x1, y1)-(x2-y2) rectangle when the area is designated.

[Output]
None

[Description]
This is used to draw dot patterns in the VRAM.

4. Draw "+" center mark pattern

[Call]
void ptn_juuji (int col, int width_h, int width_v, int h_len, int v_len)

[Input]
col   : drawing color (palette no: 0 to 255)
width_h   : horizontal line width (0 to 255) of center mark; 0 is treated as 1 .
width_v   : vertical line width (0 to 255) of center mark; 0 is treated as 1 .
h_len   : horizontal length (0% to 100%) of center mark; 0% is treated as 5%.
v_len   : vertical length (0% to 100%) of center mark; 0% is treated as 5%.

[Output]
None

[Description]
This is used to draw (cross-shaped) center mark patterns in the VRAM.

5. Draw "□" edge pattern

[Call]
void ptn_waku (int col, int width_h, int width_v)

[Input]
col   : drawing color (palette no: 0 to 255)
width_h   : horizontal line width (0 to 255) of edge mark; 0 is treated as 1.
width_v   : vertical line width (0 to 255) of edge mark; 0 is treated as 1.

[Output]
None

[Description]
This is used to draw "□" edge patterns in the VRAM.

6. **Draw block pattern**

[Call]
void ptn_block   (int mod, int dir, int col_su, int h_interva[, int v_interval,
unsigned char & col, int area, int x1, int y1, int x2, int y2)

[Input]

mod　　　: 0=%; 1=dots; 2=lines
　　　　　　0xH*col [ ] designation; data of up to Col [ ] used.
　　　　　　8xH*col [ ] no designation; up to Col [0] = first palette No.; Col [1]=last
　　　　　　palette No.; Col [2]=palette No. increment
dir　　　　: direction (0=horizontal; 1=vertical; 2=horizontal & V;
　　　　　　3=vertical & H; 4=top left→bottom right; 5=bottom left→top right; 6=top
　　　　　　right→bottom left; 7=bottom right→top left)
col_su　　: number of palette No. data (1 to 256)
h_interval : H interval (0.0 to 100%, 0 to 9999 dots, 0 to 9999 lines)
v_interval : V interval (0.0 to 100%, 0 to 9999 dots, 0 to 9999 lines)
col [256]　: palette No. (1bytex Col_su) *max. 256
area　　　: 0=entire display area; 1=designated area
x1, y1, x2, y2 : coordinates (LDC or WC);
　　　　　　ignored when entire display area is designated
　　　　　　The pattern is drawn inside the (x1, y1)-(x2-y2) rectangle when the area
　　　　　　is designated.

[Output]
None

[Description]
This is used to draw block patterns in the VRAM.

7. **Draw burst pattern**

[Call]
void ptn_burst (int fomt, int interval, int step, int col1, int widthl, int col2,
int width2, int area, int x1, int y1, int x2, int y2)

[Input]

fomt　　　: format (0=left→right; 1=right→left;2=center→left/right;
　　　　　　3=left/right→center; 4=top→bottom; 5=bottom→top;
　　　　　　6=center→top/bottom; 7=top/bottom→center)
interval　: interval (1 to 99): number of lines of same thickness
step　　　: step (1 to 99): thickness increments
coll　　　: #1 drawing color (palette No.: 0 to 255)
width1　　: #1 line width (0 to 255)
col2　　　: #2 drawing color (palette No.: 0 to 255)
width2　　: #2 line width (0 to 255)
area　　　: 0=entire display area; 1=designated area
x1,y1,x2,y2   : coordinates (LDC or WC);
　　　　　　ignored when entire display area is designated
　　　　　　The pattern is drawn inside the (xl, yl)-(x2-y2) rectangle when the area
　　　　　　is designated.

[Output]
None

[Description]
This is used to draw burst patterns in the VRAM.

6 Error reference

6.1. The error message of SP-8028

The various error messages which may be displayed by the SP-8028 are listed below.

