
**User's
Manual**

**Model 701989
PBL250 Logic Probe**

Foreword

Thank you for purchasing the PBL250 250 MHz Logic Probe (Model 701989). This user's manual describes the functions, operating procedures, specifications, handling precautions, and other important information about the PBL250 Logic Probe. To ensure correct use, please read this manual before beginning operation. After reading this manual, keep it in a convenient location for quick reference in the event a question arises during operation.

Manual Title	Manual No.	Description
Model 701989 PBL250 Logic Probe User's Manual	IM 701989-01E	This manual. It explains the functions, operating procedures, specifications, handling precautions, and other important information about the PBL250 Logic Probe.

The "E" in the manual number is the language code.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

Document No.	Description
PIM 113-01Z2	List of worldwide contacts

Revisions

- 1st Edition November 2008
- 2nd Edition August 2014
- 3rd Edition January 2016

The following markings are used in this manual.



Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION

Calls attention to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

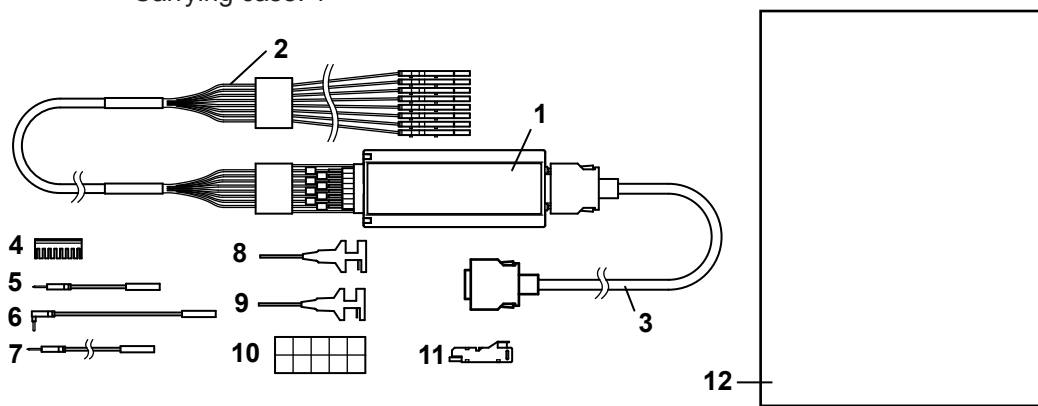
Note

Calls attention to information that is important for proper operation of the instrument.

Checking the Contents of the Package

The accessories below are included. If some items are missing or otherwise inconsistent with the contents description, please contact your dealer or nearest YOKOGAWA representative.

- PBL250 probe: 1
- Standard accessories: 1 set
- Carrying case: 1



PBL250 Logic Probe

Name	Qty.	Part Number
1 Logic probe	1	–
2 Probe lead set	1	B8099BT
3 Cable (1 m)	1	B8099BZ

Standard Accessories

Name	Qty.	Part Number
4 Stacking holder	2	–
5 Clip lead 50 mm	8	–
6 GND lead 75 mm	8	–
7 GND lead 250 mm	2	–
8 Microclips (black, set of 10)	1	B9852VX
9 Microclips (red, set of 8)	1	B9852VY
10 Number labels	1	(with number labels)
11 Stacking spacer	2	–
12 Manuals	1	This manual
	1	IM 701988-92
	1	IM 701988-93Z2
	1	IM 701989-01E
	1	PIM 113-01Z2
	1	Document for China
	1	Document for Korea
	1	List of worldwide contacts

Accessories (Sold Separately)

Name	Part Number
IC clips (set of 10)	B9852ES
Accessory kit	701909

Accessory Kit

Name	Qty.
Stacking holder	5
Clip lead 50 mm	8
GND lead 75 mm	8
GND lead 250 mm	2
Microclips (black, set of 10)	1
Microclips (red, set of 8)	1
Number labels	1
Stacking spacer	8
Removable GND terminal	5

Safety Precautions

The following safety precautions must be taken to ensure safe and correct operation of the instrument. The instrument's functions may not work if used in a manner not described in this manual. YOKOGAWA bears no responsibility for, nor implies any warranty against damages occurring as a result of failure to take these precautions.

Safety Symbols and Wording Used in This Manual



Danger. (This symbol warns against danger to personnel and instruments, and indicates that the user should refer to the relevant instructions in the user's manual.)

Important Warnings and Information for Users

For safe operation and proper use of the instrument's functions, please heed the following warnings and safety precautions.



