LEADER

LT 4441 / LT 4442

CHANGEOVER

INSTRUCTION MANUAL

LEADER
ELECTRONIC MEASURING INSTRUMENTS

TABLE OF CONTENTS

1. INTRODUCTION 1

1.1 Scope of Warranty 1
1.2 Operating Precautions 1
1.2.1 Power Supply Voltage 1
1.2.2 Maximum Allowable Input Voltage 1
1.2.3 Shorting and Applying External Input to the Output Connectors 2
1.2.4 Mechanical Shock 2
1.2.5 Electrostatic Damage 2
1.2.6 Rack Mounting 2
1.2.7 Warming Up 2

2. SPECIFICATIONS 3

2.1 General 3
2.2 Features 3
2.3 Specifications 4
2.3.1 I/O Connectors 4
2.3.2 I/O Characteristics 4
2.3.3 Types of Input Signals 5
2.3.4 Signal Switching 5
2.3.5 Error Detection 6
2.3.6 Key Lock 7
2.3.7 External Control Connectors 7
2.3.8 General Specifications 7

3. NAMES AND FUNCTIONS OF PARTS 8

3.1 Front Panel 8
3.2 Rear Panel 9
3.3 Side Panel 9
3.4 Top Panel 10

4. HOW TO USE 11

4.1 Turning the Power ON 11
4.2 Attaching the Cover Inlet Stopper 12
4.3 DIP Switch Settings 13
4.3.1 Setting Method 14
4.3.2 Input Signal Settings 15
4.3.3 Error Detection Reference Settings 16
4.3.4 Error Detection Level Settings (User setting) 17
4.3.5 Signal Switch Time Settings 18
4.3.6 Operation Mode and Standby Time Settings 19
4.4 Signal I/O 20
4.5 Configuring the LT 4441/4442 21
4.5.1 Enabling the Key Lock 21

4.5.2 Switching the Output Signal 21
4.5.3 Setting Automatic Signal Switching 22
4.5.4 Error Display and Resetting 23

5. EXTERNAL INTERFACE 24

5.1 Remote-control Connector 24

6. CALIBRATION AND REPAIRS 26

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.

<Symbol> 	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. 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.
<Term> 	Ignoring the precautions that this term indicates could lead to death or serious injury.
<Term> 	Ignoring the precautions that this term indicates could lead to personal injury or damage to the instrument.

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 except for setting DIP switches. 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

Do not use a power source with a voltage other than the rated power source voltage for the instrument. Doing so could lead to fire.
Confirm the voltage of the commercial power source before you connect the AC power cord.
Only use a power source whose frequency is 50/60 Hz.

Only use the supplied power cord. Using any other power cord with this instrument could lead to fire. If the supplied 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.

There is no power switch on this instrument. Only use this instrument after you have secured a method that enables you to shut off the power source in an emergency.

■ If You Notice Something Wrong during Operation

If you notice smoke, flame, a strange smell, or something else that is wrong with the instrument while you are operating it, a fire may occur. Remove the power cord from the outlet to stop operation immediately. After making sure that fire has not spread anywhere, contact your local LEADER agent.

■ Installation Environment

- Operating Temperature Range
  Use this instrument in a 0 to 40 °C environment. Using the instrument with its vents blocked or 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.

GENERAL SAFETY SUMMARY

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

- 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.
- 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.

■ Cautions Concerning the Input and Output Connectors
To avoid damaging the instrument, only apply signals to the input connectors that conform to the specifications in this instruction manual.
Also, do not apply signals to the output connectors. Doing so could damage the instrument.

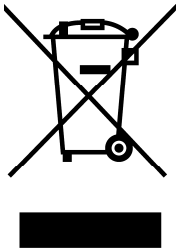
■ If You Will Not Use the Instrument for an Extended Period of Time
If you will not use the instrument for an extended period of time, remove the power plug from the outlet.

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 Supply Voltage

Confirm the voltage of the commercial power source before you connect the power plug to it. The operating voltage range is 90 to 250 VAC. Only use a power source that supplies a voltage within the operating voltage range and has a frequency of 50/60 Hz.

1.2.2 Maximum Allowable Input Voltage

The maximum signal voltage that can be applied to the input connectors is indicated below. Do not apply excessive voltage to the connectors. Doing so may damage the instrument or lead to injury.

Table 1-1 Maximum allowable input voltage

Input Connector	Maximum Allowable Input Voltage
Channels 1 to 3	±5 V
Channels 4 to 10	±1.5 V
CH11	0 V or +5 V

1.2.3 Shorting and Applying External Input to the Output Connectors

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

1.2.4 Mechanical Shock

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

1.2.5 Electrostatic Damage

Electronic components can be damaged by static discharge. Static electricity can build up in the core wire of a coaxial cable. Before connecting a coaxial cable to the instrument, short the core wire of the cable with the external conductor.

1.2.6 Rack Mounting

If you are mounting this instrument on a rack, be sure to provide additional support for the instrument. If you only use the included rack supports to mount the instrument, the instrument case may be deformed, or the instrument may fall. This instrument can be mounted on an EIA 19-inch rack.

The recommended slide rails are shown in the following table. To mount this instrument on a rack, two slide rails, one for the left side and one for the right side of the instrument, are required.

Table 1-2 Recommended slide rails

Stock Number	Manufacturer
C-203-16	Settsu Metal Industrial Co., Ltd.
KC-251-16	TAKIGEN MFG CO., LTD.
MODEL 203-16	Accuride Japan Co., Ltd.

1.2.7 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.

2. SPECIFICATIONS

2.1 General

The LT 4441/4442 is a changeover unit that automatically switches the signal from the primary signal to the backup signal when problems are detected in the primary signal. Two systems of input signals (primary and backup) are connected to the LT 4441/4442, and the LT 4441/4442 detects errors in the amplitude of the primary input signal.

A single LT 4441/4442 provides 11 channels. Depending on the configuration of the internal switches, SDI (channels 1 to 3 only), NTSC/PAL analog black burst, tri-level sync, AES/EBU digital audio, and word-clock signals can be received by the channels.
Relays are used to switch channels 1 to 3. Electrical switches are used to switch channels 4 to 11. In addition to the electrical switches, channels 4 to 11 are also equipped with high-speed, error detection circuits. When trouble such as a signal interruption occurs, the LT 4441/4442 can quickly switch to a signal that has a small amount of glitches.
If a switch occurs from a primary signal to a backup signal, the LT 4441/4442 indicates the channel that caused the problem on the panel LED.

The LT 4442 is a short version of the LT 4441 changeover unit. The depth of the LT 4442 is 400 mm. You can combine the LT 4441/4442 with multi-format video generator LT 443D or LT 4400 to configure a system.

2.2 Features

- **I/O Connectors**

  The LT 4441/4442 is equipped with 11 sets of I/O connectors (a single set consists of a primary input connector, a backup input connector, and an output connector).

- **High-Speed Switching through the Use of Electrical Switches**

  The LT 4441/4442 uses electrical switches for switching channels 4 to 11. It also uses high-speed detection circuits for detecting errors. These enable the LT 4441/4442 to switch to a backup signal with barely any disturbances shown on the screen when problems such as interruptions occur in the primary signal.

