

LEADER

LT 60A

FLAT PANEL CHECKER

INSTRUCTION MANUAL

TABLE OF CONTENTS

GENERAL SAFETY SUMMARY	1
1. INTRODUCTION	1
1.1 Scope of Warranty	1
1.2 Operating Precautions	2
1.2.1 Power Source Voltage	2
1.2.2 Mechanical Shock.....	2
1.2.3 Electrostatic Damage.....	2
1.2.4 Electric Shock.....	2
1.2.5 Warming Up.....	2
1.3 Trademarks.....	2
2. SPECIFICATIONS.....	3
2.1 General.....	3
2.2 Features.....	3
2.3 Specifications.....	4
2.3.1 Output Signal.....	4
2.3.2 Display Patterns.....	5
2.3.3 External Interface.....	5
2.3.4 General Specifications.....	5
3. NAMES AND FUNCTIONS OF PARTS.....	6
3.1 Front and Side Panels	6
3.2 Bottom Panel	8
4. PROCEDURE.....	9
4.1 Connection.....	9
4.2 Signal Output.....	10
4.3 Flicker Adjustment	13
5. Display Features.....	15
5.1 PANEL	15
5.2 PATTERN.....	15
5.3 LEVEL.....	16
5.4 SETTING	16
5.5 Factory Default Settings.....	16
5.6 LED.....	17
5.7 OUTPUT	18
6. Remote Control	22

6.1	Installing the USB Driver.....	22
6.2	Connecting the LT 60A to a PC.....	23
6.3	Control	25
6.3.1	Notes	25
6.3.2	Remote Control Functions	26
6.3.3	Remote Control Function Details	26
6.4	Sample Program.....	32
6.4.1	Installation.....	33
6.4.2	Starting the Sample Program.....	35
6.4.3	Window Explanation	35
6.4.4	Uninstallation	37
7.	CALIBRATION AND REPAIRS	38

GENERAL SAFETY SUMMARY

■ Read This before Using the Instrument

This instrument should only be used by persons with sufficient knowledge of electronics who thoroughly understand the contents of this manual.




This instrument is not designed or manufactured for households or ordinary consumers. If a person without sufficient knowledge of electronics uses this instrument, it may be damaged, and the user may be injured. Such a person should not use this instrument unless they are supervised by a person who does possess such knowledge.

■ Note about Reading This Manual

The contents of this manual contain specialized terminology and may be difficult to understand. If you have any questions about the contents of this manual, please contact your local LEADER agent.

■ Symbols and Terms

The following symbols and terms are used in this instruction manual and on the instrument to indicate important warnings and notes.

<p><Symbol></p> 	<p>This symbol appears in this instruction manual and on the instrument to indicate an area where improper handling could result in personal injury, damage to the instrument, or malfunction of the instrument or devices connected to it.</p> <p>When you encounter this symbol on the instrument, be sure to refer to the information in this instruction manual that corresponds to the area that the symbol marks.</p>
<p><Term></p>  WARNING	<p>Ignoring the precautions that this term indicates could lead to death or serious injury.</p>
<p><Term></p>  CAUTION	<p>Ignoring the precautions that this term indicates could lead to personal injury or damage to the instrument.</p>

GENERAL SAFETY SUMMARY

Read the warnings and information below thoroughly to avoid death, personal injury, and damage and deterioration of the instrument.



■ Warnings Concerning the Case and Panels

Do not remove the instrument's case or panels for any reason. Touching the internal components of the instrument could lead to fire or electric shock.

Also, do not allow foreign materials, such as liquids, combustible matter, and metal, to enter the instrument. Turning the instrument on when such materials are inside it could lead to fire, electric shock, damage to the instrument, or some other accident.

■ Warnings Concerning the Power Source

Confirm the voltage of the power source before you connect the power cord to it.

Only use a power source whose frequency is 50/60 Hz.

Use a power cord that is appropriate for the voltage of the power source. Also, use a power cord that meets the safety standards of the country that you are using it in. Using a power cord that does not meet the standards could lead to fire. If the power cord is damaged, stop using it, and contact your local LEADER agent.

Using a damaged power cord could lead to electrical shock or fire. When removing the plug from the power outlet, do not pull on the cord. Pull from the plug.

■ Installation Environment

• Operating Temperature Range

Use this instrument in a 0 to 40 °C environment. Using this instrument in a high-temperature environment could lead to fire.

Drastic changes in temperature, such as might be caused by moving the instrument between two rooms with different temperatures, can damage the instrument by causing condensation to form within it. If there is a possibility that the instrument has condensation within it, wait for approximately 30 minutes before turning on the power.

• Operating Humidity Range

Use this instrument in an environment whose relative humidity is 85 % or less where there is no threat of condensation forming.

Also, do not operate this instrument with wet hands. Doing so could lead to electric shock or fire.

• Do Not Operate in an Explosive Atmosphere

Using this instrument in an environment where flammable gasses, explosive gasses, or steam is emitted or stored could lead to an explosion or fire. Do not use the instrument in such an environment.

GENERAL SAFETY SUMMARY

Read the warnings and information below thoroughly to avoid death, personal injury, and damage and deterioration of the instrument.



- **Do Not Insert Foreign Materials**

If foreign materials, such as metal, flammable objects, or liquid are allowed into the instrument (through the vents for example), fire, electric shock, damage to the instrument, or some other accident may result.

- **If You Notice Something Wrong during Operation**

If you notice smoke, fire, a strange smell, or something else that is wrong with the instrument while you are operating it, stop operation immediately. Failing to do so could lead to fire. Turn off the power switch, and remove the power cord from the outlet. After making sure that fire has not spread anywhere, contact your local LEADER agent.



- **Cautions Concerning the Output Connector**

Do not apply an external signal to the output connectors. Also, do not short the output connectors. Doing so may damage the instrument and devices that are connected to it.

- **Cautions Concerning the AC Adapter**

Only use the specified type of AC adapter.

Using a non-specified type of adapter could damage the instrument and lead to fire.

- **If You Will Not Use the Instrument for an Extended Period of Time**

If you will not use the instrument for an extended period of time, remove the power plug from the outlet.

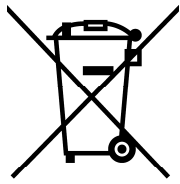
GENERAL SAFETY SUMMARY

- **Routine Maintenance**

When you clean the instrument, remove the power plug from the outlet.

Do not use thinner or benzene when you clean the instrument's case, panels, or knobs. Doing so could lead to paint chipping and the corrosion of plastic components. To clean the case, panels, and knobs, use a soft cloth with mild detergent, and wipe gently. While cleaning, make sure that foreign materials, such as water and detergent, do not enter the instrument. If liquid or a metal object enters into the instrument, fire or electric shock may result.

- **About the European WEEE Directive**



This instrument and its accessories are subject to the European WEEE Directive. Follow the applicable regulations of your country or region when discarding this instrument or its accessories.

(WEEE stands for Waste Electrical and Electronic Equipment.)

Follow the warnings and precautions that have been listed in this section to use the instrument correctly and safely. Precautions are also contained in various other sections of this instruction manual. To use the instrument correctly, be sure to follow those precautions as well.

If you have any questions or comments about this instruction manual, please contact your local LEADER agent.

1. INTRODUCTION

Thank you for purchasing this LEADER instrument. To use this instrument safely, read this instruction manual thoroughly, and make sure that you know how to use the instrument properly.

If some point about the operation of this instrument is still unclear after you have read this instruction manual, refer to the contact information on the back cover of the manual to contact LEADER, or contact your local LEADER agent.

After you have finished reading this manual, keep it in a convenient place so that you can refer to it when necessary.

1.1 Scope of Warranty

This LEADER instrument has been manufactured under the strictest quality control guidelines.

LEADER shall not be obligated to furnish the following free services during the warranty period.

- 1 Repair of malfunction or damages resulting from fire, natural calamity, or improper voltage applied by the user.
- 2 Repair of an instrument that has been improperly repaired, adjusted, or modified by personnel other than a factory-trained LEADER representative.
- 3 Repair of malfunctions or damages resulting from improper use.
- 4 Repair of malfunctions caused by devices other than this instrument.
- 5 Repair of malfunctions or damages without the presentation of a proof of purchase or receipt bill for the instrument.

1.2 Operating Precautions

1.2.1 Power Source Voltage



Confirm the voltage of the power source before you connect the power cord to it. The AC adapter that comes with the instrument can handle voltages of 90 to 250 VAC. Only use a power source whose frequency is 50/60 Hz.

1.2.2 Mechanical Shock

This instrument contains sensitive components, so it may be damaged if it is dropped or otherwise exposed to a strong shock.

1.2.3 Electrostatic Damage

Electronic components can be damaged by static discharge.

1.2.4 Electric Shock

When testing TV receivers, VCRs, or other related devices, read the service manual of a device before you perform adjustments on it. When you connect this instrument to the inside of the DUT, to avoid electric shock, be sure to remove the DUT's power cord. Especially for TV receivers, which have high-voltage circuits, take measures to prevent electric shock, such as wearing voltage resistant gloves.

1.2.5 Warming Up

To ensure more accurate measurements, turn on the instrument approximately 30 minutes before you intend to use it to allow its internal temperature to stabilize.

1.3 Trademarks

Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries.

2. SPECIFICATIONS

2.1 General

The LT 60A is a portable checker for directly testing flat-panel displays during flat-panel TV repair.

The LT 60A can be used to determine whether the cause of a problem is the flat-panel display or the circuit.

2.2 Features

- **Portable**

Because the LT 60A is portable and light, it is easy to carry and convenient for servicing.

- **Support for WXGA (1366 × 768) and F-HD (1920 × 1080)**

The LT 60A supports WXGA and F-HD as they are defined in the VESA TV Panels Standard.

- **Support for Double Frame Rate TV Panels**

The LT 60A supports double frame rates of 120 frames-per-second.

- **Support for 8-bit and 10-bit Displays**

The LT 60A can be used to check 10-bit deep color flat-panel displays.

- **Data Mapping Modes**

The LT 60A supports VESA, SPWG, and PSWG data mapping.

- **Support for 5 V and 12 V Displays**

The LT 60A can be switched to the voltage type that is appropriate for the flat-panel display being tested.

- **Protection against Incorrect Display Power-Source Voltage Setting**

To prevent the mistaken application of 12 V to a 5 V display, an LED blinks to warn the user when output is turned on and 12 V is selected.

- **Short-Circuit Warning for the Display Power Source**

An LED blinks when the display's power source is shorted to the ground.

- **Display Power-Source Overcurrent Protection**

If the display power source generates excessive current, the LT 60A protects the display by turning off the power source.

- **Flicker Adjustment**

The LT 60A is equipped with a VCOM voltage adjustment feature, which is necessary when an LCD panel is exchanged.(*1)

- **USB Remote Control Feature**

Through the use of a dedicated library, the settings of the LT 60A can be remotely controlled from an external PC equipped with USB.

2. SPECIFICATIONS

- **Cable Switching to Match the Flat-Panel Display's Connector**

The cable can be changed to match the flat-panel display's connector.
(Users must provide their own cables.)

*1 The LT 60A can handle typical flicker adjustment, but it may need to be customized to handle certain types of flat-panel displays. For more information, contact your nearest LEADER agent.