Error message	Code (H)	Description
Parameter Error	0101	Parameter error
DotClock Range Error	0110	Dotclock in the horizontal timing data is outside the specified range.
Hfrontp Range Error	0111	The front porch in the horizontal timing data is outside the specified range.
HD (start+Width) Range Error	0112	HD in the horizontal timing data is outside the specified range.
Hperiod Range Error	0113	Hperiod in the horizontal timing data is outside the specified range.
Hdisp Range Error	0114	Hdisp in the horizontal timing data is outside the specified range.
Hsync Range Error	0115	Hsync in the horizontal timing data is outside the specified range.
Hbackp Range Error	0116	Hbackp in the horizontal timing data is outside the specified range.
Hblanking Range Error	0117	The blanking period in the horizontal timing data is outside the specified range.
Hfreq Range Error	0118	The horizontal frequency in the horizontal timing data is outside the specified range.
Other H-Timing Data Error	0119	Other error in the horizontal timing data.
Vtotal Range Error	0120	Vtotal in the vertical timing data is outside the specified range.
Vdisp Range Error	0121	Vdisp in the vertical timing data is outside the specified range.
Vsync Range Error	0122	Vsync in the vertical timing data is outside the specified range.
Vbackp Range Error	0123	Vbackp in the vertical timing data is outside the specified range.
Vfrontp Range Error	0124	The front porch in the vertical timing data is outside the specified range.
Vblanking Range Error	0125	The blanking period in the vertical timing data is outside the specified range.
Vfreq Range Error	0126	The vertical frequency in the vertical timing data is outside the specified range.
VD Start+Width) Range Error	0127	VD in the vertical timing data is outside the specified range.
Veqpfp Range Error	0128	EQPfp in the vertical timing data is outside the specified range.
Veqpbq Range Error	0129	EQPbp in the vertical timing data is outside the specified range.
Other V-Timing Data Error	012A	Other error in the vertical timing data.
Timing Data Disable	0130	Timing data disable error.
Pattern Data Disable	0131	Pattern data disable error.
FlashMemory write Error	0140	Flash card writing error.
User Character Code Error	0141	User character code is outside the specified range.
User Character Size Error	0142	User character size is outside the specified ranae.
Timing NO Error	0143	Timing number is outside the specified range.
Palette NO Error	0144	Palette number is outside the specified range.
FontSet NO Error	0145	Font number is outside the specified range.
FontSet FAT Error	0146	Font data call error.
FontSet Data Not Regist	0147	Font data error.
Pattern NO Error	0148	Pattern is not registered.
Pattern Data Size Over	0149	Pattern data size is outside the specified range.
Pattern Data Not Regist	014A	Pattern data error.
Pattern FAT Error	014B	Pattern data call error.
Pattern Data Size Over	014C	Pattern data size is outside the specified range.
Flash Firm Disable	0150	Flash card disable error.
Flash Firm Write Error	0151	Flash card writing error.
Write Flash while Firm Working	0152	Flash card writing error.
Communication TimeOut	01F0	Communication timeout error.
Undefined Command	01F1	Undefined command error.
V-Sync Timeout	01F2	V-sync timeout error.

6.2. The error message at the time of option pattern creation

The various error messages which may be displayed when optional patterns are created are listed below.

