

SONY®

PERSONAL COMPUTER
HB-G900AP

OPERATING INSTRUCTIONS Page 2

When operating the unit, please read this manual thoroughly, and retain it for future reference.

MANUAL DE INSTRUCCIONES Página 42

Antes de utilizar el ordenador, lea detenidamente este manual, y reténelo para futuras referencias.

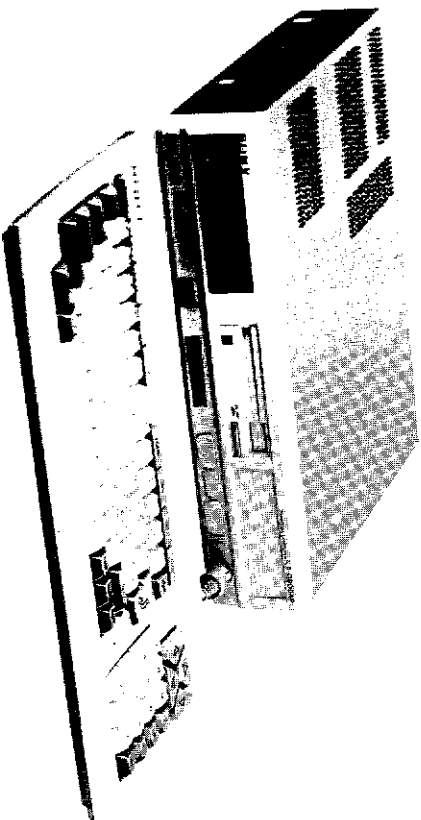


TABLE OF CONTENTS

| | |
|---|----|
| Warning | 3 |
| Features | 4 |
| Supplied manuals and a disk | 5 |
| Precautions | 6 |
| Parts identification | 8 |
| Connections | 13 |
| Connecting the keyboard..... | 13 |
| Connecting a color monitor | 14 |
| Connecting a trackball or a mouse | 15 |
| Connecting a printer..... | 15 |
| Connecting a tape recorder for use as an external memory | 16 |
| How to start up | 17 |
| To start MSX-Disk BASIC | 17 |
| To start programs in a floppydisk | 18 |
| To start programs in an MSX cartridge | 19 |
| The computer does not start up | 19 |
| Keyboard | 20 |
| How to set the calendar-clock | 23 |
| Superimpose function | 25 |
| Memory map | 35 |
| Specifications | 37 |

WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.

To avoid electrical shock, do not open the cabinet. Refer servicing to qualified personnel only.

WARNING FOR THE CUSTOMERS IN THE UNITED KINGDOM THIS APPARATUS MUST BE EARTHED

IMPORTANT

The wires in this mains lead are coloured in accordance with the following code:

Green-and-yellow: Earth
Blue : Neutral
Brown : Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows:

The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol \equiv or coloured green or green-and-yellow. The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black. The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

FEATURES

Computer of MSX Version 2.0

This computer is designed on the MSX standard Version 2.0, the powerful version of MSX, especially on graphics. To display clear pictures, this computer is equipped with an analog RGB connector for a color monitor.

The built-in MSX-BASIC Version 2.0¹⁾ has many commands, statements and functions which give the use of the features of the MSX Version 2.0.

Extended MSX2-BASIC commands for controlling a videodisc player

(Video Utility)

The built-in MSX2-BASIC has extended commands which allow you to control a Sony LDP-180P or LDP-1500P videodisc player from the computer.

RAM Disk Utility Program

Using the RAM disk utility program, data can be recorded in the volatile dynamic RAM, allowing high-speed data transmission.

"Genlock" synchronization capability

This computer utilizes a circuit that allows GENLOCK synchronization of the computer video output with an external video signal. When the computer video signal is genlocked to an external video signal, video and color synchronization problems do not occur, and the computer images can be overlaid (superimposed) onto the video images or these images can be switched. When this computer is used in conjunction with a Sony HBL-G900P Videotizer, the superimposed images can be recorded.

Built-in floppydisk drive

The built-in disk drive allows you to read or write data/programs on a 3.5-inch micro floppydisk, either single- or double-sided.

A Sony HBD-G900 micro floppydisk drive unit can be built in this computer as the second disk drive.

Resident RS-232C interface

This computer is equipped with an RS-232C interface connector which enables the communication between this computer and other apparatus. The built-in MSX2-BASIC also has extended commands for RS-232C communication.

1) In this manual, MSX-BASIC Version 2.0 is referred to as MSX2-BASIC.

SUPPLIED MANUALS AND A DISK

MANUALS

The following manuals are supplied with this computer. Please refer to the appropriate manuals according to your intended use of the computer.

Operating Instruction (this manual)

Provides a system outline and basic handling instructions. Please read this manual first.

MSX-BASIC Version 2.0 Programming Reference Manual

Provides a detailed explanation of each MSX2-BASIC command and gives program examples so that MSX2-BASIC can be fully utilized by the BASIC user.

Explanation of MSX-DOS is also included in this manual.

Reference Chart

All MSX2-BASIC commands are briefly explained. Please use this chart as a handy reference during daily programming.

Video Utility

Provides the usage and detailed explanation of the extended MSX2-BASIC commands which control a videodisc player.

A Guide to RS-232C Communication

Explains the RS-232C standards for communication between this computer and other apparatus and explains in detail the commands for communication.

RAM Disk Utility

Provides the usage and explanation of the RAM disk utility program.

DISK

MSX-DOS/Character Font System, RAM Disk Utility and Font Disk

MSX disk operating system, MSX-DOS, for use with the softwares to be commercially available in the future is included. For explanation of MSX-DOS and its commands, refer to the MSX-BASIC Version 2.0 Programming Reference Manual.

This disk also includes the character font files for the Video Utility built-in the computer, and the RAM disk utility program. Refer to the supplied Video Utility manual and RAM disk utility manual.

PRECAUTIONS

On safety

- Operate the unit on 220 V–240 V AC.
- Should any solid object or liquid fall into the cabinet, turn the power off and have the unit checked by qualified personnel before operating it any further.
- Unplug the unit from the wall outlet if it is not to be used for an extended period of time.
- Do not place or drop heavy objects on the power cord. Use of a damaged cord is dangerous. To disconnect the cord, pull it out by the plug—never pull the cord itself.
- The nameplate indicating operating voltage, power consumption, etc. is located on the bottom.
- The caution labels are located on the bottom of the unit.

On installation

- The computer consists of high-precision electronic parts. Do not drop it or bump it against other objects. Do not place it in a place subject to vibration or on an unstable bases.
- Do not install the unit near heat sources such as a radiator or an air duct, or in a place subject to direct sunlight, excessive dust, and/or moisture.
- Provide adequate air circulation to prevent internal heat build-up. Do not place the unit on surfaces (rugs, blankets) or near materials (curtains, draperies) that may block the ventilation slots.
- Use only the specified peripheral equipment; otherwise, trouble may result. Before connecting peripheral equipment, be sure to turn the power off or the internal IC chip may be damaged.
- Do not place an electric equipment which incorporates an electro-magnet, such as a TV set or a speaker, near this unit. If affected by an electromagnetic field, it may malfunction.
- Since the computer handles high-frequency signals, use of the computer near a radio, TV, audio tuner, etc., may cause noise in the operation of such equipment. In such cases, move the computer and the equipment in question away from each other.

On cleaning

- Clean the cabinet and keyboard with a soft, dry cloth, or a soft cloth lightly moistened with a mild detergent solution. Do not use any type of solvent, such as alcohol or benzine, which might damage the finish.

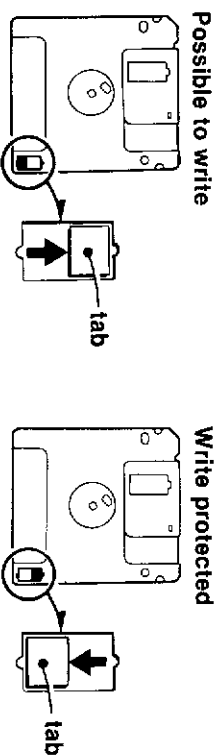
DISK CARE

Disk handling

- Use only 3.5-inch micro floppydisks, either single- or double-sided with an 80-track per side system. Manual-shutter type disks cannot be used.
- Before using a new (unused) disk, be sure to "format" the disk to prepare it to store and read data by using a fixed format. See "FORMAT" command in the MSX-BASIC Version 2.0 Programming Reference Manual. Note that formatting of a disk erases all previous information stored on that disk.
- Never touch the exposed surface of the disk. Even minor dirt or dust may adversely affect contact with the head or cause a disk read/write error.
- Keep disks away from equipment with magnets, such as speakers or amplifiers, because their magnets could cause erasure or dropouts of stored data.
- Do not expose disks to direct sunlight, extremely cold temperature, or moisture.
- Protect disks from dust by storing them in their case or a box.