- **Time until Errors Are Detected**

  The delay for starting the error detection at power up can be set to FAST or SLOW depending on the rise time of the system signal source that the LT 4441/4442 is connected to.

- **Input Signal Selection**

  You can select the type of input signal for each channel from SDI (only for channels 1 to 3), NTSC/PAL analog black burst, and tri-level sync signals. However, channels 9 and 10 are used exclusively for AES/EBU digital audio signals, and channel 11 is used exclusively for word-clock signals.

- **Error Detection**

  When a signal level error is detected, the LT 4441/4442 lights the error LED on the panel as well as the panel LED that indicates the channel that is causing the problem. This feature allows quick investigation of the problem.

- **Combining with an LT 443D or LT 4400**

  The depth of the LT 4441 matches the LT 443D and the depth of the LT 4442 matches the LT 4400. This makes it easy to wire and operate the devices when you combine them.

2.3 Specifications

2.3.1 I/O Connectors

Primary Input Connectors	
Channels 1 to 10	10 input connectors (75 Ω BNC connectors)
Channel 11	1 input connector (TTL input, 75 Ω BNC connector)
Backup Input Connectors	
Channels 1 to 10	10 input connectors (75 Ω BNC connectors)
Channel 11	1 input connector (TTL input, 75 Ω BNC connector)
Output Connectors	
Channels 1 to 10	10 output connectors (75 Ω BNC connectors)
Channel 11	1 output connector (+5 V CMOS output, 75 Ω BNC connector)

2.3.2 I/O Characteristics

Return Loss	
Channels 1 to 3	30 dB (0 to 10 MHz) 15 dB (10 to 750 MHz) 10 dB (750 MHz to 1.5 GHz)
Channels 4 to 10	30 dB (0 to 10 MHz, internally terminated)
Channel 11	TTL input
Insertion Loss	
Channels 1 to 3	0.2 dB (0 to 10 MHz) 0.5 dB (10 to 200 MHz) 2.0 dB (200 MHz to 1.5 GHz)
Channels 4 to 10	0.3 dB (0 to 10 MHz)
Channel 11	TTL input
Crosstalk	
Channels 1 to 3	-60 dB (0 to 10 MHz) -30 dB (10 MHz to 1.0 GHz) -20 dB (1.0 to 1.5 GHz)
Channels 4 to 10	-55 dB (0 to 10 MHz) -45 dB (10 to 30 MHz)
Channel 11	TTL input

Maximum Input Voltage	
Channels 1 to 3	±5 V
Channels 4 to 10	±1.5 V
Channel 11	0 V or +5 V (when receiving TTL word-clock signals)

2.3.3 Types of Input Signals

Channels 1 to 3	HD-SDI signal (1.485 Gb/s) SD-SDI signal (270 Mb/s) SD-SDI signal (143 Mb/s) Tri-level sync signal NTSC/PAL analog black burst signal
Channels 4 to 8	Tri-level sync signal NTSC/PAL analog black burst signal
Channels 9 and 10	AES/EBU digital audio signal
Channel 11	Word-clock signal (TTL)

2.3.4 Signal Switching

Switching Method	
Channels 1 to 3	Relay
Channels 4 to 11	Electrical switches
Switch Time	
Manual Switching	Time required to switch the output signal after you use the front-panel SYNC SOURCE key to change it
Channels 1 to 3	10 ms or less
Channels 4 to 11	100 ns or less
Automatic Switching	Time until the LT 4441/4442 switches to a backup signal after the primary signal is interrupted
Channels 1 to 3	70 ms or less
Channels 4 to 8	90 µs or less (FAST) 60 ms or less (SLOW)
Channels 9 and 10	6 µs or less (FAST) 60 ms or less (SLOW)
Channel 11	60 µs or less (FAST) 60 ms or less (SLOW)

2.3.5 Error Detection

Time from When the LT 4441/4442 Turns On to When Error Detection Starts

FAST	1 minute or more (60 to 80 seconds)
SLOW	4 minutes or more (240 to 320 seconds)

Error Display

Total Error Display	The corresponding front-panel FAULT INDICATOR LED blinks.
Error Channel Display	The corresponding front-panel FAULT CHANNEL LED lights.

Detection Reference: LOW or HIGH (can be selected for each signal type)

Detection Level

When the Detection Level is LOW[*1]

HD-SDI Signal (1.485 Gb/s)	450 to 635 mV	(800 mV)
SD-SDI Signal (270 Mb/s)	450 to 635 mV	(800 mV)
SD-SDI Signal (143 Mb/s)	450 to 635 mV	(800 mV)
AES/EBU Digital Audio Signal	631 to 794 mV	(1000 mV)
NTSC Analog Black Burst Signal	-180 to -227 mV	(-286 mV)
PAL Analog Black Burst Signal	-190 to -238 mV	(-300 mV)
Tri-Level Sync Signal	337 to 476 mV	(600 mV)
Word-clock Signal (TTL)	1515 to 1907 mV	(2400 mV)

When the Detection Level is HIGH[*1]

HD-SDI Signal (1.485 Gb/s)	505 to 713 mV	(800 mV)
SD-SDI Signal (270 Mb/s)	505 to 713 mV	(800 mV)
SD-SDI Signal (143 Mb/s)	505 to 713 mV	(800 mV)
AES/EBU Digital Audio Signal	734 to 924 mV	(1000 mV)
NTSC Analog Black Burst Signal	-210 to -264 mV	(-286 mV)
PAL Analog Black Burst Signal	-220 to -277 mV	(-300 mV)
Tri-Level Sync Signal	379 to 535 mV	(600 mV)
Word-clock Signal (TTL)	1759 to 2215 mV	(2400 mV)

When the Detection Reference Is Set by the User[*2]

Channels 1 to 8	-100 to -700 mV (when a signal that is equivalent to a horizontal sync signal is applied)
Channels 9 and 10	150 to 1400 mV (p-p value of an AES/EBU digital audio signal)
Channel 11	500 to 3000 mV (high level value of a TTL word-clock signal)

*1 The parenthetical values are levels during normal operation.

*2 Depending on the shape of the waveform, the detection level that you have set may not be reached.

2.3.6 Key Lock

Function	If no key operations are performed, the keys are locked automatically.
Time until Keys Are Locked	60 seconds

2.3.7 External Control Connectors

Remote-control Connector

Application	Remote control
Input	SYNC SOURCE, AUTO SWITCHING, RESET
Output	SYNC SOURCE, FAULT
Connector	9-pin D-sub (female) (Inch screws for fixing the shell)

2.3.8 General Specifications

Environmental Conditions	
Operating Temperature	0 to 45 °C
Operating Humidity Range	90 %RH or less (no condensation)
Optimal Temperature	5 to 40 °C
Optimal Humidity	85 %RH or less (no condensation)
Operating Environment	Indoors
Elevation	Up to 2,000 m
Overvoltage Category	II
Pollution Degree	2
Power Requirements	
Voltage	90 to 250 VAC
Frequency	50/60 Hz
Power Consumption	25 W max.
Dimensions	426 (W) × 44 (H) × 560 (D) mm (LT 4441) 426 (W) × 44 (H) × 400 (D) mm (LT 4442) (both excluding protrusions)
Weight	4.0 kg (LT 4441) 3.5 kg (LT 4442)
Accessories	Power Cord ..... 1 Cover/Inlet Stopper ..... 1 Rack Supports..... 2 Rack Support Mounting Screws ..... 4 Instruction Manual..... 1