Error message	Code (H)	Description
Program not Exist	0201	Program has not been loaded.
Variables Stack Error	0202	Variable stack error. (Overflow or underflow) An overflow may occur when the number of hierarchical levels increases for the functions that have declared many variables.
Register Stack Error	0203	Register stack error. (Overflow or underflow) An overflow may occur when the calculation formula is too complex.
Call Stack Error	0204	Function call stack error. (Overflow or underflow) An overflow occurs when the number of function call hierarchical levels exceeds 64.
Illegal Instruction Code	0205	An attempt was made to execute an illegal command. The compiled program may have been destroyed.
Divide by Zero	0206	Division by zero was executed.
Math Error	0207	Mathematical error
Unfinished Error	0214	The program was terminated part of the way through. This may occur if the parentheses { } are not paired up properly.
Program Size too Big	0215	The program size is too big.
Variables Area Overflow	0216	The variable area has overflowed.
Illegal Character	0217	An illegal character has appeared.
Numeral Buffer Overflow	0218	A character string expressing a number is too long.
String Buffer Overflow	0219	The character string has more than the maximum 255 characters.
malloc Fail	021A	Insufficient memory.
No Semicolon	021B	The statement does not end with a semicolon.
Variable Not Defined	021C	An undefined variable was used.
Illegal Expression	021D	The type of expression is not correct.
Illegal Expression for Real	021E	The type of expression using real numbers is not correct. This occurs when a bit inversion operation is performed for a real number.
Unbalanced Parenthesis ( )	021F	The parentheses ( ) are not paired up properly.
Unbalanced Bracket [ ]	0220	The brackets [ ] are not paired up properly.
Symbol Solve Error	0221	The correspondence between the symbol (variable name or function name) definition and reference is illegal.
Multiple Symbol Definition	0222	The same symbol has been defined more than once.
'main()' Definition Error	0223	"main" function definition error.
'goto' Statement Error	0224	"goto" statement error.
'return' Statement Error	0225	"return" statement error.
Return Type error	0226	The type of function return value is illegal.
'if' Statement Error	0227	"if" statement error.
'while' Statement Error	0228	"while" statement error.
'do' Statement Error	0229	"do" statement error.
'for' Statement Error	022A	"for" statement error.
'switch' Statement Error	022B	"switch" statement error.
'case' Statement Error	022C	"case" of statement error.
Too Many 'case' Statement	022D	Too many "case" statements have been used. Up to 127 "case" statements can be used per "switch".
'default' Statement Error	022E	"default" statement error.
'break' Statement Error	022F	"break" statement error.
"continue" statement error	0230	"continue" statement error.
Argument Type Error	0231	Illegal type of function argument.
Number of Argument Error	0232	Illegal number of function arguments.
Function Call Error	0233	Illegal function call.
Function Declare Error	0234	Illegal function declaration.
Variable Declare Error	0235	Illegal variable declaration.
Argument Declare Error	0236	Illegal function argument declaration
Variable Initialize Error	0237	Illegal variable initialization.
Array Declare Error	0238	Illegal array variable declaration.

Error message	Code (H)	Description
Mode Error (Write or Not)	0264	Illegal object control mode.
Code Poke Offset Error	0265	Error in offset during code writing.
Parser Error	0266	Parsing status error.
Expression Error	0267	Numerical expression analysis status error.
Build-In Function Error	0268	Built-in function error.
User Function Error	0269	User-defined function error.
Internal Label Error	0270	Label control error in parsing.

6.3. The error message displayed from a driver

The various error messages which may be displayed from the driver are listed below

Error message	Code (H)	Description
Driver: Command Execution Timeout.	0840	Driver: Command execution timeout.
Driver: Command Parameter Error.	0841	Driver: Parameter Error
Driver: Control Port Not Ready	0842	Driver: Data cannot be written into control port.
Driver: Data Port Write Timeout.	0850	Timeout for writing data into data port.
Driver: Data Port Read Timeout.	0851	Timeout for reading data from data port.
Driver: DMA Timeout	0860	DMA execution timeout.
Driver: DMA Illegal Page	0861	DMA memory error.
Driver: DMA Linear Lock	0862	DMA memory lock error.
Driver: DMA CopyPageTable	0863	DMA memory page processing error.
Driver: DMA Setup	0864	DMA setup error.
Driver: DMA Start Read	0865	DMA start error.
Driver: DMA Start Complete	0866	DMA start completion error.
Driver: DMA Trans Complete	0867	DMA transfer completion error.
Driver: Wait Interrupt Timeout	0870	DMA transfer completion wait error.
Driver: Parameter Error	087D	Parameter error.
Driver: Device IOControl Error	087E	Driver call error.
Driver: Device Open Error	087F	Driver open error.