Write protect tab

- A write-protect tab is attached to the back of the disk to protect your recorded information. Make sure that this tab is in upper position to record data on the disk. To prevent the loss of recorded data due to accidental erasure, slide the tab downwards as shown.



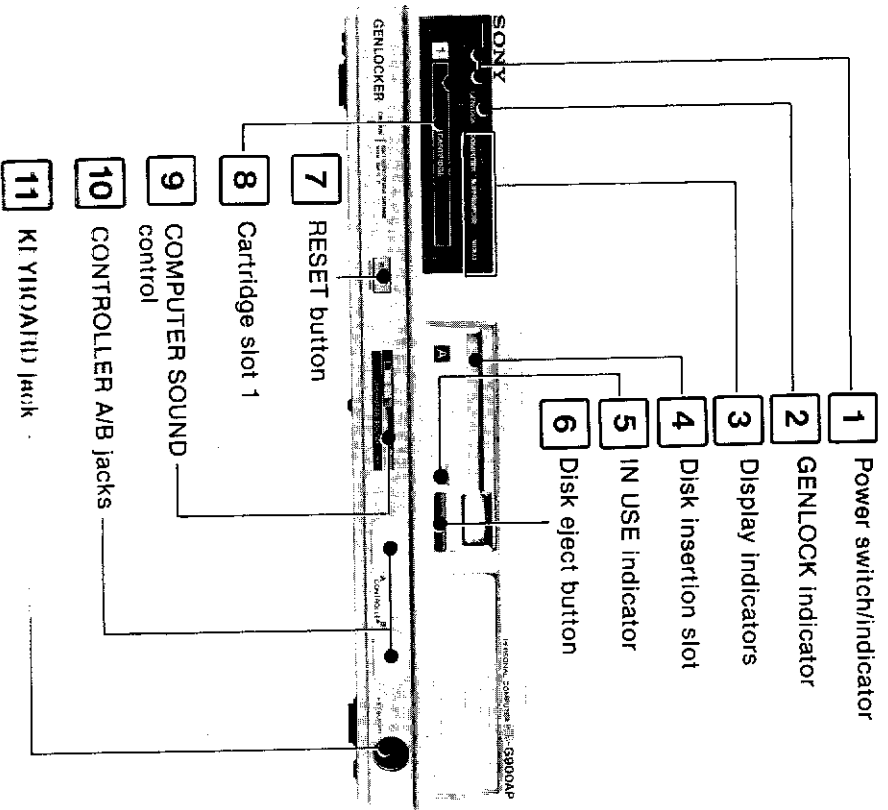
Label

- Use the specified labels.
- If there is no space to write on a label, peel the label off, and attach a new label. Do not attach a new label over the old one, because the cumulative thickness may cause a read/write error or trouble with the micro floppydisk unit.

If trouble occurs, unplug the unit, and contact your designated Sony dealer.

PARTS IDENTIFICATION

Front panel



- 1 Power switch/indicator**
Press to turn on the power, and the indicator lights. Press again to turn off the power.

- 2 GENLOCK indicator**
This indicates the current graphics mode. It lights when the computer output is in the external synchronization mode and goes off when in the internal synchronization mode.

3 Display indicators

These indicate the image(s) displayed on the color monitor connected to the computer. The image to be displayed is selected by specifying the "mode" parameter of the MSX2-BASIC SET VIDEO command.
COMPUTER: Lights when the computer output is to be displayed. (When "mode" is 0.)

SUPERIMPOSE: Lights when the computer output is superimposed over the external video signal. (When "mode" is 1 or 2. However, only the computer output is visible in mode 1.)

VIDEO: Lights when the external video signal is to be displayed. (When "mode" is 3.)

For details, refer to "SUPERIMPOSE FUNCTION".

4 Disk insertion slot

Insert a disk here.

5 IN USE indicator

The indicator lights while data is being read or written on the disk. Do not turn off the power of the computer, press the RESET button or eject the disk while this indicator is on.

6 Disk eject button

Press to eject a disk.

7 RESET button

Press to reset the computer to the initial state. When the computer is reset, the contents of the built-in memory will be destroyed.

8 Cartridge slot 1

Insert an MSX ROM, RAM or interface cartridge.

9 COMPUTER SOUND control

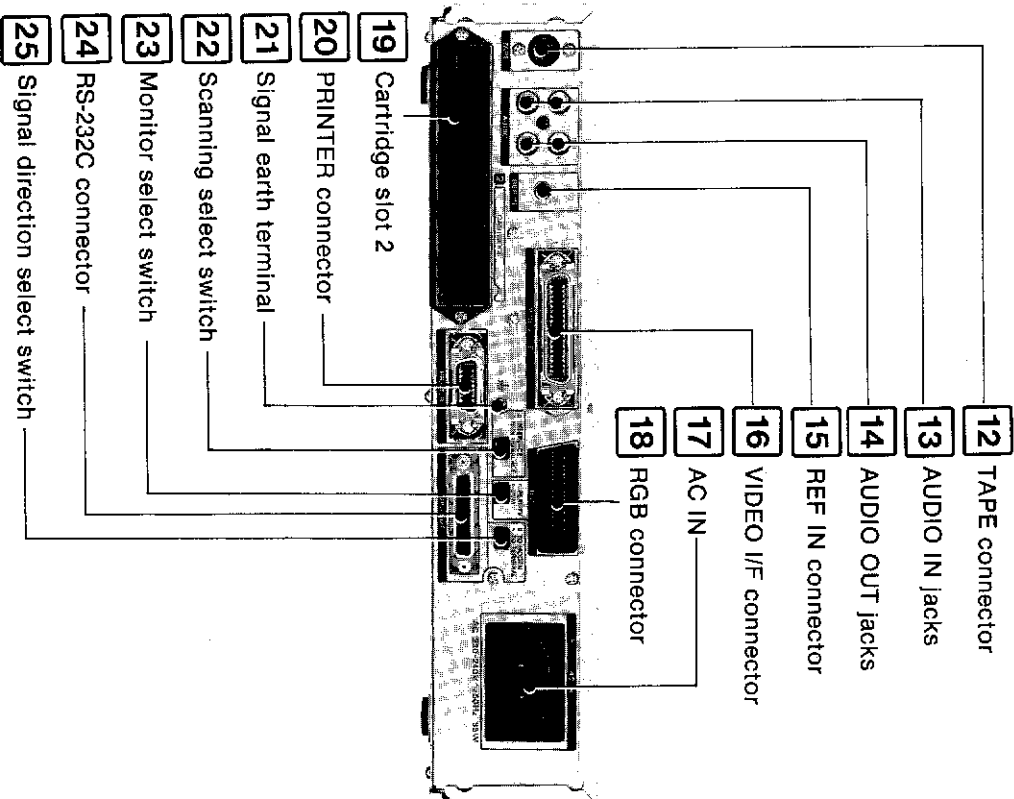
Slide to adjust the volume of the computer sound. The volume of the sound input from the AUDIO IN jacks (13) or RGB connector (18) and output from the AUDIO OUT jacks (14) and RGB connector is not changed using this control.

10 CONTROLLER A/B jacks

Connect a trackball or a mouse.

11 KEYBOARD jack

Connect the supplied keyboard.



12 TAPE connector (8-pin DIN)

Connect to a tape recorder to save or load a program or data.

13 AUDIO IN jacks (phono)

Connect to the audio output of the external video equipment. The audio signal from these jacks can be mixed with the computer sound and can be output from the AUDIO OUT jacks [14] and the RGB connector [18].

14 AUDIO OUT jacks (phono)

Connect to the audio input of the color monitor or audio equipment. The computer sound and/or the external audio sound is output through these jacks. The MSX2-BASIC SET VIDEO command selects the output sound signal. When the computer's power is off, the sound from the AUDIO IN jacks will be output from these jacks.

15 REF IN connector (BNC)

Connect to the video output of the external video equipment. The computer's video output signal can be synchronized with the video signal input from this connector. The computer picture can be superimposed over the video picture of the signal input from this connector.

