LEADER

PROGRAMMABLE VIDEO GENERATOR

INSTRUCTION MANUAL

LT 1610
LT 1611
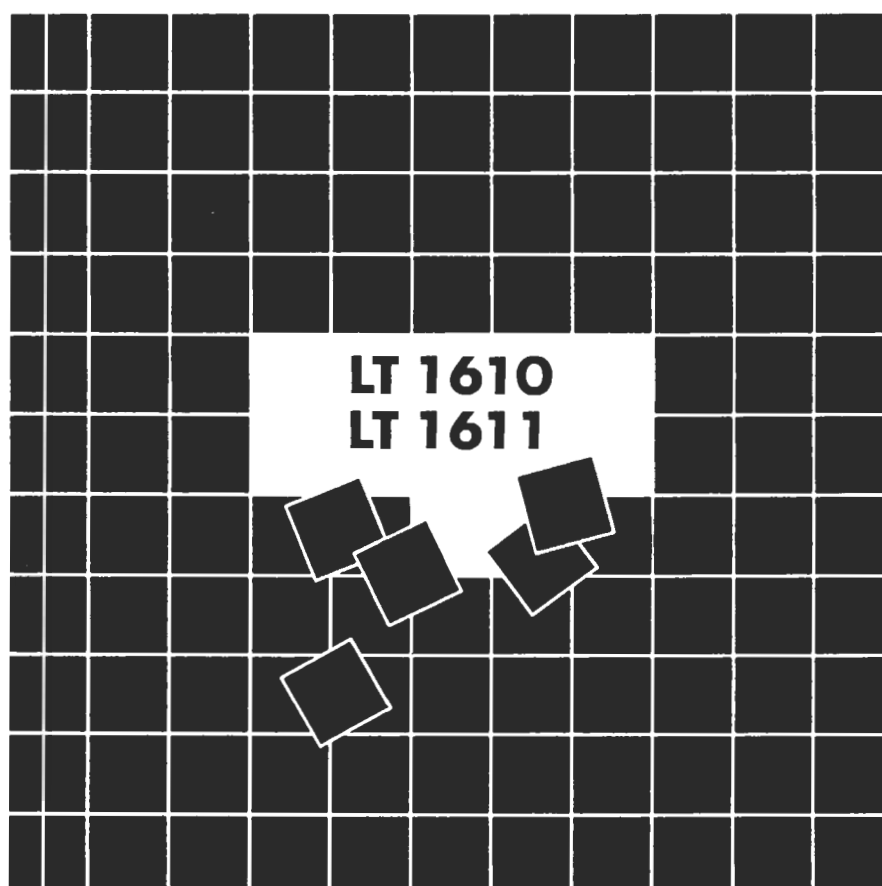
LEADER ELECTRONICS CORP.

There are quick manuals and information of revised version for system ROM & Windows Remote controller software at the back of this instruction manual.

•Installing Software
•Setting Timing Data & Pattern Data
•Sending Data

•Customer using 1610A need to refer to information at the back of this manual.

TABLE OF CONTENTS

1.   PREFACE

Thank you very much for your purchase of our measuring instrument. For your safe and effective use of the product, read this manual thoroughly and understand the correct use of the product before using it.

For anything uncertain or doubt in this manual, do not hesitate to contact our office or agency stated on the back of this manual.

After reading this manual, keep it handy for reference.

1.1   Grant of Use of Attached Software

1.1.1   Copyright

* Leader Electronics Corp. owns the copyright for Software (this software) supplied with the LT 1610 or LT 1611. The company grants the use of this software only to the customer who purchases the LT 1610 series.
* The customer is inhibited to rework, transfer, or sell this software for whatever reason.
* The customer is allowed to copy this software only once for backup.

1.1.2   Warranty Range

Leader Electronics Corp. has no responsibility for the operation results of this software. However, the company will replace the software if it contains a serious defect such as damage on the medium.

1.2 Precautions

1.2.1 Supply Voltages and Fuses ⚠ WARNING

Before connecting the AC power cord to the commercial power source, check the voltage. The supply voltages, working voltage range, and fuse rating of this product are indicated on the right side of the product.
Always use the product within the working voltage range at 50 or 60 Hz.
When replacing the fuse, turn off the power switch and unplug the power cord in advance.
Use a fuse of the specified rating.

Table 1-1

Model number	Working voltage range	Fuse rating	Spare fuse Parts number of LEADER
LT 1610	90 to 250 V	4.0 A Time lag	436 3795 005
LT 1611	90 to 250 V	4.0 A Time lag	436 3795 005

1.2.2 Maximum Allowable Voltage on Input Terminal ⚠ CAUTION

The remote connector is designed for the TTL level specifications. Do not apply negative voltage or a voltage exceeding +5 V. It causes damage to the product. Do not use the RS-232C connector for any purpose other than RS-232C communication. It causes damage to the product.

1.2.3 Installation Environment ⚠ CAUTION

Do not use the product in the following environments:

● High temperature area

Do not place the product on an area exposed to the direct sunlight for a long time or near a heater.
Do not subject the product to a sudden change of temperature such as moving it from a cold area to a hot area.
Operating temperature range: 0 to 40°C
● Humid area

Do not place the product in a humid environment such as in the bathroom or near a humidifier.
Operating humidity range: 10 to 80%RH
● Dusty area

2. SPECIFICATIONS

2.1 General

The LT 1610 (for both analog and digital)/LT 1611 (specialized for analog) is a portable video signal generator that enables programming of horizontal timing, vertical timing, output conditions, and output patterns. This A4-size compact unit features excellent functions such as natural image pattern output (245 colors), dot-step setting of horizontal timing, and high-speed pattern switching. These functions are most suitable for development, production, and service of flat panels like LCD and PDP and CRT displays. This video generator has industrial standard video timing data preset, so the user can immediately work with it using more than 40 kinds of built-in patterns. The unit also enables programming of user's original test patterns and video timing data easily under Windows running on the personal computer.

2.2 Features

● Equipped with both analog and digital outputs (LT 1610)
The LT 1610 is equipped with both analog and digital RGB outputs (8 bits each), so it can be used for displays designed for either analog or digital input specifications. It can also be switched between digital output levels 5 V and 3.3 V to meet either voltage type of displays. (The LT 1611 is equipped with only analog output.)

● Dot clock
Analog output of 150 MHz and digital output of 120 MHz (60 MHz + 60 MHz). The video generator supports digital output of up to 120 MHz in two-dot (even and ODD) parallel output mode (1/2 clock mode).

● Setting in dot steps
Horizontal timing can be set in dot steps over the entire band, so precise video signals can be output at the specified timing.

● High-speed pattern switching
A newly developed high-speed pattern switching circuit greatly reduces the pattern switching idle time than old models.

● Natural-color image
The video generator can output a natural-color image (256 colors) of up to 2,048 (H) x 1,024 (V) dot matrixes. This feature exhibits power for total evaluation of CRT displays. Natural-color images can easily displayed by transferring natural-color data edited in the 256-color bit map format from the personal computer to the LT 1610/1611. The unit also contains one VGA-size natural-color image.

●Coordinate display function and after-image evaluation patterns

The video generator provides the coordinate display function that can locate a defective spot on the display, character patterns effective for after-image evaluation, and window pattern scroll and blink function.

●Power saving test function

This function can test the power saving function of computer displays specified in the VESA standard.

●Programming on personal computers

The LT 1610/1611 enables the user to create programs or write data to ROM using Windows running on the personal computer. (Windows software is supplied with equipment.)

●Using flash memory as user ROM

The video generator uses flash memory as user ROM, so ROM data can be modified repeatedly with the ROM chip kept set in the ROM writer.

●Direct control from external controller

The timing or output conditions of the LT 1610/1611 can be changed from an external controller or personal computer through the RS-232C interface. Pattern drawing using the graphics function can also be directly controlled from the outside through the RS-232C interface.

2.3   Specifications

2.3.1   Timing

● Dot clock
   (1) Oscillation frequency range
      • Analog: 1.024 to 150.000 MHz
      • Digital: 1/1 clock mode (single mode):   1.024 to 60.000 MHz
                    1/2 clock mode (dual mode):   2.048 to 120.000 MHz
   (2) Setting resolution: 1 kHz step
   (3) Accuracy: ±10 ppm

● Horizontal synchronization setting range

Table 2-1

Input Mode	dot	μ sec
H_Freq	3.077 to 250.000 KHz	
H_Period	80 to 8192 (1 dot steps)	4.00 to 325.00
H_Sync	12 to 2000 (1 dot steps)	0.08 to 162.50
H_BP	0 or 4 to 4076 (1 dot steps)	0.00 to 324.50
H_Disp	1 to 4000 (4 dot steps)	0.10 to 324.60
HD_Start	0 to 4090 (4 dot steps)	0.00 to 324.99
HD_Width	0 to 4090 (4 dot steps)	0.00 to 324.99

* LT 1610/1611 program data is stored in dot values.
* When the input mode is "dot," Total_Dot=H_Period and H_Disp_Dot=H_Disp are used.
* Any setting that makes H_Blanking (H_Period - H_Disp) 63 dots or less is inhibited.
* When using digital output in 1/2 clock mode, set the even number of dots in H_Period.
* Set HD_Start and HD_Width in 4-dot steps. To generate these timing signals exactly as set, set H_Period, H_Sync, and H_BP also in 4-dot steps.

● Vertical synchronization setting range

Table 2-2

Input Mode	Line	msec
V_Freq	1.000 to 5000.000 Hz	
V_Period	50 to 4090.0	0.200 to 999.999
V_Sync	0.5 to 99.0	0.002 to 32.175
V_BP	0 to 4088.5	0 to 99.000
V_Disp	1 to 4089.5	0.004 to 999.799
VD_Start	0 to 4089.5	0 to 999/899
VD_Width	0 to 4089.5	0 to 999/899
EQ_FP	0 to 99.0	0 to 32.175
EQ_BP	0 to 99.0	0 to 32.175

* LT 1610/1611 program data is stored in line values.
* When the input mode is "line," set data in 0.5-line steps.

2.3.2 Output Conditions

Table 2-3

Setting Item		Description
SCANNING	AD	NON_INTERLACE/INTERLACE/INTERLACE SHRINK(SYNC & VIDEO)
V_DISP MODE	AD	NORMAL/SPECIAL
EQ_PULSE	A	OFF/0.5H/1H
SER_PULSE	A	OFF/0.5H/1H/XOR
OUTPUT MODE	AD	ANALOG/DIGITAL/ALL
VIDEO LEVEL	A	0.300 to 1.200 V (5 mV steps)
SYNC ON G	A	ON/OFF
SET UP	A	ON/OFF
HS OUTPUT SEL	AD	HS/CS
HS POLARITY	AD	POSI/NEGA
HS ON/OFF	A	ON/OFF
HS ON/OFF	D	ON/OFF
VS POLARITY	AD	POSI/NEGA
VS ON/OFF	A	ON/OFF
VS ON/OFF	D	ON/OFF
CS POLARITY	AD	POSI/NEGA
CS ON/OFF	A	ON/OFF
CS ON/OFF	D	ON/OFF
DISP POLARITY	AD	POSI/NEGA
DISP ON/OFF	A	ON/OFF
DISP ON/OFF	D	ON/OFF
CLK INTERVAL	AD	DISP/ALL
CLK POLARITY	AD	POSI/NEGA
CLK ON/OFF	A	ON/OFF
CLK ON/OFF	D	ON/OFF
CLK MODE	D	(1/1)/(1/2)
CLK DELAY	D	0 to 30 ns (2 ns steps)
HD POLARITY	D	POSI/NEGA
HD ON/OFF	D	ON/OFF
VD POLARITY	D	POSI/NEGA
VD ON/OFF	D	ON/OFF
VIDEO POLARITY	D	POSI/NEGA
RGB OUTPUT BIT	D	1 to 8 bit
R BIT ON/OFF	D	R7,R6,R5,R4,R3,R2,R1,R0 each bit ON/OFF (R7:MSB)
G BIT ON/OFF	D	G7,G6,G5,G4,G3,G2,G1,G0 each bit ON/OFF (G7:MSB)
B BIT ON/OFF	D	B7,B6,B5,B4,B3,B2,B1,B0 each bit ON/OFF (B7:MSB)
DOT DUTY	AD	50%(RZ)/100%(NRZ)
OUTPUT	AD	R:ON/OFF G:ON/OFF B:ON/OFF INVERSE::ON/OFF
CTRL0 to 2 ON/OFF	D	CTRL0:ON/OFF CTRL2:ON/OFF CTRL3:ON/OFF (ON=Hi,OFF=Lo)

* The alphabet in each setting item indicates the output system related to the setting.
  A: Analog output (BNC connector)   D: Digital output (57-series connector)
  AD: Analog and digital

2.3.3 Output Patterns

● Pattern types

(1) Stock patterns: 28

No parameter can be changed. However, only a character code can be changed for some patterns related to character output.

(2) Patterns with parameters: 14

Some pattern parameters can be changed.

(3) 256-color natural-color image pattern: 1 (containing VGA size)

The number of natural-color image pattern types can be increased by adding optional RAM. The maximum pattern size is 2,048 (H) by 1,024 (V). The pattern is divided for smaller sizes. For instance, six VGA or two XGA patterns can be accommodated.

(4) Special pattern: 1

The user can combine the patterns (1) to (13) below as desired to output them as a special pattern. Up to 16 patterns (PATTERN buttons) can be created.

● Special pattern

(1) Window
: Number of windows that can be set
Graphics window: 25
Color window: 8 (single color in a window)
* Only one color window can be set when a window is divided in different colors.

(2) Flat field
: Screen background of entire display area
Designated color: One of 1.677 million colors

(3) Line and character color
: Color of line and characters drawn in the graphics window
Designated color: One of 1.677 million colors

(4) Color bar
: Displayed in the graphics window.
Number of divisions in the window: 16 or less (both H and V)
Designated color: 256 of 1.677 million colors

(5) Gray scale
: Displayed in the color window
Number of divisions in the window: 16 or less (both H and V)

(6) Crosshatch
: Displayed in the graphics window.
Horizontal: 1 dot/step Vertical 1 line/step

(7) Dot	: Displayed in the graphics window. Horizontal: 1 dot/step Vertical 1 line/step
(8) Resolution	: Displayed in the graphics window. Stock pattern: 3 types User-defined: 1 type
(9) Circle	: Displayed in the graphics window. Stock pattern: 4 types User-defined: 16 types
(10) Ellipse	: Displayed in the graphics window. User-defined: 16 types
(11) Straight line	: Displayed in the graphics window. User-defined: 16 lines
(12) Character	: Displayed in the graphics window. Built-in character font: 5x7, 7x9 (JIS code) User character font: 32x32 (16 types) 64x64 (8 types) 128x128 (2 types) User strings:Up to 2,048 characters (JIS code)
(13) Others	: Scale, frame, diagonal, and marker are displayed in the graphics window.

● PATTERN button: 16

Use the PATTERN buttons by assign stock patterns, patterns with parameters, 256-color natural-color image patterns, or a special pattern to them. Each PATTERN button has a memory area to store various pattern parameters that make up a pattern.

[Patterns that must be assigned to PATTERN buttons]
The LT 1610/1611 provides two methods of pattern selection: selecting by changing the address or by pressing the PATTERN button. When an address is changed, the pattern of the number assigned to the address is output. Then, press the PATTERN button to output the pattern of the number assigned to the PATTERN button.

However, a pattern with a parameter or a special pattern which requires a parameter cannot be directly assigned to an address. It must first be assigned to a PATTERN button and then the PATTERN button number must to be assigned to an address.

2.3.4 Memory

● Program memory
  (1) Program address
    • User ROM: 0 to 99
    • Backup RAM: 0 to 99
      (Select one of user ROM or backup RAM.)

  (2) User ROM type
    • Flash memory: Hitachi's HN28F101P
    • E-PROM: 27512 of each vendor
      * E-PROM can be used only for data reading.

● Video memory: (2,048 x 2,048 dots) x 4

2.3.5 Output Signals

● Analog output (BNC connector)
  (1) Video signal output
    • R (red), G (green), B (blue): 1 each
    • Output impedance: 75 Ω
    • Output level: 0.300 to 1.200 V
                                   Set by the program in 5 mV steps (error:
                                   within ±15 mV).
    • Fine control: Video level (interlocked with RGB)
                                   GR video level balance, GB video level
                                   balance, offset level (R, G, B   independent)
    • Composite sync signal: ON/OFF with only G output added
    • Setup: ON/OFF with only G output added
      * The composite signal and setup levels conform to the RS-343A standard.

  (2) Sync signal output
    • Output signal: HS, VS, CS, DISP: 1 each
    • Signal level: Switching between C-MOS/TTL level (H=3.8 V
                                   or more, L=0.6 V or less) and low voltage C-
                                   MOS/TTL level (H=2.0 V or more, L=0.6 V or
                                   less)
      * Use the slide switch on the back to switch between the C-MOS/TTL and
        low voltage C-MOS/TTL level voltages. The LT 1611 does not support
        the low voltage C-MOS/TTL level.

  (3) Clock signal output
    • CLK: 1
    • Signal level: 0.6 Vp-p or more (ECL amplitude AC couple
                                   output)
    • Maximum frequency: 150 MHz
      * When the digital output CLK signal is set to the 1/2 clock mode, the analog
        output is still made at 1/1 frequency. (LT 1610)

●Digital output 1 (57-series 50-pin connector) * Provided only to the LT 1610.
  (1) Video signal output
       • R7-R0, G7-G0G, B7-B0:   1 each
       • Signal level: Switching between C-MOS/TTL level (H=3.8 V
                                    or more, L=0.6 V or less) and low voltage C-
                                    MOS/TTL level (H=2.0 V or more, L=0.6 V or
                                    less)
       * Even dot data is output in 1/2 clock mode.

  (2) Sync signal output
       • Output signal: HS, VS, CS, HD, VD, DISP: 1 each
       • Signal level: Switching between C-MOS/TTL level (H=3.8 V
                                    or more, L=0.6 V or less) and low voltage C-
                                    MOS/TTL level (H=2.0 V or more, L=0.6 V or
                                    less)

  (3) Clock signal output
       • CLK: 1
       • Signal level: Switching between C-MOS/TTL level (H=3.8 V
                                    or more, L=0.6 V or less) and low voltage C-
                                    MOS/TTL level (H=2.0 V or more, L=0.6 V or
                                    less)
       • Maximum frequency: 60 MHz
       * When the dot clock frequency exceeds 60 MHz, the 1/2 clock mode is used.

  (4) Other   CTRL0 (AV), CTRL1 (YS), VCC (+5 V/+3.3 V)
       * CTRL# is a general-purpose control output signal.
       * VCC (digital output 1 + 2) can be used for up to 300 mA.

●Digital output 2 (57-series 50-pin connector) * Provided only to the LT 1610.
  (1) Video signal output
       • R7-R0, G7-G0G, B7-B0:   1 each
       • Signal level: Switching between C-MOS/TTL level (H=3.8 V
                                    or more, L=0.6 V or less) and low voltage C-
                                    MOS/TTL level (H=2.0 V or more, L=0.6 V or
                                    less)
       * Video signal output is used only in 1/2 clock mode in which odd dot data is
         output. In 1/1 clock mode, these signals are not output but are pulled down
         to the ground by a 330-ohm resistance.

  (2) Other   CTRL2 (YM), VCC (+5 V/+3.3 V)

2.3.6　External Interface

- RS-232C:　　　　　　　　　　　　D-sub 9-pin connector (socket)
- REMOTE:　　　　　　　　　　　　Amphenol 57-series 36-pin connector

2.3.7　General Specifications

- Power requirement:　　　　　　　90 to 250 VAC (50/60 Hz)
- Power consumption:　　　　　　　LT 1610/about 61 VA (about 43 W),
  LT 1611/about 43 VA (about 29 W) (main unit only)
- Dimensions:　　　　　　　　　　295 (W) x 72 (H) x 210 (D) mm
- Weight:　　　　　　　　　　　　LT 1610/about 3.2 kg, LT 1611/about 2.9 kg
- Operating ambient temperature:　0 to 40°C
- Performance guarantee temperature:　5 to 35°C
- Indoor use
  Altitude up to 2,000m
  Overvoltage Category:　　　　II
  Pollution degree:　　　　　　2
- Accessories:　　　　　　　　　User ROM(installed in main unit when shipped)　　1
  Windows application software(3.5-inch floppy disk)　　1
  Power cord　　1
  fuse(250 V, 4 A, ST4)　　1
  Instruction manual　　1

3.   PANEL DESCRIPTION

3.1   Upper Panel
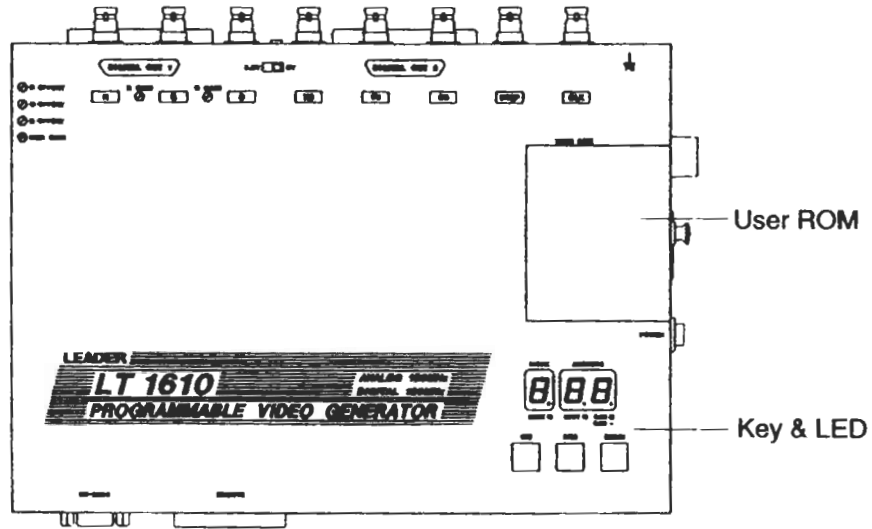

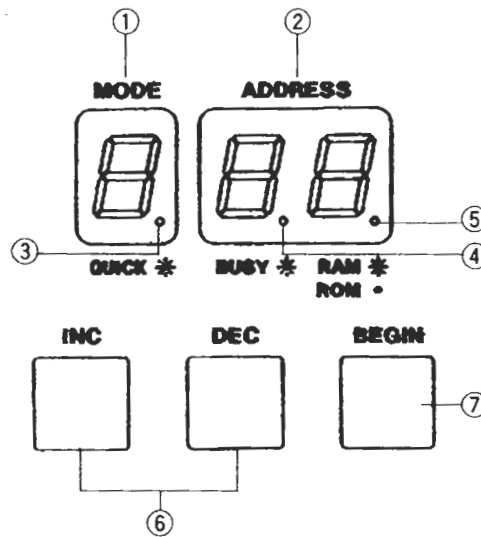— User ROM

— Key & LED

Figure 3-1

● Keys and LEDs

Figure 3-2

① MODE display

MODE displays the LT 1610/1611 operation mode.

is displayed when the unit is controlled through the RS-232C interface.

② ADDRESS display

ADDRESS displays the program address. It also displays the operation mode when the FUNCTION mode is entered using the LT 1610-01 remote controller.

③ QUICK LED

The QUICK LED lights while the LT 1610/1611 is operating in high-speed pattern switching mode.

④ BUSY LED

The BUSY LED lights while the LT 1610/1611 internal CPU is processing programs.

⑤ ROM/RAM LED

The ROM/RAM LED indicates whether the program data stored in user ROM or the program data stored internal backup RAM is used to output signals. It lights when the program data stored in internal backup RAM is used.

⑥ INC/DEC key

The INC or DEC key increments or decrements the address for program execution each time it is pressed.

* Pressing the INC or DEC key for more than 1 second continuously advances or reverses addresses (repeat function). However, the program is executed only once at the address located when the key is released.

⑦ BEGIN key

When the BEGIN key is pressed, the program returns to the address defined in advance for BEGIN and is executed.
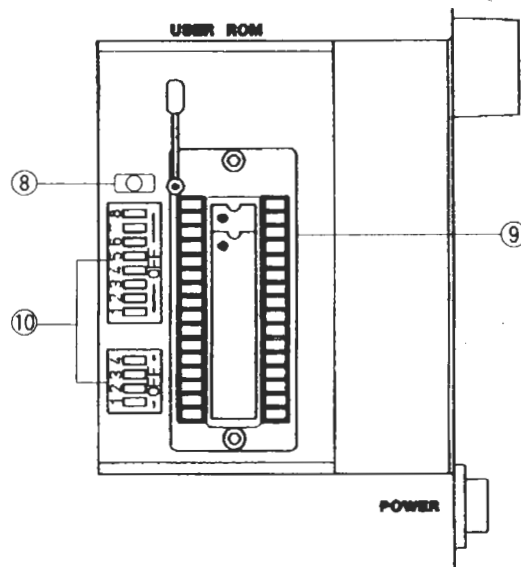
●User ROM

Figure 3-3

⑧ User ROM insert/extract inhibit LED

⚠ CAUTION   Do not insert or extract the user ROM package while the LED is on.

⑨ User ROM socket

Attach the user ROM package into this socket. The following types can be used as user ROM:

• Frash memory: Hitachi's HN28F101P
• E-PROM: Each vendor's 27512 (The LT 1610/1611 does not allow data to be written to E-PROM.)

⑩ Panel DIP switches

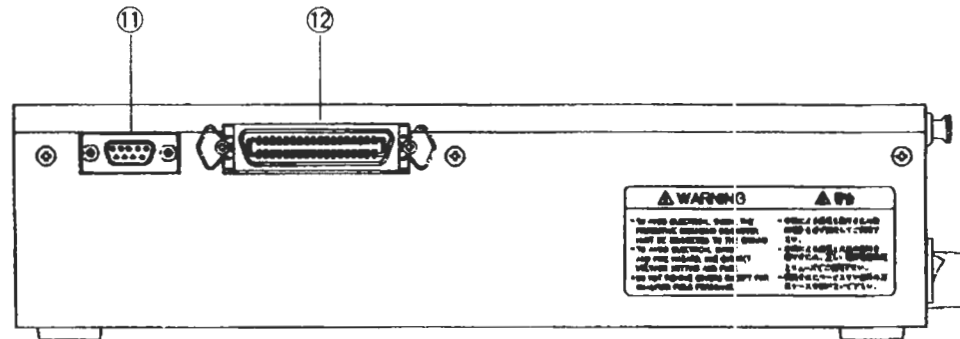Use these DIP switches to set LT 1610/1611 operation modes.

3.2   Front Panel

Figure 3-4

⑪ RS-232C connector (D-sub 9-pin)

The RS-232C connector is used to control the LT 1610/1611 from an external personal computer or controller.

⑫ REMOTE connector (57-series 36-pin)

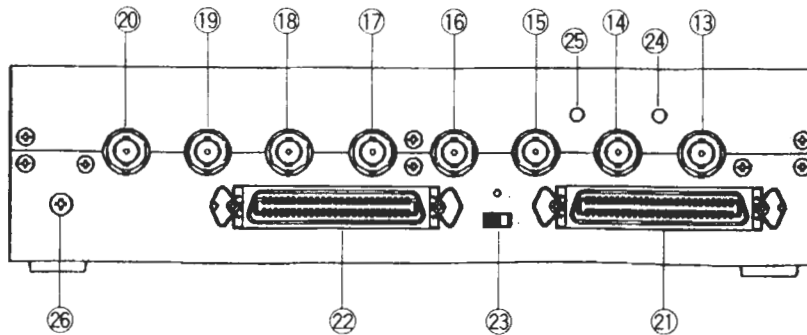The REMOTE connector is used to connect the LT 1610-01 or LVG1603-01 remote controller to perform remote operation.

Figure 3-5

⑬ R , ⑭ G , ⑮ B

These are the R, G, and B video signal output terminals. Output impedance is 75 ohms. The output level can be set in the range from 0.3 to 1.2 V (75-ohm termination).

⑯ HS

This is the horizontal sync signal or horizontal/vertical composite sync signal output terminal. The signal types can be switched by program setting.

* The HS, VS, CS, or DISP signal can be switched between the C-MOS/TTL level (H=3.8 V or more, L=0.6 V or less) and low voltage C-MOS/TTL level (H=2.0 V or more, L=0.6 V or less). The slide switch in ㉓ can be used for this switching. Note that the LT 1611 does not support the low voltage C-MOS/TTL level.

⑰ VS

This is the vertical sync signal output terminal.

⑱ CS

This is the composite sync signal output terminal.

⑲ DISP

This is the display period timing signal output terminal.

⑳ CLK

The CLK terminal outputs the internal dot clock frequency. The output level is 0.6 Vp-p or higher (ECL amplitude, AC couple output).

㉑ DIGITAL OUT1 connector (57-series 50-pin) * Provided only to the LT 1610.
This is a digital output connector that can accommodate a DDK's 57-30500 or the equivalent. See Section 12.1, "DIGITAL OUT Connectors," for pin assignments.

* The DIGITAL OUT1 or DIGITAL OUT2 signal can be switched between the C-MOS/TTL level (H=3.8 V or more, L=0.6 V or less) and low voltage C-MOS/TTL level (H=2.0 V or more, L=0.6 V or less). The slide switch in ㉓ can be used for this switching.

㉒ DIGITAL OUT2 connector (57-series 50-pin) * Provided only to the LT 1610.
This is a digital output connector that can accommodate a DDK's 57-30500 or the equivalent. See Section 12.1, "DIGITAL OUT Connectors," for pin assignments.

㉓ Slide switch * Provided only to the LT 1610.
This slide switch is used to switch between analog sync signal output relations or between digital voltage output levels (5 V/3.3 V).
⚠ CAUTION   Handle this switch carefully. A wrong setting may cause overcurrent resulting in destruction of the display.

㉔ R GAIN
Use the R GAIN control for fine adjustment of the R video signal output level.

㉕ B GAIN
Use the B GAIN control for fine adjustment of the B video signal output level.

㉖ Grounding terminal
The grounding terminal is connected to the chassis of the LT 1610/1611.
⚠ WARNING   This product provides a grounding terminal to prevent users from an electrical shock or protect the product. For safety, be sure to connect the product to the ground before using it.
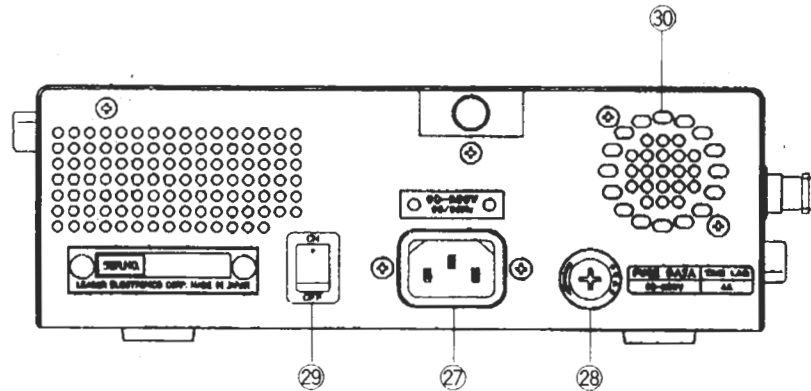
Figure 3-6

㉗ Inlet

Connect the AC power cord supplied with equipment to this inlet. The available supply voltages range from 90 to 250 VAC.

⚠WARNING   ●Use only the rated supply voltages indicated on the product. Failure to do so may cause a fire. Check the voltage before connecting the AC power cord to the commercial power. Use the product at 50 or 60 Hz.

●About power cord

Use the power cord supplied with the product. Using another power cord may cause a fire. If the power cord supplied with the product is damaged, stop using it and contact us or our local agency. Using a damaged power cord may cause an electrical shock or fire. When unplugging the power cord, do not pull the cord but hold the plug and pull it.

㉘ Fuse holder

Fuse data is indicated at the right side of the fuse holder. When replacing the fuse, remove the cap by turning it counterclockwise with a Philips screw driver and replace the fuse.

⚠WARNING   Before replacing the fuse, be sure to turn off the power switch and unplug the power cord. Use a fuse of the specified rating.

㉙ Power switch

The power switch turns on or off the equipment power.

㉚ Fan

⚠CAUTION   This is an air cooling fan. Do not block the fan ventilation holes on the back and side of equipment. Doing so cause equipment failure.

Figure 3-7

③ RGB GAIN

Use this control for fine adjustment of the R, G, and B video signal output level.

③ R OFFSET

Use this control for fine adjustment of the R video signal output offset level.

③ G OFFSET

Use this control for fine adjustment of the G video signal output offset level.

③ B OFFSET

Use this control for fine adjustment of the B video signal output offset level.

③ Fan

⚠ CAUTION   This is an air cooling fan. Do not block the fan ventilation holes on the back and side of equipment. Doing so cause equipment failure.
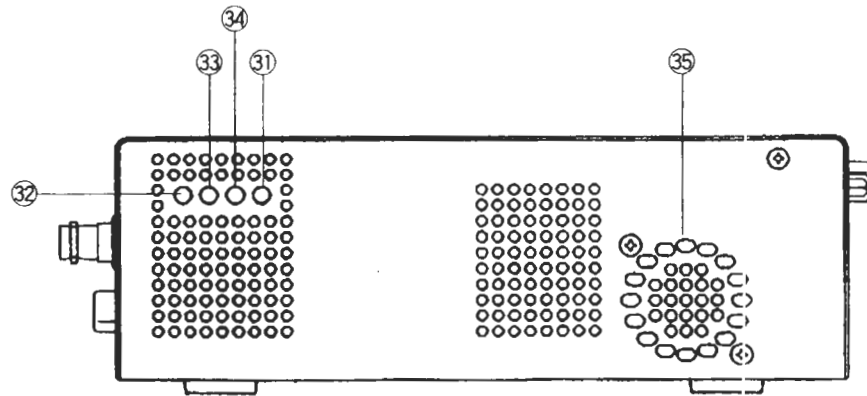
4.   USING ATTACHED SOFTWARE

This section describes how to install application software supplied with equipment into the personal computer and also describes the basic operation of the software. For the function of each application, refer to the function description of each application.

4.1   Attached Software

Medium: 3.5-inch floppy disk
Quantity: Seven floppy disks
Format: MS-DOS format
Disk name: LT 1610 Control disks 1 to 4: Installer and control
           LT 1610 sample data: Sample data
           LT 1610 database engine disks 1 and 2: Data editing software

4.2   Operating Environment

Software runs on a personal computer in which Windows 3.1 or Windows 95 is installed. The hard disk must have an empty space of 20 megabytes or more, and RAM must be 8 megabytes or more (16 megabytes or more is recommended). A mouse or the equivalent function is required. SVGA or a better resolution is recommended for the monitor screen.

4.3   Installing Attached Software

Before installing software, make backup copies of seven software floppy disks.

4.3.1   Windows 95

(1)   Control software
    ① Start Windows. For an explanation on how to operate Windows or the personal computer, refer to the relevant instruction manuals.
    ② Insert the CONTROL DISK1 floppy disk, among other floppy disks supplied with the LT 1610, into the floppy disk drive.
    ③ Click the start button, then select "Run by specifying file name (R) ...."
    ④ Enter the following in the command input field, then click the OK button. The drive number is the one into which the floppy disk has been inserted (drive numbers depend on the type of the personal computer used).

    | A : ¥ setup |

    ⑤ Installation begins. Follow the messages on the screen and install software on up to CONTROL DISK4. When installation is finished, The LEADER LT 1610 group is created in the program, and five icons "Cursor Move," "Picture Transfer," "Remote Controller," "Timing Set," and "Uninst_1" are added to the group. Make a shortcut on the desktop as needed.

(2) Database engine
① Insert the DATABASE ENGINE DISK1 floppy disk into the floppy disk drive.
② Click the start button, then select "Run by specifying file name (R) ...."
③ Enter the following in the command input field, then click the OK button. The drive number is the one into which the floppy disk has been inserted (drive numbers depend on the type of the personal computer used).

```
A : ¥ install
```

④ Installation begins. Follow the messages on the screen and install software on up to DATA DISK2. When installation is finished, a folder named "idapi" is created.
⑤ Click the start button, then select "Run by specifying file name (R) ...."
⑥ Enter the following in the command input field, then click the OK button. The drive number is the one of the hard disk (drive numbers depend on the type of the personal computer used).

```
C : ¥ idapi ¥ bdedfg
```

⑦ The "BDE environment setup utility" window opens. Select the "Alias" tab.
Click "New alias (N)" to open the "Add new alias" dialog.
Write "1610hostDB" in en-size characters in the "New alias (N)" text box, then click the OK (O) button. Check that alias name "1610hostDB" is selected, then write "c:¥leader¥Data" in the PATH parameter field (Figure 4-1).
When you close the file, the system asks whether to save data. So, click "Yes."
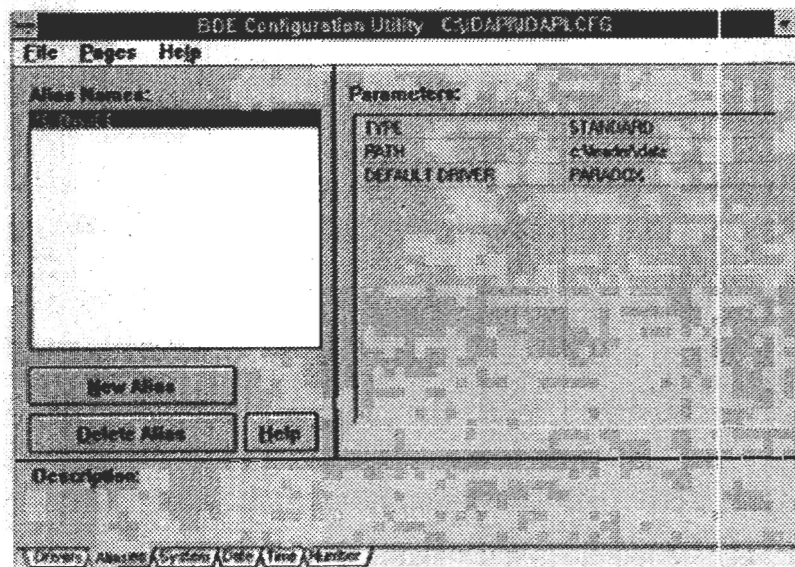⑧ After installation is completed, restart Windows.

Figure 4-1

(3)   Sample data

The SAMPLE DATA floppy disk contains sample data and database initialization
software.

●See Section 7.1.5, "Calling a File (BANK Transfer)," for examples of using
sample data. This data uses the values listed in Section 9, "Sample Program
Data List."

●The database initialization software is stored in the A:¥recover¥setup.exe file. Do
not use this file normally. It is used if the database is damaged and cannot be
read normally. Executing this software initializes the database and deletes
BANK data stored previously. Handle it carefully.

4.3.2   Windows 3.1

(1)   Control software

( ) Start Windows. For an explanation on how to operate Windows or the
personal computer, refer to the relevant instruction manuals.

(2) Insert the CONTROL DISK1 floppy disk, among other floppy disks supplied
with the LT 1610, into the floppy disk drive.

(3) Open the program manager and select "Icon(F)", then select "Run by
specifying file name (R) ...." from the pull-down menu.

( ) Enter the following in the command input field, then click the OK button. The
drive number is the one into which the floppy disk has been inserted (drive
numbers depend on the type of the personal computer used).

```
A : ¥ setup
```

( ) Installation begins. Follow the messages on the screen and install software
on up to CONTROL DISK4. When installation is finished, The LEADER LT
1610 group is created in the program manager, and five icons "Cursor Move,"
"Picture Transfer," "Remote Controller," "Timing Set," and "Uninst_1" are
added to the group.

(2)   Database engine

( ) Insert the DATABASE ENGINE DISK1 floppy disk into the floppy disk drive.

(2) Open the program manager and select "Icon(F)", then select "Run by
specifying file name (R) ...." from the pull-down menu.

(3) Enter the following in the command input field, then click the OK button. The
drive number is the one into which the floppy disk has been inserted (drive
numbers depend on the type of the personal computer used).

```
A : ¥ install
```

(4) Installation begins. Follow the messages on the screen and install software
on up to DISK2. When installation is finished, a directory named "icapi" is
created.

⑤ Open the program manager and select "Icon(F)", then select "Run by specifying file name (R) ...." from the pull-down menu.

⑥ Enter the following in the command input field, then click the OK button. The drive number is the one of the hard disk (drive numbers depend on the type of the personal computer used).

```
C : ¥ idapi ¥ bdedfg
```

⑦ The "BDE environment setup utility" window opens. Select the "Alias" tab.
Click "New alias (N)" to open the "Add new alias" dialog.
Write "1610hostDB" in en-size characters in the "New alias (N)" text box, then click the OK (O) button. Check that alias name "1610hostDB" is selected, then write "c :¥leader¥Data" in the PATH parameter field (Figure 4-1).
When you close the file, the system asks whether to save data. So, click "Yes."

⑧ After installation is completed, restart Windows.

(3) Sample data
The SAMPLE DATA floppy disk contains sample data and database initialization software.

● See Section 7.1.5, "Calling a File (BANK Transfer)," for examples of using sample data. This data uses the values listed in Section 9, "Sample Program Data List."

● The database initialization software is stored in the A:¥recover¥setup.exe file. Do not use this file normally. It is used if the database is damaged and cannot be read normally. Executing this software initializes the database and deletes BANK data stored previously. Handle it carefully.

* Note on use of Windows 3.1
If the conventional memory area contains much resident software leaving little space, a system error may occur when software supplied with LT 1610/1611 is started. If so, remove resident software to increase free space of the conventional memory area.

If an error message still appears or the system does not operate normally, run the BDE environment setup utility (BDECFG.EXE) and decrease the value set for LOW MEMORY USAGE LIMIT in the "System" card or set it to 0 (Figure 4-2).
(Default is the C : ¥ idapi ¥ bdecfg.exe file.)

Figure 4-2

Also, add SHARE/F:4096/L:40 to the autoexec.bat file.

4.4 Icon Functions

- Cursor Move: Starts the cursor function.
- Picture Transfer: Transfers natural-color image or other bit map data to the LT 1610/1611.
- Remote Controller: Enables remote control of the LT 1610/1611.
- Timing Set: Used for parameter setting for each address, pattern selection, and editing.
- Unlnst_1:   Uninstaller

4.5 Basic Operation

The basic operation, terminology, and notation of attached software conform to those of Windows. For details, refer to the manuals and documents for Windows.

4.5.1 Setting Communication Port and Baud Rate

The personal computer communication speed and port to be used need to be set. To do so, click "File(F)" on the menu bar of each software, then select "Com Port(C)" from the pull-down menu displayed. The "Comm Setting" dialog is displayed. Select the communication port and speed to be used. Note that the communication speed must match that of the LT 1610/1611.
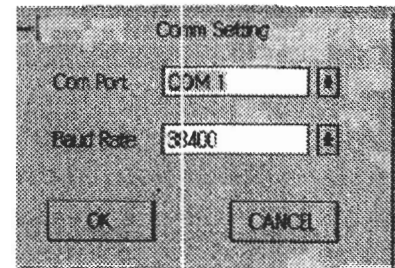

Figure 4-3

4.6 Cursor Move

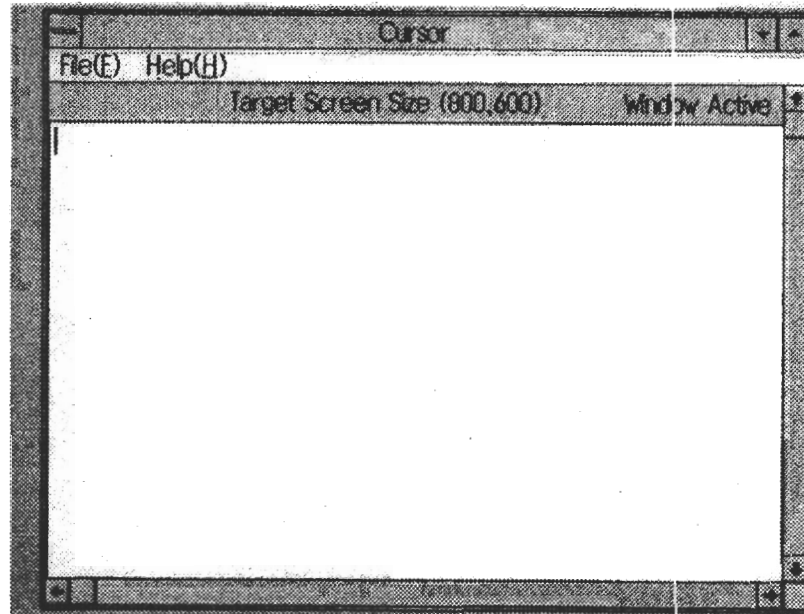Click the "Cursor Move" icon to open the "Cursor" window (Figure 4-4).

Figure 4-4

4.6.1   Menu Bar

① "File(F)" pull-down menu (Figure 4-5)
   • "Com Port(C)":
     Displays the personal computer RS-232C port
     setup menu.
   • Close(X):
     Closes the "Cursor" window.
② Target Screen Size (800,600)
   This item indicates the resolution set for the LT
   1610/1611. The values in parentheses are those
   displayed automatically by the personal computer
   according to information received from the LT
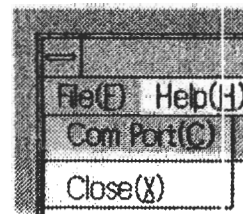   1610/1611.

Figure 4-5

4.6.2   Cursor Operation

① Moving the cursor
   Operate the mouse while pressing down the SHIFT key. A crosshair cursor and
   coordinates (X, Y) are displayed on the screen of the monitor under test. The
   coordinates are also displayed on the tool bar on the personal computer monitor
   screen.
② Inching the cursor
   For fine movement of the cursor, operate the cursor key while pressing the CTRL
   key.
③ Scroll bar
   A scroll bar is displayed when the size of the monitor screen under test is larger
   than the cursor operation range (white range) on the window used. Change the
   operation range as needed.

4.7   Picture Transfer

Click the "Picture transfer" icon to open the "Leader 1610 Bitmap Viewer" window
(Figure 4-8).

4.7.1   Menu Bar

① "File(F)" pull-down menu (Figure 4-6)
   • Open(O): Displays the menu for selection of bit
     map data (extension: bmp) to be transferred to the
     LT 1610/1611.
   • Comm Port(C): Displays the personal computer
     RS-232C port setup menu.
   Close(X):
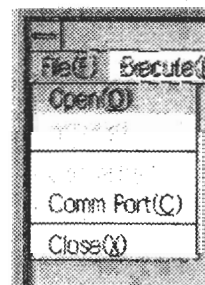   Closes the "Leader 1610 Bitmap Viewer" window.

Figure 4-6

② "Execute(E)" pull-down menu (Figure 4-7)
   • Data Send(S): Transfers selected bit map data to the LT 1610/1611.
   • Initialize(I):   Deletes all data in natural-color image backup RAM.
   • Get Address(G):   Displays the start address of the empty space of natural-color image backup RAM in the "Code:" field on the status bar.
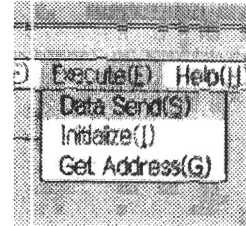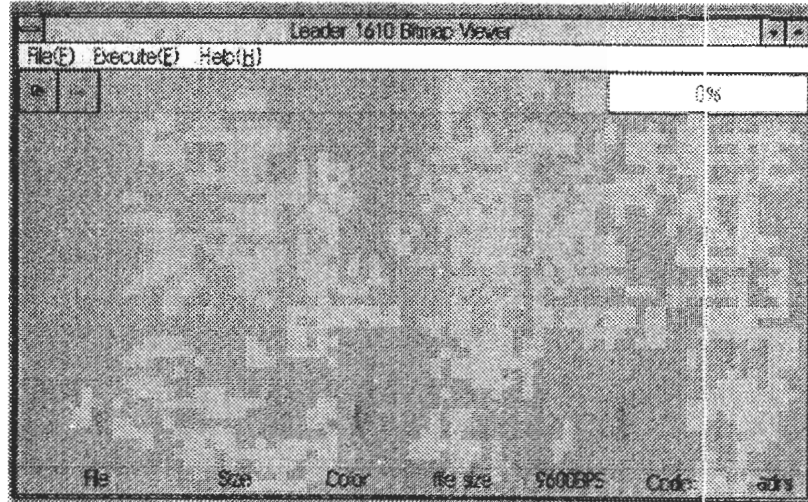

Figure 4-7

Figure 4-8

③ "Help(H)" pull-down menu (Figure 4-9)
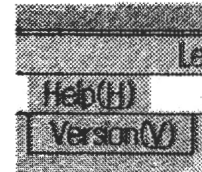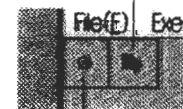   • Version(V): Displays the software version.

Figure 4-9

4.7.2   Tool Bar
   • Open file button:
     Displays the menu for selection of bit map data (extension: bmp) to be transferred to the LT 1610/1611.
   • Transfer button: Transfers data to the LT 1610/1611.
   • 0%: Displays the progress of transfer.

4.7.3   Image Display Area

Bit map data to be transferred is displayed in image mode.

Transfer button

Open file button

Figure 4-10

4.7.4 Status Bar

The status bar displays information on transferred data and transfer rate.
- "File": Displays the file name of transferred data.
- "Size": Displays the image size of transferred data in pixels.
- "Color": Displays the number of transferred data colors.
- "file size": Displays the image size of transferred data in bytes.
- "9600BPS": Displays the transfer rate.
- "Code": Displays the pattern number assigned to the natural-color image pattern transferred.
- "adrs": Displays the RAM start address where transferred data is stored.

4.8 Remote Controller

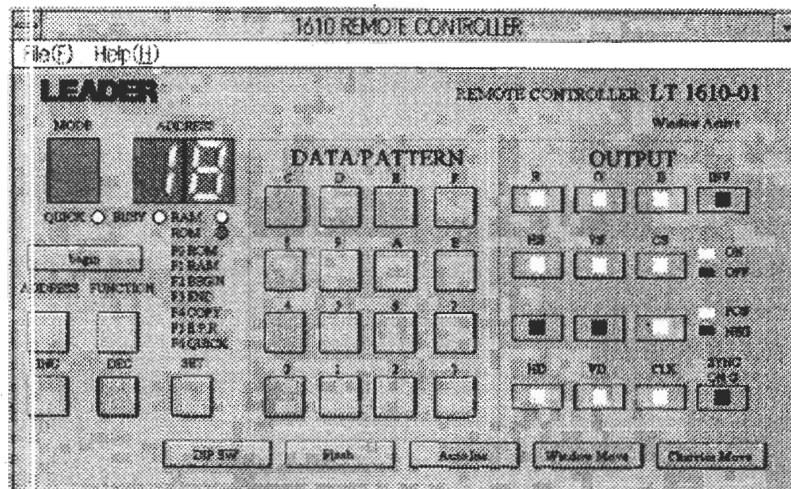Click the "Remote controller" icon to open the "1610 REMOTE CONTROLLER" window (Figure 4-11).

Figure 4-11

4.8.1 Menu Bar

① "File(F)" pull-down menu (Figure 4-12)

- "Com Port(C)":
Displays the personal computer communication
   port setup menu.
- "Status(S)":
Transfers information of the LT 1610/1611 to the
   personal computer and reflects it in the LED
   display on the window.
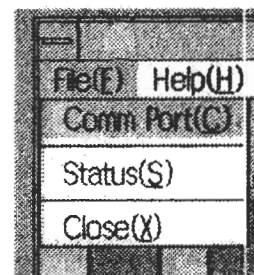- "Close(X)":
Closes the "1610 REMOTE CONTROLLER"
   window.

Figure 4-12

4.8.2   Control Buttons

① Incrementing or decrementing addresses
Click the "begin," "INC," or "DEC" button.

② Address direct operation
Click the "ADDRESS" button ("A" is displayed on the "MODE" LED), use the "DATA/PATTERN" button to display the address value on the "ADDRESS" LED, then click the "SET" button to set it.

③ Setting each function
Click the "FUNCTION" button ("F" is displayed on the 'MODE" LED), click the "DATA/PATTERN" key corresponding to the target function, then click the "SET" button to set it.

• ROM mode (using user ROM data)	[FUNCTION]→[0]→[SET]
• RAM mode (using backup RAM data)	[FUNCTION]→[1]→[SET]
• BEGIN setup (setting the start address)	[FUNCTION]→[2]→[SET]
• END setup (setting the last address)	[FUNCTION]→[3]→[SET]
• Transfer (copying user ROM data to backup RAM)	[FUNCTION]→[4]→[SET]
• ROM write (copying backup RAM data to user ROM)	[FUNCTION]→[5]→[SET]
• Quick pattern setting (setting the quick pattern mode)	[FUNCTION]→[6]→[1]→[SET]
• Quick address setting (setting the quick pattern mode)	[FUNCTION]→[6]→[2]→[SET]
• Quick cancel (canceling the quick pattern)	[FUNCTION]→[6]→[0]→[SET]

④ Operating output signals
Click LED buttons in the "OUTPUT" group. The type of operation can be determined by the button color.

4.8.3   Button That Displays a Dialog

Each of the following buttons displays a dialog box when clicked:
• "DIP SW" (Figure 4-13): Enables the LT 1610/1611 DIP switch setting to be changed temporarily. See Section 5.3 for more information.
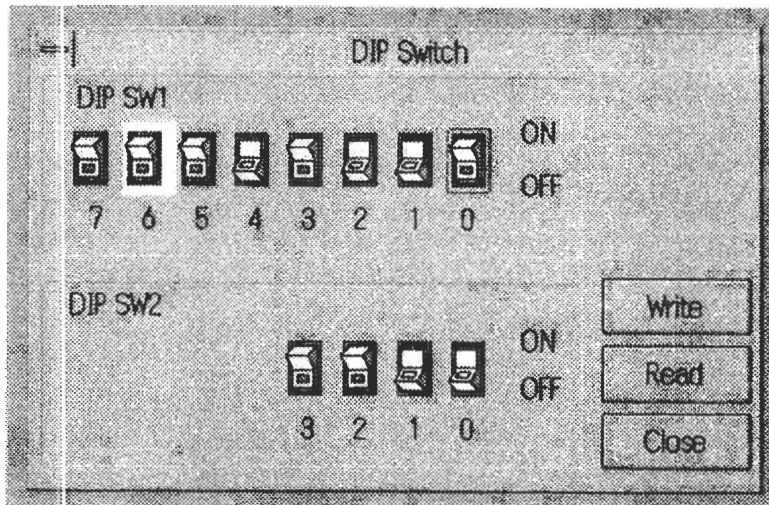
Figure 4-13

- "Flash" (Figure 4-14):
  Specifies the parameters for using the flashing pattern.
- "Auto Inc" (Figure 4-15):
  Specifies the automatic increment mode parameter.
  * "Pattern/Address" select button
    Pattern --- The patterns assigned to the PATTERN buttons are repeatedly output from 0 to F.
    Address --- The patterns assigned between BEGIN and END are repeatedly output.
  * "Time" text box
    Specify the switching interval from when pattern drawing ends till next pattern drawing begins.
  * "Start" button
    The automatic switching function begins.
  * "Break" button
    The automatic switching function is interrupted.
- "Window Move" (Figure 4-16):
  Specifies the window scroll pattern parameters.
  * "V Moving" group: Specifies the parameters in the vertical direction.
  * "H Moving" group: Specifies the parameters in the horizontal direction.
  * "Write" button: Transfers the specified parameter data to the LT 1610/1611. The data is backed up in the LT 1610/1611.
- "Character Moving" (Figure 4-17):
  Specifies the character scroll pattern parameters.
  * "User Character Code": Selects the character to be displayed.
  * "V Moving" group: Specifies the parameters in the vertical direction.
  * "H Moving" group: Specifies the parameters in the horizontal direction.
  * "Write" button: Transfers the specified parameter data to the LT 1610/1611. The data is backed up in the LT 1610/1611.
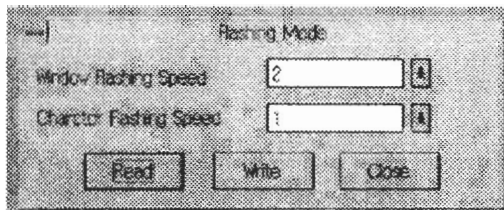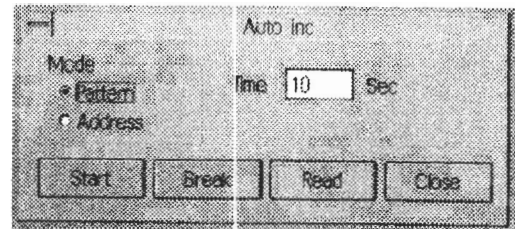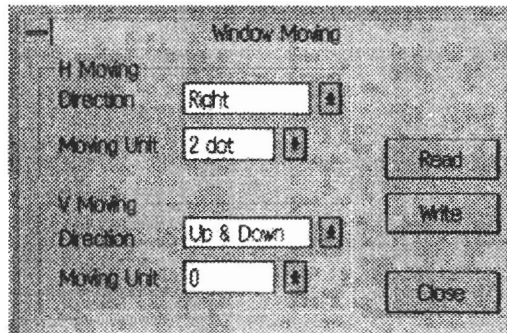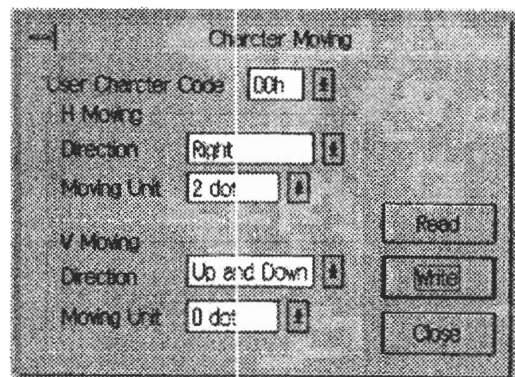
4-11

Figure 4-14

Figure 4-15

Figure 4-16

Figure 4-17

4.9 Timing Set

Click the "Timing Set" icon to open the "Address Data Setting" window (Figure 4-19).

* Before starting "Timing Set," release the LT 1610/1611 from the high-speed pattern switching mode. Otherwise, edited data will be changed when transferred to the LT 1610/1611.

4.9.1 Menu Bar

① "File(F)" pull-down menu (Figure 4-18)
- "Com Port(C)":
  Displays the personal computer communication port setup menu.
- "Bank Append(R)", "Bank Copy(W)":
  Saves one bank of data or calls saved data.
- "Bank New(N)", "Bank Delete(D)":
  Specifies a new bank or deletes an unnecessary bank.
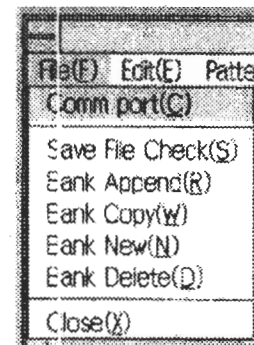- "Close(X)":
  Closes the "Address Data Setting" window.

Figure 4-18
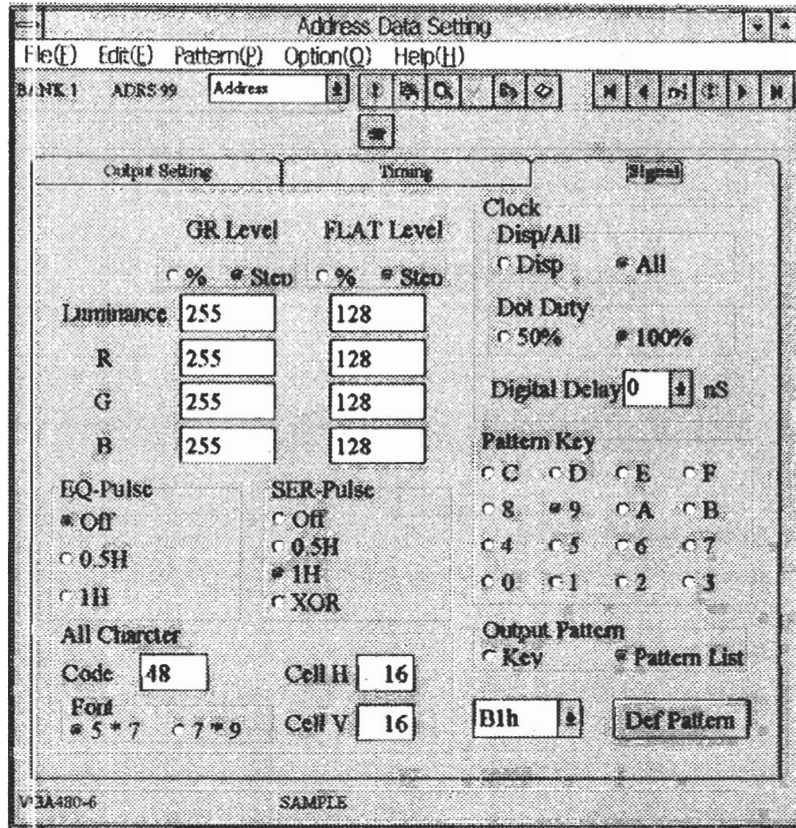
Figure 4-19

② "Edit(E)" pull-down menu (Figure 4-20)

- "Copy(C)", "Paste(P)":
  Used to edit data for one address.

- "Comment(M)":
  Write-enables the comment box on the status bar.
  Move the cursor and write data in up to eight
  alphanumeric characters.

- "Program ID(I)":
  Write-enables the program ID box on the status
  bar. Move the cursor and write data in up to eight
  alphanumeric characters.

- "String(S)":
  Opens the "Strings Edit" window (Figure 4-12).
  Move the cursor to the "Strings Edit" window and
  edit strings. Up to 2,048 alphanumeric characters
  can be written. Select a font by clicking "Front(T)"
  in the "Option(O)" pull-down menu.
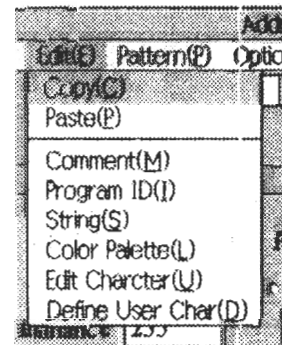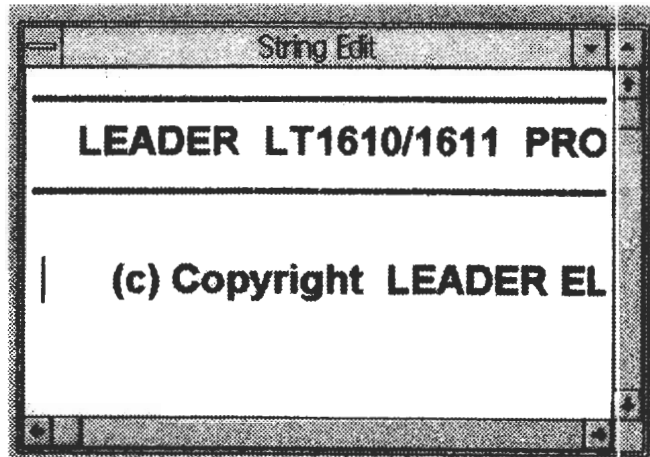
Figure 4-20

Figure 4-21

• "Color Palette(L)":

Opens the "Color Palette Edit" window (Figure 4-22) on which a color palette is displayed.

* Palette button: Selects the palette column to be edited.
* "pattern No" select button: Selects the pattern buttons to be used for editing the color palette.
* "Default Color" select button: Selects the initial palette color.
* "Default" button: Specifies the color palette initial values.
* "Write" button: Assigns the edited palette to PATTERN button numbers.
* "Edit" button: Opens the "Color setting" window (Figure 4-23).
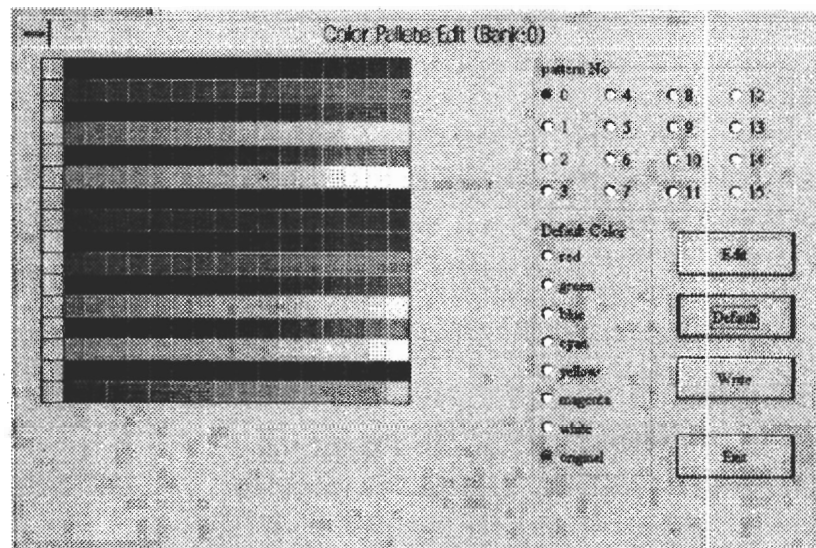
Figure 4-22

- 'Color setting" window (Figure 4-23): Selects colors to be set for the palette.
* "Basic color(B)" select box: Selects the basic color for color setting. The selected color is displayed in the "Color/pure color" box.
* "Created color(C)" select box: Specifies the created colors in the palette. When the window is opened, the palettes selected by the palette buttons in the "Color Palette Edit" window. Click the palette to be set.
* 'Add(A)" button: Moves the decided color to the "Created color" select box.
* 'OK" button: Ends color setting.
* 'Cancel" button: Cancels color setting.
* Color panel: Select a color with the mouse cursor. The parameters of the selected color are displayed in the boxes below. You can also enter parameters to display the corresponding color.

