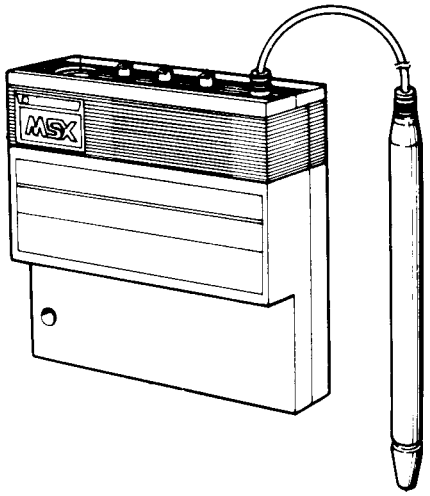
SANYO

MLP-001

MSX



LIGHT PEN UNIT

OPERATING INSTRUCTIONS

CONTENTS

Note:

1) These Operating Instructions may not be copied or published either in whole or in part without permission of Sanyo.
2) These operating Instruction may be revised or changed with or without notice.
3) Sanyo assumes no liability whatsoever for any claim arising from the use of this unit.
4) This unit is intended for with MSX personal computer only.

CAUTIONS

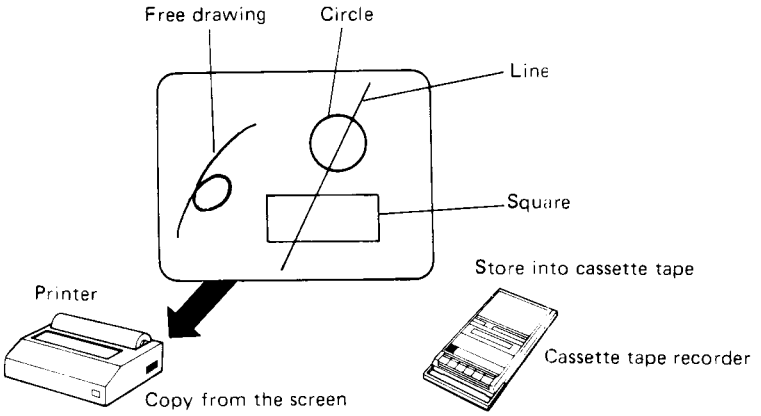
Before connecting or disconnecting the light pen unit to or from the computer, be sure to turn off the power switch of the computer and peripheral units.

There is no user-serviceable parts inside. Never open the cabinet to prevent any electric shock and damage to this unit.

Do not forcibly bend the cord of the light pen. Do not place any heavy object on top of the cord, either.

FEATURES

- As many as 15 colors are available.
- Drawn illustrations can be stored in cassette tapes.
- They may also be recorded on BASIC programs.
- You can draw any shape; straight line, square, circle, etc.
- Drawn illustrations can be redisplayed in the order of your drawing.
- A printer hooked-up provides for copies of a drawn illustration.



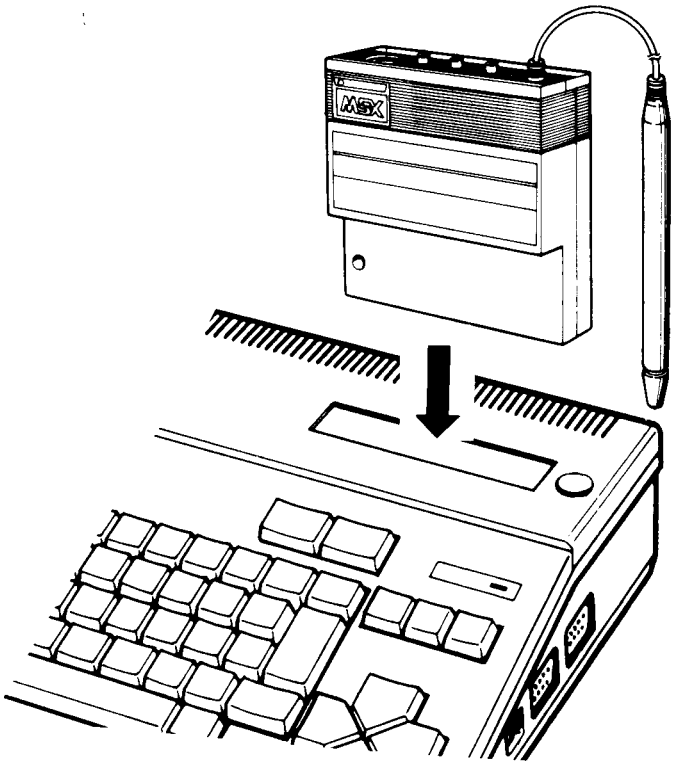
LOADING AND CONNECTION

LOADING

Insert the light pen unit into the slot of the computer. You need not remove the lid of the slot to insert the light pen unit in position. The lid will give in inside the slot.

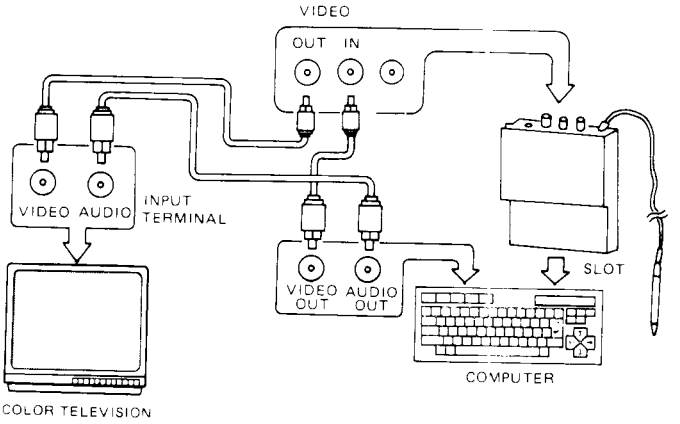
Make sure that:

1. The hole on the light pen unit is on the left toward yourself.
2. The unit is locked in position; i.e., push it down all the way until a click sound is heard. Poor contact may damage the computer and unit.

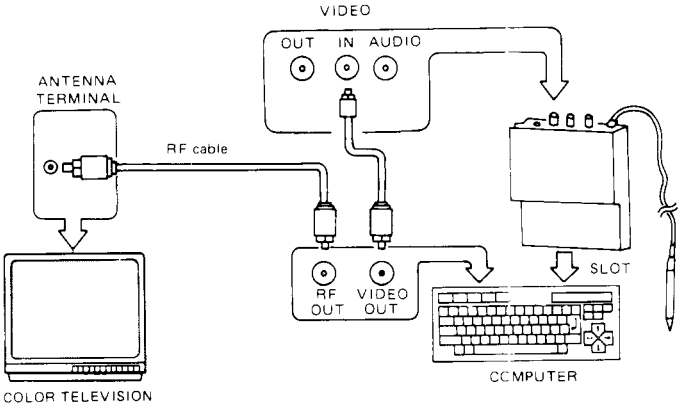


CONNECTION

1. Connecting to a TV set with VIDEO and AUDIO input terminals
   a. Plug in one cable between the VIDEO IN terminal on the light pen unit and the VIDEO OUT terminal on the computer.
   b. Plug in the other cable between the VIDEO OUT terminal on the light pen unit and the VIDEO IN terminal on the color TV set.