3. NAMES AND FUNCTIONS OF PARTS

3.1 Front Panel

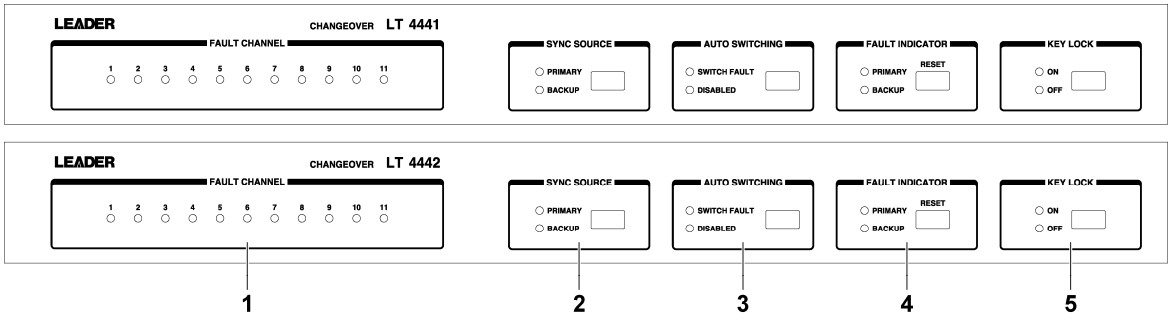


Figure 3-1 Front panel

1 FAULT CHANNEL

The LED that corresponds to the channel that an error has been detected on lights in red.

Once the LED lights, it will remain lit even if the error is fixed. To turn off the LED, apply a proper signal, and then press RESET.

See section 4.5.4, “Error Display and Resetting.”

2 SYNC SOURCE

The LED that is lit shows which signal (primary or backup) is being transmitted from the output connectors. Also, you can press the key to manually switch the signal that is being transmitted.

This setting is the same for channels 1 to 11.

See section 4.5.2, “Switching the Output Signal.”

3 AUTO SWITCHING

You can select whether or not to automatically switch the output signal when an error occurs in the input signal.

Select SWITCH FAULT to switch the output signal automatically. Select DISABLED to not switch the output signal automatically.

This setting is the same for channels 1 to 11.

See section 4.5.3, “Setting Automatic Signal Switching.”

4 FAULT INDICATOR

The LED that corresponds to the signal that an error has occurred in (primary or backup) blinks in red. To turn off the LED, apply a proper signal, and then press RESET.

The appropriate LED blinks when there is an error in any channel from channel 1 to 11.

See section 4.5.4, “Error Display and Resetting.”

5 KEY LOCK

The LEDs show the key-lock state. Also, you can press the key to turn the key lock ON or OFF.

The LT 4441/4442 locks its keys after 1 minute of inactivity (no key operations). When the key lock is ON, front-panel key operations are ignored.

See section 4.5.1, “Enabling the Key Lock.”

3.2 Rear Panel

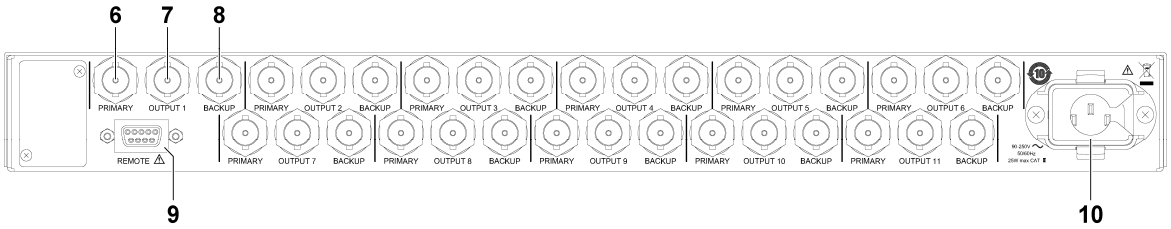


Figure 3-2 Rear panel

6 PRIMARY

This is the primary input connector. Normally apply the primary signal to this connector.
See section 4.4, “Signal I/O.”

7 OUTPUT

This transmits the signal that is applied to the primary or backup input connector.
See section 4.4, “Signal I/O.”

8 BACKUP

This is the backup input connector. Normally apply the backup signal to this connector.
See section 4.4, “Signal I/O.”

9 REMOTE

This is the remote control connector. You can use this connector to perform functions such as configuring the LT 4441/4442 and generating error information.
See section 5.1, “Remote-control Connector.”

10 AC inlet

Attach the included cover inlet stopper to the AC inlet before using it.
See section 4.2, “Attaching the Cover Inlet Stopper.”

3.3 Side Panel

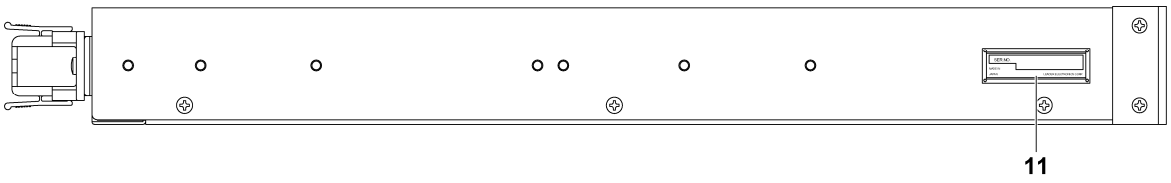


Figure 3-3 Side panel

11 Serial number label

The instrument's serial number is printed on this label.