Figure 4-23

4-15

• "Edit Character(U)": Opens the "User Character Edit" window (Figure 4-24). A desired character can be created.

Figure 4-24

* "File(F)" pull-down menu (Figure 4-25): Used to save the edited character in character data or read it.

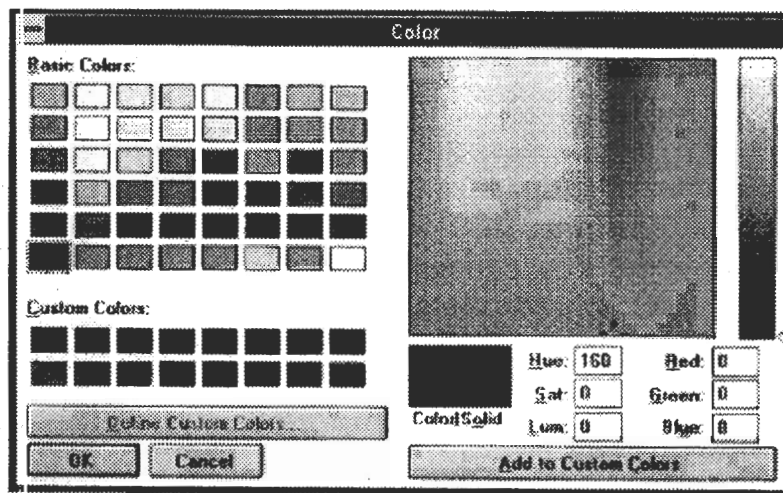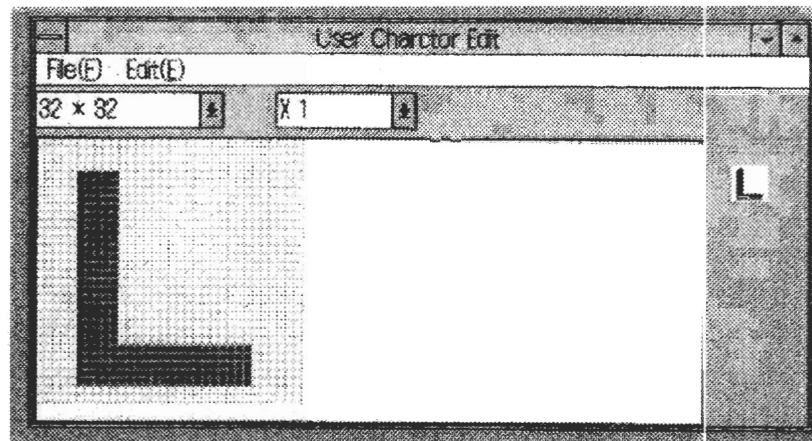To save or read data, click "Write(W)" or "Read(R)" to open the corresponding dialog box. The file extension is "*.chr".

* "Edit" pull-down menu: Used to clear character data being created.

* Cell size text box: Used to select a cell size.

* Magnification text box: Used to select a display magnification.
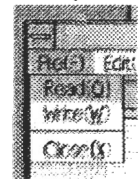
Figure 4-25

• "Define User Char(D)": Opens the "User Character" dialog box. Create a user character, then assign a character code to it.

[Notes on band data copying in terms of user characters]
User character data is not copied when bank data is copied such as to a floppy disk. When user character data needs to be copied, the following files must be copied: File in which a user character created with Edit Character is stored with Define User Char Copy Code-00.Chr, Code-0F.Chr, and Code-19.Chr together with bank data.
The first eight characters of each file name can be used the same as those used under Windows. However, it is recommended to assign a code number to part of a file name as shown above.

[Notes on bank data appending in terms of user characters]
When Bank Append is used, save user character data in the same directory tree as the copied bank. If the directory name has been changed, save the user character file in an arbitrary directory and set it with Define User Char.

③ ' Pattern(P)" pull-down menu (Figure 4-26)
Specify special pattern parameters. Click the target pattern name to open the pattern parameter setup window.

Pattern(P)	Option(Q)
Cross & Dot(D)	
Resolution(S)	
Circle(C)	
Ellipse(E)	
Line(L)	
Charcter(I)	
Graphic Window(G)	
Color Gray Window(W)	
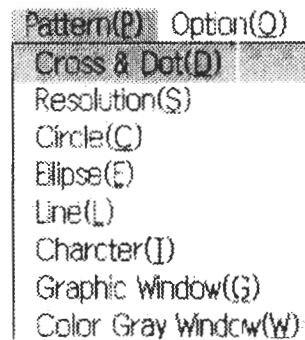
Figure 4-26

• "Cross & Dot(D)":
   Opens the "Cross & Dot" dialog box (Figure 4-27) so that crosshatched or dot pattern parameters can be specified.
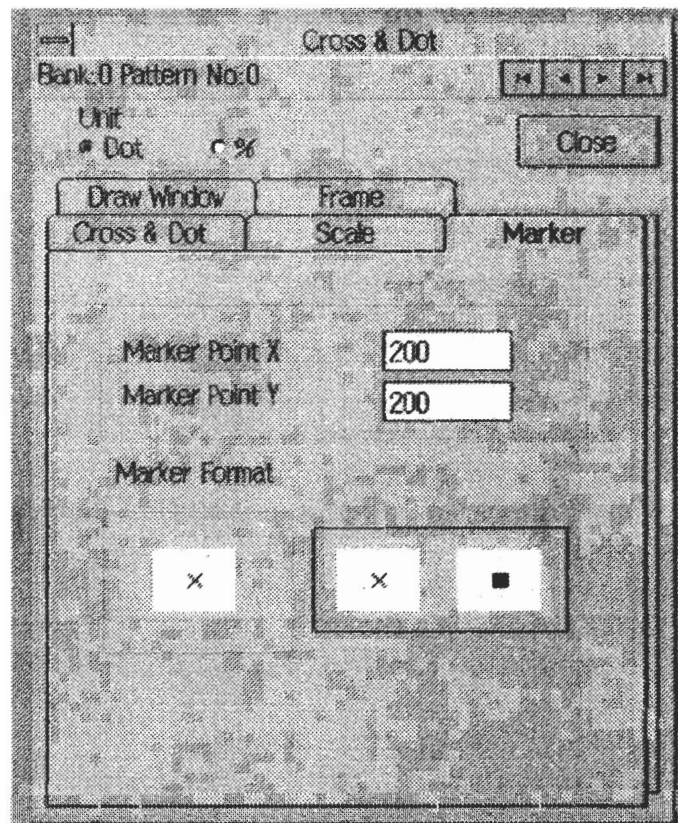
Figure 4-27

* "Unit" select button: Selects the unit used for setting.
   Dot: Makes setting in dots. The origin is the upper left of the display screen.
   When the number of display dots is changed after the pattern is set in dots, the size of GR-W also looks changed.
   %: Specifies a pattern with the upper left of the display screen set to 0% and the lower right set to 100%.
   When the number of display dots is changed after the pattern is set with %, the size of GR-W remains unchanged.

* Arrow button: Used to select the pattern button numbe to be assigned.

* "Marker" card: Used to set a marker (Figure 4-27).
  • "Marker Format" select box:
    Selects one of two marker formats. The selected marker is displayed in the left frame viewed from the front.
  • "Marker Point X"/"Marker Point Y" text box:
    Specifies the marker position. Position the cursor and enter data using the ten-key pad.

* "Scale" card: Specifies a scale in the crosshatched pattern (Figure 4-28).
  • "Scale Format" select box:
    Selects one of two scale formats. The selected scale is displayed in the left frame viewed from the front.
  • "Scale Pitch H"/"Scale Pitch V" text box:
    Specifies the scale memory pitch. Enter data using the ten-key pad.
  • "Scale Width H"/"Scale Width V" text box:
    Specifies the scale memory width. Enter data using the ten-key pad.

* "Close" button:
  Closes the "Cross & Dot(D)" dialog box.

* "Cross & Dot" card: Specifies crosshatch and dot parameters (Figure 4-29).
  <<Cross group>>
  Set the crosshatch parameter data.
  • "Cross H"/"Cross V" text box:
    Specifies the pitch between crosshatching lines. Enter data using the ten-key pad.
  • "Line Width H"/"Line Width V" text box:
    Specifies crosshatching line width. Enter data using the ten-key pad.
    The crosshatching line width of Cross & Dot becomes the same.
  <<Dot group>>
  Set dot and crosshatch & dot parameter data.
  • "Dot H"/"Dot V" text box:
    Specifies dot pitches. Enter data using the ten-key pad.
  • "Dot Width H"/"Dot Width V" text box:
    Specifies dot width. Enter data using the ten-key pad.
  • "Cross & Dot H"/"Cross & Dot V" text box
    Specifies the pitch between crosshatching lines and dots. Enter data using the ten-key pad.

* "Frame" card (Figure 4-30):

Selects GR-W for displaying the frame and diagonal line.

• "Frame" check box:

Selects GR-W (multiple GR-Ws can be selected) for displaying frame lines.

• "Diagonal" check box:

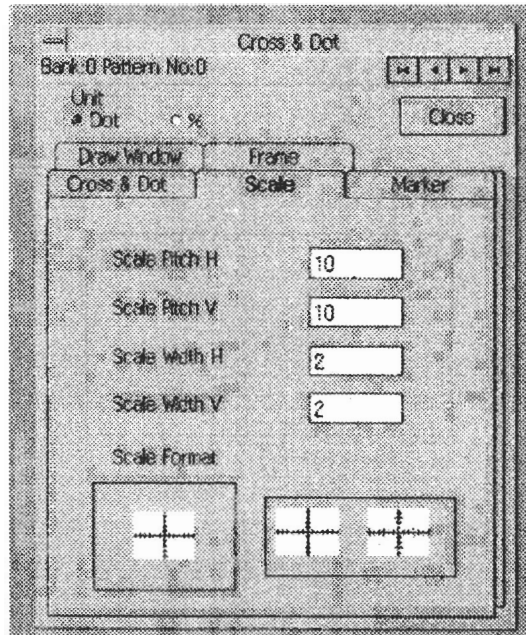Selects GR-W (multiple GR-Ws can be selected) for displaying diagonal lines.

Figure 4-28

Figure 4-29

Figure 4-30

* "Draw Window" card (Figure 4-30):
  Selects GR-W for drawing. More than one draw window can be selected but
  the drawn data becomes the same.

Figure 4-31

• "Resolution(S)":

Displays the "Resolution" dialog box so that the resolution pattern parameters can be set (Figure 4-32).

Figure 4-32

* Arrow button: Used to select the pattern button number to be assigned.
* "Draw Window" select button:

Select GR-W to be drawn.

More than one draw window can be selected but all widows have the same drawn data.
* "Resolution Format" select box:

Four resolution pattern formats can be selected. When the format at the leftmost of the format list is selected, the following parameter data can be set. The other three formats have fixed patterns.
* "Unit" select button:

Selects the unit of input data.
* "Pitch X"/"Pitch Y" text box:

Specifies line width of the "x1 area." Enter data using the ten-key pad.
* "Disp Pitch"/"Mask Pitch" text box:

Specifies the display and mask periods. Data is common to X and Y. Enter data using the ten-key pad.
* "Start" text box:

Selects whether the display start point (X direction: left, Y direction: up) is Disp or Mask. Enter data using the ten-key pad.
* "Close" button:

Closes the "Resolution(S)" dialog box.
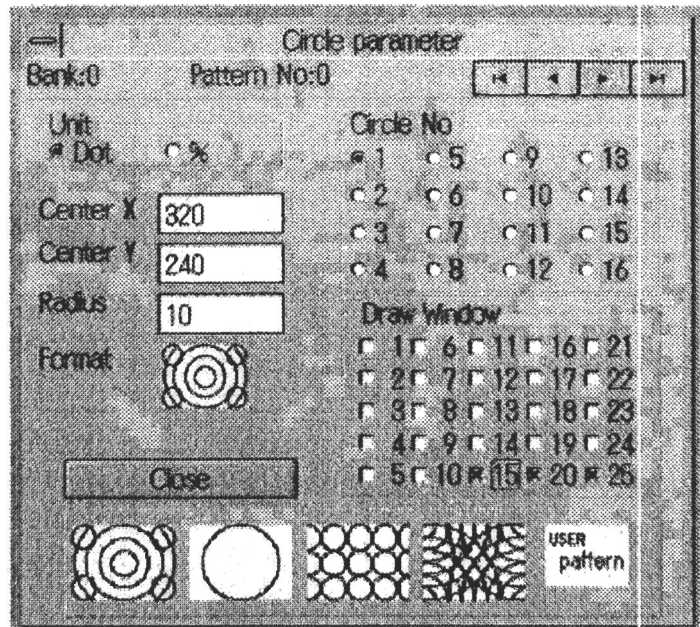
Figure 4-33

• "Circle(C)":

Opens the "Circle parameter" dialog box so that the circle pattern parameters can be set (Figure 4-33).

* Arrow button:

Used to select the pattern button number to be assigned.

* "Draw Window" select button:

Selects GR-W to be drawn. More than one draw window can be selected but all windows have the same drawn data.

* "Format" select box:

Five pattern formats can be selected. When the USER pattern is selected, only the user pattern set by the following parameter data is displayed. When any of the other formats is selected, the user pattern is displayed overlapping the prefixed pattern.

* "Unit" select button:

Selects the unit of input data.

* "Circle No." select box:

Selects the circle pattern to be drawn. Up to 16 circle patterns can be drawn.

* "Center X"/"Center Y" text box:

Specifies the coordinates of the center of a circle. Enter data using the ten-key pad.

* "Radius" text box:

Selects the radius of a circle. Enter data using the ten-key pad.

* "Close" button:

Closes the "Circle(C)" dialog box.

4-22

- "Ellipse(E)":

  Opens the "Ellipse" dialog box so that the ellipse pattern parameters can be set
  (Figure 4-34).

  * Arrow button: Used to select the pattern button number to be assigned.
  * "Draw Window" select button:

    Selects GR-W to be drawn.

    More than one draw window can be selected but all windows have the same
    drawn data.
  * "Unit" select button:

    Selects the unit of input data.
  * "Ellipse No." select box:

    Selects the ellipse pattern to be drawn. Up to 16 ellipse patterns can be drawn.
  * "Center X"/"Center Y" text box:

    Specifies the coordinates of the center of an ellipse. Enter data using the ten-key
    pad.
  * "DX" text box:

    Specifies length from the center of an ellipse to the maximum point in the X
    direction. Enter data using the ten-key pad.
  * "DY" text box:

    Specifies length from the center of an ellipse to the maximum point in the Y
    direction. Enter data using the ten-key pad.
  * "Close" button:

    Closes the "Ellipse(E)" dialog box.
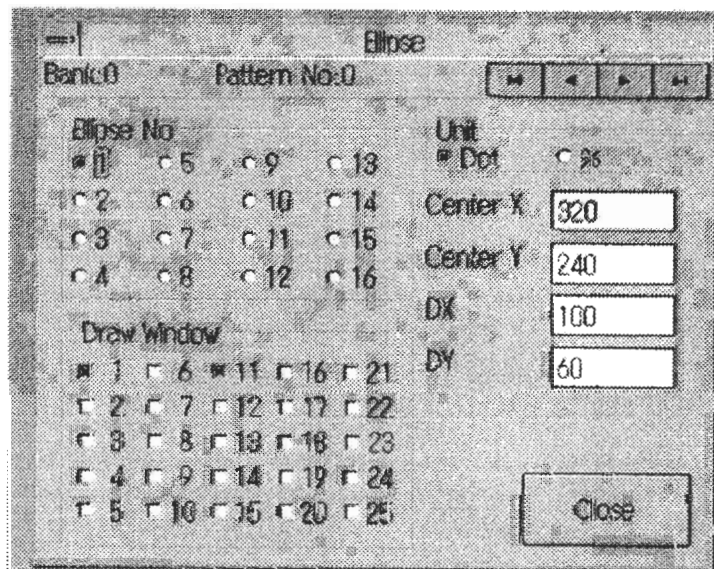
Figure 4-34

- "Line(L)":

   Opens the "Line" dialog box so that the line pattern parameters can be set (Figure 4-35).

   * Arrow button:

      Used to select the pattern button number to be assigned.

   * "Draw Window" select button:

      Selects GR-W to be drawn.

      More than one draw window can be selected but all windows have the same drawn data.

   * "Unit" select button: Selects the unit of input data.

   * "Line No." select box: Selects the line pattern to be drawn. Up to 16 line patterns can be drawn.

   * "Start X"/"Start Y" text box: Specifies the coordinates of the start point of a line.
      Enter data using the ten-key pad.

   * "End X"/"End Y" text box: Specifies the coordinates of the end point of a line.
      Enter data using the ten-key pad.

   * "Close" button:

      Closes the "Line(L)" dialog box.

Figure 4-35

• "Character(T)":

Opens the "Character" dialog box so that the character pattern parameters can be
set (Figure 4-36).

  * Arrow button:

    Used to select the pattern button number to be assigned.

  * "Draw Window" select button:

    Selects GR-W to be drawn.

    Different characters can be displayed in 25 individual GR-Ws.

  * "Character" text box:

    Specifies a JIS code of a character. Enter the code using the ten-key pad. The
    character set here is displayed on part of or the whole of the screen when all
    characters or a character pattern is selected for "Format."

  * "Font Size" text button:

    Selects one of two font sizes, "5x7" or "7x9."

  * "Cell Size H"/"Cell Size V" text box:

    Specifies a cell size. Enter data using the ten-key pad. The maximum size is
    "Cell Size H = 128, Cell Size V = 128."

  * "Format" select box:

    Selects the character display format.

  * "Close" button: Closes the "Character(T)" dialog box.
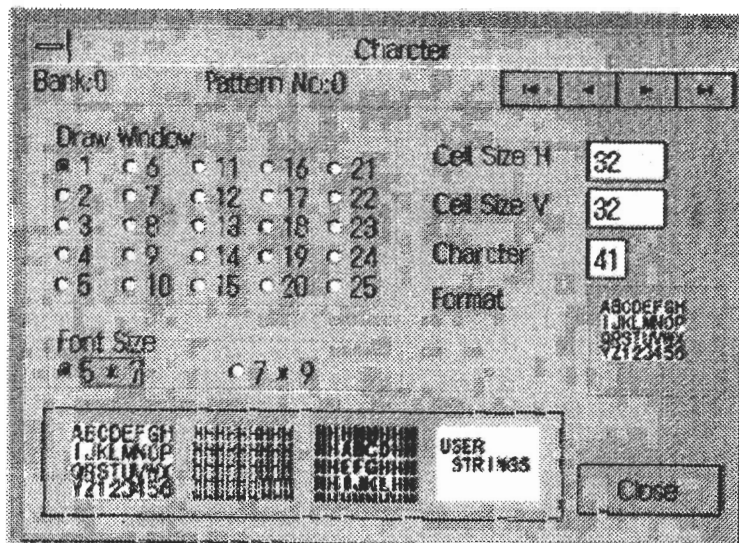
Figure 4-36

• "Graphic Window(G)":

  Opens the "Graphic Window" dialog box so that the graphic window parameters can be specified (Figure 4-37).

  * "Arrow button:

    Used to select the pattern button number to be assigned.

  * "Window No." select button:

    Selects a GR-W number.

  * "Unit" select button:

    Selects the unit in which the size of GR-W is set.

  * "Window Format" select box:

    Selects one of six window formats.

  * "Start X"/"Start Y" text box:

    Specifies the coordinates of the start point of GR-W. Enter data using the ten-key pad.

  * "End X"/"End Y" text box:

    Specifies the coordinates of the end point of GR-W. Enter data using the ten-key pad.

  * "Shadow Width"/"Shadow Height":

    Specifies shadow width in dot units. Set data here when the shadowed-window format is selected.

  * "Close" button:

    Closes the "Graphic Windows(G)" dialog box.
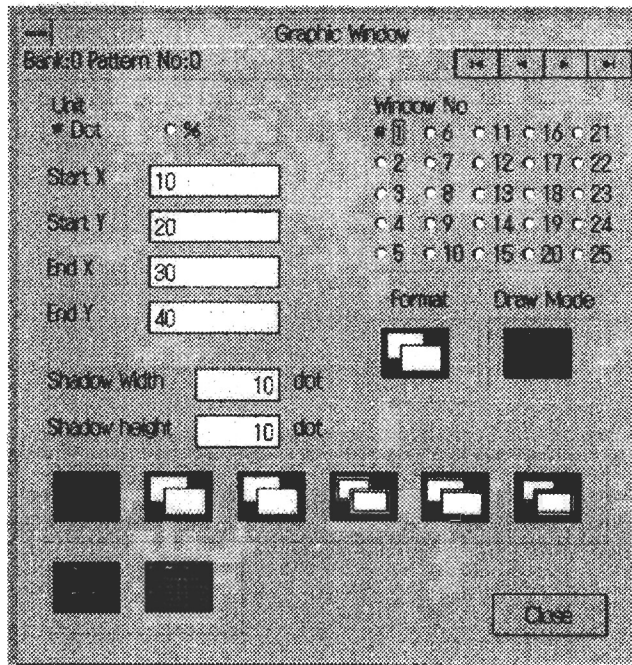
Figure 4-37

• "Color Gray Window(W)":
   Opens the "Color Gray Window" dialog box so that the color gray window
   parameters can be specified (Figure 4-38).
   * Arrow button: Used to select the pattern button number to be assigned.
   * "Window No." select button:
      Selects a color window number.

   <<Color window>> group
   * "Start X"/"Start Y" text box:
      Specifies the coordinates of the color window start point. Enter data using the
      ten-key pad.
   * "End X"/"End Y" text box: Specifies the coordinates of the color window end
      point. Enter data using the ten-key pad.
   * "Color" text box:
      Specifies a color palette number for the color window color. Enter data using the
      ten-key pad.

   <<Color window partition>> group
      Specify the color window color distribution parameters.
   * "Partition X, Partition Y" text box:
      Specifies the number of divisions in the X and Y directions in one color window.
      Note that only one window can be set when the color window is divided in colors.
      Enter data using the ten-key pad.
   * "Start Color" text box:
      Specifies the color palette number corresponding to the division area on the
      upper left of the window. Enter data using the ten-key pad.
   * "Stop Color" text box:
      Specifies the color palette number corresponding to the division area on the
      lower right of the window. Enter data using the ten-key pad.
   * "Step" text box:
      Specifies the number of steps of the color palette number corresponding to the
      division area.
   * "Close" button:
      Closes the "Color Gray Window(W)" dialog box.
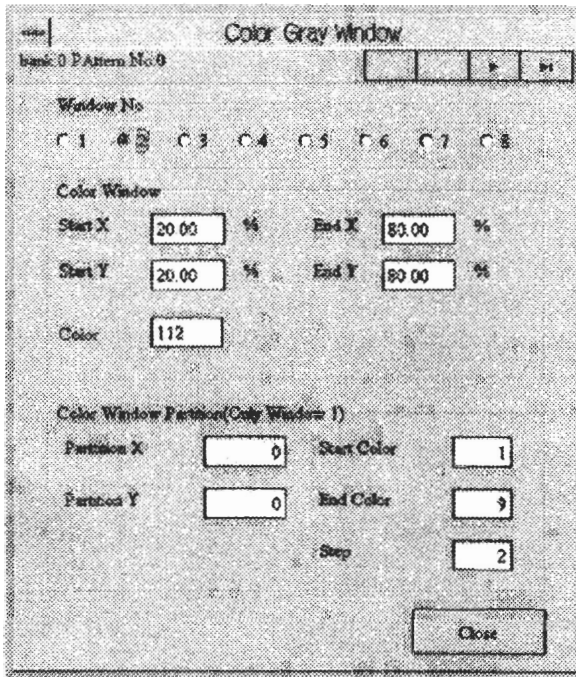
Figure 4-38

④ "Option(O)" pull-down menu (Figure 4-39)
- "Font(T)":

  Opens the "Font" dialog box so that the font used
  for "String(S)" can be selected (Figure 4-40).
  The "Font" dialog box is the same as that of
  Windows.
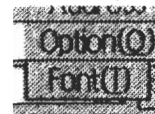
Figure 4-39
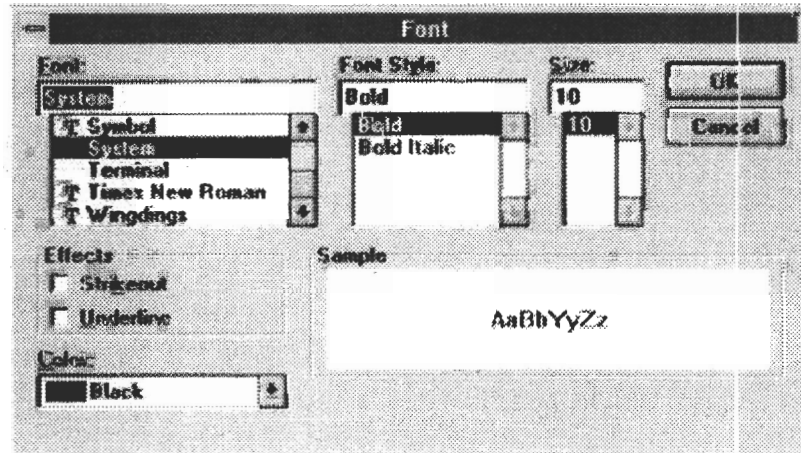
Figure 4-40

4.9.2 Tool Bar

① "BANK:0"/"ADRS:0" display
- "BANK:0": Indicates the number of the bank being edited.
- "ADRS:0": Indicates the number of the address being edited.

② Transfer data select box

This box allows the operator to select data to be transferred to the LT 1610/1611. Click the select button to display a pull-down menu for selection (Figure 4-41). The data selected here is transferred to the LT 1610/1611 when the "SEND TO 1610" button.
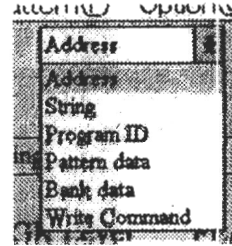
図4-41

- "Address":
  Transfers data for one address. Data set in the "Signal," "Timing," and "Output Setting" card is transferred (excluding the data assigned to a pattern button in 'Def Pattern"). The transferred data is stored in the LT 1610/1611 work buffer so that temporary operation verification can be performed.
- "String":
  Transfers string data edited in "String(S)" of the "Edit(E)" pull-down menu. String data of one bank (file) is transferred.
- "Program ID":
  Transfers program ID data edited in "Program ID(I)" of the "Edit(E)" pull-down menu. Program ID data of one bank (file) is transferred.
- "Pattern Data":
  Transfers various parameter and color palette data set in the "Pattern(P) menu and data assigned to the pattern button in "Def Pattern. This data is transferred as parameter data of the pattern button selected in "Pattern Key" in the "Signal" card.
- "Bank Data":
  Transfers data of one called bank (100 addresses). Transferred data is stored in backup RAM of the LT 1610/1611. User character data is transferred only when "Bank Data" is selected.
- "Write Command":
  Writes LT 1610/1611 data being used in the work area to backup RAM at the specified address and data area. This command updates one-address data (including comment and character data), program ID, pattern number, pattern parameter, strings, and user characters. The transfer address is the one currently selected.

③ "Communication Abort" button
Clicking this button aborts data transfer to the LT 1610/1611.

④ "COPY" and "PASTE" buttons
Use these buttons for editing data of one address. They have the same functions as "Copy(C)" and "Paste(P)" in the "Edit(E)" pull-down menu.

⑤ "Timing Check" button

This button is used to decide the data in the "Timing" card. When this button is clicked, data in the edit buffer is recalculated and stored on the hard disk.

If recalculation results unacceptable, an error message is displayed and data is not transferred to the hard disk.

⑥ "SEND TO 1610" button

Clicking this button transfers data displayed in the transfer data select box in ② to the LT 1610/1611.

⑦ "Bank Select" button

Use this button to select the bank to be edited. Clicking the button opens the "Select Bank" dialog box (Figure 4-42). Use arrow buttons to select a bank.
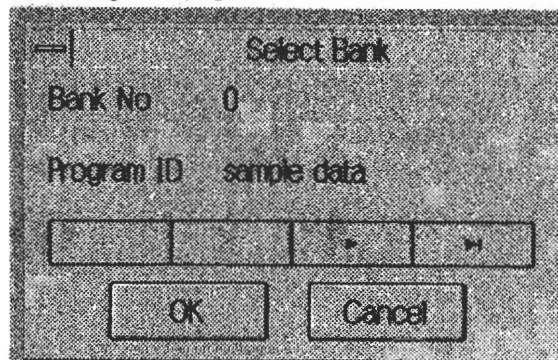
Figure 4-42

⑧ "First Address," "Prior Address," "Next Address," and "Last Address" buttons

Use these buttons to select an address.

⑨ "Set Bookmark" and "Jump Bookmark" buttons

An address may need to be changed temporarily during editing. In this case, click the "Set Bookmark" button. After work with another address is finished, click the "Jump Bookmark" button to go back to the original address.

⑩ "Off Line" button

Click the "Off Line" button to vary communication with the LT 1610/1611 offline. When data is edited in the personal computer without connection with the LT 1610/1611, click this button to shift to the offline mode (the button is displayed white). The "Address Data Setting" window may be closed after the personal computer online with the LT 1610/1611 is turned offline. In this case, the LT 1610/1611 is not released from the RS-232C control mode and does not accept key instructions from the remote controller or LT 1610/1611 main unit.

If the online state is kept without connection with the LT 1610/1611, editing is disabled in about 10 seconds with "Communication Timeout" displayed at the left side of the offline button. If this event occurs, close the "Address Data Setting" window once and open it again.

4.9.3 Status Bar

① Comment display
   • Comment display field
      A comment is displayed. One comment is allowed for one address.

② Program ID display
   • Program ID display field
      A program ID is displayed. One program ID is allowed for one bank (file).

4.9.4 "Output Setting" Card

The "Output Setting" card is used to set the LT 1610/1611 output conditions. Click the "Output Setting" tab to display the card. The output conditions can be set for each address (Figure 4-43).

① "Sync, Clock" group
   Set the polarities of sync and clock outputs, and also specify required signal outputs.
   • "Polarity" check box
      Click the box of the signal with the positive polarity (signal beginning with a rising edge). The analog and digital (LT 1610 only) outputs are set simultaneously.
   • Output" - "Analog:Digital" check box
      Click the box of the signal to be output. Analog and digital (LT 1610 only) signals can separately be set, but the HD and VD outputs are digital (LT 1610) only. HD and VD are not provided for analog output (the LT 1611 does not have HD and VD outputs).
   • "HS Output Sel" select button:
      Sets the HS terminal output signal. Select the button of the required signal.

② "Analog Level" group
   Set analog signals.
   • "Video" text box:
      Sets the video level of the analog signal. Move the mouse cursor to the text box and click, then enter a voltage value (0.3 to 1.2) using the ten-key pad.
   • "Setup *.***V" and "Sync *.***V" display:
      Displays the setup voltage and sync signal amplitude value corresponding to the video level. The setup voltage is indicated as 0 V when the "SETUP" check box is not marked. The sync amplitude during sync-on-green operation is indicated.
   • "SYNC(G)" check box
      Click the box for sync-on-green operation.
   • "SETUP" check box
      Click the box to add setup.
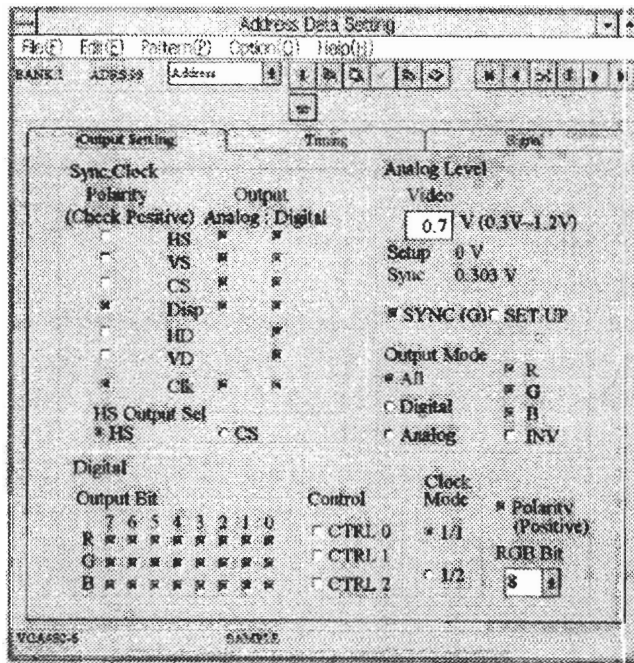
Figure 4-43

③ "Output Mode" group

Select output signals.

- "All," "Digital," and "Analog" select buttons

  Select analog or digital output. If All is selected, both analog and digital signals are output simultaneously (LT 1610). For the LT 1611, select All or Analog.

- "R," "G,", and "B" check boxes

  Click the boxes of the RGB signals to be output. The signal not marked is not output. This setting is common to both analog and digital signals (LT 1610).

- "INV" check box

  Click this box to invert the RGB signals. This setting is common to RGB, analog, and digital signals (digital for LT 1610 only).

④ "Digital" group

Set data related to LT 1610 digital output. This group has nothing to do with the LT 1611. The LT 1611 ignores the setting if made.

⑤ "Output Bit" check box

Click the box of the bit to be output.

⑥ "Control" check box

This is a control bit that the user can use as needed. Click the box of the signal to be output.

⑦ "Clock Mode" select button

Select one of two clock modes.

⑧ "Polarity" check box

Click the box to output signals with the positive polarity.

⑨ "RGB Bit" text box:

Selects the number of RGB output bits. Click the text box or menu button and select one from 1 to 8 bits.

4.9.5   "Timing" Card

Use the "Timing" card to set the LT 1610/1611 HV timing parameters. Click the "Timing" tab to display the card. The parameters can be set for each address (Figure 4-44).

① Parameter input

To specify each parameter value, move the cursor to the corresponding text box and enter a value using the ten-key pad. After a parameter value is entered, press the RETURN key. The cursor moves to the next text box.

If the parameter value entered exceeds the specified range, an alarm message is displayed under the tool bar.

After all parameter values are entered, click the "Timing Check" button. Data is calculated and transferred to the hard disk.

If calculation results unacceptable, an error message is displayed and data is not transferred to the hard disk.

Some parameters are automatically determined and changed by other parameter values (ex. H-Freq).

② "H Timing" and "V Timing" (blue letters) select buttons

Use these buttons to select the unit in which the H or V timing is set.

③ "NON-INT," "INTERLACE," and "INT-SHRINK" select buttons

Use these buttons to select the signal scan mode.

④ "Norm," and "Spec" select buttons

When "INTERLACE" or "INT-SHRINK" is selected in ③, use these buttons to select the scan mode of the half scan display. When "Spec" is selected, half scan display is not performed.

4.9.6 "Signal" Card

Use the "Signal" card to set the LT 1610/1611 output signal parameters. Click the "Signal" tab to display the card. The parameters can be set for each address (Figure 4-45).

① "GR Level" and "FLAT Level"

Set the graphic plane and flat field window levels.

- "%" and "Step" select buttons

  Use these buttons to select the unit in which parameters are set.

- "Luminance" text box

  To set the display color to gray (equal RGB levels), move the cursor to this text box and enter a value using the ten-key pad. The value entered in this box is reflected in each of the R, G, and B text boxes. If the entered value exceeds 255 steps or 100%, an alarm message is displayed.

- "R," "G," and "B" text boxes

  Use these boxes to set R, G, and B individually. The value in each box takes precedence over the value in the "Luminance" text box. If the entered value exceeds 255 steps or 100%, an alarm message is displayed.

② "Clock" group

Set the clock output parameters.

- "Disp/All" select buttons

  Select the clock output period: continuous (All) or only the video signal period.

- "DotDuty" select buttons

  Select clock pulse width. When "50%" is selected, clock pulse width becomes a half of one-pixel width of the signal.

- "Digital" - "Clock Delay" text box (effective for LT 1610 only)

  The digital output clock timing can be delayed against the signal in units of 2 ns up to 30 ns.

Figure 4-44

Figure 4-45

③ "Pattern Key" select buttons

Select the button numbers of the patterns to be output when "Key" is selected in "Output Pattern."

④ "Output Pattern" select buttons

Select the output pattern select mode. Click "Key" to select a pattern from those assigned to the pattern buttons. Click "Pattern List" to select a pattern code from the list.

⑤ Pattern code text box

When "Pattern List" is selected in "Output Pattern," use this box to select a pattern code. Click the pull-down button and select a pattern code from the code list (Figure 4-46).
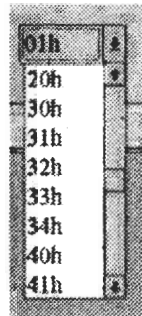
⑥ "Def Pattern" button

Select patterns to be assigned to keys. This assignment s common to one bank. Data is transferred to the LT 1610/1611 in BANK DATA transfer mode. Click the "Def Pattern" button to display the "Def Pattern" dialog box (Figure 4-47).
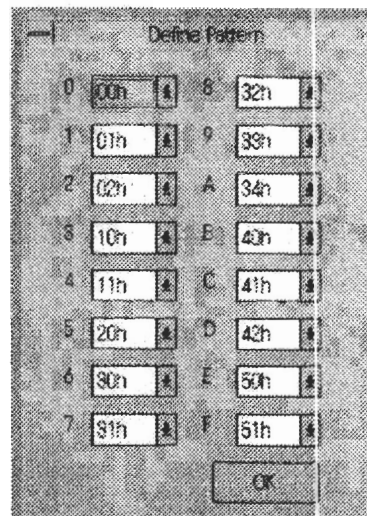
Figure 4-46

Figure 4-47

⑦ "All Character" group

Set the character parameters for all character patterns.
• "Code" text box: Enter the code in ASCII using the ten-key pad.
• "Cell H"/"Cell V" text box: Enter the cell size using the ten-key pad.
• "Font": Select the font size of JIS code 20h up.

4.10   **Operating unInst_1**

Use unInst_1 to delete attached software from the hard disk when it is no longer required. Click the icon to delete all execution files, database engine, and icons of the software supplied with the LT 1610/1611, except for address data and character data.

5.   BEFORE POWER-ON

Before turning on the LT 1610/1611 power, read the following and do preparation for operation.

5.1   Mounting User ROM

(1)   The LT 1610/1611 operates according to program data stored in user ROM on the panel or internal backup RAM. To run it according to user ROM, mount user ROM containing program data.
[Mounting ROM]
Open the cover of the user ROM section. While raising the lever of the ROM socket, place the user ROM package in the socket. Check that the ROM package is put in position, then lower the lever to flat.

⚠ CAUTION   Do not place the ROM package in an opposite direction.

(2)   The following types of user ROM can be used for the LT 1610/1611:
  • Flash memory: Hitachi's HN28F101P
  • E-PROM: Each vendor's 27512
  * The user ROM supplied with the product contains sample program data combining industrial standard video timing data listed in Table 9-1 and internal patterns.
  * The user ROM (27512) of model 1605 can be used for the LT 1610/1611. However, parameters for some video signals may be changed or some video signals may not be displayed. Note that the LT 1610/1611 does no allow E-PROM to be written.

5.2   Setting the Digital Signal Output Level (LT 1610 only)

The LT 1610 digital output (DIGITAL OUT1, DIGITAL OUT2) level and analog output level of the sync signals (HS, VS, CS, DISP) can be switched between 5 and 3.3 V using the slide switch on the signal output block. Select the proper one according to the specifications of the display to be connected.

⚠ CAUTION   Be careful not to make a wrong setting which results in overvoltage. It damages the display.

5.3   Setting the Panel DIP Switches

The panel DIP switch functions are described below. The LT 1610/1611 reads the panel DIP switch settings when power is turned on. If the setting is changed, therefore, turn power off and turn it on again. The setting of the switch with a number followed by the @ mark is valid when the LT 1610/1611 is controlled locally. It is ignored when the LT 1610/1611 is controlled through the remote connector or RS-232C connector. The LT 1610/1611 follows the settings of the external controller. The default setting made before shipment is underlined.

[DIP SW1]

• SW1-1 @   Switches between user ROM and backup RAM.

Select either user ROM or internal backup RAM contain ng program data under which the LT 1610/1611 runs.

    <u>OFF</u>: User ROM   ON: Backup RAM

• SW1-2 @   Specifies whether to display comments.

Specify whether to display comments on the display. A comment is displayed in the following format: DOT CLOCK, H-FREQ, V-FREQ, number of display dots (H X V), address number, eight-character comment.

    OFF: Not display   <u>ON</u>: Display

• SW1-3   Selects the character parameter assignment mode.

Use this switch to select one of two character display modes used when the fixed pattern (number 10h, 11h, or 20h) of a character assigned to a pattern button or a character flashing pattern (number C5h) is displayed. In one mode, the character assigned to the pattern button is displayed (pattern parameter). In the other mode, a character assigned to each address is displayed (address parameter). When the pattern parameter is selected, data in graphic window 1 is used as the character parameter.

    OFF: Pattern parameter   <u>ON</u>: Address parameter

• SW1-4 @   Specifies whether to enter the quick address mode.

Specify whether to enter the quick address mode.

* For more information about the quick address mode, refer to Section 6.2.10, "Setting the High-speed Pattern Switching Mode."

    <u>OFF</u>: Don't enter   ON: Enter

• SW1-5   Specifies whether to sound a beep.

A beep may sound during key operation or if an error occurs or when some operation is completed.

    OFF: No beep   <u>ON</u>: Beep

• SW1-6   Sets the user ROM type.

Select the type of user ROM used.

    <u>OFF</u>: Flash memory   ON: E-PROM

• SW1-7   Reserved

• SW1-8 @   Specifies whether to use the auto-display function.

The auto-display function automatically advances addresses or pattern key numbers at regular time intervals while displaying them one after another according to the progress.

    <u>OFF</u>: Don't use   ON: Use

[DIP SW2]

• SW2-1, 2   Sets the RS-232C communication speed.
  Match the communication speed of the personal computer.

Table 5-1

	9600 bps	19200 bps	19200 bps	38400 bps
SW2-1	OFF	ON	OFF	<u>ON</u>
SW2-2	OFF	OFF	ON	<u>ON</u>

• SW2-3   Specifies whether to make CS interoperate with HS and VS.
  Specify whether to make ON/OFF of the HS and VS outputs interoperate with the CS output.

    <u>OFF</u>: Don't interoperate   ON: Interoperate

• SW2-4   Specifies whether to validate the default setting.
  Specify whether to set the LT 1610/1611 to the default state.

Set this switch to ON if backup RAM data is lost and the LT 1610/1611 operates abnormally. Set it to OFF for normal operation.

    <u>OFF</u>: Not default   ON: Default

* When power is turned on with this switch set to ON, LT 1610/1611 internal memory is initialized. The details of initialization are described below.
  Setting the LT 1610/1611 to the default state is complete when the BUSY LED goes off. After this, be sure to set the switch to OFF.
  ① Delete program data stored in backup RAM, then write the contents at address number 18 (VGA480-6) of the sample program data to all addresses.
  ② Set the program address use range to "BEGIN=0 to END=99."
  ③ Set the window flashing pattern (C4) and character flashing pattern (C5) to the no-flashing mode.
  Set the user character code of the character flashing pattern (C5) to 00.
  ④ Set the window scroll pattern (C2) and character scroll pattern (C3) to no-scroll mode.
  ⑤ Set auto-display to the pattern mode with "time interval = 1 second."

[DIP switch settings at shipment]

DIP SW1

8		···· Auto-display
7		···· Reserved
6		···· User ROM type
5		···· Beep
4	OFF	···· Quick address
3		···· Character parameter assignment mode
2		···· Comment display
1		···· ROM/RAM

SW1-1 ········

DIP SW2

4		···· Default
3		···· CS and HS/VX interoperation
2	OFF	···· RS-232C communication speed
1		

SW2-1 ········
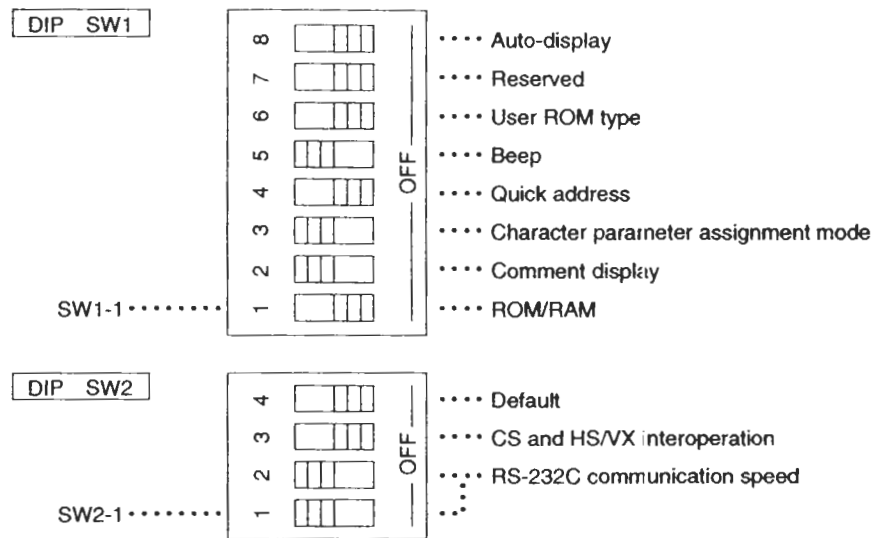
Figure 5-1

6.   OPERATION FOR PATTERN OUTPUT

Three methods are available for controlling the LT 1610/1611 for output of video signals. One is to control the LT 1610/1611 locally. One is to control it using attached LT 1610 control software running on a personal computer. One is to control it remotely using the optional LT 1610-01 or 1603-01 controller.

* The LT 1610/1611 reads the panel DIP switch settings when power is turned on. If the setting is changed, therefore, turn power off and turn it on again. The description of this operation is omitted in the following sections.

6.1   Local Control

●Connections

Connect the LT 1610/1611 to the display as shown in Figure 6-1.
* For connection to an analog input display, connect required signals out of the analog output (BNC) according to the input specifications.
* For connection to a digital input display, prepare the cable between the digital output (57LE-series 50-pin) and display according to the input specifications and connect them.
* While the LT 1610/1611 is connected to the remote controller or while it is controlled through the RS-232C interface ($\boxed{F}$ is displayed on the MODE display on the unit), local key operation on the unit is not accepted.
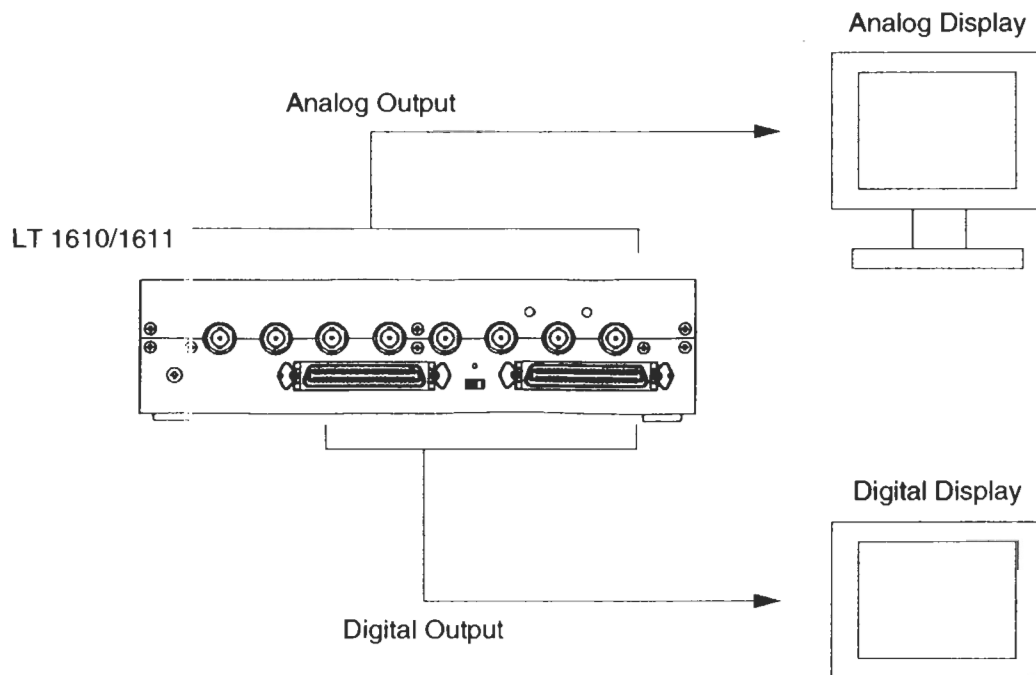
Figure 6-1 Connection with Display

6.1.1   Selecting Program Memory (ROM or RAM)

The user must select which program data to use to operate the LT 1610/1611, one stored in user ROM or one stored in internal backup RAM.

●Setting to ROM mode
  (1) Attach the user ROM package containing program data into the ROM socket on the panel.
  (2) Set the panel DIP SW1-1 to OFF (change the DIP switch with power off).
      • The ROM/RAM LED goes off.
      • The address immediately before power-off is displayed.
      • If ROM is not installed, error code "E 1" is displayed.

●Setting to RAM mode
  (1) Check that program data is stored in backup RAM. If not, store program data in it using the remote controller (LT1610-01) or personal computer.
  (2) Set the panel DIP SW1-1 to ON (change the DIP switch with power off).
      • The ROM/RAM LED lights.
      • The address immediately before power-off is displayed.
      • If program data is not stored in backup RAM, error code "E 2" is displayed.
[Data retaining period of backup RAM]
Backup RAM data is retained for at least 14 days from when the battery is full, provided that ambient temperature is 40°C or less and relative humidity is 80% or less.

6.1.2   Selecting Program Addresses

One set of pattern, resolution, timing, and output on/off data is stored at one program address. Up to 100 addresses "00" to "99" can be used each in ROM and RAM modes.
●To increment the current address by 1
  (1) Press the INC key.
      • The current address is incremented by 1 and the program is executed.
      • Pressing the INC key at address "END value" returns to address "BEGIN value."
  (2) Pressing down the INC key for one second or more activates the repeat function and increments the address continuously. The program is executed only once at the address determined when the key is released.

● To decrement the current address by 1
    (1) Press the DEC key.
        • The current address is decremented by 1 and the program is executed.
        • Pressing the DEC key at address "BEGIN value" returns to address "END value."
    (2) Pressing down the DEC key for one second or more activates the repeat function and decrements the address continuously. The program is executed only once at the address determined when the key is released.

● To set the address to "BEGIN value"
    (1) Press the BEGIN key.
        • The address is set to the "BEGIN value," and the program is executed.
        * "BEGIN" and "END" are set to define the program address use range. They are set from the remote controller (LT 1610-01) or personal computer. Note that turning power on with the panel DIP SW2-4 set to ON initializes the use range to 00 (BEGIN) to 99 (END) (continuous between BEGIN and END).

6.1.3　Specifying Whether to Display Comments

A comment is the information of a pattern output to the display. It consists of the following: DOT CLOCK, H-FREQ, V-FREQ, the number of display dots (H x V), address number, and eight-character comment.

● To display comments
    (1) Set the panel DIP SW1-2 to ON (change the DIP switch with power off).
        • Comments are displayed.

● To not display comments
    (1) Set the panel DIP SW1-2 to OFF (change the DIP switch with power off).
        • No comments are displayed.

<Example>

		Display
DOT CLOCK	107.580 MHz	
H FREQ	63.694 KHz	
V FREQ	60.032 Hz	
H=1000	V=1000.0	
ADRS 60	TEST PAT	

|_____| COMMENT8 character
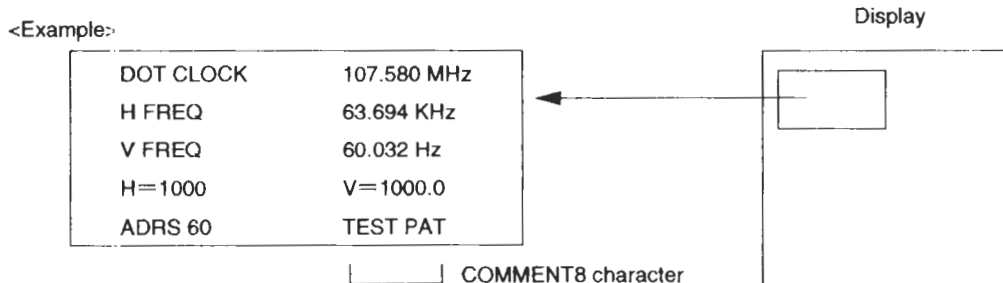
Figure 6-2 Comment representation

   * The eight-character comment can be edited as desired for each address on the personal computer. The other data items are those set for the video timing signals output by the LT 1610/1611.

6.1.4   Auto-Display

The auto-display function automatically advances the address or pattern button number at regular time intervals according to the data stored in the user ROM or backup RAM while changing and displaying the outputs.
- To execute auto-display
  (1) Set the panel DIP SW1-8 to ON (change the DIP switch with power off).
     - The auto-display function is executed.

- To cancel auto-display
  (1) Set the panel DIP SW1-8 to OFF (change the DIP switch with power off).

* Set the auto-display mode (address mode/pattern mode) and time interval from the personal computer. The time interval can be set in 0.1 second steps from 0 to 6553.5 seconds.

6.1.5   Quick Address Mode

In quick address mode, the pattern is switched at high speeds when the address is changed.
- To validate quick address mode
  (1) Set the panel DIP SW1-4 to ON (change the DIP switch with power off).
     - The QUICK LED lights.
     - Patterns are drawn in work memory sequentially from address "BEGIN" according to program data.
     - Key operation is disabled till drawing is finished.
     - When drawing is finished, the address number registered last in the range from "BEGIN" to "END" is displayed on the seven-segment display.
  (2) Select an address using the INC, DEC, or BEGIN key.
     - The drawing time is omitted or shortened so that patterns are switched at high speeds.
     * Some patterns may not be switched at high speeds. Natural-color patterns cannot be displayed in this mode. Refer to Section 6.2.7, "Setting the High-Speed Pattern Switching Mode," for more information about high-speed pattern switching.

- To invalidate quick address mode
  (1) Set the panel DIP SW1-4 to OFF (change the DIP switch with power off).
     - The QUICK LED goes off.

6.2 Control from Personal Computer Remote Control Screen

●Connections

Connect the LT 1610/1611 as shown in Figure 6-3.

* While the LT 1610/1611 is controlled from the personal computer or external controller through the RS-232C interface, instructions from a remote controller or key operations on the LT 1610/1611 are not accepted.
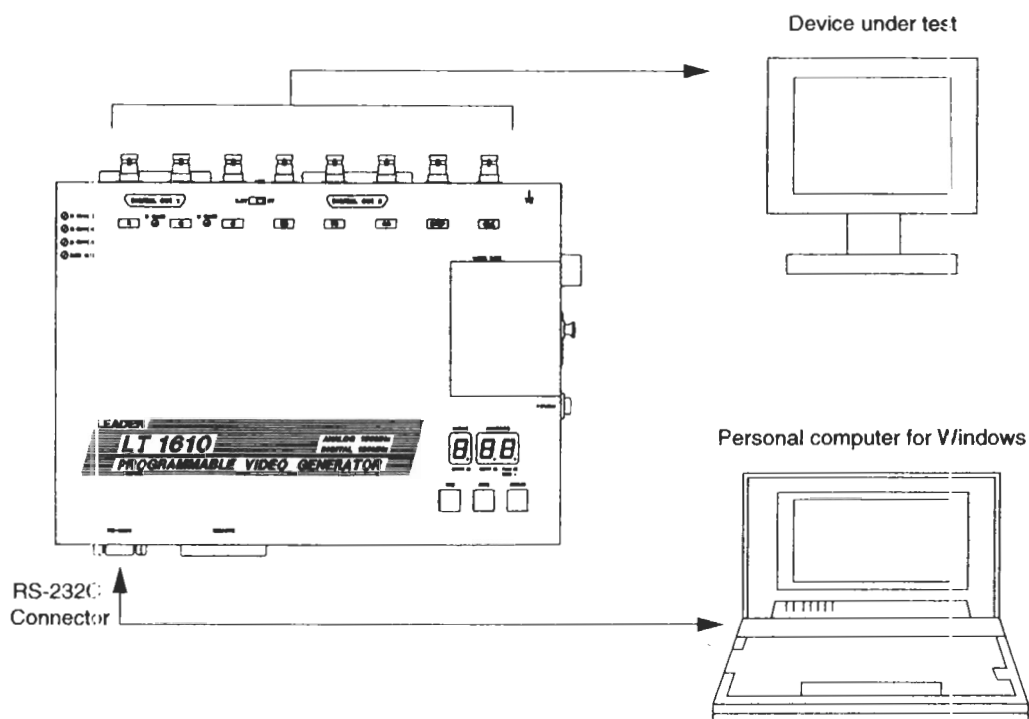
Figure 6-3

[RS-232C communication mode]

• Refer to Section 12.3, "RS-232C Connector," for details of the RS-232C connector and communication mode.

* The specifications of the RS-232C connector on the personal computer vary depending on the vendor and model. Select the RS-232C connector cable conforming to the specifications of the personal computer used.

6.2.1 Displaying the Remote Control Screen

The "1610 REMOTE CONTROLLER" window is used for remote control from the personal computer.

| Operation |

① Start the Remote Controller program.

② The "1610 REMOTE CONTROLLER" window is displayed.

③ Click "File(F)" on the menu bar, then select "Comm Port(C)" from the pull-down menu.

④ The "Comm Setting" dialog box is displayed. Select the communication port and speed.

* Select the appropriate communication port installed on the personal computer used.

* Match the communication speed with the value set with the panel DIP switch (baud rate) of the LT 1610/1611.

This completes the preparation for remote control.

* If a "Time Out !!" alarm is displayed such as because the cable between the LT 1610/1611 and RS-232C port is disconnected, remove the alarm cause and restart the Remote Controller program.

* When the cursor function is used, the Cursor Move program must also be started.

6.2.2 Description of Remote Control Screen
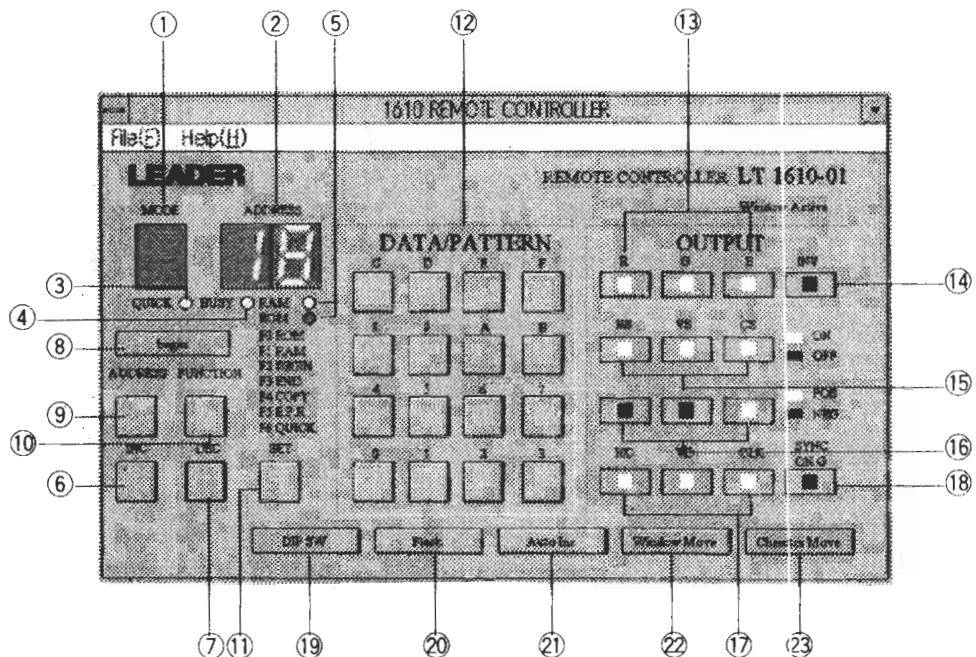
Figure 6-4

① MODE display

The LT 1610/1611 operation mode is displayed.

② ADDRESS display

The program address number is displayed. In FUNCTION mode, the operation mode is displayed as well.

③ QUICK LED

The QUICK LED lights while the LT 1610/1611 runs in high-speed pattern switching mode.

④ BUSY LED

The BUSY LED lights while the LT 1610/1611 CPU is processing a program.

⑤ ROM/RAM LED

The ROM/RAM LED indicates which program data, in user ROM or in internal backup RAM, is used to output signals. The LED lights when internal backup RAM is used.

⑥ INC button

Clicking the INC button increments the address by 1 and executes the program.

⑦ DEC button

Clicking the DEC button decrements the address by 1 and executes the program.

⑧ BEGIN button

Clicking the BEGIN button returns to the address set as BEGIN and executes the program.

⑨ ADDRESS button

Use the ADDRESS button to set an address directly.

⑩ FUNCTION button

Use the FUNCTION button to enter the function mode (F0: ROM to F6: QUICK).

⑪ SET button

Use the SET button to decide input data.

⑫ DATA/PATTERN buttons

Use the DATA/PATTERN buttons to enter numerical data or select an output pattern.

⑬ R, G, and B buttons

Use these buttons to turn on or off the R (red), G (green), and B (blue) video signal outputs individually. Each LED lights when the corresponding signal output is on.

⑭ INV button

Click the INV button to invert the light and dark arrangement of monochrome or gray scale or color bar color arrangement. The LED lights in invert mode.

⑮ HS, VS, and CS ON/OFF buttons

Use these buttons to turn on or off the HS, VS, or CS sync signal output. Each LED lights when the corresponding signal output is on.

⑯ HS, VS, and CS POSI/NEGA buttons

Use these buttons to change the polarity of the HS, VS, or CS sync signal output. Each LED lights when the corresponding signal output is POSITIVE (positive polarity).

⑰ DH, VD, and CLK buttons

Use these buttons to turn on or off the DH, VD, or CLK signal output. Each LED lights when the corresponding signal output is on. The LT 1611 does not output the HD and VD signals.

⑱ SYNC ON G button

Use this button to specify whether to add a composite sync signal to analog G video signal output. When the LED is on, a composite video signal with a composite sync signal added is output. (The polarity of the sync signal is negative.)

⑲ DIP SW button

Some of the DIP switch numbers described in Section 5.3, "Setting the Panel DIP Switches," are followed by the @ mark. Use the DIP SW button to change their settings using the DIP switches on Windows (Figure 4-12).

⑳ Flash button

Use the Flash button to set the flashing speed of the window flashing pattern (pattern No. C4h) or character flashing pattern (pattern No. C5h).

㉑ Auto Inc button

Use the Auto Inc button to set auto-display parameters.

㉒ Window Move button

Use the Window Move button to set the window scroll pattern (pattern No. C2h) parameters.

㉓ Character Move button

Use the Character Move button to set the character scroll pattern (pattern No. C3h) parameters.

6.2.3　Outline of Functions

The following functions can be performed from the remote control screen of the personal computer:
- Selecting program memory (ROM or RAM)
- Setting the program address use range
- Selecting program addresses
- Selecting output patterns
- Direct control of output signals
- Copying program data
- Setting high-speed pattern switching mode
- Setting panel DIP switches by software
- Setting flashing speeds
- Setting auto-display parameters
- Setting scroll pattern parameters

* To stop function setting and use another function mode, click the FUNCTION button and select the target function mode.
* To stop function setting and return to the address display mode, click the ADDRESS button and then click the SET button.

6.2.4　Selecting Program Memory (ROM or RAM)

Specify which program data to use, the one in user ROM or the one in backup RAM.
● To use program data in ROM (ROM mode)

(Operation)　　　　　　　　　　　(Display)

① Click the FUNCTION button.　　① [F | |]

② Click the 0 button.　　　　　② [F | | □]

　　　　　　　　　　　　　　　　The ROM mode is
　　　　　　　　　　　　　　　　validated and an
③ Click the SET button.　　　　③ [| ∃ | ⊏]　address is displayed.
　　　　　　　　　　　　　　　　The ROM/RAM LED
　　　　　　　　　　　　　　　　goes off.
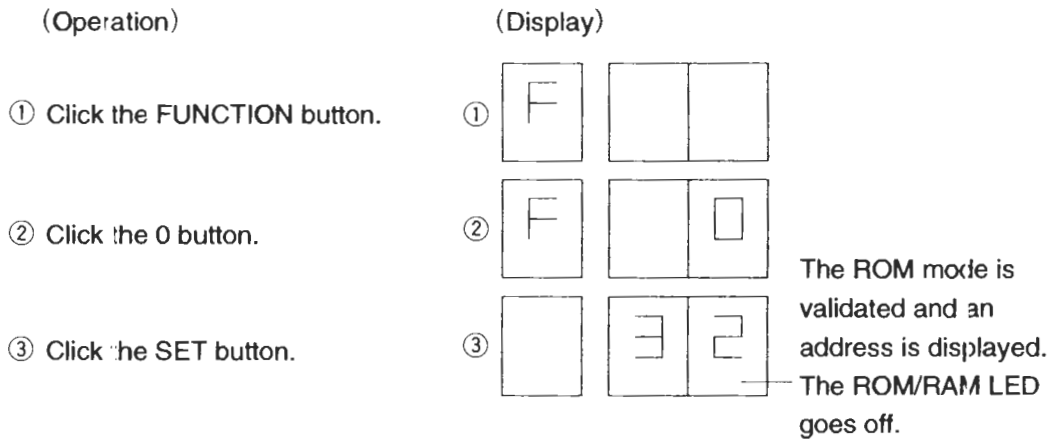
●To use program data in RAM (RAM mode)

(Operation)   (Display)

① Click the FUNCTION button.   ① | F | | |

② Click the 1 button.   ② | F | | 1 |

③ Click the SET button.   ③ | | 3 | 2● |

The RAM mode is validated and an address is displayed. The ROM/RAM LED lights.