2. Connecting to a TV set without AUDIO and VIDEO input terminals
   a. Plug in the cable between the VIDEO IN terminal on the light pen unit and the VIDEO OUT terminal on the computer.
   b. Plug in the RF cable (MPC-100 accessory) between the RF OUT terminal on the computer and the ANTENNA terminal on the color TV set.



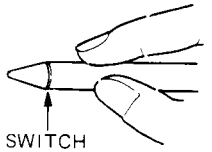
OPERATION

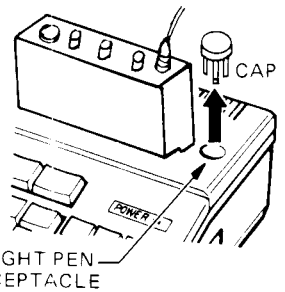
LIGHT PEN OPERATION

a. The switch is located about 3/4" from the tip (working end) of the light pen. You can hold the light pen anywhere above the 3/4" point.

b. Hold the light pen at a right angle to the screen. Touch the screen gently with the pen until a "beep" is heard. A square box with a dot in its center will appear instantly on the screen and the signal from the light pen transmitted into the computer.

c. Light pen receptacle
The light pen receptacle is located on the far right corner of the computer (MPC-100 for example). Uncap the receptacle and put the pen in it when not in use.





Note:

- The sensitivity of the light pen may be affected if the screen is covered with a non-glare mask. Remove the mask when the pen fails to function properly. Also, adjust the brightness control of the color TV set.
- Plastic non-glare masks can be damaged by the light pen. So detach such a mask when using the pen. Also keep the screen surface clear with a soft cloth moistened with detergent or anti-static solution.
- Clean up the tip of the light pen and the screen surface from time to time. Dust deposits or stain can affect the sensitivity of the pen.

PREPARATION FOR DRAWING

a. Set the ROM switch on the light pen unit to "IN" position.
b. Turn on power for all the peripheral units.
c. Now turn on the power switch of the computer.

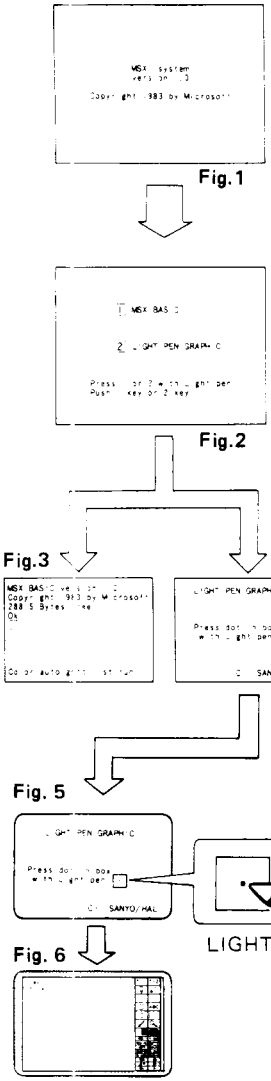
d. Menu selection
Just after the computer starts, the display as shown in Fig. 1 appears on the screen, and several seconds after that, the menu as in Fig. 2 shows up. Select your desired function on the menu.

- For graphic displaying
Touch number [2] on the menu with the light pen, or push the [2] key on the computer keyboard. The display as in Fig. 4 will appear instead on the screen.
- For programming
Touch number [1] on the menu with the light pen, or push the [1] key on the computer keyboard. The display as in Fig. 3 will appear instead on the screen.
For programming, refer to the Instruction Manual accompanying the computer.

Note: With the light pen unit being hooked up to the computer, you can use the EXPANDER BASIC commands. (See page 24.)

e. Touch the center dot ([·]) on the screen display with the light pen. (See Fig. 5.) This dot is to correct the drawing reference position.
f. Now the screen turns into the drawable state (Fig. 6).

- To reset the screen from the drawable to programmable state (Fig. 3), push the RESET switch on the computer keyboard to display the menu on the screen, and select the programming function.



DISPLAY EXPLANATION

Memory capacity
(indicates how many illustrations can be drawn)

Graphic area
(drawable zone)

Ineffective area
(non-drawable zone)

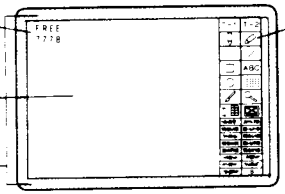
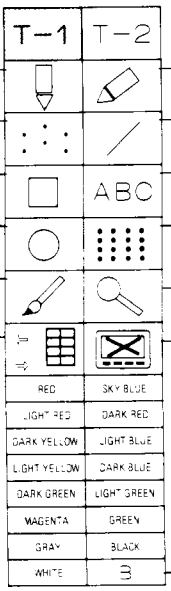


Table
(lists the drawing instructions. Consists of graphics table (T-1) and conversion table (T-2). Touch the T-1 or T-2 at the top of the table with the light pen for selection.)

Graphics table
(When T-1 is contacted with the light pen)

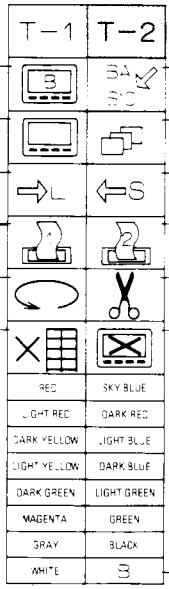
- **Line thickness**
  Two thicknesses, bold and light, selective.
- **Dots**
  Dotted display available.
- **Square**
  A square drawable with two specified points as its diagonal line ends.
- **Circle**
  A circle drawable by specifying its center and radius.
- **Coloring**
  A specified color to be put in an enclosed zone.
- **Table shift**
  This table shiftable right or left on the screen.



- **Free drawing**
  Drawable freely with the light pen.
- **Straight line**
  Straight line drawable by specifying two points.
- **Characters**
  Letters and numerals inputtable by the keyboard.
- **Dotted screen**
  Dots displayable on the screen for easy positioning.
- **Enlargement**
  A specified section enlargeable and displayable.
- **Erase**
  Illustrations erasable
- **Pallete**
  Colors individually specifiable.
- **Background**
  Background color specifiable.

Conversion table
(When T-2 is contacted with the light pen)

- **Program display** — Illustrations programmable and displayable.
- **Redisplay** — Illustrations redisplayable in the order of drawing.
- **Load** — Illustrated data loadable from cassette tapes.
- **Print 1** — Screen display copyable by the printer.
- **Display shift** — Illustrations shiftable laterally on the screen.
- **Table erase** — Table erasable from the screen.