2.3 Specifications

2.3.1 Output Signal

Reference LVDS Standard	TIA/EIA-644 Electrical Characteristics of Low-Voltage Differential Signaling (LVDS) Interface Circuits
Transmitter	THC63LVD1025 (THine Electronics)
Video Data	
Format	RGB 4:4:4
Number of Bits	8 or 10 (select using DIP switch)
Mapping	VESA, SPWG, or PSWG (select using dip switch)
Supported Displays	See Table 5-1.
Display Power Source	5 V or 12 V, 3 A (4 A inrush current)
Protection against Incorrect Power-Source Voltage Setting	Protects against the application of 12 V to a 5 V display (An LED blinks to warn the user when output is turned on and 12 V is selected. Output is enabled when the + key is pressed.)
Power-Source Short-Circuit Warning	An LED blinks to warn the user that the display's power supply is shorted to the ground.
Power-Source Overcurrent Protection	Output to the display is cut off when an excessive current is generated.
Elements Used	Self-recovering type, overcurrent and overheat protection fuses
Activation Current	3.7 ± 0.3 A
General-Purpose Control Signals	2 (GPIO-0, 1)
Signal Level	3.3 V CMOS
Flicker Adjustment	I2C VCOM voltage adjustment (The adjustment method is switched according to the type of display.)
Operations	Plus, minus, and write
Output Connectors	
Upper	HIF3BA-30PA-2.54WB (HIROSE ELECTRIC) or an equivalent device
Lower	HIF3BA-20PA-2.54DS (HIROSE ELECTRIC) or an equivalent device
Pin Arrangement	See Table 5-7.

2. SPECIFICATIONS

2.3.2 Display Patterns

Patterns	Full-field color bar, raster, tile, ramp, and flicker adjustment (see Table 5-2)
Level Range	0 to 100 % (see Table 5-3)
RGB On/Off	Can be set separately with DIP switches
Pattern Changing	The LT 60A switches between all patterns automatically except for the pattern for flicker adjustment.
Switching Time	Approx. 2 s

2.3.3 External Interface

USB Port	
Function	Used to remotely control the settings of the LT 60A through the use of a dedicated library from an external PC equipped with USB
Connector	USB (B type)

2.3.4 General Specifications

Environmental Conditions	
Operating Temperature Range	0 to 40 °C
Operating Humidity Range	85 %RH or less (no condensation)
Optimal Temperature	10 to 35 °C
Operating Environment	Indoors
Elevation	Up to 2,000 m
Overvoltage Category	I
Pollution Degree	2
Power Requirements	
Voltage	12 VDC
Power Consumption	60 W max.
Dimensions	100 (W) × 160 (H) × 38 (D) mm (excluding protrusions)
Weight	0.32 kg
Accessories	AC adapter..... 1
	Display cable connectors
	FAS-20-17 (Yamaichi Electronics)..... 1
	FAS-30-17 (Yamaichi Electronics)..... 1
	CD-ROM (USB drivers etc.)..... 1
	Instruction manual..... 1

3. NAMES AND FUNCTIONS OF PARTS

3.1 Front and Side Panels

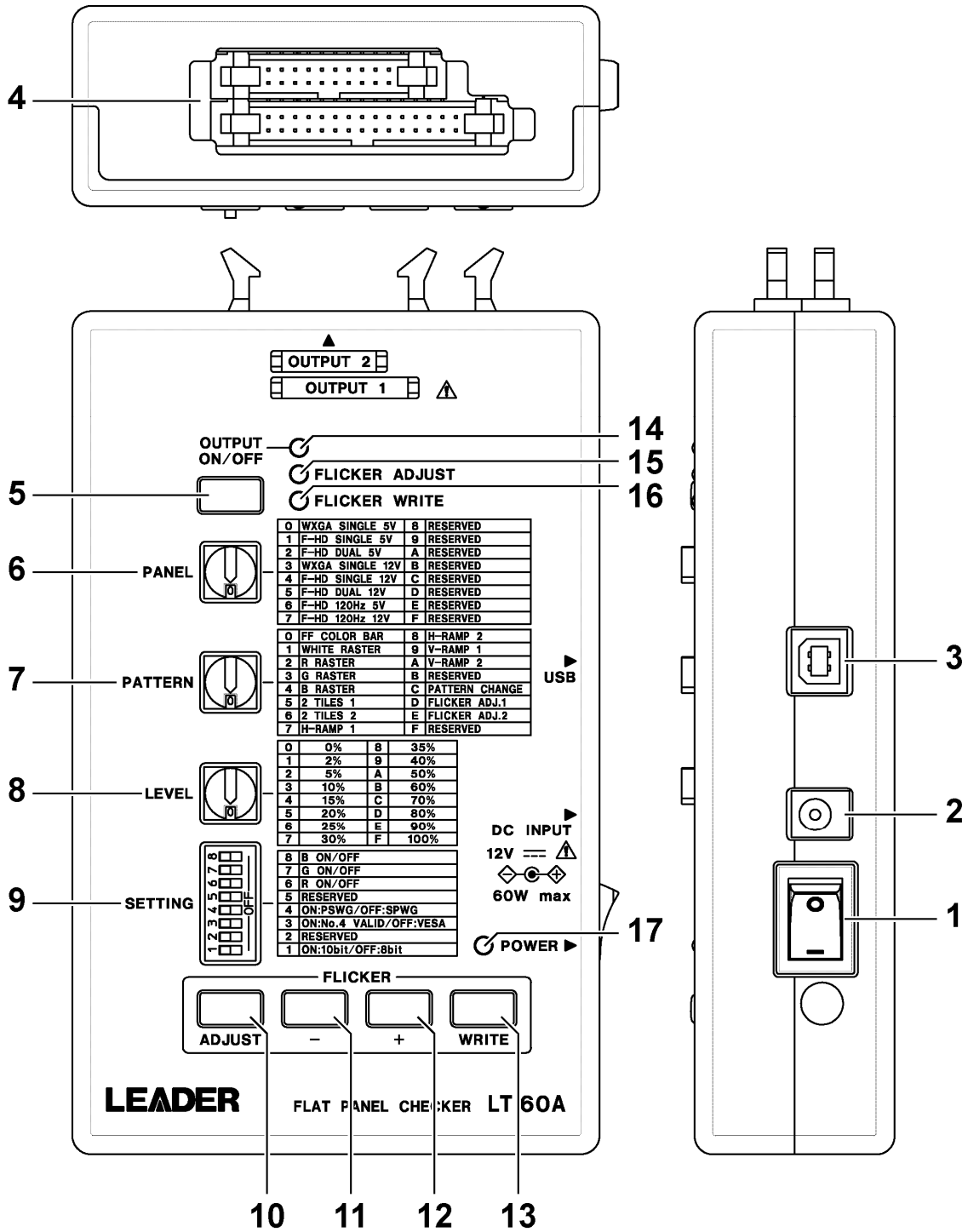


Figure 3-1 Front and side panels

3. NAMES AND FUNCTIONS OF PARTS

Table 3-1 Front and side panel items and functions

No.	Name	Function
1	POWER	The power switch. Flip the switch to ○ to turn the power on. Flip it to to turn the power off. Reference: Section 4.2, "Signal Output"
2	DC INPUT	Input connector for the DC power source. Connect the included AC adapter to this connector. Reference: Section 4.1, "Connection"
3	USB	Used to connect the LT 60A to a PC so that it can be controlled remotely. Reference: Section 6, "Remote Control"
4	OUTPUT 1 (upper level) OUTPUT 2 (lower level)	The signal output connectors. They are divided into an upper and lower level. Reference: Section 5.7, "OUTPUT"
5	OUTPUT ON/OFF key	Turns the output to the flat-panel display on and off. Reference: Section 4.2, "Signal Output"
6	PANEL	Use this rotary switch to select a display type. Reference: Section 5.1, "PANEL"
7	PATTERN	Use this rotary switch to select a display pattern. Reference: Section 5.2, "PATTERN"
8	LEVEL	Use this rotary switch to vary the display pattern output level. Reference: Section 5.3, "LEVEL"
9	SETTING	Use these DIP switches to perform various settings. Reference: Section 5.4, "SETTING"
10	ADJUST key	Press this key to switch to flicker-adjustment mode. This key is valid when a flicker adjustment pattern is selected. Reference: Section 4.3, "Flicker Adjustment"
11	- key	Press this key to reduce the VCOM value. Reference: Section 4.3, "Flicker Adjustment"
12	+ key	Press this key to raise the VCOM value or to enable 12 V output. Reference: Section 4.3, "Flicker Adjustment"
13	WRITE key	Press this key to write the VCOM value to the flat-panel display. Reference: Section 4.3, "Flicker Adjustment"
14	OUTPUT ON/OFF LED	This LED lights when a signal is being output. Reference: Section 5.6, "LED"
15	FLICKER ADJUST LED	This LED blinks when the flicker is being adjusted. Reference: Section 5.6, "LED"
16	FLICKER WRITE LED	This LED lights momentarily when you press the + or - key. It lights for approximately 1 second when you press the WRITE key. Reference: Section 5.6, "LED"
17	POWER LED	This LED lights when the LT 60A is on. Reference: Section 5.6, "LED"

3.2 Bottom Panel

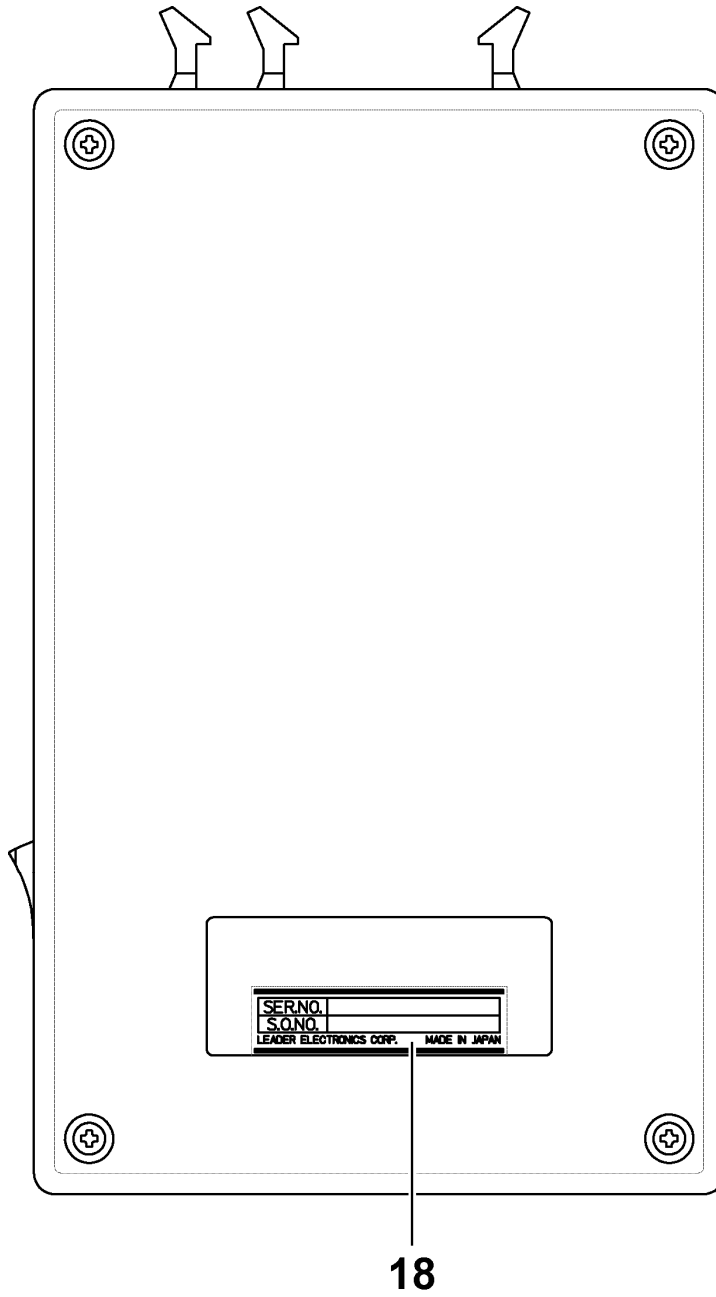


Figure 3-2 Bottom panel

Table 3-2 Bottom panel items and functions

No.	Name	Function
18	Serial number label	The LT 60A's serial number is printed on this label.