6.2.5   Setting the Program Address Use Range

Set the range of program addresses that can be set with the INC or DEC button.
●To set the program address BEGIN value
  • The BEGIN value can be set in the range from 0 to 99.

(Operation)   (Display)

                                        | | 3 | 5 | The current address is displayed.

① Click the FUNCTION button.   ① | F | | |

② Click the 0 button.   ② | b | 3 | 2● | The current BEGIN value is displayed.

③ Enter the BEGIN value using   ③ | b | | 5● | The entered value is displayed.
   the 0 to 9 data buttons.

④ Click the SET button.   ④ | | 3 | 5● | The BEGIN value is set and the current address is displayed.

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●To set the program address END value
  • The END value can be set in the range from the BEGIN value to 99.

(Operation)   (Display)

		The current address is displayed.
① Click the FUNCTION button.	①	The current END value is displayed.
② Click the 3 button.	②	The entered value is displayed.
③ Enter the END value using the 0 to 9 data buttons.	③	The END value s set and the current address is displayed
④ Click the SET button.	④	

6.2.6   Selecting Program Addresses

Specify the address of the program to be executed.

●To increment the current address by 1

(Operation)   (Display)

		The current address is displayed.
① Click the INC button.	①	The address is incremented by 1 and the program is executed.

●To decrement the current address by 1

(Operation)   (Display)

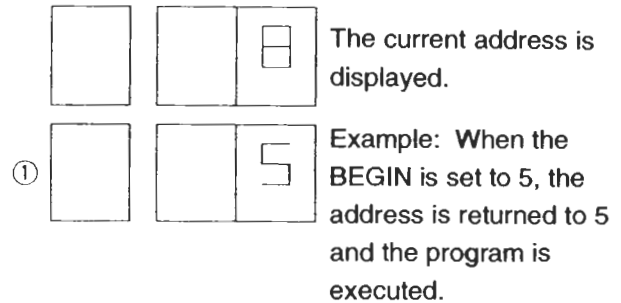|		
		The current address is displayed.
① Click the DEC button.	①	The address is decremented by 1 and the program is executed.

●To return the address to the BEGIN value

(Operation)   (Display)

The current address is displayed.

① Click the BEGIN button.   ① Example: When the BEGIN is set to 5, the address is returned to 5 and the program is executed.

●To enter an execution address directly

- If operation ② is omitted, the current address is not changed and restored on the display.
- Even an address outside of the BEGIN and END range can be executed. In this case, the address returns to the BEGIN address when the INC or DEC button is clicked.

(Operation)   (Display)

① Click the ADDRESS button.   ①

② Enter the address using the 0 to 9 data button.   ②   The entered value is displayed.

③ Click the SET button.   ③   The program at the new address is executed.
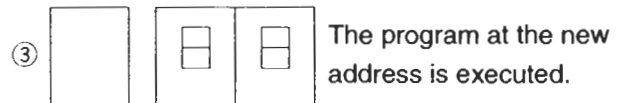
6.2.7   Selecting Output Patterns

- The LT 1610/1611 allows a pattern to be selected in two ways, i.e., by changing the address or pressing the pattern button. When an address is changed, the pattern corresponding to the number defined for the address is output. When the pattern button is then pressed, the pattern corresponding to the number assigned to the pattern button is output.
- Natural-color patterns are not displayed in high-speed pattern switching mode.

●To select a pattern button

(Operation)   (Display)

The current address is displayed.

The current address is displayed.

① Click the target pattern button (0 to F).   ①   The pattern assigned to the pattern button is output.

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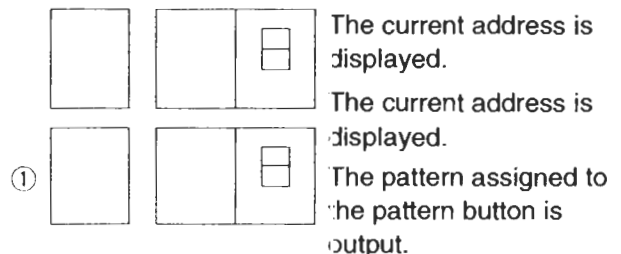
● To select the pattern assigned to the address
  • After the output pattern is changed with the PATTERN button, the pattern assigned to the address can be output again.
    In quick pattern mode, the pattern stored at the address is not changed in high-speed mode.

(Operation)   (Display)

The current address is displayed.

The current address is displayed.

① Click the SET button.   ①   The pattern stored at the address is output.

6.2.8   Direct Control of Output Signal

The output conditions can be changed temporarily as shown below by using the OUTPUT buttons.

<Description of OUTPUT button functions>
● |R|, |G|, and |B| buttons
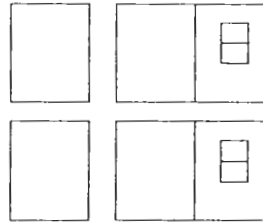 • Use these buttons to turn on or off the R, G, and B video signal outputs individually.
    However, depending on the setting in program data, the R, G, and B buttons are invalid for some the following signals and these signals are not output:
  ① Output system suppressed in "Output Mode setting"
  ② Analog output with video level set to 0.000 V in "Video Level setting"
  ③ Output of low-order bit outside of digital output specification when the output bit s not set to 8 in "RGB Output Bit setting" (When the output bit is set to 6, the ow-order two bits are invalid.)
  ④ Digital bit output set to OFF in "RGB output bit ON/OFF setting"
  • Each signal output is on when the LED lights.

● |INV| button
  • Click the INV button to invert the light and dark arrangement of monochrome or gray scale or color bar color arrangement.
  • The LED lights in invert mode.

● |HS|, |VS|, and |CS| ON/OFF buttons
  • Use these buttons to turn on or off the HS, VS, or CS sync signal output.
    However, the system set to OFF in "analog and digital output HS, VS, and CS ON/OFF setting" in program data is not output even when the button is set to ON.
  • When the panel DIP SW2-3 (CS and HS/VX interoperation) is set to ON (interoperate), CS changes as HS or VS turns on or off.
  • The LT 1610 allows the HS, VS, and CS to be set to on or off separately for analog and digital outputs. When the address is changed, these signals are output as set in the program. The LED indicates the analog output status. After the button is clicked, the ON/OFF states of analog and digital outputs become the same.
  • Each LED lights when the corresponding signal output is on.

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- $\boxed{\text{HS}}$, $\boxed{\text{VS}}$, and $\boxed{\text{CS}}$ POS/NEG buttons
    - Use these buttons to change the polarity of the HS, VS, or CS sync signal output.
    - Each LED lights when the corresponding signal output is POSITIVE (positive polarity).

- $\boxed{\text{HD}}$, $\boxed{\text{VD}}$, and $\boxed{\text{CLK}}$ buttons
    - Use these buttons to turn on or off the HD, VD, or CLK signal output.
      However, the CLK signal of the system set to OFF in "CLK analog and digital output ON/OFF setting" in program data is not output even when the button is set to ON.
    - The LT 1610 allows the CLK signal to be set to on or off separately for analog and digital outputs. When the address is changed, the signal is output as set in the program. The LED indicates the analog output status. After the button is clicked, the ON/OFF states of analog and digital outputs become the same.
    - Each LED lights when the corresponding signal output is on.

- $\boxed{\text{SYNC ON G}}$ button
    - Use this button to specify whether to add a composite sync signal to analog G video signal output.
    - When the LED is on, a composite video signal with a composite sync signal added is output. (The polarity of the sync signal is negative.)

6.2.9 Copying User ROM

- Program data at addresses 00 to 99 can be copied in a batch.
- Refer to Section 5.1, "Mounting User ROM," for an explanation on how to mount the user ROM package.

- To copy user ROM data to backup RAM
    - Place the user ROM package containing data in the ROM socket, then operate as follows:
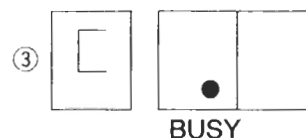
(Operation)   (Display)

① Click the FUNCTION button.

② Click the 4 button.

③ Click the SET button.
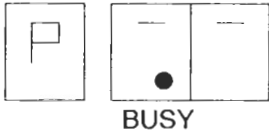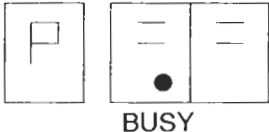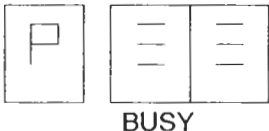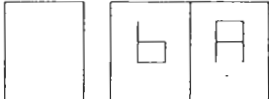Start of copying
The BUSY LED lights.
BUSY

End of copying (buzzer sound)
The BUSY LED goes off.

The checksum is displayed.

● To write backup RAM data to user ROM
  • Place the user ROM package containing no data in the ROM socket and operate as follows:

(Operation)   (Display)

① Click the FUNCTION button.   ① [F] [|]

② Click the 5 button.   ② [P] [|]

③ Click the SET button.   ③ [P] [— | —]
                                            [●]   End of deletion
                                            BUSY   The BUSY LED lights.

                                        [P] [— | —]
                                              [●]   End of program
                                              BUSY   The BUSY LED lights.

                                        [P] [— | —]
                                              [— | —]   End of verification
                                              BUSY   (buzzer sound)
                                                           The BUSY LED lights.

                                        [   ] [b | A]   The checksum is
                                                          displayed.

6.2.10   Setting High-Speed Pattern Switching Mode

● About high-speed pattern switching mode

The LT 1610/1611 outputs a pattern by drawing it into frame memory and HV memory. It normally draws a pattern each time pattern switching occurs. It takes time to draw a complex pattern such as a character pattern to frame memory, resulting in slow pattern switching.

The LT 1610/1611 supports the high-speed pattern switching mode in which it selects an output pattern from several patterns drawn in advance into frame memory. Drawing previously required during pattern switching is omitted or shortened. The high-speed switching mode is further divided into the quick pattern mode and quick address mode.

[Pattern drawing memory]

The LT 1610/1611 uses two types of memory into which patterns are drawn. One is the frame memory to which data can be written in units of pixels. The size s (2048 [H] x 2048 [V]) x 4 dots. Graphic patterns (line drawing and characters) and natural-color patterns are written to this memory. The other is the HV memory consisting of matrixes of horizontal dot memory (4 dots/bit) and vertical line memory. Color and gray patterns (color bar and gray scale) are drawn into this

memory. High-speed pattern switching is implemented by a special design in read/write of frame memory. Natural-color patterns cannot be output in high-speed pattern switching mode because they use too much space of memory.

* In high-speed pattern switching mode, the system operates with 100% dot duty though 50% dot duty is set.

● Quick pattern mode
(1) Outline of quick pattern mode
   • In quick pattern mode, the pattern stored at a certain program address can be switched at high speeds to a pattern assigned to a pattern button (0 to F).

(2) Patterns for which quick pattern mode is ineffective
   • High-speed switching is impaired for single or combined patterns of color bar or gray scale (excluding graphic patterns).

(3) Storing patterns in frame memory
   • When the address is changed, as many patterns as can be stored in four frame memories (2048 x 2048 dots each) are stored automatically according to the H and V display dots set in program data.
   • The priority of patterns stored in frame memory is given in descending order of pattern button numbers beginning from button number 0. The patterns described in (2) are excluded.
   • When a pattern not stored in frame memory is loaded to the work area. The pattern in the work area is not subjected to high-speed switching because it is deleted when another pattern is selected. (Work area 2 is used to display a pattern consisting of two planes.)
   • A pattern consisting of 2,049 display dots or more in the horizontal direction or 1,025 dots (lines) or more in the vertical direction cannot be stored and is not subjected to high-speed switching.
   * One plane indicates one piece of memory (1 bit) of the display size. Two pieces of memory (2 bits) of the display size are used to display a two-plane composite pattern.
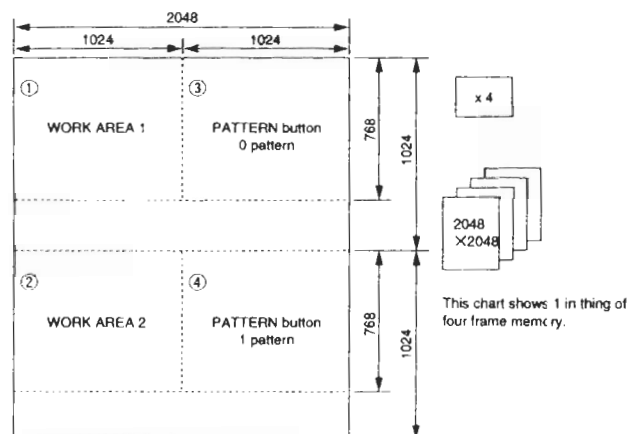
Example of storage: 1,024 (H) x 768 (V) display dots

Figure 6-5

● Quick address mode
  (1) Outline of quick address mode
      • In quick address mode, the patterns stored at addresses are switched at high speeds when an address is selected.
      • In quick address mode, no pattern buttons are accepted.
      • The available program addresses range from the BEGIN address to the "storable address." The "storable address" is the END address or after.
      * Note that any address outside the use range cannot be executed in quick address mode.
      * Use the quick address mode in RAM mode. The quick address mode cannot be used in ROM mode.

  (2) Patterns for which quick pattern mode is ineffective
      • High-speed switching is impaired for single or combined patterns of color bar or gray scale (excluding graphic patterns).

  (3) Storing patterns in frame memory
      • When the quick address mode is entered, the patterns stored at up to the maximum drawable addresses are stored automatically in frame memory according to the H and V display dots set at address data.
      • The priority of patterns stored in frame memory is given in descending order from the pattern at the BEGIN address to the pattern at the "BEGIN + 1" address and so on. The patterns described in (2) are excluded.
      • A pattern consisting of 2,049 display dots or more in the horizontal direction or 1,025 dots (lines) or more in the vertical direction cannot be stored and is not subjected to high-speed switching.

	1024	1024		1024	1024		1024	1024
2048	WORK AREA		2048	WORK AREA		2048	WORK AREA	
1024	①	②	1024	①		1024		
							①	
1024	③	④	1024	②		1024		
1024	⑤	⑥	1024	③		1024		
							②	
1024	⑦	⑧	1024	④		1024		
1024	⑨	⑩	1024	⑤		1024		
							③	
1024	⑪	⑫	1024	⑥		1024		

H≤1024、 V≤1024
Maximum storing numbers 12

H≤1024≤2048、 V≤1024
Maximum storing numbers 6

H≤1024≤2048、 1024≤V≤2048
Maximum storing numbers 3
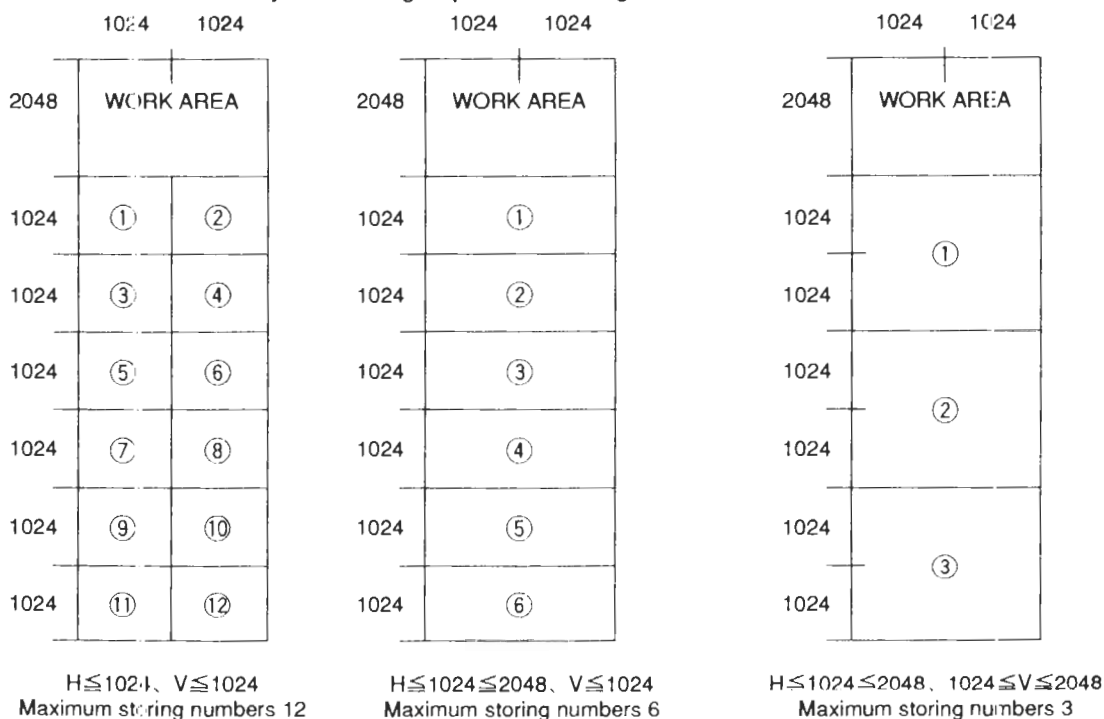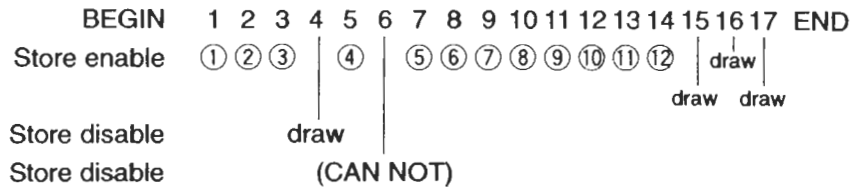
Figure 6-6

(4) Example of storing more patterns than those that can be stored in the address range (BEGIN to END)

```
       BEGIN   1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17  END
Store enable   ①②③  |  ④  |  ⑤⑥⑦⑧⑨⑩⑪⑫  | draw |
                                                        draw  draw

Store disable        draw  |
Store disable             (CAN NOT)
```

● Patterns that can be stored and those that cannot be stored
   • Numbers of patterns that can be stored
      00h, 01h, 10h, 11h, 20h, 40h, 41h, 42h, 50h, 51h, 60h, 61h, 62h, 70h, 72h, 74h
   • Numbers of patterns that cannot be stored but can be drawn
      30h, 31h, 32h, 33h, 34h, 80h, 81h, 82h, 83h, 84h, 90h, 91h, A0h, B0h
   • Numbers of patterns that cannot be stored ("CANNOT BE REGISTERED" is displayed.)
      02h, B2h, B3h, C2h, C3h, C4h, C5h, F0h, F1h, F2h, F3h, F4h, F5h, F6h, F7h, F8h, F9h, FAh, FBh, FCh, FDh, FEh

| Operation method |

● To set the quick pattern mode
   * A pattern assigned to the pattern button not registered is drawn and displayed in normal mode.

(Operation)   (Display)

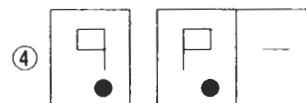① Click the FUNCTION button.   ①

② Click the 6 button.   ②   The current mode is displayed.

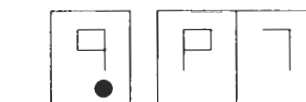③ Click the 1 button.   ③   The quick pattern mode is specified.

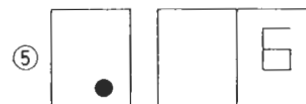④ Click the SET button.   ④   The QUICK and BUSY LEDs light during pattern drawing.

                                                After pattern drawing is finished (buzzer sounded), the number os the pattern button registered last is displayed.

⑤ Click the SET button.   ⑤   The current address is displayed.

●To set the quick address mode

  ‘ The patterns in the range from the BEGIN address to the highest address where a pattern is stored can be output. The highest storable address is the END address or after.
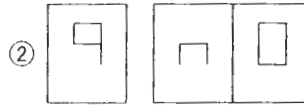
(Operation)   (Display)

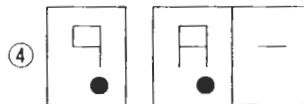① Click the FUNCTION button.   ① `F`

② Click the 6 button.   ② `q n 0`   The current mode is displayed.

③ Click the 2 button.   ③ `q A —`   The quick address mode is specified.

④ Click the SET button.   ④ `q A —`   The QUICK and BUSY LEDs light during pattern drawing.
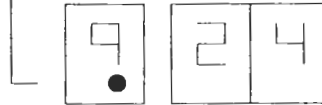
                                        `q A —`   After pattern drawing is finished (buzzer sounded).

Alternately displayed every 0.5 second.

                                        `q 2 4`   The number of the pattern button registered last s displayed.

●To cancel the quick mode

(Operation)   (Display)

① Click the FUNCTION button.   ① `F`

② Click the 6 button.   ② `q P 7`   The current mode is displayed.

③ Click the 2 button.   ③ `q n 0`   Cancel of the quick mode is specified.

④ Click the SET button.   ④ `8 5`   The QUICK LED goes off. The current address is displayed.

6.2.11 Setting Panel DIP Switches with Software

- Part of the LT 1610/1611 panel DIP switch settings can be changed using software switches.
- The settings of the DIP switches with their numbers followed by the @ mark in Section 5.3, "Setting the Panel DIP Switches," can be changed. Any change in the other settings, if made with software switches, is ignored.

(Operation)

① Click the DIP SW button to open the "DIP Switch" box.

② Click the Read button to read the LT 1610/1611 panel DIP switch setup data.

③ Change the switch setting. (The switch status is inverted each time the switch button is pressed.)

④ Click the Write button to change the LT 1610/1611 panel DIP switch setup data.
* Turning off the LT 1610/1611 power returns the DIP switch settings to the original hardware DIP switch settings.

⑤ Click the Close button to close the "DIP Switch" box.

6.2.12 Setting Flashing Speeds

- Set the flashing speeds of the window flashing pattern (pattern No. C4h) and character flashing pattern (pattern No. C5h).

(Operation)

① Click the Flashing button to open the "Flashing Mode" box.

② Click the Read button to read the current setup data from the LT 1610/1611.

③ Click the "Window Flashing Speed" or "Character Flashing Speed" text box to list the following eight flashing speed items. Select one from them.

NO Flash	8/V Blank
1/V Blank	16/V Blank
2/V Blank	32/V Blank
4/V Blank	64/V Blank * Flushing count per V blanking cycle

④ Click the Write button to write new setup data the LT 1610/1611.

⑤ Click the Close button to close the "Flashing Mode" box.

6.2.13   Setting Auto-Display

• Set the auto-display parameters.

(Operation)

① Click the | Auto Inc | button to open the "Auto Inc" box.

② Click the | Read | button to read the current setup data from the LT 1610/1611.

③ Select one of the following modes:
   Pattern Mode: Automatically advances pattern button numbers 0 to F while displaying them one after another.
   Address Mode: Automatically advances address numbers while displaying them one after another.

④ Set the time interval. Specify a value from 0 to 6553.5 seconds in units of 0.1 second in the "Time" text box.

⑤ Click the | Write | button to write the new setup data to the LT 1610/1611.

⑥ Click the | Close | button to close the "Auto Inc" box.

6.2.14   Setting the Window Scroll Pattern

• Set the window scroll pattern (No. C2h) parameters.

(Operation)

① Click the | Window Move | button to open the "Window Moving" box.

② Click the | Read | button to read the current setup data from the LT 1610/1611.

③ Click the H Moving "Direction" text box to list the following three scroll direction items, then select one (horizontal scroll mode) from the list. Do the same for the V Moving "Direction" text box to select the scroll mode in the vertical direction. The scroll direction is determined by the combination of H and V.

   [H Moving]   [V Moving]
   • Right and Left (↔)   • Up and Down (↕)
   • Right (→)   • Up (↑)
   • Left (←)   • Down (↓)

④ Click the H Moving "Moving Unit" text box to list the following eight scroll speed items, then select one (horizontal scroll speed) from the list. Do the same for the V Moving "Moving Unit" text box to select the scroll speed in the vertical direction. The scroll angle is determined by the combination of H and V.

   [H Moving]: 0, 2, 4, 6, 8, 10, 12, 14, 16 dots
   [V Moving]: 0, 1, 2, 4, 5, 6, 7, 8 dots
   * Move distance (dots) per V blanking cycle

⑤ Click the |Write| button to write the new setup data to the LT 1610/1611.

⑥ Click the |Close| button to close the "Window Moving" box.

6.2.15   Setting the Character Scroll Pattern

• Set the character scroll pattern (No. C3h) parameters.

(Operation)
① Click the |Character Move| button to open the "Character Moving" box.

② Click the |Read| button to read the current setup data from the LT 1610/1611.

③ Click the "User Character Code" text box to list 16 character codes (No. 00 to 0F), then select the character to be scrolled.
   * Code Nos. 00 to 0F indicate 16 user character fonts (32 x 32). Use the personal computer to register user characters. For details, refer to the "User characters" section in Section 7.6.1, "Drawing in Graphic Window."

④ Click the H Moving "Direction" text box to list the following three scroll direction items, then select one (horizontal scroll mode) from the list. Do the same for the V Moving "Direction" text box to select the scroll mode in the vertical direction. The scroll direction is determined by the combination of H and V.
   [H Moving]   [V Moving]
   • Right and Left (↔)   • Up and Down (↕)
   • Right (→)   • Up (↑)
   • Left (←)   • Down (↓)

⑤ Click the H Moving "Moving Unit" text box to list the following eight scroll speed items, then select one (horizontal scroll speed) from the list. Do the same for the V Moving "Moving Unit" text box to select the scroll speed in the vertical direction. The scroll angle is determined by the combination of H and V.
   [H Moving]: 0, 2, 4, 6, 8, 10, 12, 14, 16 dots
   [V Moving]: 0, 1, 2, 4, 5, 6, 7, 8 dots
   * Move distance (dots) per V blanking cycle

⑥ Click the |Write| button to write the new setup data to the LT 1610/1611.

⑦ Click the |Close| button to close the "Character Moving" box.

6.3 Displaying the Cursor

- When the liquid crystal display (LCD) causes a dot failure, the defective position must be located. In this case, a cursor with coordinates can be displayed to determine the exact dot position.
  * Start the "Cursor Move" program to display the cursor.

(Operation)
① Start the "Cursor Move" program.
② The "Cursor" window is displayed. A cursor is displayed with the X-Y coordinates indicated in dot units.
③ Move the cursor as follows:
　○ For rough movement
　　Move the mouse while pressing down the $\boxed{\text{SHIFT}}$ key on the personal computer keyboard.

　○ For fine movement
　　Press the $\boxed{\rightarrow}$, $\boxed{\leftarrow}$, $\boxed{\uparrow}$, or $\boxed{\downarrow}$ key while pressing down the $\boxed{\text{CTRL}}$ key on the personal computer keyboard.

6.4 Using the Remote Controller (Option)

The LT 1610/1611 can be remotely controlled through the remote connector in two modes: LT 1610-01 mode and LVG 1603-01 mode. The functions and specifications vary depending on the control mode used. The control mode is identified by the remote controller ID assigned to the remote connector pins ② to ④.

● Connection
　Connect the LT 1610/1611 as shown in Figure 6-7. Local key operation on the LT 1610/1611 is disabled when the remote controller is connected.
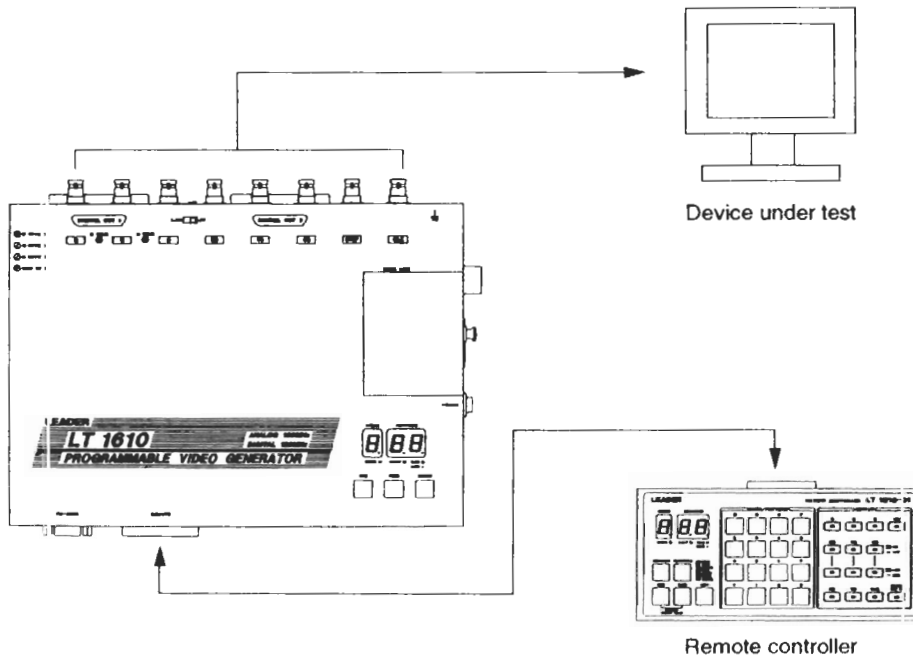

Device under test

Remote controller

Figure 6-7

6.4.1 LT 1610-01 Mode

This mode has many functions as listed in the following "Outline of functions." In this mode, optional remote controller LT 1610-01 is used. The functions and operation methods are basically the same as those described in Section 6.2, "Control from Personal Computer Remote Control Screen" except for some portions. Refer to that section.

● Outline of functions
 • Selecting program memory (ROM or RAM)
 • Setting the program address use range
 • Selecting program addresses
 • Selecting output patterns
 • Direct control of output signals
 • Copying program data
 • Setting the high-speed pattern switching mode

● Differences from operation on personal computer remote control screen

Table 6-1

Operation on personal computer remote control screen	Operation on remote controller (LT 1610-01)
The INC and DEC buttons do not support the repeat function.	The repeat function works when the INC or DEC key is pressed down for one second or more.
Clicking the BEGIN button returns the address to the BEGIN value.	Pressing down the INC and DEC keys simultaneously for one second or more returns the address to the BEGIN value
Part of the LT 1610/1611 panel DIP switch settings can be changed.	The DIP switch settings cannot be changed.
The flashing speed of the window flashing pattern (No. C4h) or character flashing pattern (No. C5h) can be set.	The flashing speed cannot be set.
The auto-display parameters can be set.	The auto-display parameters cannot be set.
The window scroll pattern (No. C2h) parameters can be set.	The pattern parameters cannot be set.
The character scroll pattern (No. C3h) parameters can be set.	The pattern parameters cannot be set.
The button and key indications are different. (Address) [ADRS] ———— [ADDRESS] (Function) [FUNC] ———— [FUNCTION]	

* The INC or DEC key repeat function continuously advances addresses when the key is pressed down for one second or more. The program is executed only once at the address where the key is released.

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● External control using the personal computer

The LT 1610/1611 can also be controlled from a personal computer connected to it, instead of using the optional remote controller LT 1610-01. In this case, note the following (refer to Section 12.2, "Remote Connector," for the connector specifications):

① The key input section consists of key matrixes. Therefore, when a personal computer is used for control, the key switch must be replaced with an electronic switch (digital transistor).
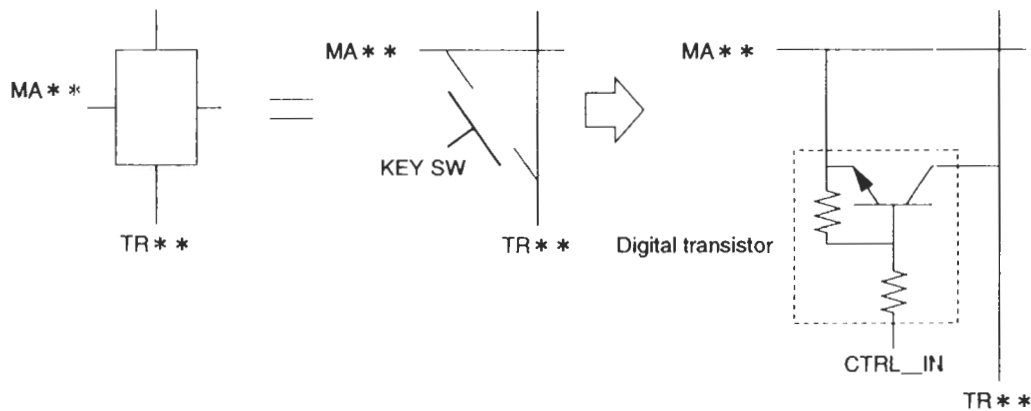

Figure 6-8

- Input the control signal into CTRL IN from the external controller.

  Key ON state → CTRL IN = +5 V

  (The ON state is required to continue for 5 us or more to remove chattering noise.)

  Key OFF state → CTRL IN = Ground

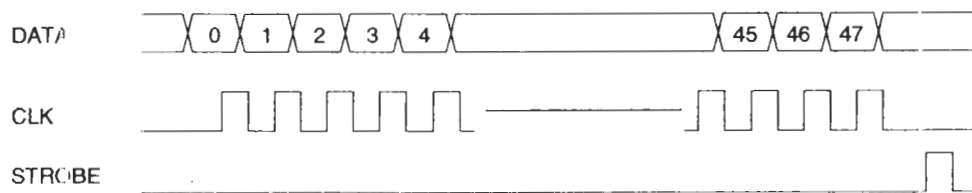② Key and seven-segment display data is transferred serially. Data is transferred in the following format:

Figure 6-9 LED display data transfer timing

Table 6-2 LED display data

DATA NO.	Key LED	DATA NO.	7 Segment LED	DATA NO.	7 Segment LED
0	SYNC ON G	16	dp ⌐	32	dp ⌐
1	CLK	17	g	33	g
2	VD	18	f	34	f
3	HD	19	e ADDRESS	35	e MODE
4	NOT USED	20	d 10^0 Digit	36	d Segment
5	CS (POS/NEG)	21	c Segment	37	c
6	VS (POS/NEG)	22	b	38	b
7	HS (POS/NEG)	23	a ⌐	39	a ⌐
8	NOT USED	24	dp ⌐	40	NOT USED
9	CS (ON/OFF)	25	g	41	NOT USED
10	VS (ON/OFF)	26	f	42	NOT USED
11	HS (ON/OFF)	27	e ADDRESS	43	NOT USED
12	INV	28	d 10^1 Digit	44	NOT USED
13	B	29	c Segment	45	NOT USED
14	G	30	b	46	NOT USED
15	R	31	a ⌐	47	NOT USED

6.4.2 LVG 1603-01 Mode

The LVG 1603-01 mode has simple specifications as shown in the following "Outline of functions" section. Optional remote controller LVG 1603-01 is used in this control mode. Refer to its instruction manual for its operation.

●Outline of functions
  • Selecting program memory (ROM or RAM)
  • Setting the program address use range
  • Selecting program addresses

●External control using the personal computer
  The LT 1610/1611 can also be controlled through a parallel port on an external controller such as a personal computer, instead of using the optional remote controller LVG 1603-01. Refer to Section 12.2, "Remote Connector," for details.

7. PROGRAM DATA EDIT

7.1 Creating and Editing Program Data

The LT 1610/1611 recalls the previously programmed data for execution. The "Timing.exe" application software included with the instrument is used to create and manage the program data on the PC. This chapter describes how to manage (i.e., save and recall) the completed program data, create new program data by extending existing program data, and transfer the edited program data to the LT 1610/1611.

* Before launching "Timing Set", keep the LT 1610/1611 high-speed pattern switching mode closed. Otherwise, the contents of data is modified when you transfer the edited data to the LT 1610/1611.

7.1.1 Program Data Structure

The program data is managed in units of 100 addresses. This is because the preset number of addresses registrable in the whole user ROM area is 100; the number of units for management corresponds to that of items of data for one user ROM. For the program data, you may assign an individual file name for each of the units for management, and several pieces of program data can be saved on the media such as a floppy disk.

The program data is edited in address units. It includes the HV timing parameters, output control information, output patterns, and so on.

7.1.2 Kinds of Program Data Edit

There are the following kinds of program data edit:

① Parameter edit
To edit parameters within one address. See Sections 7.2, 7.3, and 7.5 for details.

② Inter-address copy within one unit of management
When the parameters of several addresses are identical, this method is useful when you need to modify only the pattern.

③ Inter-address copy in several units of management
Useful when you need to use the preset standard timing or part of a previously created file.

7.1.3 Edit Area

As described in Item ③ in the previous section, the program data edit requires you to use several files concurrently. Without transferring data between files directly, "Timing.exe" reserves the BANK area, which stores the edit work data on the hard disk. It transfers the file to this storage area, and performs the edit while copying one-address data from the area to the edit buffer.

Therefore, the original file is still protected after the edit work. The above storage area to contain the data for one file (100 addresses) is defined as BANK.

If an existing file is used for editing, you should prepare several BANKS for it, transfer the files to all of them, and perform the edit through an edit buffer for one address (Figure 7-1).

Since there are no differences between BANKs in weight, the files to use can be edited concurrently. The BANKs are provided on the PC hard disk, and can be used repetitively unless you intentionally deletes them.

There is no limit on the size whole BANK area (i.e., number of BANKs); the size increases each time you transfer a new file there. The size of hard disk area used per BANK is approximately 136K bytes. If there are too many BANKs on the hard disk, delete unwanted ones, depending on your operating environment.
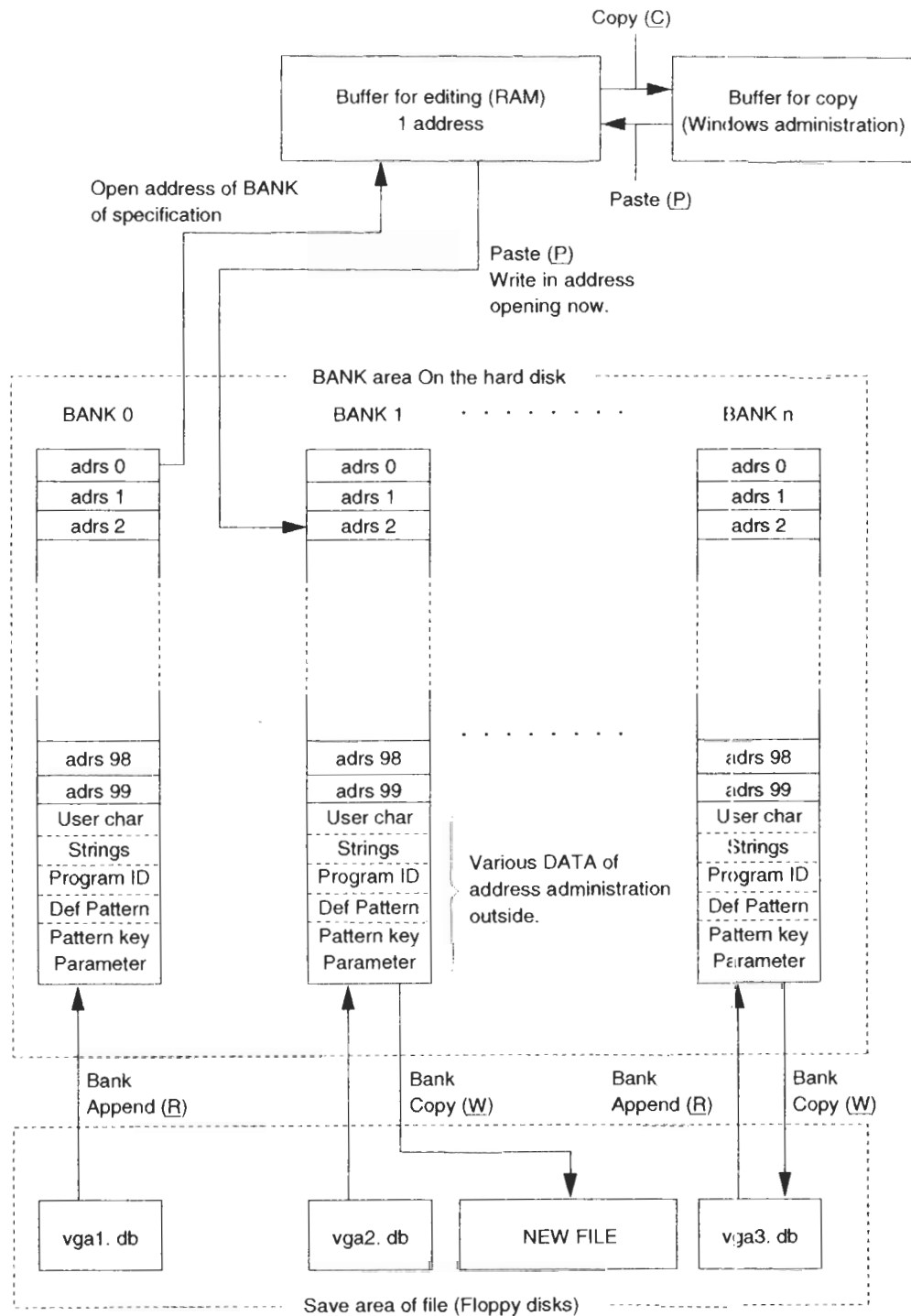
Figure 7-1

* The user character data is not in the BANK area. User char, in the BANK area, includes the *.chr file, which contains the user key character data saved.

7.1.4 Menu Items Related to Edit in Window (Except the Parameter Edit Items)

After "Timing.exe" is launched, the "Address Data Setting" window is opened. The following menu items in this window relates to editing.

- "File (F)" pull-down menus (Figure 7-2)

"Save File Check (S)": Used if execution of "Bank Append (R)" fails in reading the file into the BANK.

"Bank Append (R)": Used to add a new BANK and reads a file there from the floppy or hard disk.

"Bank Copy (W)": Used to save the data within the specified BANK, as a file, onto the media such as the floppy or hard disk.

"Bank New (N)": Used to reserve a new BANK.

"Bank Delete (D)": Used to delete BANKs that are no longer needed.
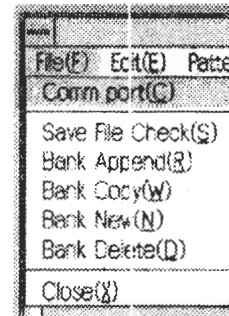
Figure 7-2

- "Edit (E)" pull down menu (Figure 7-3)

"Copy (C)": Used to transfer one-address data from the edit buffer to the copy buffer.

"Paste (P)": Used to transfer one-address data from the buffer to the currently open address.

"Program ID (I): Used to enter the ID that identifies the program data for one file. This ID is entered and displayed in the box to the right of the status bar.
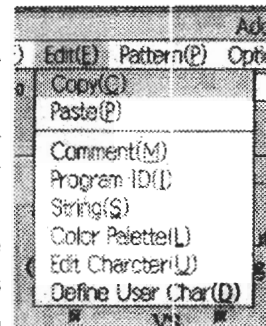

Figure 7-3

- Command buttons (Each character string in parentheses is displayed when the cursor is pointed in the button.)

 * (Communication Abort):
   Used to stop the transfer of program data to the LT 1610/1611.

 * (COPY): Same as "Copy (C)" in the "Edit (E)" pull-down menu.

 * (PASTE): Same as "Paste (P)" in the "Edit (E)" pull-down menu.

 * (SEND TO 1610):
   Used to transfer the Address data, String data, Program ID, Pattern data, or Bank data from the edit buffer to the LT 1610/1611. The destination is the work area, where a temporary operation check is enabled.

 * (Bank Select): Used to select a BANK.

7.1.5　Invoking a File (Transfer to the BANK)

Click on "File (F)" and then the "Bank Append (R)" in the pull-down menu (Figure 7-2). The "Open File" dialog (Figure 7-4) appears. Click on the desired file. The file extension of the program data is *.db. As shown in Figure 7-4, the menu lists user.db, user_1.db, and so on. It includes a file name without underscore character and those with "_2" to "_9", all of which contains the same main name (user.db). Select "user.db". The other files ("user_2.db" to "user_9.db") are read automatically. Then, click on the "OK" button to read the file. The BANK number next to the currently used one is assigned automatically to the file (Figure 7-5).

You can define the BANK number.

If you use write-protectable media (floppy disk etc.) in the destination drive, reset the write inhibition setting before invoking the file.

Notes on Bank Append of user characters:

Reading BANK data from the media such as the floppy disk into the BANK does not cause user character data to be copied.

If user character has been set, the user character data at time of Bank Append should be saved to be included in the same directory tree as the copied BANK. If a certain attribute such as the directory name has been changed, Define User Char should be set again, with the user character file saved in a proper directory.
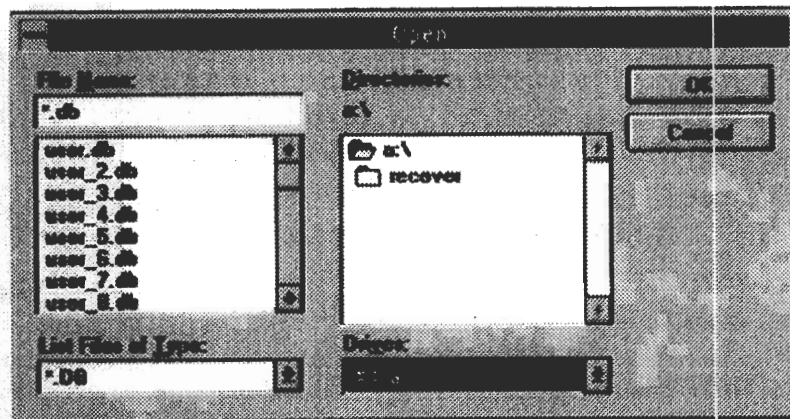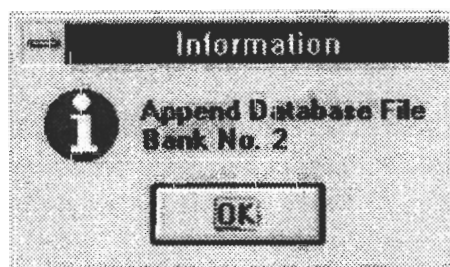

Figure 7-4

Figure 7-5

If the "Bank Append (R)" operation results in display of the alarm dialog shown in Figure 7-6, this indicates that an attempt to read the file into the BANK results in failure.
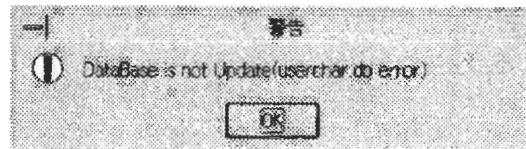

Figure 7-6

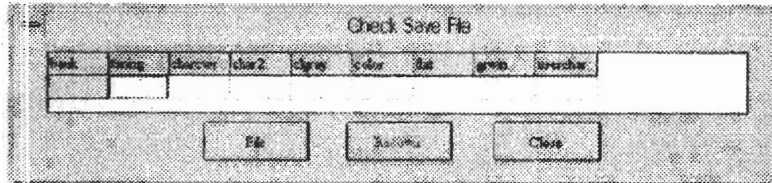(1) Select "Save File Check (S)" from the "File (F)" pull-down menu. The dialog in Figure 7-7 is displayed.

Figure 7-7

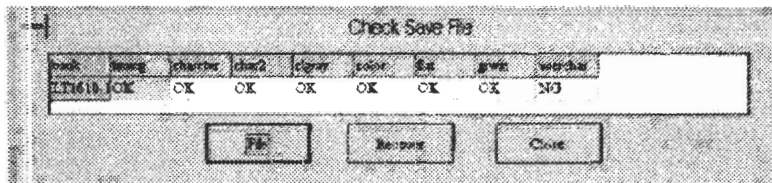(2) Click on the "File" button to select the file. Data that could not be read is marked with "NG" (Figure 7-8).

Figure 7-8

* If the "Bank Append (R) operation results in failure in reading one or more data items, the data for all items cannot be read.

timing: Data about the timing data
character: Data about the line and cross
char2:   Character data
clgray: Data about color windows
flat   Data about flow windows.
grwin: Data about graphic windows
userchar: Data about user characters
color: Data about the color palette

(3) Data read is completed by clicking on the "Recover" button.
    (When you perform operations (1) and (2) again, you see the data item marked with "NG" instead of "NG" in Figure 7-8.)

* When you click on the "Recover" button, only the data items marked with "OK" in Figure 7-8 are read into the BANK. The contents of the one marked with 'NG" are deleted, and the appropriate area is initialized.

7-5

7.1.6 Saving a File (Transferring BANK Data to a File)

Click on "File (F)" and then the "Bank Copy (W)" in the pull-down menu (Figure 7-2). The "Bank Copy" dialog (Figure 7-9) appears. Select the BANK that contains the desired data to save. Click on the "Copy" button. The "Name and Save File" dialog (Figure 7-10) appears. Enter the file name in the "File Name (N)" text box, and select the drive in which you desire to save the file. The file extension of the program data is *.db. Then, click on the "OK" button to save the file. Upon completion of saving, the menu lists test.db, test_.db, and so on as shown in Figure 7-4. A total of nine files are generated: a file name without underscore character and those with "_2" to "_9", all of which contains the same main name (user.db). If you recall a file later, select "test.db". The other files ("user_2.db" to "user_9.db") are read automatically.

> * <u>Use a six-character (each 1 byte) or shorter alphanumeric string to specify the file name.</u>

Notes on Bank Copy of user characters:

Reading BANK data from the media such as the floppy disk into the BANK does not cause user character data to be copied.

If user characters have been set, you also need to copy the files listed below.

Use Edit Character to create user characters. The files set with Define User Char such as Code-00.Chr, Code-0f.Chr, and Code-19.Chr should be copied together with the BANK data.

To guarantee that the Define User Char code is set correctly, it is recommended that the code number be included in the file name as shown above, although the first eight characters of the name may be defined arbitrarily like Windows.
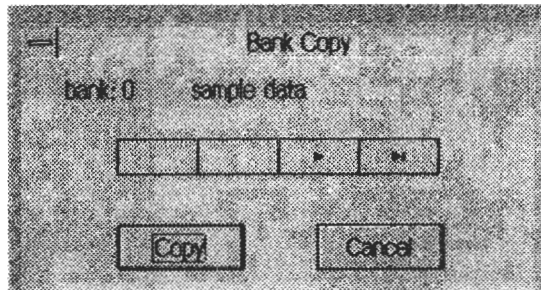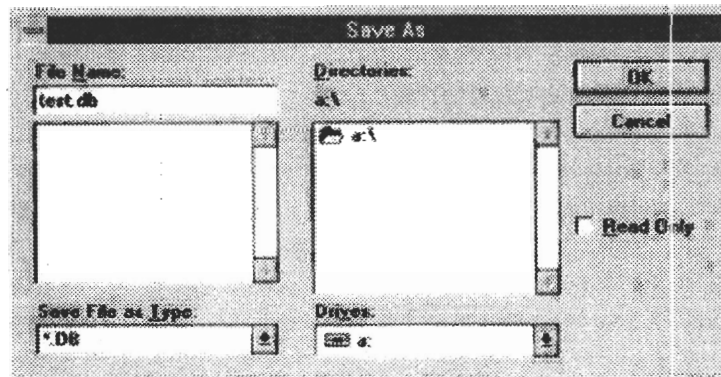

Figure 7-9

Figure 7-10

7.1.7 Creating a New BANK

To perform a new editing work without using an existing file, you should create a new BANK.

• Click on "File (F)" and then "Bank New (N)" in the pull-down menu.

The "Make Timing Data" dialog (Figure 7-11) is opened, a new BANK number is assigned to the next to the currently used BANK number. Write data into "Program ID (P)" and click on the "OK" button to display the informational dialog (Figure 7-12). Note that you cannot define the new BANK number. In the new BANK, the VGA480-6 timing data is contained in all addresses.
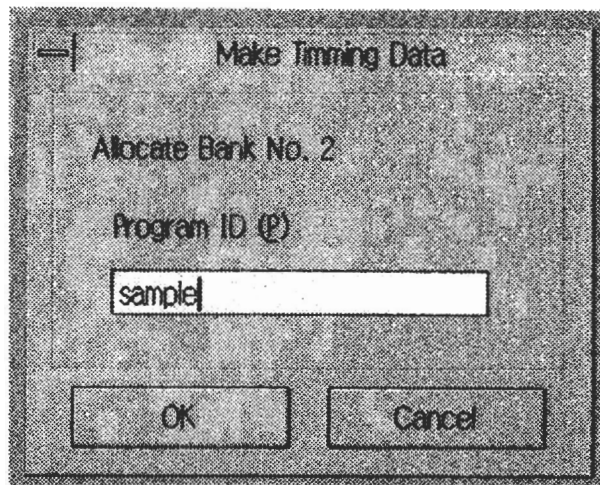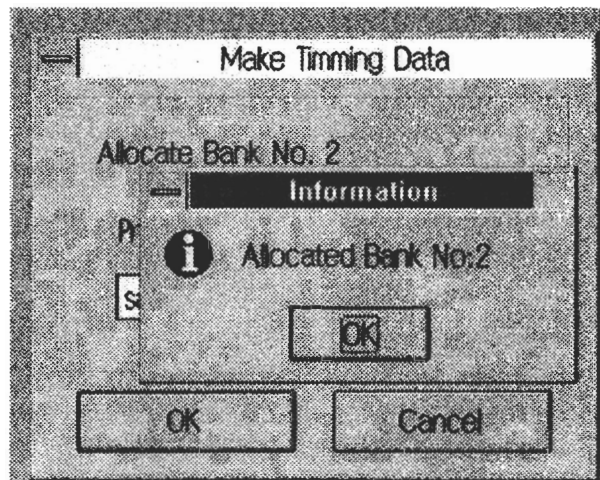
Figure 7-11

Figure 7-12

7.1.8   Deleting Unwanted BANKs

This section describes how to delete unwanted files here.

• Click on "File" in the window and then "Bank Delete (D)" in the pull-down menu. The "BANK Delete" dialog (Figure 7-13) is opened. Select one or more unwanted BANKs and click on "Delete". After the files have been deleted, the informational dialog appears.

* BANK numbers are always used consecutively in order, beginning at 0. If BANK5 is deleted for example when BANK numbers 0 to 10 are in use, the numbers of the old BANK6 and subsequent ones are decremented respectively (the old BANK6 changes to the new BANK5).
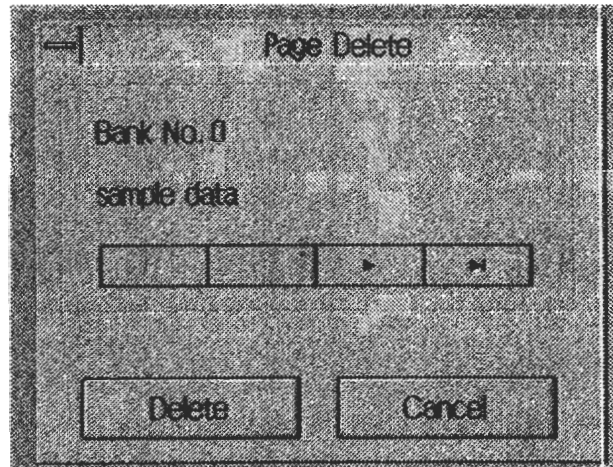

Figure 7-13

7.1.9   Inter-BANK Data Copy

• Select the source of copy
  Click on the "Bank Select" toolbar. The Select BANK cialog (Figure 4-42) is opened. Click on the arrow button to select desired BANK to view.
  Click on the "OK" button to show the label of address 0 of the selected BANK.

• Select the desired address to copy.
  Click on the arrow button on the tool bar to select the desired address to display.
  When the address is selected, the data is viewed and at the same time the data on the hard disk is transferred to the edit buffer.

• Read the data within the address into the copy buffer.
  Click on "Edit (E)" in the window to open the pull-down menu.
  Click on "Copy (C)".
  Alternatively, click on the "COPY" button on the toolbar.

• Select the address of the destination BANK.
  Details of the operation are the same as for selecting the source of copy.

• Write the data within the copy buffer into the destination address.
  Click on "Edit (E)" on the menu bar to open the pull-down menu.
  Click on "Paste (P)".
  Alternatively, click on the "PASTE" button on the toolbar.
  The copied data is currently in the edit buffer.

• Complete the data entry, which causes transfer from the edit buffer to the hard disk
  Click on the Timing Check button on the toolbar.
  The data on the hard disk is not updated unless this work is completed.

Remarks:
• Using PROGRAM ID to identify the program data within several BANKs
  The PROGRAM ID is used to identify the program data stored in several BANKs. It
  appears in the right column to the status bar. You can set its contents, as desired.
  Usually, it is a good idea to use the file name itself or define a name with some
  common attributes for this ID.

7.2　　Setting Timing Data

This section describes how to set the horizontal and vertica sync timing parameters for the video signals.

7.2.1　　Horizontal Sync Timing

All the horizontal sync timing parameters are set with the Tim ng Card displayed.
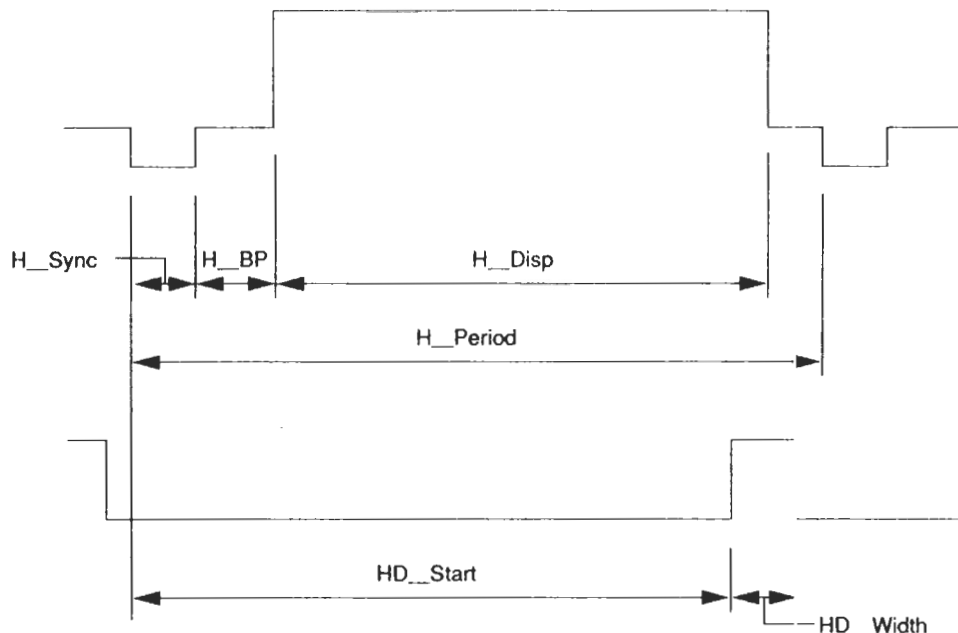●Set parameters and timing chart

Figure 7-14 Horizontal sync timing

●Setting the unit of input
  You select the unit for the horizontal sync parameters. Click the "us" or "dot" button in "H Timing" for selection.

  * Data is always saved in the instrument in dots regardles: of the H_Timing setting of the unit, although either "μs" or "dot" may be sele:ted in order to set the horizontal sync parameters.
  If you have set a parameter with the unit set to "us", the following expression is used for conversion during data save.

$$H\_^{***} \text{ (dot)} = H\_^{***} \text{ (}\mu\text{sec)} \times \text{DotClock}$$

  Example: H_Period (dot) = H_Period (μsec) x DotClock
  * If "μs" is set as the unit, the data entered for the horizor tal sync parameters are corrected into the values (in dots) corresponding to one dot.

●Setting the individual parameters

In the text box for each parameter, enter the parameter setting condition and the value meeting the specification. Then, press the ENTER key to complete the entry.

* For setting of H_Period, H_Sync, H_BP, and H_Disp, the following inequalities must always be satisfied:

H_Period$\geq$H_Sync+H_BP+H_Disp
H_Period-H_Disp$\geq$64 (dot)

* When the H_Period, H_Sync, H_BP, and H_Disp settings are changed, this only causes the width of the horizontal sync front porch to change, without mutual influence.

(1) "H-Freq"

Set the horizontal sweep frequency. The setting conditions and the specifications are as listed below:

• Set the frequency in KHz. The number of significant digits includes 3 digits in the real part and 3 digits in the fraction part.

• If the unit of HTiming is "μs", H_Period is the inverse of H_Freq. If H_Freq is set, H_Period also changes to the converted value automatically.

• If the unit of HTiming is "dot", each of H_Period and Total_Dot equals DotClock/H_Freq. If H_Freq is set, each of these parameters also changes to the converted value automatically.

• H_Freq must be set to a value meeting the following inequalities:

3.077KHz$\leq$H_Freq$\leq$250KHz
If the unit of HTiming is "μs": (1/H_Freq)$\geq$H_Sync+H_BP+H_Disp
If the unit of HTiming is "dot": H_Freq$\leq$DotClock/ (H_Sync+H_BP+H_Disp)

(2) "Total-Dot"

Set the total number of dots for the horizontal sweep period. The setting conditions and the specifications are as listed below:

• The unit used to set is "dot", and the value must be set in dots.

• If the unit of Htiming is "dot", H_Period equals Total_Dot. If Total_Dot is set, H_Period also changes automatically.

• When the Total_Dot setting changes, DotClock also changes automatically according to the following expression:

DotClock (MHz) = Total_Dot x H_Freq (KHz)

• Total_Dot must be set to a value meeting the following inequalities:

80 dot$\leq$Total_Dot$\leq$8192 dot
If the unit of HTiming is "μs": Total_Dot$\geq$(H_Sync+H_BP+H_Disp) x DotClock
If the unit of HTiming is "dot":
(1) If the value of (Total_Dot - H_Sync - H_BP) is a multiple of 4:
Total_Dot$\geq$H_Sync+H_BP+H_Disp
(2) If the value of (Total_Dot - H_Sync - H_BP) is NOT a multiple of 4:
Total_Dot$\geq$H_Sync+H_BP+H_Disp+5
* Also if the unit of data entered is "μs", the converted value in dots must meet expressions (1) and (2) above.

* For the LT 1610 only: If you use the "1/2 CLK" digital output clock mode, be sure to set Total_Dot to an even number of dots.

(3) "H-Disp-Dot"

Set the number of dots for the horizontal display period. The setting conditions and the specifications are as listed below:

• The unit used to set is "dot", and the value must be set in 4-dot steps.

• If the unit of HTiming is "dot", H_Disp equals H_Disp_dot. If H_Disp_Dot is set, H_Disp also changes automatically.

• If the unit of HTiming is "μs", H_Disp_Dot meets the following expression. If H_Disp_Dot is set, Total_Dot changes automatically.

$$H\_Disp\_Dot = Total\_Dot \times \{H\_Disp\,(\mu\,sec)/H\_Period\,(\mu\,sec)\}$$

DotClock is simultaneously changed according to the following expression:

$$DotClock\,(MHz) = Total\_Dot \times H\_Freq\,(KHz)$$

• H_Disp_Dot must be set to a value meeting the following expression:

$$16\,dot \leq H\_Disp\_Dot \leq 4000\,dot$$

(4) "DotClock"

Set the dot clock frequency. The setting conditions and the specifications are as listed below:

• The set range is 1.024 to 150.000 MHz. The range used varies with the output type (analog or digital). (The digital output applies only to the LT 1610.)

Analog output:	1.024 - 150.000 MHz
Digital output:	1/1 clock mode 1.024 - 60 MHz
	1/2 clock mode 2.048 120.000 MHz

• The value must be set in 1 KHz.

• When the DotClock setting changes, some of the other parameters change correspondingly as below. The parameter changes depend on which unit is used for HTiming or VTiming setting.

Table 7-13

Unit of HTiming	Unit of VTiming	Effect to other parameter
dot	Line	H_Freq and V_Freq are changed. V_Freq (Hz)=DotClock(MHz)/(H_Period x V_Period) H_Freq (KHz)=V_Freq (Hz) x V_Period
dot	ms	H_Freq are changed. H_Freq (KHz)=DotClock (MHz)/H_Period
μs	Line	Total_Dot and H_Disp_Dot are changed. Total_Dot=DotClock(MHz) x H_Period(μsec) H_Disp_Dot=Total_Dot x {H_Disp (μsec)/H_Period (μsec)}
μs	ms	Total_Dot and H_Disp_Dot are changed. Total_Dot=DotClock (MHz) x H_Period(μsec) H_Disp_Dot=Total_Dot x {H_Disp (μsec)/H_Period (μsec)}

(5) "H-Period"

Set the cycle of horizontal 1H.

• If the unit of HTiming is "μs", the number of significant digits includes 3 digits in the real part and 2 digits in the fraction part. When the H_Period setting changes, H_Freq and DotClock change automatically according to the following expressions:

> H_Freq (KHz)=1/H_Period (μ sec)
> DotClock (MHz)=Total_Dot/H_Period (μ sec)

• If the unit of HTiming is "dot", the value can be set in dots. When the H_Period setting changes, Total_Dot and H_FRQ also change according to the following expressions:

> Total_Dot=H_Period
> H_Freq (KHz)=DotClock (MHz)/H_Period

• H_Period must be set to a value meeting the following inequalities:

> 80 dot≤H_Period≤8192 dot
> 4.00 μ sec≤H_Period≤325.00 μ sec

* For the LT 1610 only: If you use the "1/2 CLK" digital output clock mode, be sure to set Total_Dot to an even number of dots.