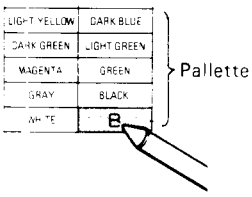
- **Program save** — Illustrations savable on BASIC program.
- **Data selection** — Types of data selective to be tape-recorded.
- **Save** — Illustrated data savable in tapes.
- **Print 2** — Screen display copyable double-sized by the printer.
- **Delete** — Illustrations deletable little by little.
- **Erase** — Illustrations erasable.
- **Pallete** — Colors individually specifiable.
- **Background** — Background color specifiable.

HOW TO USE THE GRAPHICS TABLE

You can draw freely on the screen with the light pen while the graphics table is visible on the screen.

1. **Changing the background color (B).**
   The screen is initially light blue in color. Select your desired background color before starting to draw.

Graphics table

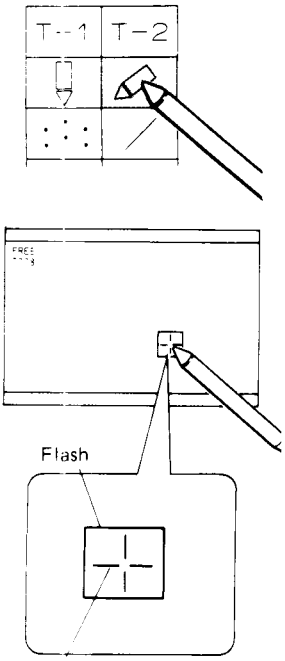


a. At the bottom of the right-hand column on the pallete there is letter B. Touch it with the light pen. This segment turns red.
b. Touch your specified background color on the pallete also with the light pen.

Note: If you change the background color midway during drawing, the illustrations drawn may look wrong. Reset it to the original color, and the illustrations will be good.

2. Free drawing ( )

a. Choose a drawing line color among those on the pallete. Touch the color with the light pen.
b. Touch the symbol on the table with the light pen. The table disappears and the screen is ready for drawing.
   Now start drawing. A flash (white square) and a cursor (−|−) appear where the light pen is applied, so as to indicate the current drawing position.
c. To finish your drawing, touch any point in the screen's ineffective area with the light pen. The table will reappear.



3. Shifting the table ( )

Touch the symbol on the table with the light pen. When the table is at right on the screen, it will move to the left, and vice versa. The memory capacity indicator will shift together.

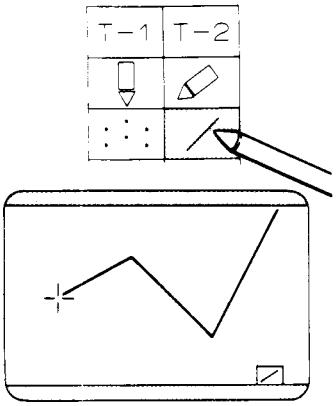
4. Changing the line thickness (or)

In free drawing ( ) and straight line ( ), the line thickness can be selected as bold or light. The symbol changes its thickness each time you touch it with the light pen.

5. Drawing a straight line (⟋)

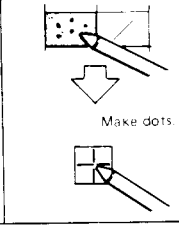
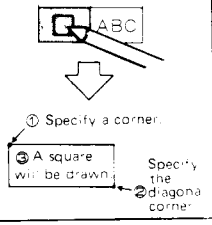
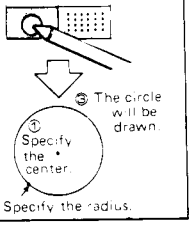
A straight line can be drawn by specifying two points.

a. Select a drawing line color on the pallete with the light pen.
b. Touch the symbol ⟋ on the table with the light pen. The table will disapplear.
c. Specify one end point of the line with the light pen. The cursor will be displayed on the screen.
d. Next specify the other end of the line with the light pen, and the straight line will be on the screen. The cursor is now on the second point. By specifying the third point another straight line will show up between the second and third points.
e. Touch any point in the screen's ineffective area with the light pen to stop drawing.



6. Dotting, and drawing a square or circle (⋯ , □ , ○)

a. Select a dot or drawing line color with the light pen.
b. Refer to the chart below for actual drawing. As many dots, squares and circles as you like can be drawn on the screen.
c. Touch any point in the screen's ineffective area with the light pen to stop drawing.

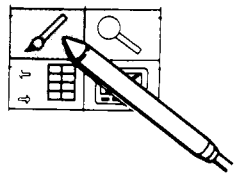
Drawing	Dots	Square	Circle
Operation			

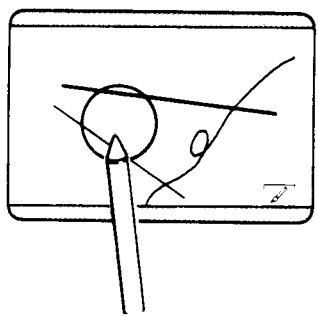
7. Putting colors ( )

Blanks enclosed with thick/thin lines or a circle can be colored as you like.

a. Select your desired color with the light pen.
b. Touch the symbol on the table with the light pen. The table will disappear.
c. Touch the blank with the light pen to be colored.
d. Touch any point in the screen's ineffective area with the light pen to stop coloring.

- If you put the light pen on an open area, the color will spread outward through its opening. In this case, push the keys CTRL and STOP on the computer keyboard and the screen will resume the state just before you had put light pen on the symbol .

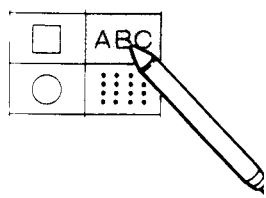


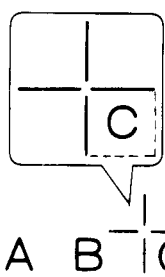


8. Displaying the characters (ABC)

You can display letters, numerals and symbols on the screen by the computer keyboard.

a. Select your desired character color on the pallete with the light pen.
b. Touch the symbol ABC on the table with the light pen. The table will disappear.
c. Specify the position of the character to be displayed with the light pen or the computer's cursor key.
d. Input the character to be display with the computer keyboard.
e. Touch any point in the screen's i effective area with the light pen stop character displaying.





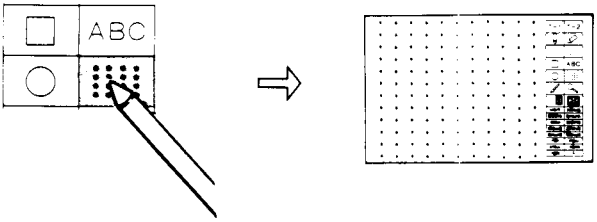
Character is displayed at lower right section of cursor.