3.4 Top Panel

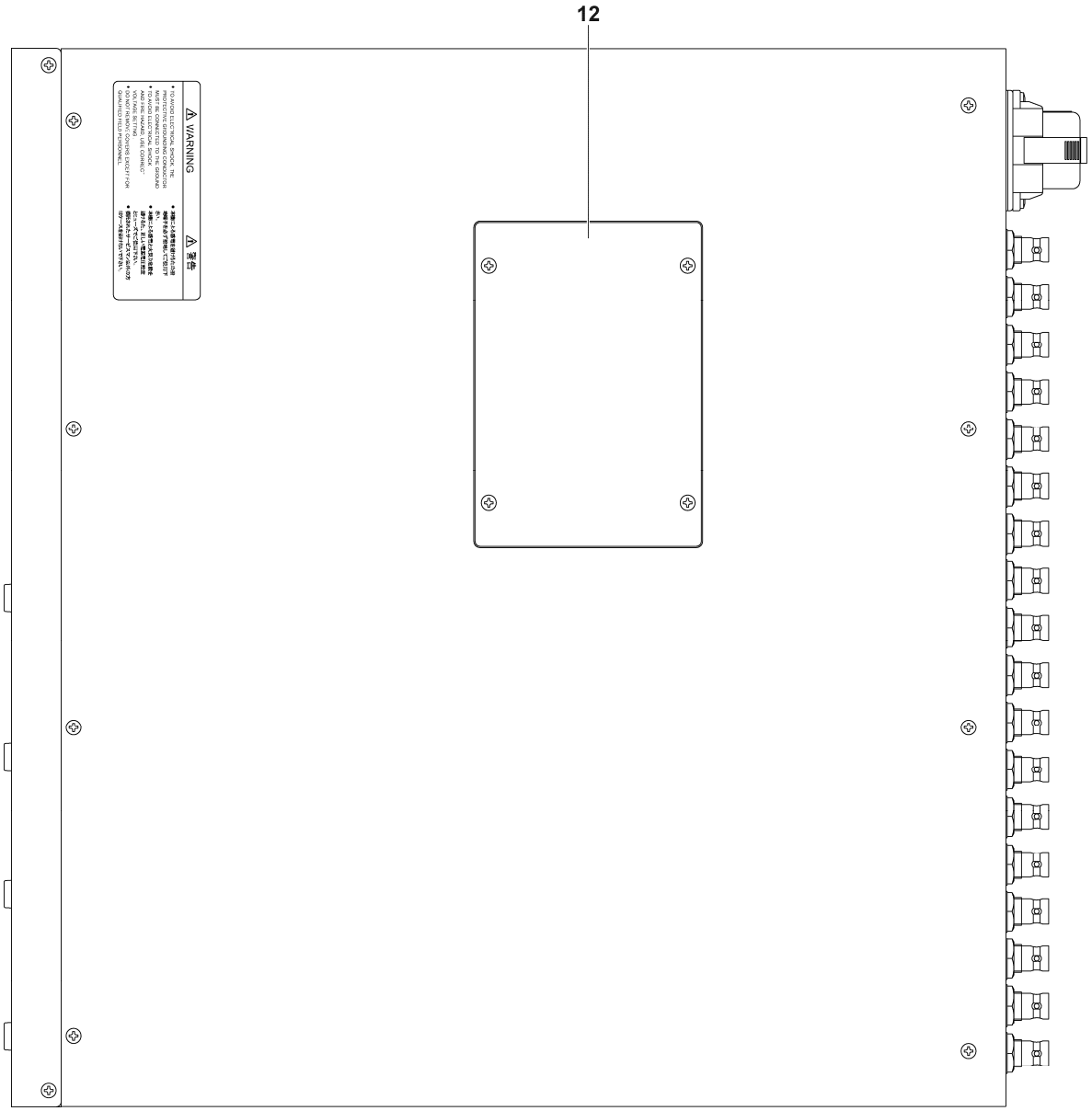


Figure 3-4 Top panel

12 DIP switch cover

When you remove the four screws and the cover, the DIP switches appear. DIP switches are used to configure the LT 4441/4442.

An explanation of the settings is printed on the back side of the cover.

See section 4.3, “DIP Switch Settings.”

4. HOW TO USE

4.1 Turning the Power ON

The LT 4441/4442 does not have a power switch. To turn the power ON, connect the power cord to the instrument, and connect the power cord plug to a power outlet.
The LT 4441/4442 uses a relay. A clicking noise can be heard when you turn the power ON or OFF, but this is not a sign that the instrument is malfunctioning.

- **Standby**

When you turn the power ON, the LT 4441/4442 enters Standby mode. When on standby, the SYNC SOURCE PRIMARY, AUTO SWITCHING SWITCH FAULT, and KEY LOCK ON and OFF LEDs light, and the AUTO SWITCHING DISABLED LED blinks. The LT 4441/4442 does not function when it is in this state.

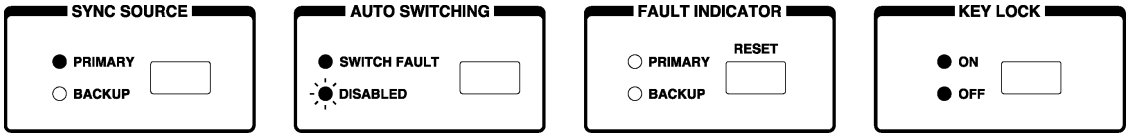


Figure 4-1 Standby mode

- **Leaving Standby Mode**

When the LT 4441/4442 leaves Standby mode, the SYNC SOURCE PRIMARY, AUTO SWITCHING SWITCH FAULT, and KEY LOCK ON LEDs light.
The LT 4441/4442 does not have a last-memory feature. Regardless of the settings that were being used when the LT 4441/4442 was turned OFF, it starts with the following settings when it is turned ON.

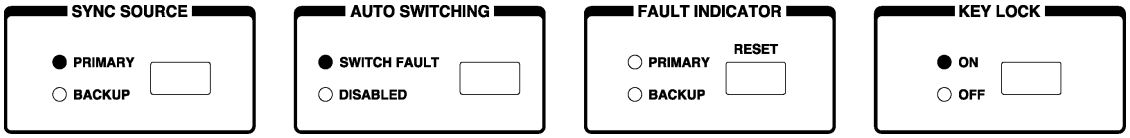


Figure 4-2 Leaving Standby mode

- **Setting the Standby Time**

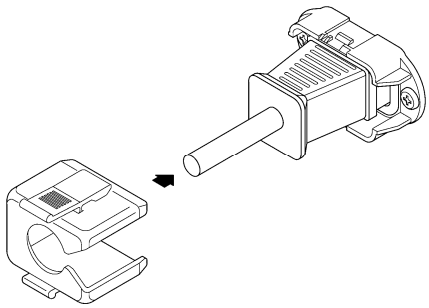
You can use DIP switch S7's SW2 to select the standby time. You can select approximately 1 minute (ON) or approximately 4 minutes (OFF). Match this setting to the rise time of the system signal source that you are connected to.
The factory default setting is approximately 1 minute.
See section 4.3.6, “Operation Mode and the Standby Time Settings.”

4.2 Attaching the Cover Inlet Stopper

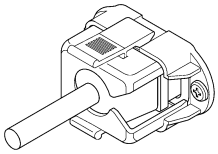
A cover/inlet stopper is included with the LT 4441/4442. Use this device to prevent the power cord from being pulled free of the AC inlet. To attach the cover/inlet stopper, follow the procedure below.

- **Attaching the Cover/Inlet Stopper**

1. Cover the power cord with the cover/inlet stopper.



2. Push the cover/inlet stopper, until you hear a click, to attach it to the AC inlet.

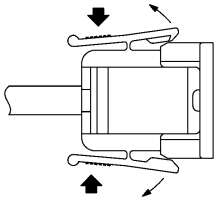


3. Check that the cover/inlet stopper is securely attached to the AC inlet.

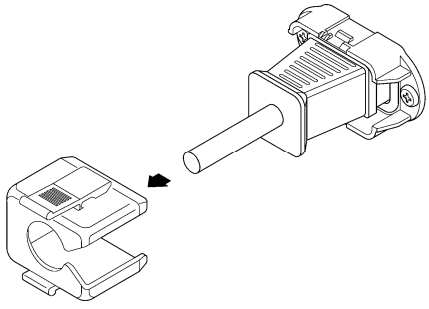
To remove the cover/inlet stopper, follow the procedure below.

- **Removing the Cover/Inlet Stopper**

1. Release the lock by using two fingers to press the cover/inlet stopper levers.



2. Pull the cover/inlet stopper away from the AC inlet.



4.3 DIP Switch Settings

Use the DIP switches on the top panel to configure the LT 4441/4442. To access the DIP switches, first remove the DIP switch cover by unscrewing its four screws.