16 VIDEO I/F connector (36-pin)

Connect a Sony HBI-G900P Videotizer.

17 AC IN

Connect to a wall outlet using the supplied ac power cord.

18 RGB connector (21-pin)

Connect a color monitor equipped with a perI-TV connector (21-pin) or a Sony PVM monitor equipped with an RGB connector (25-pin).

19 Cartridge slot 2

Insert an MSX ROM, RAM or interface cartridge.

20 PRINTER connector (14-pin)

Connect an 8-bit parallel transfer printer of MSX specifications.

21 Signal earth terminal

22 Scanning select switch

This switch is effective only when the internal synchronization is selected by the MSX2-BASIC SET VIDEO command. Depress and lock the switch (NON INTERLACE) to select noninterlace scanning. Press again and release (INTERLACE) to select interlace scanning.

Normally, select interface scanning mode. When the characters displayed on the screen is invisible, select non-interlace scanning.

23 Monitor select switch

Depress and lock the switch (PVM) when a Sony PVM monitor equipped with an RGB connector (25-pin) is connected. Press again and release (PERI-TV) when a color monitor equipped with a perI-TV connector (21-pin) is connected.

CONNECTIONS

Before making connections, be sure to turn off the computer and all the devices to be connected.

CONNECTING THE KEYBOARD

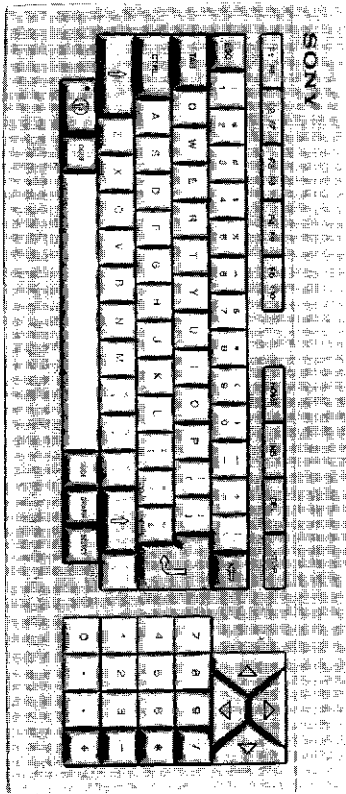
24 RS-232C connector (25-pin)

This connector is used for serial data communication with other computer systems or peripherals equipped with an RS-232C connector.

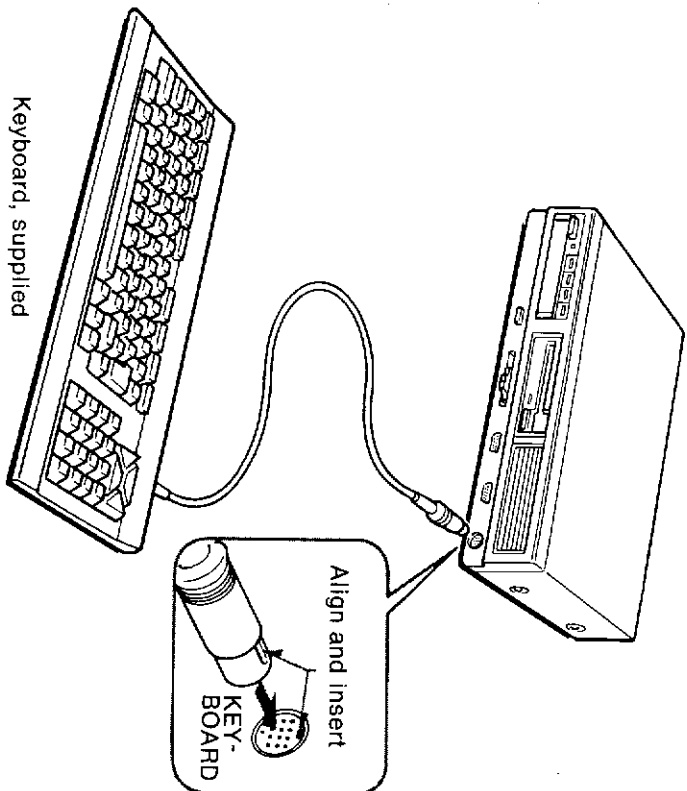
25 Signal direction select switch

Depress and lock the switch (TO TERMINAL) to connect to a terminal device (DTE) for RS-232C communications.
Press again and release (TO MODEM) to connect to a modem (DCE).

Keyboard

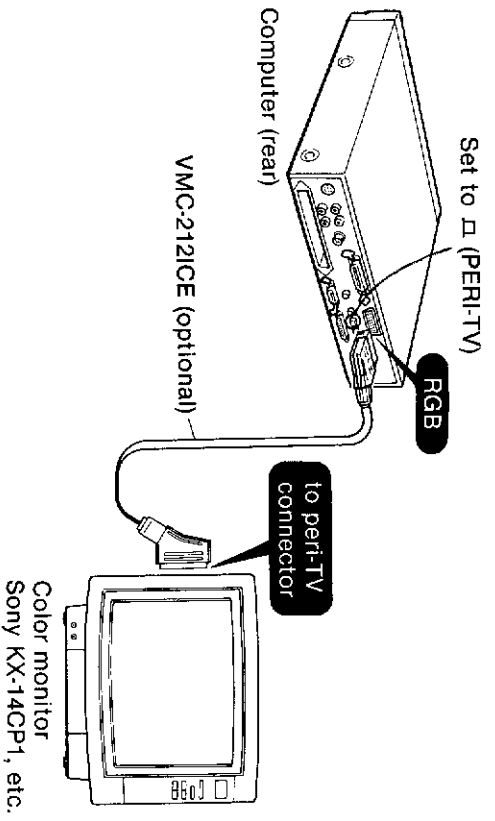


Use to enter programs and data into the computer.

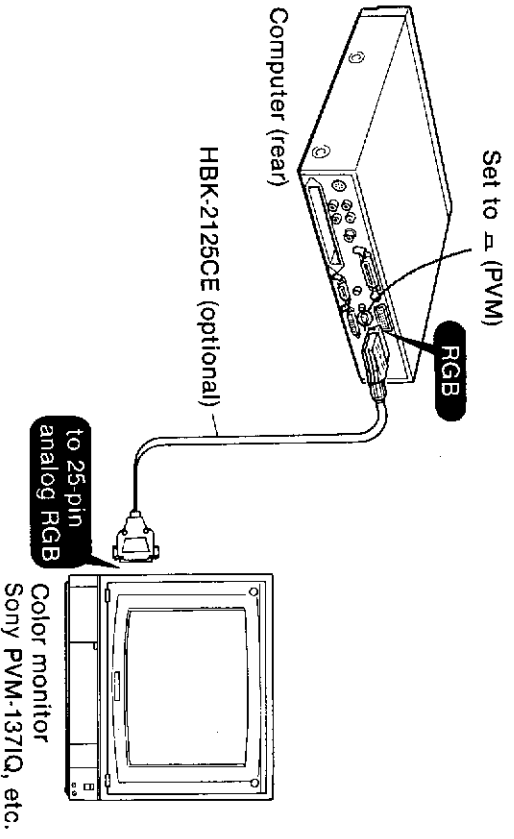


CONNECTING A COLOR MONITOR

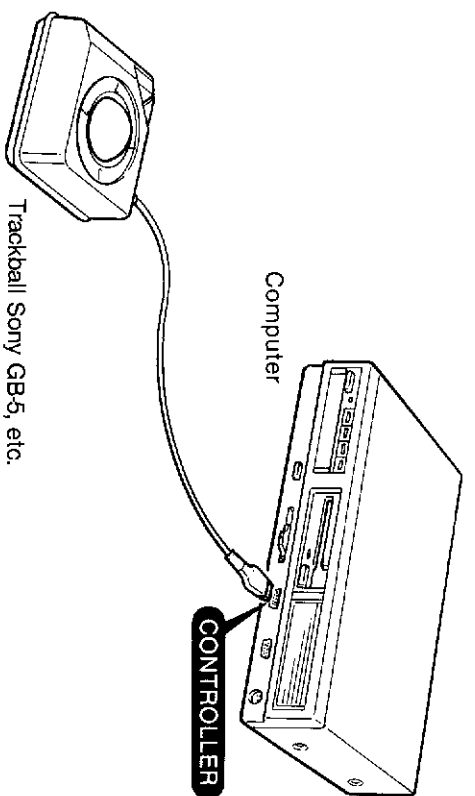
To connect a color monitor equipped with a perI-TV connector (21-pin)