- Drawing with the light pen is impossible after the symbol ABC is touched.

9. Displaying the dotted lines (⁞⁞)

a. Touch the symbol ⁞⁞ on the table with the light pen. The screen will show up dotted all over. These equally spaced dots enable you to easily draw vertical and horizontal lines or symmetrical figures.

b. Touch the symbol ⁞⁞ again with the light pen to delete the dots.



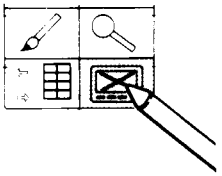
10. Deleting the illustrations (⊠)

The symbol ⊠ is used to delete all the illustrations on the screen.

a. Touch the symbol ⊠ with the light pen. This symbol turns red.

b. Touch this symbol again or any point in the screen's graphic area with the light pen. All the illustrations will disappear.

- The memory capacity indicator, displayed on the upper left of the screen, changes into 7777 when deleting the illustrations.
- To cancel the deleting action, touch any point in the screen's ineffective area with the light pen in step b above.

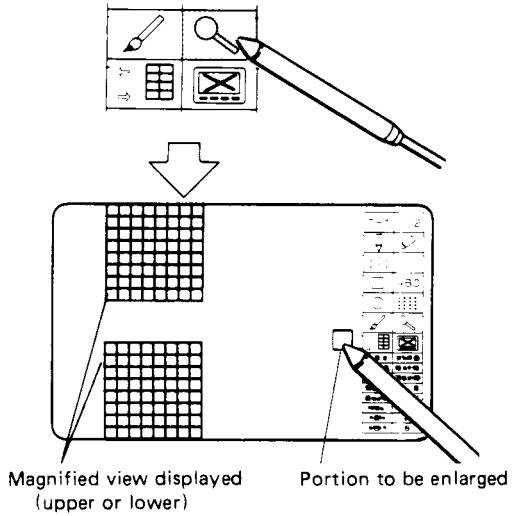


11. Enlarging an illustration

A specified portion may be magnified 8 times and displayed in the upper or lower area on the screen. Elaborate corrections can be easily made on such magnified views.

a. Touch the symbol [ ] on the table with the light pen. The table will disappear.
b. Specify the illustration to be enlarged with the light pen.
c. The specified portion is now enclosed with a white square and then its magnified view is displayed in the upper or lower area on the screen. The table too will be on the screen for you to specify a desired color.
d. Make corrections to the magnified view with the light pen. To enlarge the other portion, take back to step b.
e. Touch any point in the screen's ineffective area with the light pen to stop enlarging an illustration.

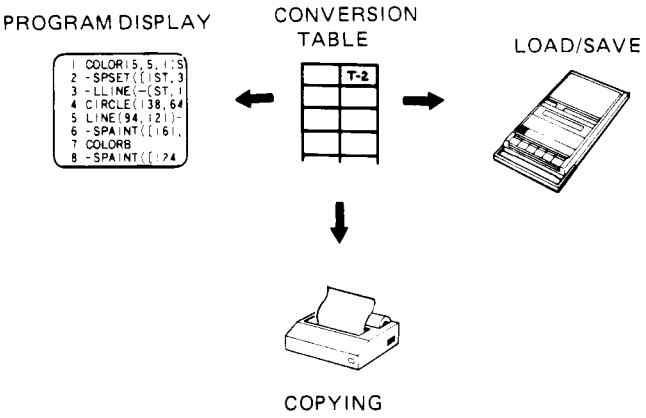
- The position of a magnified view is markec off every 8 dots from the left upper corner of the graphic area.



HOW TO USE THE CONVERSION TABLE

The conversion table is used in displaying your drawings with programs or in converting data on cassette tapes and printers. To utilize the conversion table, touch the symbol T-2 on the table with the light pen.

- If you touch the graphics area with the light pen while the conversion table is on the screen, the graphics table will show up instead.



1. Displaying the program ( )

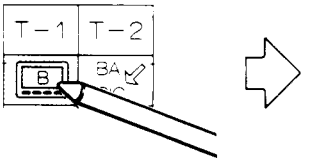
Your drawings can be converted into BASIC program (discussed on page 24, EXPANDER BASIC), which is displayed on the screen.

a. Touch the symbol on the table with the light pen. The program will be displayed on the screen.

b. If you touch the screen with the light pen in the course of displaying the program, the program will be stopped halfway. Touch again the screen, and the program will continue to be displayed.

c. Touch the screen with the light pen after finishing the program displaying. The screen will be resume its original state.

- The SPACE key on the computer may be used for steps b. and c.




```
1 COLOR15,5,1:SCREEN2:OPEN
2 -SPSET(  ST,32))
3 -LLINE -(  ST,174))
4 CIRCLE(  38,64),  54
5 LINE(94,  21)-(143,178),,B
6 -SPAINT  61,92))
7 COLOR8
8 -SPAINT  24,158))
9 -SPSET(147,123))
10 -LLINE -(47,123))
11 -LLINE -(58,  21))
12 -LLINE -(54,128))
13 -LLINE -(58,  22))
14 -LLINE -(62,123))
15 -LLINE -(63,126))
16 -LLINE -(66,128))
17
18 -SPSET(175,15))
19 -BLINE -(88,129))
20 GOTO20
```

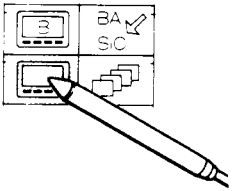
2. Redisplaying the drawing in its order ( )

The drawing may be redisplayed in the order you have drawn.

a. Touch the symbol on the table with the light pen.

b. The drawing will all disappear and be redisplayed in the order you have drawn.

c. Now the drawing is on the screen. Then the table will be displayed on the screen.



3. Picture save/load (BA SC, ⇨L, ⇦S)

Your illustrations can be saved (recorded) and loaded (read-in) in a cassette tape recorder. There are three types of save/load function.

Type	Function	Usage and features
BASIC save/load BA SC	Drawings are converted into EXPANDER BASIC program and saved in a cassette tape recorder.	• This saved program can be combined with another BASIC program for you to play games using your drawings. • The program loading is made on BASIC status.
Program save/load and ⇨L ⇦S	Drawings are converted into personal computer program (machine language) and saved or loaded.	• If you want to draw an illustration for days, the reloading enables you to continue illustrating even with the personal computer power on and off. • The load/save with the machine language requires a memory unit. You can keep on drawing until the memory capacity reaches one.
Screen save/load and ⇨L ⇦S	Drawings are saved and loaded on color information.	• When the memory capacity is short, you have to save and reload. The momory capacity display now shows 7777 for you to continue illustrating. • This saved program may be loaded by other MSX personal computers.

What is Memory Capacity?

The personal computer memorizes your drawings in their order as a program. This function provides for program display and program save. If the drawings are too complicated, however, the computer may fail to do it. The memory capacity display on the upper left or upper right of the screen indicates how much can be still memorized.