(6) "H-Sync"

Set the horizontal sync period. The setting conditions and the specifications are as listed below:

- If the unit of HTiming is "μs", the number of significant digits includes 3 digits in the real part and 2 digits in the fraction part.
- If the unit of HTiming is "dot", the value can be set in dots.
- H_Sync must be set to a value meeting the following inequalities:

$$12 \text{ dot} \leq \text{H\_Sync} \leq 2000 \text{ dot}$$
$$0.08 \ \mu \text{ sec} \leq \text{H\_Sync} \leq 162.50 \ \mu \text{ sec}$$

(7) "H-BP"

Set the horizontal sync back porch period. The setting conditions and the specifications are as listed below:

- If the unit of HTiming is "μs", the number of significant digits includes 3 digits in the real part and 2 digits in the fraction part.
- If the unit of HTiming is "dot", the value can be set in dots.
- H_BP must be set to a value meeting the following inequalities:

$$0 \text{ または } 4 \text{ dot} \leq \text{H\_BP} \leq 4076 \text{ dot}$$
$$0.00 \ \mu \text{ sec} \leq \text{H\_BP} \leq 324.50 \ \mu \text{ sec}$$

(8) "H-Disp"

Set the horizontal display period. The setting conditions and the specifications are as listed below:

- If the unit of HTiming is "μs", the number of significant digits includes 3 digits in the real part and 2 digits in the fraction part.
- If the unit of HTiming is "dot", the value can be set in 4-dot steps.
- H_Disp must be set to a value meeting the following inequalities:

$$16 \text{ dot} \leq \text{H\_Disp} \leq 4000 \text{ dot}$$
$$0.10 \ \mu \text{ sec} \leq \text{H\_Disp} \leq 324.60 \ \mu \text{ sec}$$

(9) "HD-Start"

Set the starting point of the horizontal drive pulse. The setting conditions and the specifications are as listed below:

- Set the starting point relative to the falling edge of the horizontal sync signal as long as the sync polarity is negative. (If the polarity is positive, set it relative to the rising edge.)
- If the unit of HTiming is "μs", the number of significant digits includes 3 digits in the real part and 2 digits in the fraction part.
- If the unit of HTiming is "dot", set the value in 4-dot steps. To output the pulse with the exact trimming as you set, you need to set H_Period (= Total_Dot) and H_Sync, and H_BP in 4-dot steps.
- HD_Start must be set to a value meeting the following inequalities:

$$0 \text{ dot} \leq \text{HD\_Start} \leq 4090 \text{ dot}$$
$$0.00 \ \mu \text{ sec} \leq \text{HD\_Start} \leq 324.99 \ \mu \text{ sec}$$

Where,
HD_Start < H_Period

7-14

(10) "HD-Width"

Set the pulse width of the horizontal drive pulse. The setting conditions and the specifications are as listed below:

- If the unit of HTiming is "μs", the number of significant digits includes 3 digits in the real part and 2 digits in the fraction part.
- If the unit of HTiming is "dot", set the value in 4-dot steps. To output the pulse with the exact timing as you set, you need to set H_Period (= Total_Dot) and H_Sync, and H_BP in 4-dot steps.
- HD_Start must be set to a value meeting the following inequalities:

0 dot $\leq$ HD_Width $\leq$ 4090 dot	Where,
0.00 μ sec $\leq$ HD_Width $\leq$ 324.99 μ sec	HD_Width < H_Period

7.2.2 Horizontal Sync Timing

The Signal Card should be used only if the EQ or SER Pulse is set. (All the other vertical sync timing parameters can be set with the Timing Card displayed.)
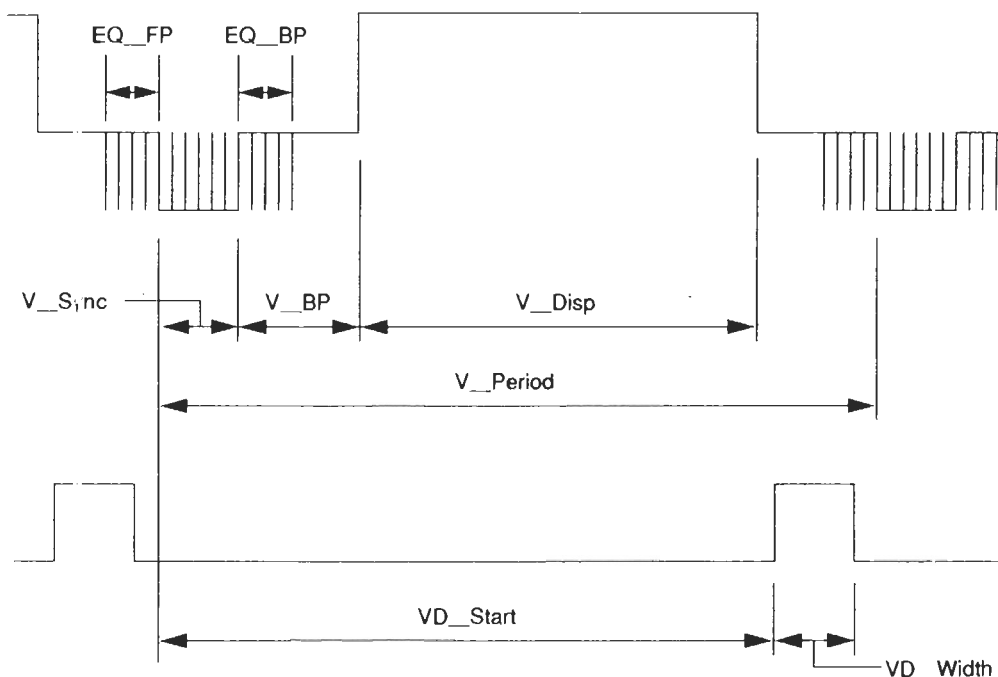
● Set parameters and timing chart

Figure 7-15 Vertical sync timing

● Setting the unit of data entered

Select the unit of vertical sync parameter setting. Click either "ms" or 'Line" in "VTiming" radio button.

* Data is always saved in the instrument in lines regardless of the H_Timing setting of the unit, although either "ms" or "line" may be selected in order to set the horizontal sync parameters.

If you have set a parameter with the unit set to "ms", the following expression is used for conversion during data save.

7-15

$$V\_{***} \text{ (Line)} = V\_{***} \text{ (msec)} \times V\_Period \text{ (Line)} \times V\_Freq \text{ (Hz)}$$

Example: $V\_Sync \text{ (Line)} = V\_Sync \text{ (msec)} \times V\_Period \text{ (Line)} \times V\_Freq \text{ (Hz)}$

* If the unit is "Line", any of the vertical sync parameters can be set in 0.5 H steps. If such a parameter was set in steps of a less value, the value in the fraction part of the setting changes to 0 or 5 (whichever nearer one) after operation.
Example: The setting 595.3 changes to 595.5.

* If the unit is "ms", the data entered for any of the vertical sync parameters can be corrected to the value corresponding to 0.5 H or 1 H, with the setting converted in lines.

●Setting the individual parameters
In the text box for each parameter, enter the parameter setting condition and the value meeting the specification and then press the ENTER key.
* For setting of V_Period, V_Sync, V_BP, V_Disp, EQ_FP, EQ_BP, only the width of the vertical sync front porch changes without mutual influence when one or more of their settings are changed.

* The scanning method (SCANNING) is interlace or interlace shrink, the "NORMAL" or "SPECIAL" mode may be selected, depending on how 0.5 H scanning lines are handled at the starting and ending portions of vertical display.
If there is the following relationship between V_Sync and V_BP, the setting conditions for each parameter depends on the mode.

$$V\_Sync + V\_BP = \text{Integer value}$$

Hereafter, different descriptions are provided if the setting conditions vary with the mode. If the mode is not indicated, the setting conditions are common to both modes.
(See Section 7.2.2, Item (11), "V_Disp_MODE" for details of the NORMAL and SPECIAL modes.)

* For setting of V_Period, V_Sync, V_BP, V_Disp, and EQ_FP, the following expressions must always hold if the unit of VTiming is "Line":

★NORMAL mode: $\boxed{V\_Period \geqq EQ\_FP + V\_Sync + V\_BP + V\_Disp}$

★SPECIAL mode: $\boxed{V\_Period \geqq EQ\_FP + V\_Sync + V\_BP + V\_Disp + 0.5}$

7-16

(1) "V-Freq"

Set the vertical sweep frequency. The setting conditions and the specifications are as listed below:

" Set the frequency in Hz. The number of significant digits includes 4 digits in the real part and 3 digits in the fraction part.

" If the unit of VTiming is "ms", V_Period is the inverse of V_Freq. If V_Freq is set, V_Period also changes to the converted value automatically.

" If the unit of Htiming is "line", setting of V_Freq causes V_Period to change to the converted value automatically according to the following expression:

V_Period (Line)=H_Freq (KHz) /V_Freq (Hz)

" V_Freq must be set to a value meeting the following inequalities:

$$1,000 \text{ Hz} \leq V\_Freq \leq 5000.000 \text{ dot}$$
If the unit of VTiming is "ms": $(1/V\_Freq) \geq EQ\_FP+V\_Sync+V\_BP+V\_Disp$
If the unit of VTiming is "line":
$$1/ |H\_Period (\mu \text{ sec}) \times 4090| \leq V\_Freq \leq 1/ |H\_Period (\mu \text{ sec}) \times 50|$$

(2) "V-Period"

Set the period (lines) during which the voltage remains at 1 V.

" If the unit of VTiming is "ms", the number of significant digits includes 3 digits in the real part and 3 digits in the fraction part. V_Freq is the invert of V_Period; setting of V_Period causes V_Freq to change to the converted value automatically.

" If the unit of VTiming is "Line", the number of significant digits includes 4 digits in the real part and 3 digits in the fraction part.

" V_Freq must be set to a value meeting the following inequalities:

$$50.0 \text{ Line} \leq V\_Period \leq 4090.0 \text{ Line}$$
$$0.200 \text{ msec} \leq V\_Period \leq 999.999 \text{ msec}$$

(3) "V-Sync"

Set the vertical sync period. The setting conditions and the specifications are as listed below:

" If the unit of VTiming is "ms", the number of significant digits includes 2 digits in the real part and 3 digits in the fraction part.

" If the unit of VTiming is "Line", the number of significant digits includes 2 digits in the real part and 1 digits in the fraction part.

" V_Sync must be set to a value meeting the following inequalities:

$$0.5 \text{ Line} \leq V\_Sync \leq 99.0 \text{ Line}$$
$$0.100 \text{ msec} \leq V\_Sync \leq 32.175 \text{ msec}$$

(4) "V-BP"

Set the vertical sync back porch period. The setting conditions and the specifications are as listed below:

- If the unit of VTiming is "ms", the number of significant digits includes 3 digits in the real part and 3 digits in the fraction part.
- If the unit of VTiming is "Line", the number of significant digits includes 4 digits in the real part and 1 digits in the fraction part.
- V_BP must be set to a value meeting the following inequalities:

★NORMAL mode: $0.0\ \text{Line} \leq V\_BP \leq V\_Period - 1.5\ \text{Line}$ (MAX 4088.5 Line)   ★SPECIAL mode: $0.0\ \text{Line} \leq V\_BP \leq V\_Period - 2.0\ \text{Line}$ (MAX 4088.0 Line) $0.000\ \text{msec} \leq V\_BP \leq 999.000\ \text{msec}$

(5) "V-Disp"

Set the vertical display period. The setting conditions and the specifications are as listed below:

- If the unit of VTiming is "ms", the number of significant digits includes 3 digits in the real part and 3 digits in the fraction part.
- If the unit of VTiming is "Line", the number of significant digits includes 4 digits in the real part and 1 digits in the fraction part.
- V_Disp must be set to a value meeting the following inequalities:

★NORMAL mode: $1.0\ \text{Line} \leq V\_Disp \leq V\_Period - 0.5\ \text{Line}$ (MAX 4089.5 Line)   ★SPECIAL mode: $1.0\ \text{Line} \leq V\_Disp \leq V\_Period - 1.0\ \text{Line}$ (MAX 4089.0 Line) $0.004\ \text{msec} \leq V\_Disp \leq 999.799\ \text{msec}$

(6) "VD-Start"

Set the starting point of the vertical drive pulse. The setting conditions and the specifications are as listed below:

- Set the starting point relative to the falling edge of the horizontal sync signal as long as the sync polarity is negative. (If the polarity is positive, set it relative to the rising edge.)
- If the unit of VTiming is "ms", the number of significant digits includes 3 digits in the real part and 3 digits in the fraction part.
- If the unit of VTiming is "Line", the number of significant digits includes 4 digits in the real part and 1 digits in the fraction part.
- VD_Start must be set to a value meeting the following inequalities:

$0.0\ \text{Line} \leq VD\_Start \leq 4089.5\ \text{Line}$ $0.000\ \text{msec} \leq VD\_Start \leq 999.899\ \text{msec}$

Where,
VD_Start < V_Period

(7) "VD-Width"

Set the pulse width of the vertical drive pulse. The setting conditions and the specifications are as listed below:

" If the unit of VTiming is "ms", the number of significant digits includes 3 digits in the real part and 3 digits in the fraction part.

" If the unit of VTiming is "Line", the number of significant digits includes 4 digits in the real part and 3 digits in the fraction part.

" VD_Width must be set to a value meeting the following inequalities:

0.0 Line $\leq$ VD_Width $\leq$ 4089.5 Line 0.000 msec $\leq$ VD_Width $\leq$ 999.899 msec

Where,
VD_Width < V_Period

(8) "EQ-FP"

Set the equalizing pulse front porch period. The setting conditions and the specifications are as listed below:

· If the unit of VTiming is "ms", the number of significant digits includes 2 digits in the real part and 3 digits in the fraction part.

· If the unit of VTiming is "Line", the number of significant digits includes 2 digits in the real part and 1 digits in the fraction part.

· EQ_FP must be set to a value meeting the following inequalities:

★NORMAL mode: 0.0 Line $\leq$ EQ_FP $\leq$ V_Period$-$V_Sync$-$V_BP$-$V_Disp (MAX 99.0 Line) ★SPECIAL mode: 0.0 Line $\leq$ EQ_FP $\leq$ V_Period$-$V_Sync$-$V_BP$-$V_Disp$-$0.5 (MAX 99.0 Line) 0.000 msec $\leq$ EQ_FP $\leq$ 32.175 msec

(9) "EQ-BP"

Set the equalizing pulse vertical back porch period. The setting conditions and the specifications are as listed below:

• If the unit of VTiming is "ms", the number of significant digits includes 2 digits in the real part and 3 digits in the fraction part.

• If the unit of VTiming is "Line", the number of significant digits includes 2 digits in the real part and 1 digit in the fraction part.

• EQ_FP must be set to a value meeting the following inequalities:

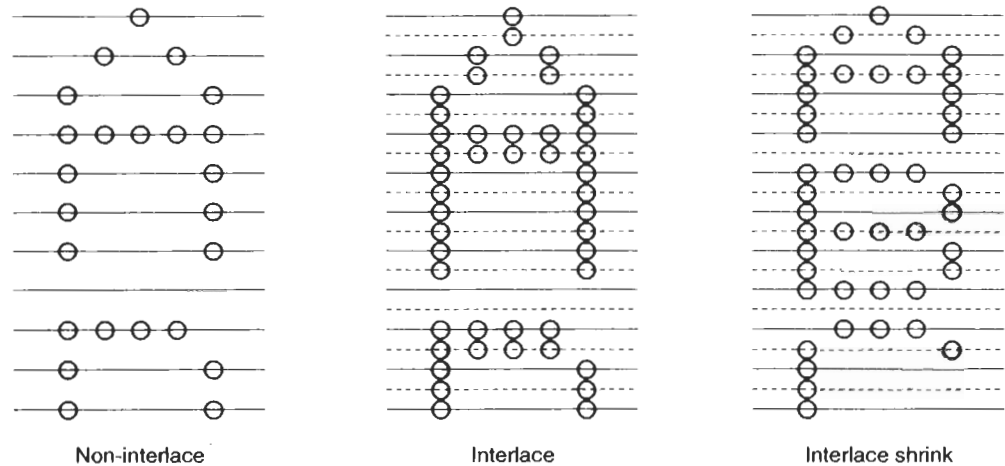| |
|---|
| 0.0 Line $\leq$ EQ_BP $\leq$ V_BP
(MAX 99.0 Line)
0.000 msec $\leq$ EQ_BP $\leq$ 32.175 msec |

(10) "SCANNING"

Select switching of the scanning method from the following three options:

NON-INT: Non-interlace.

INTERLACE: Interlace.

INT-SHRINK: Interlace shrink.

• See Figure 7-16 for details of the individual methods. For non-interlace, scanning lines in the first and second fields in the interlace method trace across the same portion. (The size of apparent scanning lines is half of that for interlace.)

| Non-interlace | Interlace | Interlace shrink |

Figure 7-16 Scanning method

(11) "V-Disp-Mode"

For the interlace or interlace shrink scanning method "V-Disp-Mode" selects how 0.5 H scanning lines are handled at the starting and ending portions of vertical display. You may choose one of two modes:

NORMAL: Outputs scanning lines faithfully as specified with the settings.

SPECIAL: Automatically corrects scanning lines for use on the PC display.

[Description]

In the interlace mode, usually scanning lines are displayed, with the starting line of vertical display missing 0.5 Line (see NORMAL in Figure 7-17). Such a shape on a PC display screen causes a problem such as a missing head of a character. For PC display devices, this is generally corrected automatically in the CRT controller.

For the LT 1610/1611, the vertical line setting is always made in 0.5-line steps; the interlace scanning method is used when the number of scanning lines is "*****.5 Line" (e.g., 262.5 lines). This correction takes place if the SPECIAL mode has been set.

NORMAL   SPECIAL

Figure 7-17 Interlace scanning

(12) "EQ-Pulse" * Set this, with the Signal Card displayed.
Select the mode for an equalizing pulse within the vertical blanking period.
OFF: Does not add any equalizing pulse.
0.5H: Adds an equalizing pulse at 0.5 H intervals.
1H: Adds an equalizing pulse at 1 H intervals.

* The width of equalizing pulse is one-half of H_Sync in 4-dot steps. Note that the fraction is discarded for correction into the approximate value ur less the calculated result is a multiple of 4.
Example: If H_Sync = 60 dots, the pulse width of EQ_Pulse is 28 dots.

* To guarantee that TA = TB, the number of dots of H_Sync, H_BP, and H_Period/2 must all be a multiple of 4. Otherwise, TA may be longer than TB (less than 4 dots).

Example: The following figure is a timing chart where the following are set: H-Sync = 63 dots, H_BP = 62 dots, H_Period = 910 dots, and EQ_Pulse mode = 0.5H.
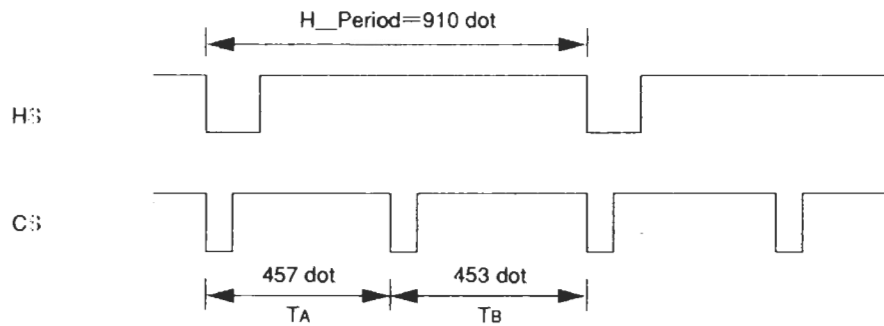
Figure 7-18 Enlarged view of part of EQ_FP (EQ_BP) period

(13) "SER-Pulse" * Set this, with the Signal Card displayed.

Select the mode of a serration pulse.

OFF: Does not add any serration pulse.

0.5H: Adds a serration pulse at 0.5 H intervals.

1H: Adds a serration pulse at 1 H intervals.

XOR: XOR of VS and HS.

* In the 0.5H or 1H mode, the pulse width of serration pulse equals H_Sync. (The approximate value may result within 3 dots, depending on the H_Sync, H_BP, or H_Period setting.)

* In the XOR mode, the pulse width exactly equals H_Sync.

0.5H mode

VS

H__Period=910 dot

HS

CS

457 dot   453 dot
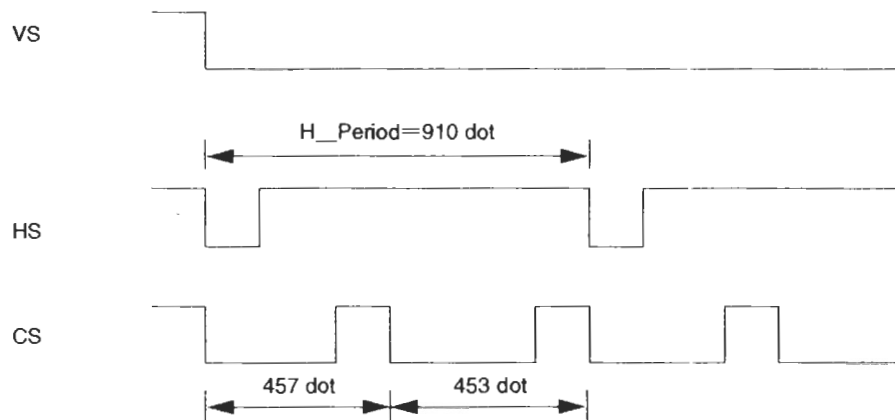
Figure 7-19 SER_Pulse: 0.5H mode

1H mode

H__Period

HS

V__Sync

VS

CS
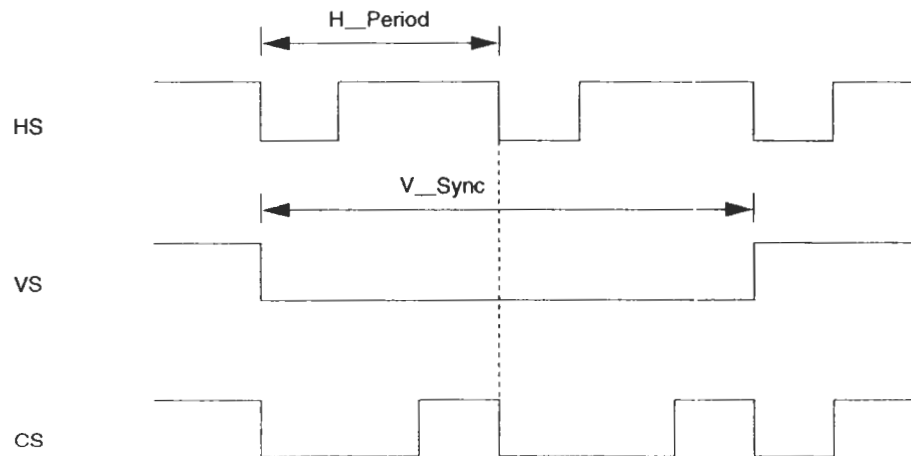
Figure 7-20 SER_Pulse: 1H mode

H__Period

V__Sync

HS

VS

CS
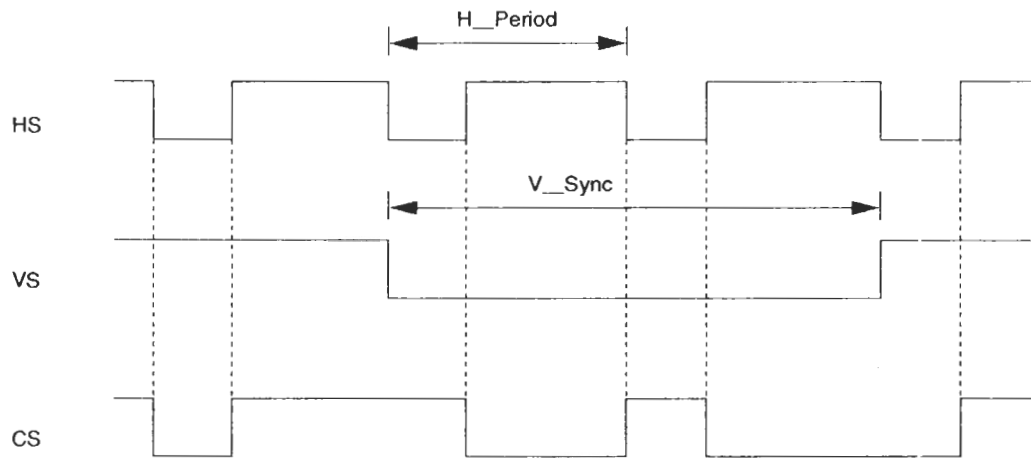
Figure 7-21 SER_Pulse: XOR mode

7.3 **Setting the Output Conditions**

This section descries how to set the parameters about the video signal output conditions. The output conditions should be set, with the Output Setting or Signal Card displayed. In the following subsections, the <card name to display> and (if any) <<group name>> are denoted to the right of each setting title.
Example: <Output Setting Card>-<<Analog Level group>>
The LT 1610 is equipped with both analog and digital output, and the settings for it are described separately for each of the output systems.

7.3.1 **Setting the Analog Output**

This section describes the parameter settings about analog output. Some of these parameters are used also for "Setting the Digital Output", and reflected also to digital output signals. Such common parameters are denoted with [AD] to the right of the setting title.

●Setting Output Mode [AD] <Output Setting Card>-<<Analog Mode group>>
 Manages each of the digital and analog signal output signals separately. Select one of the following:
 • All: Allows both the digital and analog signals to be output.
 • Digital: Allows the digital signal to be output. No analog signal is output.
 • Analog: Allows the analog signal to be output. No digital signal is output.

 * See Section 3.3, "Back Panel" for details of the analog and digital output.
 * The signal output state is determined by this setting and the logical product of the On/Off setting for the individual signal.
 * The LT 1611 is not equipped with digital output.

●Setting the RGB video output
------[About the video level] ---
◇RS-343A standard
 The LT 1610/1611 video, setup, and synchronizing signal (only the G signal is addable) levels conform to the RS-343A standard. It may have the two types of signals shown below, depending on whether it is with or without setup.
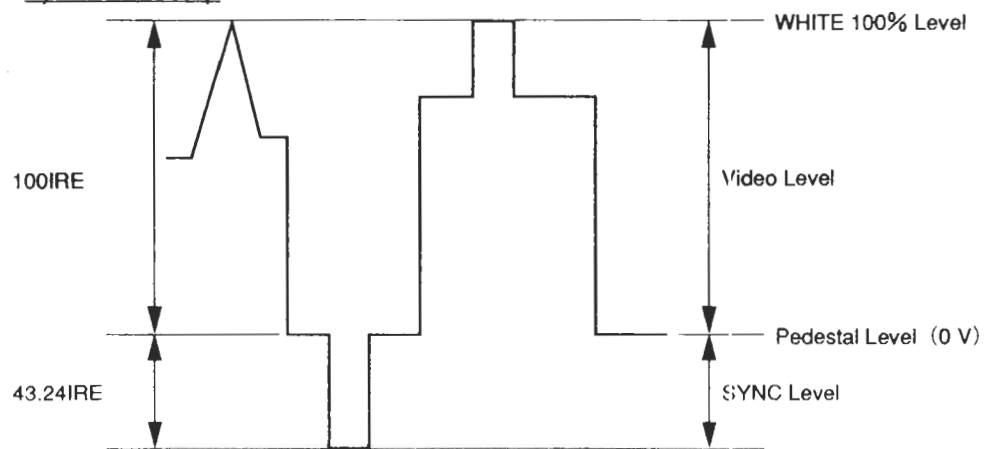 A) Without setup
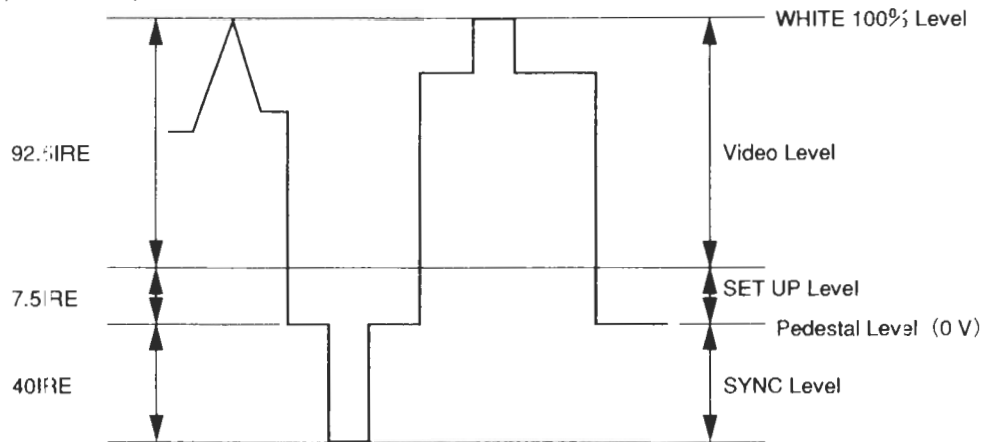

Figure 7-22 Without setup

7-24

B) With setup

Figure 7-23 With setup

◇Regarding the relationship between the video level settings, the setup, and synchronizing levels, the LT 1610/1611 video level settings correspond to the amplitude settings in the "Video Level" segment shown in Figures 7-22 and -23. The setup and synchronizing signal levels are as follows. Note that the pedestal level is at 0 V (factory setting).

A) Without special pattern
- Setup Level = 0.00 V (fixed)
- Sync Level = Video Level x 40/92.5

Example: If the program memory setting is Video Level = 0.700 V:
- Setup Level = 0.00 V
- Sync Level = 0.700 V x 40/92.5 = 0.303 V

B) With special pattern
- Setup Level = Video Level x 7.5/92.5
- Sync Level = Video Level x 40/92.5

Example: If the program memory setting is Video Level = 0.660 V:
- Setup Level = 0.660 V x 7.5/92.5 = 0.054 V
- Sync Level = 0.660 V x 40/92.5 = 0.285 V

----

(1) Video_Level <Output Setting Card>-<<Analog Level group>>
   Set the video signal level. (This corresponds to "Video Level", shown in Figures 7-22 and -23.)
   " The range is 0.3 to 1.2 V, and the value is set in 5 mV steps.
   " The special pattern and synchronizing signal levels are calculated based on "Video Level" and displayed. These levels cannot be set.

(2) SYNC (G) <Output Setting Card>-<<Analog Level group>>
Set whether to add the synchronizing signal to the analog G output.
- The synchronizing signal level conforms to RS-343A and is fixed.
- The synchronizing signal cannot be added to the R or B output.
* If panel DIP SW2-3 on is set on, the HS and VS On/Off settings are reflected also to CS. If CS and HS are set on and VS is off for example, only HS (horizontal synchronizing signal) will be added.

(3) SETUP <Output Setting Card>-<<Analog Level group>>
Set whether to add the special pattern level to the analog R, G, and B output.
- The special pattern level ratio conforms to RS-343A and is fixed.

(4) RGB_Output [AD] <Output Setting Card>-<<Analog Mode group>>
Set whether to turn on or off each of the R, G, and B output video signals.

(5) RGB_INV [AD] <Output Setting Card>-<<Analog Mode group>>
Set whether to turn on or off the inverse of R, G, and B output (i.e., whether or not to invert the output).

(6) DotDuty [AD] <Signal Card>-<<Clock group>>
Set 100% (NRZ) or 50% (RZ). If DOT DUTY is set to 50%, the video level will be held at 0 V during the last 50% period.
* If the pattern for which "50%" functions, described below, is selected with DOT DUTY set to "50%", the CLK output frequency will be doubled.
* The maximum clock frequency with which DOT DUTY can be set to "50%" is 60 MHz.
* After DOT DUTY has been set to "50%", only the following patterns function: (Patterns No.00h, 01h, 10h, 11h, 20h, 40h, 41h, 42h, 50h, 51h, 60h, 61h, 62h, 70h, 71h, 72h, 73h, 74h)
* If DOT DUTY has been set to "50%", INV does not work. In this case, more time for pattern drawing is required than that for "100%".
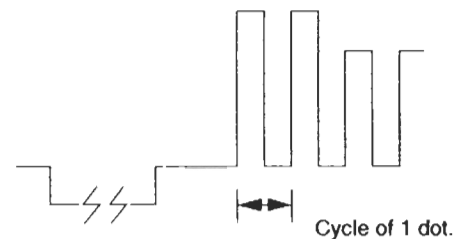

Figure 7-24 DOT DUTY 100% (NRZ) video signal

Figure 7-25 DOT DUTY 50% (RZ) video signal

● Setting the GR-W line drawing

Specify the color of lines in the graphic window (GR-W). See Section 7.6.1,
"Drawing in the graphic window".

(1) GR Level_UNIT [AD] <Signal Card>

Set the unit used to set each of the following levels:

%:   The level set in "Video Level" is assumed to be 100%. (Real part: 3
digits; fraction part: 1 digit).

step: The level set in "Video Level" is set with a resolution of 256 (0 to 255).

(2) GR Level_Luminance [AD] <Signal Card>

Set the luminance level for the condition in which all the R, G, and B levels are
identical (i.e., white). This setting causes each of the GR Level_R, _G, and _B
levels to be identical to the value set here, regardless of the previously set
one.

(3) GR Level_R, _G, _B [AD] <Signal Card>

Set each of the R, G, and B levels alone.

● Setting the FLAT_FIELD color

Set the color of the background area on the color gray window screen. See
Section 7.6.2, "Drawing in the color gray window" for FLAT_FIELD details.

(1) FLAT Level_UNIT [AD] <Signal Card>

Set the unit used to set each of the following levels:

%:   The level set in "Video Level" is assumed to be 100%. (Real part: 3
digits; fraction part: 1 digit).

step: The level set in "Video Level" is set with a resolution of 256 (0 to 255).

(2) FLAT Level_Luminance [AD] <Signal Card>

Set the luminance level for the condition in which all the R, G, and B levels are
identical (i.e., white). This setting causes each of the FLAT_FIELD_R, _G,
and _B levels to be identical to the value set here, regardless of the previously
set one.

(3) FLAT Level_R, _G, _B [AD] <Signal Card>

Set each of the R, G, and B levels alone.

● Setting the synchronizing signal

Set the conditions about BNC output HS, VS, CS, and DISP.

(1) HS Output Sel [AD] <Output Setting Card>-<<Sync, Clock group>>

Selects the synchronizing signal that is output to the HS terminal. HS
(horizontal synchronizing signal) or CS (composite synchronizing signal) may
be selected.

(2) HS_Polarity [AD] <Output Setting Card>-<<Sync, Clock group>>
Selects the polarity of the synchronizing signal that is output through the HS terminal.

(3) HS_Output [AD] <Output Setting Card>-<<Sync, Clock group>>
Set whether to turn on or off the synchronizing signal that is output through the HS terminal. If panel DIP SW2-3 on is set on, the HS On/Off setting is reflected also to CS.

(4) VS_Polarity [AD] <Output Setting Card>-<<Sync, Clock group>>
Selects the polarity of the synchronizing signal that is output through the VS terminal.

(5) VS_Output <Output Setting Card>-<<Sync, Clock group>>
Set whether to turn on or off the synchronizing signal that is output through the VS terminal. If panel DIP SW2-3 on is set on, the VS On/Off setting is reflected also to CS.

(6) CS_Polarity [AD] <Output Setting Card>-<<Sync, Clock group>>
Select the polarity of the composite synchronizing signal that is output through the VS terminal.

(7) CS_Output <Output Setting Card>-<<Sync, Clock group>>
Set whether to turn on or off the composite synchronizing signal that is output through the CS terminal.

(8) DISP_Polarity [AD] <Output Setting Card>-<<Sync, Clock group>>
Select the polarity of the display period signal that is output through the VS terminal.

(9) DISP_Output <Output Setting Card>-<<Sync, Clock group>>
Set whether to turn on or off the display period signal that is output through the DISP terminal.

●Setting CLK
Set the conditions about the BNC terminal CLK output.
(1) Disp/All [AD] <Signal Card>-<<Clock group>>
Set the dot clock signal output period. ALL (entire period) or DISP (display period only) may be selected.

(2) Clk_Polarity [AD] <Output Setting Card>-<Sync, Clock group>>
Select the polarity of the dot clock signal.

(3) Clk_Output <Output Setting Card>-<<Sync, Clock group>>
Set whether to turn on or off the dot clock signal.

7.3.2   Setting the Digital Output * Unnecessary for the LT 1611

This section describes the parameter settings about digital output. Some of these parameters are used also for "Setting the Analog Output", and reflected also to analog output signals. Such common parameters are denoted with [AD] to the right of the setting title.

●Setting Output Mode [AD] <Output Setting Card>-<<Analog Mode group>>
Manages each of the digital and analog signal output signals separately. Select one of the following:
• All: Allows both the digital and analog signals to be output.
• Digital: Allows the digital signal to be output. No analog signal is output.
• Analog: Allows the analog signal to be output. No digital signal is output.

* See Section 3.3, "Back Panel" for details of the analog and digital output.
* The signal output state is determined by this setting and the logical product of the On/Off setting for the individual signal.
* The LT 1611 is not equipped with digital output.

●Setting the RGB digital output
Set the conditions about the DIGITAL OUT1 and OUT2 connector RGB digital output.
(1) Video_Polarity <Output Setting Card>-<<Digital group>>
     Selects the polarity of the RGB digital signal.

(2) RGB Bit <Output Setting Card>-<<Digital group>>
     Set the number of bits of the RGB digital signal.
     • The range is 1 to 8 bits.
     • If one or more bits are set in locations other than the eight bits, the eight high-order bits will be significant.
Example: If the six-bit mode is set, D7 to D2 are significant bits and D1 to D0 insignificant bits.

(3) R_Output Bit, G_Output Bit, B_Output Bit <Output Setting Card>-<<Digital group>>
     Set whether to turn on or off each of the R, G, and B bits.

(4) RGB_Output [AD] <Output Setting Card>-<Output Mode group>>
     Set whether to turn on or off R, G, and B individually.

(5) RGB_INV [AD] <Output Setting Card>-<Output Mode group>>
     Set whether to turn on or off the inverse output (i.e., whether or not to invert the output).

(6) DotDuty [AD] <Signal Card>-<<Clock group>>
     Set 100% (NRZ) or 50% (RZ). If DOT DUTY is set to 50%, the video level will be held at 0 V during the last 50% period.
     * If the pattern for which "50%" functions (described below) is selected with DOT DUTY set to "50%", the CLK output frequency will be doubled.
     * The maximum clock frequency with which DOT DUTY can be set to "50%" is 60 MHz.

* After DOT DUTY has been set to "50%", only the following patterns function: (Patterns No.00h, 01h, 10h, 11h, 20h, 40h, 41h, 42h, 50h, 51h, 60h, 61h, 62h, 70h, 71h, 72h, 73h, 74h)
* If DOT DUTY has been set to "50%", INV does not work. In this case, more time for pattern drawing is required than that for "100%".
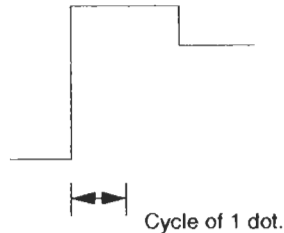
<Waveform from conversion into analog video>
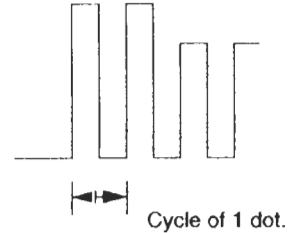

Cycle of 1 dot.

Figure 7-26 DOT DUTY 100% (NRZ)

Cycle of 1 dot.

Figure 7-27 DOT DUTY 50% (RZ)

●Setting the GR-W line drawing
Specifies the color of lines in the graphic window (GR-W). See Section 7.6.1, "Drawing in the graphic window".

(1) GR Level_UNIT [AD]
Set the unit used to set each of the following levels:
%:   Sets the value relative to the level of Data 255 (= 100%). (Real part: 3 digits; fraction part: 1 digit).
step: Sets the data in the range from 0 (MIN) to 255 (MAX).

(2) GR Level_Luminance [AD] <Signal Card>
Set the luminance level for the condition in which all the R, G, and B levels are identical (i.e., white). This setting causes each of the GR Level_R, _G, and _B levels to be identical to the value set here, regardless of the previously set one.

(3) GR Level_R, _G, _B [AD] <Signal Card>
Set each of the R, G, and B levels alone.

●Setting the FLAT_FIELD color
Set the color of the background area on the color gray window screen. See Section 7.6.2, "Drawing in the color gray window" for FLAT_FIELD details.

(1) FLAT Level_UNIT [AD] <Signal Card>
Set the unit used to set each of the following levels:
%:   The level set in "Video Level" is assumed to be 100%. (Real part: 3 digits; fraction part: 1 digit).
step: The level set in "Video Level" is set with a resolut on of 256 (0 to 255).

(2) FLAT Level_Luminance [AD] <Signal Card>
Set the luminance level for the condition in which all the R, G, and B levels are identical (i.e., white). This setting causes each of the FLAT_FIELD_R, _G, and _B levels to be identical to the value set here, regardless of the previously set one.

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(3) FLAT Level_R, _G, _B [AD] <Signal Card>
Set each of the R, G, and B levels alone.

● Setting the synchronizing signal
Set the conditions about DIGITAL OUT1 connector output HS, VS, CS, DISP, HD, and VD.
  * Hereafter, each connector pin (PIN** OF DIGITAL OUT1) is denoted in the following abbreviated form: OUT1-**P.

(1) HS_Output_Sel [AD] <Output Setting Card>-<<Sync, Clock group>>
Select the synchronizing signal that is output through HS (OUT1-20P). HS (horizontal synchronizing signal) or CS (composite synchronizing signal) may be selected.

(2) HS_Polarity [AD] <Output Setting Card>-<<Sync, Clock group>>
Select the polarity of the synchronizing signal that is output through HS (OUT1-20P).

(3) HS_Output [AD] <Output Setting Card>-<<Sync, Clock group>>
Set whether to turn on or off the synchronizing signal that is output through HS (OUT1-20P). If panel DIP SW2-3 on are set on, the HS On/Off setting is reflected also to CS.

(4) VS_Polarity [AD] <Output Setting Card>-<<Sync, Clock group>>
Selects the polarity of the synchronizing signal that is output through VS (OUT1-45P).

(5) VS_Output <Output Setting Card>-<<Sync, Clock group>>
Set whether to turn on or off the synchronizing signal that is output through VS (OUT1-45P). If panel DIP SW2-3 on is set on, the VS On/Off setting is reflected also to CS.

(6) CS_Polarity [AD] <Output Setting Card>-<<Sync, Clock group>>
Selects the polarity of the composite synchronizing signal that is output through CS (OUT1-21P).

(7) CS_Output <Output Setting Card>-<<Sync, Clock group>>
Set whether to turn on or off the composite synchronizing signal that is output through CS (OUT1-21P).

(8) DISP_Polarity [AD] <Output Setting Card>-<<Sync, Clock group>>
Selects the polarity of the display period signal that is output through DISP (OUT1-46P).

(9) DISP_Output <Output Setting Card>-<<Sync, Clock group>>
Selects the polarity of the display period signal that is output through DISP (OUT1-46P).

(10) HD_Polarity <Output Setting Card>-<Sync, Clock group>>
Selects the polarity of the horizontal drive signal that is output through HD (OUT1-22P).

(11) HD_Output <Output Setting Card>-<Sync, Clock group>>
Set whether to turn on or off the horizontal drive signal that is output through HD (OUT1-22P).

(12) VD_Polarity <Output Setting Card>-<Sync, Clock group>>
Selects the polarity of the vertical drive signal that is output through VS (OUT1-47P).

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(13) VD_Polarity <Output Setting Card>-<Sync, Clock group>>
Set whether to turn on or off the vertical drive signal that is output through VS (OUT1-47P).

●Setting CLK
Set the conditions about the CLK (OUT1-24P) output through the DIGITAL OUT1 connector output.

(1) Disp/All [AD] <Signal Card>-<<Clock group>>
Set the clock signal output period. ALL (entire period) or DISP (display period only) may be selected.

(2) Clk_Polarity [AD] <Output Setting Card>-<Sync, Clock group>>
Selects the polarity of the clock signal.

(3) Clk_Output <Output Setting Card>-<Sync, Clock group>>
Set whether to turn on or off the clock signal.

(4) Clk Delay
Set the clock signal delay time. The range is 0 to 30 rsec, and the value may be set in 2 nsec steps.
• The phase relation between the signals other than the clock signals is fixed but not varied by this setting.

(5) Clk Mode <Signal Card>-<<Clock group>>
Set the clock output mode. The 1/1 or 1/2 clock mode may be selected.

------------ [About clock mode] --
◇1/1 clock mode
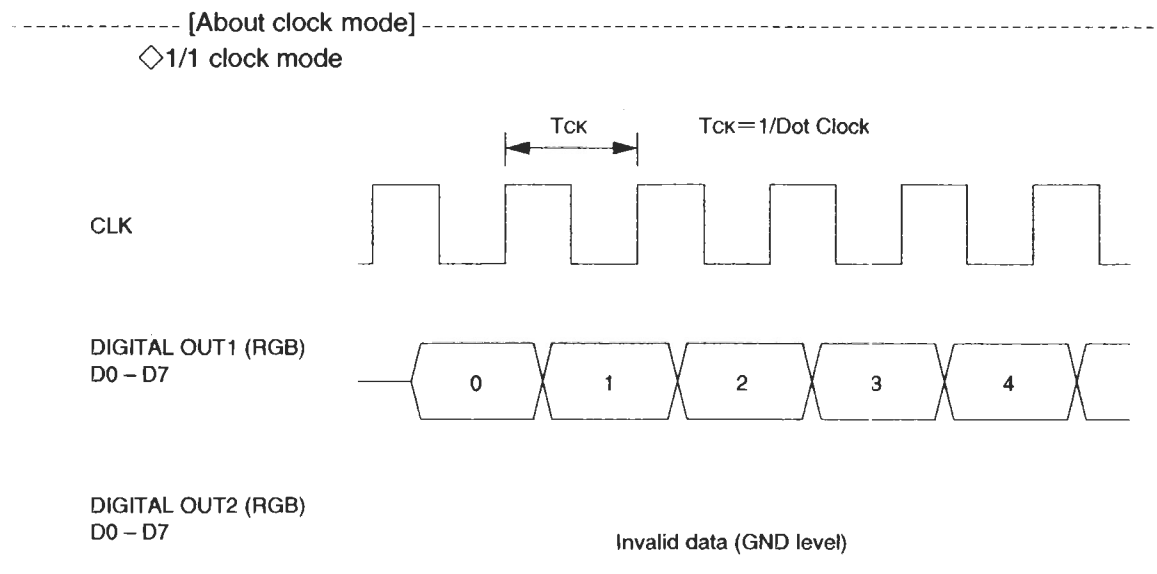
* DIGITAL OUT2 (R7-R0, G7-G0, B7-B0) remains pulled down to GND with resistance of 330 ohms.

Figure 7-28 1/1 clock mode

◇1/2 clock mode

Tck=1/Dot Clock | 2 Tck |

CLK

DIGITAL OUT1 (RGB)
D0 – D7   0   2   4

DIGITAL OUT2 (RGB)
D0 – D7   1   3   5
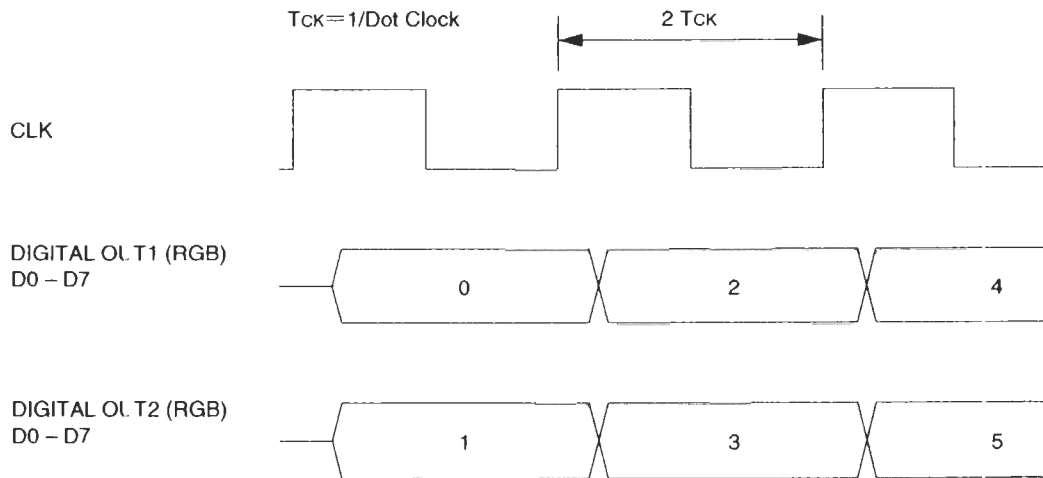
* EVEN data is output to DIGITAL OUT1, while ODD data is output to DIGITAL OUT2.
* The CLK frequency is one-half of the Dot Clock frequency.

Figure 7-29 1/2 clock mode

●Other setting
    (1) CTRL0, CTRL1, CTRL2 <Output Setting Card>-<Digital group>>
       General-purpose control signals. When the checkbox for each of the signals is
       set on, the High signal is output.

7.4   Assigning Output Patterns to PATTERN Buttons

This section describes how to assign output patterns to PATTERN buttons 0 to F.
The LT 1610/1611 contains 26 stock patterns, 14 patterns with parameters, a user
settable special pattern, and a natural color picture pattern (VGA), any of which may
be selected for pattern assignment.

* The contents of each pattern assigned with a PATTERN button are common over all
  addresses.
* Each pattern with parameters or the special pattern must always be assigned to a
  PATTERN button.

●The LT 1610/1611 may display the following four types of patterns:

[Stock patterns]
    • The LT 1610/1611 contains 26 general-purpose stock patterns. No modifications
      can be made to their own original shapes, except that some character-form
      patterns can be specified with characters. They can be registered directly for the
      addresses. For details of individual patterns, see Chapter 8, "Types and Details
      of Patterns".

[Patterns with parameters]
- The LT 1610/1611 contains 14 general-purpose patterns with parameters. Each of they may be assigned to a PATTERN button for use.
  For details of individual patterns, see Chapter 8, "Types and Details of Patterns".

  * <u>To set the parameters of a pattern with parameters, you should use some parameters you set when creating the special pattern. They can be set in the same way as for the special pattern.</u>

[Special pattern]
- The special pattern is a pattern that the user can draw as desired by using all pattern parameters provided on the LT 1610/1611.
- Every pattern code of the special pattern is "A0".
- The special pattern should be assigned to a PATTERN button for use. Different forms can be drawn for separate PATTERN buttons, and a maximum of 16 patterns can be registered.
  (See Section 7.6, "Creating the Special Pattern" for details.)

[Natural color picture pattern]
- The natural color picture pattern is a standard built-in pattern for which colors may be specified dot by dot (pixel by pixel). It is of VGA size (640 by 480) and displayed in 256 colors. (Pattern code = F0)
- * In addition to the preinstalled pattern, you can modify any natural color picture into 256-color bit map data and transferred the resulting image from the PC to the LT 1610/1611 for use. Furthermore, two or more natural picture patterns can be registered in the LT 1610/1611 by installing Backup RAM (factory option) in the unit.
  (See Section 7.7, "Natural Picture Pattern" for details.)

Operating steps:
  ① Click on the "Def Pattern" button in the Signal Card.
  ② The "Def Pattern" dialog appears.
  ③ To which you desire to assign the pattern, click in the text box that lists the PATTERN button number.
  ④ The pattern types are listed.
  ⑤ Select the desired pattern.
  ⑥ If you desire to continue assignment to a PATTERN button, repeat Steps ③ to ⑤.
  ⑦ Click on the "OK" button to complete the assignment.

7.5 Selecting the Output Pattern

7.5.1 Selecting the Output Pattern

The LT 1610/1611 enables you to register an output pattern for each address. You can select this pattern in two ways: specifying a PATTERN button and specifying the pattern type. If you choose the former, you must have assigned the output pattern to that button.

- For the stock and natural picture patterns, you may choose either of the above ways.
- For the patterns with parameters and special patterns, you may select them only by specifying the PATTERN button. If one of them has been assigned to the PATTERN button, the parameters required to draw the pattern must be set as required for the pattern type.

●Specifying the pattern type
Operating procedure:
   ① Select Pattern List of "Output Pattern" in the Signal Card.
   ② Under this list, click in the text box containing a list.
   ③ The pattern types are listed.
   ④ Select the desired pattern.

●Specify the pattern button
Operating procedure:
   ① Select the key in "Output Pattern" in the Signal Card.
   ② Select the desired pattern from "Pattern Keys" 0 to F in the Signal Card.

7.5.2 Setting the Character Parameter

If you desire to display one of the character-form stock patterns (pattern No. 10h, 11h, 20h) assigned to PATTERN keys or the character flashing pattern (pattern No. C5h), you can use DIP SW1-3 to select whether the data registered for a PATTERN button or that registered for an address is to be used as the character parameters (Character, Font Size, Cell Size).
If the data registered for a PATTERN button is selected, the GR-W1 data will be used as the character parameters.
The character parameters to be registered for an address are set under <Signal Card>-<<All Character group>>.

(1) Code
   Use a JIS code.

(2) Font
   Choose "5x7" or "7x9" as the font size.

(3) Cell H, Cell V
   Set the cell size. The maximum size is "Cell H = 128, Cell V = 128".

7.6   Creating a Special Pattern

Because every special pattern is drawn in a window, you must begin the work by specifying the window. A window is an area that displays graphic forms, characters, color bars, and so on. There are two types of windows graphic (GR-W) and color gray (GRAY-W).

* When a special pattern is currently displayed, the INV function does not work.

7.6.1   Drawing a Graphic Window

●About graphic window (GR-W)
　① A GR-W is an area used to display line drawings, characters, and so on.
　② A maximum of 25 GR-Ws are available.
　③ The following patterns can be drawn in a GR-W:
　　　• Crosshatch, dot, resolution
　　　• Circle, ellipse, line, character
　　　• Others (scale, frame, diagonal, center marker, etc.)
　④ The color of line drawings can be selected from 16,770,000 colors by user by means of color palette setting. This setting is enabled address by address. For setting the color of GR-W line drawings, see "Setting GR-W line drawings" in Section 7.3.

●Setting the graphic window
The setting for the GR-W is made using the following procedure, with the "Graphic Windows" dialog displayed:
　① Select "Pattern (P)" from the menu bar.
　② Select [Graphic Window (G)] from the pull-down menu that has appeared.
　③ The "Graphic Window" dialog appears.

　(1)　Pattern No.
　　　Select the desired PATTERN button number using the Shift button.
　　　* The following settings are registered for the PATTERN button with the Bank number being displayed.

　(2)　Window No.
　　　Selects the GR-W number.

　(3)　Window Format
　　　Select the desired window format from the six types.

　(4)　Unit
　　　Select the unit used to set the size of GR-W.
　　　dot:　Allows you to set the size in dots. The origin is at the top right corner.
　　　　　　* If this is selected, the apparent size of GR-W will change when the number of dots will be changed later.
　　　%:　　The top left corner is defined as 0%, while the top right corner is 100%.
　　　　　　* If this is selected, the apparent size of GR-W will remain unchanged even when the number of dots will be changed later.

(5) Start X, Start Y

Enter the starting point of GR-W.

(6) End X, End Y

Enter the ending point of GR-W.

(7) Shadow Width, Shadow Height

If the shadowed window format is selected in Item (3), set the shadow width in dots.

> When reading the next subsequent descriptions, note that, regarding a pattern for which "Unit" can be set, the display on the screen changes as follows in response to switching of the unit:
>
> dot: Allows you to set the size in dots. The origin is at the top left corner.
> * If this is set, the ratio of pattern size to the GR-W size will change when the number of dots will change later.
> %: The top left corner is defined as (X=0%,Y=0%), while the bottom right corner is (X=100%,Y=100%).
> * If this is set, the ratio of pattern size to the GR-W size will remain unchanged even when the number of dots will change later.

●Crosshatch & dot patterns

You need to perform the following steps before you can set the parameters for a crosshatch or dot pattern you desired to display in the GR-W:

① Select [Pattern (P)] from the menu bar.
② Select [Cross&Dot (D)] from the pull-down menu that has appeared.
③ The "Cross&Dot" dialog appears.
④ Select the desired PATTERN button number using the Shift button at the top right corner.

　* The following settings are registered for the PATTERN button with the Bank number being displayed.

⑤ Display the Draw Window Card to select the GR-W(s) in which you desire to draw the pattern.

　* If you select two or more Draw Windows, the same pattern will be drawn in all of them.

　* Any Draw Window you select will be common to the "Cross&Dot", "Scale", and "Marker" patterns.

⑥ With the Unit setting, select the unit of input data.
⑦ Display the Cross&Dot Card.

<<Cross group>>

You set the crosshatching conditions.

(1) Cross H, Cross V

Set the pitch (interval) between horizontal or vertical crosshatch lines.

(2) Line Width H, Line Width V

Set the width of horizontal or vertical crosshatch line.

　* Each of these values are used also as the width of Cross&Dot crosshatch line.
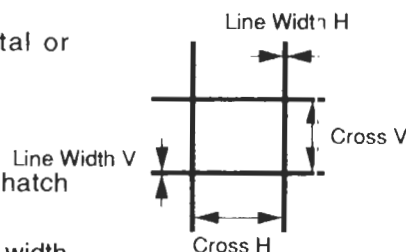
Figure 7-30 Crosshatch

<<Dot group>>
Set the dot conditions and the crosshatch & dot conditions.

(3) Dot H, Dot V
Set the horizontal or vertical pitch (interval distance) between dots.

(4) Dot Width H, Dot Width V
Set the horizontal or vertical dimension of dot.
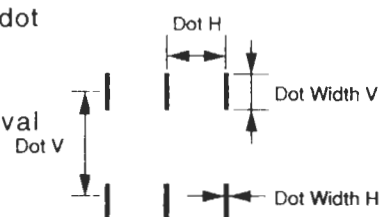
Figure 7-31 Dot

(5) Cross & Dot H, Cross & Dot V
Set pitch (interval distance) between lines and dots n the crosshatch & dot pattern.

●Scale
You need to perform the following steps before you can set the parameters for the scales you desired to display in the GR-W:
① Select [Pattern (P)] from the menu bar.
② Select [Cross&Dot (D)] from the pull-down menu that has appeared.
③ The "Cross&Dot" dialog appears.
④ Select the desired PATTERN button number using the Shift button at the top right corner.
   * The following settings are registered for the PATTERN button with the Bank number being displayed.
⑤ Display the Draw Window Card to select the GR-W(s) in which you desire to draw the pattern.
   * If you select two or more Draw Windows, the same pattern will be drawn in all of them.
   * Any Draw Window you select will be common to the "Cross&Dot", "Scale", and "Marker" patterns.
⑥ With Unit setting, select the unit of input data.
⑦ Display the Scale Card.

(1) Scale Format
Select either of two scale formats.

(2) Scale Pitch H, Scale Pitch V
Set the scale pitch in memory.

(3) Scale Width H, Scale Width V
Set the scale width in memory.
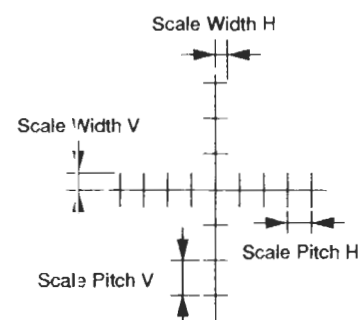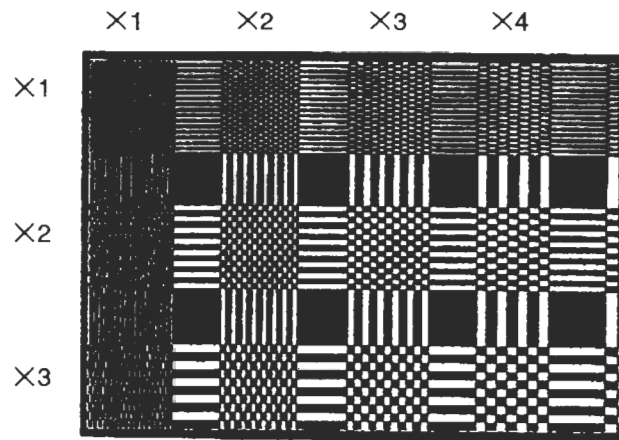
Figure 7-32 Scale

●Marker
You need to perform the following steps before you can set the parameters for the markers you desired to display in the GR-W:
① Select [Pattern (P)] from the menu bar.
② Select [Cross&Dot (D)] from the pull-down menu that has appeared.
③ The "Cross&Dot" dialog appears.
④ Select the desired PATTERN button number using the Shift button at the top right corner.
   * The following settings are registered for the PATTERN button with the Bank number being displayed.

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⑤ Display the Draw Window Card to select the GR-W(s) in which you desire to draw the pattern.
* If you select two or more Draw Windows, the same pattern will be drawn in all of them.
* Any Draw Window you select will be common to the "Cross&Dot", "Scale", and "Marker" patterns.
⑥ With Unit setting, select the unit of input data.
⑦ Display the Marker Card.

(1) Marker Format
Select either of two marker formats.

(2) Marker Point X, Marker Point Y
Set the marker position.

●Frame & diagonal
You need to perform the following steps before you can set the parameters for the frames and diagonals you desired to display in the GR-W:
① Select [Pattern (P)] from the menu bar.
② Select [Cross&Dot (D)] from the pull-down menu that has appeared.
③ The "Cross&Dot" dialog appears.
④ Select the desired PATTERN button number using the Shift button at the top right corner.
* The following settings are registered for the PATTERN button with the Bank number being displayed.
⑤ Display the Frame Card.

(1) Frame
Select the GR-W(s) in which you desire to display frame lines.

(2) Diagonal
Select the GR-W(s) in which you desire to display diagonals.

●Resolution
You need to perform the following steps before you can set the parameters for the resolution patterns you desired to display in the GR-W:
① Select [Pattern (P)] from the menu bar.
② Select [Resolution (S)] from the pull-down menu that has appeared.
③ The "Resolution" dialog appears.
④ Select the desired PATTERN button number using the Shift button at the top right corner.
* The following settings are registered for the PATTERN button with the Bank number being displayed.

(1) Draw Window
Select the GR-W(s) in which you desire to display the resolution patterns.
* If you select two or more Draw Windows, the same pattern will be drawn in all of them.

(2) Resolution Format
Four resolution pattern formats are available. If you select the leftmost one from the graphical listing of all formats, the pattern in Figure 7-33 will be output. You can set the conditions listed in Items (3) to (6) below. For the other formats, stock patterns will be used.

(3) Unit
    Select the unit of input data.

(4) Pitch X, Pitch Y
    Set the thickness of line shown in the "x1 area".

(5) Disp Pitch, Mask Pitch
    Set the display and mask periods. These are common to X and Y.

(6) Start
    Select whether the starting point of display (X direction: left; Y direction: top) is
    Disp or Mask.

Figure 7-33 Resolution

●Circle
    You need to perform the following steps before you can set the parameters for the
    circle patterns you desired to display in the GR-W:
    ① Select [Pattern (P)] from the menu bar.
    ② Select [Circle (C)] from the pull-down menu that has appeared.
    ③ The "Circle parameter" dialog appears.
    ④ Select the desired PATTERN button number using the Shift button at the top
       right corner.
        * The following settings are registered for the PATTERN button with the Bank
          number being displayed.

(1) Draw Window
    Select the GR-W(s) in which you desire to display the circle patterns.
    * If you select two or more Draw Windows, the same pattern will be drawn in all
      of them.

(2) Format
    Five circle pattern formats are available. If you select USER Pattern, the user
    pattern you set in Items (3) to (6) below will be displayed. If you select any of
    the others, the user pattern is overlapped with a preset stock pattern.

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(3) Unit

Select the unit of input data.

(4) Circle No.

A maximum of 16 circle patterns can be drawn. Select the ones you desire to draw.

(5) Center X, Center Y

Set the coordinates of the center of each circle.

(6) Radius

Set the radius of each circle.

●Ellipse

You need to perform the following steps before you can set the parameters for the ellipse patterns you desired to display in the GR-W:

① Select [Pattern (P)] from the menu bar.
② Select [Ellipse (E)] from the pull-down menu that has appeared.
③ The "Ellipse" dialog appears.
④ Select the desired PATTERN button number using the Shift button at the top right corner.
   * The following settings are registered for the PATTERN button with the Bank number being displayed.

(1) Draw Window

Select the GR-W(s) in which you desire to display the ellipse patterns.

* If you select two or more Draw Windows, the same pattern will be drawn in all of them.

(2) Unit

Select the unit of input data.

(3) Ellipse No.

A maximum of 16 ellipse patterns can be drawn. Select the ones you desire to draw.

(4) Center X, Center Y

Set the coordinates of the center of each circle.

(5) DX

Set the distance from the center of ellipse to the maximum X point.

(6) DX

Set the distance from the center of ellipse to the maximum Y point.

●Line

You need to perform the following steps before you can set the parameters for the straightforward line patterns you desired to display in the GR-W:

① Select [Pattern (P)] from the menu bar.
② Select [Ellipse (L)] from the pull-down menu that has appeared.
③ The "Line" dialog appears.

④ Select the desired PATTERN button number using the Shift button at the top right corner.

* The following settings are registered for the PATTERN button with the Bank number being displayed.

(1) Draw Window

Select the GR-W(s) in which you desire to display the line patterns.

* If you select two or more Draw Windows, the same pattern will be drawn in all of them.

(2) Unit

Select the unit of input data.

(3) Line No.

A maximum of 16 line patterns can be drawn. Select the ones you desire to draw.

(4) Start X, Start Y

Set the coordinates of the starting point of each line.

(5) End X, End Y

Set the coordinates of the ending point of each line.

● Character

You need to perform the following steps before you can set the parameters for the character patterns you desired to display in the GR-W:

① Select [Pattern (P)] from the menu bar.

② Select [Character (I)] from the pull-down menu that has appeared.

③ The "Character" dialog appears.

④ Select the desired PATTERN button number using the Shift button at the top right corner.

* The following settings are registered for the PATTERN button with the Bank number being displayed.

(1) Draw Window

Select the GR-W(s) in which you desire to display the character patterns.