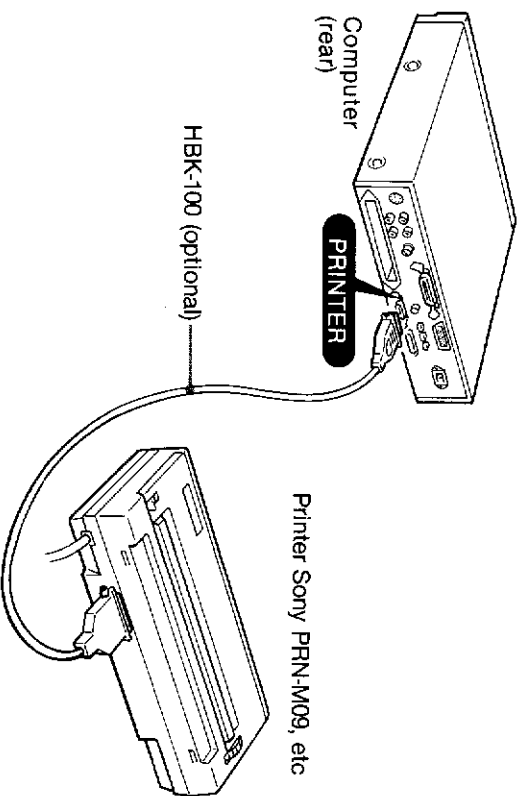
To connect a Sony PVM color monitor equipped with an RGB connector (25-pin)



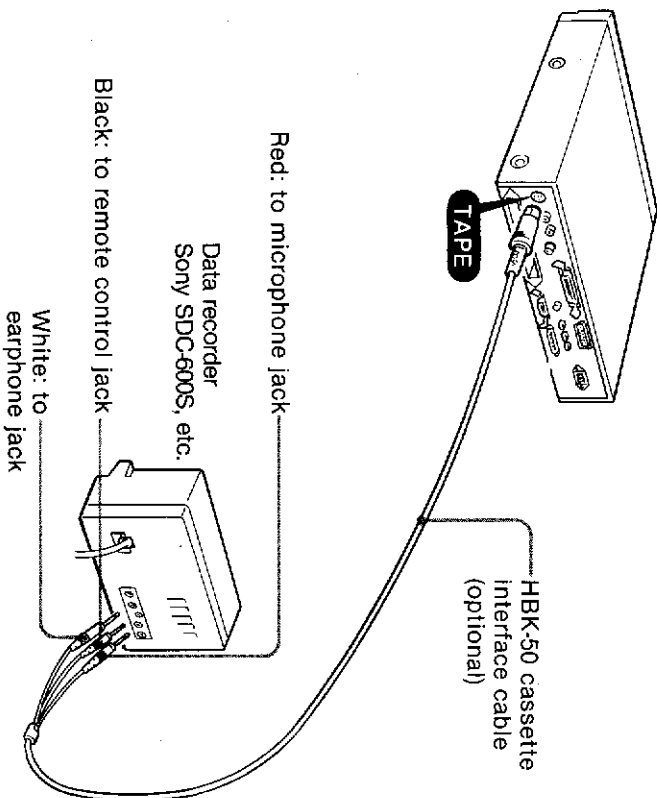
CONNECTING A TRACKBALL OR A MOUSE



CONNECTING A PRINTER



CONNECTING A TAPE RECORDER FOR USE AS AN EXTERNAL MEMORY

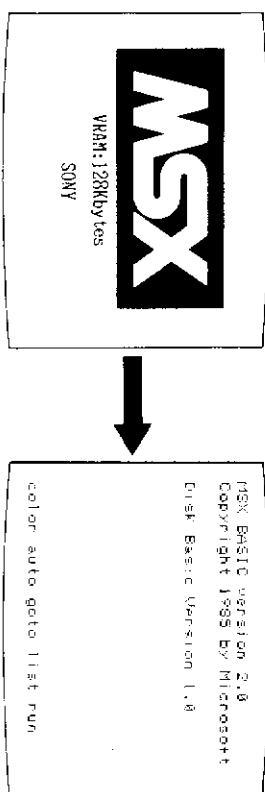


- If the recorder does not have a remote control jack, leave the black play unconnected.

HOW TO START UP

TO START MSX-DISK BASIC

- 1 Remove any program cartridges and floppydisks from the cartridge and disk slots.
- 2 Turn on the color monitor and computer.



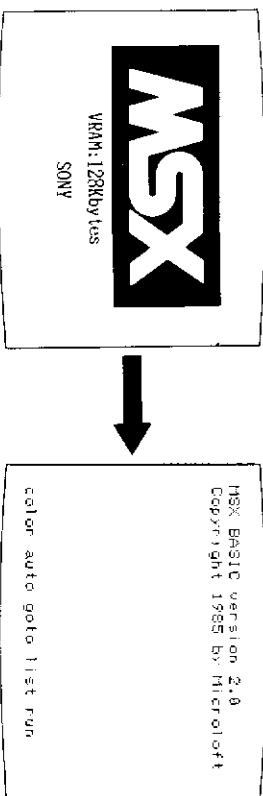
The computer enters the MSX-Disk BASIC command state. You can now enter BASIC program or use commercially available BASIC programs.

MSX-Disk BASIC includes all MSX2-BASIC commands and the commands which allow you to make use of floppydisks at the same time. You can also use the extended commands for controlling a videodisc player (Video Utility) and for RS-232C communication.

When programming your own BASIC program, refer to the "MSX-BASIC Version 2.0 Programming Reference Manual". For the video utility commands, refer to the Video Utility manual supplied. For RS-232C communication, refer to "A Guide to RS-232C Communication". When using the RAM Disk Utility Program, refer to the RAM Disk Utility manual supplied. When using commercially available BASIC programs, refer to the manual supplied with the program.

• Some commercially available BASIC programs may not be used with the MSX-Disk BASIC. It can only be used with the MSX2-BASIC. To start the MSX2-BASIC:

- 1 Remove any program cartridges or floppydisks from the cartridge and disk slots.
- 2 Turn on the color monitor.
- 3 While pressing the **[F]** key, turn on the computer. Keep pressing the **[F]** key until the following screen is displayed.



Now the MSX2-BASIC is started. The MSX2-BASIC does not have the commands which allow you to make use of floppydisks.

TO START PROGRAMS IN A FLOPPYDISK

- 1 Remove any program cartridges from the cartridge slots.
- 2 Insert the floppydisk into the disk insertion slot.
- 3 Turn on the color monitor and computer.

For details about starting and using the program, refer to the instruction manual of the program.

Do not remove the disk, press the RESET button, or turn the power switch off while the IN USE indicator is on. The contents of the disk may be destroyed.

TO START PROGRAMS IN AN MSX CARTRIDGE

- 1 Remove any program disks from the disk insertion slots.
- 2 Insert the cartridge into a cartridge slot. When cartridge slot 1 (front) is used, insert the cartridge with the label facing downwards. When the cartridge slot 2 (rear) is used, insert with the label facing upward.
- 3 Turn on the color monitor and computer.

The program will start. If cartridges are inserted both in the slots 1 and 2, the program in the cartridge in the slot 1 will start. For details about starting and using the program, refer to the instruction manual of the program.

Do not insert or remove the cartridge while the computer's power is on.

THE COMPUTER DOES NOT START UP

If the display below appears, you must enter a password. The system will not start up until you have entered the correct password.



If you have forgotten the password, you can start the system by holding down the **[GRAPH]** and the **[STOP]** keys and pressing the RESET button until the display changes.

KEYBOARD

CHARACTER INPUT

To enter characters (Normal mode)

| Character to be entered | Key(s) to press | Example | |
|-------------------------------------|------------------------|-----------|---------------|
| | | Character | Key(s) |
| Capital letter | [Shift] + Alphabet key | A | [Shift] + [A] |
| Small letter | Alphabet key | a | [A] |
| Symbol on the upper part of key/top | [Shift] + Key | " | [Shift] + ["] |
| Symbol on the lower part of key/top | Key | , | [,] |

"Key 1 + Key 2" in the table indicates pressing Key 2 while pressing Key 1.