4. PROCEDURE

4.1 Connection

To connect the LT 60A to a flat-panel display, follow the procedure below.

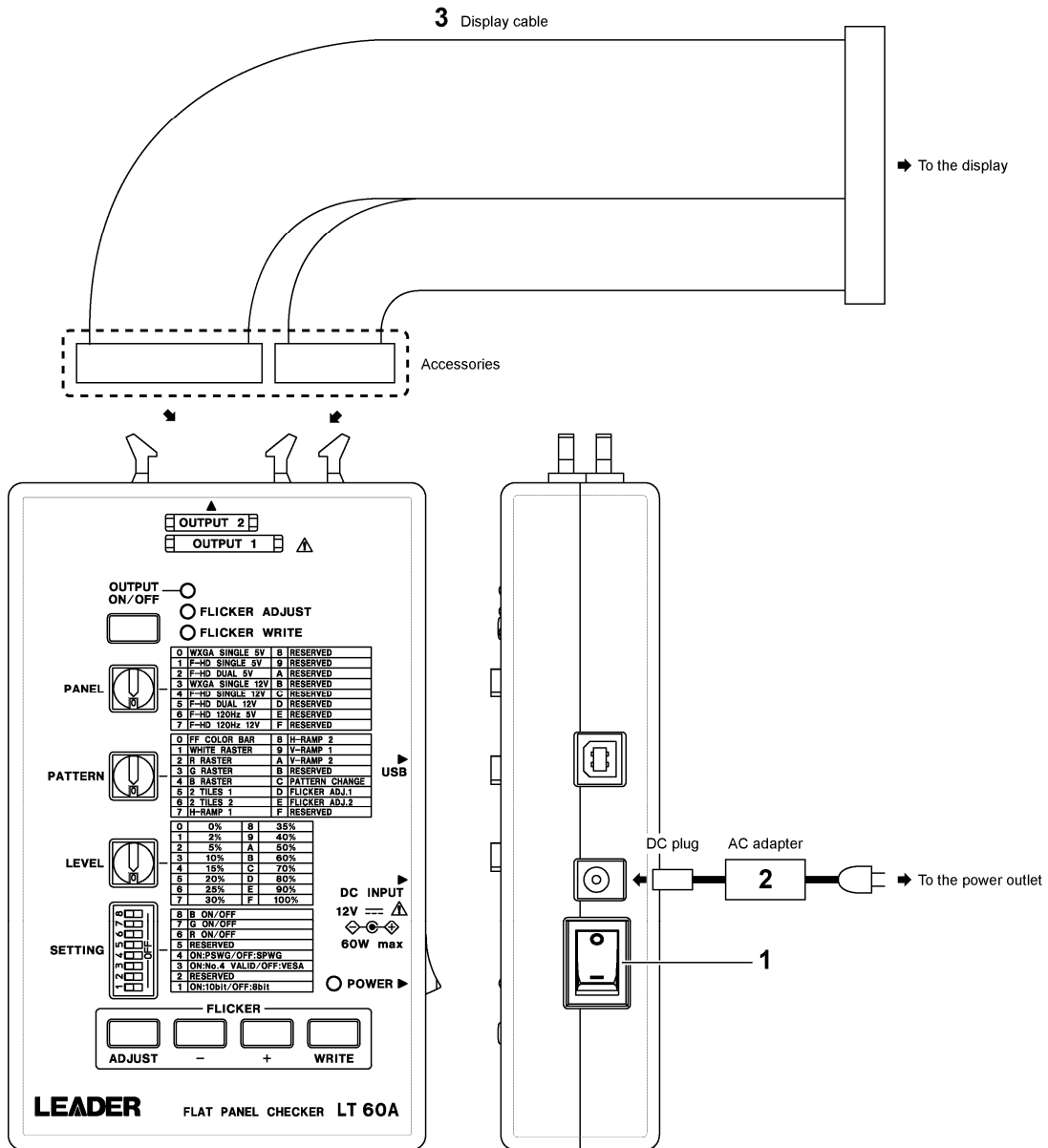
1. Turn the LT 60A power switch off (○).
2. Connect the included AC adapter.

Connect the DC plug to the DC INPUT inlet on the LT 60A, and connect the AC cable to a power outlet.

3. Connect the OUTPUT connector on the LT 60A to the flat-panel display using a display cable.

Please prepare the display cable yourself. The LT 60A comes with connectors for connecting to the OUTPUT connector. Use them as necessary.

Reference: Section 5.7, "OUTPUT"



4.2 Signal Output

To generate signals, follow the procedure below.

1. Turn the LT 60A power switch on (I).

The LT 60A is initialized when you turn it on. The POWER LED blinks during initialization, and remains lighted after initialization finishes. Initialization takes approximately 3 seconds.

2. Use the PANEL rotary switch to select a display type.

Select a setting that is appropriate for the display that you are using.

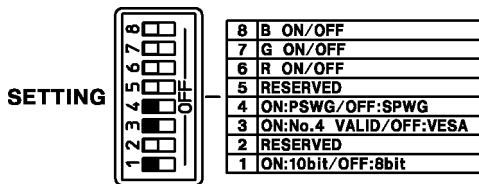
Reference: Section 5.1, "PANEL"



3. Use the SETTING DIP switches to set the number of bits and the type of mapping.

You can set the number of bits using DIP switch 1. You can set the mapping using DIP switches 3 and 4.

Reference: Section 5.4, "SETTING"



4. Press OUTPUT ON/OFF.

When you press OUTPUT ON/OFF, the LT 60A checks for a short-circuit between the display's power source and the ground (*1). If a short-circuit is detected, the OUTPUT ON/OFF LED, FLICKER ADJUST LED, and FLICKER WRITE LED blink for approximately 2 seconds and then turn off. It takes approximately 0.2 seconds for the LT 60A to check for a short-circuit.

Next, the LT 60A checks the display cable (*2). If the LT 60A detects a problem with the display cable, the OUTPUT ON/OFF LED, FLICKER ADJUST LED, and FLICKER WRITE LED blink for approximately 2 seconds and then turn off.

The next procedure varies as indicated below depending on the display type you selected in step 2.

- **When the display voltage is 5 V**

The OUTPUT ON/OFF LED lights, and the LT 60A generates a signal.

- **When the display voltage is 12 V**

The OUTPUT ON/OFF LED blinks. If you press the + key, the OUTPUT ON/OFF LED lights, and the LT 60A generates a signal. If you want to cancel signal generation, press OUTPUT ON/OFF again. When you do so, the OUTPUT ON/OFF LED turns off.

4. PROCEDURE

The above operations are performed to prevent the application of a 12 V signal to a 5 V display and thus protect the display from damage.

- *1 The LT 60A applies a voltage of 1 V to the display power source and determines that there is no short-circuit if the voltage is greater than 0.5 V after 0.1 seconds have passed.
- *2 When the display voltage is 5 V, the cable passes the test if pins 11 and 12 of OUTPUT 2 (lower level) are disconnected. When the display voltage is 12 V, the cable passes the test if the pins are connected.
- * When the OUTPUT ON/OFF key is pressed, the display power source, LVDS signal, BL ON signal, GPIO-0/1 signal, ADIM voltage, PWM signal, and I2C line pull-up power source are output.

5. Use the **PATTERN** rotary switch to select a display pattern.

If you select C (PATTERN CHANGE), the LT 60A switches through patterns 0 to A at intervals of approximately 2 seconds.

To adjust the flicker, select D (FLICKER ADJ.1) or E (FLICKER ADJ.2).


Reference: Section 5.2, "PATTERN"

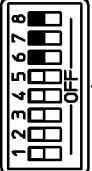
PATTERN		0	FF COLOR BAR	8	H-RAMP 2
		1	WHITE RASTER	9	V-RAMP 1
		2	R RASTER	A	V-RAMP 2
		3	G RASTER	B	RESERVED
		4	B RASTER	C	PATTERN CHANGE
		5	2 TILES 1	D	FLICKER ADJ.1
		6	2 TILES 2	E	FLICKER ADJ.2
		7	H-RAMP 1	F	RESERVED

6. Using the **LEVEL** rotary switch and the **SETTING** DIP switches, you can set the output level and turn the RGB signals on and off.

When the output level is 0 %, black is output. The output level should normally be set to 100 %. You can turn the RGB signals on and off using DIP switches 6 to 8. There are some display patterns to which the output level and RGB on/off settings do not apply.

Reference: Section 5.3, "LEVEL," section 5.4, "SETTING"

LEVEL		0	0%	8	35%
		1	2%	9	40%
		2	5%	A	50%
		3	10%	B	60%
		4	15%	C	70%
		5	20%	D	80%
		6	25%	E	90%
		7	30%	F	100%

SETTING		8	B ON/OFF
		7	G ON/OFF
		6	R ON/OFF
		5	RESERVED
		4	ON:PSWG/OFF:SPWG
		3	ON:No.4 VALID/OFF:VESA
		2	RESERVED
		1	ON:10bit/OFF:8bit

- **Overcurrent Detection**

The overcurrent protection feature is active while signals are being output. If the current exceeds a specified value, the OUTPUT ON/OFF LED blinks, and output to the display stops. If you press OUTPUT ON/OFF again, the LED turns off.

- **Stopping Output**

Output stops when you press OUTPUT ON/OFF while a signal is being output or change the display type by pressing PANEL. When output stops, the OUTPUT ON/OFF LED turns off.