* Separate characters can be displayed in different 25 GR-Ws.

(2) Character

Use JIS code characters for setting. The characters set here will be displayed on the entire area or part of the screen if you select all characters or character patterns during Format setting in Item (5).

(3) Font Size

Select either of two font sizes: "5x7" and "7x9".

(4) Cell Size H, Cell Size V

Set the cell size. The maximum size is "Cell Size H=128, Cell Size V=128".

(5) Format
Set the character display format. Four display formats are available:
- Character list   • Character pattern
- All-character pattern   • USER STRINGS (user-created character list)

Remarks:
If you desire to display a stock pattern (pattern No. 10h, 11h, 20h) or the character flashing pattern (pattern No. C5h) assigned to a PATTERN button, you can select data registered for the PATTERN button or that registered for the address as the character parameters (Character, Font Size, Cell Size). Use the panel DIP SW1-3 in this case.
If you select the data registered for the PATTERN button, the data for GR-W1 will be used as the character parameters.

●User strings
You can create the character list in the GR-W, as desired. You need to perform the following steps before you can edit the strings:
① Select [Edit (E)] from the menu bar.
② Select [String (S)] from the pull-down menu that has appeared.
③ The "String Edit " dialog appears.

Editing procedure:
(1) The previously set character list is displayed in the "String Edit" dialog.
(2) Create the character list through the keyboard.
- A maximum of 2048 JIS code characters can be set. No kanji characters can be set.

    * The font size must conform to the size that is set in "Characters".
    * The character list you set is displayed when Format is set to "USER STRINGS" in "Characters".

●User character
[Editing a user character]
You edit a user character displayed in the GR-W. You need to perform the following steps before you can edit the character:
① Select [Edit (E)] from the menu bar.
② Select [Edit Character (U)] from the pull-down menu that has appeared.
③ The "User Character Edit" window appears.

Editing procedure:
(1) Select one of the following font sizes:
- 32x32   • 64x64   • 128x128

(2) Edit characters displayed can be scaled. Select the scaling factor at which you can easily edit them.

(3)　To edit a character based on a previously created user character
　　① Select [File (F)] from the menu bar.
　　② Select [Read (O)] from the pull-down menu that has appeared.
　　③ The "Open File" dialog appears.
　　④ Select the "*.chr" file you desire to edit, and recall the edit character.

(4)　Edit the user character. With the mouse cursor in a mesh on the font board, click the left mouse-button to turn on the dot or right mouse-button to turn off the dot.

(5)　To delete all contents from the font board
　　① Select [Edit (E)] from the menu bar.
　　② Select [Clear (C)] to clear the contents of font board.

(6)　To save the user character
　　① Select [File (F)] from the menu bar.
　　② Select [Write (W)] from the pull-down menu that has appeared.
　　③ The "Name and Save File" dialog appears.
　　④ Enter file name "*.chr". Then, click on the "OK" button to save the file.

[Registering the user character code]
　　To display the edited user character, you need to perform the following steps before you can register it for the edited user character:
　　① Select [Edit (E)] from the menu bar.
　　② Select [Define User Character (D)] from the pull-down menu that has appeared.
　　③ The "User Character" window appears.

Rules for registering a user character
(1)　The font size of a user character registered vary with the character code, as follows. Pay attention to this when registering a character.

Character code	Font size
00 to 0Fh	32 x 32
10 to 17h	64 x 64
18 to 19h	128 x 128

(2)　Select the character code number using the Shift button.

(3)　The "User Character" window appears.

(4)　To register a user character for a character code.
　　① Click on the File button.
　　② The "Open File" dialog appears.
　　③ Enter file name "*.chr". Then, click on the "OK" button to save the file.

7.6.2 Drawing Color Gray Windows

●Abc ut color gray windows (COL-GRAY-W)

① Each COL-GRAY-W contains two areas of COLOR-WINDOW and FLAT-FIELD.
  ∗ If COLOR-WINDOW is set, the INV function will not work.

② FLAT-FIELD is the back area on the screen, and set in the whole display area. The colors can be set address by address. For setting the FLAT_FIELD colors, see "Setting the FLAT_FIELD colors" in Section 7.3.

③ COLOR-WINDOW sets the color data display area. A maximum of eight windows can be displayed unless different colors are used in partitions within each window. If different colors are used for horizontal or vertical partitions in a window like a color bar, only one window can be displayed.
  ∗ If different colors are used for partitions in a window, the number of partitions is restricted as follows, assuming that H direction = M and V direction = N:
  M :$M \leq 16$
  N :$N \leq 16$

④ For the color specification, you can select 256 colors from 16,770,000 colors, as desired, by setting the color palette.

FLAT FIELD
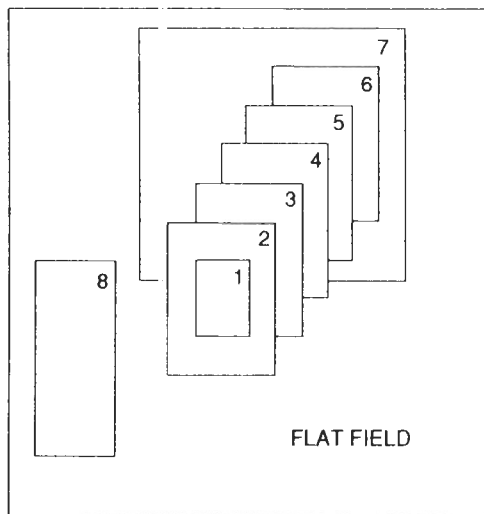
A maximum of eight COLOR-WINDOWS available.

Figure 7-34
Example in which each window is not divided by color

FLAT FIELD
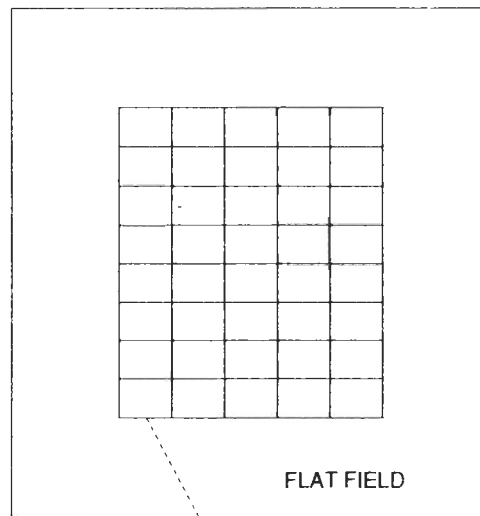
One COLOR-WINDOW avalable.

Figure 7-35
Example in which each window is divided by color

Operating procedure:

Wher setting the COLOR-WINDOW conditions, use the following procedure while the "Colo Gray Window" dialog is left displayed:

① Select [Pattern (P)] from the menu bar.

② Select [Color Gray Window (W)] from the pull-down menu that has appeared.

③ The "Color Gray Window" dialog appears.

(1) Pattern No.

Select the desired PATTERN button number using the Shift button.

* The following settings are registered for the PATTERN button with the Bank number being displayed.

(2) Window No.

Select the COLOR-WINDOW number. Note that, if you set 2 or a larger value for Partition X and/or Y, the COLOR-WINDOW number will always be set to 1, with the selection disabled.

[Setting COLOR-WINDOW]

(3) Start X, Start Y

Enter the coordinates of the COLOR-WINDOW starting point.

(4) END X, END Y

Enter the coordinates of the COLOR-WINDOW ending point.

(5) Color

Select the color of each of the COLOR-WINDOW 2 to 8 windows by setting the color palette number.

[Setting the COLOR-WINDOW color layout]

(6) Partition X, Partition Y

Set the number of partitions in each of the X and Y directions.

* If you set color partitioning within COLOR-WINDOW, only the window with No. 1 can be set.

(7) Start Color

Set the character pattern number that is fit in the top right partition on the window set in Item (6).

* If you set two or more windows, set the color of window number 1 by specifying the character pattern number.

(8) Stop Color

Set the character pattern number that is fit in the bottom right partition on the window set in Item (6).

(9) Step

Set the number of steps of the character pattern number that is fit in the partition set in Item (6).

Example: Partition X=8, Partition Y=2, Start Color=1, Stop Color=10, Step=2

1	3	5	7	9	0	2	4
6	8	10	1	3	5	7	9

* Each digit represents the character pattern number.
* The frame drawn by thick lines indicates the COLOR-WINDOW area.

Figure 7-36 Color window

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7.6.3 Color Palette

- Color palette setting enables you to generate the colors you desire to use for a special pattern in COLOR-WINDOW.
- The character pattern can be set separately for different PATTERN buttons.
- The character pattern can be set at 256 levels by combination of three primary colors (i.e., R, G, and B). You can select the desired colors from combination of 16,770,000 colors.
  * For analog RGB output, the level set here is a relative value. The output voltage is determined by the Video Level in Section 7.3.1, "Setting the analog output". When Video Level = 0.7 V, you will set 0.7 V with a resolution of 256.
- You can set a maximum of 256 character patterns, assigning them numbers 0 to 255.
- The LT 1610 is equipped with both analog and digital output. The character patterns are common to them.
  * For setting the GR-W line drawing and FLAT_FIELD colors, see "Setting the GR-W color" and "Setting the FLAT_FIELD color" in Section 7.3.

● Creating the character pattern color
  You need to perform the following steps before you can select and, as desired, generate individual colors of a character pattern.
  ① Select [Edit (E)] from the menu bar.
  ② Select [Color Palette (S)] from the pull-down menu that has appeared.
  ③ The "Color Palette Edit" dialog appears.

Editing procedure:
(1) Pattern No.
  Select the PATTERN button number for which you desire to edit the character pattern. Details of the currently registered character patterns are listed.

(2) Select the type of color using the "Select Default Color" button. Then, click on the "Default" button to initialize the character pattern.

(3) Click on the line of the palette you desire to edit in the character pattern.

(4) Click the "Edit" button to display the "Set Color" dialog. The color of the line of the palette you selected in Step (3) is displayed in "Generated Color (C)".

(5) To select the palette you desire to edit, click on the desired palette in 'Created Color (C)". The color display in "Color|Pure Color (O)" will be used for the palette.

(6) You have three options to generate a color:
  ① Selecting the color from the "Elementary Color (B)".
  ② Entering the values in the "Hue (E)", "Vividness (S), Brightness (L), Red (R), Green (G), and Blue (B) text boxes.
  ③ Use the gradation and level bar for setting.

(7)   Click on the "Add Color (<u>A</u>)" button to add the color to the palette you selected in Step (5).

(8)   Click on the "OK" button to update the character pattern.

7.7   Natural Picture Pattern

●About natural picture pattern

The natural picture pattern is a pattern for which color setting is enabled pixel by pixel by using an eight-plane frame memory. Eight-bit data (256 colors) in bit map form is transferred from the PC to the LT 1610/1611 through RS-232C interface and displayed there. The display dot size is 2048 by 1024 at the maximum. For data smaller than this size, the top left corner is used as the reference. The display mode may be either direct or backup. To use the backup mode, Backup RAM (factory option) must be installed in the instrument.

The preinstalled natural picture is of VGA size (640 by 480). It is registered in the system memory (E-PROM); during display output, the natural picture data is DMA-transferred to WORK RAM for drawing.

(1)   Direct mode
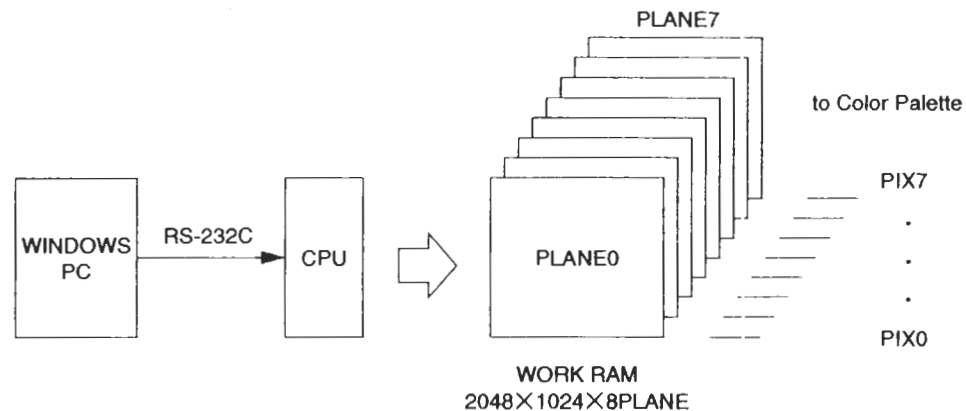
Figure 7-37 Direct mode

• This mode does not work in rapid drawing mode.
• This mode is available regardless of the program address. Note that changes in the program address and pattern cause the natural picture data to be cleared.

●Transferring the natural picture data

Operating procedure:

① Launch the "Picture Transfer" program.
② The "Leader 1610 Bitmap Viewer" window appears.
③ Click on "File (F)" in the menu bar, and select "Comm Port (<u>C</u>) from the pull-down menu.

④ The "Comm Setting" dialog appears. Select the communication port and communication speed.
   * Set the communication port as required for your PC.
   * For the communication speed, make the baud rate match that of the panel DIP SW in the LT 1610/1611.
⑤ Click the "Open File" button in the toolbar to display the dialog that lets you select the bmp file.
⑥ After selecting the bmp file, click on the "OK" button to complete the entry.
⑦ Click on the "Transfer" button in the toolbar to transfer the bmp file to the LT 1610/1611.

(2) Backup mode (Backup RAM is a factory option)
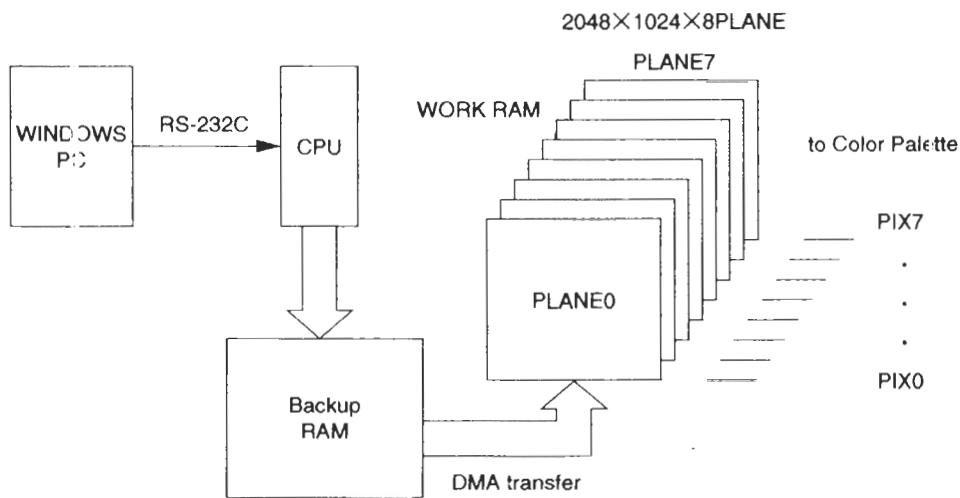
Figure 7-38 Backup mode

• This mode does not work in rapid drawing mode.
• Changes in the program address and pattern do not cause the natural picture data to be cleared. During display output, the natural picture data is DMA-transferred to WORK RAM for drawing.
• A maximum of six patterns in VGA size can be registered. If the number of display dots (H x V) is small, a maximum of 14 patterns can be registered.
   * Refer to the "Instructions Manual" (option) for operations you need to register a natural picture in Backup RAM.

8. TYPES AND DETAILS OF PATTERNS

8.1 Pattern Types

Table 8-1A Patterns

Pattern NO.	Patterns title
00h	Character list 0
01h	Character list 1
02h	Character list 2 （color）
10h	All character Pattern 0
11h	All character Pattern 1
20h	Character Pattern 0
30h	Color Bar 0 (H)
31h	Color Bar 1 (V)
32h	Color Bar 2 (Reverse · Color Bar)
33h	Color Bar 3 (Intensty · Color Bar)
34h	Color Bar 4 (Multiple Color Bar)
40h	Cross hatch 0
41h*	Cross hatch 1
42h*	Cross hatch 2
50h	Dot · Pattern 0
51h*	Dot · Pattern 1
60h	Circle Pattern 0
61h*	Circle Pattern 1
62h*	Circle Pattern 2
70h	Window 0
71h	Window 1 (With Cross hatch)
72h	Window 2 (Nine Windows)
73h*	Window 3 (Universal Window 1)
74h*	Window 4 (Universal Window 2)
80h	Gray Scale 0 (H)
81h	Gray Scale 1 (V)
82h	Gray Scale 2 (Reverse Gray Scale)
83h	Gray Scale 3 (Gray/Raster)
84h	Gray Scale 4 (Color/Gray)
90h*	Overlay Pattern 0
91h*	Overlay Pattern 1

Table 8-1B Patterns

Pattern No.	Pattern title
A0h*	Special Pattern
B0h	SMPTE RP-133
B1h	Fills a closed Scroll
B2h	Lamp H
B3h	Lamp V
C2h*	Window · Scroll
C3h*	Character · Scroll
C4h*	Window · Flushing
C5h*	Character · Flushing
F0h	Natural-Color Picture With ROM 640 (H) ×480 (V)
F1h	Natural-Color Picture OPTION
F2h	Natural-Color Picture OPTION
F3h	Natural-Color Picture OPTION
F4h	Natural-Color Picture OPTION
F5h	Natural-Color Picture OPTION
F6h	Natural-Color Picture OPTION
F7h	Natural-Color Picture OPTION
F8h	Natural-Color Picture OPTION
F9h	Natural-Color Picture OPTION
FAh	Natural-Color Picture OPTION
FBh	Natural-Color Picture OPTION
FCh	Natural-Color Picture OPTION
FDh	Natural-Color Picture OPTION
FEh	Natural-Color Picture OPTION

* Each asterisk (*) in the "Pattern No." column indicates that the parameters must be set for the pattern.

* When displaying a stock pattern with pattern No. 10h, 11h, or 20h, you can specify a character by setting the character parameters (Character Code, Font Size, Cell Size).

* When displaying a stock pattern No. 42h or 62h, you can specify a user-defined character by registering the user character (Character Code No.: 08h-0Fh).

* You can draw the pattern with pattern No. "A0h" (i.e., special pattern) of the patterns marked with an asterisk, as desired, by using all setting parameters. For the other patterns, certain parameters should only be set.

8.2 Description of Patterns

(1) Pattern No.: 00h   Character list 0

The user-defined character fonts and the preinstalled character fonts are displayed in the descending order of character codes.

With the INV button, you can reverse the character black/white display.

[Set parameters]
- ●Registering the user character
  - • Character Code NO. : 00h～19h
  - • Cell H/V

```
Character list
```

(2) Pattern No.: 01h   Character list 1

The pattern displayed is an overlapped image of the effective screen frame and the character list of pattern number 00h.

With the INV button, you can reverse the character black/white display.

```
Character list
```

↑
└── Effective screen frame
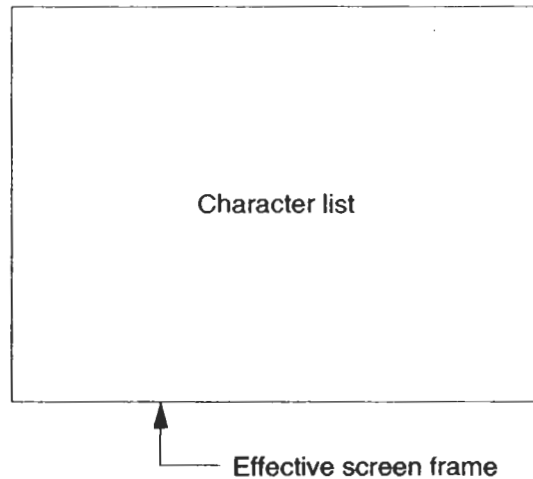
(3)   Pattern No.: 02h   Character list 2 (Color character list)

The color character list is displayed. Each time the number of display characters reaches 256, the character color changes cyclically in the following order: white, yellow, cyan, green, magenta, red, and blue.

With the INV button, you can reverse the character black/white display.

```
+-------------------------------------------+
|                                           |
|                                           |
|                                           |
|                                           |
|                                           |
|             Color character list          |
|                                           |
|                                           |
|                                           |
|                                           |
|                                           |
+-------------------------------------------+
```

(4)   Pattern No.: 10h   All-character pattern 0

The characters specified with the character code are displayed in the whole area of the screen.

With the INV button, you can reverse the character black/white display.

[Set parameters]

●Setting the character parameters

• Code • Font • Cell H/V

```
+-------------------------------------------+
|                                           |
|                                           |
|                                           |
|                                           |
|                                           |
|            All character Pattern          |
|                                           |
|                                           |
|                                           |
|                                           |
|                                           |
+-------------------------------------------+
```

(5)   Pattern No.: 11h   All-character pattern 1
The pattern displayed is an overlapped image of the effective screen frame and an all-character pattern of pattern number 10h. The color of the characters and frame is white.

[Set parameters]
●Setting the character parameters
 •Code •Font •Cell H/V

All character pattern

Effective screen frame
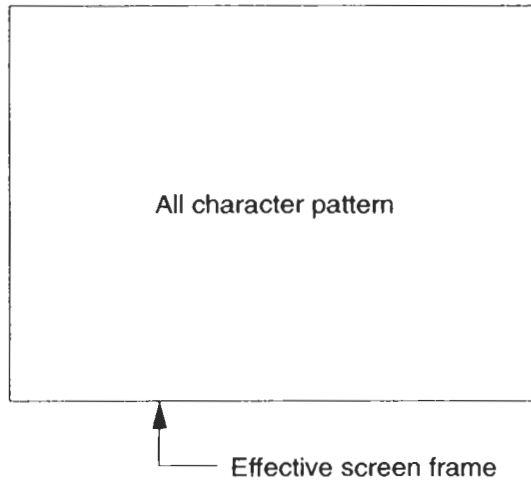
(6)   Pattern No.: 20h   Character pattern 0
The character pattern is displayed as shown below. You can select any character outside the frame by using the character code.
With the INV button, you can reverse the character black/white display.

[Set parameters]
●Setting the character parameters
 •Code •Font •Cell H/V

2 lines

ABC – – – – – ZABC – – – – – – –
ABC – – – –

5 lines   5 lines

2 to 3 lines
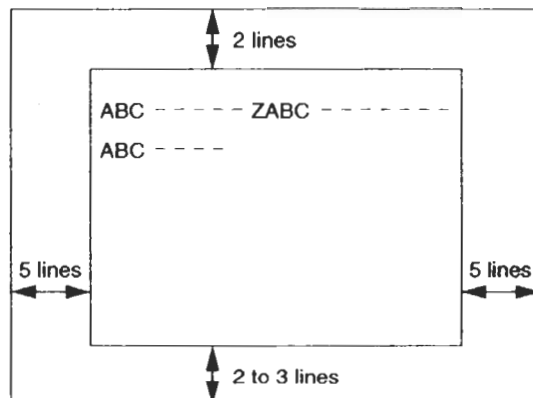
(7) Pattern No.: 30h   Color bar 0 (Color bar H)
Eight different colors, including white and black, are arranged horizontally to constitute a color bar pattern. They are placed in the following order: white, yellow, cyan, green, magenta, red, blue, and black (from left to right).

White | Yellow | Cyan | Green | Magenta | Red | Blue | Black

REMAINDER PORTIONS
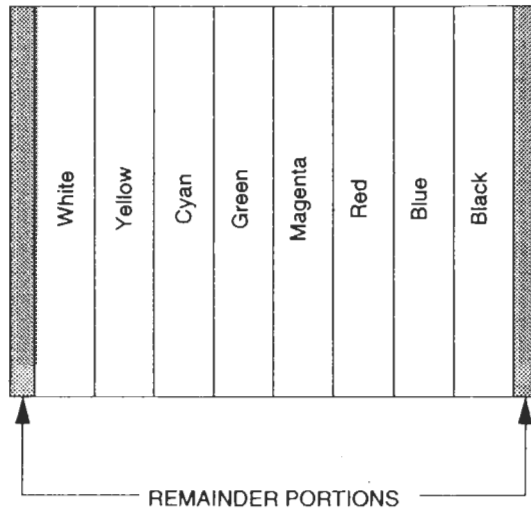
(8) Pattern No.: 31h   Color bar 1 (Color bar V)
Eight different colors, including white and black, are arranged vertically to constitute a color bar pattern. They are placed in the following order: white, yellow, cyan, green, magenta, red, blue, and black (from top to bottom).

White
Yellow
Cyan
Green
Magenta
Red
Blue
Black

REMAINDER PORTIONS
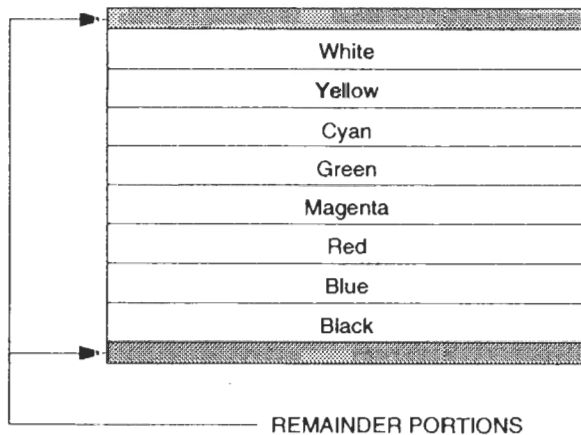
(9) Pattern No.: 32h   Color bar 2 (Reverse color bar)

Two pairs of color bar patterns each consisting of eight colors are placed in two rows array (upper and lower). They are reversed in terms of the order of colors.

White	Yellow	Cyan	Green	Magenta	Red	Blue	Black
Black	Blue	Red	Magenta	Green	Cyan	Yellow	White

(10) Pattern No.: 33h   Color bar 3 (Intensity color bar)

A 16-color bar pattern is displayed. The colors are placed in the following order: white, yellow, cyan, green, magenta, red, blue, and black (from left to right). More intensity is applied to the lower array. For analog video output, an eight-color bar pattern is generated.

* For the LT 1610/1611, the same pattern as pattern number 30h is displayed.

White	Yellow	Cyan	Green	Magenta	Red	Blue	Black
I White	I Yellow	I Cyan	I Green	I Magenta	I Red	I Blue	I Gray

I: Intensity

(11) Pattern No.: 34h   Color bar 4 (Multi color bar)

The multi color bar pattern is displayed. It is an overlapped image that consists of an eight-color bar pattern (extended vertically) and a gray scale pattern (decremented rightward).

With the INV button, you can reverse the order of the colors in the bar and the orientation of gray scale.

| White |
| Yellow |
| Cyan |
| Green |
| Magenta |
| Red |
| Blue |
| Black |
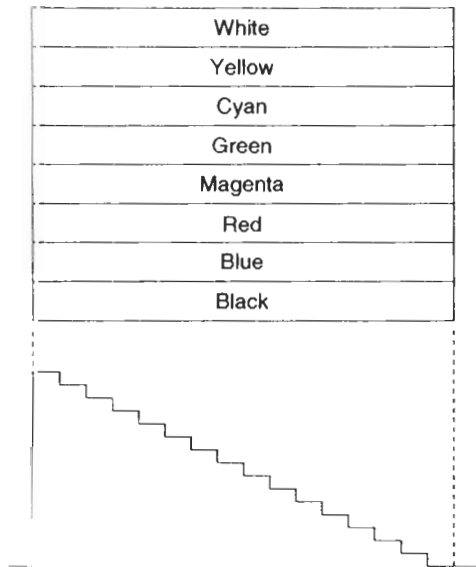
(12) Pattern No.: 40h   Crosshatch 0

A crosshatch pattern containing 17 horizontal and 13 vertical lines is displayed. With the INV button, you can reverse the black/white display on the screen.
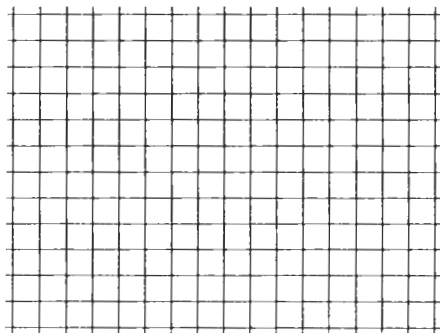
(13) Pattern No.: 41h   Crosshatch 1
    Displayed is an overlapped pattern that consists of a programmable crosshatch,
    the effective screen area, and a pattern displaying the white marker in any
    position. The lines of the crosshatch pattern are always allocated at set
    intervals, beginning in the center of the screen, toward the left and right or
    toward the top and bottom.
    With the INV button, you can reverse the black/white display on the screen.

    [Set parameters]
      ●Crosshatch
   • Cross H/V
      ●Markers
       • Marker Format   • Marker Point X/Y
      ●Frame
       • Draw Window
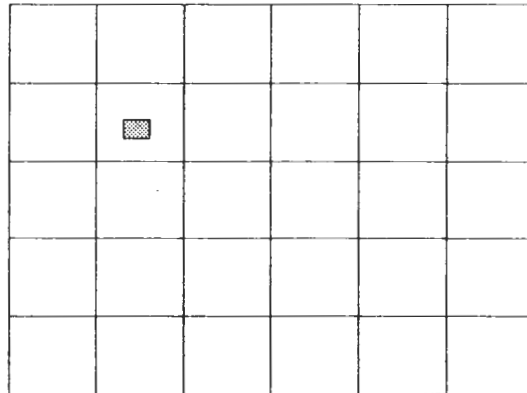
(14) Pattern No.: 42h   Crosshatch 2

Displayed is an overlapped pattern that consists of a programmable crosshatch, the effective screen area, and a corner marker pattern displaying eight user-defined characters at the top left corner on the screen.

[Set parameters]

●Crosshatch
• Cross H/V
●Registering user characters
• Character Code No.: 008h-0Fh
●Character cell size
• Cell H/V
●Frame
• Draw Window

1610 1611			
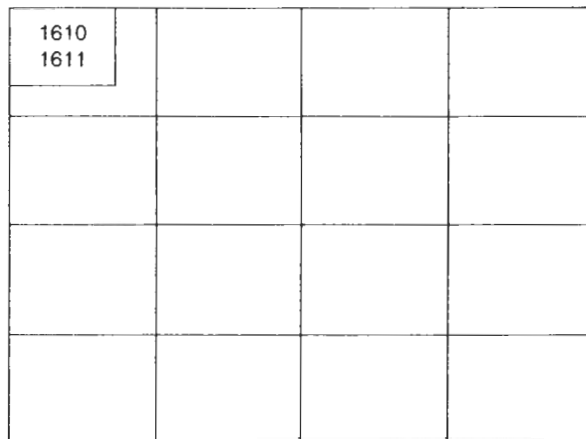
For user-defined characters, eight characters of character codes 08h to 0Fh are displayed as follows. The font size of each user-defined character is 32 by 32 dots.

• When character cells each consisting of 32 by 32 dots are set:

* The character cell and character font sizes are identical.

	128 dot			
32 dot	08h	09h	0Ah	0Bh
32 dot	0Ch	0Dh	0Eh	0Fh

32 dot
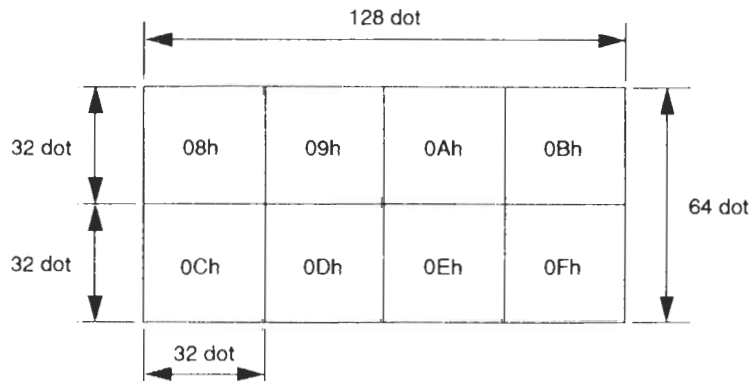
64 dot

• When character cells each consisting of 64 by 64 dots are set:

* The character cell is larger the character font.
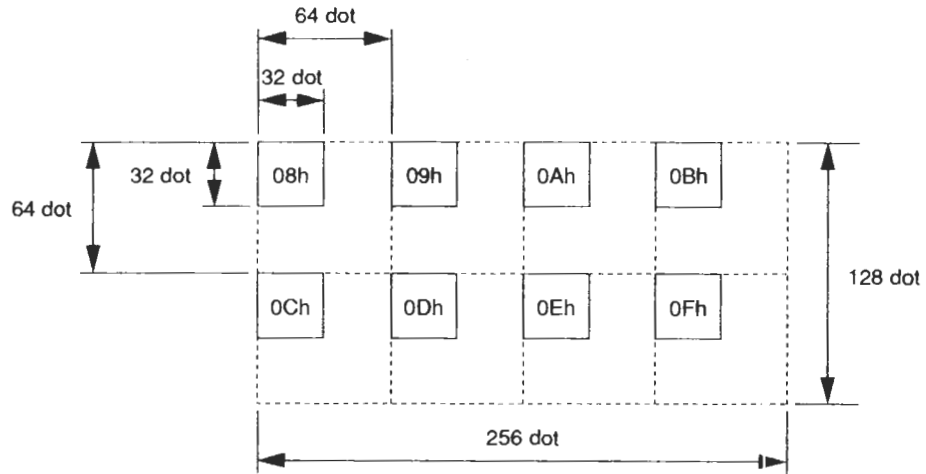
(15) Pattern No.: 50h   Dot pattern 0

Displayed is a dot pattern that consists of 17 (vertical) by 13 (horizontal) white dots.

With the INV button, you can reverse the black/white display on the screen.
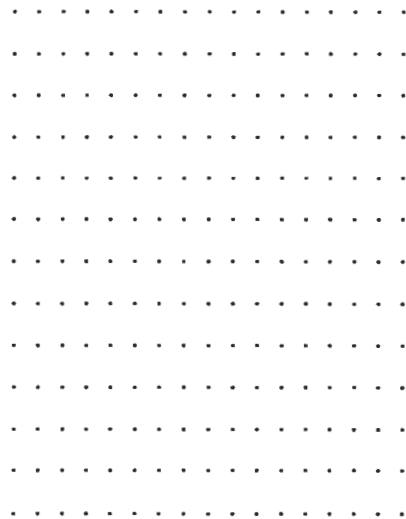
(16) Pattern No.: 51h   Dot pattern 1

Displayed is an overlapped pattern that consists of a programmable dot pattern and a pattern displaying the marker. These dots are always allocated at set intervals, beginning in the center of the screen, toward the left and right or toward the top and bottom.

With the INV button, you can reverse the black/white display on the screen.

[Set parameters]
- ●Dot
  - • Dot H/V
- ●Marker
  - • Marker Format • Marker Point X/Y

(17) Pattern No.: 60h   Circle pattern 0

An overlapped pattern consisting of the following is displayed: • Crosshatch pattern of 17 vertical and 13 horizontal lines • Effective screen frame • Concentric circles Center: H/2, V/2 Radius: V/6, V/3, V/2, H/2 from the center of circle • Circles with a radius of V/6 (at the four corners) Perfect circles are generated only when the dot aspect ratio is 1:1. This rule applies to all circle patterns.

With the INV button, you can reverse the black/white display on the screen.
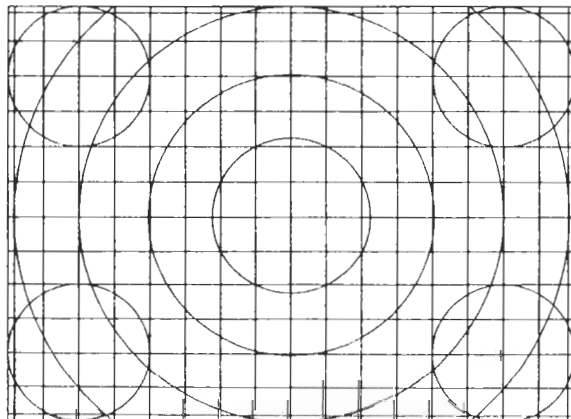
(18) Pattern No.: 61h   Circle pattern 1

An overlapped pattern consisting of the following is displayed over the effective screen frame and a pattern displaying the white marker in any position: • Programmable crosshatch pattern • Concentric circles Center: H/2, V/2 Radius: V/6, V/3, V/2, H/2 from the center of circle - Circles with a radius of V/6 (at the four corners) The lines of this crosshatch pattern are always allocated at set intervals, beginning in the center of the screen, toward the left and right or toward the top and bottom.

With the INV button, you can reverse the black/white display on the screen.

[Set parameters]
- ●Crosshatch
  - • Cross H/V
- ●Marker
  - • Marker Format   • Marker Point X/Y
- ●Frame
  - • Draw Window
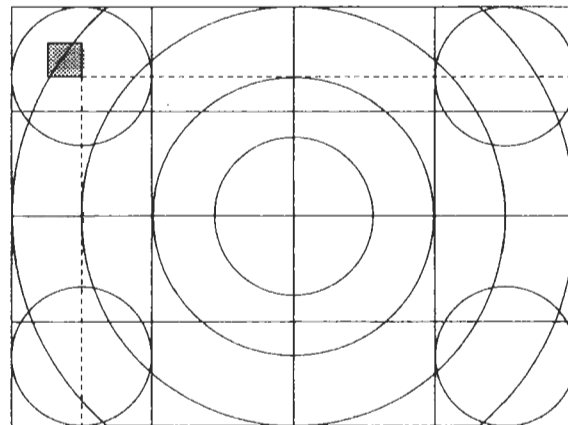
Effective screen frame

(19) Pattern No.: 62h   Circle pattern 2

An overlapped pattern consisting of the following is displayed over the effective screen frame: • Corner marker pattern displaying eight-character user-defined characters • Programmable crosshatch pattern • Circle pattern Center: H/2, V/2 Radius: 5V/12, 5H/12 from the center (smaller one of H of V)

The lines of this crosshatch pattern are always allocated at set intervals, beginning in the center of the screen, toward the left and right or toward the top and bottom.

With the INV button, you can reverse the black/white display on the screen.

[Set parameters]
● Crosshatch
 • Cross H/V
● Registering user characters
 • Character Code No.: 08h-0Fh
● Character cell size
 • Cell H/V
● Frame
 • Draw Window
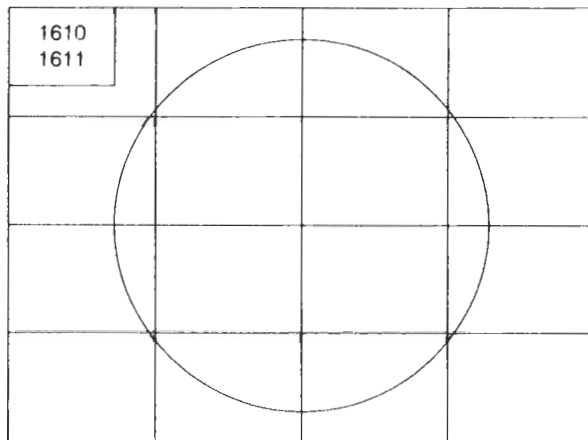
Eight characters of 08h to 0Fh are displayed as user-defined characters as below. The font size of each user-defined character is 32 by 32 dots.

• When character cells each consisting of 32 by 32 dots are set:

* The character cell and character font sizes are identical.

	128 dot		
08h	09h	0Ah	0Bh
0Ch	0Dh	0Eh	0Fh

32 dot · 32 dot · 64 dot · 32 dot

• When character cells each consisting of 64 by 64 dots are set:

* The character cell is larger the character font.

64 dot	32 dot			
08h	09h	0Ah	0Bh
0Ch	0Dh	0Eh	0Fh
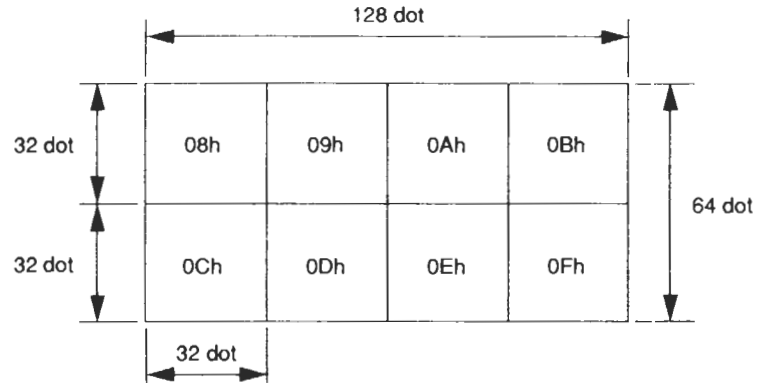
64 dot · 32 dot · 128 dot · 256 dot
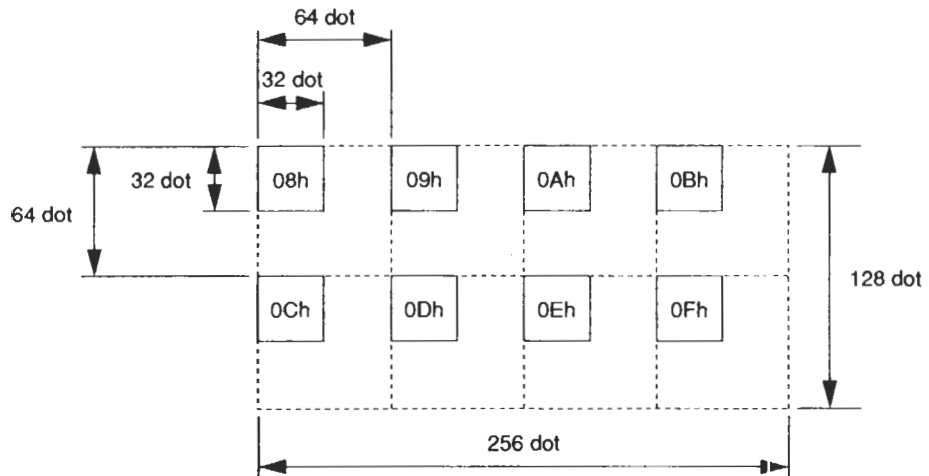
(20) Pattern No.: 70h Window 0

The white window shown below is displayed at the center of the screen.

With the INV button, you can reverse the black/white display on the screen.
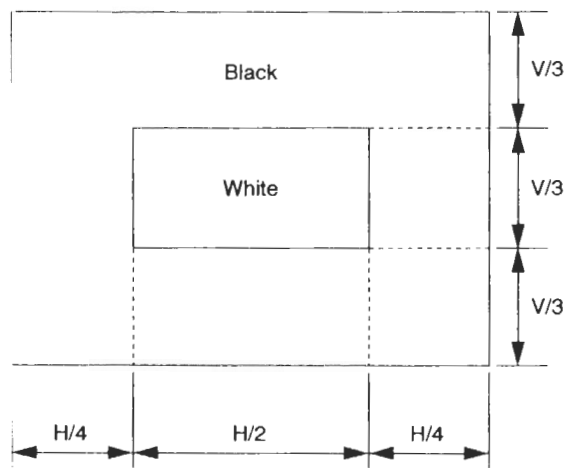
(21) Pattern No.: 71h   Window 1

Displayed is an overlapped pattern that consists of pattern number 70h and the crosshatch pattern shown below.

With the INV button, you can reverse the black/white display on the screen.
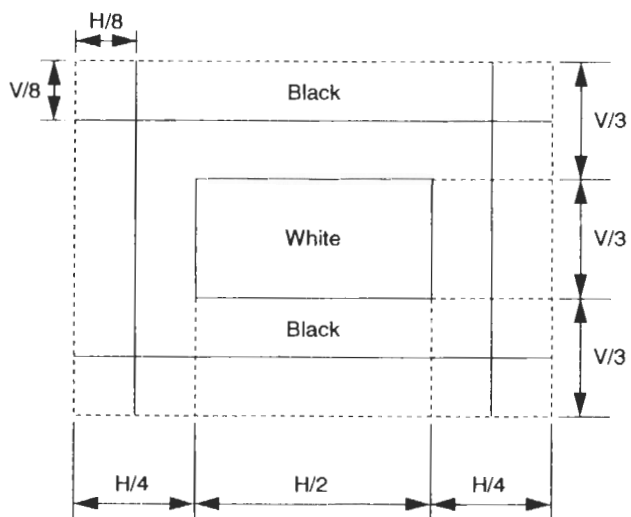
(22) Pattern No.: 72h   Window (Nine-window)

A nine-window pattern as shown below is displayed.

With the INV button, you can reverse the black/white display on the screen.

$a=V/5$
$b=H/5$
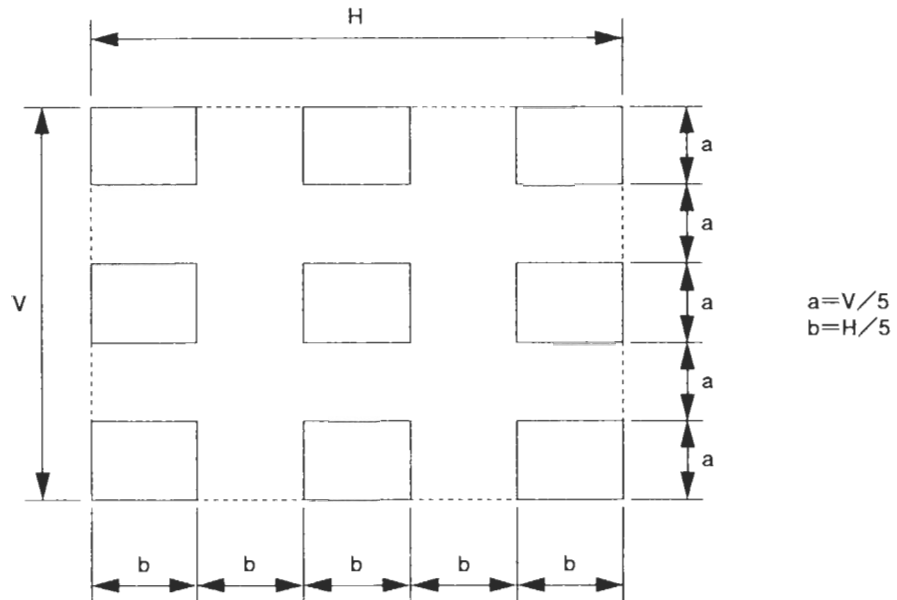
(23) Pattern No.: 73h   Window 3 (Universal window 1)

With this pattern, you can draw a maximum four white windows in any size in any positions. If white windows overlap, the overlapping sections are displayed in black. Windows 1 to 4 you have set in Section 7.6.1, "Drawing a graphic window" are displayed.

With the INV button, you can reverse the black/white display on the screen.

[Set parameters]
● Setting the graphic window
  • Start X/Y • End X/Y (GR-W No.: 1-4)
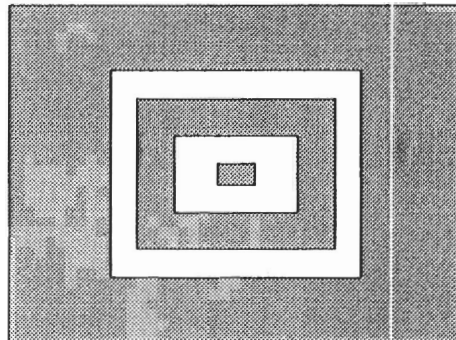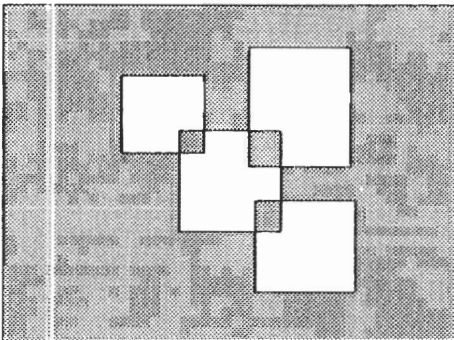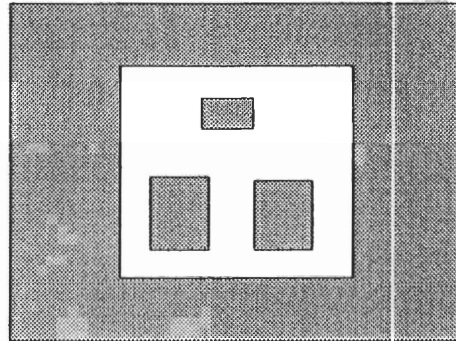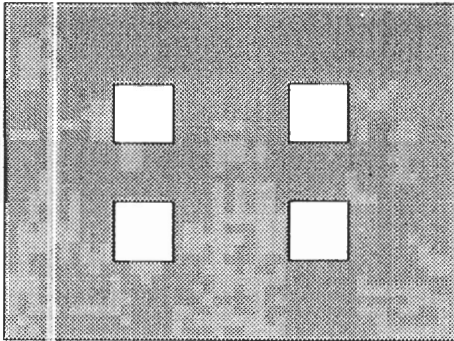
(24) Pattern No.: 74h   Window 4 (Universal window 2)

With this pattern, you can draw a maximum of white windows in any size in any positions. If white windows overlap, the overlapping sections are displayed in black. Windows 1 to 16 you have set in Section 7.6.1, "Drawing a graphic window" are be displayed.

With the INV button, you can reverse the black/white display on the screen.

[Set parameters]
●Setting the graphic window
 • Start X/Y • End X/Y (GR-W No.: 1-16)
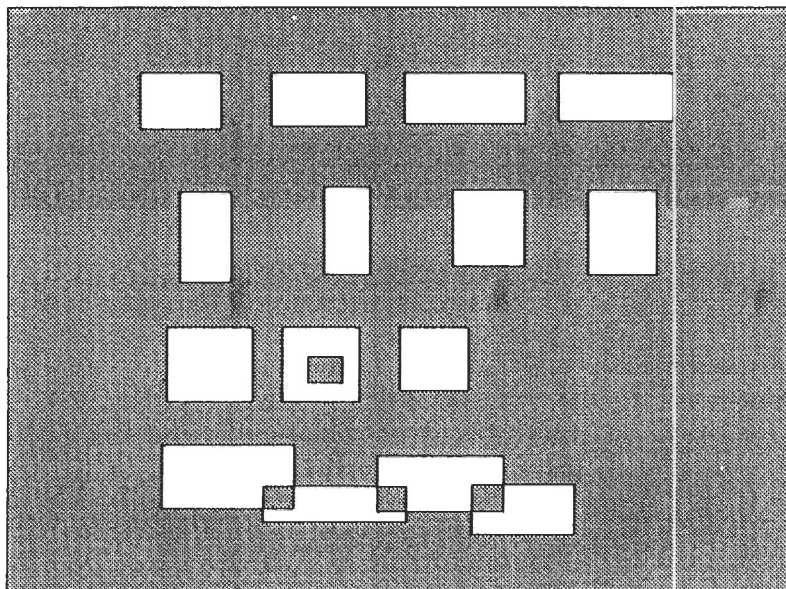
(25) Pattern No.: 80h   Gray scale 0 (Gray scale H)

A gray scale showing 16 gradations is horizontally displayed. Assigning value 1 to white, the gradation is decremented rightward beginning with 15/15, up to 0/15 (a total of 16 steps).

With the INV button, you can reverse the left and right of the gray scale.
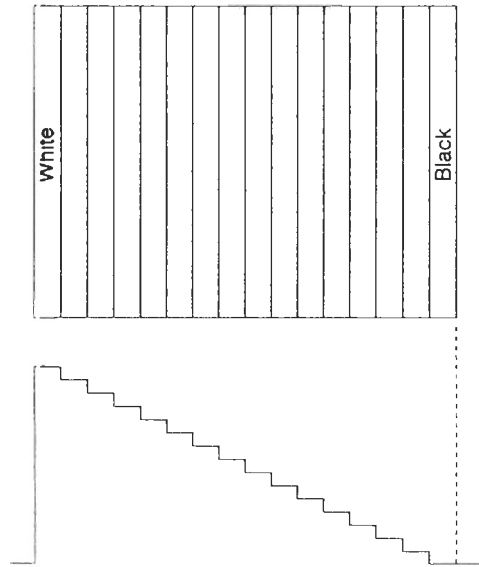
(26) Pattern No.: 81h   Gray scale 1 (Gray scale V)

A gray scale showing 16 gradations is displayed vertically. Assigning value 1 to white, the gradation is decremented rightward, beginning with 15/15, up to 0/15 (a total of 16 steps).

With the INV button, you can reverse the left and right of the gray scale.
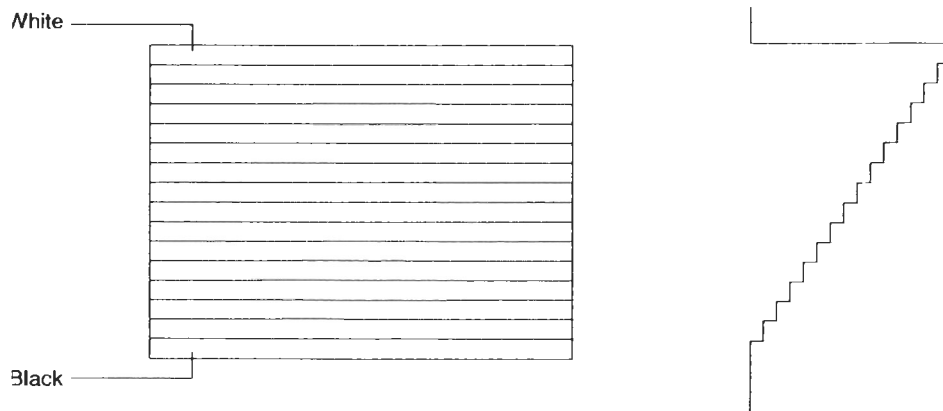
(27) Pattern No.: 82h   Gray scale 2 (Reverse gray scale)

Two gray scales are displayed in upper and lower rows, respectively. The upper displays a gray scale that is decremented rightward, while the lower displays a gray scale that is decremented leftward.

With INV button, you can reverse the gray scale with respect to the left-right orientation.

| White | | | | | | | | | | | | | | | Black |

| Black | | | | | | | | | | | | | | | White |

(28) Pattern No.: 83h   Gray scale 3 (Gray/raster)

Two gray scales are displayed in upper and lower rows, respectively. The upper displays a gray scale that is decremented rightward, while the lower displays white raster.

With INV button, you can reverse the gray scale with respect to the left-right orientation.

| White | | | | | | | | | | | | | | | Black |

White

(29) Pattern No.: 84h   Gray scale 4 (Color/gray)

Two gray scales are displayed in upper and lower rows, respectively. The upper displays a color bar, while the lower displays a gray scale that is decremented rightward. In the color bar, the colors are displayed in the following order: white, yellow, cyan, green, magenta, red, blue, and black.

With INV button, you can reverse the gray scale with respect to the left-right orientation.

W	Y	Cy	G	Mg	R	B	Bl
White							Black

(30) Pattern No.: 90h   Overlay pattern 0

A multi color bar of pattern No. 34h is overlapped with an all-character pattern of pattern No. 10h. Over this pattern, a circle pattern 0 of pattern No. 60h and a universal window pattern 1 of pattern No. 73h are overlapped.

With the INV button, you can reverse the order of colors in the color bar and the orientation of gray scale.

[Set parameters]
●Setting the character parameters
 • Code • Font • Cell H/V
●Setting the graphic window
 • Start X/Y • End X/Y (GR-W No.: 1-4)

(31) Pattern No.: 91h   Overlay pattern 1

For this pattern, • Either of the color bar or gray scale pattern and • Circles, crosshatch, dot pattern, and window can be overlapped. The actually displayed pattern depends on the settings of the following parameters:

[Set parameters]
- ●Setting the color bar or gray scale
  - • Compiles with the settings for Color-Window No. 1.
- ●Circle
  - • Format (The format of pattern No. 60h or 62h can be set.)
  - * All parameters other than Format are fixed.
- ●Crosshatch
  - • Cross H/V
- ●Dot
  - • Dot H/V
- ●Setting the graphic window
  - • Start X/Y   • End X/Y (GR-W No.: 1-2)

(32) Pattern No.: A0h   Special pattern

The special pattern is a pattern that the user can generate as desired by using all LT 1610/1611 prepared pattern parameters. See Section 7.6, "Creating a Special Pattern" for details.
The INV button does not work.

(33) Pattern No.: B0h   SMPTE RP-133

This pattern is the "SMPTE RP-133" pictorial image test pattern, which is used for evaluation of a medical diagnostics TV monitor or hard copy recording camera.

(34) Pattern No.: B1h   Fill-in of circles

A pattern of filled-in circles as shown below is displayed.
With the INV button, you can reverse the black/white display on the screen.
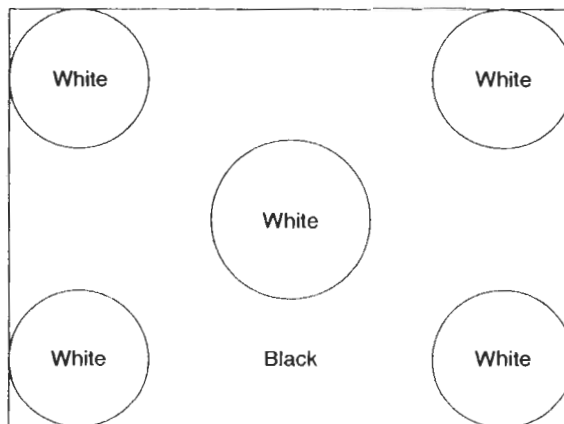
(35) Pattern No.: B2h   Ramp H

A ramp pattern of 256 grades is displayed horizontally.

With the INV button, you can reverse the pattern with respect to the ramping direction (right-left).

255 (White)

(Black)
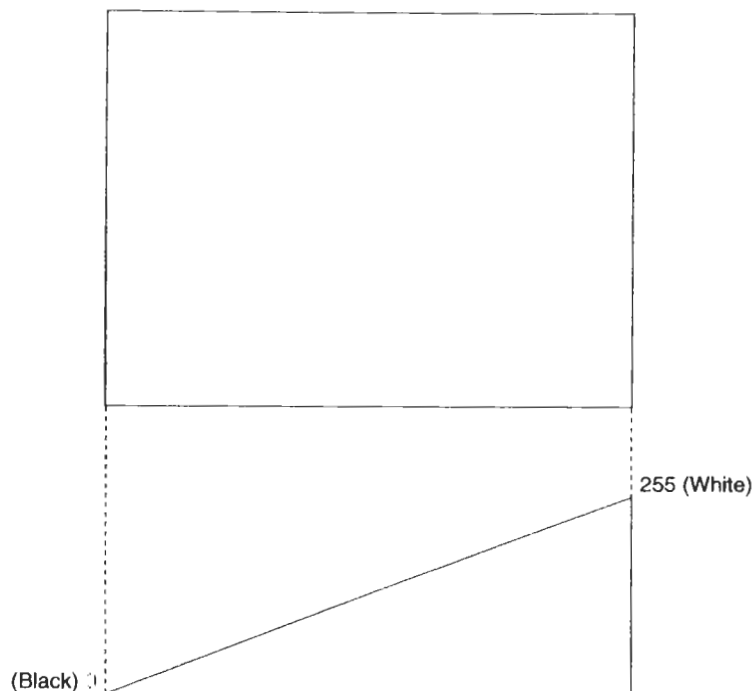
(36) Pattern No.: B3h   Ramp V

A ramp pattern of 256 grades is displayed horizontally.

With the INV button, you can reverse the pattern with respect to the ramping direction (top-bottom).

0 (Black)

255 (White)
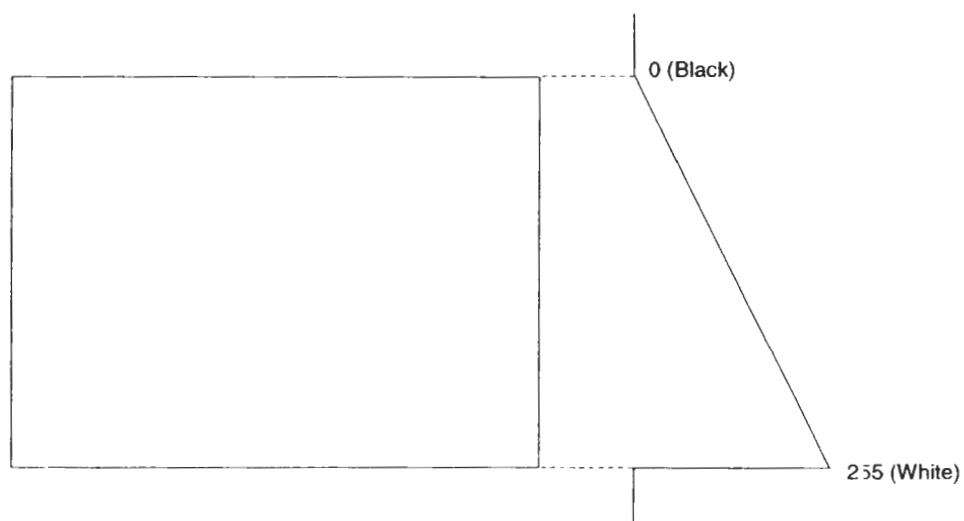
(37) Pattern No.: C2h   Window scroll

The fixed window is scrolled in the set direction. The following parameters are managed by the system, without allowing you to register them for an address or pattern button.

[Set parameters]

● Setting the window scroll

① Direction

[H Moving]
- Right and Left (↔)
- Right (→)
- Left (←)

[V Moving]
- Up and Down (↕)
- Up (↑)
- Down (↓)

② Moving Unit

[H Moving]
- 0 to 16 dots for 2 dot steps

[V Moving]
- 0 to 8 dots per dot step

* Moving distance (dots) per V blanking cycle

* The window scroll direction is determined by combination of ① and ② above.

For the following settings, the scroll takes place as shown in the figure:

- Direction   : [H Moving]   Right (→)
                    [V Moving]   – – – –
- Moving Unit   : [H Moving]   4 dot
                    [V Moving]   0 dot
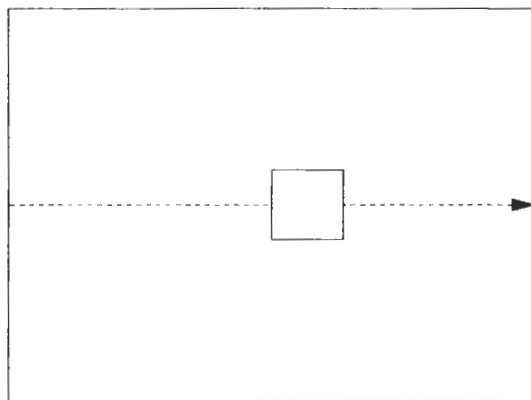
(38) Pattern No.: C3h   Character scroll

The user character (Character Code No.: 00h-0Fh) you have set is scrolled in the set direction. The fixed window is scrolled in the set direction. The following parameters are managed by the system, without allowing you to register them for an address or pattern button.

[Set parameters]
●Registering the user character
 • Character Code No.: 00h-0Fh

●Setting character scroll
 ① Direction
    [H Moving]   [V Moving]
     • Right and Left (↔)   • Up and Down (↕)
     • Right (→)   • Up (↑)
     • Left (←)   • Down (↓)

 ② Moving Unit
    [H Moving]   [V Moving]
     • 0 to 16 dots for 2 dot steps   • 0 to 8 dots per dot step
     * Moving distance (dots) per V blanking cycle

     * The window scroll direction is determined by combination of ① and ② above.

For the following settings, the scroll takes place as shown in the figure:
    • Direction   : [H Moving]   Right   (→)
                        [V Moving]   Up   (↑)
    • Moving Unit   : [H Moving]   4 dot
                        [V Moving]   0 dot
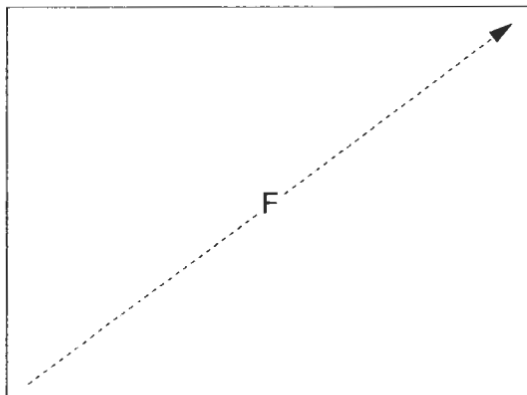
(39) Pattern No.: Ch4   Window flashing
The white windows you have set in a maximum of 25 graphic windows flashes in the set cycle. The following set parameters for the window flashing speed are managed by the system, without allowing you to register them for an address or pattern button.

[Set parameters]
● Setting the graphic window
 • Start X/Y • End X/Y (GR-W No.: 1-25)
● Setting the window flashing speed
 • Window Flashing Speed

NO Flash	8/V Blank
1/V Blank	16/V Blank
2/V Blank	32/V Blank
4/V Blank	64/V Blank

* Flashing count per V blanking cycle

(40) Pattern No.: C5h   Character flashing
The characters specified in a maximum of 25 graphic windows flash in the set cycle. The following set parameters for the character flashing speed are managed by the system, without allowing you to register them for an address or pattern button.

[Set parameters]
● Setting the graphic window
 • Start X/Y • End X/Y (GR-W No.: 1-25)
● Setting the character parameters
 • Code • Font • Cell H/V
● Setting the window flashing speed
 • Character Flashing Speed

NO Flash	8/V Blank
1/V Blank	16/V Blank
2/V Blank	32/V Blank
4/V Blank	64/V Blank

* Flashing count per V blanking cycle

(41) Pattern No.: F0h   Natural picture (Built-in ROM 1-14)
This is a 256-color natural picture pattern in VGA size (640 by 480). If its resolution exceeds VGA, this pattern is displayed relative to the top left corner.