The following figure shows the DIP switches. This figure shows the factory default settings.

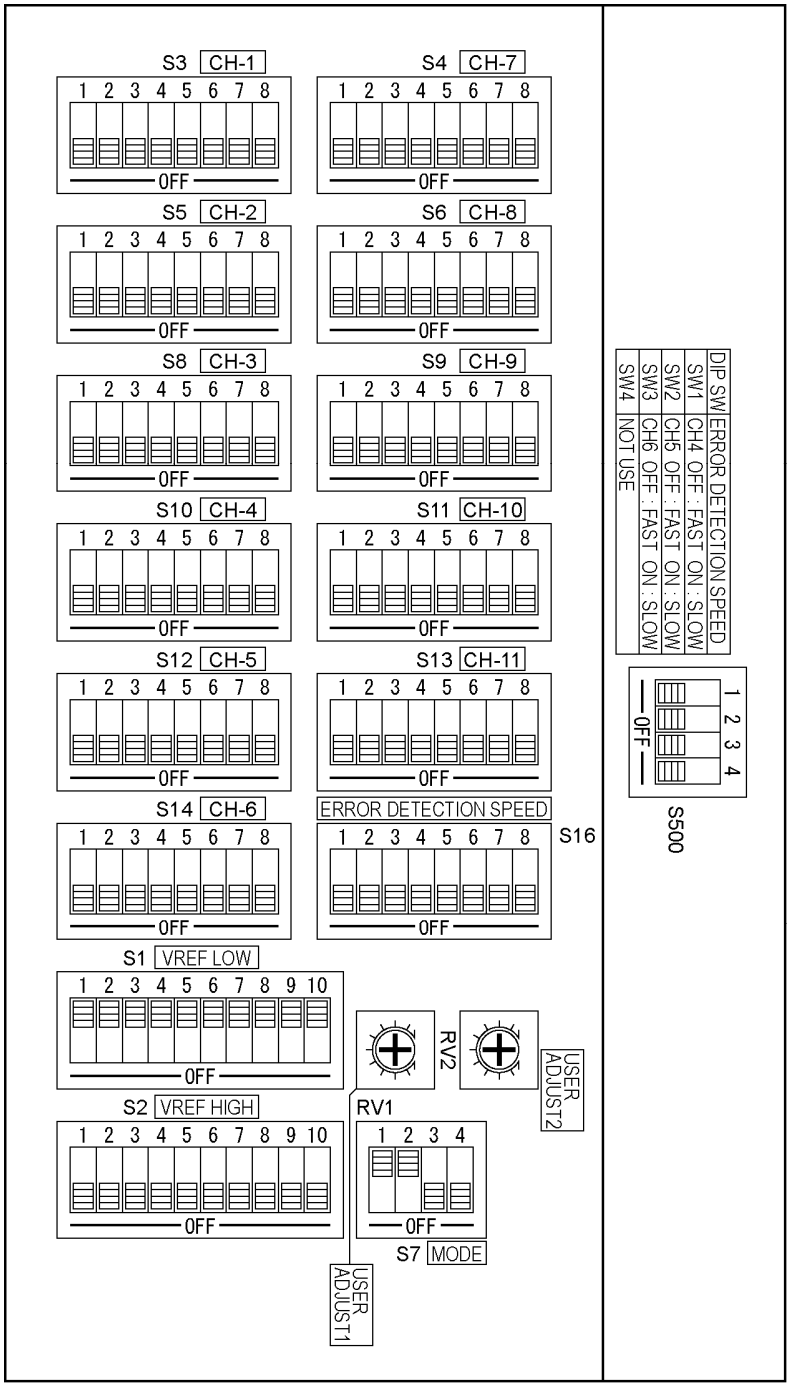


Figure 4-3 DIP switches

The settings are listed below. For details on each item, see the following sections in chapter 4. A simple explanation of the settings is also printed on the back side of the DIP switch cover.

Table 4-1 List of settings

Setting	Name	Remark	Factory Default	
Input signal settings	CH-1	S3	All OFF	No signal selected
	CH-2	S5	All OFF	No signal selected
	CH-3	S8	All OFF	No signal selected
	CH-4	S10	All OFF	No signal selected
	CH-5	S12	All OFF	No signal selected
	CH-6	S14	All OFF	No signal selected
	CH-7	S4	All OFF	No signal selected
	CH-8	S6	All OFF	No signal selected
	CH-9	S9	All OFF	No signal selected
	CH-10	S11	All OFF	No signal selected
	CH-11	S13	All OFF	No signal selected
Error detection reference settings	VREF LOW	S1	All ON	LOW
	VREF HIGH	S2	All OFF	
Error detection level settings (user-defined)	USER ADJUST1	RV1	-	-
	USER ADJUST2	RV2	-	-
Signal switch time settings	ERROR DETECTION SPEED	S500	All OFF	High speed
		S16	All OFF	
Operation mode and standby time settings	MODE	S7	SW1: ON	NORMAL
			SW2: ON	Approx. 1 minute
			SW3, SW4: OFF	-

4.3.1 Setting Method

When one of the slide switches on the DIP switch is in the OFF position, that switch is OFF. When a slide switch is in the opposite position, it is ON. Use an item that has a fine tip, such as a pen or a pair of tweezers, to move switches between the ON and OFF positions. When making settings, be careful to not touch any components other than the DIP switches.

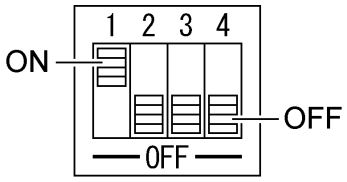


Figure 4-4 DIP switch ON and OFF positions

4.3.2 Input Signal Settings

The types of signals that you can apply to the LT 4441/4442 differ depending on the channel as shown below. Decide the type of signal that you will assign to each channel. To avoid errors, do not connect the signals until you have completed making all the settings.

Table 4-2 Types of input signals

	Input Signal	Signal Switching Method
Channels 1 to 3	NTSC analog black burst signal PAL analog black burst signal SD-SDI signal (143 Mb/s) SD-SDI signal (270 Mb/s) HD-SDI signal (1.485 Gb/s) Tri-level sync signal	Relay
Channels 4 to 8	NTSC analog black burst signal PAL analog black burst signal Tri-level sync signal	Electrical switches
Channels 9 and 10	AES/EBU digital audio signal	Electrical switches
Channel 11	Word-clock signal	Electrical switches

Set the CH-1 to CH-11 DIP switches to match the types of signals that you want to apply. For example, if you want to apply an NTSC analog black burst signal to channel 1, set CH-1 (S3)'s SW1 to the ON position. If the settings do not match the signals that you apply or if you set two or more slide switches to the ON position for a single DIP switch, errors will occur.

If you specify a signal with a DIP switch but do not apply the signal, it will be considered an error. If you will not apply a signal to a channel, set all the switches on the corresponding DIP switch to the OFF position.

If you select the SW6 or SW7 user setting, you can set the error detection level.
See section 4.3.4, “Error Detection Level Settings (User setting).”