4. PROCEDURE

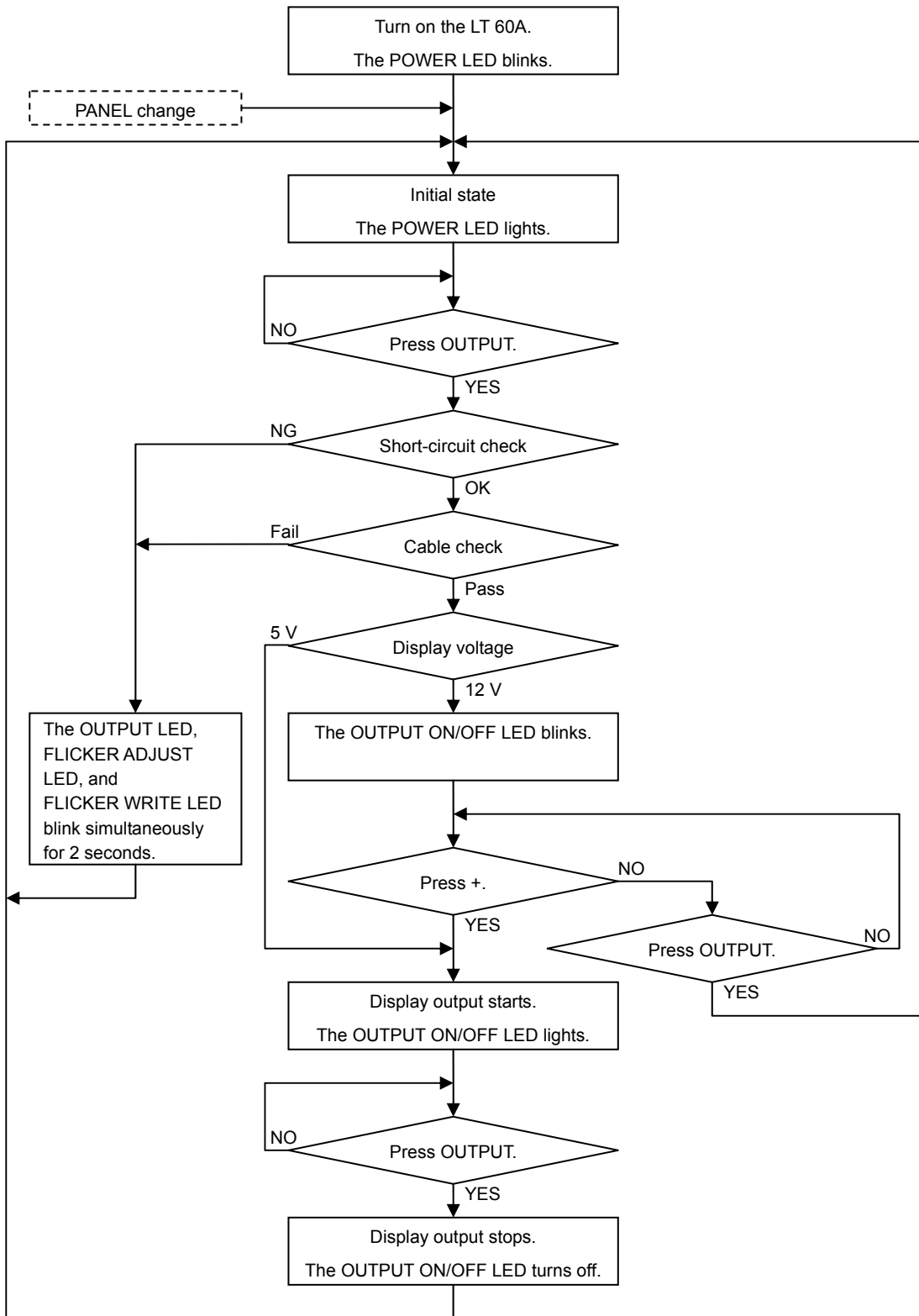


Figure 4-2 Signal output flowchart

4.3 Flicker Adjustment

To adjust the flicker, follow the procedure below.

The flicker is adjusted through the adjustment of the display's VCOM voltage.

Follow the procedure in section 4.2, "Signal Output," to turn on the output to the display.

* The LT 60A can handle typical flicker adjustment, but it may need to be customized to handle certain types of flat-panel displays. For more information, contact your nearest LEADER agent.

1. Use SETTING DIP switch 2 to select a flicker adjustment mode.

The LT 60A has the following two flicker adjustment modes.

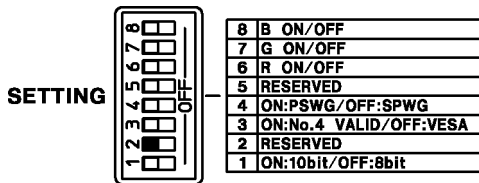
Table 4-1 Flicker adjustment modes

Item	Flicker Adjustment Mode	
	VCOM1	VCOM2
E2PROM	Yes	No
Steps	±2	±4

Select a flicker adjustment mode using DIP switch 2. Select the mode that is most appropriate for the LCD panel.

When the switch is on, the mode is VCOM2. When you turn the switch off, the LT 60A checks for the display's E2PROM and switches to VCOM1 if it receives a response (ACK). If the LT 60A does not receive a response, it assumes that the display does not have E2PROM and stays in VCOM2 mode.

Reference: Section 5.4, "SETTING"



2. Use the PATTERN rotary switch to set the display pattern to D (FLICKER ADJ.1) or E (FLICKER ADJ.2).

Reference: Section 5.2, "PATTERN"



3. Press ADJUST.

While the flicker is being adjusted, the FLICKER ADJUST LED blinks, and adjustment bars appear in the bottom part of the pattern.

If the LT 60A cannot load the device information, an error occurs, and flicker adjustment stops. When this happens, the FLICKER WRITE LED blinks for approximately 2 seconds, and the FLICKER ADJUST LED turns off.

4. Use the + and - keys to adjust the flicker.

The value of the leftmost adjustment bar is 0, and the value of the rightmost bar is 255. To return to the pre-adjustment value, press + and - at the same time. To specify the

4. PROCEDURE

middle value (128), press and hold + and - for 3 seconds or more.

The FLICKER WRITE LED lights momentarily when you press the + or - key.

5. Press WRITE.

The VCOM value is written to the display. The FLICKER WRITE LED lights for approximately 1 second, and the FLICKER ADJUST LED turns off.

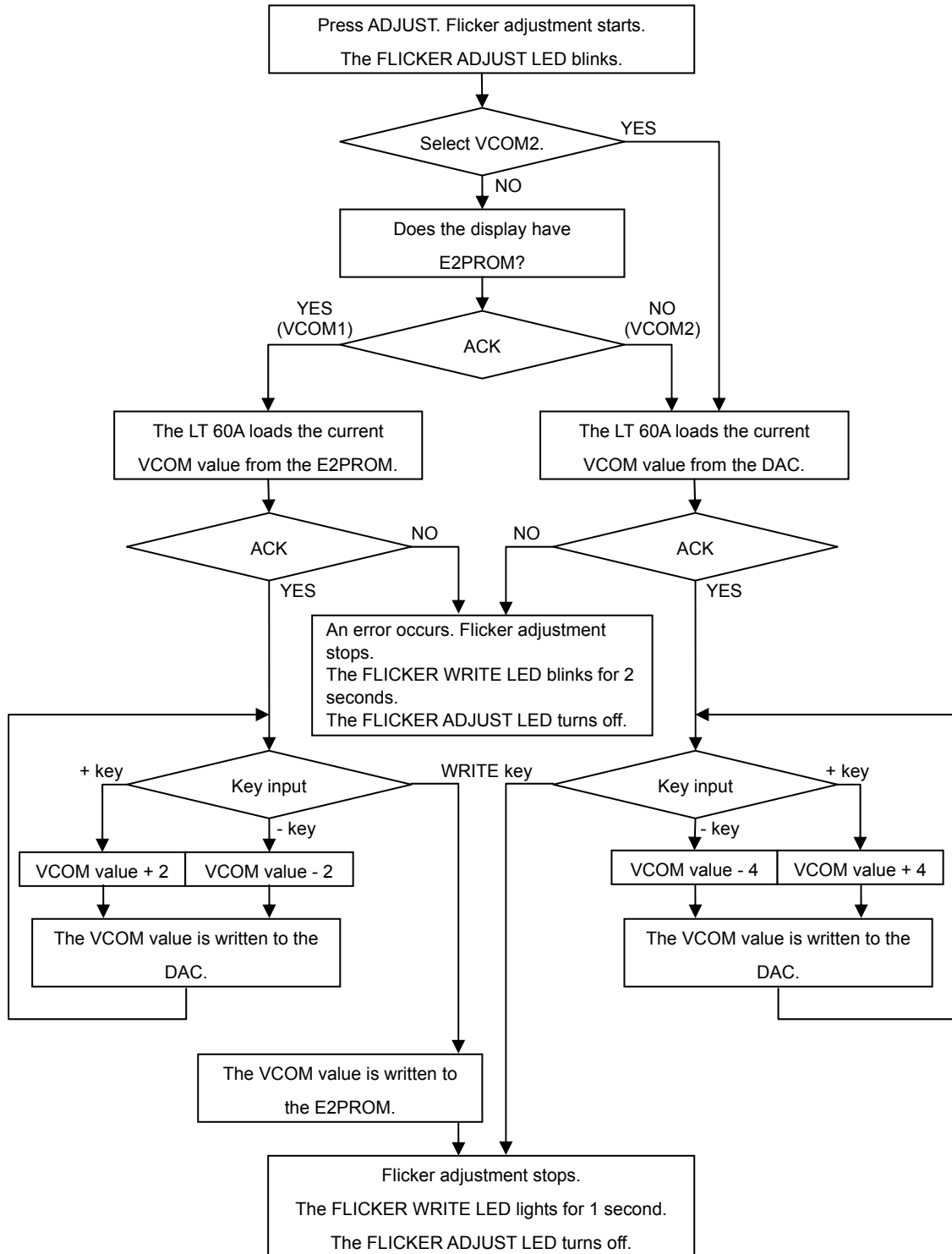


Figure 4-3 Flicker adjustment flowchart

5. Display Features

5.1 PANEL

Table 5-1 Display settings

No.	Format	Link	Power Source Voltage (V)	Frame Rate (Hz)
0	WXGA (1366 × 768)	SINGLE	5	60
1	F-HD (1920 × 1080)	SINGLE	5	60
2	F-HD (1920 × 1080)	DUAL	5	60
3	WXGA (1366 × 768)	SINGLE	12	60
4	F-HD (1920 × 1080)	SINGLE	12	60
5	F-HD (1920 × 1080)	DUAL	12	60
6	F-HD (1920 × 1080)	DUAL	5	120
7	F-HD (1920 × 1080)	DUAL	12	120
8	RESERVED	—	—	—
9	RESERVED	—	—	—
A	RESERVED	—	—	—
B	RESERVED	—	—	—
C	RESERVED	—	—	—
D	RESERVED	—	—	—
E	RESERVED	—	—	—
F	RESERVED	—	—	—

5.2 PATTERN

Table 5-2 Display patterns

No.	Display Pattern	LEVEL	RGB ON/OFF	Description
0	FF COLOR BAR	Yes	Yes	Full-field color bars
1	WHITE RASTER	Yes	Yes	White rasters
2	R RASTER	Yes	No	Red rasters
3	G RASTER	Yes	No	Green rasters
4	B RASTER	Yes	No	Blue rasters
5	2 TILES 1	Yes	No	Vertical tiles, top: white, bottom: black
6	2 TILES 2	Yes	No	Vertical tiles, top: black, bottom: white
7	H-RAMP 1	No	No	Horizontal ramp, left: white, right: black
8	H-RAMP 2	No	No	Horizontal ramp, left: black, right: white
9	V-RAMP 1	No	No	Vertical ramp, top: white, bottom: black
A	V-RAMP 2	No	No	Vertical ramp, top: black, bottom: white
B	RESERVED	—	—	Reserved
C	PATTERN CHANGE	—	—	Switches through patterns 0 to A at intervals of approximately 2 seconds
D	FLICKER ADJ.1	No	No	Pattern 1 for flicker adjustment
E	FLICKER ADJ.2	No	No	Pattern 2 for flicker adjustment
F	RESERVED	—	—	Reserved

(Yes: Valid, No: Invalid)

5.3 LEVEL

Table 5-3 Levels

No.	Level	No.	Level
0	0 %	8	35 %
1	2 %	9	40 %
2	5 %	A	50 %
3	10 %	B	60 %
4	15 %	C	70 %
5	20 %	D	80 %
6	25 %	E	90 %
7	30 %	F	100 %

5.4 SETTING

Table 5-4 Settings

No.	Setting	Description		Notes
		ON	OFF	
8	B ON/OFF	Blue on	Blue off	GBR on/off
7	G ON/OFF	Green on	Green off	
6	R ON/OFF	Red on	Red off	
5	RESERVED	High-FIX	I2C BR SYNC WRITE	I2C BR operation during flicker adjustment
4	ON:PSWG/OFF:SPWG	PSWG	SPWG	Output LVDS mapping
3	ON:No.4 VALID/OFF:VESA	No. 4 is valid	VESA	
2	RESERVED	VCOM2	Automatic	Flicker adjustment mode
1	ON:10bit/OFF:8bit	10 bit	8 bit	Pixel depth

5.5 Factory Default Settings

Table 5-5 Factory default settings

Setting	Factory Default	
PANEL	No.5	F-HD DUAL 12V
PATTERN	No.0	FF COLOR BAR
LEVEL	No.F	100 %
SETTING 8	ON	B ON
SETTING 7	ON	G ON
SETTING 6	ON	R ON
SETTING 5	OFF	I2C BR SYNC WRITE
SETTING 4	OFF	SPWG
SETTING 3	ON	No. 4 is valid
SETTING 2	ON	VCOM2
SETTING 1	ON	10 bit

5.6 LED

Table 5-6 LED displays

LED Display		Operation
POWER LED	OFF	Before power is turned on
	Blinking	While the LT 60A is initializing after power has been turned on
	ON	While the LT 60A is running
OUTPUT ON/OFF LED	OFF	When display output is off
	ON	When display output is on
	Blinking (slowly)	When PANEL is set to 12 V and OUTPUT ON/OFF has been pressed (Press + to turn display output on.)
	Blinking (fast)	When the overcurrent check fails (Press OUTPUT ON/OFF to clear the error.)
FLICKER ADJUST LED	Blinking	During flicker adjustment
FLICKER WRITE LED	Momentarily on	During flicker adjustment when + or - has been pressed
	On for approx. 1 second	During flicker adjustment when WRITE has been pressed
	Blinking for approx. 2 seconds	During flicker adjustment when the LT 60A cannot load the device information
OUTPUT ON/OFF LED FLICKER ADJUST LED FLICKER WRITE LED	Blinking simultaneously for approx. 2 seconds	When the short-circuit check or cable check fails

5.7 OUTPUT

The output connector pinout is shown below.