(42) Pattern No.: F1h-FEh   Natural picture (OPTION RAM1-14)
This is a 256-color natural picture pattern that is registered when the factory option Backup RAM is installed in the instrument. The display dot size is 2048 by 1024 at the maximum. For VGA size, up to six natural pictures can be registered. If the number of display dots (H x V) is small, a maximum of 14 natural pictures can be registered.

8.3 Character Fonts

The following two preinstalled character fonts are available for character patterns.

(1) 5 by 7 dot character font listing

Table 8-2

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00																
10																
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	|	}		
80																
90																
A0																
B0																
C0																
D0																
E0																
F0																

(2) 7 by 9 dot character font listing

Table 8-3

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00																
10																
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	¥	]	£	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	¦	}	~	▓
80	▓	☰	‖	▨	▤	∥	▧	▀	¶	＋	－	｜	／	∧	＼	□
90																
A0		｡	｢	｣	､	･	ヲ	ｱ	ｲ	ｳ	ｴ	ｵ	ｶ	ｭ	ｮ	ｯ
B0	ｰ	ｱ	ｲ	ｳ	ｴ	ｵ	ｶ	ｷ	ｸ	ｹ	ｺ	ｻ	ｼ	ｽ	ｾ	ｿ
C0	ﾀ	ﾁ	ﾂ	ﾃ	ﾄ	ﾅ	ﾆ	ﾇ	ﾈ	ﾉ	ﾊ	ﾋ	ﾌ	ﾍ	ﾎ	ﾏ
D0	ﾐ	ﾑ	ﾒ	ﾓ	ﾔ	ﾕ	ﾖ	ﾗ	ﾘ	ﾙ	ﾚ	ﾛ	ﾜ	ﾝ	ﾞ	ﾟ
E0																
F0																

9. LISTING OF SAMPLE PROGRAM DATA

- The flash memory and floppy disks included with the LT 1610/1611 contains preregistered sample patterns as well as timing data about typical display models. When editing the program data, you can ease your work by performing the edit from the sample data.

● Sample timing data

Table 9-1A

ADDRESS	COMMENT	DOTCLK [MHz]	H_FREQ [KHz]	V_FREQ [Hz]	HV_RESO [dot]
0	NTSC14.3	14.318	15.734	59.939	768×485
1	NTSC13.5	13.500	15.734	59.939	720×485
2	PAL17.73	17.734	15.625	50.000	922×575
3	PAL13.5	13.500	15.625	50.000	720×575
4	HDTV60Hz	74.250	33.750	60.000	1920×1035
5	HDTV5994	74.176	33.716	59.940	1920×1035
6	MDVHGC	16.257	18.432	49.816	720×350
7	INCOLOR	19.000	21.542	58.222	720×350
8	CGA	14.364	15.750	60.115	640×200
9	EGA	16.257	21.851	59.702	640×350
10	PGA	24.872	30.480	60.000	640×400
11	VGA350-5	25.175	31.469	50.030	640×350
12	VGA350-6	25.175	31.469	59.941	640×350
13	VGA350-7	25.175	31.469	70.087	640×350
14	VGA400-5	25.175	31.469	50.030	640×400
15	VGA400-6	25.175	31.469	59.941	640×400
16	VGA400-7	25.175	31.469	70.087	640×400
17	VGA480-5	25.175	31.469	50.030	640×480
18	VGA480-6	25.175	31.469	59.941	640×480
19	VGA350A5	28.322	31.469	50.030	720×350
20	VGA350A6	28.322	31.469	59.941	720×350
21	VGA350A7	28.322	31.469	70.087	720×350
22	VGA400A5	28.322	31.469	50.030	720×400
23	VGA400A6	28.322	31.469	59.941	720×400
24	VGA400A7	28.322	31.469	70.087	720×400
25	8514A	44.900	35.522	86.957	1024×768
26	VESA350	31.500	37.861	84.136	640×350
27	VESA400	31.500	37.861	84.136	640×400
28	VESA480	31.500	37.861	72.810	640×480
29	VESA400A	36.000	37.736	84.045	720×400
30	VESA600A	36.000	35.156	56.250	800×600
31	VESA600B	40.000	37.879	60.317	800×600
32	VESA600C	50.000	48.077	72.188	800×600
33	VESA768A	65.000	48.363	60.004	1024×768
34	VESA768B	75.000	56.476	70.069	1024×768
35	VESA768C	78.750	60.023	75.029	1024×768
36	MAC13"	30.240	35.000	66.667	640×480

Table 9-1B

ADDRESS/COMMENT		DOTCLK [MHz]	H_FREQ [KHz]	V_FREQ [Hz]	HV_RESO [dot]
37	MAC16"	57.283	49.725	74.550	832×624
38	MAC19"	80.000	60.241	74.927	1024×768
39	MAC21"	100.000	68.681	75.062	1152×870
40	S1280-74	135.000	78.855	74.112	1280×1024
41	N1280-60	107.012	64.310	60.385	1280×1024
42	N1280-70	127.000	74.882	69.853	1280×1024
43	N1280-74	135.000	78.855	74.112	1280×1024
44	H1280-60	100.000	60.480	57.030	1280×1024
45	H1280-72	135.000	78.125	72.005	1280×1024
46	A1280-60	110.160	63.750	59.747	1280×1024
47	B1280-60	108.000	64.286	60.362	1280×1024
48	C1280-60	107.500	64.603	59.929	1280×1024
49	SUN-66Hz	92.940	61.795	69.950	1152×900
50	SUN-76Hz	105.561	71.713	76.048	1152×900
51	SUN-84Hz	92.940	70.838	84.031	1024×800
52	CPAQ1024	71.664	53.964	66.132	1024×768
53	OAK800	36.000	35.156	56.160	800×600
54	OAK1024	65.000	48.077	59.797	1024×768
55	TSENG800	36.000	35.433	55.883	800×600
56	TSEN1024	65.000	48.653	60.214	1024×768
57	PC98	21.052	24.826	56.423	640×400
58	PC98RL	47.815	32.840	80.000	1120×750
59	PC-H98	78.431	50.020	60.048	1120×750
60	98MATE15	75.000	56.476	70.069	1024×768
61	98MATE17	107.500	64.603	59.929	1280×1024
62	FMR50	22.790	26.377	59.948	640×400
63	IBM5550	24.020	29.581	73.130	640×754
64	IBM6000	111.520	63.364	60.003	1280×1024
65	HP9000-A	108.170	63.331	59.973	1280×1024
66	HP9000-B	135.000	78.125	72.005	1280×1024
67	VAX-A	69.120	54.000	60.000	1024×864
68	VAX-B	119.840	70.660	66.473	1280×1024
69	INDIGO-A	64.000	48.485	59.637	1024×768
70	INDIGO-B	130.000	77.014	72.382	1280×1024
71	IRIS4D	107.350	63.899	59.999	1280×1024
72	EWS4800	107.500	64.603	59.929	1280×1024
73	NEWS	107.500	63.384	60.023	1280×1024
74	PFU	108.070	63.721	60.000	1280×1024
75	SS2GT	135.000	81.130	76.107	1280×1024
76 to 99	VGA480-6	25.175	31.469	59.941	640×480

● Sample pattern data (address registration)

Table 9-2

Address NO.		Patterns title
00 to 75	34	Color Bar 4 (Multiple · Color Bar)
76	00	Character list 0
77	01	Character list 1
78	02	Character list 2
79	10	All character Pattern 0 (H)
80	10	All character Pattern 0 (A)
81	11	All character Pattern 1 (P)
82	11	All character Pattern 1 (Y)
83	30	Color Bar 0 (H)
84	31	Color Bar 1 (V)
85	32	Color Bar 2 (Reverse · Color Bar)
86	34	Color Bar 4 (Multiple · Color Bar)
87	40	Cross hatch 0
88	50	Dot Pattern 0
89	60	Circle Pattern 0
90	70	Window 0
91	71	Window 1 (With Cross hatch)
92	72	Window 2 (Nine Windows)
93	80	Gray Scale 0 (H)
94	81	Gray Scale 1 (V)
95	82	Gray Scale 2 (Reverse)
96	83	Gray Scale 3 (Gray/Raster)
97	84	Gray Scale 4 (Color/Gray)
98	B0	SMPTE RP-133
99	F0	Natural-Color Picture with ROM 640 (H) ×480 (V)

● Sample pattern data (PATTERN button registration)

Table 9-3

Pattern Button NO.		Pattern title
0	01	Character list
1	11	All Character Pattern 1
2	30	Color Bar 0 (H)
3	31	Color Bar 1 (V)
4	32	Color Bar 2 (Reverse)
5	34	Color Bar 4 (Multiple)
6	40	Cross hatch 0
7	50	Dot Pattern 0
8	60	Circle Pattern 0
9	71	Window 1 (With Cross hatch)
A	80	Gray Scale 0 (H)
B	81	Gray Scale 1 (V)
C	82	Gray Scale 2 (Reverse)
D	84	Gray Scale 4 (Color/Gray)
E	B0	SMPTE RP-133
F	F0	Natural-Color Picture with ROM 640 (H) ×480 (V)

●User character sample data

The user character in Figure 9-1 resides in the "¥:kanji.chr" file. It is registered for character code "00h".
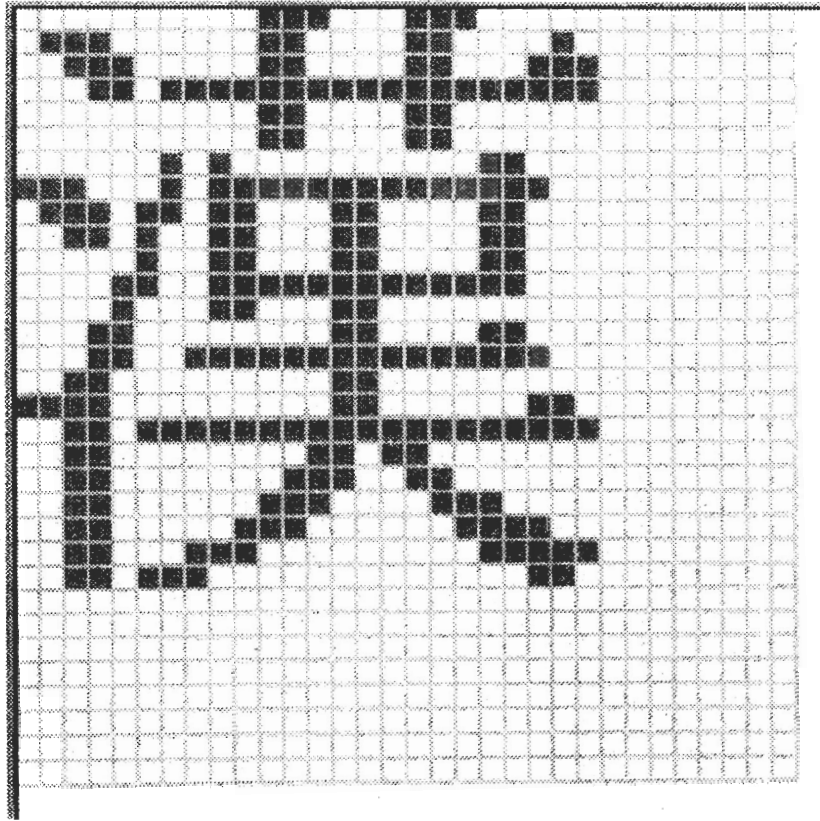
Figure 9-1

10. ERROR CODES

Error codes　　　　　　　　　　　　　Table 10-1

Error code	Description
E1	In the ROM mode, the user ROM was not installed in the panel ROM. Alternatively, an error occurred in the user ROM format number during user ROM data read.
E2	The timing parameter did not satisfy one of the requirements while the program was running.
E3	In BEGIN or END settings, the condition BEGIN <_ END was not satisfied. Alternatively, the input address was outside the BEGIN-END range during direct specification of the address.
E5	When the mode was set to rapid pattern switching, a pattern larger than 2048 (H) by 1024 (V) was found in the patterns registered.
E6	Data was cleared from Backup RAM. The cleared data is set to the default value.
E10	The transfer data did not comply with the LT 1610/1611 communication protocol during RS-232C communication.
E11	After a checksum error occurred, the transmission was retried during RS-232C communication; however, the checksum error still reappears.
E20	When the external device ran a command for the LT 1610/1611 during RS-232C communication, the data was not transferred within the predetermined period.

11. LT 1610/1611 BLOCK DIAGRAM AND OUTPUT CIRCUITS

11.1 Block Diagram
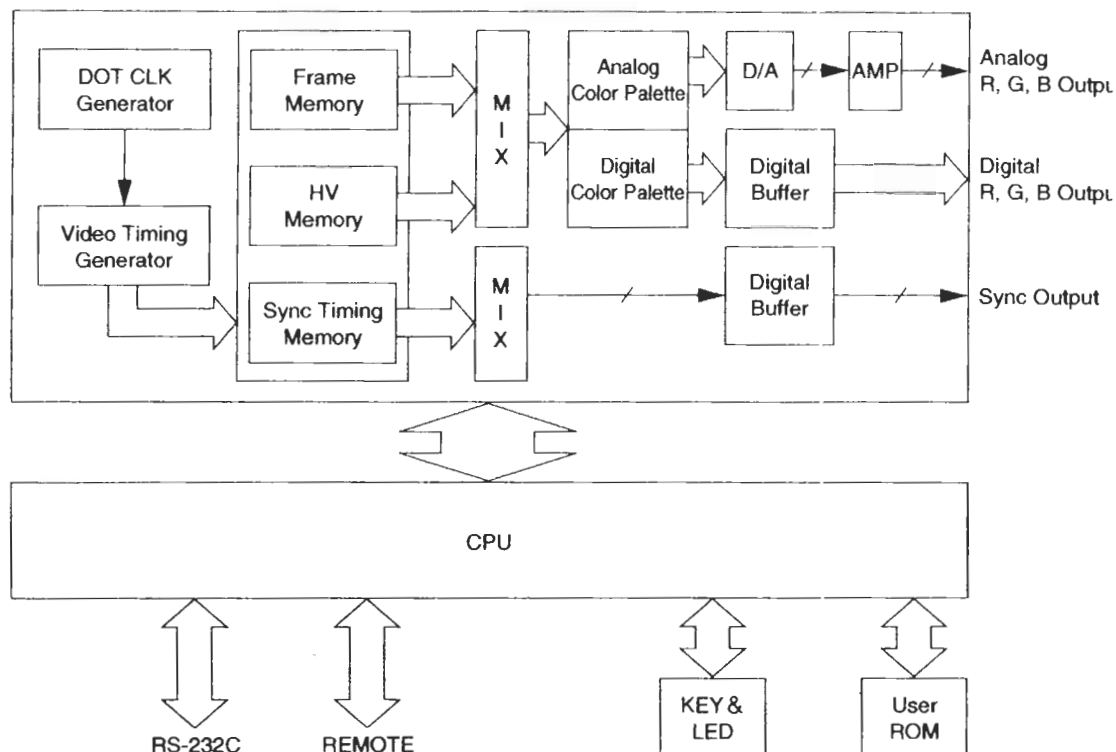
Figure 11-1

11.2 Output Circuits

● Analog R, G, B
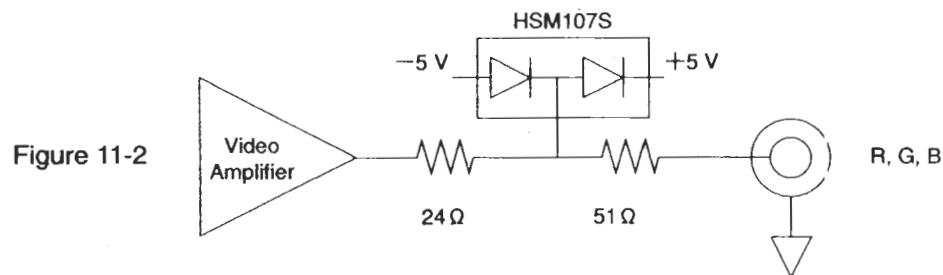
Figure 11-2

● Analog HS, VS, CS, DISP

Figure 11-3

● Analog CLK

Figure 11-4

MA157

10H
105

+5 V

+5 V

0.1 μ

CLK

+3 V ⌇75 Ω

220 μ
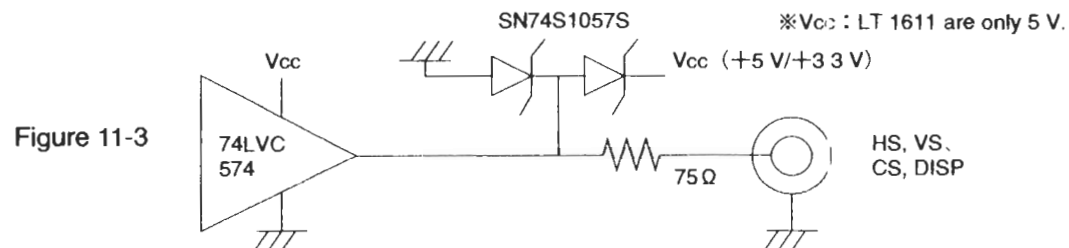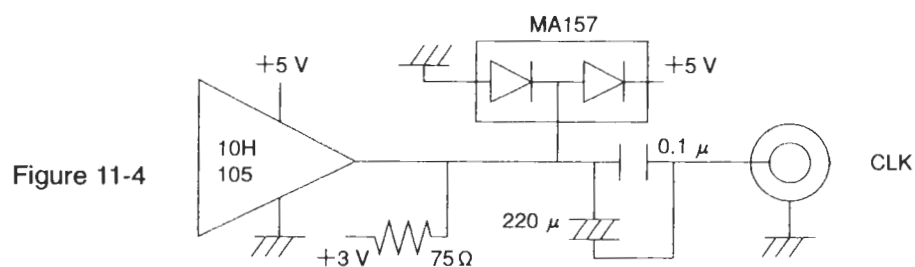
● Digital R, G, B, HS, VS, CS, HD, VD, DISP

Figure 11-5

74LVC574
or 74LVC541

Vcc

SN74S1057S

Vcc （+5 V/+3.3 V）

10 Ω

R, G, B
HS, VS, CS,
HD, VD, DISP

330 Ω
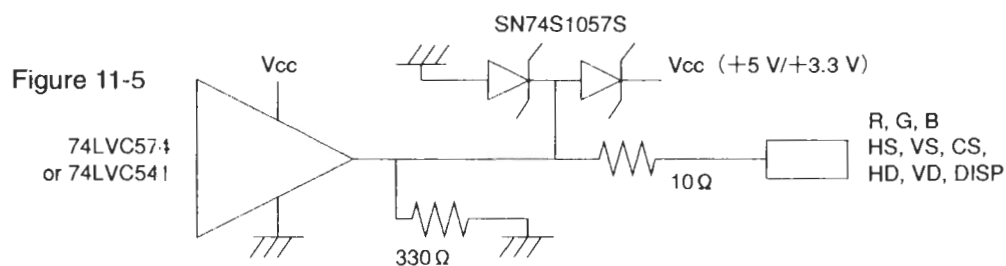
● Digital CTRL0, CTRL1, CTRL2

Figure 11-6

74LVC
541

Vcc

SN74S1057S

Vcc （+5 V/+3.3 V）

CTRL0, CTRL1,
CTRL2

330 Ω

● Digital Vcc

+5 V/+3.3 V
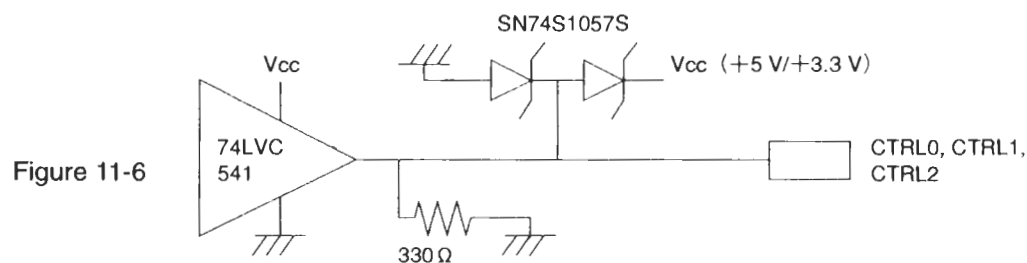
Vcc

* Vcc is available up to 300 mA with
respect to total of OUT1 and OUT2.

Figure 11-7

12. PIN LAYOUT AND SPECIFICATION OF MULTI PIN CONNECTORS

12.1 Digital Out Connectors

Table 12-1

●DIGITAL OUT1 (57 type 50 Pin)

Pin No.	Signal	Pin No.	Signal
1	GND	26	GND
2	R0	27	R1
3	R2	28	R3
4	GND	29	GND
5	R4	30	R5
6	R6	31	R7
7	GND	32	GND
8	G0	33	G1
9	G2	34	G3
10	GND	35	GND
11	G4	36	G5
12	G6	37	G7
13	GND	38	GND
14	B0	39	B1
15	B2	40	B3
16	GND	41	GND
17	B4	42	B5
18	B6	43	B7
19	GND	44	GND
20	HS	45	VS
21	CS	46	DISP
22	HD	47	VD
23	GND	48	GND
24	CLK	49	Vcc
25	CTRL0 (AV)	50	CTRL1 (YS)

●DIGITAL OUT2 (57 type 50 Pin)

Pin No.	Signal	Pin No.	Signal
1	GND	26	GND
2	R0	27	R1
3	R2	28	R3
4	GND	29	GND
5	R4	30	R5
6	R6	31	R7
7	GND	32	GND
8	G0	33	G1
9	G2	34	G3
10	GND	35	GND
11	G4	36	G5
12	G6	37	G7
13	GND	38	GND
14	B0	39	B1
15	B2	40	B3
16	GND	41	GND
17	B4	42	B5
18	B6	43	B7
19	GND	44	GND
20	NC	45	NC
21	NC	46	NC
22	NC	47	NC
23	NC	48	NC
24	NC	49	Vcc
25	CTRL2 (YM)	50	NC

* Vcc: Switching between +5 and +3.3 V (For the 1611, fixed to 5 V)

* R7, G7, and B7 are the MSBs of respective pieces of color data.

12.2   Remote Connectors (57 TYPE, 36-PIN)

Table 12-2

●LT 1610-01 mode specifications

Pin No.		Signal	Pin No.		Signal
1		+5 V	19		+5 V
2		H ⌐	20	I	TR00
3	I	H ⎬ mode	21	I	TR01
4		L ⌐ (Remote controller ID)	22	I	TR02
5		NC	23	I	TR03
6		NC	24	I	TR04
7		NC	25	I	TR05
8		NC	26	I	TR06
9		NC	27	I	TR07
10	O	MA00	28	I	TR08
11	O	MA01	29	I	TR09
12	O	MA02	30	I	TR10
13	O	MA03	31		NC
14		NC	32		NC
15	O	CLK	33		NC
16	O	DATA	34	I	Vcc ON/OFF CTRL
17	O	STROBE	35	I	SIG ON/OFF CTRL
18		GND	36		GND

* "Vcc ON/OFF CTRL" controls the ON/OFF state of power output Vcc (+5 V/+3.3 V) of DIGITAL OUT1, OUT2 and all signal outputs of DIGITAL OUT1, OUT2. In addition, it controls ON/OFF control of analog BNC output. This signal goes off at the L (TTL) level.
* "SIG ON/OFF CTRL" controls the ON/OFF state of all DIGITAL OUT1 and OUT2 signals. The analog sync signal output operates together. "SIG ON/OFF CTRL" goes off at the L (TTL) level. (The LT 1610-01 remote controller is not provided with such ON/OFF control features.)
* The "I" or "O" symbols in the "Signal name" column represent input signal and output signal, respectively.
* Do not anything to the NC pin.

(REMOTE KEY MATRIX)
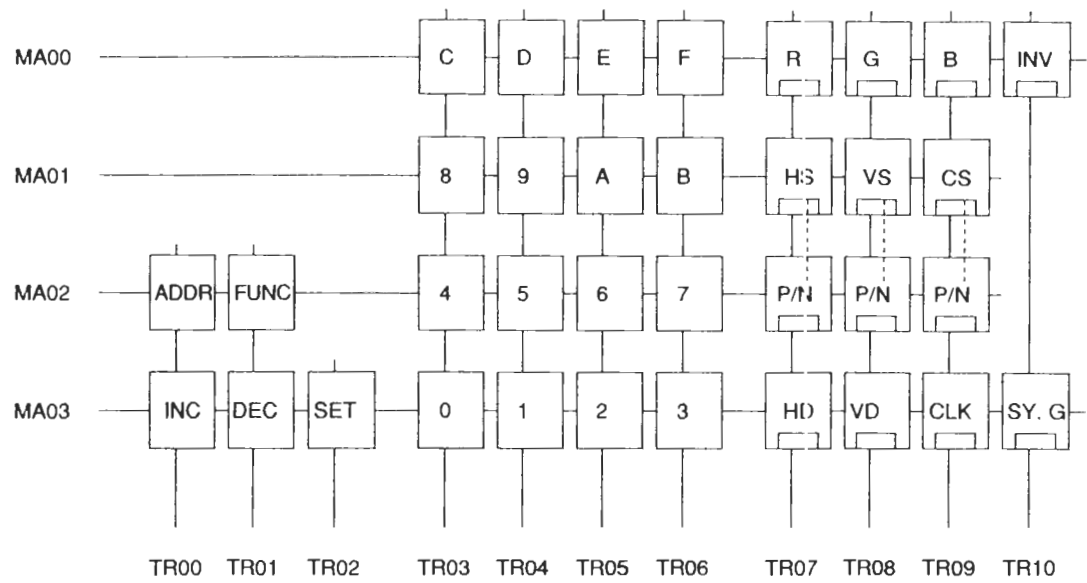
Figure 12-1 Remote key matrix

(Segment names in 7-segment LED)
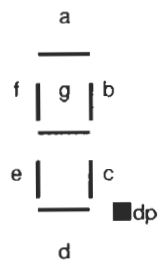
Figure 12-2 7-segment LED

●LVG 1603-01 mode specifications   Table 12-3

Pin No	Signal	Pin No	Signal
1	+5 V	19	+5 V
2	L ─┐ mode	20	1 ─┐ address
3	H │	21	2 │ BCD×10⁰
4	H ─┘ (Remote controller ID)	22	4 │ (LSD)
5	NC	23	8 ─┘
6	NC	24	1 ─┐ address
7	NC	25	2 │ BCD×10'
8	NC	26	4 │ (MSD)
9	ROM/RAM	27	8 ─┘
10	NC	28	NC
11	NC	29	NC
12	NC	30	NC
13	NC	31	NC
14	NC	32	NC
15	NC	33	NC
16	NC	34	NC
17	READY (OUTPUT)	35	NC
18	GND	36	GND

* When the READY terminal (Pin 17) is Low, the remote control address can be accepted.

* Do not connect the NC pin.

12.3   RS-232C Connector (D-SUB, 9-PIN)

●Pin layout and specifications

The pin layout and specifications of the LT 1610/1611 RS-232C connection are as
listed in Table 12-4.

Table 12-4

Pin No.	Signal	Pin No.	Signal
1	NC	6	ER (DTR)
2	SD (TXD)	7	CS (CTS)
3	RD (RXD)	8	RS (RTS)
4	DR (DSR)	9	NC
5	SG (GND)		

* Do not connect the NC pin.

[RS-232C specifications]

• Transmission method: Start-stop

• Baud rate: 9600, 19,200, 38,400 bps (selectable with panel DIP SW)

• Data format: 1 start bit, 8 data bits, 1 stop bit,

                 Parity check Checksum (for some versions)

• Error control: None.

• I/O level: Conforms to RS-232C.

12-4

● Cabling

Use cables meeting the RS-232C connector specification of the PC to connect.
A few cabling examples are shown below.

(1) Cabling with a DOS/V PC

LT 1610/1611 side   DOS/V PC side
DSUB connector 9Pin (Pin)   DSUB connector 9Pin (Socket)
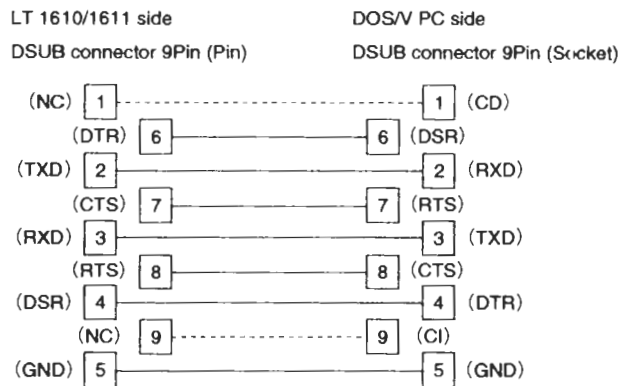
Figure 12-3

(2) Cabling with a PC-9821

LT 1610/1611 side   PC-9821 side
DSUB connector 9Pin (Pin)   DSUB connector 25Pin (Pin)
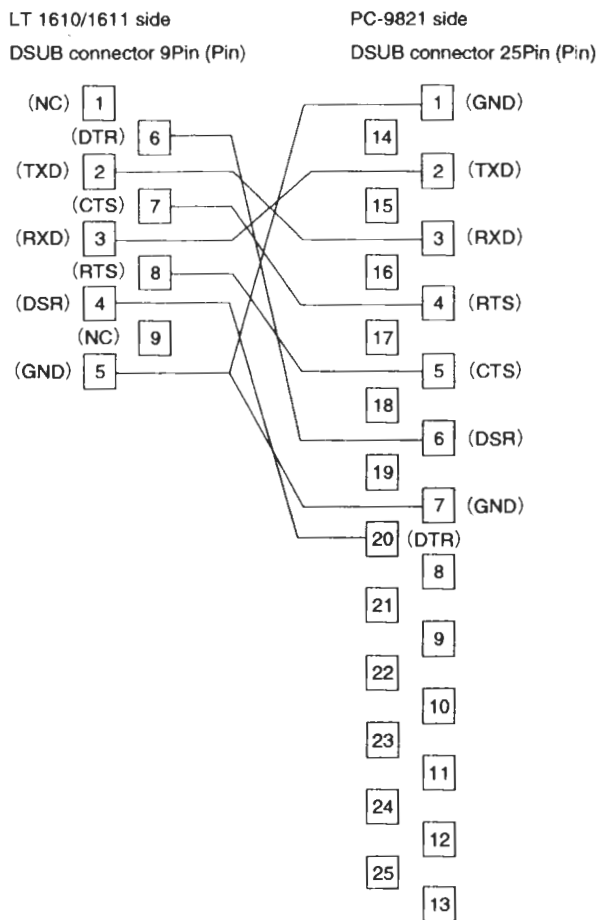
LT 1610 / LT 1611
PROGRAMMABLE
VIDEO GENERATOR
(Addendum for Virsion 1.4)

INSTRUCTION MANUAL

TABLE OF CONTENTS

1. Displaying Installed Software Version

This function has been added for Version 1.3.

Hold down the INC and DEC keys of the LT 1610/LT 1611 simultaneously, then turn power on.
The MODE and ADDRESS displays show the ROM version about one second.

Figure 1-2 shows an example of Version 1.4.
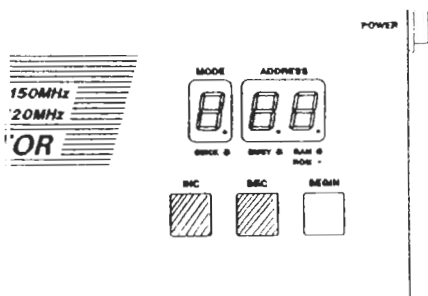
Figure 1-1

Figure 1-2

2. Displaying the Software Version of Windows

This function has been added for Version 1.4.

When the Timing software starts, the version is displayed in the center of Windows screen. See Figure 2-1.
This display disappears in a few seconds, then Timing software is recalled.

Figure 2-1 shows an example of Version 1.4J (Japanese version).

LEADER
ELECTRONIC MEASURING INSTRUMENTS

REMOTE CONTROLLER

Ver 1.4 J

for LT 1610 series
Windows3.1/Windows95
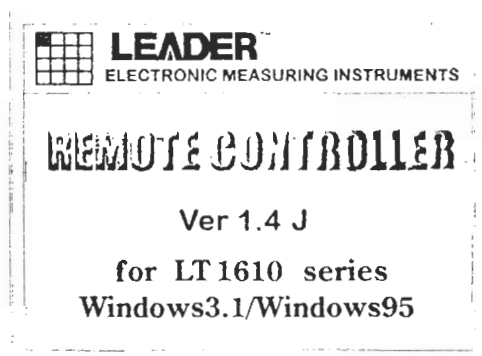
Figure 2-1

3. Pattern Number: B4h White Raster

This function has been added for Version 1.4.

The white raster is displayed throughout the effective screer area.

The following patterns can also be obtained by using the model LT 1610-01 or Windows remote control software.
- Use the INV button for reverse video
- Combination of R, G, and B buttons for yellow, cyan, green, magenta, red, or blue raster.

White
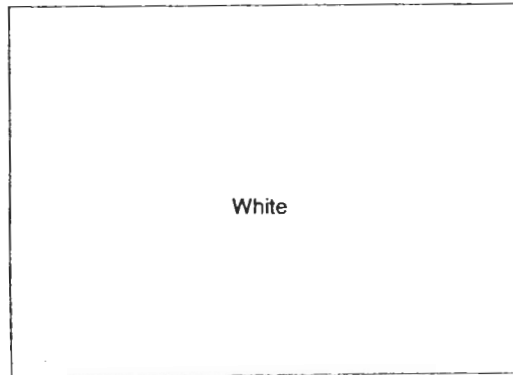
Figure 3-1

4. Jumping the Address

This function has been added for Version 1.3.

Address can be incremented or decremented by one while editing by using the control bar of Timing software (see Figure 4-1). An address jumping function is also provided to conveniently select a remote address.

Help(H)

Signal

Figure 4-1

-2-
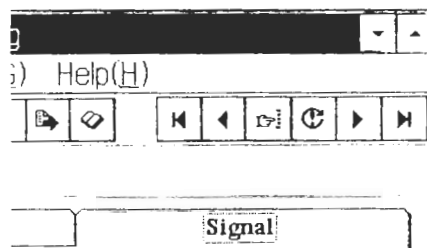
Setting Procedure

(1)   Double-click the "ADRS" (see Figure 4-2), or select the Jump (J) from the Edit (E) menu (see Figure 4-3).
(2)   Message "Please input address No." is displayed. See Figure 4-4.
(3)   Input the desired address number, then click the "OK" button.
(4)   The address will be recalled.
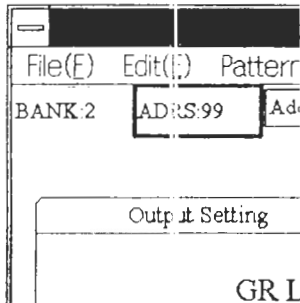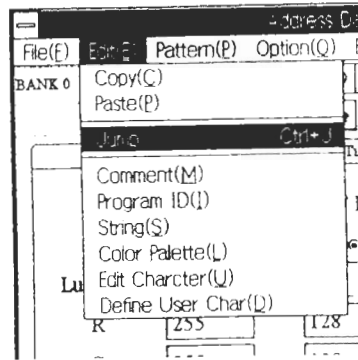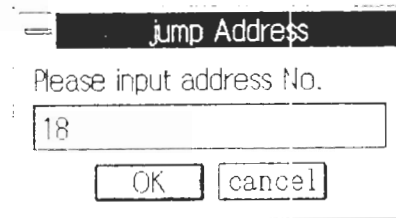
Figure 4-2   Figure 4-3   Figure 4-4

5. Pattern Number Input

This function has been improved for Version 1.4.

There are two modes, "Pattern List" mode and "Key" mode, to input the pattern number. The pattern number can only be input to the selected mode.

• Using the "Pattern List" Mode

This mode can be used to set the pattern number to the desired address, 0 to 99.

(1)   Select the "Pattern List" from the "Output Pattern" menu. See Figure 5-1
(2)   The "↓ below the "Pattern List" is changed from gray to black as shown n Figure 5-2. Click the "↓".
(3)   The pattern number list is displayed as shown in Figure 5-2.
       Use the "↑" or "↓" to select the pattern number.

⌐8　⊙9　⌐A　⌐B

⌐4　⌐5　⌐6　⌐7

⌐0　⌐1　⌐2　⌐3

Output Pattern
　⌐ Key　　⊙ Pattern List

16

16

| 10h (all charcter 0) | ↕ |

⌐8　⊙9　⌐A　⌐B

⌐4　⌐5　⌐6　⌐7

⌐0　⌐1　⌐2　⌐3

Output Pattern
　⌐ Key　　⊙ Pattern List

16

15

34h (multi color bar)	↓
31h (color bar V)	↑
32h (reverse color bar)	
33h (intensity color bar)	
34h (multi color bar)	
40h (cross hatch 0)	
41h (cross hatch 1)	
42h (cross hatch 2)	
50h (dot pattern 0)	↓
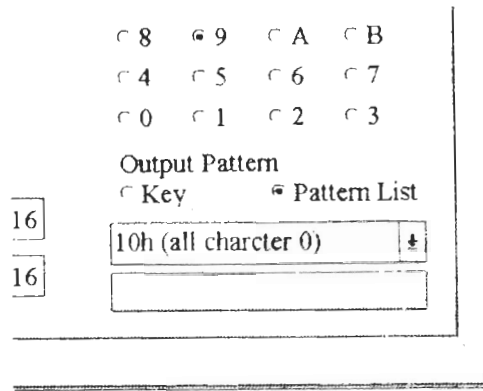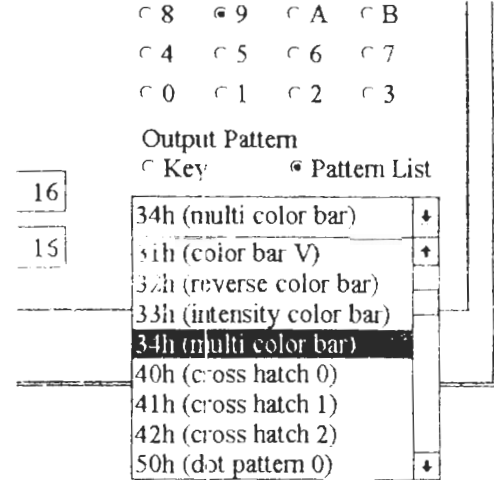
Figure 5-1　　　　　　　　　　Figure 5-2

• Using the "Key" Mode

This mode is used to recall the pattern number preset to the pattern key number,
0 to F.
This convenient mode allows a desired patten to be recalled even when
changing the timing for each address.

(1)　Select the "Key" from the "Output Pattern" menu. See Figure 5-4.
(2)　The "Def Pattern" button is changed from gray to black. Click the button.
(3)　The setting menu is displayed as shown in Figure 5-5
(4)　Click "↓" of the pattern number input box of the desired pattern key number.
(5)　The pattern number list is displayed.
　　　Use the "↑" or "↓" to select the pattern number.
(6)　See Figure 5-6. Click the "Pattern Key" number set for "X" set in Step (4).
　　　The example below shows pattern number "9" (i.e., 71h Window 1).

Output Pattern
⊙ Key　　　⌐ Pattern List

| 10h (all character 0) | |

| Def Pattern |
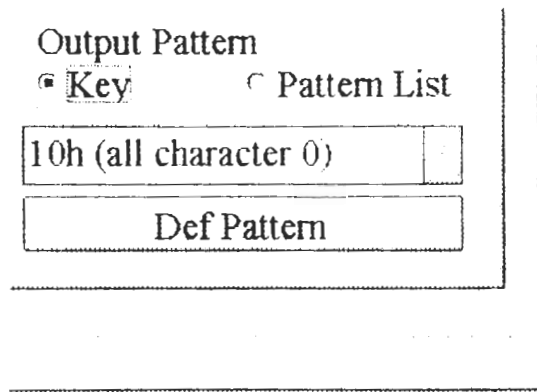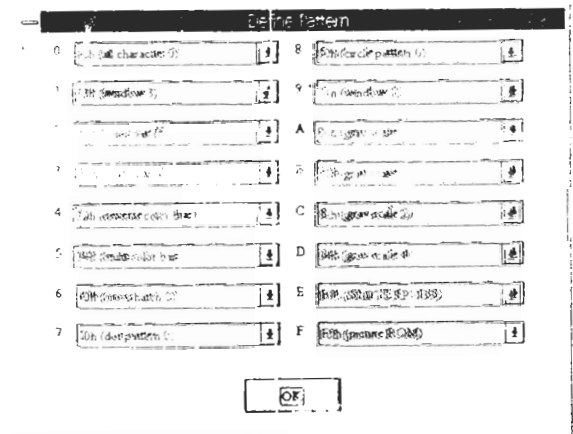
Figure 5-4

Figure 5-5

Pattern Key

$\circ$ C $\circ$ D $\circ$ E $\circ$ F

$\circ$ 8 $\bullet$ 9 $\circ$ A $\circ$ B

$\circ$ 4 $\circ$ 5 $\circ$ 6 $\circ$ 7

$\circ$ 0 $\circ$ 1 $\circ$ 2 $\circ$ 3

Figure 5-6

6. Command Transfer Using Pull-Down Menu

This function has been improved for Version 1.4.

In previous versions, the VGA screen (640 x 400 dots) used for note book computers was somewhat inconvenient since the entire Timing folder could not be displayed on the Windows screen. For instance, when frequently sending address data (pattern numbers) to the model 1610/1611, you had to repeatedly use the scroll bar to display the "SEND TO 1610" icon (see Figure 6-1) and revise the pattern code. In other words, frequent scrolling was required. The new version lets you execute the same operation by simply selecting Send (S) from the pull-down menu Execute (G). This eliminate the tedious scrolling. See Figure 6-2.
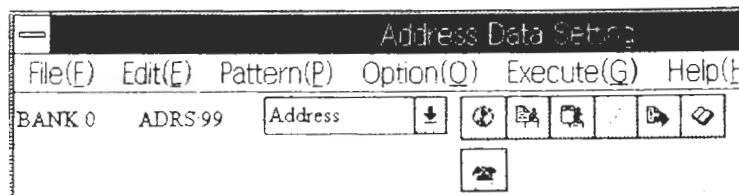
Figure 6-1
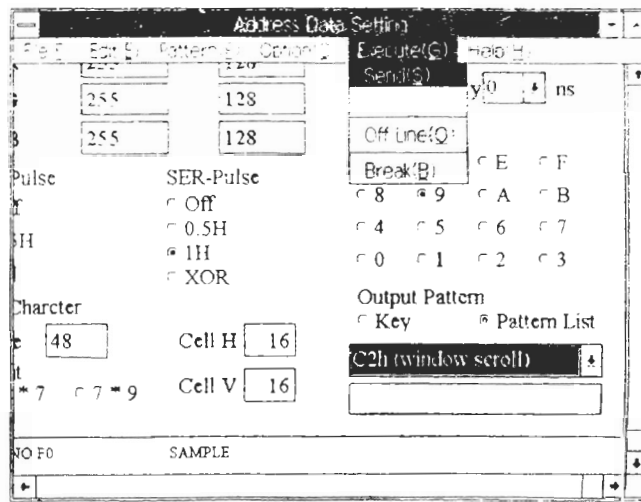
Figure 6-2

7. Quick Address Mode

This function has been added for Version 1.4.

This mode was previously available only in RAM mode. In version 1.4, it can also be used in ROM mode.
Refer to Sections 6.1.5, "Quick Address Mode" and 6.2.10, "Setting High-Speed Pattern Switching Mode" for detail on quick address mode.

8. Checking the Dip Switch Settings

This function has been improved for Version 1.4.

By clicking the "DIP SW" (see Figure 8-1) of the remote control software, the dip switch panel is displayed. See Figure 8-2.

- By pressing the "Read" button next to the ROM socket, setting of dip switches 1 and 2 can be checked without removing a ROM cover. The "X" indicates on; blank indicates off.

Figure 8-1

-6-
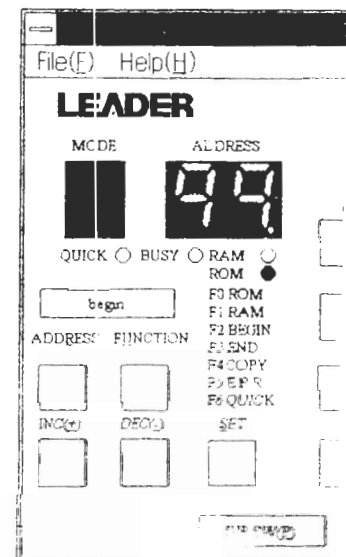
See Figure 8-2. Current switch settings can easily be checked since each switch function is displayed to the right of the box.

- The "Write" button changes the setting of COMMENT display with the Windows software as follows:.

  Click "DIP SW 1-2" for X to display comments for later drawings.
  Click "DIP SW 1-2" for blank to not display comments for later drawings.
  Refer to Section 6.1.3, "Specifying Whether to Display Comments" for the contents of comment.

  When the unit is powered on again, the dip switch settings depend on unit.

  The SW2 can only switch the mode when the "Write" key is pressed. To switch the mode other than the SW2, turn power off and set the dip switch on the unit, then turn power on again.

- By pressing the "Close" button, this menu is closed and returns to the previous conditions.

Note: Personal computers not set for 38400 bps must use 19200 or 9600 bps. Refer to personal computer instruction manual.

Figure 8-2

9. Remote Control Key Assignments

This function has been improved for Version 1.4.

Previously, remote control software could only be controlled by clicking the panel button of the LT 1610-01 Remote Controller displayed on the Windows screen. The new version enables remote control from a personal computer. Thus, such frequent mouse operations as address increment and decrement are eliminated.

Table 9-1 shows the personal computer key assignments.

Table 9-1

Function		Key
INC	*1	"+", "Enter"
DEC	*1	"-", "Enter"
DATA/PATTERN 0		"0", "Enter"
DATA/PATTERN 1		"1", "Enter"
DATA/PATTERN 2		"2", "Enter"
DATA/PATTERN 3		"3", "Enter"
DATA/PATTERN 4		"4", "Enter"
DATA/PATTERN 5		"5", "Enter"
DATA/PATTERN 6		"6", "Enter"
DATA/PATTERN 7		"7", "Enter"
DATA/PATTERN 8		"8", "Enter"
DATA/PATTERN 9		"9", "Enter"
DATA/PATTERN A		"A", "Enter"
DATA/PATTERN B		"B", "Enter"
DATA/PATTERN C		"C", "Enter"
DATA/PATTERN D		"D", "Enter"
DATA/PATTERN E		"E", "Enter"
DATA/PATTERN F		"F", "Enter"
ADDRESS	*2	"R", "Enter", "9", "Enter", "9", "Enter", "S", "Enter"
FUNCTION	*3	"U", "Enter", "1", "Enter", "S", "Enter"
SET		"S", "Enter"
DIP SW		"P"
Flash		"L"
Auto inc		"T"
Window Move		"N"
Character Move		"H"
Other Functions		"←" or →" to move active button, then "Enter"

Note: Either uppercase or lowercase letter can be used.
   *1   After INC or DEC key is used, the "Enter" key can be used to repeat the operation.
   *2   Example for setting the address to 99.
   *3   Example for setting the RAM mode.

10. Data Base Restructure (dbreset.exe)

This function has been added for Version 1.4.

When repeatedly adding and deleting data using Timing software, the data base file is grows larger because even deleted data remains in the file. This software allows unnecessary files to be completely deleted to minimize data base.

(1) To start this software, select "dbreset.exe" from the "C:\leader\BIN" menu, or double-click the icon shown in Figure 10-1.
(2) After the program starts, screen as shown in Figure 10-2 is displayed.
(3) By clicking the "OK" button, data restructuring starts. After restructuring is completed, "Database restructure complete" is displayed. See Figure 10-3.
(4) This operation minimizes the data base file.

database
pack tool

Figure 10-1

The directory name not be entered since all data to be restructured refers to the directory set at "bdecfg.exe".

Amount of data is not reduced when executing "bdecfg.exe" for data not subject to "Bank Delete" operation.
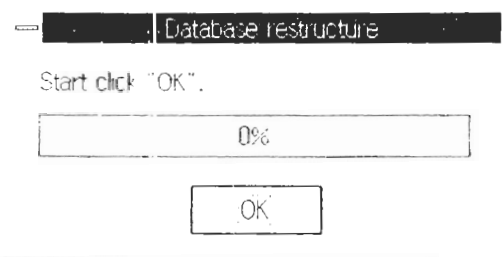
Figure 10-2
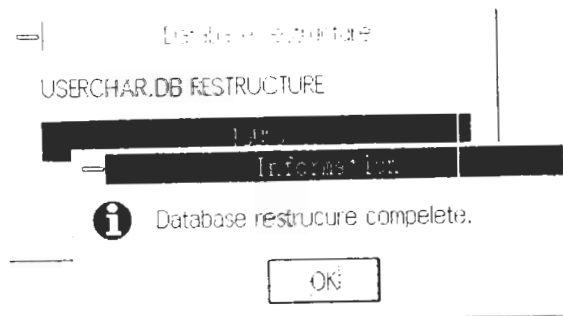
Figure 10-3

LT 1610A / LT 1611
PROGRAMMABLE
VIDEO GENERATOR
(Addendum for Virsion 1.5)

INSTRUCTION MANUAL

TABLE OF CONTENTS

> This instruction manual describes additional functions for ROM version 1.5 and Windows REMOTE CONTROLLER software version 1.5 of models LT 1610A and LT 1611. Read the front section of this manual for other information.

1. SPECIFICATIONS ADDED

* The specifications below are for the LT1610A and LT1611 unless otherwise noted.

• Dot clock (LT1610A only)
  The dot clock frequency for digital output is improved to 150 MHz (75 MHz + 75 MHz)

• Reading data to personal computer (Bank read)
  Data stored in backup RAM of the LT1610A / LT1611 can be added to Bank data of the personal computer.
  This data can also be edited using "Timing set" software and transferred to LT1610A / LT1611.

• Additional flash memory for user ROM
  In addition to the current ROM (i.e., HN28F101P manufactured by Hitachi), M28F101 (manufactured by Thomson) can also be used.
  Refer to Section 6.1,of version 1.5 adden dum "Additional Flash Memory for User ROM" of detail.

2. SPECIFICATIONS CHANGED

* Specifications changed for the LT1610A and LT1611 are underlined.

2.1 Timing (Dot Clock)

• Oscillation Frequency Range
    Digital (LT1610A only)
        1/1 clock mode (Single Mode):   1.024 to 75.000 MHz (67.5 MHz for natural-color patterns
        1/2 clock mode (Dual Mode):   2.048 to 150.000 MHz (135 MHz for natural-color patterns

Caution 1:   When using frequency range between 135 MHz (67.5 MHz + 67.5 MHz) and 150 MHz (75 MHz + 75 MHz), set the "5V, 3.3 V" switch to 3.3 V.

Caution 2:   The power must be turned off before setting the "5V, 3.3V" switch.

Note 1:   When ROM of the LT1610 is only upgraded to version 1.5, the frequency is not changed to 150 MHz.

2.2 Output Signal

• DIGITAL OUT 1: Type 57, 50-pin connector (LT1610A only)
        Maximum Frequency   75 MHz

Note 1: Use 1/2 clock mode when the dot clock frequency exceeds 75 MHz.
Note 2: When ROM of the LT1610 is only upgraded to version 1.5, the specifications are the same as LT 1610.

2.3 General Specifications

Environmental Conditions
    Operating Temperature Range   0 to 40°C
    Operating Humidity Range   30 to 85% RH
    Spec-Guaranteed Temperature Range   5 to 35°C
    Spec-Guaranteed Humidity Range   30 to 85% RH
Accessories   Instruction manual   1
                    User ROM (M28F101P)   1
                    Windows application software
                     (3.5" FD)   1
                    Power Cord   1
                    Spare Fuse (250 V, 4 A, BET)   1

3. NOTES ON INSTALLING SOFTWARE

3.1 Notes on Reinstalling Program

IMPORTANT: Old bank data is overwritten when REMOTE CONTROLLER
program is installed.
Old Bank data is also deleted when reinstalling improved software
for upgrading the version.

To retain old bank data, proceed as follows.

(1)   Store Bank data.
      Refer to Section 7.1.6, "Saving a File (Transferring BANK Data to a File)"
      (page 7-6).

(2)   Execute "uninstall" in the LEADER LT1610 group to delete old data.

(3)   Install the software.
      Refer to Section 4.3, "Installing Attached Software" (page 4-1).

(4)   Return the Bank data.
      Refer to Section 7.1.5, "Invoking a File (Transfer to the BANK)" (page 7-4).

(5)   The software is now installed.

3.2 Reading Data Recovered at Version 1.4

Bank data recovered by REMOTE CONTROLLER version 1.4 may not be readable
when using version 1.5.
"Create Error: VAL file is out of date. File:c:\leader\data\timing.val" is displayed on
the personal computer in this case.
Delete "c:\leader\data\timing.val" to read data.
Bank data version 1.4 without "recover" operation can be read.

Note 1:   "recover" is used to initialize data when a database cannot be read due
          to failure. Therefore, this is not generally used.
          Refer to Section, 4.3.1 "Windows 95," (3) "Sample data" (page 4-3).

Note 2 :   The "timing.val" file is used to check for matching (i.e., used as a
           checksum) among multiple "timing.***" files.
           Matching is not checked, however, when the "timing.val" file is not
           available. No problem generally occurs.

4. USING "Bank read" FUNCTION

The "Bank read" function is used to fetch data stored in backup RAM of LT1610A / LT1611 units, and add it to the end of Bank data used for "Timing set" software. Since a checksum display function for fetched data is also provided, you can conveniently compare data.

4.1 Operating Procedure

(1) The "Bank read" function can only be run for data stored in backup RAM. Since data stored in ROM cannot be directly read width the "Bank read" function, copy the data to RAM, then perform the following procedure. Data in RAM can be fetched even when ROM is selected.
(Bank read operation for optional natural-color patterns in RAM cannot be performed.)

(2) Start "Timing Set" software.

(3) Select "Read Bank RAM data" from the "Execute" menu.
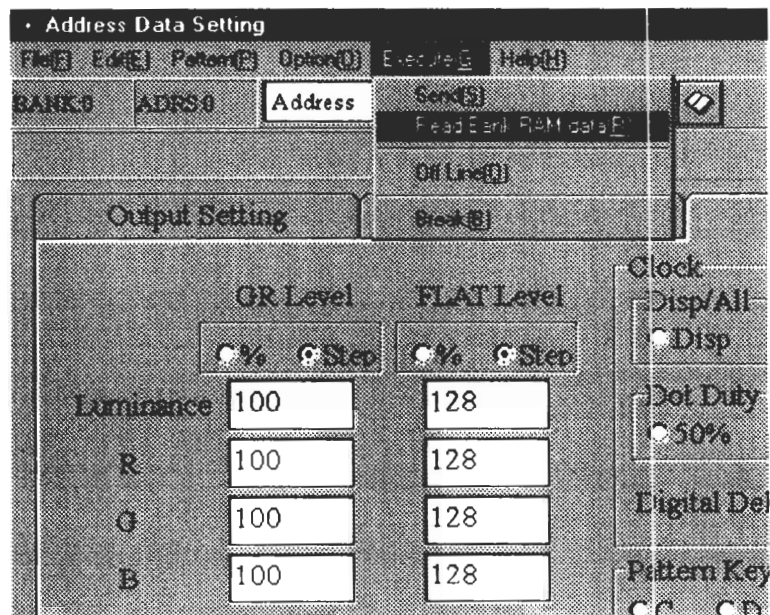
(4) Data transfer operation starts. The status bar shows the current status of the "Bank read" function.

Status bar →
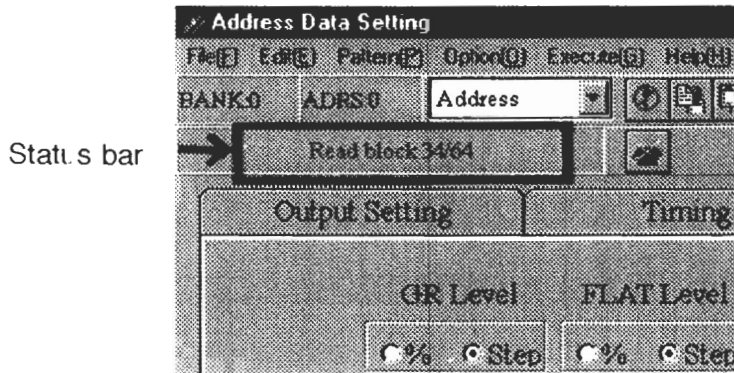
(5) After data is transferred, checksum is displayed in the upper row as shown below.
A screen prompt asks the operator whether data is to be appended in the database.
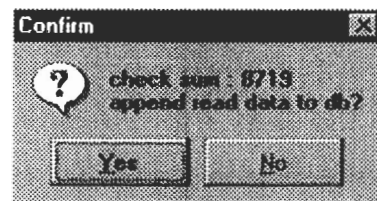
(6) When "No (N)" is selected, data will not be added to database.
Dialog box is displayed as shown below. "Bank read" operation is now completed.
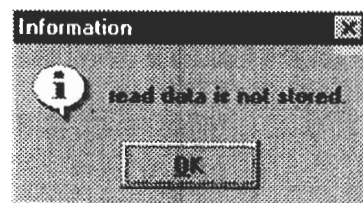
* This function is convenient to confirm checksum.
* Checksum is the summation of data according to an arbitrary set of rules, and is primarily used for checking purposes.
* This checksum differs from the checksum displayed by reading flash memory.

(7)   When "Yes (Y)" is selected, data will be added to database. The following
      dialog box is displayed for naming directory to save user character.
      If up to Bank 6 are present as a database, the directory "c:\leader\data\Bank7"
      (for Bank 7) is automatically created.
      The disk drive name "c:\" depends on the personal computer.
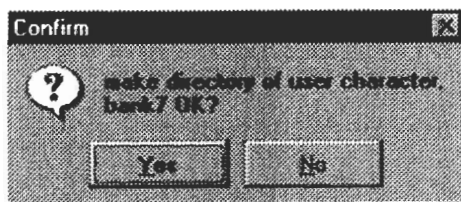
      File name is automatically created for user character data as follows.
      Naming is only possible when data exists.

      c:\leader\data\Bank7 00_032.chr (data of user character code 00)
                           01_032.chr (data of user character code 01)
                           02_032.chr (data of user character code 02)
                           03_032.chr (data of user character code 03)
                           04_032.chr (data of user character code 04)
                                 :
                           0f_032.chr (data of user character code 0f)
                           10_064.chr (data of user character code 10)
                                 :
                           17_064.chr (data of user character code 17)
                           18_128.chr (data of user character code 18)
                           19_128.chr (data of user character code 19)

      "c:\" indicates the disk drive where the "Timing set" program is stored. The
      actual indication depends on the personal computer.

(8) When "No (N)" (shown in step 7) is selected, any setting except directory name can be performed.
In the example below, directory "c:\leader\data\crt_test" is created.
The disk drive name "c:\" depends on the personal computer.
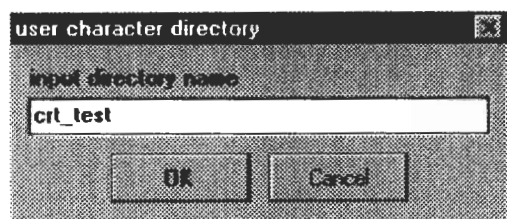
(9) The instrument restarts operation to add data. After operation is completed, dialog box is displayed as shown in Figure below.
Data is added as Bank 7 (upper row).
The same checksum as step 5 is displayed again (lower row).
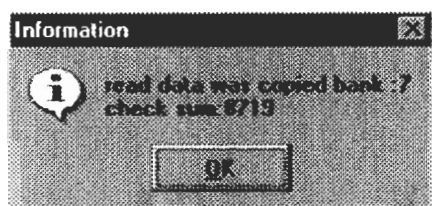
(10) "Bank read" operation is now completed.
When "Bank 7" is selected from the "Bank Select" menu, the fetched data can be checked and edited.

* To store this data to a floppy disc, refer to Section 7.1.6, "Saving a File (Transferring BANK Data to a File)" (page 7-6).

5. "Picture transfer" MENU SCREEN
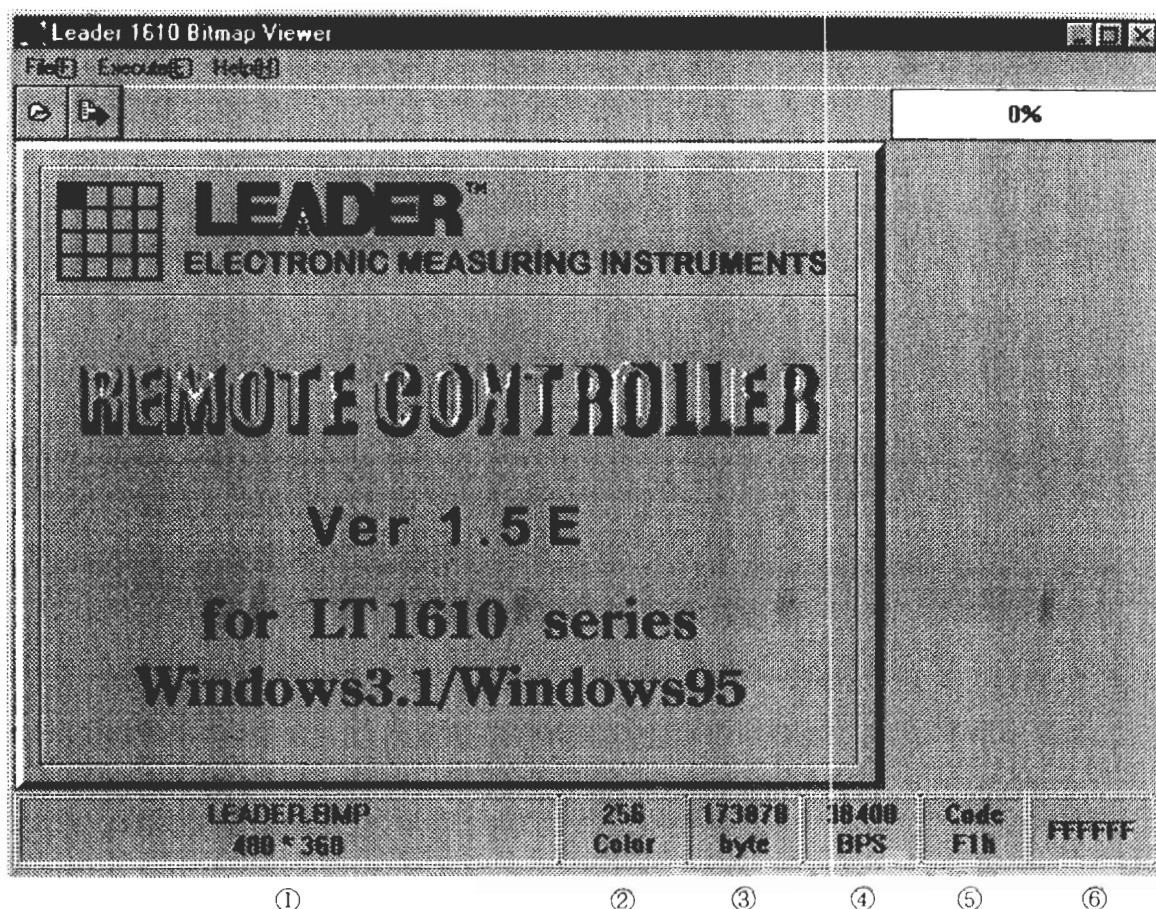
When "Picture transfer" runs, the status bar at the lower part of the screen displays information as follows. This method is suitable for a VGA (640 x 480) screen.

• Information
  ① File name and picture size (pixel)
  ② Color type of bit map data
  ③ Picture size of bit map data in units of byte
  ④ Baud rate
  ⑤ Pattern number assigned to natural-color pattern
     The next pattern number to be assigned is displayed after data is transferred.
  ⑥ Begin address registered to backup RAM
     When natural-color backup RAM (factory option) is not installed, "FFFFFF" is displayed.

* Refer to Section 4.7, "Picture Transfer" (page 4-7).

6. SUPPLEMENT

6.1 Additional Flash Memory for User ROM

In addition to the current ROM (i.e., HN28F101P manufactured by Hitachi),
M28F101 (manufactured by Thomson) can also be used.
    Flash memories supported   HN28F101P, Hitachi
                                        M28F101, Thomson

Improved programs enable faster data writing due to a revised algorithm.

6.2 Error Code "E7"

If power is turned off when data is being written to flash memory, write the data to
memory again.
If "E7" is displayed when power is turned on, write the data to flash memory as
required.

6.3 Storing and Recalling Database

To save Bank data respectively, refer to Section 7.1.6, "Saving a File (Transferring
BANK Data to a File)" (page 7-6) and Section 7.1.5, "Invoking a File (Transfer to the
BANK)" (page 7-4).
To save database containing multiple banks, proceed as follows.
Database should be saved for safety purposes.

6.3.1 Storing Database

(1)   If "Timing set" or "Timing report" software runs when storing data, be sure to
        exit this software.

(2)   Create a directory with the appropriate name. Files related to the directory
        name should only be saved because all files located here are returned to the
        previous locations.
        Example: c:\leader\backup1\

(3)   Copy all files in the "c:\leader\data" to the directory created in step 2.
        The disk drive name "c:\" depends on the personal computer.

(4)   When using user character font data, be sure to save this cata in the
        subdirectory of the directory created in step 2.
        Example: User character data, c:\leader\backup1\usr_chr1\

(5)   Saving database is now completed.

6.3.2   Recalling Database

IMPORTANT: The existing database is overwritten at database recall. To retain
                    the existing database, do not perform the procedure below.

(1)   If "Timing set" or "Timing report" software runs when storing data, be sure to
        exit this software.