Table 4-3 Input signal settings

No.	Channels 1 to 3	Channels 4 to 8	Channels 9 and 10	Channel 11
SW1	NTSC analog black burst signal	NTSC analog black burst signal	Not used	Not used
SW2	PAL analog black burst signal	PAL analog black burst signal	Not used	Not used
SW3	SD-SDI signal (143 Mb/s)	Not used	Not used	Not used
SW4	SD-SDI signal (270 Mb/s) Tri-level sync signal	Tri-level sync signal	Not used	Not used
SW5	Reserved	Not used	AES/EBU digital audio signal	Word-clock signal
SW6	User setting 1	User setting 1	User setting 1	User setting 1
SW7	User setting 2	User setting 2	User setting 2	User setting 2
SW8	HD-SDI signal (1.485 Gb/s)	Not used	Not used	Not used

4.3.3 Error Detection Reference Settings

You can select the reference level that is used to detect errors in the input signals. You can select LOW or HIGH. Set VREF LOW or VREF HIGH to ON for each signal type.

Normally, VREF LOW is set to ON. If you set VREF HIGH to ON, errors may be detected due to level fluctuations in the signals or due to noise. By factory default, all the VREF LOW switches are set to ON, and all the VREF HIGH switches are set to OFF.

Do not set VREF LOW and VREF HIGH to ON for the same signal. Doing so could cause errors.

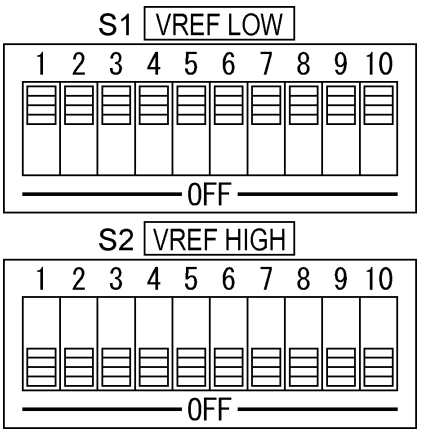


Figure 4-5 Error detection reference settings

Table 4-4 Error detection levels

No.	Signal Type	Error Detection Level[*1]	
		VREF LOW	VREF HIGH
SW1	NTSC analog black burst signal	-180 to -227 mV	-210 to -264 mV
SW2	PAL analog black burst signal	-190 to -238 mV	-220 to -277 mV
SW3	SD-SDI signal (143 Mb/s)	450 to 635 mV	505 to 713 mV
SW4	SD-SDI signal (270 Mb/s)	450 to 635 mV	505 to 713 mV
	Tri-level sync signal	337 to 476 mV	379 to 535 mV
SW5	AES/EBU digital audio signal	631 to 794 mV	734 to 924 mV
SW6	Not used	-	-
SW7	Not used	-	-
SW8	HD-SDI signal (1.485 Gb/s)	450 to 635 mV	505 to 713 mV
SW9	Reserved	-	-
SW10	Word-clock signal	1515 to 1907 mV	1759 to 2215 mV

*1 Depending on the instrument that you are using, there will be deviations in the error detection level within the ranges given in this table.

4.3.4 Error Detection Level Settings (User setting)

You normally select the level that is used to detect errors in an input signal from VREF LOW and VREF HIGH, but you can also set this level. Set SW6 or SW7 to ON as shown in section 4.3.2, “Input Signal Settings,” and then adjust the trimmer.

You can set up to two user-defined error detection levels. When you set SW6 to ON, adjust RV1. When you set SW7 to ON, adjust RV2.

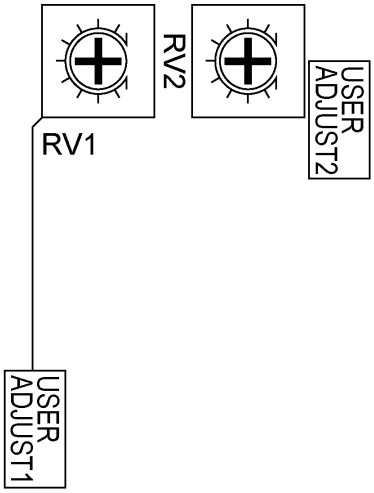


Figure 4-6 Error detection level settings

Table 4-5 Trimmer adjustment range

Channel	Error Detection Level Adjustment Range
Channels 1 to 8	-100 to -700 mV
Channels 9 and 10	150 to 1400 mV
Channel 11	500 to 3000 mV

4.3.5 Signal Switch Time Settings

If an error is detected in the primary signal, the LT 4441/4442 switches to the backup signal automatically. You can select the time that the LT 4441/4442 takes to switch signals.
You can select the switch times for channels 4 to 11. The switch times for channels 1 to 3 are fixed.

Select high speed (OFF) or low speed (ON) for each channel. The factory default setting is high speed for all channels.

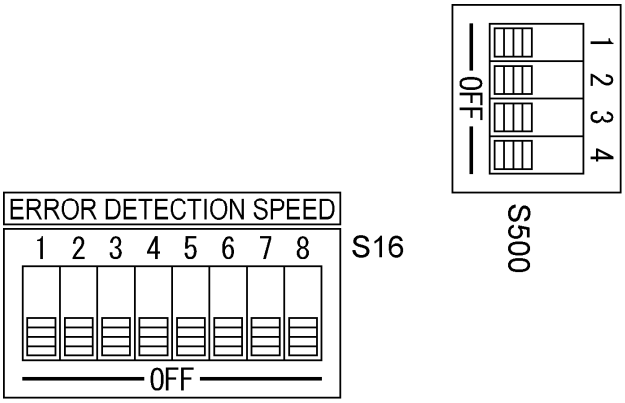


Figure 4-7 Signal switch time settings

Table 4-6 Switch time

Remark	No.	Channel	Switch Time	
			High Speed (OFF)	Low Speed (ON)
S500	SW1	Channel 4	90 µs or less	60 ms or less
	SW2	Channel 5	90 µs or less	60 ms or less
	SW3	Channel 6	90 µs or less	60 ms or less
	SW4	Not used	-	-
S16	SW1	Channel 7	90 µs or less	60 ms or less
	SW2	Channel 8	90 µs or less	60 ms or less
	SW3	Channel 9	6 µs or less	60 ms or less
	SW4	Channel 10	6 µs or less	60 ms or less
	SW5	Channel 11	60 µs or less	60 ms or less
	SW6	Not used	-	-
	SW7	Not used	-	-
	SW8	Not used	-	-

4.3.6 Operation Mode and Standby Time Settings

Use the MODE DIP switch (S7) to set the operation mode and standby time.

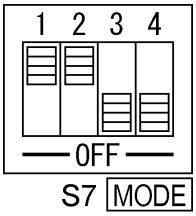


Figure 4-8 Operation mode and standby time settings

Table 4-7 Settings

No.	Setting	ON	OFF
SW1	Operation mode	NORMAL	OVERRIDE
SW2	Standby time	Approx. 1 minute	Approx. 4 minutes
SW3	Not used	-	-
SW4	Not used	-	-

• Setting the Operation Mode

Normally, you can use the front-panel SYNC SOURCE key to switch the output signal, but when there are errors in only one of the input signals (primary or backup), you cannot switch to the signal that has errors.

If you set the operation mode to OVERRIDE, regardless of the state of the input signals, you can use the SYNC SOURCE key to switch the output signal. However, this setting is valid when AUTO SWITCHING is set to DISABLED. If AUTO SWITCHING is set to SWITCH FAULT, even if you set the operation mode to OVERRIDE, you cannot switch to the signal that has errors.