To enter capital letters continuously

Press the [Caps Lock] key to light up the indicator on the key. In this mode (cap lock mode), capital letters will be entered by pressing the alphabet keys. Numbers and symbols will be entered in the same way as in the normal mode. To return to the normal mode, press the [Caps Lock] key to turn off the indicator.

To put an accent mark on a character

Key [CODE] is used to put an accent mark on a character.

1 Enter an accent mark.

To enter ` , press [CODE].

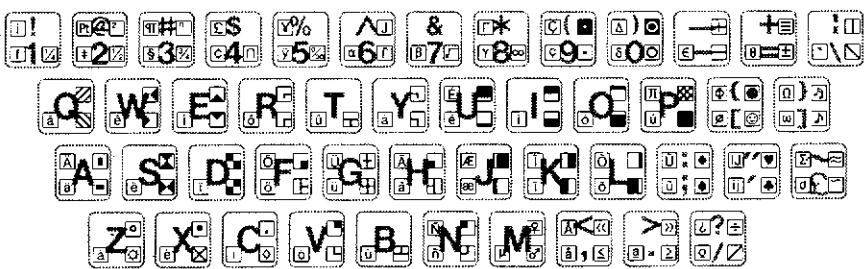
To enter ` , press [CODE] + [CODE].

To enter ` , press [CODE] + [CODE].

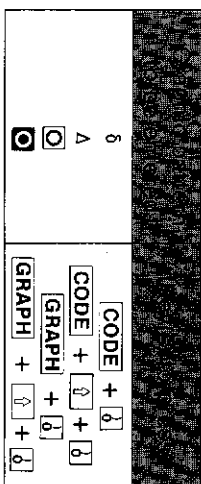
To enter ` , press [CODE] + [CODE] + [CODE].

2 Press the key for the letter needing the accent mark.

To enter a graphic character or symbol
The following graphic characters and symbols can be entered.

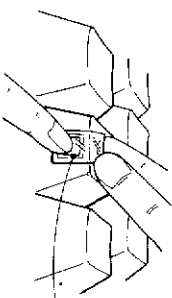


To enter 6, Δ, □ and □, for example,



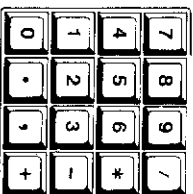
Graphic pattern decals

Graphic pattern decals are supplied for your convenience when entering graphic patterns. Place the decal on the front of the corresponding key. Rub the decal and peel the backing sheet off.



Rub the pattern and peel the sheet off.

NUMERIC KEYS



The numeric keys are located to the right of the keyboard. The characters on the numeric keys can be entered whether the □ or □ key is pressed or not.

Note

When some commercially available programs are applied, the numeric keys cannot be used. In this case, use the number input keys on the left of the keyboard to enter numbers.

HOW TO SET THE CALENDAR-CLOCK

A calendar clock is incorporated in the HB-G900AP, which is backed up by a nickel-cadmium battery so that the contents of the calendar-clock will not be erased, even when the power switch is turned off.

TO SET THE DATE

- 1 Start up MSX-Disk BASIC, referring to page 17.
- 2 Enter **SET DATE "DD/MM/YY"** from the keyboard.
DD is a 2-digit day number, MM a 2-digit month number, and YY a 2-digit year number.
For example, to set 10th January, 1986, you must type **SET DATE "10/01/87"** on the keyboard.
- 3 Press the □ key.
The date will be set.

TO SET THE TIME

- 1 Start up MSX-Disk BASIC, referring to page 17.
- 2 Enter **SET TIME "HH:MM:SS"** from the keyboard.
HH is a 2-digit hour number (24-cycle), MM a 2-digit minute number, and SS a 2-digit second number.
For example, to set 2:30 pm and 00 seconds, you must type **SET TIME "14:30:00"** on the keyboard.
- 3 Press the □ key.
The time will be set and the clock will start.

If you make a mistake while setting the calendar-clock

If you have not pressed the □ key, correct the required part with the [INS] or [DEL] key.
If you have already pressed the □ key, start from step 1 again.

LIFE OF THE BACK-UP BATTERY

The nickel-cadmium battery inside the computer is charged while the computer's power is on. After the computer's power is on for 8 hours, the battery will last for 1 week when the power is turned off. A fully charged battery will last for approximately 2 months.

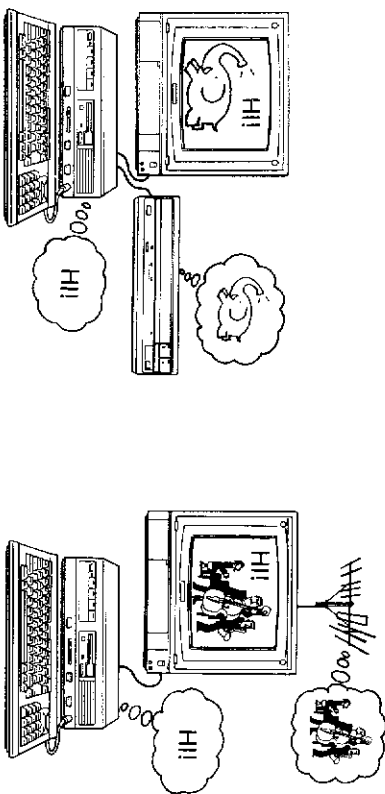
When the battery becomes weak, the calendar-clock will not operate properly and the contents of the memory switch function (such as those set by the title and prompt statements, screen statement, beep statement) will be erased. Therefore, when the computer is used for the first time or, if it has not been operated for a long time, the battery may be weak and/or the memory switch function may not operate properly. It is recommended that the HB-G900AP be turned on from time to time to recharge the battery.

SUPERIMPOSE FUNCTION

With this computer, the computer picture can be superimposed over the video picture from external sources.

Two types of color monitors, a monitor equipped with a peri-TV connector (21-pin) or a Sony PVM monitor equipped with an RGB connector (25-pin), can be used for superimposing. When a monitor with a peri-TV connector is used, the computer picture can be superimposed over the picture of the external video equipment connected to the REF IN connector, or can be superimposed over the picture received by the tuner built-in the monitor TV.

When a Sony PVM monitor is used, the computer picture can be superimposed only over the picture of the external video equipment connected to the computer's REF IN connector.



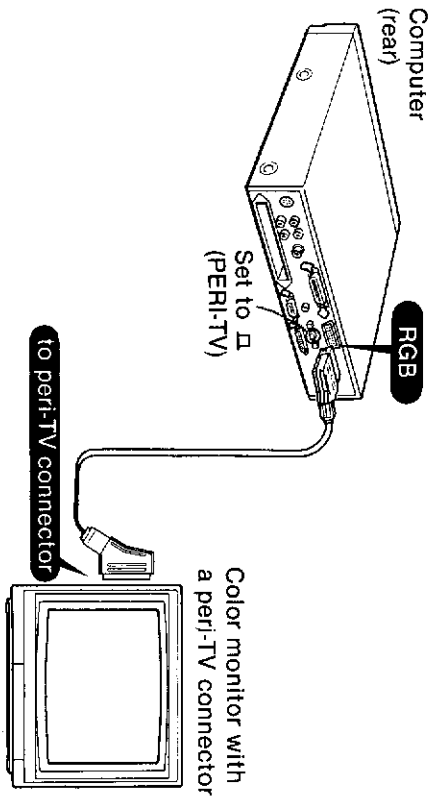
The picture to be displayed can be selected computer picture only, video picture only or superimposed picture, by executing an MSX2-BASIC SET VIDEO command.

When the Sony HBL-G900P Videotizer (optional) is used with this computer, the superimposed picture can be recorded on a video cassette recorder. For details about use with the Videotizer, refer to the Videotizer's manual.