When the capacity becomes short, use the screen save function to clear the screen and reload the illustrations. The memory capacity display shows 7777 and you can continue illustrating. Note, however, that the order of drawing is not programmed. So the background color, dotted screen, program display, redisplay, BASIC save, program save, erase, and some other commands can not be used.

3.1. Recording the drawing on BASIC (BASIC)

a. Set the cassette tape recorder to record mode.

b. Touch the symbol BASIC on the table with the light pen. "BASIC Filename?" will be displayed on the screen.

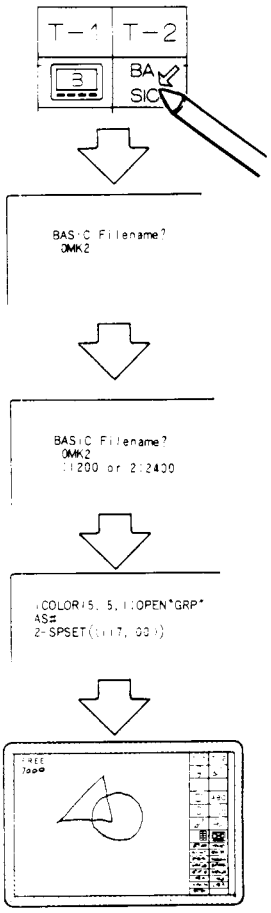
c. Key in a file name of six or less characters.
Example: 10MK2

d) Push the RETURN key. The cassette tape recorder's saving speeds (baud rate) are displayed; 1:1200 or 2:2400.

e) Push the numeral key 1 or 2 on the keyboard. The cassette tape recorder will start saving. The saved program list will be displayed in order on the screen.

f) At last the cassette tape recorder stops and the conversion table will be redisplayed on the screen.

- If the cassette tape recorder is not provided with a remote control terminal, take the following before step e. Set the recorder to record mode, and when the conversion table appears, stop the recorder.
- Two baud rates are available; 1200 (low) and 2400 (high). For cassette tape recorders other than data recorders (Sanyo data recorders), use the 1200-baud rate (numeral key 1).
- The saved program can be loaded (read-in) by the LOAD command of BASIC.



- To interrupt the saving halfway, push the CTRL and STOP keys on the keyboard at the same time. The original display will reappear on the screen by pressing the SPACE or other key.

3.2. Picture save/load

How to save

a. Touch the "data selection" symbol on the table with the light pen. Every time you touch this symbol, the "program" and "screen" symbols appear alternately. Select your desired save function.

b. Set the cassette tape recorder to record mode.

c. Touch the symbol ⇨S on the table with the light pen.
"SAVE Filename?" will be displayed on the screen.

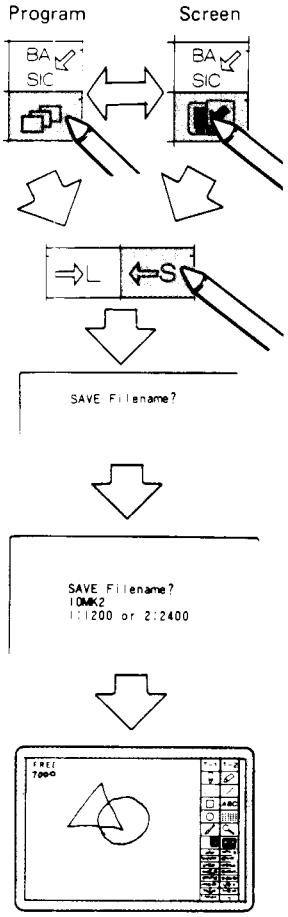
d. Key in a file name of six or less characters.

e. Push the RETURN key. The cassette tape recorder's saving speeds (baud rate) are displayed.

f. Push the numeral key 1 or 2 on the keyboard. The cassette tape recorder will start saving. In the screen save function, your drawing will be on the screen.

g) At last the cassette tape recorder stops and the conversion table will be redisplayed on the screen.

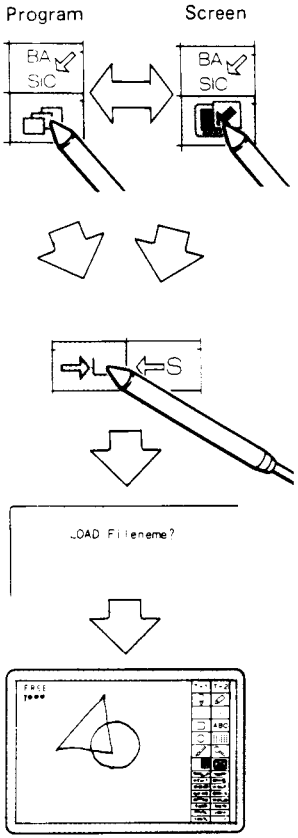
- If the cassette tape recorder is not provided with a remote control terminal, take the following before step f. Set the recorder to record mode. Just when the recording is over, the conversion table will be on the screen. Now stop the recorder.



How to load

a. Touch the "data selection" symbol on the table with the light pen. Select the program save or screen save function. The program-saved and screen-saved ones are loaded in their respective functions.
b. Set the cassette tape recorder to playback mode.
c. Touch the symbol ⇨L on the table with the light pen. "LOAD Filename?" will be displayed on the screen.
d. Key in a the file name used for saving. Wrong file names give no input.
e. Push the RETURN key.
f. The cassette tape recorder starts loading.
g. In the screen load function, your illustration will be redrawn from upper left corner on the screen. In the program load function, the screen remains unchaged until the entire program will be read in.
h. At last the cassette tape recorder stops. In the program load function, the screen will show up the illustration at this time. The loading is now over and the conversion table will be on the screen. The memory capacity display reads 7777 in the screen load function, or the save-up value in the program load function.

- If the cassette tape recorder is not provided with a remote control terminal, take the following after step e. Set the recorder to playback mode. When the conversion table appears, stop the recorder.



- To interrupt the saving/loading halfway, push the CTRL and STOP keys at the same time. The original display will reappear on the screen by pressing the SPACE or other key.
  In the screen load function, the remaining part of the illustration is still on the screen.
  In the program load function, the illustration is not displayed and the memory capacity display reads 7777.
- The screen loading causes the ineffective area to change its color. This area will return black by selecting the program display, screen save, or other mode on the redisplayed conversion table.

WHAT ARE PROGRAM SAVE/ LOAD AND SCREEN SAVE/ LOAD?

Here is the difference between the two types of save/load.

- **Program save/load**
  In this system the personal computer memorizes the illustrations in their order as a collection of data, that is, according to the kinds of instructions (circle, square, etc.) and their coordinates. These data stored in the computer memory can be saved into cassette tapes. It is, however, impossible to reproduce the illustrations with a computer which can load the data, but the computer without the light pen unit cannot convert them in their drawing order.