When PANEL is set to SINGLE, pins Y10 to Y14 and CLK1 are used.

When PANEL is set to DUAL or 120 Hz, the first set of pixel data is output from pins Y10 to Y14 and CLK1, and the second set of pixel data is output from pins Y20 to Y24 and CLK2.

The LT 60A does not provide power for the backlight. Provide the power for the backlight from the TV.

Table 5-7 Output connector pinout

OUTPUT 1 (Upper level)					
Pin no.	Signal	Description	Pin no.	Signal	Description
1	GND	GND (LVDS)	16	GND	GND (LVDS)
2	GND	GND (LVDS)	17	Y20-	LVDS output CH2
3	Y10-	LVDS output CH1	18	Y20+	LVDS output CH2
4	Y10+	LVDS output CH1	19	Y21-	LVDS output CH2
5	Y11-	LVDS output CH1	20	Y21+	LVDS output CH2
6	Y11+	LVDS output CH1	21	Y22-	LVDS output CH2
7	Y12-	LVDS output CH1	22	Y22+	LVDS output CH2
8	Y12+	LVDS output CH1	23	CLK2-	LVDS output
9	CLK1-	LVDS output	24	CLK2+	LVDS output
10	CLK1+	LVDS output	25	Y23-	LVDS output CH2
11	Y13-	LVDS output CH1	26	Y23+	LVDS output CH2
12	Y13+	LVDS output CH1	27	Y24-	LVDS output CH2
13	Y14-	LVDS output CH1	28	Y24+	LVDS output CH2
14	Y14+	LVDS output CH1	29	GND	GND (LVDS)
15	GND	GND (LVDS)	30	GND	GND (LVDS)

OUTPUT 2 (Lower level)					
Pin no.	Signal	Description	Pin no.	Signal	Description
1	Vdd	Display power source	11	SEND_12VCHK	Cable check signal
2	Vdd	Display power source	12	RETURN_12VCHK	Cable check signal
3	Vdd	Display power source	13	I2C BR	VCOM control signal
4	Vdd	Display power source	14	SDA	VCOM adjustment data
5	Vdd	Display power source	15	SCL	VCOM adjustment clock
6	GND	GND	16	GND	GND
7	GND	GND	17	FAIL IN	BL error signal
8	GND	GND	18	BL ON	BL on/off signal
9	GPIO-0	General-purpose control signal	19	PWM	PWM output (fixed H)
10	GPIO-1	General-purpose control signal	20	ADIM	ADIM voltage (adjustable VR)

* The following signals may need to be customized for different display types: GPIO-0, GPIO-1, I2C BR, SDA, SCL, FAIL IN, BL ON, PWM, ADIM. For more information, contact your nearest LEADER agent.

Table 5-8 SINGLE mode

LVDS Output CH1					LVDS Output CH2				
Differential pair	Bit output order	Mapping			Differential pair	Bit output order	Mapping		
		SPWG	PSWG	VESA			SPWG	PSWG	VESA
Y10	7	R14	R12	R10	Y20	7	—	—	—
	6	R15	R13	R11		6	—	—	—
	5	R16	R14	R12		5	—	—	—
	4	R17	R15	R13		4	—	—	—
	3	R18	R16	R14		3	—	—	—
	2	R19	R17	R15		2	—	—	—
	1	G14	G12	G10		1	—	—	—
Y11	7	G15	G13	G11	Y21	7	—	—	—
	6	G16	G14	G12		6	—	—	—
	5	G17	G15	G13		5	—	—	—
	4	G18	G16	G14		4	—	—	—
	3	G19	G17	G15		3	—	—	—
	2	B14	B12	B10		2	—	—	—
	1	B15	B13	B11		1	—	—	—
Y12	7	B16	B14	B12	Y22	7	—	—	—
	6	B17	B15	B13		6	—	—	—
	5	B18	B16	B14		5	—	—	—
	4	B19	B17	B15		4	—	—	—
	3	Hsync	Hsync	Hsync		3	—	—	—
	2	Vsync	Vsync	Vsync		2	—	—	—
	1	Denb	Denb	Denb		1	—	—	—
Y13	7	R12	R18	R16	Y23	7	—	—	—
	6	R13	R19	R17		6	—	—	—
	5	G12	G18	G16		5	—	—	—
	4	G13	G19	G17		4	—	—	—
	3	B12	B18	B16		3	—	—	—
	2	B13	B19	B17		2	—	—	—
	1	CNT11	CNT11	CNT11		1	—	—	—
Y14	7	R10	R10	R18	Y24	7	—	—	—
	6	R11	R11	R19		6	—	—	—
	5	G10	G10	G18		5	—	—	—
	4	G11	G11	G19		4	—	—	—
	3	B10	B10	B18		3	—	—	—
	2	B11	B11	B19		2	—	—	—
	1	CNT12	CNT12	CNT12		1	—	—	—

* When the pixel depth is 8 bits, the least significant 2 bits (R11, R10, G11, G10, B11, and B10) are always low.

* When the pixel depth is 8 bits and differential line pair Y14 is not connected, the most significant 2 bits for VESA mapping cannot be transferred. Use PSWG mapping instead.

Table 5-9 DUAL mode

LVDS Output CH1					LVDS Output CH2				
Differential pair	Bit output order	Mapping			Differential pair	Bit output order	Mapping		
		SPWG	PSWG	VESA			SPWG	PSWG	VESA
Y10	7	R14	R12	R10	Y20	7	R24	R22	R20
	6	R15	R13	R11		6	R25	R23	R21
	5	R16	R14	R12		5	R26	R24	R22
	4	R17	R15	R13		4	R27	R25	R23
	3	R18	R16	R14		3	R28	R26	R24
	2	R19	R17	R15		2	R29	R27	R25
	1	G14	G12	G10		1	G24	G22	G20
Y11	7	G15	G13	G11	Y21	7	G25	G23	G21
	6	G16	G14	G12		6	G26	G24	G22
	5	G17	G15	G13		5	G27	G25	G23
	4	G18	G16	G14		4	G28	G26	G24
	3	G19	G17	G15		3	G29	G27	G25
	2	B14	B12	B10		2	B24	B22	B20
	1	B15	B13	B11		1	B25	B23	B21
Y12	7	B16	B14	B12	Y22	7	B26	B24	B22
	6	B17	B15	B13		6	B27	B25	B23
	5	B18	B16	B14		5	B28	B26	B24
	4	B19	B17	B15		4	B29	B27	B25
	3	Hsync	Hsync	Hsync		3	Hsync	Hsync	Hsync
	2	Vsync	Vsync	Vsync		2	Vsync	Vsync	Vsync
	1	Denb	Denb	Denb		1	Denb	Denb	Denb
Y13	7	R12	R18	R16	Y23	7	R22	R28	R26
	6	R13	R19	R17		6	R23	R29	R27
	5	G12	G18	G16		5	G22	G28	G26
	4	G13	G19	G17		4	G23	G29	G27
	3	B12	B18	B16		3	B22	B28	B26
	2	B13	B19	B17		2	B23	B29	B27
	1	CNT11	CNT11	CNT11		1	CNT21	CNT21	CNT21
Y14	7	R10	R10	R18	Y24	7	R20	R20	R28
	6	R11	R11	R19		6	R21	R21	R29
	5	G10	G10	G18		5	G20	G20	G28
	4	G11	G11	G19		4	G21	G21	G29
	3	B10	B10	B18		3	B20	B20	B28
	2	B11	B11	B19		2	B21	B21	B29
	1	CNT12	CNT12	CNT12		1	CNT22	CNT22	CNT22

* When the pixel depth is 8 bits, the least significant 2 bits (R11, R10, G11, G10, B11, B10 and R21, R20, G20, G20, B21, B20) are always low.

* When the pixel depth is 8 bits and differential line pairs Y14 and Y24 are not connected, the most significant 2 bits for VESA mapping cannot be transferred. Use PSWG mapping instead.

5. Display Features

Table 5-10 120 Hz mode

LVDS Output CH1					LVDS Output CH2				
Differential pair	Bit output order	Mapping			Differential pair	Bit output order	Mapping		
		SPWG	PSWG	VESA			SPWG	PSWG	VESA
Y10	7	R14	R12	R10	Y20	7	R14	R12	R10
	6	R15	R13	R11		6	R15	R13	R11
	5	R16	R14	R12		5	R16	R14	R12
	4	R17	R15	R13		4	R17	R15	R13
	3	R18	R16	R14		3	R18	R16	R14
	2	R19	R17	R15		2	R19	R17	R15
	1	G14	G12	G10		1	G14	G12	G10
Y11	7	G15	G13	G11	Y21	7	G15	G13	G11
	6	G16	G14	G12		6	G16	G14	G12
	5	G17	G15	G13		5	G17	G15	G13
	4	G18	G16	G14		4	G18	G16	G14
	3	G19	G17	G15		3	G19	G17	G15
	2	B14	B12	B10		2	B14	B12	B10
	1	B15	B13	B11		1	B15	B13	B11
Y12	7	B16	B14	B12	Y22	7	B16	B14	B12
	6	B17	B15	B13		6	B17	B15	B13
	5	B18	B16	B14		5	B18	B16	B14
	4	B19	B17	B15		4	B19	B17	B15
	3	Hsync	Hsync	Hsync		3	Hsync	Hsync	Hsync
	2	Vsync	Vsync	Vsync		2	Vsync	Vsync	Vsync
	1	Denb	Denb	Denb		1	Denb	Denb	Denb
Y13	7	R12	R18	R16	Y23	7	R12	R18	R16
	6	R13	R19	R17		6	R13	R19	R17
	5	G12	G18	G16		5	G12	G18	G16
	4	G13	G19	G17		4	G13	G19	G17
	3	B12	B18	B16		3	B12	B18	B16
	2	B13	B19	B17		2	B13	B19	B17
	1	CNT11	CNT11	CNT11		1	CNT21	CNT21	CNT21
Y14	7	R10	R10	R18	Y24	7	R10	R10	R18
	6	R11	R11	R19		6	R11	R11	R19
	5	G10	G10	G18		5	G10	G10	G18
	4	G11	G11	G19		4	G11	G11	G19
	3	B10	B10	B18		3	B10	B10	B18
	2	B11	B11	B19		2	B11	B11	B19
	1	CNT12	CNT12	CNT12		1	CNT22	CNT22	CNT22

- * When PANEL is set to 120 Hz, the same data is output for LVDS CH1 and CH2.
- * When the pixel depth is 8 bits, the least significant 2 bits (R11, R10, G11, G10, B11, B10 and R21, R20, G21, G20, B21, B20) are always low.
- * When the pixel depth is 8 bits and differential line pairs Y14 and Y24 are not connected, the most significant 2 bits for VESA mapping cannot be transferred. Use PSWG mapping instead.