TO SUPERIMPOSE THE COMPUTER PICTURE OVER THE PICTURE RECEIVED BY THE TUNER BUILT-IN THE MONITOR

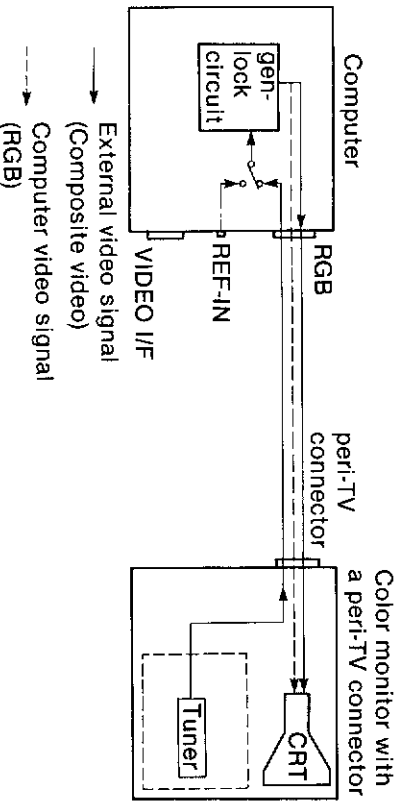
When a color monitor with a peri-TV connector (21-pin) is used (System 1)

Connection



Video signal flow of this system

In this system, the video signal received by the tuner built-in the monitor will be input to the computer through the RGB connector. The computer video signal will be gen-locked with this video signal and will be output from the RGB connector. The picture of the computer will be superimposed over the picture of the video signal received by the tuner in the monitor.



Selecting of the display

The picture to be displayed on the monitor screen will be selected by executing the MSX2-BASIC SET VIDEO command as follows:

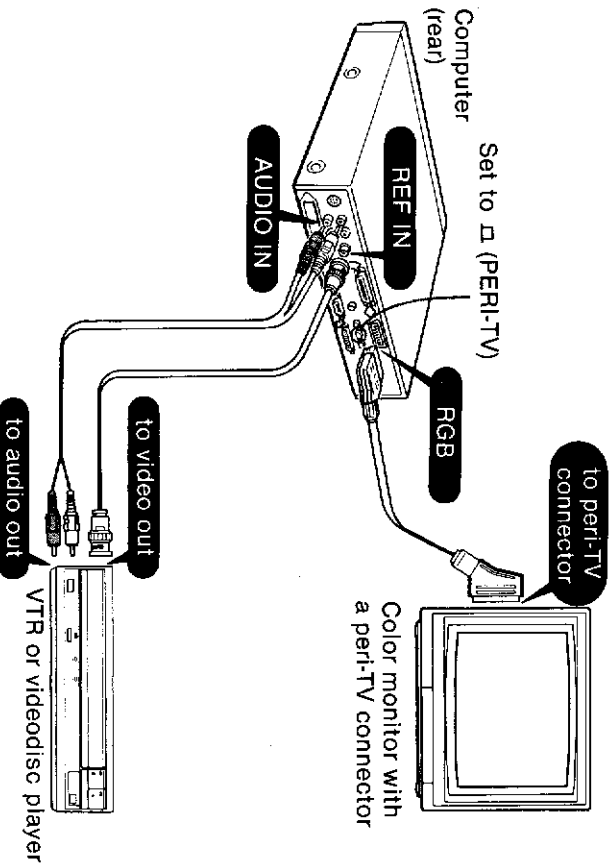
| Picture to be displayed | Statement to be executed |
|-------------------------|--|
| Computer | SET VIDEO 0,0,0,0,*,0,1 (internal sync) |
| Superimposed Video | SET VIDEO 1,0,0,1,*,0,1 (external sync) |
| | SET VIDEO 2,0,0,1,*,0,1 SET VIDEO 3,0,0,1,*,0,1 |

- Refer to page 32 and 33.
- * is the parameter to select the audio output

TO SUPERIMPOSE THE COMPUTER PICTURE OVER THE EXTERNAL VIDEO PICTURE

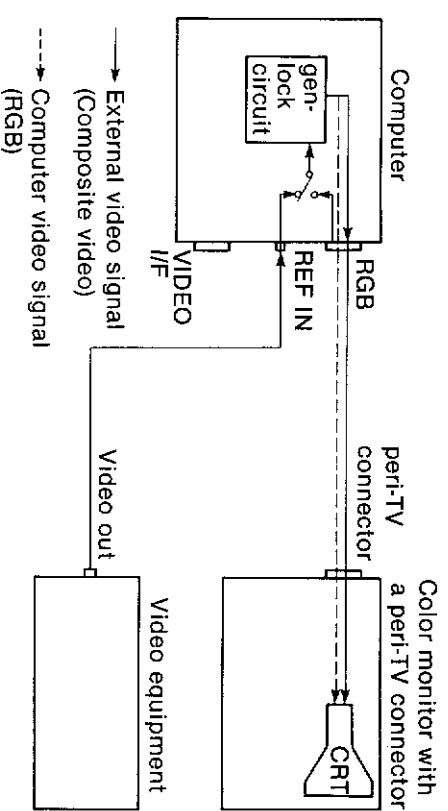
When a color monitor with a peri-TV connector (21-pin) is used (System 2)

Connection



Video signal flow of this system

In this system, the video signal from the external video equipment will be input to the computer through the REF IN connector. The computer video signal will be gen-locked with this video signal. The computer video signal and the video signal from the external video equipment will be output from the RGB connector. The picture of the computer will be superimposed over the picture of the external video equipment in the monitor.



Selecting of the display

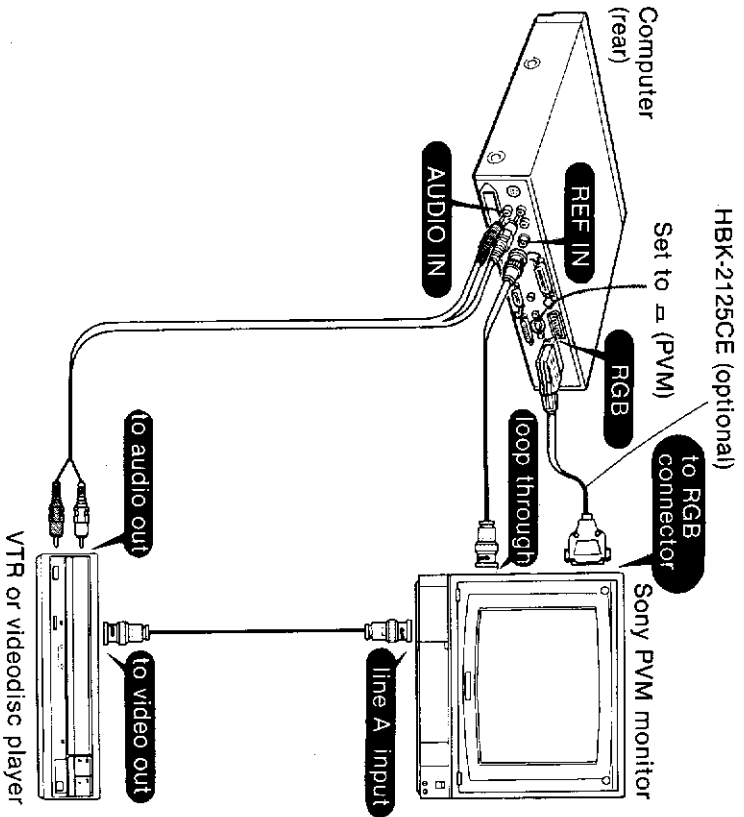
The picture to be displayed on the monitor screen will be selected by executing the MSX2-BASIC SET VIDEO command as follows:

| Picture to be displayed | Statement to be executed |
|-------------------------|---|
| Computer | SET VIDEO 0,0,0,0,*1,1 (internal sync) |
| Superimposed Video | SET VIDEO 1,0,0,1,*1,1 (external sync) |
| | SET VIDEO 2,0,0,1,*1,1 |
| | SET VIDEO 3,0,0,1,*1,1 |

- Refer to page 32 and 33.
- * is the parameter to select the audio output.

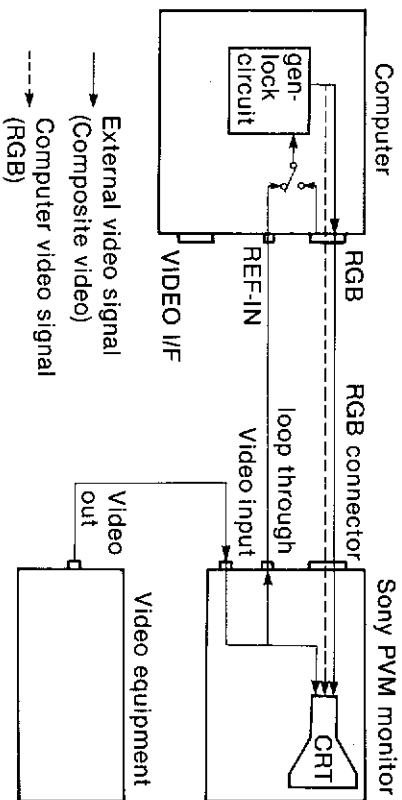
When a Sony PVM color monitor with an RGB connector (25-pin) is used (System 3)

Connection



Video signal flow of this system

In this system, the video signal from the external video equipment will be input to the computer through the REF-IN connector. The computer video signal will be gen-locked with this video signal. The computer video signal and the video signal from the external video equipment will be output from the RGB connector. The picture of the computer will be superimposed over the picture of the external video equipment in the monitor.