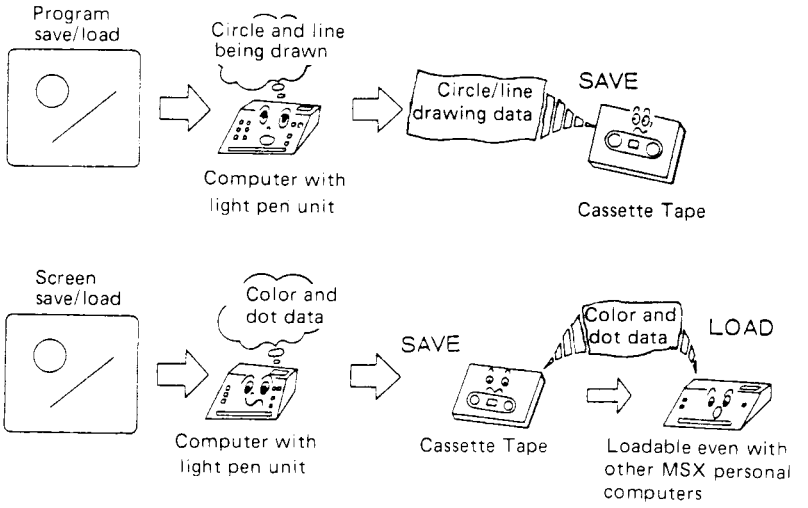
- **Screen save/load**

  In this system, on the other hand, the persona computer memorizes the information (colors, dots and other expressions) on the screen as a block of data, which can be saved into cassette tapes.

  The illustrations are memorized not in their order but as a block, so they can be reproduced on the screen of even an MSX personal computer without the light pen unit.

  The screen save/load system directly controls the video RAM memory located in the personal computer. Hence, the data to be saved are displayed on the screen, while those to be loaded are reproduced starting at the left upper corner on the screen.

Note: An exclusive program is needed to carry out the screen load.
(See page 29.)



4. Copying from the screen (,)

On-screen illustrations can be copied, by specifying the copying size or with the light pen, through the printer hooked up (MSX specification, optionally available). Two copying sizes are available.

	Original size (approx. 8 x 7 cm)
	Double size (approx. 16 x 14 cm)

a. Touch the symbol or on the table with the light pen. The table will disappear and the printer will start its operation.
b. The table will reappear on the screen after the copying operation.

- Printers other than MSX-specified may fail to output the figures and symbols.
- The copy mode is not effective when no printer is linked.
- To interrupt the copying operation halfway, push the CTRL and STOP keys on the computer.
- The printers come in black and white.

Screen Color	Black	Green	Light Green	Dark Blue	Light Blue	Dark Red	Sky Blue	Red	Light Red	Dark Yellow	Light Yellow	Dark Green	Magenta	Gray	White
Print	A	B	B	A	A	A	B	A	A	B	B	B	A	B	B

Colors A and B are actually printed in black when the other color is on background.

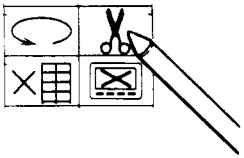
5. Deleting the last drawing ( )

The illustration lastly drawn using the graphics table can be deleted. (This corresponds to one line of the program.) This function is very useful in deleting the illustrations made with symbols , , , and so on.

a. Touch the symbol [✂] on the table with the light pen. All the illustrations on the screen will be once erased and redrawn automatically in their order. But the last drawing only will be deleted.

b. The deletion is complete just when the table reappears.

c. To further delete the preceding one, take step a. again.



6. Shifting the illustration ( )

The drawing over the screen can be shifted to the right or left. This trick provides for animation-like movement, too.

a. Touch the symbol [ ] on the table with the light pen. The table will disappear.

b. Use the cursor key (← or →) on the computer to control the shifting direction (right or left) and speed.

c. To stop the motion, touch the screen with the light pen. The table will reappear and the illustration will resume original state.

7. Erasing the table ( )

a. Touch the symbol [ ] on the table with the light pen to cancel the table itself and the memory capacity indicator.

b. To redisplay the table and the indicator, touch the screen with the light pen.

Note: How to use the pallette, [B] and symbol [ ] is the same as for the graphics table.

EXPANDER BASIC

This light pen unit enables the programming of EXPANDER BASIC instructions in addition to the MSX-BASIC ones. Select 1 on the menu on page 6.)

There are four EXPANDER BASIC instructions.

CALL BLINE (Bold Line)	CALL SPAINT (Super Paint)
CALL LLINE (Light Line)	CALL SPSET (Super Point Set)

The above EXPANDER BASIC instructions are so often used in programming the illustrations drawn with the light pen.
(This can be checked by means of the symbol ⎓ on table T-2.)

- The EXPANDER BASIC should be utilized in the graphics mode (SCREEN 2 or SCREEN 3).
- A program such as shown below is made together with the EXPANDER BASIC.

  Example: CALL BLINE ((10, 20) – (100, 100))
  "–" (underline) substitutable for CALL

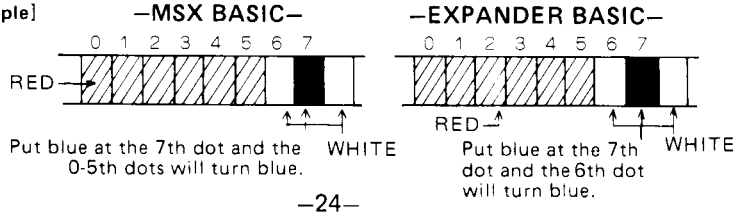
Points to Remember

SPECIFIC USAGE OF EXPANDER BASIC

By the MSX personal computer, the colors are individually specified every 8 dots from the left upper corner (0, 0) rightward on the screen. And only two colors can be used for each horizontal 8-dot divided section.

If you try to draw lines in three colors (including the background color) for the above section, therefore, the preceding line may change in its color. The EXPANDER BASIC serves to solve this problem to keep the screen colors clear.

[Example]



CALL BLINE

Call bold line (EXPANDER BASIC)

Function: To draw bold lines

Format: CALL BLINE ([(<start point x>, <start point y>)] – (<last point x>, <last point y>))

Example: COLOR 8: CALL BLINE (–(100, 100))

Explanation: A bold line (3 x 3 dots) is drawn between (<start point x>, <start point y>) and (<last point x>, <last point y>).

The specifying of (<start point x>, <start point y>) may be omitted. In this case, the LP (last point) is supposed to have been specified. Furthermore, a STEP statement may be also used to specify the start and last points for a relative coordinating.

The line color is a foreground one specified with a COLOR statement.

Sample program:

```
10 COLOR 2,1,1:SCREEN 2 :C=2
20 FOR Y=0 TO 191 STEP 12
30 CALL BLINE((0,Y)-(255,191-Y))
40 C=C+1:IF C>15 THEN C=2
50 COLOR C:NEXT Y
60 GOTO 60
```

CALL LLINE

Call light line (EXPANDER BASIC)

Function: To draw light lines.