6. Remote Control

You can control the LT 60A remotely using the USB connector on its side panel. You will need to prepare the following devices to control the LT 60A remotely.

Table 6-1 Required items

Item	Notes
PC	Windows 2000, XP, or Vista, Japanese version (*1) CD-ROM drive and USB port
USB cable	USB (A) male–USB (B) male

*1 The sample program discussed later is intended for use on the Japanese version Windows XP.

6.1 Installing the USB Driver

Before you control the LT 60A remotely, you need to install the USB driver on the PC you will use. To install the USB driver from the CD-ROM that comes with the LT 60A, follow the procedure below.

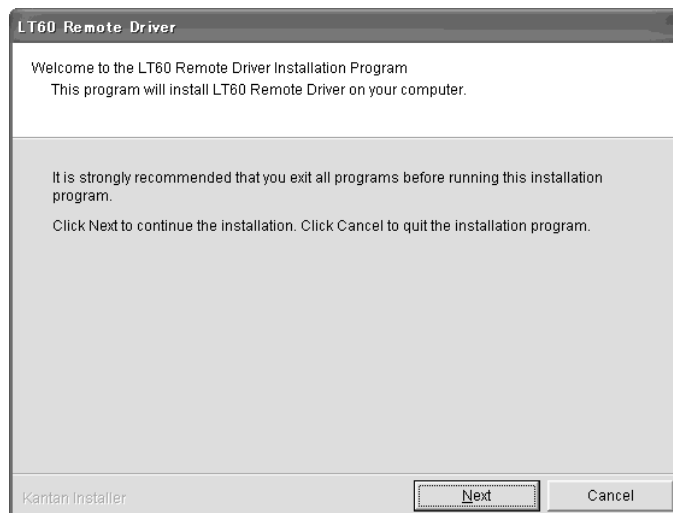
1. From the PC, execute the file “LT60A_driver_V200.exe” on the CD-ROM (accessory).

Before you execute the file, close any applications or programs that you are running. The location of the file is indicated below.

```

⊙ CD-ROM
├─ Driver
│  └─ LT60A_driver_V200.exe
├─ Library
└─ Sample
  
```

2. When the following window appears, click Next.



3. When the following confirmation window appears, click Yes.

During the installation, two DOS windows appear. Do not close the DOS windows. Wait for the installation to finish. After all the windows close, the installation is complete.



6.2 Connecting the LT 60A to a PC

When you first connect the LT 60A to a PC using a USB cable, you need to perform the following operations.

- 1. Connect the LT 60A to the PC using a USB cable.**
- 2. Turn on the LT 60A.**

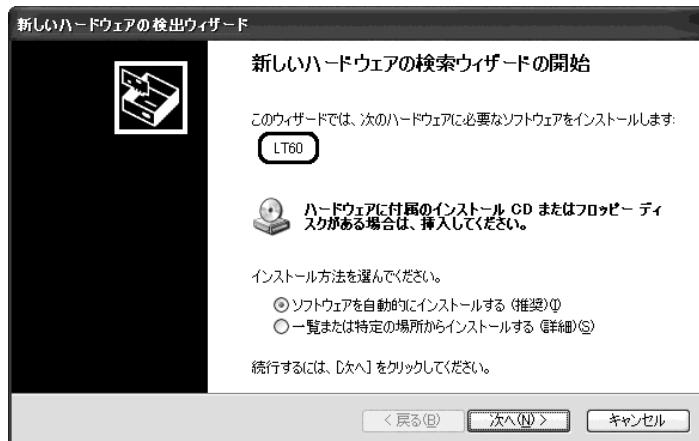
The Found New Hardware Wizard will appear.

Depending on the OS that you are using, the message, “Can Windows connect to Windows Update to search for software?” may appear. If this message appears, select **No, not this time**, and click **Next**.

- 3. The next steps vary as indicated below depending on the hardware name that is displayed.**

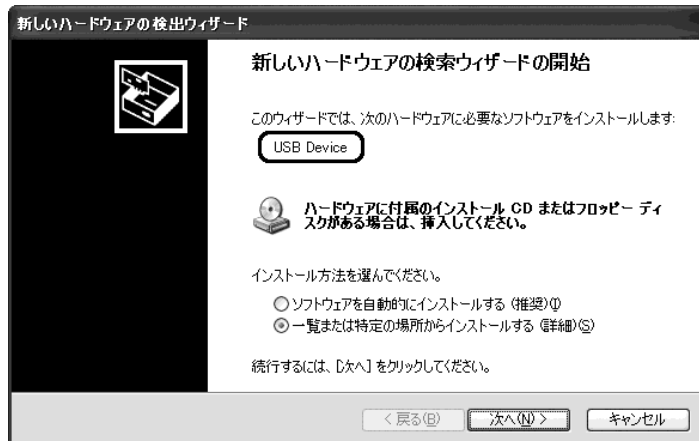
- **When the hardware name is “LT60”**

Select **Install the software automatically**, and click **Next**.



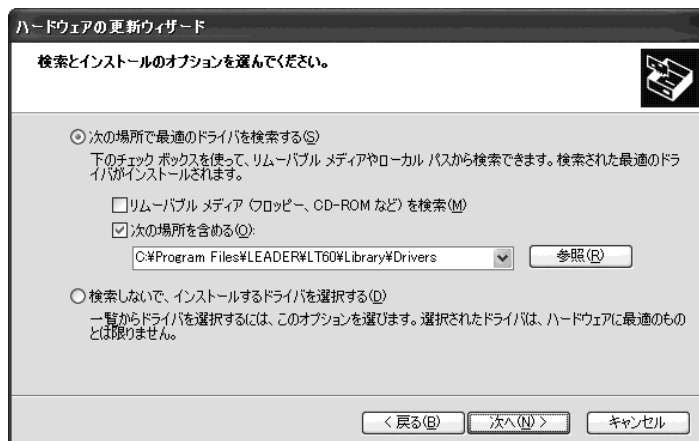
• **When the hardware name is “USB Device”**

Select **Install from a list or specific location**, and click **Next**.

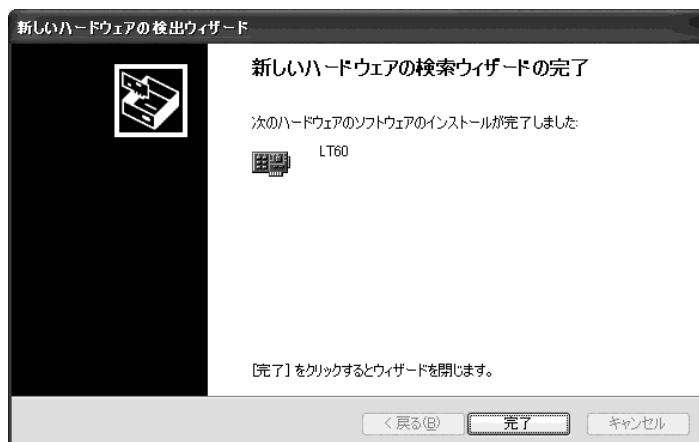


Select **Search for the best driver in these locations** and the **Include this location in the search** check box.

Click **Browse**, specify C:\Program Files\LEADER\LT60\Library\Drivers, and click **Next**.



4. When the following window appears, click Finish.



6.3 Control

The CD-ROM that comes with the LT 60A includes header files and library files for programming with Borland C++ Builder or Microsoft Visual C++. Use these files as necessary. You can find the files you need by using the reference below.

⊗ CD-ROM

```

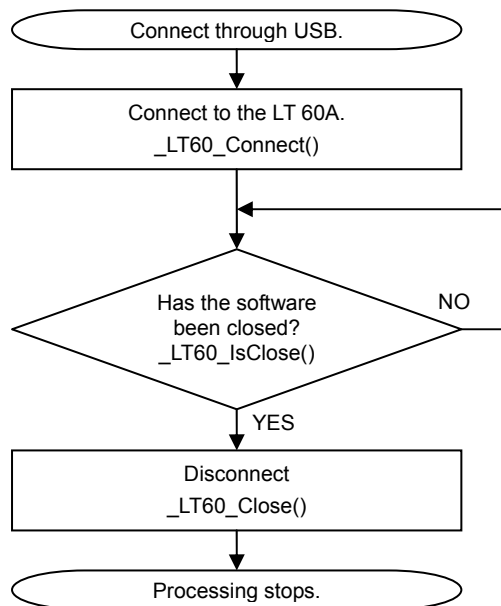
├─ Driver
├─ Library
│  ├─ BCB6.....For Borland C++ Builder 6
│  │  └─ LT60cntl.h .....Header file for the LT 60A control library
│  │     └─ LT60cntl.lib.....Library file
│  └─ VC6 .....For Microsoft Visual C++ 6.0
│     └─ LT60cntl.h .....Header file for the LT 60A control library
│        └─ LT60cntl.lib.....Library file
├─ LT60cntl.dll .....LT 60A control library
├─ wdapi921.dll .....USB driver control library
├─ WinUSB_921DLL.dll.....USB driver control library
└─ Sample

```

6.3.1 Notes

- During remote control, no operations can be performed from the LT 60A other than the turning on and off of the power. To enable operations from the LT 60A, turn the power off and then on again.
- When starting remote control, be sure to load the starting function (unless you are using the sample software).

The communication flowchart is shown below. For details about each function, see the next sections.



6.3.2 Remote Control Functions

The functions that can be controlled remotely are listed below. For details about each function, see the next section.

Table 6-2 Remote control functions

No.	Function
1	Start remote control.
2	End remote control.
3	Check the connection status.
4	Acquire the library version.
5	Acquire library execution errors.
6	Acquire the status from the LT 60A.
7	Acquire specific data from the received status.
8	Select the display type.
9	Select a mapping type (VESA, SPWG, or PSWG).
10	Select the number of bits (8 or 10 bits).
11	Turn display output on and off.
12	Turn the RGB signals on and off.
13	Select a display pattern.
14	Select an output level (0 to 100 %).
15	Set the GPIO output (to low or high).
16	Start flicker adjustment.
17	Adjust the VCOM value.
18	Specify the VCOM value.
19	End flicker adjustment.
20	Cancel flicker adjustment.
21	Select a flicker adjustment mode (auto or VCOM2).
22	Select an I2C BR operation (I2C BR SYNC WRITE or High-FIX).
23	Specify the DAC I2C device address.
24	Specify the E2PROM I2C device address.
25	Specify the E2PROM address to write the VCOM value to.
26	Set numbers 21 to 25 all at once.

6.3.3 Remote Control Function Details

The details of the remote control functions are explained here. If no return values are specified for a function, its return values are as follows.