6.4. The error message displayed at the time of option pattern execution

The various error messages which may be displayed when the created optional patterns are executed are listed below.

Error message	Code(H)	Description
Option Pattern not exists	0081	User-created optional pattern does not exist.
Variables stack error	0082	Variable stack error.
Register stack error	0083	Register stack error.
Call stack error.	0084	Function stack error.
Illegal instruction	0085	Illegal instruction code.
Divide by Zero	0086	Division by zero was executed.
Math error	0087	Error in floating decimal point calculation.

7 Appendices

7.1. Sample pattern data

Listed below is the sample pattern data.

Filename	File format	Pattern
4BlockPat	Graphic pattern	Crosshatch & dot & burst
4ColorBar	Graphic pattern	Color bars in 8 colors x 4
9×9Cross	Graphic pattern	9x9 crosshatch
Burst	Graphic pattern	Burst
CharList	Graphic pattern	Characters (7x9/16x16)
Color2	Graphic pattern	Color bars in 16 colors x 4
ColorBar	Graphic pattern	Color bars in 16 colors
Dot	Graphic pattern	Dots (H=10, V=10) x 4
gray	Graphic pattern	Gray scale (8 vertical gradations)
T01_Dot	Graphic pattern	Dot (1 point)
T02_line	Graphic pattern	Lines (blue, red, green, white)
T03_rect	Graphic pattern	Rectangle
T04_tria	Graphic pattern	Triangle (yellow)
T05_Elli	Graphic pattern	Ellipse (purple)
T06_Cros	Graphic pattern	9x9 crosshatch
T07_Dots	Graphic pattern	Dots (H=10, V=10) x 4
T08_Bloc	Graphic pattern	Color bars in 8 colors
T09_Char	Graphic pattern	Characters (16x16/20x20)
T10_Burs	Graphic pattern	Vertical and horizontal burst
T11_EDGE	Graphic pattern	Edge (H=20, V=20)
T12_EDGE	Graphic pattern	Edge (H=1, V=1)
T13_Burs	Graphic pattern	Burst (interval=1)
Variety	Graphic pattern	Combinations of a variety of graphic patterns (circle, ellipse, gray scale, triangle, rectangle, burst, crosshatch, line, dot, color bar and other patterns)
o00_256Col	Optional pattern	Block colors in 256 colors
o01_64Gray	Optional pattern	Block gray in 64 gradations (white -> black)
o02_64Gray	Optional pattern	Block gray in 64 gradations (black -> white)
o03_8C16G	Optional pattern	8 color bars & 16 gray scales
o04_GrayCross	Optional pattern	Gray scale & crosshatch
o06_ColTemp	Optional pattern	Color temperature
o07_PairRing	Optional pattern	Pair of rings
o08_Kyowa	Optional pattern	Crosshatch & circle & gray
o0b_CharEdgeH	Optional pattern	Character edge (H)
o0c_CharEdge	Optional pattern	Character edge (O)
o12_10Step	Optional pattern	10 steps & 1/10 MHz
o13_Ramp25	Optional pattern	Gamma correction ramp wr=2.5
o14_Ramp20	Optional pattern	Gamma correction ramp wr=2.0
o15_Ramp05	Optional pattern	Gamma correction ramp wr=0.5