Format: CALL LLINE ([(<start point x>, <start point y>)] – (<last point x>, <last point y>))

Example: COLOR 15: CALL LLINE (–(150, 50))

Explanation: A light line is drawn between (<start point x>, <start point y>) and (<last point x>, <last point y>). This instruction varies from LINE statement in that a special handling is carried out when two lines intersect. The specifying of (<start point x>, <start point y>) may be omitted. In this case, the LP (last point) is supposed to have been specified. Furthermore, a STEP statement may be also used to specify the start and last points for a relative coordinating.

The line color is a foreground one specified with a COLOR statement.

Sample program:

```
10  COLOR 15,1,1:SCREEN 2
20  CALL BLINE((0,0)-(255,191))
30  COLOR 4
40  LINE(100,0)-(100,191)
50  CALL LLINE((114,0)-(114,191))
60  GOTO 60
```

CALL SPAINT

Call super paint (EXPANDER BASIC)

Function: To put color all over in an enclosure.

Format: CALL SPAINT ((<x axis>, <y axis>))

Example: COLOR 8: CALL SPAINT ((100, 100))

Explanation: An area enclosed with lines is painted with a specified color, being centered about (<x axis>, <y axis>). The framing lines' color can be different from that to be painted. The color to be put is a foreground one specified with a COLOR statement. The coordinates can be relative with a STEP statement.

Sample program:

```
10 COLOR 15,1,1:SCREEN 2
15 LINE(50,50)-(200,160),15,B
20 CIRCLE(100,100),40,15
30 CIRCLE(150,100),40,8
40 COLOR 3:CALL SPAINT(( 80,100))
50 PAINT(170,100),15
60 GOTO 60
```

CALL SPSET

Call super point set (EXPANDER BASIC)

Function: To arrange dot

Format: CALL SPSET ((<x axis>, <y axis>))

Example: COLOR 11: CALL SPSET ((50, 50))

Explanation: Dots are arranged along (<x axis>, <y axis>). This instruction varies from PSET statement in that a special handling is carried out when two figures overlap. The color of dots is a foreground one specified with a COLOR statement. The coordinates can be relative with a STEP statement.

Sample program:

```
10 COLOR 8,4,7:SCREEN 2
20 LINE(81,0)-(87,191),15,BF
30 PSET(84,70),8
40 CALL SPSET((84,140))
50 GOTO 50
```

SAMPLE PROGRAM

1. THE PROGRAM FOR SCREEN LOAD

(With out the light pen unit)

```
10 '*** SCREEN LOAD ***
20 CLEAR 100,&HEAC0:DEF USR=&HEAD0
30 FOR I=&HEACF TO &HEC6D
40 READ A$:POKE I,VAL("&H"+A$)
50 NEXT I
60 POKE &HF3C8,&H38:POKE &HF3CA,&H20
70 POKE &HF3CC,&H0:POKE &HF3CE,&H1C
80 POKE &HF3D0,&H18
90 SCREEN 2,1:CLS:A=USR(X)
100 DATA 00,CD,40,EC,00,00,00,CD,FC,EB
110 DATA CD,59,EB,00,00,00,01,0D,0A,CD
120 DATA 69,EB,B9,20,F1,10,F8,21,B0,FF
130 DATA E5,06,06,CD,69,EB,77,23,10,F9
140 DATA E1,11,B6,FF,06,06,1A,13,FE,20
150 DATA 20,04,10,F8,18,0D,11,B6,FF,06
160 DATA 06,1A,BE,00,00,23,13,10,F8,00
170 DATA 00,00,00,00,00,18,0B,11,C7,EB
180 DATA CD,94,EB,CD,59,EB,18,B8,CD,59
190 DATA EB,CD,69,EB,00,00,00,CD,69,EB
200 DATA 32,D3,FF,CD,69,EB,32,D4,FF,CD
210 DATA 30,EC,21,00,00,11,FF,3A,CD,F1
220 DATA EB,CD,69,EB,D3,98,E7,30,03,23
230 DATA 18,F5,CD,E7,00,C9,00,00,F5,C5
240 DATA D5,E5,CD,E1,00,00,00,00,E1,D1
250 DATA C1,F1,C9,00,C5,D5,E5,CD,E4,00
260 DATA E1,D1,C1,C9,CD,E7,00,C3,F3,EB
270 DATA CD,52,EC,11,B6,EB,CD,9E,EB,3A
280 DATA B6,FF,00,00,00,01,05,00,11,06
290 DATA F4,21,B1,EB,ED,B0,C9,CD,9E,EB
300 DATA 3A,B0,FF,00,00,00,C9,06,01,21
310 DATA BC,FF,CB,6E,21,18,16,28,03,21
320 DATA 04,16,00,00,00,C9,25,2D,0E,16
330 DATA 1F,09,46,C9,6C,65,6E,61,6D,65
340 DATA 3A,06,46,6F,75,6E,64,3A,06,53
350 DATA 6B,69,70,20,3A,CD,84,44,CD,53
360 DATA 52,21,BC,FF,CB,6E,21,01,01,28
370 DATA 03,21,05,01,CD,E9,E1,CD,A1,44
```

```
380 DATA CD,40,45,CD,B3,55,31,00,F3,C9
390 DATA F5,7D,D3,99,7C,F6,40,D3,99,F1
400 DATA C9,3E,0E,D3,99,3E,82,D3,99,3E
410 DATA FF,D3,99,3E,83,D3,99,3E,03,D3
420 DATA 99,3E,84,D3,99,3E,38,D3,99,3E
430 DATA 85,D3,99,3E,03,D3,99,3E,86,D3
440 DATA 99,C9,00,00,00,00,00,00,00,00
450 DATA 00,00,00,F5,3A,D4,FF,D3,99,3E
460 DATA 87,D3,99,F1,C9,00,00,00,00,F5
470 DATA AF,D3,99,3E,60,D3,99,0E,30,CD
480 DATA 60,EC,0D,20,FA,00,F1,C9,00,00
490 DATA 00,00,00,00,00,00,00,00,00,00
500 DATA 00,F5,C5,06,80,AF,D3,98,00,00
510 DATA 10,FA,C1,F1,C9,00
520 GOTO 520
```