WARNING

- Take care to avoid electric shock when connecting the probe to the circuit under test.
- Never disconnect the probe from the oscilloscope while connected to the circuit under test.
- Do not allow the probe to become wet, and do not handle the probe with wet hands. Doing so can result in electric shock.
- Before connecting the probe's lead set to the circuit under test, confirm that the oscilloscope is properly grounded, and that the probe's cable is connected to the oscilloscope's logic signal input port.
- Ground the Oscilloscope
Be sure to implement the oscilloscope's protective earth ground.
- Maintain Nondestructive Input Voltages
Do not apply a voltage between input and ground exceeding ± 42 V (DC + AC_{peak}).
- Do not use the probe in humid locations
To avoid electric shock, never use the probe in areas of high humidity.
- Do not use the probe near flammable gases.
To avoid injury and fire, do not use the probe near flammable or explosive gasses or vapors.
- Avoid exposed circuits.
To prevent injury, when the power is ON, do not touch any exposed contact points or components.

CAUTION

- Be sure to use the accessory probe lead set when connecting to the circuit under test.
- The instrument's GND lead is of the same electric potential as the grounding of the connected oscilloscope.

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- This is a precision-manufactured instrument. Damage can occur as a result of sudden changes in ambient temperature or physical shocks. Handle with care.
 - To prevent trouble such as breakages or contact failures, please note the following when handling the cable connected to the instrument.
 - Do not apply force to the connectors.
 - Never bend the cable to a radius of less than 60 mm.
 - Never apply force to a small part of the cable, nor deform the cable.
 - Never twist or pull the probe leads or GND lead any more than necessary. The wires inside the leads can break, causing malfunction.
 - Avoid vibration, shock, and static electricity when transporting or handling the instrument. Especially take care not to shock the instrument such as by dropping it.
 - Avoid storing or using the probe in direct sunlight, or areas that have high heat, humidity, or condensation. The probe can become deformed or its insulation can deteriorate, resulting in the probe failing to meet its specifications.
 - Before use, inspect and check the operation of the probe to confirm that no problems have been caused by harsh storage or transport conditions. If problems are found, please contact your nearest Yokogawa dealer or representative.
 - This instrument is not drip- or dust-proof. Do not use in areas where it may come into contact with water or a large amount of dust.
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Operating Environment Restrictions

Please note that there are restrictions on the operating environment.

CAUTION

This product is a Class A (for industrial environments) product. Operation of this product in a residential area may cause radio interference in which case the user will be required to correct the interference.

Sales in Each Country or Region

Waste Electrical and Electronic Equipment



Waste Electrical and Electronic Equipment (WEEE), Directive

(This directive is valid only in the EU.)

- This product complies with the WEEE directive marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category

With reference to the equipment types in the WEEE directive, this product is classified as a “Monitoring and control instruments” product.

When disposing products in the EU, contact your local Yokogawa Europe B.V. office.

Do not dispose in domestic household waste.

Authorized Representative in the EEA

Yokogawa Europe B.V. is the authorized representative of Yokogawa Meters & Instruments Corporation for this product in the EEA. To contact Yokogawa Europe B.V., see the separate list of worldwide contacts, PIM 113-01Z2.

Contents

Foreword.....	i
Checking the Contents of the Package.....	iii
Safety Precautions.....	iv
Sales in Each Country or Region.....	vi
Overview.....	1
Names and Functions of Parts.....	2
Usage Precautions.....	3
Operating Procedure.....	3
Product Specifications.....	8

Overview

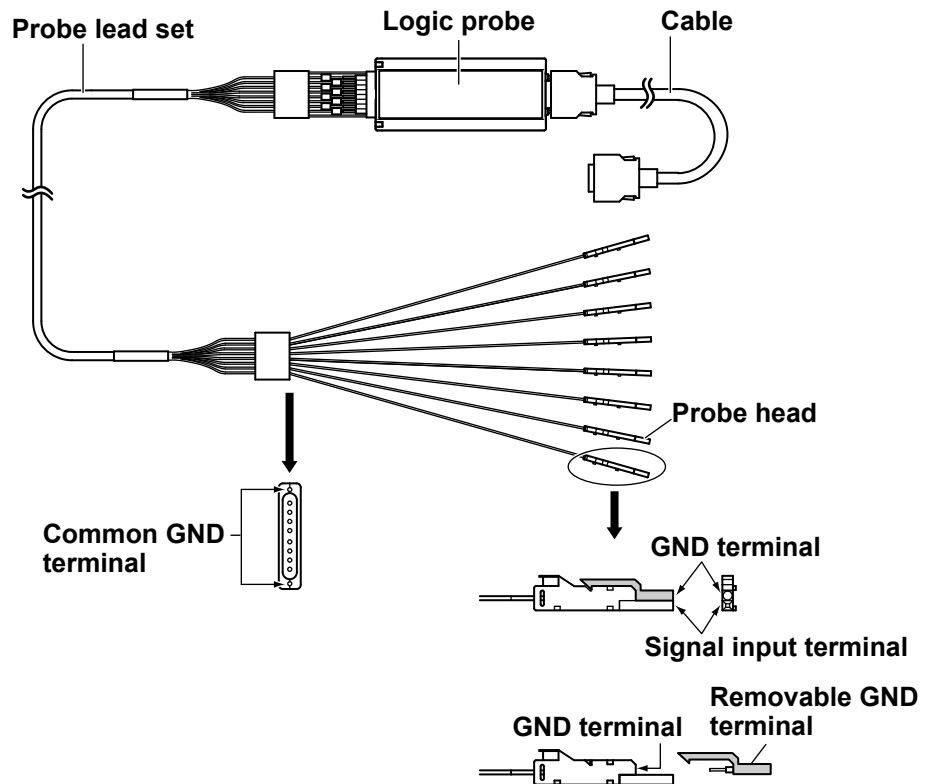
The PBL250 is an 8-bit input logic probe with a maximum toggle frequency of 250 MHz that is used with oscilloscopes equipped with logic input.*