Table 6-3 Return values

Return Value	Description
0	Normal
1	No USB connection
2	USB communication error
3	USB response timeout
100	Processing glitch or exception handling

Table 6-4 Remote control function details

No.	Description	
1	Operation	Start remote control.
	Function	DWORD _LT60_Connect(void)
	Program example	_LT60_Connect()
	Notes	Be sure to execute this function first. This function must be performed again after the PC is disconnected from the LT 60A.
2	Operation	End remote control.
	Function	void _LT60_Close(void)
	Program example	_LT60_Close()
3	Operation	Check the connection status.
	Function	DWORD _LT60_IsClose(DWORD typ)
	Parameter (typ)	LT60_CHK_NONE: The status is determined according to the current state (high-speed determination). LT60_CHK_CONNECT: The connection status is renewed after the communication is checked.
	Return values	0: Connected Other values: Not connected
	Program example	Disconnect=_LT60_IsClose(LT60_CHK_NONE)
	Notes	If there is a possibility that the USB connection was lost (because the LT 60A was turned off or for some other reason), set the parameter to LT60_CHK_CONNECT.
4	Operation	Acquire the library version.
	Function	DWORD _LT60_GetDllVer(void)
	Return values	228: Ver 2.28 (example)
5	Operation	Acquire library execution errors.
	Function	void _LT60_GetErrStr(BYTE *strPtr)
	Parameter (strPtr)	Sends a pointer to char [] (up to 128 characters)
	Program example	<pre> int st; char buf[130]; st=_LT60_xxxx(); if(st != 0) // An execution error occurs. { _LT60_GetErrStr(&buf); printf(buf); } </pre>
6	Operation	Acquire the status from the LT 60A.
	Function	DWORD _LT60_RecvStatus(DWORD *rxNum)
	Parameter (rxNum)	The area within which the status reception number is set (a counter that is incremented by one each time the status is received)
	Program example	<pre> DWORD st, rxNum; st=_LT60_RecvStatus(&rxNum) </pre>

6. Remote Control

No.	Description	
7	Operation	Acquire specific data from the received status.
	Function	DWORD _LT60_GetStatus(DWORD *rxNum,DWORD typ)
	Parameter (rxNum)	The area within which the received status reception number is set (a counter that is incremented by one each time the status is received) Can be used to determine whether a received status is new
	Parameter (typ) return values	LT60_STS_FIRM_VER_CPU: CPU version 110: Ver 1.10 (example)
	Parameter (typ) return values	LT60_STS_FIRM_VER_FPGA: FPGA version 110: Ver 1.10 (example)
	Parameter (typ) return values	LT60_STS_NOW_OUTPUT: Display output state 0: OFF 1: ON
	Parameter (typ) return values	LT60_STS_NOW_ERR: Error state Bit assignments 0: No errors 1(b0): The firmware has not yet been written. 1(b1): I2C error 1(b2): Cable short 1(b3): Wrong display cable voltage 1(b4): Overcurrent error 1(b5): Reserved 1(b6): USB command error
	Parameter (typ) return values	LT60_STS_NOW_VOLT: Display voltage 1: 5 V 2: 12 V
	Parameter (typ) return values	LT60_STS_NOW_PANEL: Display type 0 to 15
	Parameter (typ) return values	LT60_STS_NOW_PATN: Display pattern 0 to 15
	Parameter (typ) return values	LT60_STS_NOW_LEVEL: Output level 0 to 15
	Parameter (typ) return values	LT60_STS_NOW_DIPSW: DIP SW status 0 to 255
	Parameter (typ) return values	LT60_STS_NOW_ADJ: Flicker adjustment status 0: Not adjusting 1: Preparing to adjust 2: Adjusting
	Parameter (typ) return values	LT60_STS_NOW_ADJ_MODE: Flicker adjustment mode 0: Not determined 1: VCOM1 2: VCOM2
	Parameter (typ) return values	LT60_STS_NOW_DAC_I2C: DAC I2C address 02 to FEh (most significant 7 bits)
Parameter (typ) return values	LT60_STS_NOW_EEP_I2C: E2PROM I2C address 02 to FEh (most significant 7 bits)	

6. Remote Control

No.	Description	
7	Parameter (typ) return values	LT60_STS_NOW_DAC_INIT: Initial DAC setting when flicker adjustment started 00 to FE/FCh
	Parameter (typ) return values	LT60_STS_NOW_DAC_VALUE: DAC setting during flicker adjustment 00 to FE/FCh
	Parameter (typ) return values	LT60_STS_NOW_EEP_ADRS1: First E2PROM address for writing the VCOM value 0000 to FFFFh
	Parameter (typ) return values	LT60_STS_NOW_EEP_ADRS2: Second E2PROM address for writing the VCOM value 0000 to FFFFh
	Program example	DWORD st, rxNum, typ; typ = LT60_STS_FIRM_VER_CPU; st= _LT60_GetStatus(&rxNum,typ);
Notes	The return value when there is no valid data is FFFFFFFFh.	
8	Operation	Select the display type.
	Function	DWORD _LT60_SelectPanel(DWORD typ)
	Parameter (typ)	0 to 15
	Program example	_LT60_SelectPanel(3)
	Notes	Same as the PANEL rotary switch on the LT 60A front panel
9	Operation	Select a mapping type.
	Function	DWORD _LT60_SelectMapping(DWORD map)
	Parameter (map)	LT60_MAP_VESA: VESA LT60_MAP_SPWG: SPWG LT60_MAP_PSWG: PSWG
	Program example	_LT60_SelectMapping(LT60_MAP_VESA)
	Notes	Same as SETTING DIP switches 3 and 4 on the LT 60A front panel
10	Operation	Select the number of bits.
	Function	DWORD _LT60_SelectRGBbit(DWORD bit)
	Parameter (bit)	LT60_RGB_8BIT: 8 bit LT60_RGB_10BIT: 10 bit
	Program example	_LT60_SelectRGBbit(LT60_RGB_8BIT)
	Notes	Same as SETTING DIP switch 1 on the LT 60A front panel
11	Operation	Turn display output on and off.
	Function	DWORD _LT60_SetPower(DWORD on)
	Parameter (on)	LT60_OUT_OFF: Turn output off. LT60_OUT_ON: Turn output on.
	Program example	_LT60_SetPower(LT60_OUT_ON)
	Notes	Same as the OUTPUT ON/OFF key on the LT 60A front panel.
12	Operation	Turn the RGB signals on and off.
	Function	DWORD _LT60_SetRGBon(DWORD r,DWORD g,DWORD b)
	Parameters (r, g, and b)	0: Turn output off. 1: Turn output on.
	Program example	_LT60_SetRGBon(1,0,0)
	Notes	Same as SETTING DIP switches 6 to 8 on the LT 60A front panel

6. Remote Control

No.	Description	
13	Operation	Select a display pattern.
	Function	DWORD _LT60_SetPattern(DWORD num)
	Parameter (num)	0 to 15
	Program example	_LT60_SetPattern(12)
	Notes	Same as the PATTERN rotary switch on the LT 60A front panel
14	Operation	Select an output level.
	Function	DWORD _LT60_SetRGBlevel(DWORD lvl)
	Parameter (lvl)	LT60_LVL_0 to LT60_LVL_100
	Program example	_LT60_SetRGBlevel(LT60_LVL_20) (output level 20 %)
	Notes	Same as the LEVEL rotary switch on the LT 60A front panel
15	Operation	Set the GPIO output.
	Function	DWORD _LT60_SetGPIO(DWORD gpio0, DWORD gpio1)
	Parameters (gpio0 and gpio1)	0: Low 1: High
	Program example	_LT60_SetGPIO(0,1)
	Notes	This function is only available through remote control. When the display output is off, the GPIO output is low regardless of this setting.
16	Operation	Start flicker adjustment.
	Function	DWORD _LT60_VCOMstart(void)
	Program example	_LT60_VCOMstart()
	Notes	Same as the ADJUST key on the LT 60A front panel A flicker adjustment pattern must be displayed for this function to be valid.
17	Operation	Adjust the VCOM value.
	Function	DWORD _LT60_VCOMchange(DWORD up)
	Parameter (up)	LT60_STEP_DOWN: The operation that is performed when you press - LT60_STEP_UP: The operation that is performed when you press +
	Program example	_LT60_VCOMchg(LT60_STEP_UP)
	Notes	This function is only valid during flicker adjustment.
18	Operation	Specify the VCOM value.
	Function	DWORD _LT60_VCOMvalue(DWORD value)
	Parameter (value)	00 to FFh
	Program example	_LT60_VCOMvalue(0x80) (VCOM value 80h)
	Notes	This function is only valid during flicker adjustment.
19	Operation	End flicker adjustment.
	Function	DWORD _LT60_VCOMwrite(void)
	Program example	_LT60_VCOMwrite()
	Notes	Same as the WRITE key on the LT 60A front panel The adjustment results are recorded while the EEPROM is being used. This function is only valid during flicker adjustment.

6. Remote Control

No.	Description	
20	Operation	Cancel flicker adjustment.
	Function	DWORD _LT60_VCOMcancel(void)
	Program example	_LT60_VCOMcancel()
	Notes	Same as the ADJUST key on the LT 60A front panel This function is only valid during flicker adjustment.
21	Operation	Select a flicker adjustment mode.
	Function	DWORD _LT60_VCOMmode(DWORD typ)
	Parameter (typ)	LT60_VCOM_MODE_AUTO: Auto LT60_VCOM_MODE_WAX2: VCOM2
	Program example	_LT60_VCOMmode(LT60_VCOM_MODE_AUTO)
	Notes	Same as SETTING DIP switch 2 on the LT 60A front panel This function is not valid during flicker adjustment.
22	Operation	Select an I2C BR operation.
	Function	DWORD _LT60_BINTmode(DWORD typ)
	Parameter (typ)	LT60_BINT_SYNC: I2C BR SYNC WRITE LT60_BINT_H: High-FIX
	Program example	_LT60_BINTmode(LT60_BINT_H)
	Notes	Same as SETTING DIP switch 5 on the LT 60A front panel This function is not valid during flicker adjustment.
23	Operation	Specify the DAC I2C device address.
	Function	DWORD _LT60_VCOM_befDACi2c(DWORD adrs)
	Parameter (adrs)	02 to FEh (the least significant bit is ignored)
	Program example	_LT60_VCOM_befDACi2c(0x9E)
	Notes	Use this function before flicker adjustment.
24	Operation	Specify the E2PROM I2C device address.
	Function	DWORD _LT60_VCOM_befEePi2c(DWORD adrs)
	Parameter (adrs)	02 to FEh (the least significant bit is ignored)
	Program example	_LT60_VCOM_befEePi2c(0xA0)
	Notes	Use this function before flicker adjustment (for VCOM1).
25	Operation	Specify the E2PROM address to write the VCOM value to.
	Function	DWORD _LT60_VCOM_befEePAdr(DWORD adrs1,DWORD adrs2)
	Parameter (adrs1)	0000 to FFFFh: E2PROM write address 1
	Parameter (adrs2)	0000 to FFFFh: E2PROM write address 2
	Program example	_LT60_VCOM_befEePAdr(0x1FD1,0x1FE1)
	Notes	Use this function before flicker adjustment (for VCOM1).

No.	Description	
26	Operation	Set numbers 21 to 25 all at once.
	Function	DWORD _LT60_VCOM_param6(DWORD mode,DWORD bint,DWORD dacl2c,DWORD eepl2c,DWORD adrs1,DWORD adrs2)
	Parameter (mode)	See number 21.
	Parameter (bint)	See number 22.
	Parameter (dacl2c)	See number 23.
	Parameter (eepl2c)	See number 24.
	Parameter (adrs1, adrs2)	See number 25.
	Program example	_LT60_VCOM_param6(LT60_VCOM_MODE_AUTO,LT60_BINT_H,0x9E,0xA0,0x1FD1,0x1FE1)

6.4 Sample Program

A sample program is included for reference in the CD-ROM that comes with the LT 60A. This program uses many of the functions in section 6.3.2, "Remote Control Functions," and enables simple remote control of the LT 60A. Install the program if necessary.

- **Operating Environment**

The sample program has been tested in the following environment.

Table 6-5 Operating environment of the sample program

Item	Specification
OS	Windows XP, Japanese version
Processor	3.2 GHz Pentium 4
Memory	1 GB
Hard disk	1 MB or more of free disk space (For the sample program only. The space required for the Microsoft .NET Framework 3.5 is not included.)
Display	1024 × 768, high color 32 bit

- **Notes**

- Some of the means of operation are different than those on the LT 60A.
- The sample program is not guaranteed in any way.