Selecting of the display

The picture to be displayed on the monitor screen will be selected by executing the MSX2-BASIC SET VIDEO command as follows:

| Picture to be displayed | Statement to be executed |
|-------------------------|---|
| Computer | SET VIDEO 0,0,0,*1,1 (internal sync) |
| Superimposed Video | SET VIDEO 1,0,0,1,*1,1 (external sync) |
| | SET VIDEO 2,0,0,1,*1,1 |
| | SET VIDEO 3,0,0,1,*1,1,0 |

- Refer to page 32 and 33.
- * is the parameter to select the audio output.

**SELECTING OF THE PICTURE TO BE DISPLAYED
—SET VIDEO COMMAND—**

| Parameter | Mode | YM | CB | Sync |
|-----------------|--|-------------|-------------------------|---|
| Function System | Picture to be displayed is: | No function | VDP color bus state is: | Computer's video output is gen-locked with: |
| page 25 1 | 0: Computer 1: Computer 2: Superimposed 3: Picture of the video signal received by the tuner | | | 0: Internal 1: Video signal connected to RGB (video signal received by the tuner.) |
| page 26 2 | 0: Computer 1: Computer 2: Superimposed 3: Picture of the video equipment connected to REF IN | | 0: Output state | 0: Internal 1: Video signal connected to REF IN |
| page 28 3 | | | | |
| page 30 | | | | |

Information on specifying "mode"

When "0" is to be specified as "mode" (mode 0), select the internal sync by specifying "0" as "Sync".

When the mode 1, 2 or 3 is specified, select the external sync by specifying "1" as "Sync". The computer's video output signal will be gen-locked with the external video signal selected by "video input".

When mode 2 is specified, the picture of the computer is superimposed over the picture of the external video signal and the SUPERIMPOSE

SET VIDEO [mode][YM][CB][sync][sound][video input][AV control]

| Sound | Video input | AV control |
|---|--|---|
| Audio output from RGB and AUDIO OUT is: | Video signal input to the computer is: | |
| 0: Computer 1: Audio from audio R input of RGB is mixed with computer sound. 2: Audio from audio input of RGB is mixed. 3: Audio from audio R and L input of RGB is mixed. | 0: Video signal input from RGB | 1 |
| 0: Computer 1: Audio from AUDIO R IN (phono) is mixed with computer sound. 2: Audio from AUDIO L IN (phono) is mixed with computer sound. 3: Audio from AUDIO R and L IN (phono) is mixed with computer sound. | 1: Video signal input from REF IN | 0: Specify when only the picture of the external video equipment is to be displayed. "mode" can be any value. 1 Specify when "mode" is 0, 1 or 2. |

Indicator on the front of the computer lights.

When mode 1 is specified, the picture of the computer is superimposed over the picture of the external video signal and the SUPERIMPOSE indicator on the front of the computer lights. However, the picture of the external video signal is invisible and only the computer's picture can be seen. In mode 1, the computer's video output is gen-locked with the external video signal. Therefore, the displayed picture can smoothly be switched to the superimposed picture or the picture of the external video signal.

SAMPLE PROGRAM

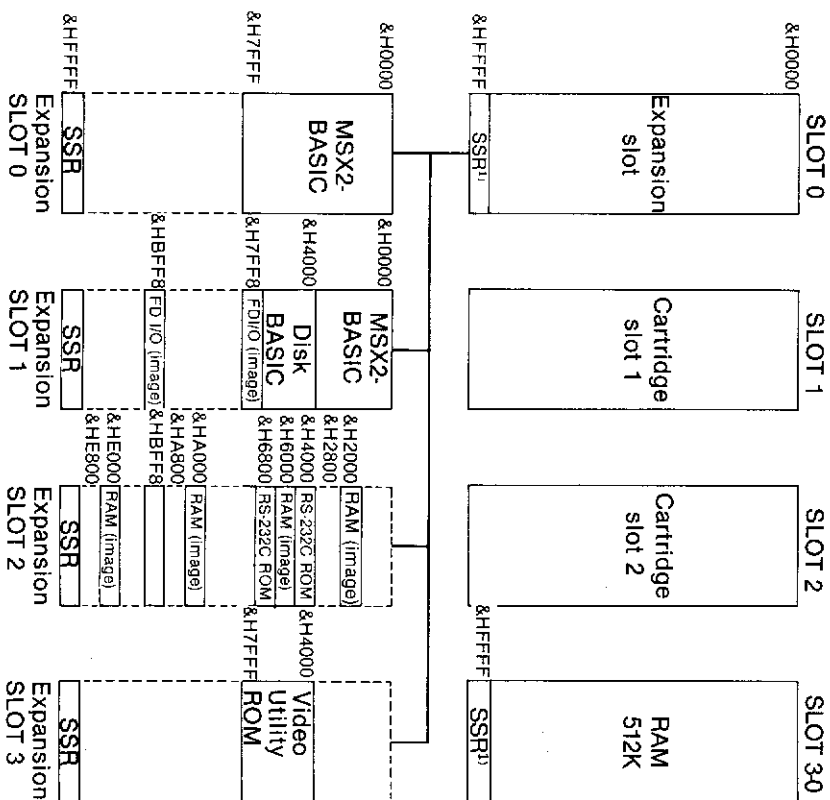
The following is the sample program for the system 2 (page 28).
By executing this program, red, green and blue boxes are drawn and the picture on the screen will then be selected.

```

10 REM =====
20 REM          SAMPLE PROGRAM for HB-G900AP
30 REM          : RGB-BOX
40 REM          : MODE-SELECT
50 REM =====
60
70 SCREEN 5:COLOR,0,0
80 SET VIDEO 0,...,0,1,1
90
100
110
120
130 LINE ( 0, 0)-(255,211),0,BF
140 LINE ( 80, 50)-(130,100),8,BF
150 LINE (105, 75)-(155,125),2,BF
160 LINE (130,100)-(180,150),4,BF
170
180
190
200
210
220
230
240
250
260
270
280
290
300
310
320
330
340
350
360
-----
MODE-SELECT
0 : COMPUTER MODE
1 : SUPER MODE ( TRANSPARENT = COMPUTER )
2 : SUPER MODE ( TRANSPARENT = VIDEO )
3 : EXT-VIDEO MODE
-----
AS=LNKEY$:IF AS="" THEN GOTO 260
IF AS="0" THEN SET VIDEO 0,...,0,1,1
IF AS="1" THEN SET VIDEO 1,...,1,1,1
IF AS="2" THEN SET VIDEO 2,...,1,1,1,1
IF AS="3" THEN SET VIDEO 3,...,1,1,1,1
GOTO 260
-----

```

MEMORY MAP



The capacity of the free area (RAM capacity excluding the system area) can be checked by the FRE function.

1) SSR: Slot Select Register

SPECIFICATIONS

CPU

Processor used
Clock frequency

Z80A
3.579545 MHz $\pm 5\%$ (GENLOCK ON)
3.579545 MHz (GENLOCK OFF)

WAIT
Interrupt

1 WAIT at CPU M1 cycle, V9938 access cycle
Maskable interrupt

Resetting

Z80A mode 1 interrupt enable
Automatic at power on/Manual
(Memory contents are not maintained.)