2. MUSIC PROGRAM FOR USING THE LIGHT PEN

```
10 ' *** LIGHTPEN MUSIC ***
20 DEFINT A-Z:DIM S(37,1),D$(15)
30 RESTORE 620:FOR S=1 TO 37:READ SS:IF
SS=0 THEN 50
40 SS=1789773#/(16*SS):S(S,0)=SS MOD 256
:S(S,1)=SS \ 256
50 NEXT
60 OPEN"GRP:"FOR OUTPUT AS #1
70 COLOR15,1,1:SCREEN 2,0
80 LINE(120,88)-(135,103),4,BF:PSET(128,
96),15
90 DRAW"BM35,20":PRINT#1,"Press dot in b
ox":DRAW"BM35,30":PRINT#1,"with Lightpen
"
100 OUT &HBB,0
110 W=INP(&HBA):W=W AND 8:IF W=8 THEN110
120 GOSUB 670:XS=E-128:YS=F-96
130 W=INP(&HBA):W=W AND 8:IF W=0 THEN130
140 PLAY"V907C64":COLOR 15,4,4
150 CLS:RESTORE 210:R=0:SF=1:SOUND0,0:SO
UND1,0:TE=120:CC=10
160 D$=CHR$(0)+CHR$(32)+CHR$(112)+CHR$(2
24)+CHR$(224)+CHR$(112)+CHR$(32)
```

```
170 FOR D=1 TO 4:SPRITE$(D)=D$:NEXT
180 FOR D=1 TO 17:LINE(D*13+5,100)-(D*13
+16,180),,BF:NEXT
190 READ D:IF D=0 THEN 220
200 LINE(D,100)-(D+8,150),3,BF:GOTO190
210 DATA 27,40,66,79,105,118,131,157,170
,196,209,222,0,57,105,169,210
220 COLOR4:DRAW"BM60,162":PRINT#1,"●":DR
AW"BM152,162":PRINT#1,"●"
230 COLOR15:DRAW"BM17,7":PRINT#1,"PIANO
ORGAN TREMORO PIPE END":LINE(10,2)-(240,
19),,B
240 FOR D=1 TO 4:READ C:LINE(C,3)-(C,19)
:NEXT
250 LINE(10,22)-(130,39),,B:LINE(72,23)-
(72,38):LINE(97,23)-(97,38)
260 DRAW"BM16,27":PRINT#1,"SUSTAIN ON OF
F"
270 SOUND7,&HF8:SOUND8,16:SOUND12,30:SOU
ND0,0:SOUND1,0:SOUND5,20
280 ON INTERVAL=30 GOSUB 600:INTERVAL OF
F
290 LINE(10,42)-(142,59),,B:LINE(88,43)-
(88,58):LINE(113,43)-(113,59)
300 DRAW"BM16,47":PRINT#1,"METRONOME ON
OFF"
310 LINE(10,62)-(220,79),,B:LINE(60,63)-
(60,78):LINE(82,63)-(82,79)
320 LINE(122,62)-(122,78):DRAW"BM16,67":
PRINT#1,"TEMPO UP DOWN tempo= 120"
330 PUT SPRITE1,(11,5),8:PUT SPRITE2,(73
,25),8:PUT SPRITE3,(114,45),8
340 D$="GABCDEFGABCDEFGAB":FOR D=1 TO 17
:PSET(D*13+7,90),4:PRINT#1,MID$(D$,D,1):
NEXT
350 IF SF=0 THEN SOUND0,0:SOUND1,0
360 OUT &HBB,0:Q=INP(&HBA) AND 8:IF Q=8
THEN FL=0:GOTO 350
370 IF FL=1 THEN 360
380 FOR D=1 TO 50:NEXT
390 FL=1:GOSUB 670:X=E-XS:Y=F-YS
400 IF Y<100 THEN 450
410 IF Y<150 THEN 440
420 IF X<16 THEN 360
```

```
430 S=(X-5)/13:SOUND0,S(S,0):SOUND1,S(S,
1):SOUND13,R:GOTO 360
440 S=(X-12)/13:SOUND0,S(S+19,0):SOUND1,
S(S+19,1):SOUND13,R:GOTO 360
450 D=INT(Y/20)+1:ON D GOTO 470,520,540,
560
460 GOTO 370
470 IF X<57 THEN SOUND8,16:SOUND12,30:SO
UND0,0:SOUND1,0:R=0:PUT SPRITE1,(11,5),8
:GOTO 350
480 IF X<105 THEN SOUND8,12:SOUND0,0:SOU
ND1,0:R=1:PUT SPRITE1,(58,5),8:GOTO 350
490 IF X<169 THEN SOUND8,16:SOUND0,
0:SOUND1,0:R=10:SOUND12,1:SOUND13,
0:PUT SPRITE1,(106,5),8:GOTO 350
500 IF X<210 THEN SOUND8,16:SOUND0,0:SOU
ND1,0:R=13:SOUND12,10:SOUND13,0:PUT SPRI
TE1,(170,5),8:GOTO 350
510 INTERVAL OFF:PLAY"V0","V0","V0":END
520 IF X>97 THEN SF=0:PUT SPRITE2,(98,25
),8:GOTO 350
530 SF=1:PUT SPRITE2,(73,25),8:GOTO 350
540 IF X<113 THEN INTERVAL ON:PUT SPRITE
3,(89,45),8:GOTO 360
550 INTERVAL OFF:PUT SPRITE3,(114,45),8:
GOTO 360
560 IF X<82 THEN TE=TE+2:IF TE>254 THEN
TE=254
570 IF X>81 THEN TE=TE-2:IF TE<34 THEN T
E=34
580 LINE(175,63)-(219,78),4,BF:DRAW"BM17
7,67":PRINT#1,TE
590 ON INTERVAL=(3600/TE) GOSUB 600:GOTO
 360
600 SOUND10,14:PUT SPRITE4,(120,185),CC:
CC=ABS(CC-18)
610 DRAW"BM177,67":SOUND10,0:RETURN
620 DATA 196,220,247,262,294,330,349,393
630 DATA 440,494,523,587,659,698,785,880
640 DATA 988,0,0,208,233,0,277,311,0,370
650 DATA 415,466,0,554,622,0,740,831,932
660 DATA 0,0,0
670 ' *** INPUT CHECK ***
680 A=INP(&HBA):C=A AND &H20
```

```
690 A=INP(&HBA):D=A AND &H20
700 IF D=C THEN690
710 A=INP(&HB8):F=A
720 B=INP(&HB9):C=INP(&HBA)
730 IF B AND 1 THEN F=A+256
740 E=B/2:D=C AND 7
750 IF D>3THEN 680
760 IF D=1THEN E=E+128
770 IF D=2THEN E=E+256
780 RETURN
```

SPECIFICATION

Hook-up terminals:	VIDEO IN;	RCA pin, 75Ω, 1 Vp-p
	AUDIO IN;	RCA pin, 47kΩ, 1.26Vp-p (100% modulation)
	VIDEO OUT;	RCA pin, 75Ω, 1 Vp-p
	RF adapter;	5-pin DIN contact

(As viewed from the unit)

	Slot;	50-pin, MSX-specified
Outer dimensions:	134 (H) x 109 (W) x 32 (D) mm (without light pen)	
Weight:	256 g	

*Specifications and appearance subject to change for product improvement without prior notice.

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