Filename	File format	Pattern
o16_SmpteCbar	Optional pattern	SMPTE color bars
o17_SmptePR271	Optional pattern	SMPTE PR27.1
o18_ITC9Window	Optional pattern	ITC pattern, 9 windows
o19_ITCCrsMark	Optional pattern	ITC pattern, crosshatch & markers
o1a_ITCHchar	Optional pattern	ITC pattern, H characters
o1b_32GrayH	Optional pattern	Gray scale with 32 gradations (H)
o1c_64GrayH	Optional pattern	Gray scale with 64 gradations (H)
o1d_64GrayCol	Optional pattern	64 grays + RGBW color bars superimposed
o1e_GrayCrcl	Optional pattern	Gray scale + circle
o21_CrsTalk60	Optional pattern	Crosstalk (60% width)
o23_8Cross	Optional pattern	Crosshatch with 8 blocks
o24_DspPosAdj	Optional pattern	Display position adjuster
o25_SmpteRP133	Optional pattern	SMPTE RP-133
o26_SmpteCol	Optional pattern	SMPTE color version
o2a_256BlkCol	Optional pattern	Block color "color" character in 256 colors
o2d_Rndm256Col	Optional pattern	Color bar with 256 random colors
o3a_RampHV	Optional pattern	Ramp scroll (diagonal)
o3b_AnsiSetup	Optional pattern	ANSI pattern (setup)
o3c_AnsiCntrst	Optional pattern	ANSI pattern (contrast)
o3d_Ansi9Point	Optional pattern	ANSI pattern (9 points)
o40_Ramp	Optional pattern	10-bit lamp
o41_RampHV	Optional pattern	10-bit lamp HV superposition (H:R,V:G)
o42_RampHV	Optional pattern	10-bit lamp HV superposition (H:R,V:B)
o43_RampHV	Optional pattern	10-bit lamp HV superposition (H:G,V:R)
o44_RampHV	Optional pattern	10-bit lamp HV superposition (H:G,V:B)
o45_RampHV	Optional pattern	10-bit lamp HV superposition (H:B,V:R)
o46_RampHV	Optional pattern	10-bit lamp HV superposition (H:B,V:G)
o47_RampHret	Optional pattern	The direction repetition of 10-bit lamp H
VGA	VBM pattern	Picture of sailboat
XGA	VBM pattern	Picture of owl
1080	VBM pattern	Yacht harbor

7.2. Concerning the drawings of the patterns

Caution

When a pattern smaller than the previously drawn pattern is drawn while the product is being used to draw patterns, the previously drawn pattern will be displayed in the background.

Example: Output is as shown in the figure below when first a black circle is drawn in the timing data VGA mode and then a 200 x 150 white circle is drawn using the same timing data.
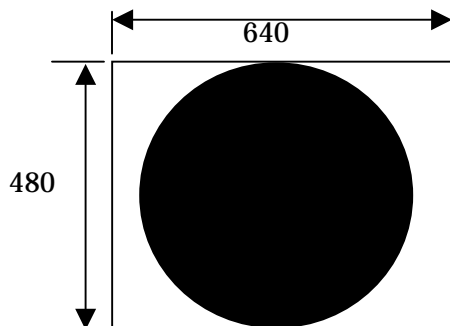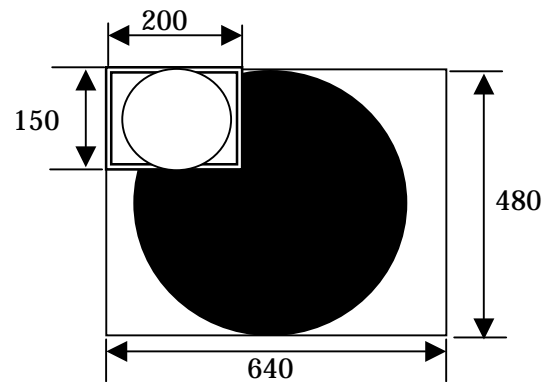
Fig. 7.2.1   Black circle drawn   Fig. 7.2.2   White circle drawn

7.3. System requirements

```
CPU                    Pentium 133MHz or more is recommended.
Memory                 32MB or more is recommended.
Hard disk space        There must be room of 32MB or more.
Display resolution     800 X 600 or more is recommended.
```

OS
  Windows98   English version
  Windows2000 English version
  WindowsXP   English version

BIOS
  PCI BIOS V.2.1 or more

SP-8028

Instruction Manual

NOTICE

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