Memory

Main memory
Video memory
ROM

512K bytes RAM
128K bytes RAM
MSX2-BASIC: 48k bytes
MSX-Disk BASIC: 16k bytes
Video Utility: 16k bytes
RS-232C: 14k bytes

CRT display

CRT controller
Display screen

V9938
Character display, graphic display, and border area

Character display

Screen 0: Max. 80 characters \times 24 lines
16 colors out of 512 colors
(Initial state in MSX2-BASIC is set to this mode, 37 characters \times 24 lines)
Screen 1: Max. 32 characters \times 24 lines
16 colors out of 512 colors
Screen 2: 256 (horizontal) \times 192 (vertical) dots
16 colors out of 512 colors
Screen 3: 64 \times 48 dots
16 colors out of 512 colors
Screen 4: 256 \times 192 dots
16 colors out of 512 colors
Screen 5: 256 \times 212 dots
16 colors out of 512 colors, 4 pages
Screen 6: 512 \times 212 dots
4 colors out of 512 colors, 4 pages
Screen 7: 512 \times 212 dots
16 colors out of 512 colors, 2 pages
Screen 8: 256 \times 212 dots
256 colors, 2 pages
16-color display

Graphic display

Border area

Note on the mapper system
The built-in 512K bytes RAM is divided into blocks of 16K bytes. The value of the mapper register (&HFC, &HFE, &HFF of the I/O, corresponding to page 0, 1, 2, 3), which can be changed, defines the block corresponding to each page. The relation of the I/O address and mapper register is as follows.

| I/O address | RW* | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | Register | A15 | A14 |
|----------------|-----|----|----|----|------|------|------|------|------|------------------------|-----|-----|
| &HFC | RW | / | / | / | | | | | | Mapper register page 0 | 0 | 0 |
| &HFD | RW | / | / | / | | | | | | Mapper register page 1 | 0 | 1 |
| &HFE | RW | / | / | / | | | | | | Mapper register page 2 | 1 | 0 |
| &HFF | RW | / | / | / | | | | | | Mapper register page 3 | 1 | 1 |
| Mapper address | | | | | MA18 | MA17 | MA16 | MA15 | MA14 | | | |

*RW: Read/Write

I/O Interface

| | |
|-----------------------------------|---|
| Keyboard | Separate keyboard Software scanning Total number of keys: 75 Control keys: 12 Function keys: 5 Edit keys: 8 Numeric keys: 16 |
| RGB input/output | 21-pin multi connector (see page 39) |
| Reference input | BNC connector |
| Video interface | 1 Vp-p, 75 ohms terminate, sync negative |
| Audio input | 36-pin connector (See page 40) Phono jack |
| Audio output | Input impedance: more than 10K ohms Phono jack |
| Sound generator | Output impedance: less than 1K ohms |
| Audio cassette interface | 8-octave, 3 tones and 1 noise output |
| Printer interface | 8-pin DIN jack Baud rate: 1200/2400 bps Remote control function provided |
| RS-232C interface | 14-pin connector TTL level Standard 8-bit parallel transfer 25-pin connector |
| General purpose interface | RS-232C standards Baud rate: 75-19200 bps (selectable) |
| MSX cartridge slot | 9-pin connector (2) For connection of track ball, etc. 2 |
| Disk drive section | |
| Disk used | 3.5" micro floppy/disk |
| Disk type | Double- or single-sided |
| Recording capacity (double-sided) | Unformatted: 1M bytes Formatted: 720K bytes Bytes/sector: 512 Sectors/track: 9 Tracks/cylinder: 2 Tracks/disk: 160 Bytes/disk: 720K |

| | |
|------------------------|--|
| Recording density | 8717 bits/inch |
| Track density | 135 tracks/inch |
| Total no. of cylinders | 80 cylinders |
| Total no. of tracks | 160 tracks |
| Recording method | MFM (Modified-Frequency Modulation) |
| Disk rotation speed | 300 rpm |
| Data transfer rate | 250K bits/sec |
| Average latency time | 100 msec |
| Access time | Average: 350 msec Between tracks: 12 msec Settling time: 30 msec |

General

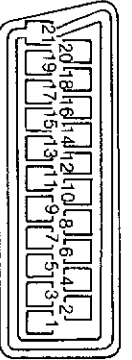
| | |
|----------------------|--|
| Power requirement | 220 V-240 V AC \pm 10%, 50 Hz |
| Power consumption | 35 W (main unit only) |
| Operating conditions | Temperature: 5°C to 35°C (41°F to 95°F) Humidity: 20 to 80 % |
| Storage temperature | -15°C to +60°C (5°F to 140°F) |
| Dimensions | Main unit: Approx. 355×80×325 mm (w/h/d) (14×3 ¹ / ₁₆ ×12 ⁷ / ₁₆ inches) Keyboard: Approx. 405×30×180 mm (w/h/d) (16×1 ¹ / ₁₆ ×7 ¹ / ₁₆ inches) |
| Weight | approx. 6.5 kg (14 lb 15 oz) |
| Accessories supplied | Graphic decals MSX-DOS/Character Font System, RAM Disk Utility and Font Disk Operating Instructions MSX-BASIC Version 2.0 Programming Reference Manual Reference chart Video Utility manual RAM Disk Utility manual A Guide to RS-232C Communication |
| | (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) |

While the information given is true at the time of printing, small production change in the course of our company's policy of improvement through research and design might not necessarily be indicated in the specifications. We would ask you to check with your appointed Sony dealer if clarification on any point is required.

Note

This appliance conforms with EEC Directives 76/889 and 82/499 regarding interference suppression.

Pin assignment

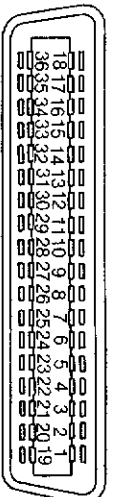


RGB

| Pin No. | Signal | Signal level | Impedance |
|---------|---|--|---------------------|
| 1 | Audio (R) output | nominal: 0.5 V maximum: 2 V | less than 1 K ohm |
| 2 | Audio (R) input | nominal: 0.5 V maximum: 2 V | more than 10 K ohms |
| 3 | Audio (L) output | nominal: 0.5 V maximum: 2 V | less than 1 K ohm |
| 4 | Audio common return | | |
| 5 | Blue return | | |
| 6 | Audio (L) input | nominal: 0.5 V minimum: 0.2 V maximum: 2 V | more than 10 K ohms |
| 7 | Blue input/output | 0.7 Vp-p | 75 ohms |
| 8 | Function switching ¹⁾ | logical "0": 0.2 V logical "1": 9.5 V-12 V | |
| 9 | Green return | | |
| 10 | — | | |
| 11 | Green output | 0.7 Vp-p | 75 ohms |
| 12 | — | | |
| 13 | Red return | | |
| 14 | Intercommunication data line common return | | |
| 15 | Red output | 0.7 Vp-p | 75 ohms |
| 16 | Blanking output ²⁾ | logical "0": 0-0.4 V logical "1": 1-3 V | 75 ohms |
| 17 | Video return | | |
| 18 | Blanking return | | |
| 19 | Video output ²⁾ | 1 Vp-p (composite video) | 75 ohms |
| 20 | Video input | 1 Vp-p (composite video) | 75 ohms |
| 21 | Common return | | |

1) When a PVM monitor is connected, the signal level will be:
logical "0": 0 V
logical "1": 5 V

2) When a PVM monitor is connected, the signal level will be: 1 Vp-p
(composite sync)



VIDEO I/F

| Pin No. | Signal | Signal level |
|---------|----------------|------------------------|
| 1 | Video input | 1.0 Vp-p, 75 ohm term. |
| 2 | Video output | 1.0 Vp-p, 75 ohm term. |
| 3 | R | 0.7 Vp-p, 75 ohm term. |
| 4 | G | 0.7 Vp-p, 75 ohm term. |
| 5 | B | 0.7 Vp-p, 75 ohm term. |
| 6 | Yes | TTL |
| 7 | Ym | No-connect |
| 8 | SYNC | TTL |
| 9 | BF | TTL |
| 10 | SYM0 | TTL |
| 11 | VIDEO/NO VIDEO | TTL |
| 12 | C0 (B1) | TTL |
| 13 | C2 (R0) | TTL |
| 14 | C4 (R2) | TTL |
| 15 | C6 (G1) | TTL |
| 16 | RCA/21 pin | TTL |
| 17 | SC | TTL |
| 18 | DLCLK | TTL |
| 19 | GND | |
| 20 | GND | |
| 21 | GND | |
| 22 | GND | |
| 23 | GND | |
| 24 | GND | |
| 25 | Computer sync | TTL |
| 26 | ALT | TTL |
| 27 | BLK | TTL |
| 28 | SYM1 | TTL |
| 29 | GND | |
| 30 | C1 (B2) | TTL |
| 31 | C3 (R1) | TTL |
| 32 | C5 (G0) | TTL |
| 33 | C7 (G2) | TTL |
| 34 | GND | |
| 35 | GND | |
| 36 | GND | |