(2)   Copy to return data to "c:\leader\data" from the directory created at Section
        6.3.1, "Storing Database."
        The disk drive name "c:\" depends on the personal computer.

(3)   Recalling database is now completed.

7. MAINTENANCE

When calibration or service is required, contact your local Leader agent.

Setting Timing Data & Pattern Data

QUICK MANUAL

TABLE OF CONTENTS

> This manual is written for the LT 1610A
> and can be used for LT 1610 series units.

1. MONITOR SPECIFICATIONS

A picture monitor with the following specifications is used in this manual as an example.

- Specifications: XGA monitor, 1024 x 768 (frequency : 75 Hz)

- Dot Clock Frequency (DOT RATE): 78.75 MHz

- Horizontal Sync (HORIZONTAL)

H-Freq (S)	H-Period (P)	H-Sync (V)	H-BP (B)	H-Disp (D)	Polarity
60.023 kHz	1312 dots	96 dots	176 dots	1024 dots	POS
	16.66 μs	1.219 μs	2.235 μs	13.003 μs	

- Vertical Sync (VERTICAL)

V-Freq (R)	V-Period (I)	V-Sync (Y)	V-BP (O)	V-Disp (U)	Polarity
75.030 Hz	800 lines	3 lines	28 lines	768 lines	POS
	13.328 ms	0.05 ms	0.466 ms	12.795 ms	

- Horizontal and Vertical Sync Formats (H/V SEPARATE SYNC)

Using the horizontal system in unit of dot/μs and vertical system in unit of line/ms ensures accurate settings.

2. OUTLINE OF SETTING TIMING AND PATTERN DATA

There are three cards used to set timing data and pattern data in the "Address Data Setting" window as shown below.

Output Setting card   Timing card   Signal card
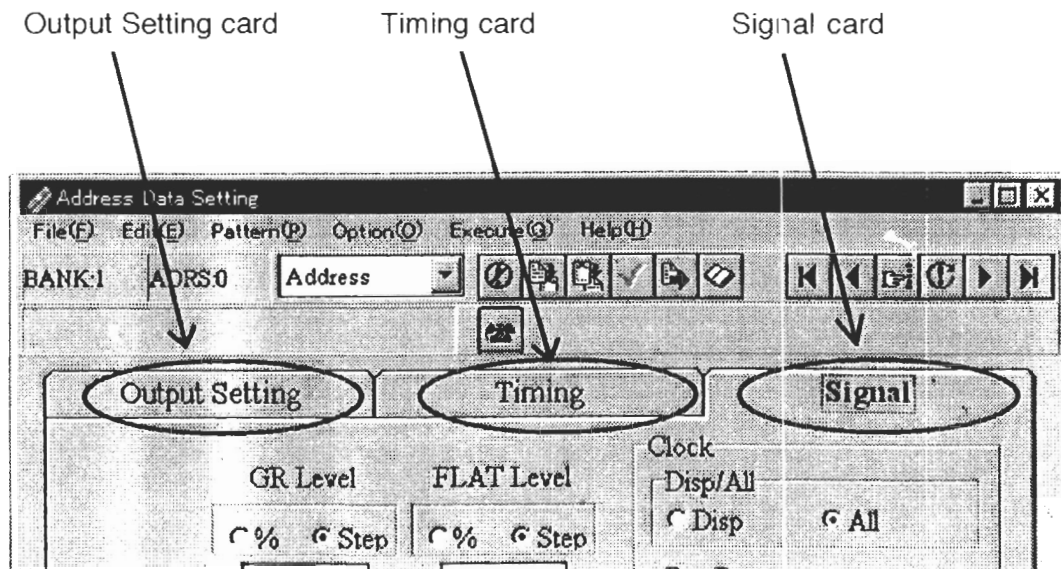
Output Setting card
This card is used to set output signal format.
Sync signal polarity, composite sync signal, SYNC (G), and setup on/off can be set.

Timing card
This card is used to set output signal timing.
Interlace, non-interlace, and interlace shrink can also be set.

Signal card
This card is used to set output parameter, and to assign the pattern to the keys addresses.

3. SETTING TIMING DATA

3.1 Using Timing Card

Operating Procedure

a. Click "Timing Set" icon to start "Timing Set," then click "Timing" tab to display the screen as shown below.
(The figure below shows default values.)

3.1.1 Creating New Bank

Operating Procedure

a. Select Bank New (N) from the "File (F)" menu.
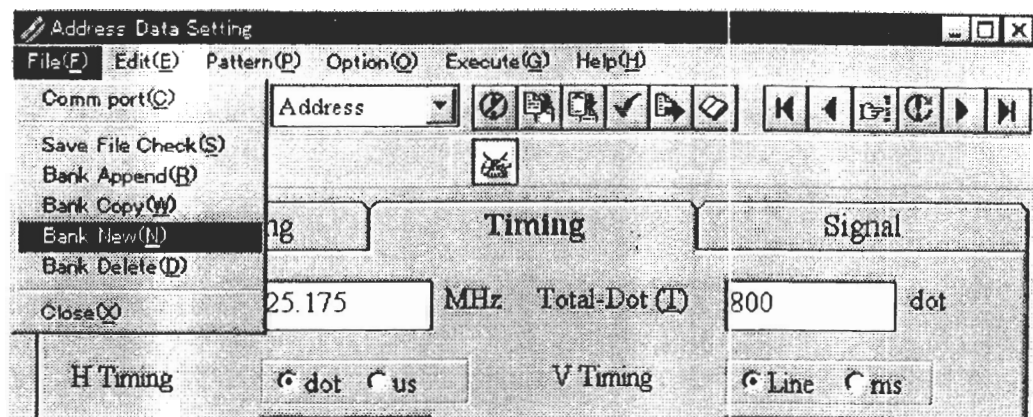
b. Enter program ID (e.g., XGA).
    (Up to 40 characters can be entered.)
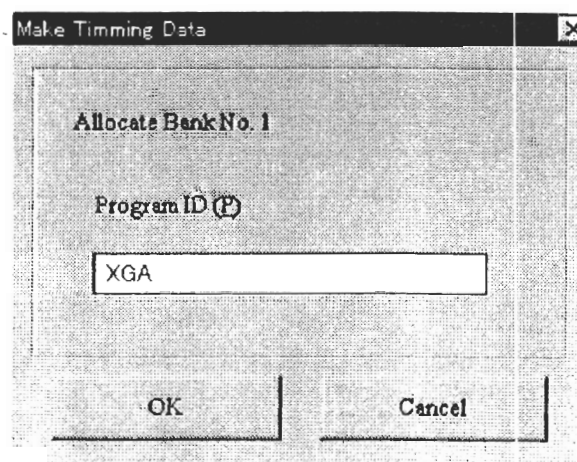
c. Clicking "OK" button displays the screen as follows.
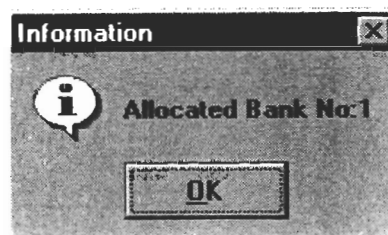
See the figure above. New bank is added to Bank No. 1. The bank number cannot be selected (i.e., automatically allocated).
New bank is now created.

d. Click "OK" button.

e. Select Bank 1.
   Use "Bank Select" icon (book opened shape).
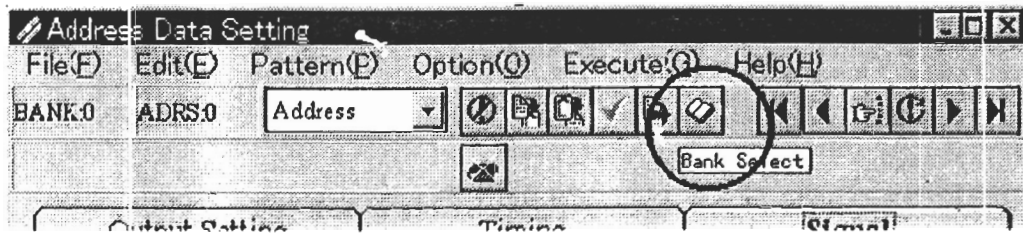
Click the con.
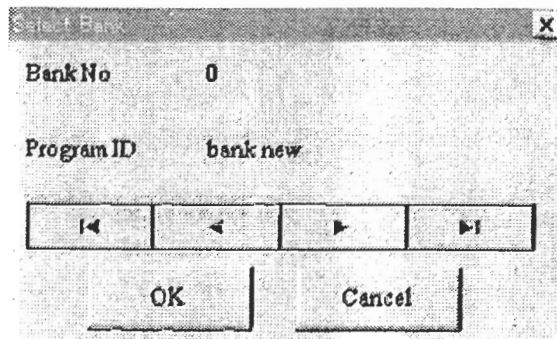
f. Select the bank to be edited.
   (Select the Bank No. 1, here.)

g. Click Right-Arrow key to set the bank number to 1.

h. Click "OK" button.

i. The screen is displayed as shown below.

Address Data Setting

File(F) Edit(E) Pattern(P) Option(O) Execute(Q) Help(H)

BANK:1   ADRS:0   Address

| Output Setting | Timing | Signal |

DotClock (C) 25.175   MHz   Total-Dot (T) 800   dot

H Timing	dot us		V Timing	Line ms	
H-Freq (S)	31.469	kHz	V-Freq (R)	59.934	Hz
H-Period (P)	800	dot	V-Period (I)	525.0	Line
H-Sync (V)	96	dot	V-Sync (Y)	2.0	Line
H-BP (B)	48	dot	V-BP (O)	33.0	Line
H-Disp (D)	640	dot	V-Disp (U)	480.0	Line
HD-Start (Z)	0	dot	VD-Start (A)	0.0	Line
HD-Width (N)	96	dot	VD-Width (X)	2.0	Line
			EQ-FP (Q)	0.0	Line
Disp Dot	640	dot	EQ-BP (W)	0.0	Line

NON-INT   INTERLACE   INT-SHRINK   Norm Spec

VGA480-6   XGA

Program ID is displayed.

3-4

3.1.2 Setting Timing Data

Refer to Section 1, "MONITOR SPECIFICATIONS" for setting timing data.

First, set Dot Clock.

Use the tab key to position the cursor.

Setting of Total Dot (T), H-Freq (S), and V-Freq (R) is not required because they are automatically set by setting other timing data.

HD-Start (Z), HD-Width (N), VD-Start (A), and VD-Width (X) are only provided for the LT 1610A and LT 1612A; leave initial settings for the LT 1611.

Leave equalizing pulses {i.e., EQ-FP (Q), EQ-BP (W)} for the initial settings (0.0), here.

Operating Procedure

Enter data to the framed items shown in the figure.

a. Position the cursor to Dot Clock (C) with a mouse.
b. Delete the current value using the DEL or backspace key, then enter "78.750" using the keyboard.
c. Press the tab key to position the cursor to the H-Period (R), then enter "1312" using the keyboard.
d. Perform the same procedure to enter all data.
    The screen is displayed as shown in the figure below.
    Confirm that the data is correct, then click "Timing Check" icon. Data is stored on the hard disk.
    The color of "Timing Check" icon changes from red to gray. If incorrect data is entered, the color remains red. The status bar displays error contents and the cursor indicates the incorrect item. Check the data for correction.

Status bar

Timing Check icon

Address Data Setting

File(F) Edit(E) Pattern(P) Option(O) Execute(G) Help(H)

BANK: ADRS:0   Address

| Output Setting | Timing | Signal |

DotClock (C) 78.750   MHz   Total-Dot (T) 1312   dot

H Timing   • dot ◦ us   V Timing   • Line ◦ ms

H-Freq (S)   60.023   kHz   V-Freq (R)   75.030   Hz

H-Period (P) 1312   dot   V-Period (I) 800.0   Line

H-Sync (V)   96   dot   V-Sync (Y)   3.0   Line

H-BP (B)   176   dot   V-BP (O)   28.0   Line

H-Disp (D)   1024   dot   V-Disp (U)   768.0   Line

HD-Start (Z) 0   dot   VD-Start (A) 0.0   Line

HD-Width (N) 96   dot   VD-Width (X) 2.0   Line

                           EQ-FP (Q)   0.0   Line

Disp Dot   1024   dot   EQ-BP (W)   0.0   Line

• NON-INT   ◦ INTERLACE ◦ INT-SHRINK   ◦ Norm • Spec

VGA480-6   XGA

3-6

3.1.3 Setting NON-INT and INTERLACE Scanning

Leave initial settings as is
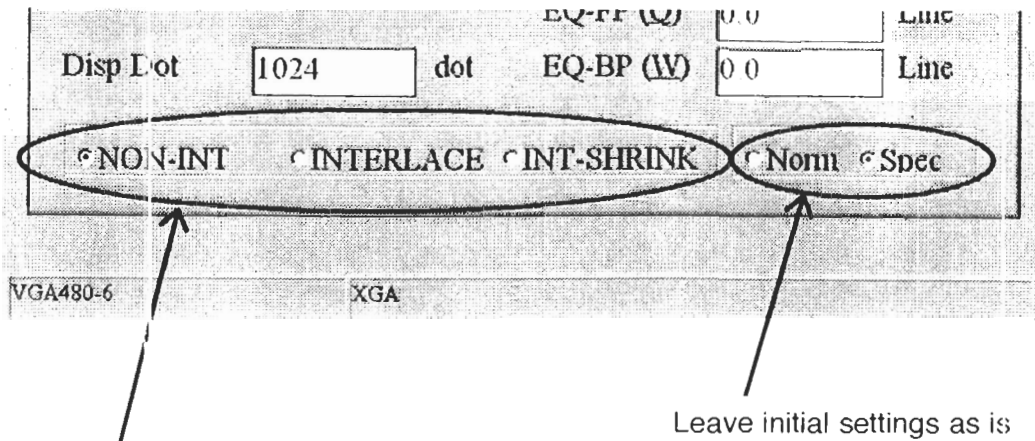
The NON-INT or INTERLACE is automatically selected by setting the V-Period (i.e., *.0, *.5).
Since INT-SHRINK cannot be set automatically, click it as required.

(1) Line Mode (Automatic Scanning Mode Selection)
    In the Line mode, the scanning mode is automatically selected by setting the V-Period (.e., *.0 Line, *.5 Line).
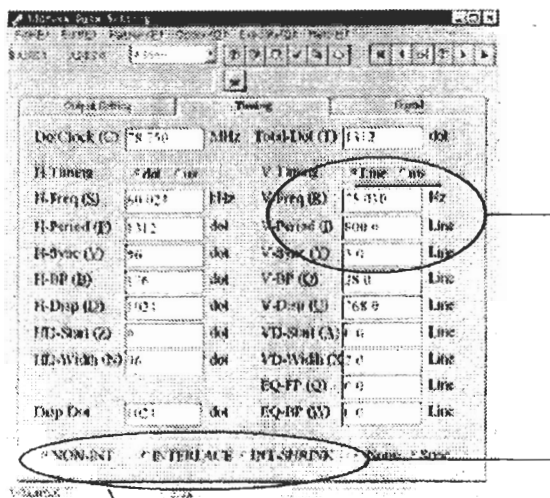
Scanning mode is automatically selected by V-Period.

For example, the NON-INT scanning is selected by setting the V-Period to 800.0 Line.
Similarly, the INTERLACE scanning is selected by setting the V-Period to 800.5 Line.
When the NON-INT box is clicked, the first digit after the decimal point is set to "*.0." V-Freq is also set to a suitable value.
When the INTERLACE box is clicked, the first digit after the decimal point is set to "*.5." V-Freq is also set to a suitable value.

(2)   Millisecond Mode (Fixed Scanning Mode)

In "ms" mode, the scanning mode is fixed unless auto scanning mode is selected.
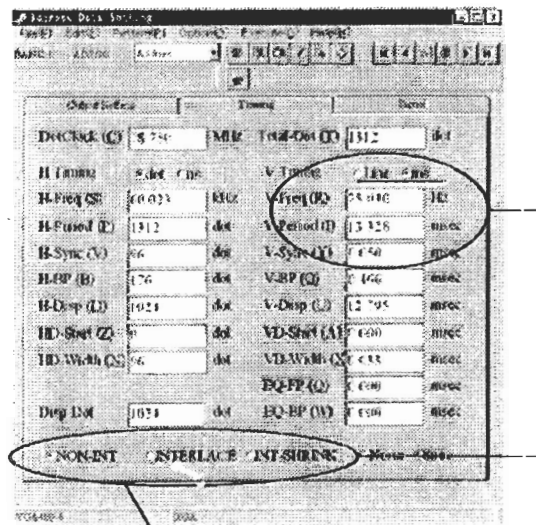
Use boxes to select scanning mode.

See the figure above.
The NON-INT is selected when the V-Period is set to 13.328 ms (800.0 Line).
The NON-INT is also selected when the V-Period is set to 13.327 ms (800.5 Line), however.
The V-Period and V-Freq are displayed in approximate value of NON-INT scanning.

3-8

3.2 Using Output Setting Card

To open the Output Setting card in the Address Data Setting window, proceed as follows.

Click Output Setting card.
The following screen is displayed.
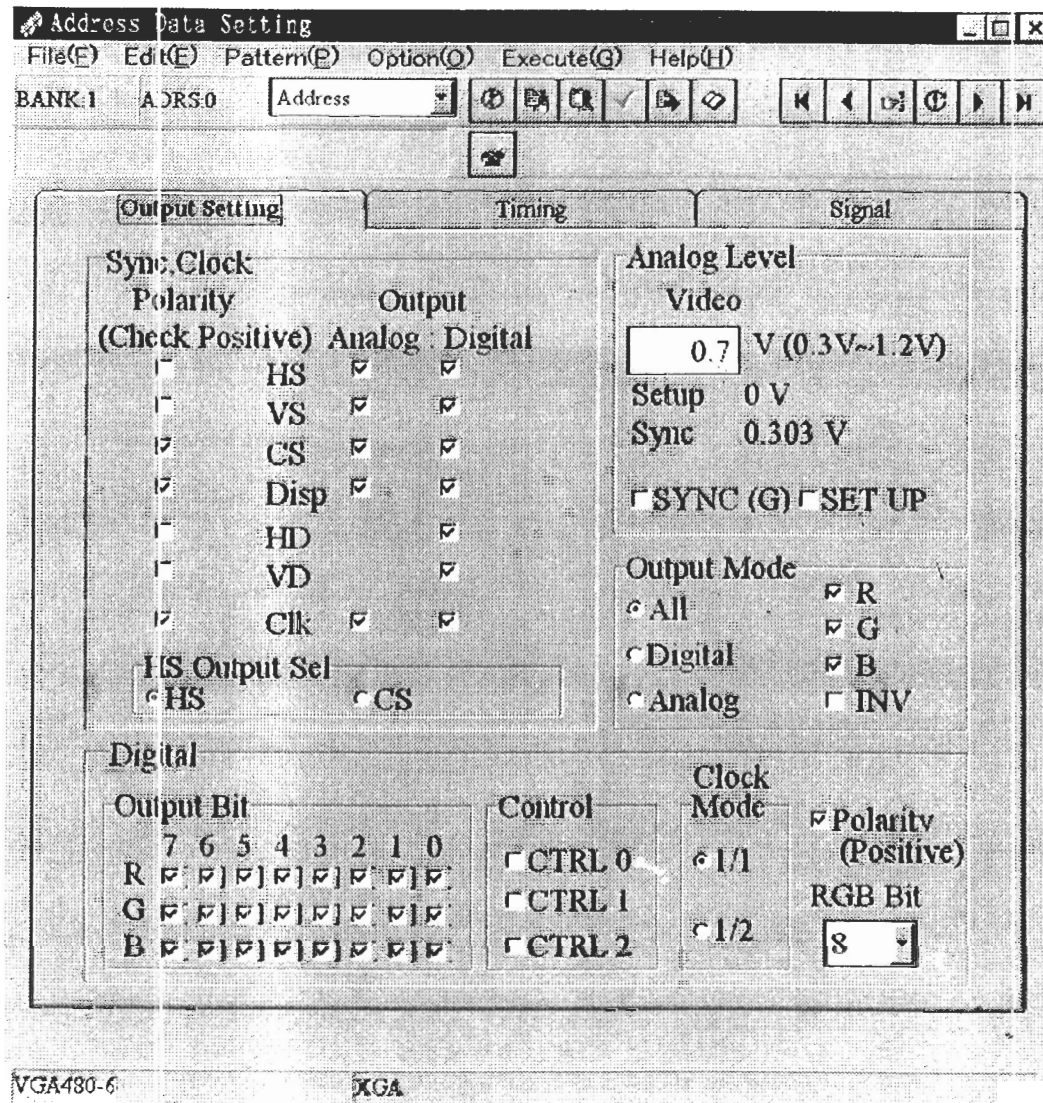
This card is used to set sync signal, clock signal polarity, the video signal level.

The framed items are used for the LT 1610A and LT 1612A; not for the LT 1611.

Leave initial settings for the LT 1611
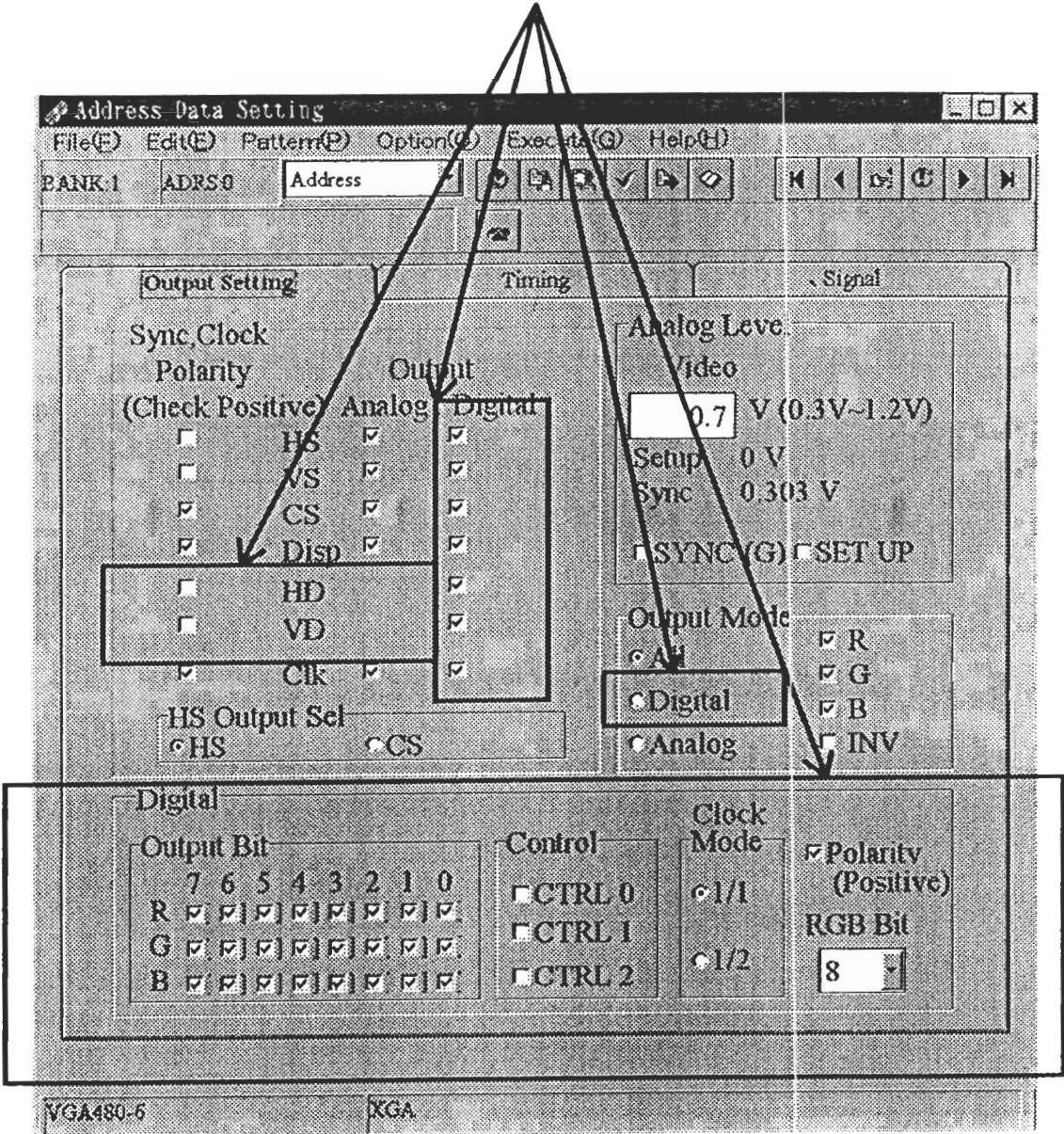
3.2.1 Setting HS and VS

Refer to Section 1, "MONITOR SPECIFICATIONS" and the screen below.
Set HS and VS polarity to positive.
Select HS from the HS Output Set.
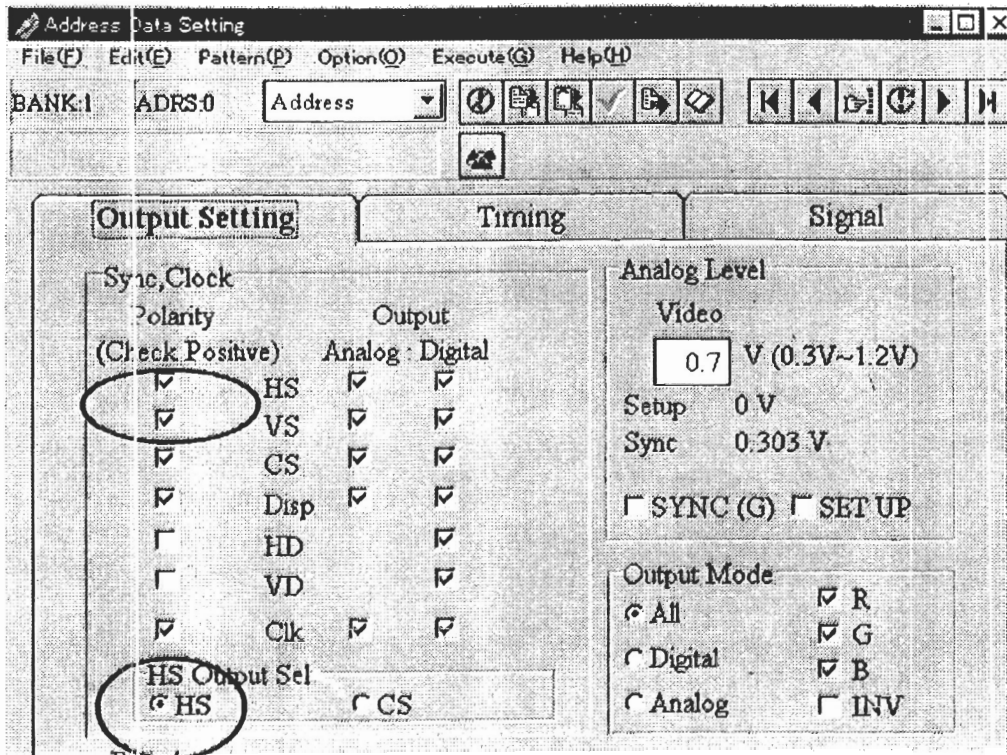
3.2.2 Displaying Specification Name

After all settings are completed, enter timing specification name of the monitor
displaying at the lower-left of the screen.
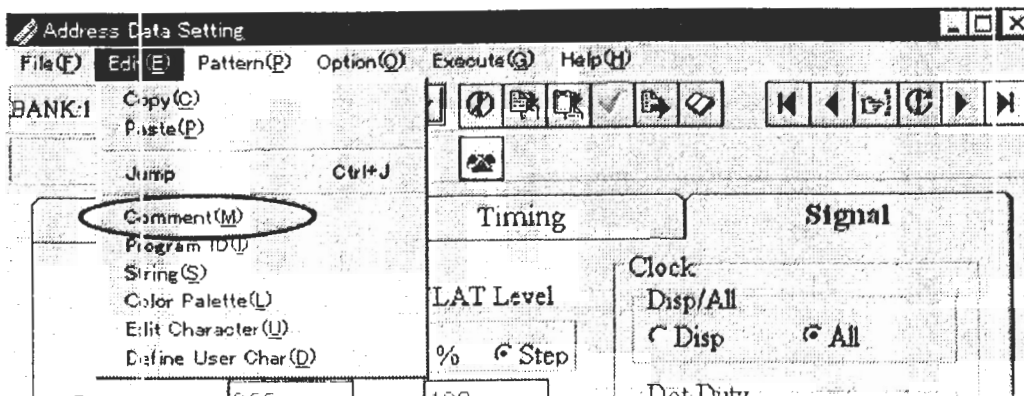
Operating Procedure

a.   Select Comment (<u>M</u>) from the Edit (<u>E</u>) menu.

b.   The comment column at the lower-left corner of the screen is displayed in reverse video.
     Type "1024*768," then press the ENTER key.

The timing data setting shown in Section 1, "MONITOR SPECIFICATIONS" is completed.

3.3 Others

The following settings are not used in general.

3.3.1 Setting Sync-On-Green

Some monitors require sync-on-green {i.e., SYNC (G)} signal.
Click "SYNC (G)" as shown in the figure below.
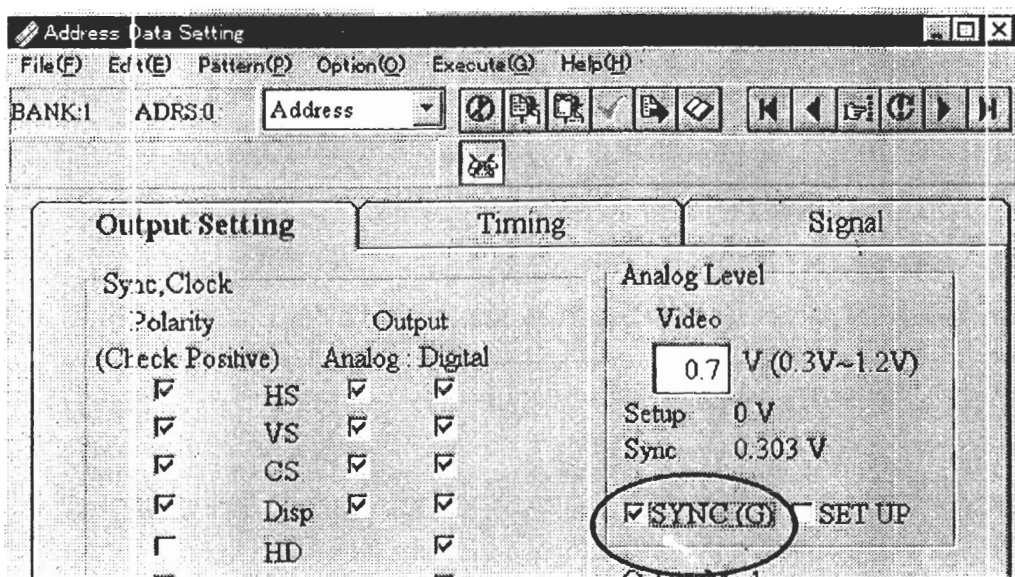
3.3.2 Setting Composite Sync Signal

To output composite sync signal (CS) from the HS connector of the LT 1610A, click CS of the HS Output Sel. See the figure below. (This setting is used for a monitor with individual R, G, B, and CS inputs.)
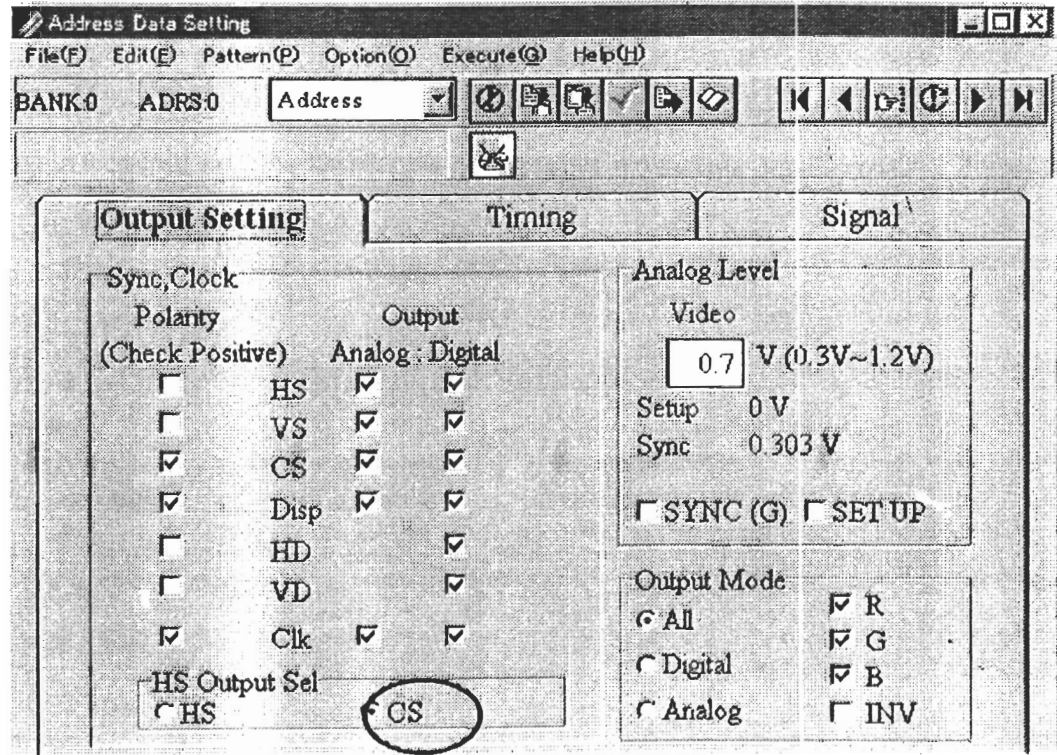
The settings related to the timing are completed.

Up to 100 timings (0 to 99 addresses) can be set and stored to RAM by repeating the procedures mentioned above.

All data are stored in the personal computer hard disk; not stored in RAM of the LT 1610A.
Data should be sent to the RAM after the pattern data setting is completed.

4. SETTING PATTERN DATA

4.1 Pattern Key Assignments

This section describes assignment method of the patterns to the keys of the Remote Controller. The patterns are assigned to the DATA/PATTERN key.
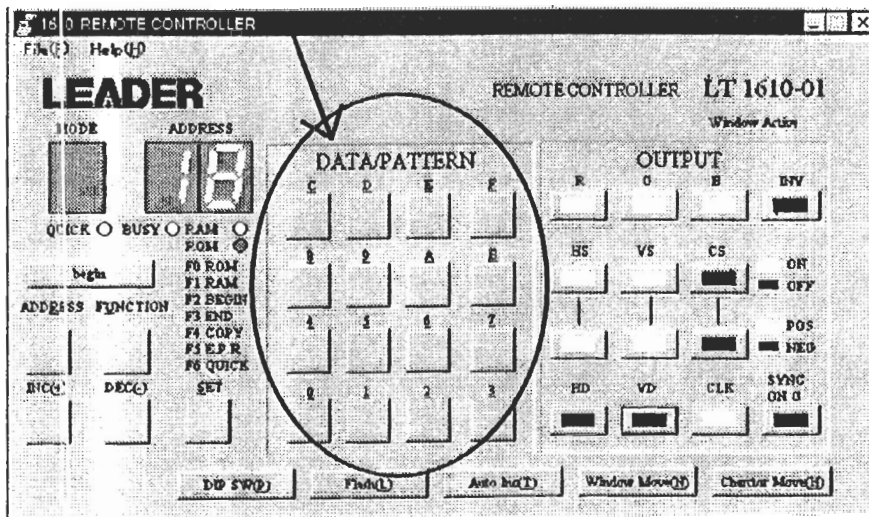
4.2 Pattern Key/Pattern Name

PATTERN Key	Pattern No.	Pattern Name
0	B4h	White raster
1	11h	All character pattern
2	30h	Color bar 0
3	31h	Color bar 1
4	32h	Color bar 2
5	34h	Color bar 3
6	40h	Crosshatch
7	50h	Dot pattern
8	60h	Circle pattern 1
9	73h	Window 73 (1/9 size of entire window)
A	80h	Gray scale 0 (gray scale H)
B	81h	Gray scale 1 (gray scale V)
C	82h	Gray scale 2 (reverse gray scale)
D	10h	All $ pattern, Font size: 7 * 9 Cell size: 16 (H) x 16 (V)
E	B0h	SMPTE RP-133
F	F0h	Natural-color pattern 640 dots (H) x 480 lines (V)

4.3 Signal Card

a. Click Signal card to open. The following screen is displayed.

Note: This setting is ignored when the DIP SW 1-3 (selecting character parameter assignment mode) of the LT 1610A is set OFF. Refer to Section 4.4.2, "Setting All $ Pattern to Key D" to select the characters.

b. Click "Key" of the Output-Pattern to assign a pattern to the key of the Remote Controller.
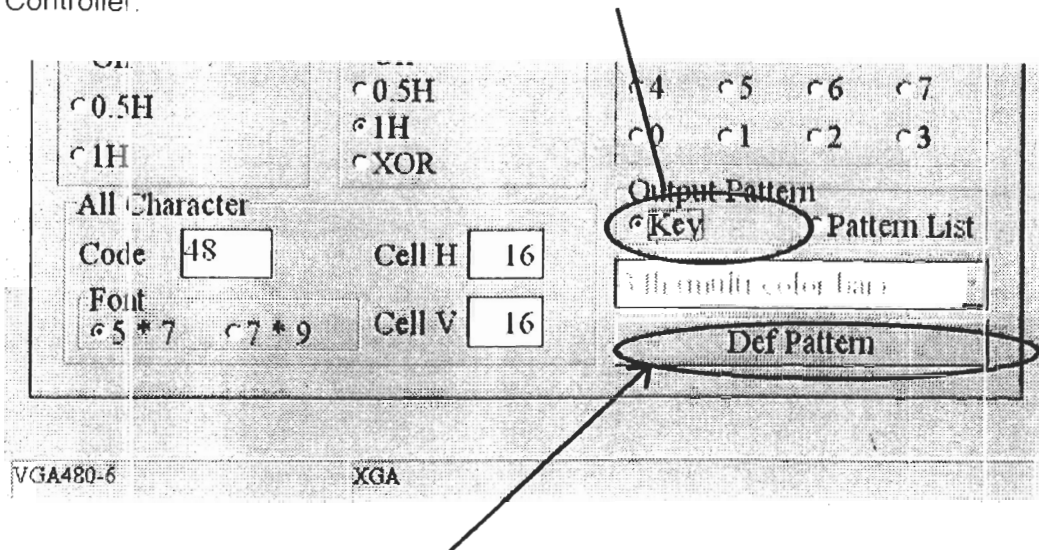
c. By selecting the key, Def Pattern becomes active.

d. The Define Pattern window is opened as shown below.
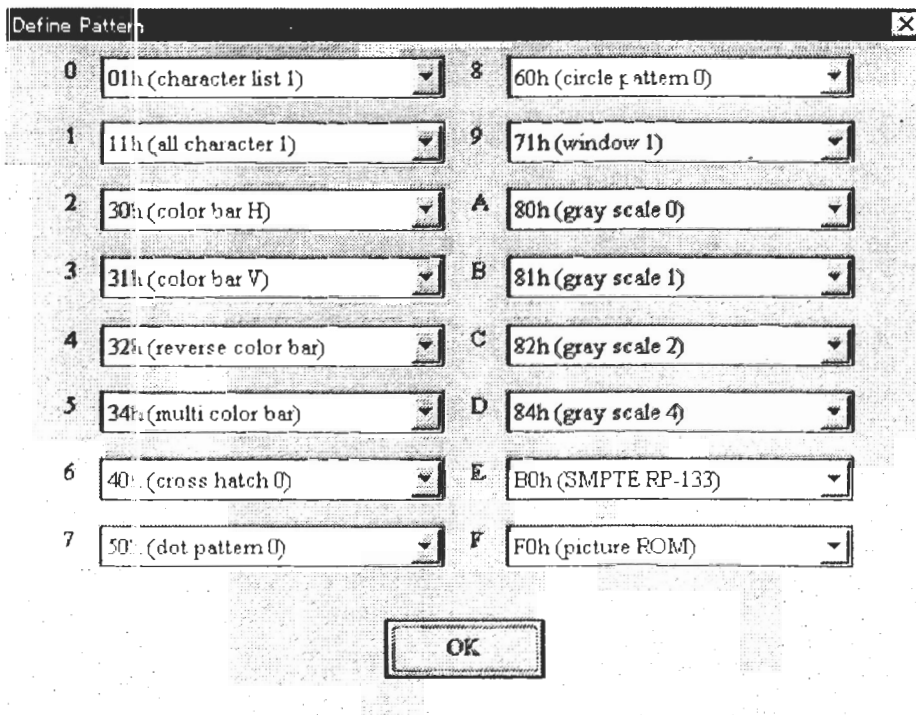
e. Click Down-Arrow of the key number 0.
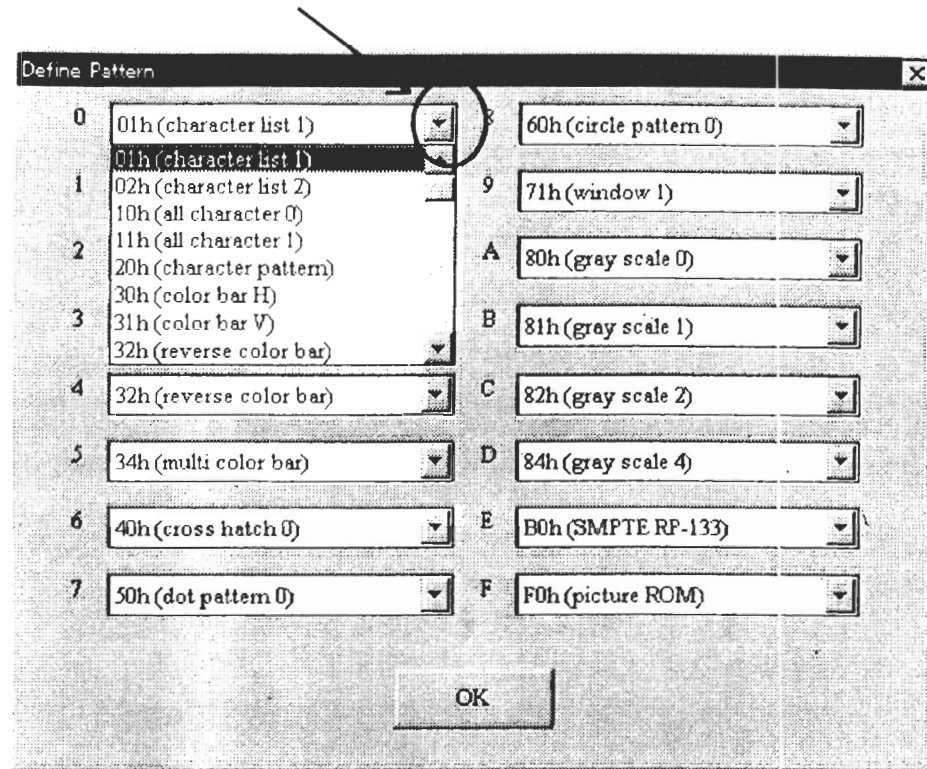
f. Click the key until B4h is displayed.
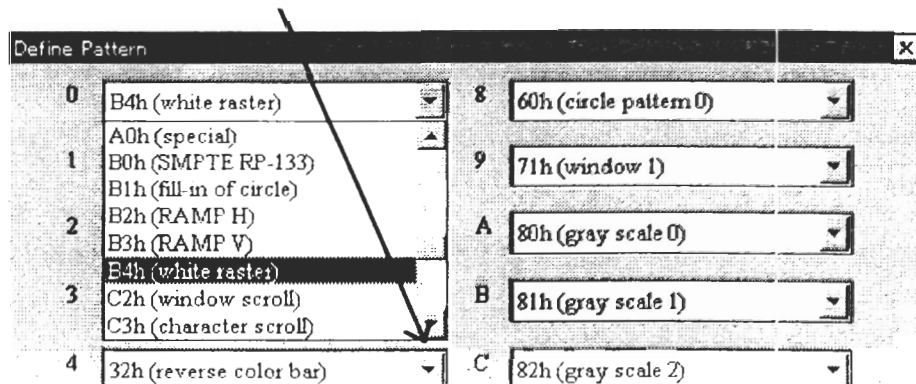
g. Click the pattern number B4h.

h. Perform the same procedure to select the pattern numbers 0 through F.
    The following screen is displayed.
    (Use the mouse or tab key to move the window.)

Define Pattern			
0	B4h (white raster)	8	60h (circle pattern 0)
1	11h (all character 1)	9	73h (window 3)
2	30h (color bar H)	A	80h (gray scale 0)
3	31h (color bar V)	B	81h (gray scale 1)
4	32h (reverse color bar)	C	82h (gray scale 2)
5	34h (multi color bar)	D	10h (all character 0)
6	40h (cross hatch 0)	E	B0h (SMPTE RP-133)
7	50h (dot pattern 0)	F	F0h (picture ROM)

OK
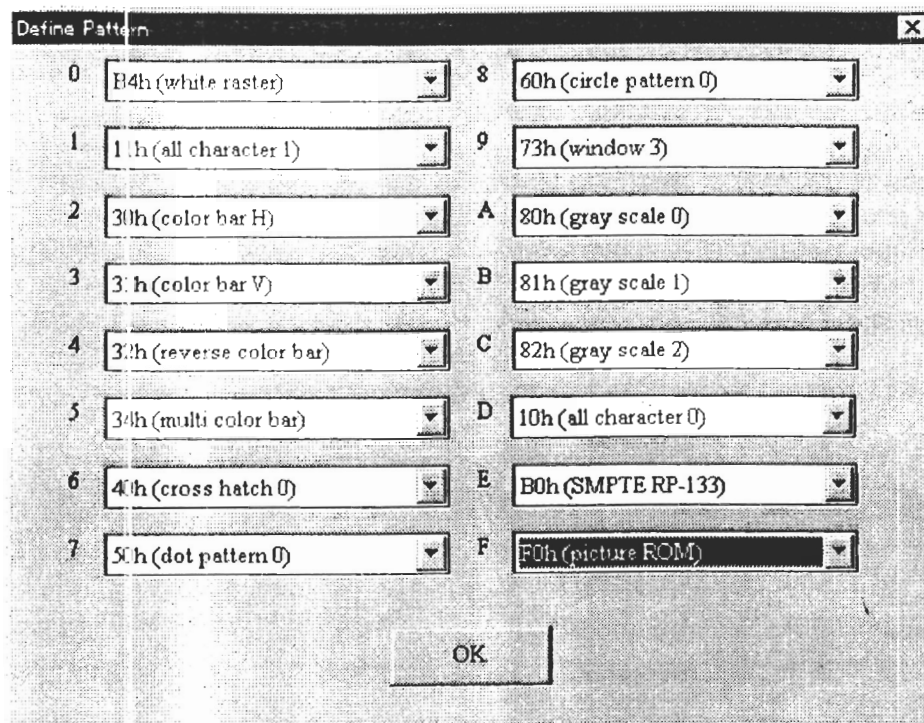
i. Click "OK" button.

4.4 Setting Pattern Parameter

This section describes parameter setting procedure for the patterns assigned to the keys 9 and D.

4.4.1 Setting 1/9-Size Window to Key 9

The pattern (number 73h) assigned to this key can be drawn up to four white windows with arbitrary sizes.
Proceed as follows.

Operating Procedure

a. Select Graphic Window (G) from the Pattern (P) menu.
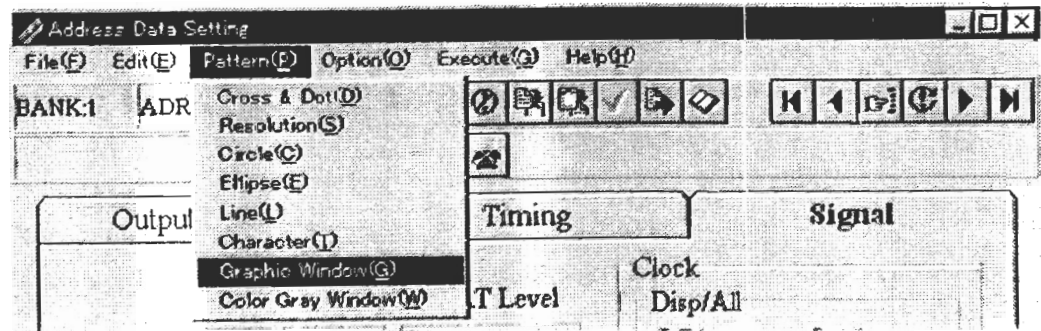
b. Click the key until "Pattern No. 9" is displayed.

c. Select "%" from the Unit.

d. To create 1/9-size window, set "Start X" and "Start Y" to 33.33, "End X" and "End Y" to 66.66.

e. Leave initial settings as follows.
   Window No.:   1
   Format: Normal video
   Shadow: Not required

f.   Click Close.

4.4.2 Setting All $ Pattern to Key D

The pattern (number 10h) assigned to this key can be filled with $.
Proceed as follows.

Operating Procedure

a.   Select Character (T) from the Pattern (P) menu.
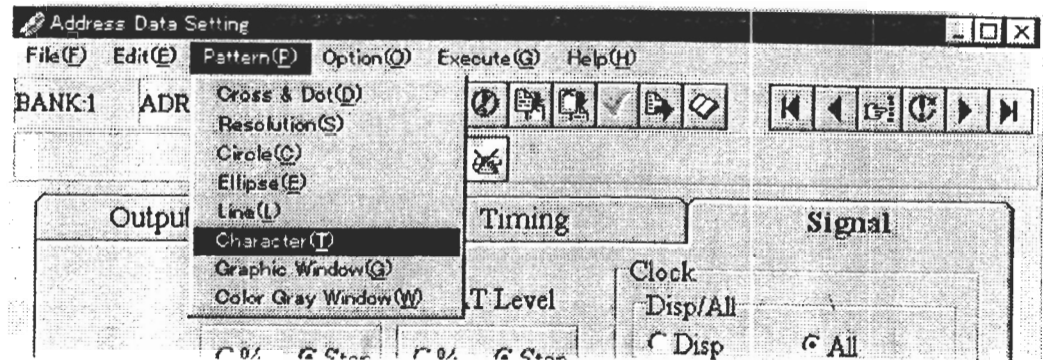
b.   Click the key until "Pattern No. 13" is displayed.
c.   Enter "16" to Cell Size H box and Cell Size V box.
d.   Enter "24" to Character box.
e.   Select "7*9" form the Font Size.
f.   Leave initial settings as follows.
   Window No.:   1
   Format: Not required
g.   Click Close.
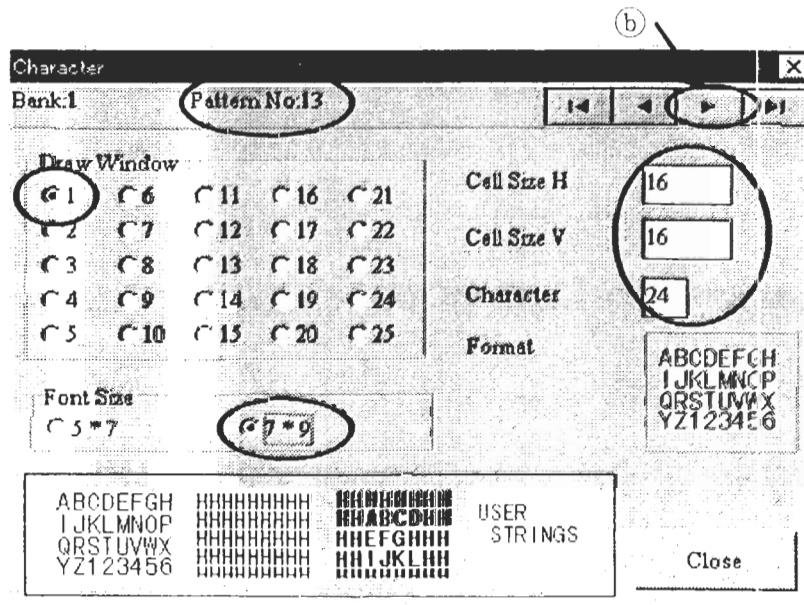
5. SENDING TIMING AND PATTERN DATA TO LT 1610A

Operating Procedure

a. Select "Bank data" from the "Address" window.
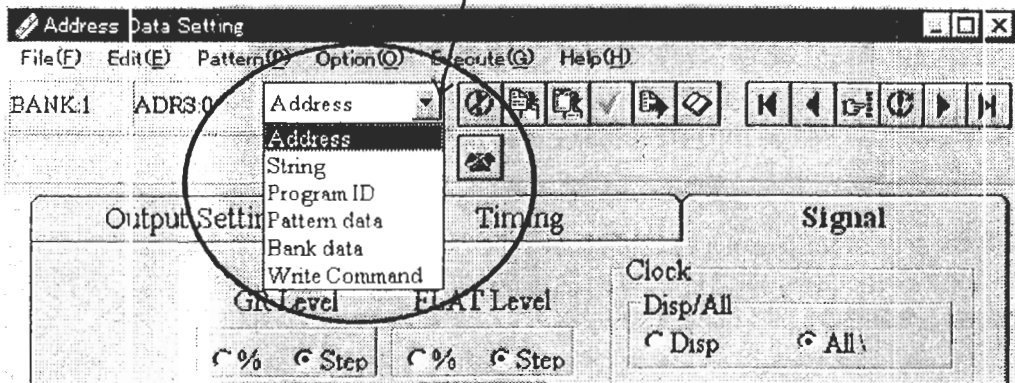
The SEND TO 1610 icon is used to send bank data to the LT 1610A.
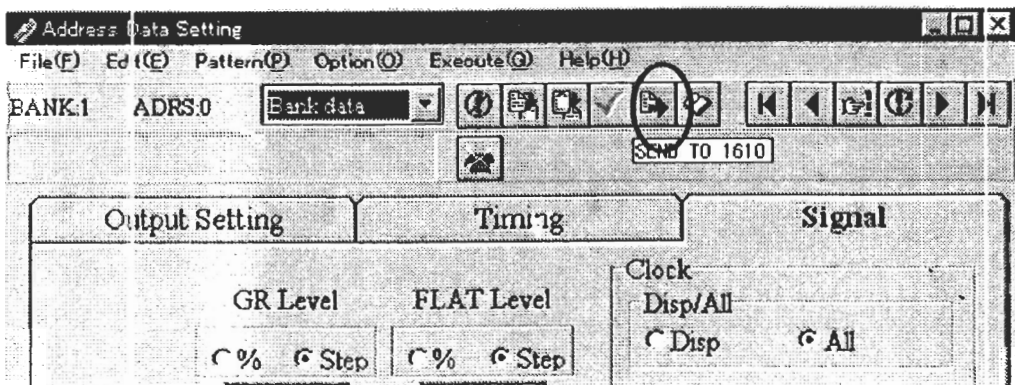
b. Clicking SEND TO 1610 icon automatically sends data.
    Wait a few minutes. The circled portion changes during data transfer.
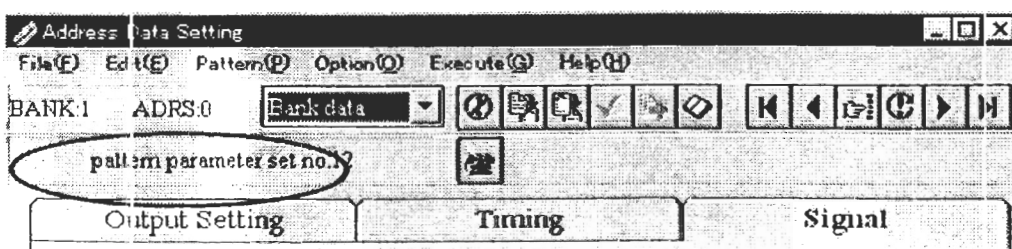
Beeper sounds after data is sent.

"Bank Data Send OK" is displayed as shown below.
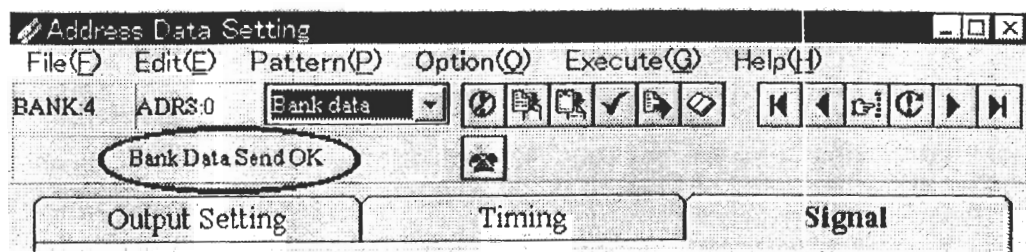
The bank data is send to RAM of the LT 1610A. Set the ROM/RAM switch to RAM as required.

RAM data should be stored in ROM for safety purposes. Refer to Sections 2.7, "Sending Bank Data" and 2.8, "Sending Data from RAM to RCM" of LT 1610A Series Quick Manual (Sending Data).

Up to 200 items of data can be used when storing different data in both ROM and RAM.

Installing Software

QUICK MANUAL

TABLE OF CONTENTS

This manual is written for the LT 1610A
and can be used for LT 1610 series units.

1. PANEL DESCRIPTION

1.1 Top Panel

Figure 1-1

- User ROM block
- Key/LED block
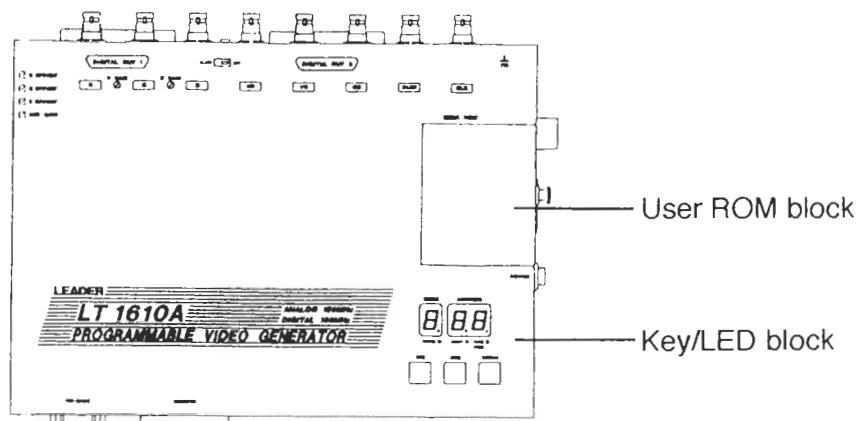
• Key/LED Block
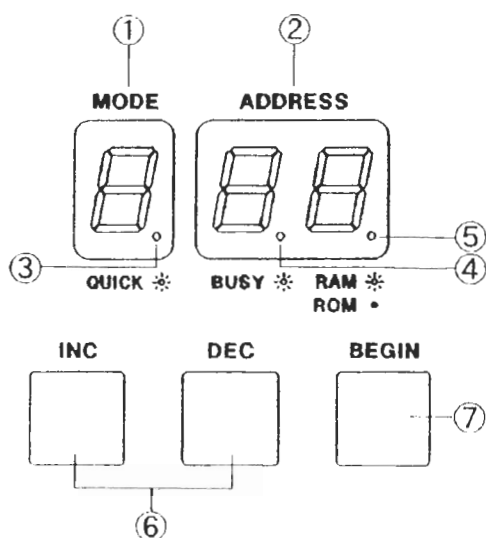
Figure 1-2

① MODE display
Displays LT 1610A operation mode.
When the instrument is controlled via the RS-232C interface, the figure right is displayed

② ADDRESS display
Displays the program address number.
The operation mode is also displayed in FUNCTION mode when the LT 1610-01 Remote Controller is used.

③ QUICK LED
Lights when the LT 1610A is operating in high-speed pattern switching mode.

④ BUSY LED
Lights when the CPU installed in the LT 1610A is in process.

⑤ ROM/RAM LED
Lights to indicate whether the program data stored in user ROM or internal backup RAM to output the signal.
Also lights when the internal backup RAM mode is selected.

⑥ INC/DEC key
Increments or decrements address by one to run the program.
* Holding down the INC/DEC key for at least one second increments or decrements the address continuously. The program runs from the address when the key is released.

⑦ BEGIN key
Returns to the BEGIN address, then runs program.

- **User ROM Block**
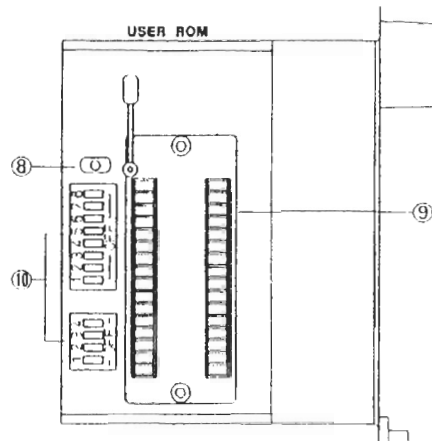
Figure 1-3

⑧   User ROM insert/remove inhibit indicator

      ⚠ CAUTION : Do not insert or remove the user ROM during the indicator
                      lights.

⑨   User ROM socket
      To install the user ROM.
      The following types can be used.
      • FLUSH MEMORY: HN28F101P, Hitachi
      • E-PROM: 27512   (The LT 1610 series units cannot write data.)

⑩   DIP switches
      Set LT 1610A operation modes.

1.2 Front Panel
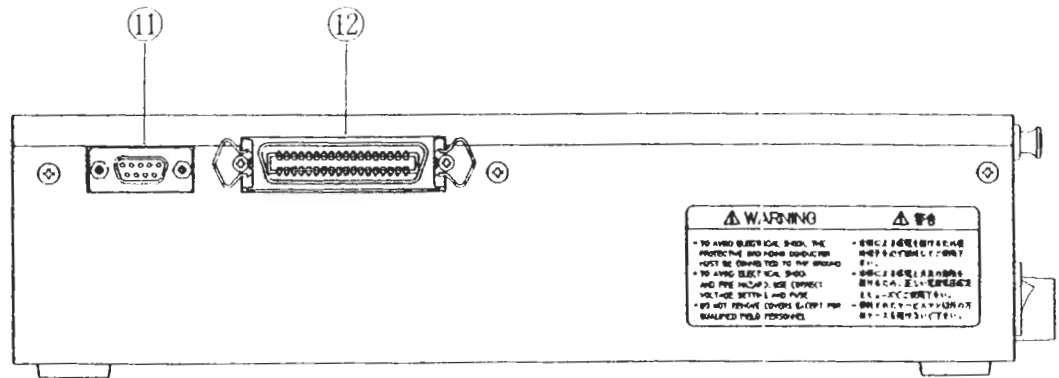
Figure 1-4

⑪ RS-232C connector (D-sub, 9-pin)
To control the LT 1610A with a personal computer or external controller.

⑫ REMOTE connector (57 type, 36-pin)
To remotely control the instrument through the Remote Controller (e.g.,
LT 1610-01, LVG 1603-01).

1.3 Rear Panel
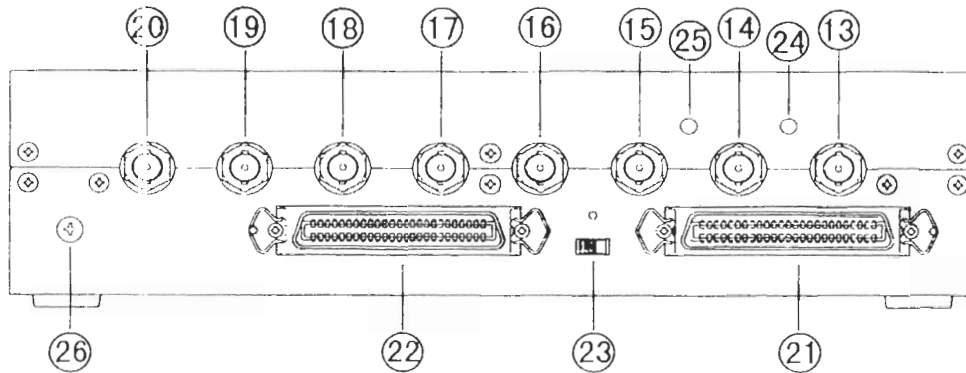
Figure 1-5

⑬ R connector
⑭ G connector
⑮ B connector
Outputs each signal. Output impedance is 75 Ω. Output level can be set in the range of 0.3 V to 1.2 V.

⑯ HS connector
Outputs horizontal sync or horizontal/vertical composite sync signal. The signal can be selected by using the program.
* The signal level of HS, VS, CS, or DISP is CMOS/TTL level (H: ≥4.5 V, L: ≤0.6 V).

⑰ VS connector
Outputs vertical sync signal.

⑱ CS connector
Outputs composite sync signal.

⑲ DISP connector
Outputs display period timing signal.

⑳ CLK connector
Outputs internal dot clock frequency. The output level is at least 0.6 Vp-p (ECL level, AC coupled).

㉑ DIGITAL OUT 1 connector (57 type, 50-pin)
Outputs digital signal. The 57-30500 (Manufactured by DDK) or equivalent connector can be used.
* The following two output levels can be selected by using the slide switch ㉓.
  CMOS/TTL level   H: ≥3.8 V, L: ≤0.6 V
  Low-voltage CMOS/TTL level   H: ≥2.0 V, L: ≤0.6 V

㉒ DIGITAL OUT 2 connector (57 type, 50-pin)
Outputs digital signal. The 57-30500 (Manufactured by DDK) or equivalent connector can be used.

㉓ Slide switch
Selects the sync signal related to analog output, and digital signal output level (5 V/3 V).

⚠ CAUTION : An incorrect setting applies excessive voltage to the monitor and may result in damage.

㉔ R GAIN
Fine adjustment for R video signal output level.

㉕ B GAIN
Fine adjustment for B video signal output level.