6.4.1 Installation

To install the sample program, follow the procedure below.

1. From the PC, execute the file “LT60_USB_Remote_CP_Ver0.1_Setup.msi” on the CD-ROM (accessory).

Before you execute the file, close any applications or programs that you are running. The location of the file is indicated below.

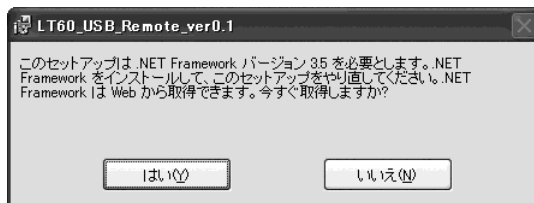
```

⊙ CD-ROM
├─ Driver
├─ Library
├─ Sample
│  └─ MainForm.cs
│     └─ LT60_USB_Remote_CP_Ver0.1_Setup.msi

```

2. Install the Microsoft .NET Framework 3.5.

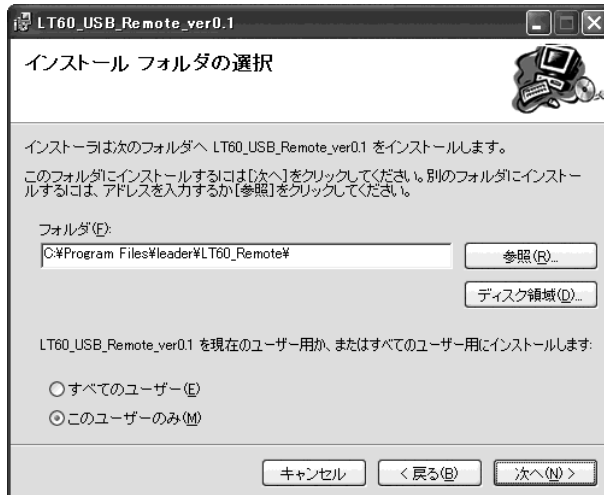
If the Microsoft .NET Framework 3.5 is not installed on the PC that you are using, the following window will appear. Click **Yes** to install the Microsoft .NET Framework 3.5. Follow the instructions provided by Microsoft to proceed with the installation.



3. When the following window appears, click Next.



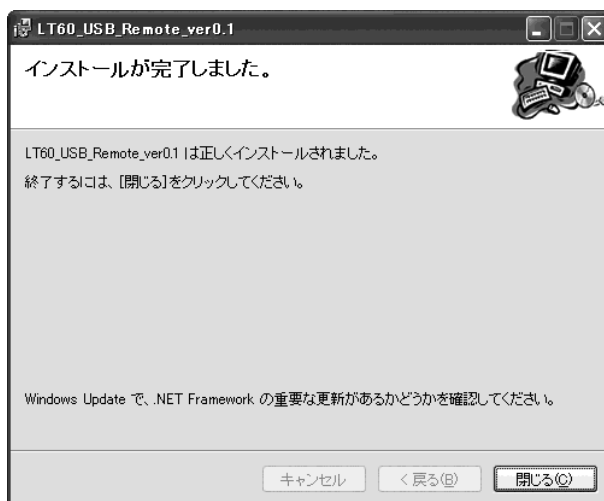
4. When the following window appears, click Next.



5. When the following window appears, click Next.



6. When the following window appears, the installation is complete. Click Finish.



6.4.2 Starting the Sample Program

To start the sample program, follow the procedure below.

1. **Connect the LT 60A to the PC using a USB cable.**
2. **Turn on the LT 60A.**

When the Found New Hardware Wizard appears, follow the procedure in section 6.2, "Connecting the LT 60A to a PC."

3. **On the desktop, double-click LT60_USB_Remote_ver0.1.**

If the sample program has been installed properly, the following icon will appear on the desktop.



You can also open the sample program by clicking **Start, All Programs**, and then **LT60 Remote**.

6.4.3 Window Explanation

When you start the sample program, a window like the one shown below appears. Immediately after you start the sample program, the only operations that are available are Connect and Close. You can perform other operations after you click Connect.

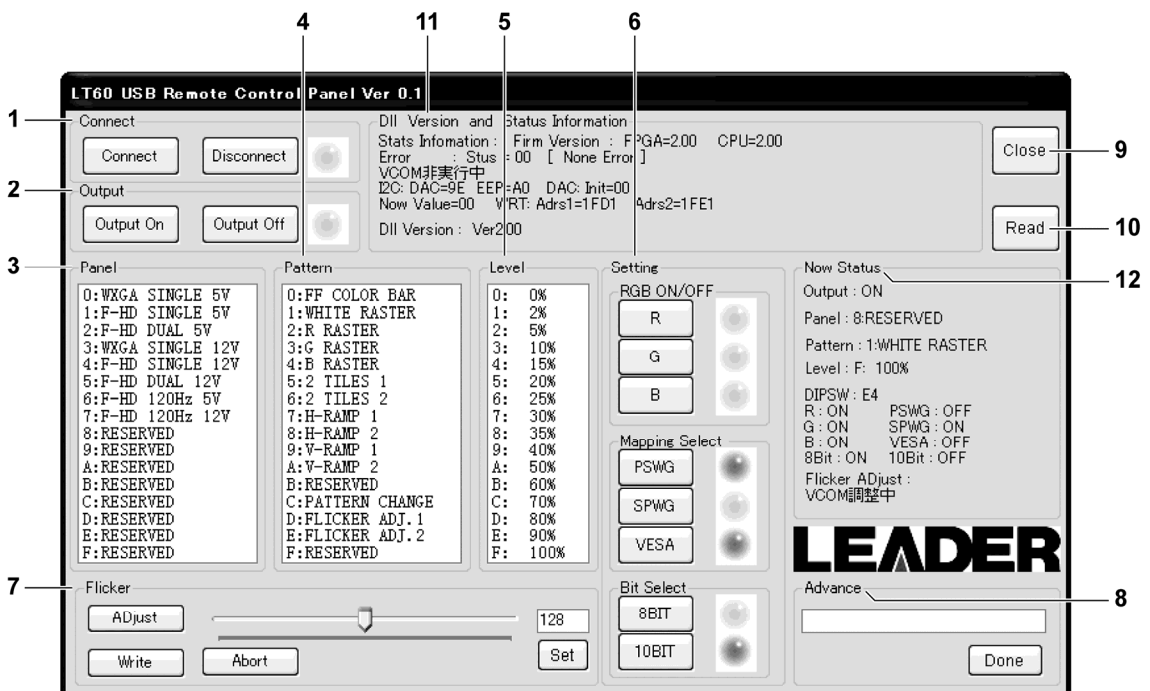


Figure 6-1 Sample program window

The various items are explained below.

1 Connect

To connect to the LT 60A, click Connect. To disconnect from the LT 60A, click Disconnect. When the connection between the PC and the LT 60A is open, the lamp on the right is green. When the connection is closed, the lamp is red. When the connection is closed, the only operations that are available are Connect and Close. If a connection has not been established between the PC and the LT 60A, clicking Connect will have no effect.

2 Output

Turn the display output on or off. When the output to the display is on, the lamp on the right is green. When the output is off, the lamp is red.

3 Panel

Select a display type. Settings are confirmed as soon as they are clicked.

4 Pattern

Select a display pattern. Settings are confirmed as soon as they are clicked.

5 Level

Select an output level. Settings are confirmed as soon as they are clicked.

6 Setting

RGB ON/OFF

Turn the RGB signals on or off. Click a signal's button to toggle between on and off. When a signal is on, its lamp is green. When a signal is off, its lamp is red.

Mapping Select

Set the mapping type to PSWG, SPWG, or VESA. The lamp of the mapping type that you select turns green, and the other lamps turn red.

Bit Select

Set the number of bits to 8 or 10. The lamp that corresponds to the number of bits that you select turns green, and the other lamp turns red.

7 Flicker

ADjust: Start flicker adjustment.

Set: Apply the flicker adjustment value (0 to 255) that you entered in the text box.

You can also set the flicker adjustment value using the scroll bar.

Write: Enter the flicker adjustment value, and then end flicker adjustment.

Abort: Cancel flicker adjustment.

8 Advance

By entering the commands listed below and then clicking Done, you can configure settings and make queries. The responses to queries appear in the bottom of the Now Status area.

Table 6-6 Advance commands

Command	Description	Response
__flicker-mode_?	Query the flicker adjustment mode.	AUTO, WAX2, etc.
__flicker-mode-auto	Automatically set the flicker adjustment mode.	—
__flicker-mode-wax2	Set the flicker adjustment mode to VCOM2.	—
__bint_?	Query the I2C BR operation.	SYNC or High
__bint_syncn	Set the I2C BR operation to I2C BR SYNC WRITE.	—
__bint_h	Set the I2C BR operation to High-FIX.	—
__setgpio-l-l	Set GPIO-0 and GPIO-1 to low.	—
__setgpio-h-l	Set GPIO-0 to high and GPIO-1 to low.	—
__setgpio-l-h	Set GPIO-0 to low and GPIO-1 to high.	—
__setgpio-h-h	Set GPIO-0 and GPIO-1 to high.	—

9 Close

Close the window. The connection with the LT 60A is also closed.

10 Read

Load the LT 60A information and display it under DII Version and Status Information and under Now Status.

11 DII Version and Status Information

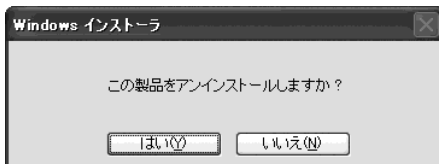
Internal information about the LT 60A, such as the firmware version, is displayed here.

12 Now Status

The current status of the output level and other settings is displayed here.

6.4.4 Uninstallation

To uninstall the sample program, click **Start, All Programs, LT60 Remote**, and then **Uninstall.exe**. When the following window appears, click Next. After the window closes, the uninstallation is complete.



7. CALIBRATION AND REPAIRS

This instrument has been carefully examined at the factory to ensure that its performance is in accordance with the standards. However, because of factors such as parts wearing out over time, the performance of the instrument may degrade. To ensure stable performance, we recommend that you have the instrument calibrated regularly. Also, if the instrument malfunctions, repairs are necessary. For repairs and calibration, contact your local LEADER agent.

Following information is for Chinese RoHS only

所含有毒有害物质信息

部件号码: LT 60A



此标志适用于在中国销售的电子信息产品, 依据2006年2月28日公布的《电子信息产品污染控制管理办法》以及SJ/T11364-2006《电子信息产品污染控制标识要求》, 表示该产品在使用完结后可再利用。数字表示的是环境保护使用期限, 只要遵守与本产品有关的安全和使用上的注意事项, 从制造日算起在数字所表示的年限内, 产品不会产生环境污染和对人体、财产的影响。产品适当使用后报废的方法请遵从电子信息产品的回收、再利用相关法令。详细请咨询各级政府主管部门。

产品中有毒有害物质或元素的名称及含量

部件名称 Parts	有毒有害物质或元素 Hazardous Substances in each Part					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
实装基板	×	○	○	○	○	○
主体部	×	○	○	○	○	○
外筐	○	○	○	○	○	○
附件	×	○	○	○	○	○
包装材	○	○	○	○	○	○

备注)

- : 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 规定的限量要求以下。
- ×: 表示该有毒有害物质或元素至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求。

LEADER

LEADER ELECTRONICS CORP.

2-6-33 Tsunashima-Higashi, Kohoku-ku, Yokohama 223-8505, Japan
PHONE:81-45-541-2123 FAX:81-45-541-2823 <http://www.leader.co.jp>