The factory default setting is NORMAL. Leave this set to NORMAL under standard operating circumstances.

For details on the SYNC SOURCE key, see section 4.5.2, “Switching the Output Signal.”
For details on the AUTO SWITCHING key, see section 4.5.3, “Setting Automatic Signal Switching.”

• Setting the Standby Time

You can select the length of time that the LT 4441/4442 waits from the time that it turns ON to the time that it begins operating. Select a setting that is appropriate for the rise time of the system signal source that you are connected to.
The factory default setting is approximately 1 minute.

4.4 Signal I/O

Apply the primary signal to the primary input connector and the backup signal to the backup input connector.
Depending on the front-panel SYNC SOURCE setting, the primary or backup signal is transmitted from the output connector. Connect the output connector to the system's signal input connector.

The types of signals that you can apply to the LT 4441/4442 differ depending on the channel. For details, see Table 4-2, “Types of input signals.”

CAUTION

Apply signals with an impedance of 75 Ω to the primary and backup input connectors. Also, terminate the output connector at 75 Ω.
(The signal that is not selected with the front-panel SYNC SOURCE setting is terminated internally at 75 Ω.)

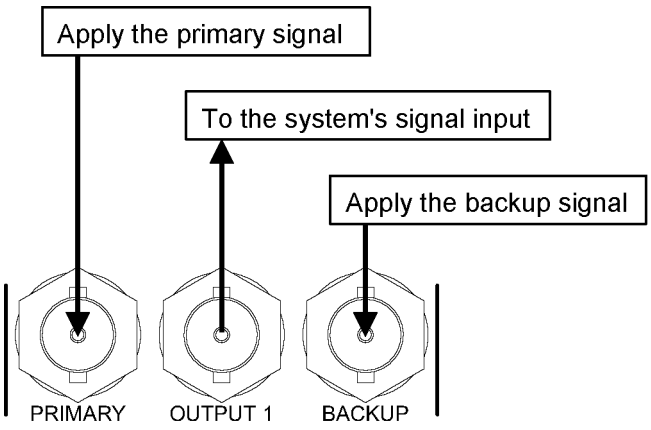


Figure 4-9 Signal I/O

4.5 Configuring the LT 4441/4442

4.5.1 Enabling the Key Lock

The LT 4441/4442 locks its keys after 1 minute of inactivity (no key operations). When the key lock is ON, front-panel key operations are ignored.

To perform front-panel key operations, turn the key lock OFF. Press the KEY LOCK key to turn the key lock ON or OFF.

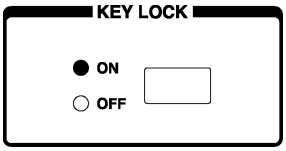


Figure 4-10 KEY LOCK

4.5.2 Switching the Output Signal

Under SYNC SOURCE, the LED that is lit shows which signal (primary or backup) is being transmitted from the output connectors. The output signal setting is the same for channels 1 to 11.

Also, you can press the key to manually switch the output signal. However, you may not be able to switch the signal depending on the state of the LT 4441/4442. For details, see Table 4-8, “LT 4441/4442 operations.”

SYNC SOURCE is set to PRIMARY when the LT 4441/4442 turns OFF or ON.

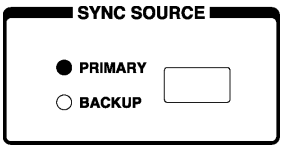


Figure 4-11 SYNC SOURCE

4.5.3 Setting Automatic Signal Switching

Press AUTO SWITCHING to select whether the output signal will be switched automatically or not when an error is detected. This setting is the same for channels 1 to 11.

If you select SWITCH FAULT, the LT 4441/4442 will automatically switch to the other signal (primary or backup signal) when an error occurs in the output signal. Normally use this setting.
If you select DISABLED, even if an error occurs in the output signal, the signal will not be switched automatically. Use this setting when you want to just detect errors.

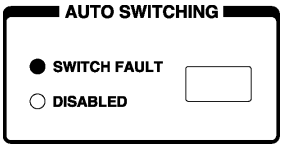


Figure 4-12 AUTO SWITCHING

Depending on the AUTO SWITCHING setting and the MODE DIP switch setting, the operation of the LT 4441/4442 differs as shown below.

For details on the MODE Dip switch setting, see section 4.3.6, “Operation Mode and the Standby Time Settings.”

Table 4-8 LT 4441/4442 operations

LT 4441/4442 Setting		Input Signal State	When SYNC SOURCE is PRIMARY		When SYNC SOURCE is BACKUP	
AUTO SWITCHING	MODE		Output Signal	SYNC SOURCE Key Operation	Output Signal	SYNC SOURCE Key Operation
SWITCH FAULT	NORMAL OVERRIDE	Normal	Remains PRIMARY	Switches to BACKUP	Remains BACKUP	Switches to PRIMARY
		BACKUP error	Remains PRIMARY	Remains PRIMARY	Switches to PRIMARY	Remains PRIMARY
		PRIMARY error	Switches to BACKUP	Remains BACKUP	Remains BACKUP	Remains BACKUP
		Errors on both	Remains PRIMARY	Switches to BACKUP	Remains BACKUP	Switches to PRIMARY
DISABLED	NORMAL	Normal	Remains PRIMARY	Switches to BACKUP	Remains BACKUP	Switches to PRIMARY
		BACKUP error	Remains PRIMARY	Remains PRIMARY	Remains BACKUP	Switches to PRIMARY
		PRIMARY error	Remains PRIMARY	Switches to BACKUP	Remains BACKUP	Remains BACKUP
		Errors on both	Remains PRIMARY	Switches to BACKUP	Remains BACKUP	Switches to PRIMARY
	OVERRIDE	Normal	Remains PRIMARY	Switches to BACKUP	Remains BACKUP	Switches to PRIMARY
		BACKUP error	Remains PRIMARY	Switches to BACKUP	Remains BACKUP	Switches to PRIMARY
		PRIMARY error	Remains PRIMARY	Switches to BACKUP	Remains BACKUP	Switches to PRIMARY
		Errors on both	Remains PRIMARY	Switches to BACKUP	Remains BACKUP	Switches to PRIMARY

4.5.4 Error Display and Resetting

• Error Display

When an error occurs, the LED under FAULT CHANNEL that corresponds to the channel in which the error has occurred lights, and the LED under FAULT INDICATOR that corresponds to the signal in which the error has occurred blinks.

For example, if an error occurs in the primary signal of channel 1, the LEDs light and blink as shown below.

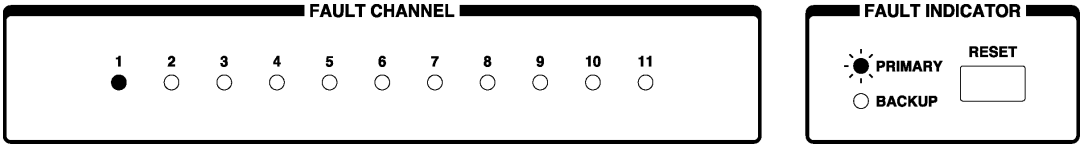


Figure 4-13 When an error occurs in the primary signal of channel 1

The FAULT INDICATOR error display is shared between channels 1 to 11. The appropriate LED blinks when there is an error in any channel from channel 1 to 11.
For example, if errors occur in the primary signal of channel 1 and in the backup signal of channel 3, the LEDs light and blink as shown below.