㉖ Grounding screw
This screw is connected to the chassis, and is used for grounding.

⚠ WARNING : The chassis must be grounded by using this screw. Otherwise, you may damage the instrument or run the risk of electrical shock.

1.4 Right-Side Panel
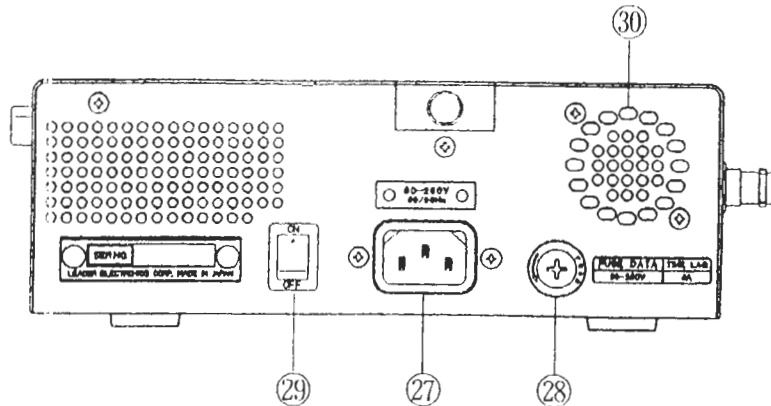
Figure 1-6

㉗ Inlet

To connect the supplied power cord.

The line voltage should be between 90 and 250 VAC.

⚠ WARNING : • Connect this instrument to the rated power line voltage.
Excessive voltage can cause fire. Confirm that the power
line voltage is correct before connecting the power cord.
The line voltage range of this instrument is 90 VAC to
250 VAC (50/60 Hz).
• Power cord
The supplied power cord must be used. Otherwise, you can
the risk of fire. If the cord is damaged, contact your local
Leader agent.
Use of a damaged cord may cause electrical shock or fire.
When disconnecting the power cord from the outlet, pull the
plug; do not pull the cord.

㉘ Fuse holder

Fuse data is indicated at the right side of the fuse holder. When replacing the
fuse, rotate the cap counterclockwise using a Phillips screwdriver.

⚠ WARNING : Before replacing the fuse, be sure to turn the power switch off
and disconnect the power cord from the mains.
Use only the fuse of correct type and rating for replacement.

㉙ Power switch

㉚ Fan

⚠ CAUTION : To prevent instrument damage due to overheating, do not
block airflow through the vents.

1.5 Left-Side Panel
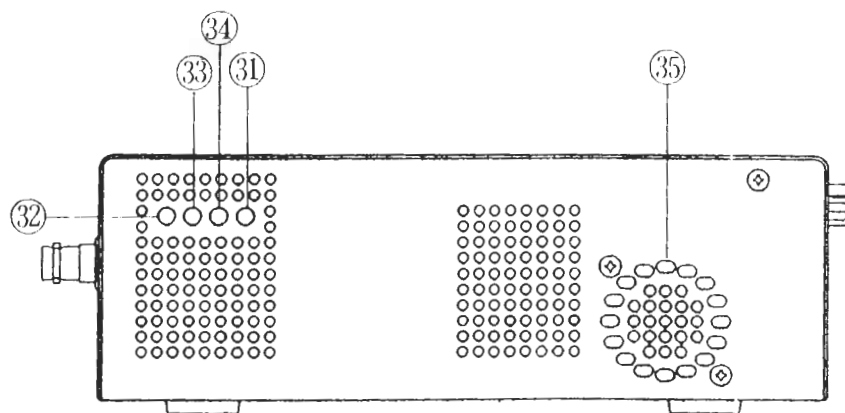
Figure 1-7

③① RGB GAIN
Fine adjustment for R, G, and B video signal output level

③② R OFFSET
Fine adjustment for R video signal offset level.

③③ G OFFSET
Fine adjustment for G video signal offset level.

③④ B OFFSET
Fine adjustment for B video signal offset level.

③⑤ Fan

⚠ CAUTION : To prevent instrument damage due to overheating, do not block airflow through the vents.

2. INSTALLING SOFTWARE

This section cescribes installation procedure of the supplied application software to the personal computer.

2.1 Softwares Supplied

Media: 3.5-inch floppy disk
Quantity: 7
Format: MS-DOS (1.44 MB format)
Disk Name: LT 1610 CONTROL DISK 1 to 4 (installation and control)
            LT 1610 SAMPLE DATA
            LT 1610 DATA BASE ENGINE DISK 1 - 2 (editing data)

2.2 Operating Environments

The software runs on personal computers in which Windows 3.1 or Windows 95 is installed.
The hard disk should have at least 20 MB of free space. RAM should have at least 8 MB of free space (though 16 MB is recommended).
A mouse or equivalent controller is required.
Resolution of a monitor should be at least SVGA (800 x 600 dots).

2.3 Notes on Reinstalling Program

IMPORTANT: Old bank data is overwritten when program is reinstalled.

To retain old bank data, refer to Section 3, "REINSTALLING PROGRAM" before installing program.

Run "uninstall" before upgrading the software.

2.4 Installing Supplied Software

2.4.1 Windows 95

(1) Control Software
a. Start Windows. (Refer to instruction manual related to Windows and personal computer as required.)
b. Insert CONTROL DISK 1 to the floppy disk drive.
c. Select "Run" from the Start button.
d. Enter the following command in the command line column, then click the "OK" button.
Specify the floppy disk drive in which the floppy disk is inserted (depending on the personal computer). Here, the floppy disk drive is called drive A; the hard disk is called drive C.

```
A:\setup
```

e. Installation automatically starts. Follow the message on the screen and install the CONTROL DISK 2 to 4.
After installation is completed, "LEADER LT1610" group is created and following six icons are registered.
Cursor Move
Picture transfer
Remote Controller
Timing Set
database pack tool
uninstall

Create a shortcut on the disk top as required.

(2) Database Engine

a. Insert DATA BASE ENGINE DISK 1 to the floppy disk drive.
b. Select "Run" from the Start button.
c. Enter the following command in the command line column, then click the "OK" button.
Specify the floppy disk drive in which the floppy disk is inserted. Here, the floppy disk drive is called drive A.

```
A:\install
```

d. Installation automatically starts. Follow the message on the screen and install the DATA BASE ENGINE DISK 2.
After installation is completed, directory "idapi" is created. (Default is C:\idapi, hard disk drive.)
e. Select "Run" from the Start button.
f. Enter the following command in the command line column, then click the "OK" button.
Specify the hard disk drive. Here, the hard disk drive is called drive C.

> C:\idapi\bdecfg

g. The "BDE Configuration Utility" window is opened, select "Aliases" tab.
Clicking the "New Alias" opens "Add New Alias" dialog box.
Write "1610hostDB" to "New Alias name:" text box, then click "OK (O)" button.
Confirm that the alias name "1610hostDB" is selected, then write "C:\leader\data" in the PATH box. See Figure 2-1. Here, the hard disk drive is called drive C.
When closing the file, the screen asks whether to save data, click "Yes" button.
h. After installation is completed, restart the Windows.
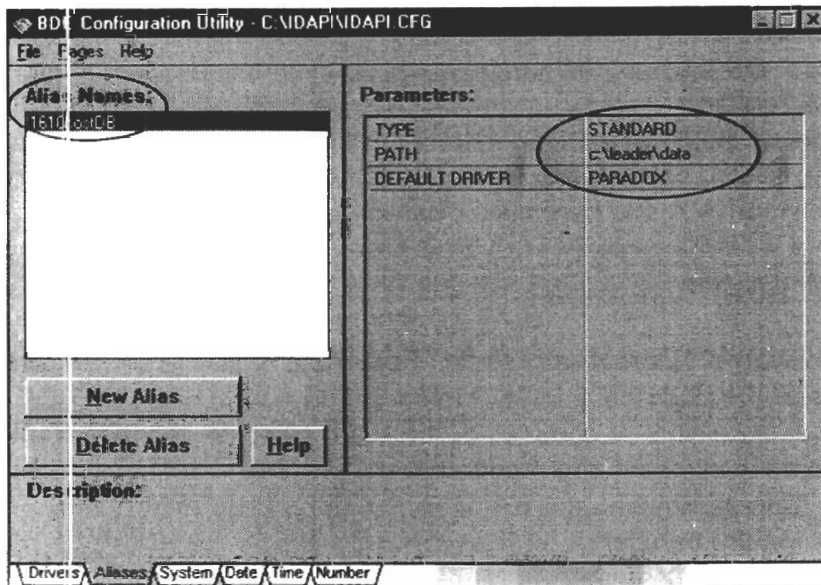
Figure 2-1

(3) Sample Data

The SAMPLE DATA disk contains sample data and database initialization
software.

- When using sample data, refer to Section 7.1.5, "Invoking a File (Transfer to
the BANK)" of LT 1610A/LT 1611 instruction manual for detail.

- The database initialization software is contained in the "A:\recover\setup.exe"
file on SAMPLE DATA disk.
IMPORTANT: Do not use this file in general. Running this software initializes
the database and stored bank data. Orly use this software
when database contents cannot be read due to failure.

2.4.2 Windows 3.1

(1) Control Software
    a.   Start Windows. (Refer to instruction manual related to Windows and
personal computer as required.)
    b.   Insert CONTROL DISK 1 to the floppy disk drive.
    c.   Select Icon (F)" from the program manager.
Select "Run by specifying file name (R)" from the pull-down menu.
    d.   Enter the following command in the command line column, then click the
"OK" button.
Specify the floppy disk drive in which the floppy disk is inserted
(depending on the personal computer). Here, the floppy disk drive is
called drive A; the hard disk is called drive C.

> A:\setup

    e.   Installation automatically starts. Follow the message on the screen and
install the CONTROL DISK 2 to 4.
After installation is completed, "LEADER LT1610" group is created and
following six icons are registered.
        Cursor Move
        Picture transfer
        Remote Controller
        Timing Set
        database pack tool
        uninstall

Create a shortcut on the disk top as required.

(2) Database Engine

    a.   Insert DATA BASE ENGINE DISK 1 to the floppy disk drive.

    b.   Select Icon (F)" from the program manager.
           Select "Run by specifying file name (R)" from the pull-down menu.

    c.   Enter the following command in the command line column, then click the
           "OK" button.
           Specify the floppy disk drive in which the floppy disk is inserted. Here,
           the floppy disk drive is called drive A.

> A:\install

    d.   Installation automatically starts. Follow the message on the screen and
           install the DATA BASE ENGINE DISK 2.
           After installation is completed, directory "idapi" is created. (Default is
           C:\idapi, hard disk drive.)

    e.   Select Icon (F)" from the program manager.
           Select "Run by specifying file name (R)" from the pull-down menu.

    f.   Enter the following command in the command line column, then click the
           "OK" button.
           Specify the hard disk. Here, the hard disk drive is called drive C.

> C:\idapi\bdecfg

    g.   The "BDE Configuration Utility" window is opened, select "Aliases" tab.
           Clicking the "New Alias" opens "Add New Alias" dialog box.
           Write "1610hostDB" to "New Alias name:" text box, then click "OK (O)"
           button.
           Confirm that the alias name "1610hostDB" is selected, then write
           "C:\leader\data" in the PATH box. See Figure 2-1. Here, the hard disk
           drive is called drive C.
           When closing the file, the screen asks whether to save data, click "Yes"
           button.

    h.   After is installation is completed, restart the Windows.

(3) Sample Data
The SAMPLE DATA disk contains sample data and database initialization
software.

- When using sample data, refer to Section 7.1.5, "Invoking a File (Transfer to
  the BANK)" of LT 1610A/LT 1611 instruction manual for detail.
- The database initialization software is contained in the "A:\recover\setup.exe"
  file on SAMPLE DATA disk.
      IMPORTANT: Do not use this file in general. Running this software initializes
                     the database and stored bank data. Only use this software
                     when database contents cannot be read due to failure.

*   Notes when using Windows 3.1
    If the conventional memory area becomes insufficient when running Terminate and Stay Resident (TSR) software, a system error may occur when starting the supplied software. Remove TSR to make space for the conventional memory area.
    If an error message is displayed or failure occurs even after performing the procedure above, run the "BDE Configuration Utility" (BDECFG.EXE), then set the "LOW MEMORY USAGE LIMIT" to a lower value or 0 by using the "System" card. See Figure 2-2.
    Also add SHARE/F:4096/L40 to the "Autoexec.bat" file.

    (Default = C:\idapi\bdecfg.exe file)
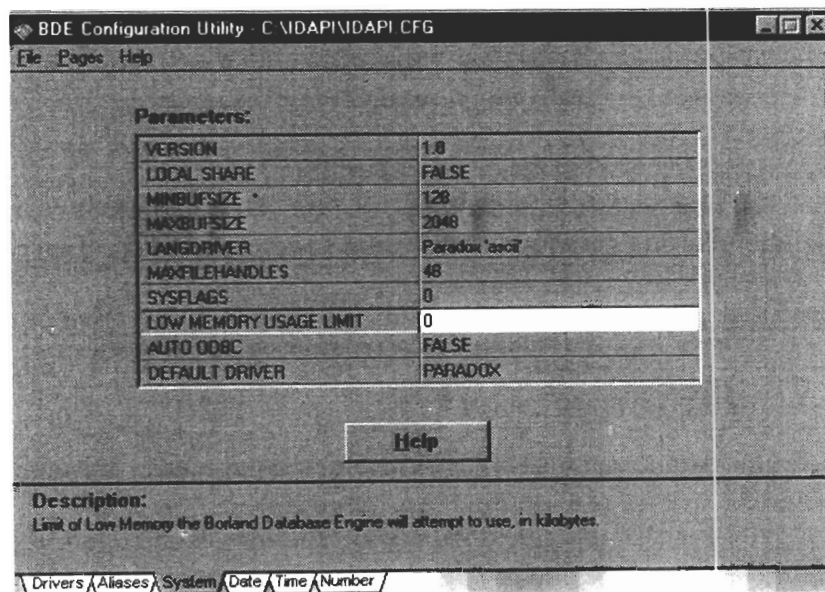
Figure 2-2

3. REINSTALLING PROGRAM

Caution: When REMOTE CONTROLLER software is reinstalled, old bank data is overwritten.

To retain old bank data, perform following procedure before installing new software.

3.1 Retaining Old Data

By selecting "File (F)" displays the menu as shown in the figure right.
Select the Bank Copy (W).

The Bank Copy control box is displayed.

Click the Left- or Right-Arrow button to display the bank data number to be retained.

Pressing the "Copy" button displays the menu to save file.

Select the drive and directory to be saved. Normally, select root directory of the floppy disk.

Enter file name. Up to six alphanumeric characters can be used. Click the "OK" button to save bank data.

When user character is used for this Bank, also copy the files (i.e., code_00.chr, code_0f.chr, code_19.chr) set in the Define User Char.

The bank data is now saved. To save other bank data, perform the procedure above.
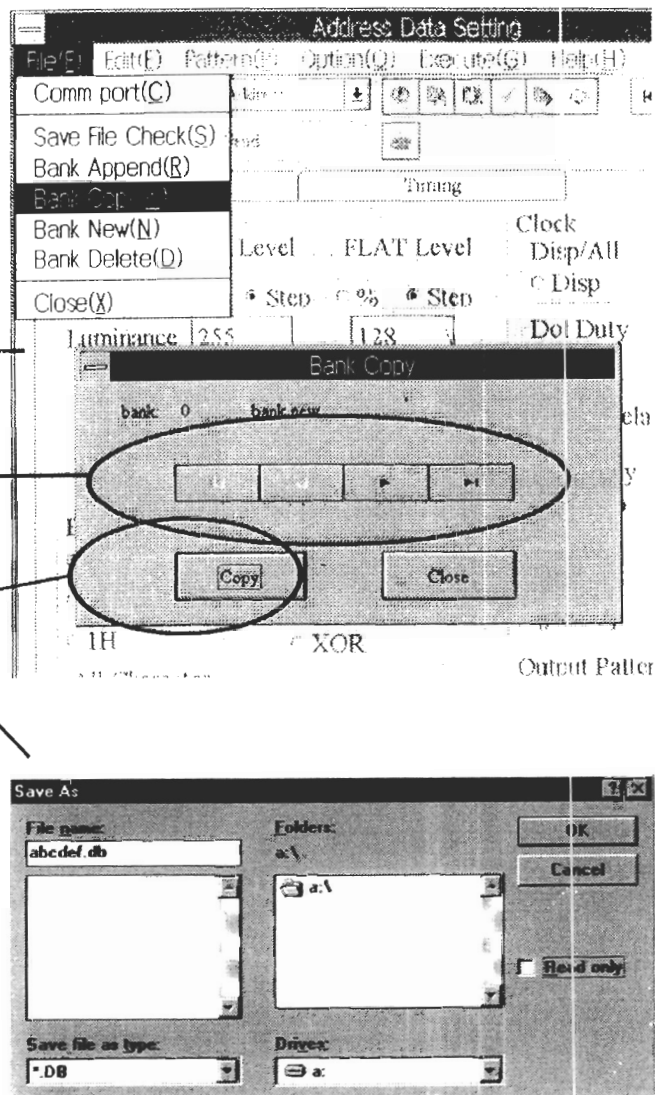
3.2 Deleting Old Program

After the bank data is saved,
double-click the "uninstall" icon
in the "LEADER LT1610" group.
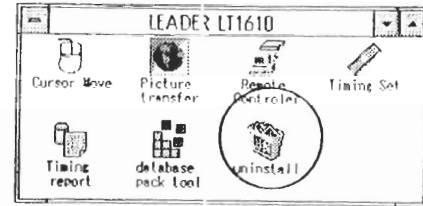
The message is displayed as
shown in the figure right. Click
the "Yes" button.
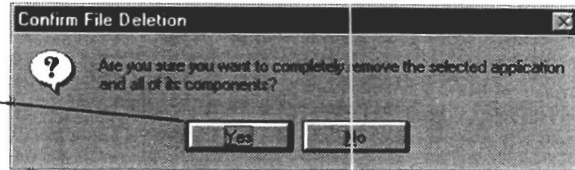
File and icon are automatically
deleted, then message is
displayed as shown in the figure
right. Click the "OK" button.
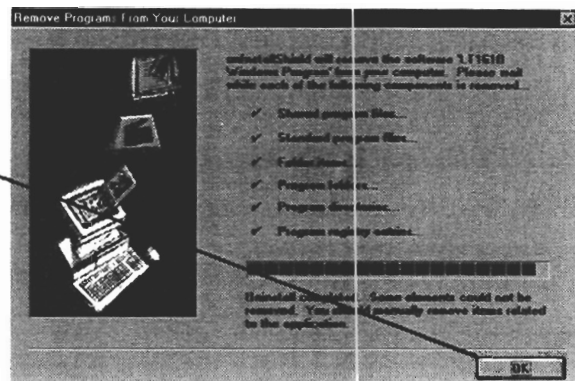
3.3 Reinstalling Program

Refer to Section 2.4, "Installing Supplied Software."

3.4 Adding Old Data

After installation is completed, select "File (F)" to display the menu as shown in the figure below. Select "Bank Append (R)."
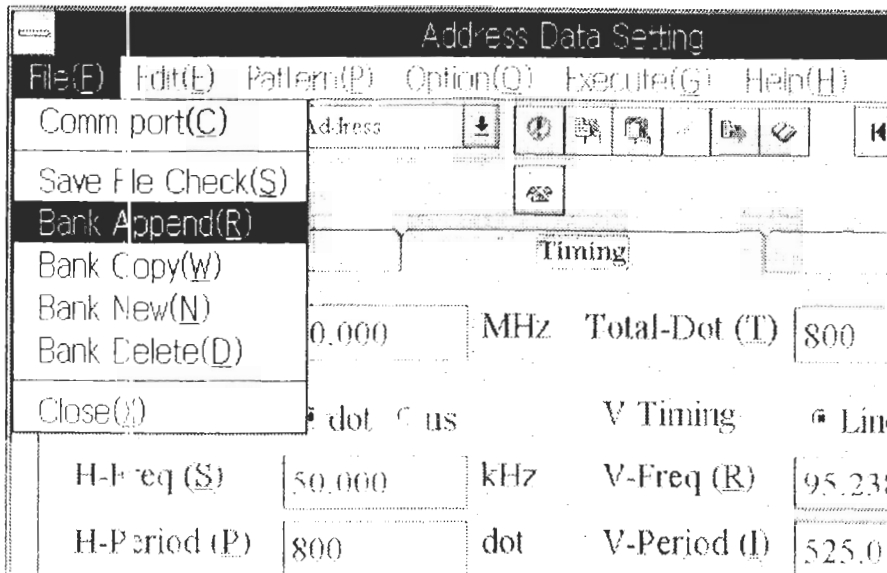
The file "Open" menu is displayed as shown in the figure right.

Select the file saved using Bank Copy.
Select "*.db" for file extension.
Example right shows "abcdef.db" selected.
Do not select the files with "_2" to "_9."
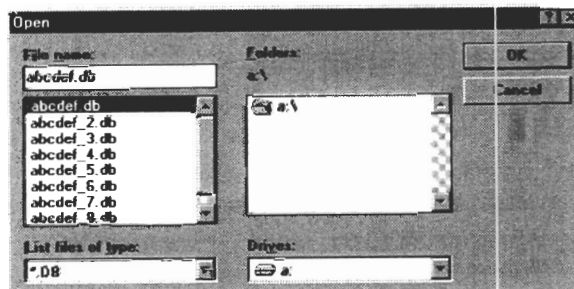
Files with "_2" to "_9" are automatically fetched by "abcdef.db" group file.

After data is appended, the message is displayed as shown in the figure right.

To append other bank data, repeat procedure from the "Bank Append" menu.
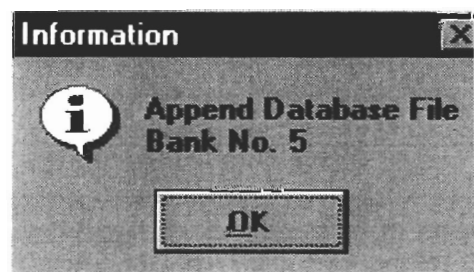
4. DISPLAYING SOFTWARE VERSION

4.1 Installed Software Version

Hold down the "INC" and "DEC" keys of the LT 1610A simultaneously, then turn power on.
The MODE and ADDRESS displays show the ROM version for about one second.

Figure lower-right shows an example of Version 1.5.
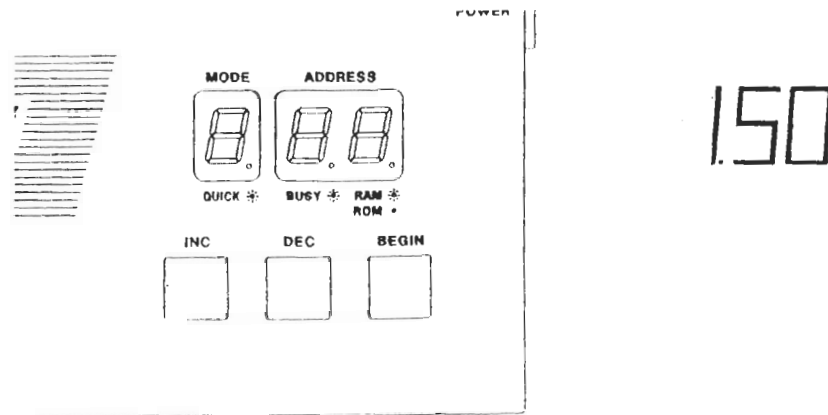
4.2 Windows Version

When the Timing software is started, the version is displayed at the center of the Windows screen.
This screen disappears in a few seconds, then Timing software control returns to the screen.

Example below shows Version 1.5E.
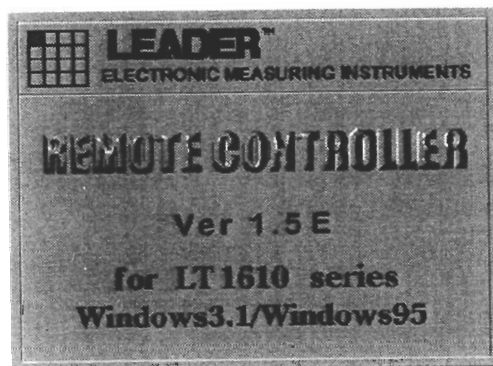
5. SETTING DIP SWITCH

The DIP switches change the operation mode (i.e., pattern drawing, sync signal, output mode). Therefore, do not change the DIP switch setting in general. Figure below shows the factory settings.

6. OUTPUT CONNECTORS

Output connectors

Before setting DIP
SW, **turn power
off**, then remove
user ROM cover.
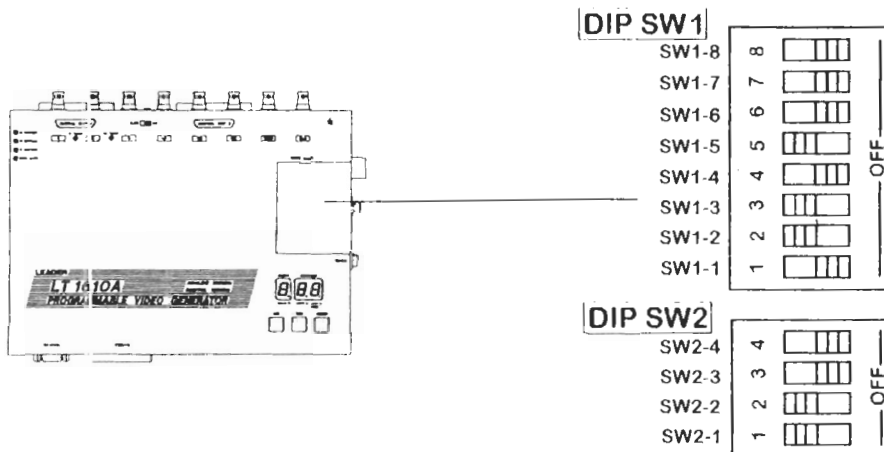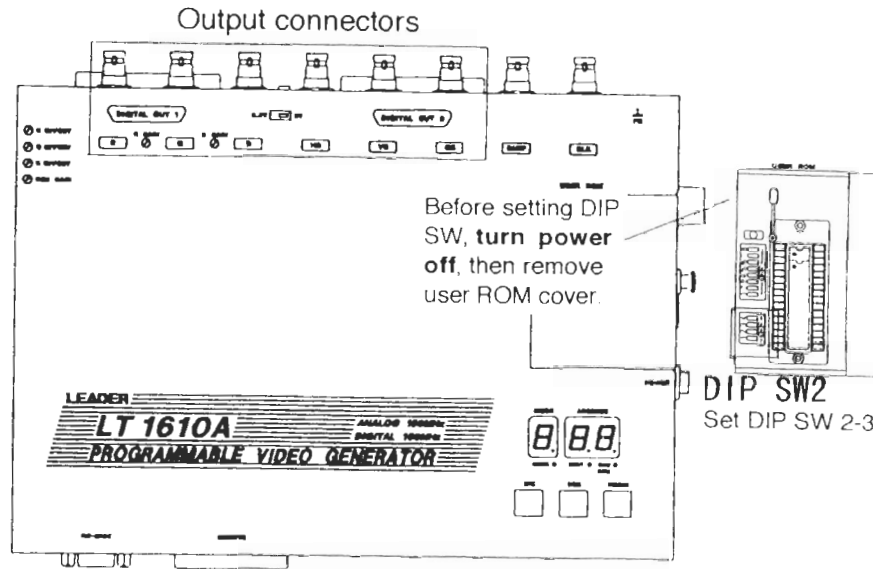
DIP SW2
Set DIP SW 2-3

The signal output mode can be changed by setting the DIP SW 2-3. Normally, set it OFF.

After the DIP SW 2-3 is set, do not change it before creating data using the Timing software.

The same setting should be used to create other bank data.

The HS output mode can be selected by using the HS Output Sel. Normally, set it HS.

HS, VS, CS ON/OFF
Polarity (POL) setting

SYNC ON G setting

HS Output Sel setting
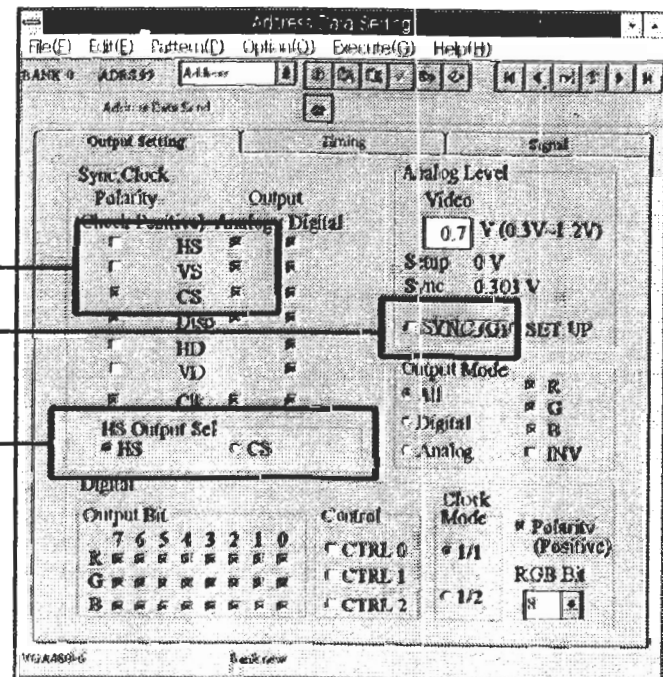
6.1 DIP SW 2-3 OFF

Use this setting in general.

<Note>
-V: Signal contains negative-polarity vertical sync tip
+V: Signal contains positive-polarity vertical sync tip
-H: Signal contains negative-polarity horizontal sync tip
+H: Signal contains positive-polarity horizontal sync tip
-H&V: Signal contains negative-polarity horizontal and vertical sync tips
+H&V: Signal contains positive-polarity horizontal and vertical sync tips
Blank   Regardless of setting

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	G OUT
G	ON							–H, V
	OFF							OFF

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	CS OUT
						ON	+	+H, V
CS						ON	–	–H, V
						OFF		OFF

HS Output Sel = HS (Use this setting in general.)

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	HS OUT
		ON	+					+H
HS		ON	–					–H
		OFF						OFF

HS Output Sel = CS (Do not use this setting in general.)

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	HS OUT
		ON	+					+H, V
HS		ON	–					–H, V
		OFF						OFF

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	VS OUT
				ON	+			+V
VS				ON	–			–V
				OFF				OFF

6.2 DIP SW 2-3 ON

Do not use this setting in general.

<Note>
-V: Signal contains negative-polarity vertical sync tip
+V: Signal contains positive-polarity vertical sync tip
-H: Signal contains negative-polarity horizontal sync tip
+H: Signal contains positive-polarity horizontal sync tip
-H&V: Signal contains negative-polarity horizontal and vertical sync tips
+H&V: Signal contains positive-polarity horizontal and vertical sync tips
Blank   Regardless of setting

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	G OUT
G	ON	ON		ON				–H, V
	ON	ON		OFF				–H
	ON	OFF		ON				–V
	OFF							OFF

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	CS OUT
CS		ON		ON		ON	+	+H, V
		ON		ON		ON	–	–H, V
		ON		OFF		ON	+	+H
		ON		OFF		ON	–	–H
		OFF		ON		ON	+	+V
		OFF		ON		ON	–	–V
						OFF		OFF

HS Output Sel = HS (Use this setting in general.)

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	HS OUT
HS		ON	+					+H
		ON	–					–H
		OFF						OFF

HS Output Sel = CS (Do not use this setting in general.)

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	HS OUT
HS		ON	+	ON				+H, V
		ON	–	ON				–H, V
		ON	+	OFF				+H
		ON	–	OFF				–H
		OFF						OFF

	SYNC ON G	HS (ON/OFF)	HS POL	VS (ON/OFF)	VS POL	CS (ON/OFF)	CS POL	VS OUT
VS				ON	+			+V
				ON	–			–V
				OFF				OFF

6.3 Remote Controlling OUTPUT

The output mode of the LT 1610 series unit can be temporary selected by using the LT 1610-01 Remote Controller or Windows screen (see the figure below).

Refer to Sections 6.1, "DIP SW 2-3 OFF" and 6.2, "DIP SW 2-3 ON" for the operations below.

      HS ON/OFF, POS/NEG
      VS ON/OFF, POS/NEG
      CS ON/OFF, POS/NEG
      SYNC ON G ON/OFF

The bank data is retained by this setting.
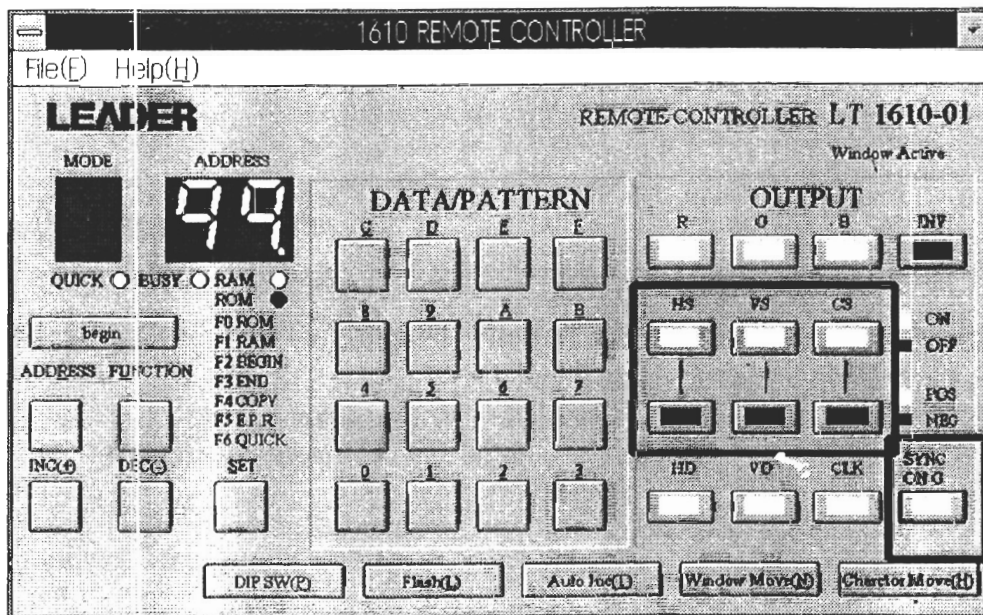
Sending Data

QUICK MANUAL

TABLE OF CONTENTS

> This manual is written for the LT 1610A
> and can be used for LT 1610 series units.

1. INSTALLING SOFTWARE

1.1 Operating Environment

The Windows 95 should be installed.
(Windows 3.1 may pose a problem due to conventional memory.)
    Memory: ≥8 MB (≥16 MB recommended)
    Hard disk drive: ≥20 MB free space

1.2 Softwares to be Installed

The following softwares should be installed.
    CONTROL DISK 1 to 4
    DATA BASE ENGINE

1.3 Installation Procedure

1.3.1 Control Software

a.   Insert CONTROL DISK 1 to the floppy disk drive.
b.   Start "Setup.exe."
c.   Follow the message on the screen and install the CONTROL DISK 2 to 4.

    After installation is completed, the following icons are created in the "LEADER
    LT 1610" folder.

    • Cursor Move: Activates cursor.
    • Picture transfer: Sends picture (e.g., natural-color pattern) to the
                            LT 1611.
    • Remote Controller: Remotely controls LT 1611.
    • Timing Set: Sets parameter at each address.
                            Selects and edits patterns.
    • Timing report: Prints Timing data.
    • database pack tool: Minimizes data base (Reconstructing data base after
                            data is deleted.)
    • uninstall: Uninstaller

1.3.2 Database Engine

a. Insert DATA BASE ENGINE DISK 1 to the floppy disk drive.
b. Start "Install.exe."
c. Follow the message on the screen and install DATA BASE ENGINE DISK 2.
d. After installation is completed, follow the message on the screen to restart the Windows.

1.4 Setting Software

Software setting is only required for database engine.

Operating Procedure

a. Start Explorer.
b. Open "idapi" folder.
c. Start "bdecfg.exe" in the "idapi" folder.
d. The "BDE Configuration Utility" window is opened. Click "Aliases" tab.
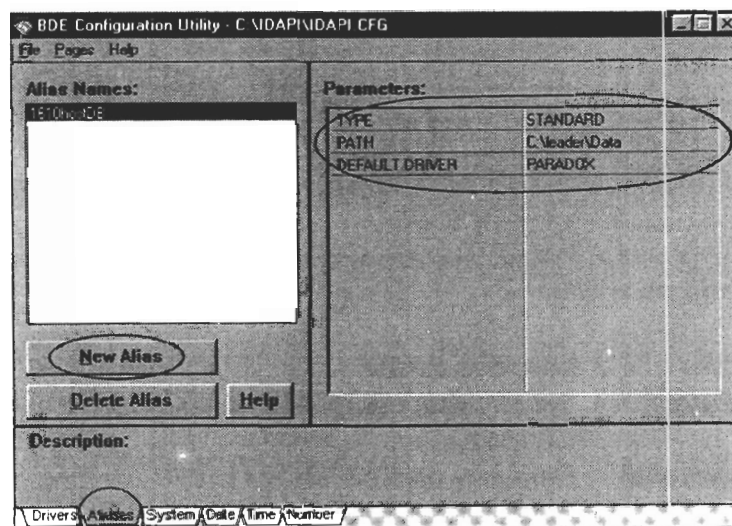
e. Click "New Alias." Write "1610hostDB" to "New Alias name:" text box.
f. Confirm that alias name "1610hostDB" is selected, then write A:\leader\data in the "PATH" box.
    Specify the floppy disk drive in which the control software is installed.
g. When closing the file, the screen asks whether to save data.
h. After installation is completed, restart the Windows.

2. OPERATING PROCEDURE

Note: Data stored in RAM is retained about 14 days with a fully charged backup battery.

Pattern data can be stored on the floppy disk or hard disk. The contents of ROM or RAM can be changed.

Either pattern data stored in ROM or RAM can be easily selected.

2.1 Setting Baud Rate

The LT 1610A can be controlled with a personal computer via the RS-232C interface. The baud rate of the LT 1610A and personal computer should be set the same.

Operating Procedure

a.   Connect the LT 1610A and a personal computer using a RS-232C cable.
b.   See Table below and confirm that the DIP SW 2 is correctly set. (DIP SW 2: 4 bits)

	9600 bps	19200 bps	19200 bps	38400 bps
SW 2-1	OFF	ON	OFF	ON
SW 2-2	OFF	OFF	ON	ON

c.   Start Remote Controller.
d.   Select Common Port (C) from the "File (F)" menu.
e.   Set the baud rate of the LT 1610A and personal computer to the same.

2.2 Sending Data to LT 1610A

The LT 1610A can easily replace data stored on a floppy disk or hard disk.
Proceed as follows.

2.2.1 Data Flow

Data stored on the floppy disk or hard disk.

Database area on the hard disk of the personal computer.

```
┌─────────────┐
│ LT 1610A    │
│ RAM area    │
└─────────────┘
```

Data is sent to RAM.
(Data stored in RAM is retained about 14 days with a fully
charged backup battery.)

```
┌─────────────┐
│ LT 1610A    │
│ ROM area    │
└─────────────┘
```

Data stored in RAM can be sent to ROM.
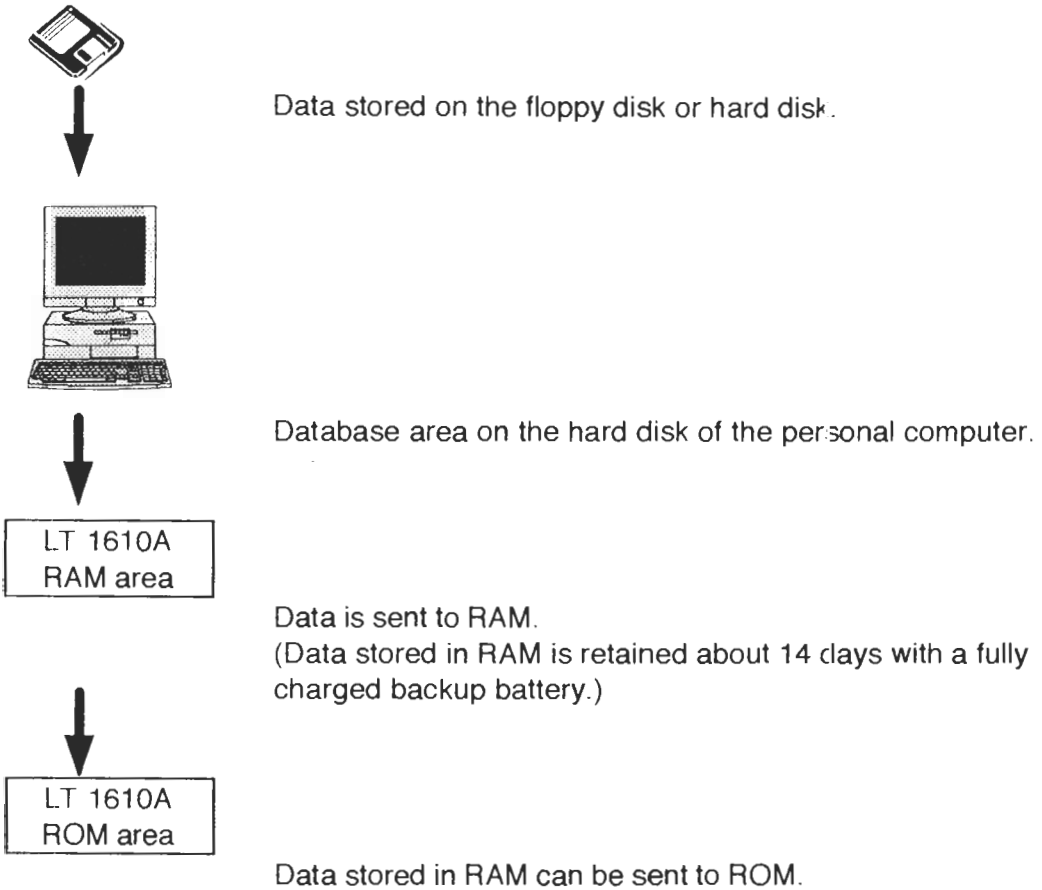
• When different data are stored in RAM and ROM, each data can be used
respectively.

2.3 Data Construction

This section describes data construction.

a. Data Type
- File data: Data stored in memory
- Bank data: Data stored in database

b. Bank/File Data
There are 100 addresses per Bank.

Construction of one bank

Address 00	Address 01	Address 02	••••••	Address 98	Address 99
Video pattern can be used commonly.					

Construction of one address

Signal timing
Pattern at each address
Sync signal output format
Others

Up to 100 signal timings and video patterns can be set per bank.

2.4 Converting File Data to Bank Data

Operating Procedure

Data is stored on the floppy disk in this case.

a. Set the Write Protect Switch of the floppy disk off.
b. Insert the floppy disk containing pattern data.
c. Start "Timing Set."
   "Address Data Setting" window as shown below is displayed.
d. Select Bank Append (R) from the "File (F)" menu.

e. Select the data file to be used.
   Example: Selecting "nec.db" reads all other "nec*.db" files.
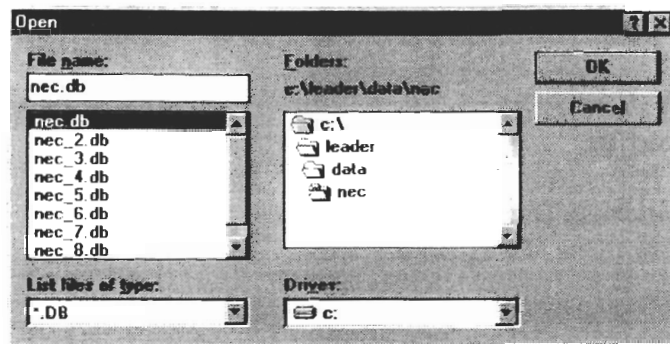
f. The following message is displayed after the file is correctly read.
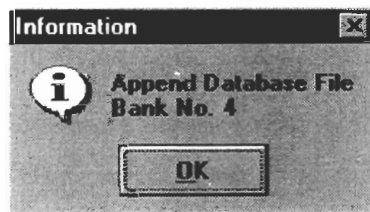
In example above, new bank data is added to Bank No. 4.
The bank number cannot be selected (automatically assigned).
If the screen displays message as shown below, perform Corrective Action.
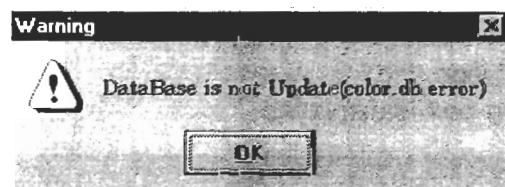
Corrective Action
   Select "Save File Check (S)" from the "File (F)" menu.
   The "Check Save File" is displayed.
   Click the "File" button.
   Select all files read.
   "NG" indicates a faulty file if data cannot be read.
   Click the "Recover" button.
   Confirm that all data is "OK."
   The pattern (file) data is sent to the bank.
   (The bank data is not displayed on the hard disk.)

2.5　Selecting Bank Data

The bank data can be sent. (136 kB/bank)
Select the desired bank data when there is a large volume of bank data.

Operating Procedure

Use "Timing Set: Address Data Setting" window.
See the figure below. Use "Bank Select" icon.
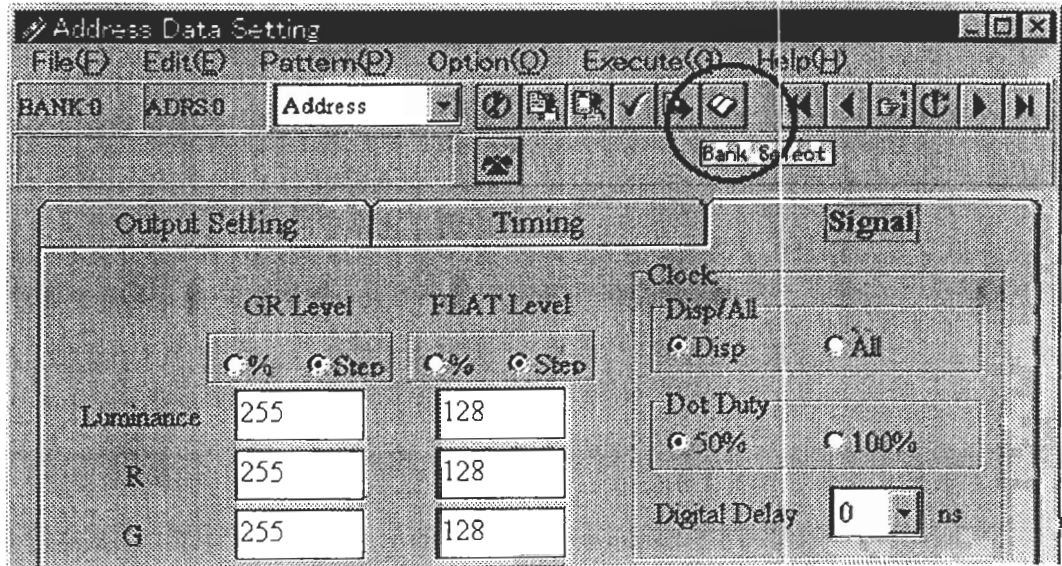
a.　Click "Bank Select" icon.
　　The following dialog box is displayed.
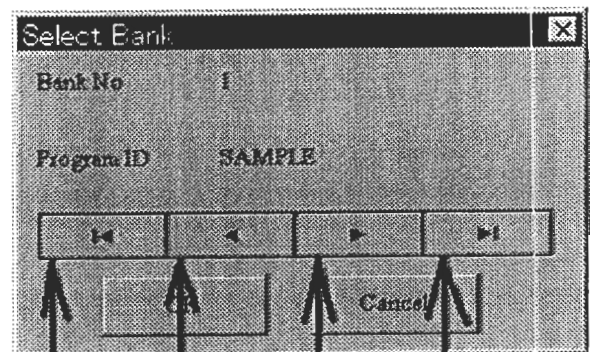
To end bank

To next bank

To previous bank

To first bank

b. Select the bank to be sent to the LT 1610A.

c. The circled portion (bottom of "Timing Set: Address Data Setting" window) is changed as shown below.
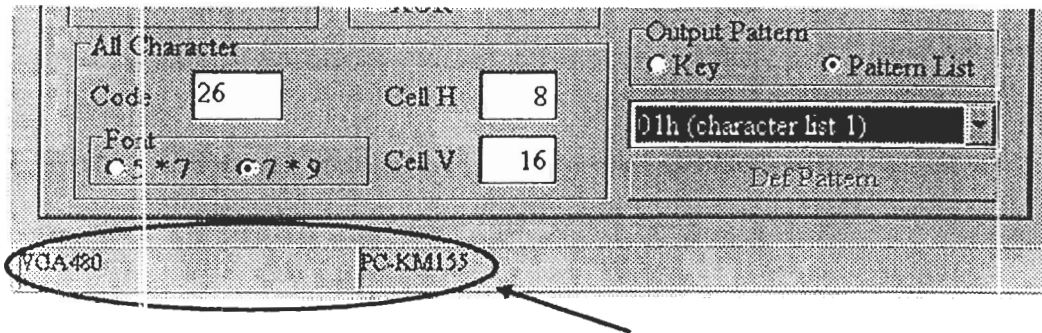
Delete unnecessary bank for easy data management. To delete bank, select "Bank Delete (D)" from the "File (F)" menu.

2.6 Selecting Data to be Sent

The data contents to be sent can be selected.

The followings are used in general.

Address: Sends data stored at each address. Data is temporary stored in the LT 1610A.

Pattern data: Sends video pattern. Data is temporary stored in the LT 1610A.

Bank data: Sends bank data. Data will be written in RAM. Data stored in RAM is retained about 14 days with a fully charged backup battery.

Write Command: Writes temporary stored data to RAM by "Address or Pattern data." Data stored in RAM is retained about 14 days with a fully charged backup battery.
IMPORTANT: This operation should be performed when storing revised Address data or Pattern data. Otherwise, data will be cleared.

Select "Bank data" in general.
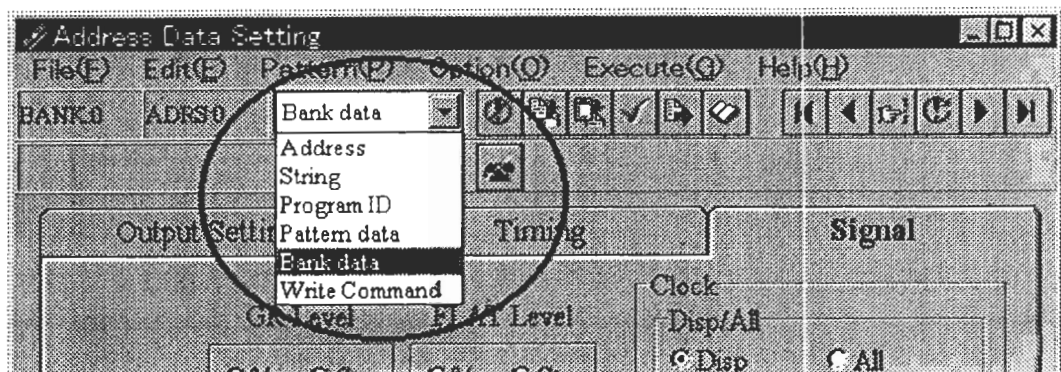
The bank data and contents to be sent are selected.

2.7 Sending Bank Data

a.   The SEND TO 1610 icon is used to send bank data to the LT 1610A.
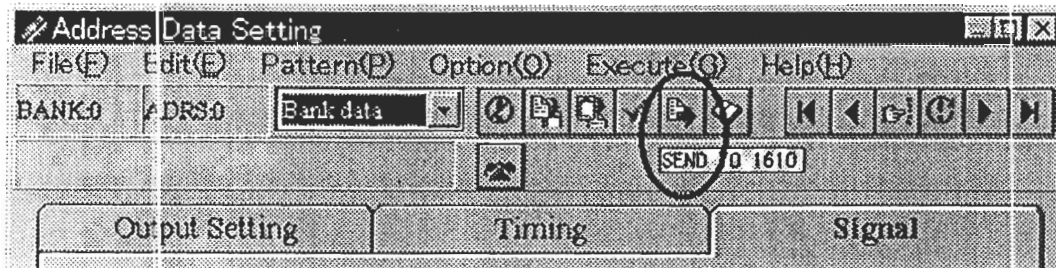
b.   Clicking the SEND TO 1610 icon automatically sends bank data.
Wait a few minutes.
The circled portion changes during data transfer.
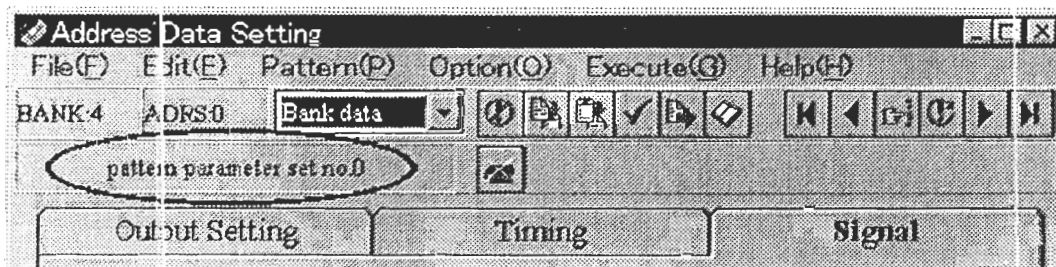
c.   Beeper sounds after data is sent.
"Bank Data Send OK" is displayed.
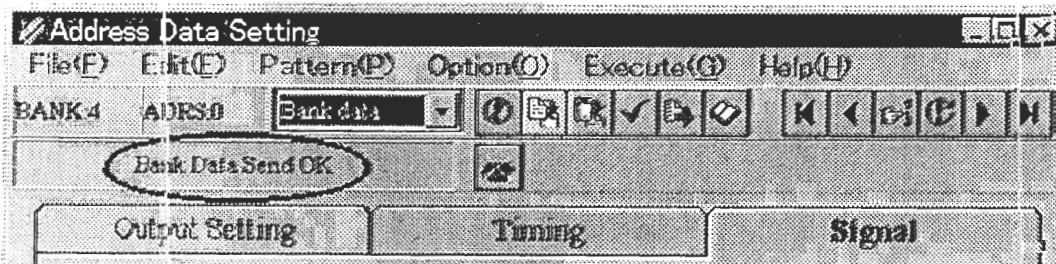

Sending bank data to RAM of the LT 1610A is completed.

Data stored in RAM should be stored in ROM because data stored in RAM is
only retained about 14 days with a fully charged backup battery.
Up to 200 items of data can be used when storing different data in both ROM
and RAM.

2.8 Sending Data from RAM to ROM

To send data stored in RAM to ROM installed in the LT 1610A proceed as follows.

Operating Procedure

a. Close "Timing Set: Address Data Setting" window.
b. Start "Remote Controller."
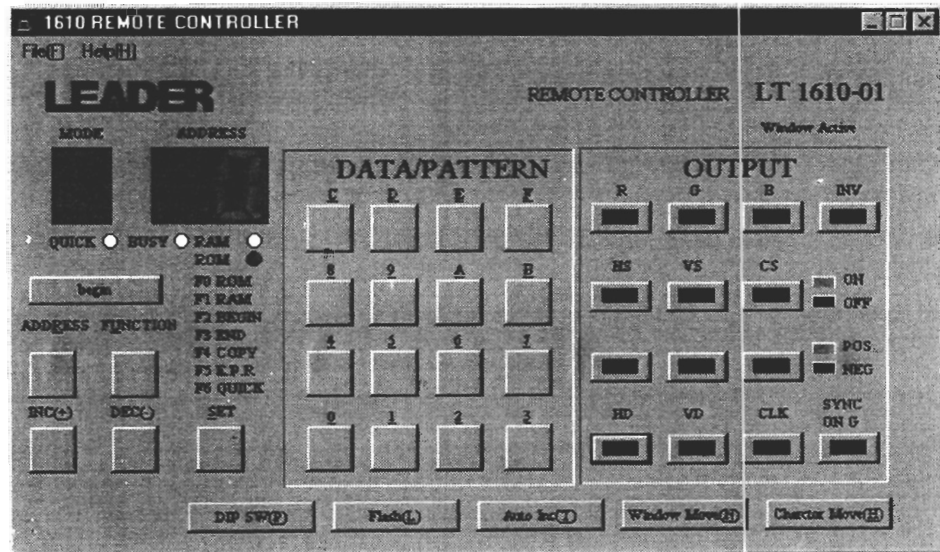
* Confirm that the ROM is installed.

c. Click "FUNCTION" button.
d. Click "5" button.
e. Click "SET" button.

The display is changed as follows.
Wait for about three minutes.

Start

ROM contents erased
BUSY LED lights

ROM programing end
BUSY LED lights

Verification end
(Beeper sounds)
BUSY LED goes off

Check sum display
(Correctly completed)
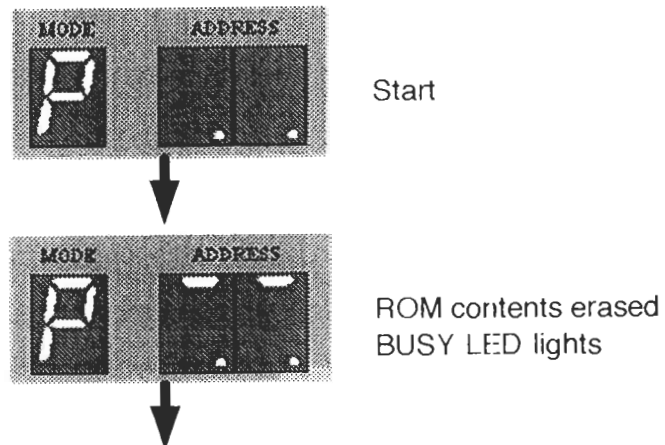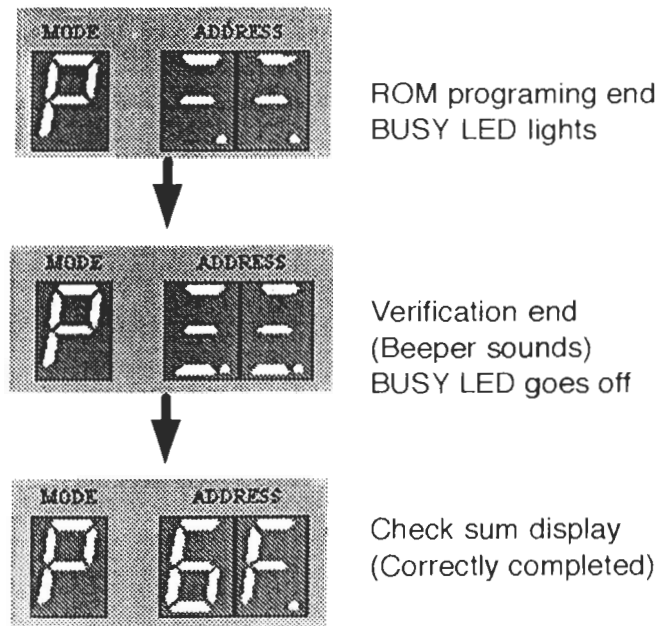
If operation is forcedly closed, error message (E1) is displayed on the
LT 1610A.
Repeat procedures above again.

The same data are now stored in RAM and ROM.

By sending other bank data to RAM, different data can be stored in RAM and
ROM.

3. USING STORED DATA

INC button:	Increments address by one.
DEC button:	Decrements address by one.
ADDRESS button:	To set address directly.
SET button:	Enter data.
DATA/PATTERN button:	To input numeric data/to select pattern

3.1 Specifying Address Directly

Operating Procedure

a. Click "ADDRESS" button.
b. Click address number to be specified (e.g., 10).
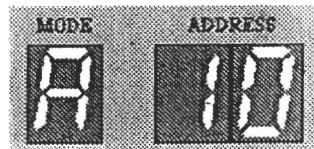
c. Click "SET" button.
d. Wait for about two seconds until the address is changed (beeper sounds).

3.2 Selecting Data Stored in RAM and ROM

There are two methods to select data stored in RAM and ROM
  • Using DIP SW
  • Using FUNCTION button

3.2.1 Using DIP SW

Set DIP SW 1-1 as follows.
    ON: RAM
    OFF: ROM

Restart the system.

3.2.2 Using FUNCTION button

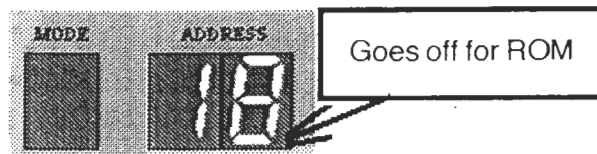Use "Remote Controller" icon to select data stored in RAM and ROM.

Operating Procedure

· RAM to ROM

a. Start "Remote Controller" with a personal computer.
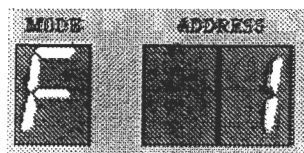b. Click "FUNCTION" button.
c. Click "0" button.
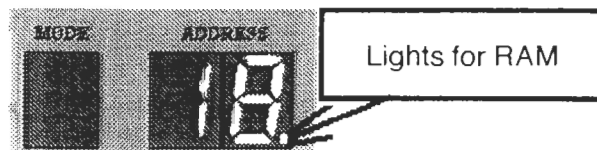

d. Click "SET" button.

Goes off for ROM

· ROM to RAM

a. Start "Remote Controller" with a personal computer.
b. Click "FUNCTION" button.
c. Click "1" button.

d. Click "SET" button.

Lights for RAM
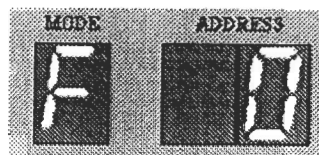
3.3 Selecting Pattern

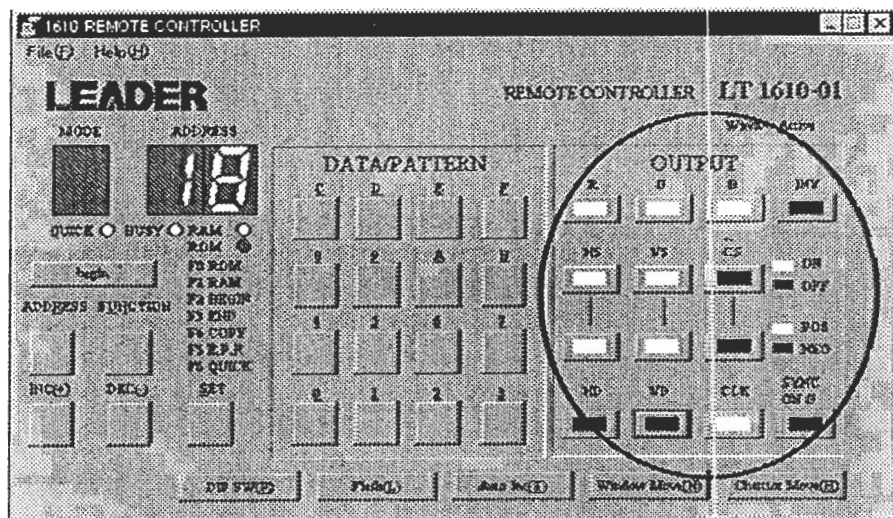The DATA/PATTERN button is used to select the pattern.
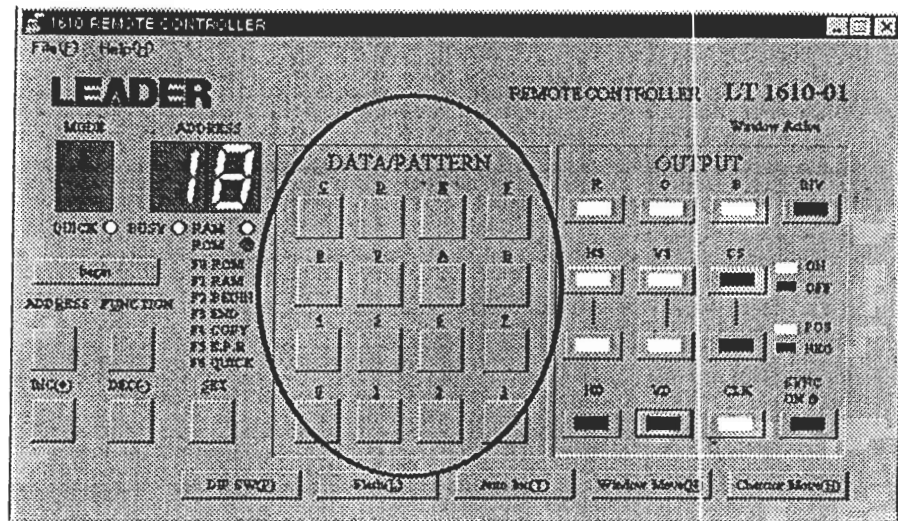
Up to 16 patterns (i.e., 0 to F) can be selected.
The pattern should be created using "Timing Set: Address Data Setting" window before selecting the pattern.
* The created pattern can only be selected.

3.4 Selecting Output Mode

The OUTPUT button is used to select the output mode.

The figure above shows the settings to output the green patten.
Click each button for turning on/off the signal.

- R, G, B buttons
  Sets each signal on/off.

- INV button
  Reverses black/white, and order of gray scale and color bar.
  Lit LED indicates the reverse mode.

- HS, VS, CS ON/OFF buttons
  Sets each signal on/off.
  Lit LED indicates on.

- HS, VS, CS POS/NEG buttons
  Selects polarity of each signal.
  Lit LED indicates positive polarity.

- HD, VD, CLK buttons
  Sets each signal on/off.
  Lit LED indicates on.
  There are no HD and VD outputs for the LT 1611.

- SYNC ON G button
  Adds composite sync signal to analog G video output.
  Lit LED indicates add.
  (The sync signal polarity is negative.)