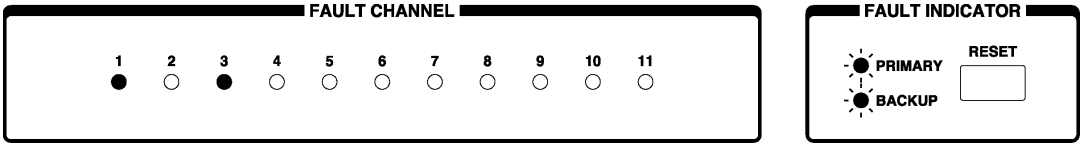


Figure 4-14 When errors occur in the primary signal of channel 1 and the backup signal of channel 3

• Resetting Errors

Once an error has occurred, even if the input signals are returned to normal, the FAULT CHANNEL and FAULT INDICATOR LEDs will continue to be lit and blink. To reset these error displays, apply proper signals, and then press RESET. The LEDs turn off, and the errors are reset.

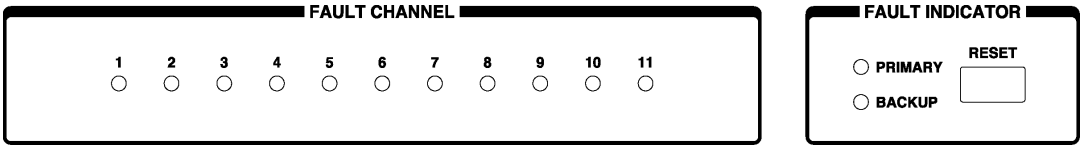


Figure 4-15 Resetting errors

5. EXTERNAL INTERFACE

5.1 Remote-control Connector

You can use the rear-panel remote-control connector to perform functions such as configuring the LT 4441/4442 and generating error information.
The remote-control connector and its pinout are shown below.

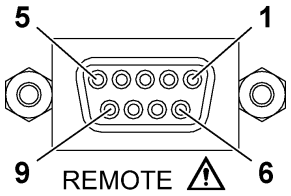
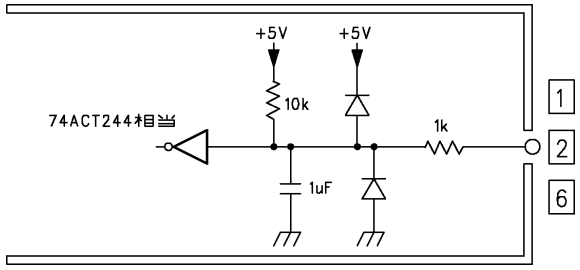
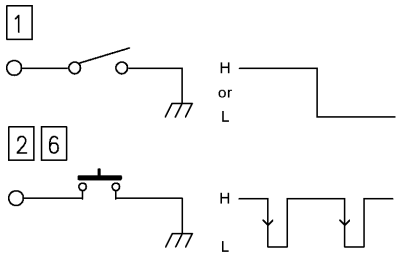
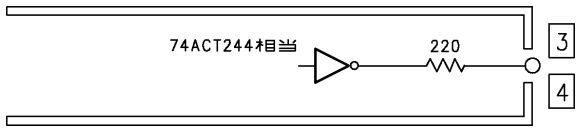
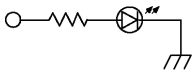
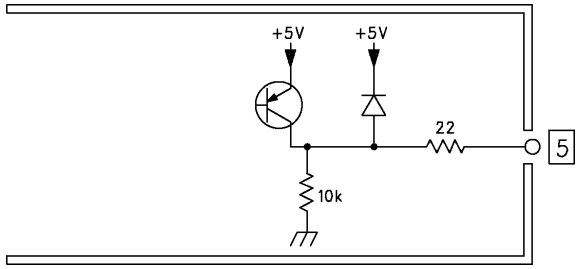
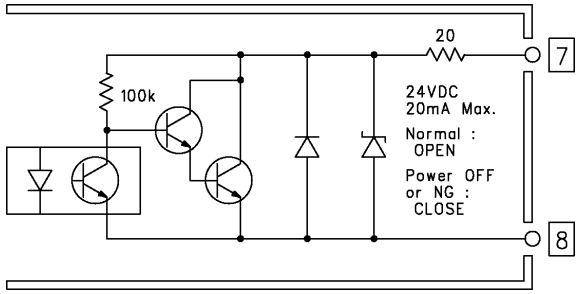


Figure 5-1 Remote-control connector (9-pin D-sub female, inch screws for fixing the shell)

Table 5-1 Remote connector functions

Pin No.	Name	I/O	Description
1	AUTO SWITCHING	I	When the front-panel AUTO SWITCHING is set to SWITCH FAULT, applying a low signal sets AUTO SWITCHING to DISABLED, and applying a high signal (or opening the circuit) sets AUTO SWITCHING to SWITCH FAULT. When the front-panel AUTO SWITCHING is set to DISABLED, remote control is not possible. Set AUTO SWITCHING to SWITCH FAULT using keys to enable remote control.
2	SYNC SOURCE	I	Each time a low signal is applied, SYNC SOURCE switches between PRIMARY and BACKUP.
3	SYNC SOURCE (PRIMARY)	O	Transmits a high signal when SYNC SOURCE is set to PRIMARY.
4	SYNC SOURCE (BACKUP)	O	Transmits a high signal when SYNC SOURCE is set to BACKUP.
5	FAULT INDICATOR	O	Transmits a high signal when an error occurs in PRIMARY or BACKUP. Even when the error clears, the LT 4441/4442 retains the high signal until the error is reset.
6	RESET	I	Apply a low signal to reset errors.
7	FAULT INDICATOR+	O	Open during normal operation. Conducts current when the power is not on or when there is an error in the input signal. Use these pair of pins when you want to electrically isolate the connected device from the LT 4441/4442. (There is a photocoupler inside the LT 4441/4442 that is used for isolation.)
8	FAULT INDICATOR-		
9	GND	-	Ground

Table 5-2　Remote connector I/O specifications

<table>
<tr><th>Pin No.</th><th>I/O</th><th>I/O Specifications</th><th>Connection example</th></tr>
<tr><td>1
2
6</td><td>I</td><td> 
</td><td>Connect a switch to apply a low signal.
Connect one side of the switch to the remote connector and the other side to ground.
 
</td></tr>
<tr><td>3
4</td><td>O</td><td> 
</td><td rowspan="2">Connect an LED so that it will light when a high signal is transmitted.
Connect the anode to the remote connector and the cathode to ground.
  </td></tr>
<tr><td>5</td><td>O</td><td> 
</td></tr>
<tr><td>7
8</td><td>O</td><td> 
</td><td>-</td></tr>
</table>

6. 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 4441/4442

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	×	○	○	○	○	○
上蓋	○	○	○	○	○	○
底座	○	○	○	○	○	○
前框	○	○	○	○	○	○
電源部	×	○	○	○	○	○
线材料一套	○	○	○	○	○	○
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。

Ver.1

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