* For oscilloscope models that are compatible with this instrument, please contact your nearest YOKOGAWA representative.

Features

- High input impedance (100 k Ω , 3 pF: each input terminal to ground)
- Supports high speed signals (maximum toggle frequency of 250 MHz)
- Supports 2.54 mm pitch pin headers
- Also supports narrow pitch ICs with IC clips (sold separately)
- Several attachments for a variety of probing tasks
- A single probe head or multiple stacked probe heads can be attached directly to 2.54 mm pitch pin headers, making probing of these headers easy.
- Easy-to-manage probe lead set
- Number tags for easy identification of the measured bit
- Compact and lightweight

Names and Functions of Parts



Probe Lead Set

Connects the probe heads for each bit to the logic probe, and consists of 8 probe leads and 2 common GND terminals.

Probe Heads

Connect directly to 2.54 pitch pin headers on the circuit board, or to the circuit under test using various attachments.

Removable GND terminal

A ground terminal that can be removed in order to attach a separate GND lead in case the GND terminal on the circuit board is separated from the signal terminals.

Common GND terminals

The points of connection for 250 mm GND leads. They are of the same electric potential as the GND terminals on the ends of the leads and the grounding of the connected oscilloscope.

Cable

Connects to the oscilloscope's logic signal input port.

Usage Precautions

CAUTION

- The cable and probe lead set are connected to the probe at the time of shipment. Do not remove prior to using the probe. Accurate measurements cannot be guaranteed if the cable or probe lead set is removed and replaced with one intended for another instrument model.
 - When cleaning, use a soft cloth and take care not to damage the probe. Also, never immerse the instrument in liquid, or use abrasive cleaning agents. Likewise, never use benzene or other volatile solvents.
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Never use the probe near transformers, large currents, or other sources of strong magnetic fields, or near high-field sources such as wireless devices. Measurement accuracy may be compromised.

Operating Procedure

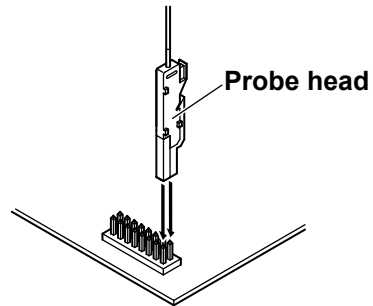
Preparing for Measurement

1. Only use this logic probe with compatible oscilloscopes*.
2. Connect the logic probe's cable to the oscilloscope's logic signal input port.
3. Connect the logic probe's probe and GND leads to the circuit under test.

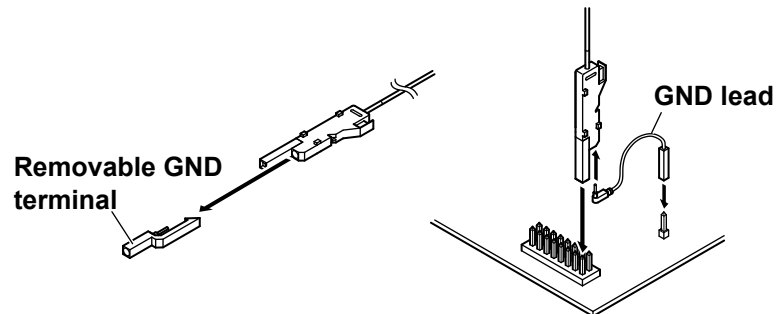
* For oscilloscope models that are compatible with this logic probe, please contact your nearest YOKOGAWA representative.

Usage Example

Connecting Directly to 2.54 mm Pitch Pin Headers on the PCB



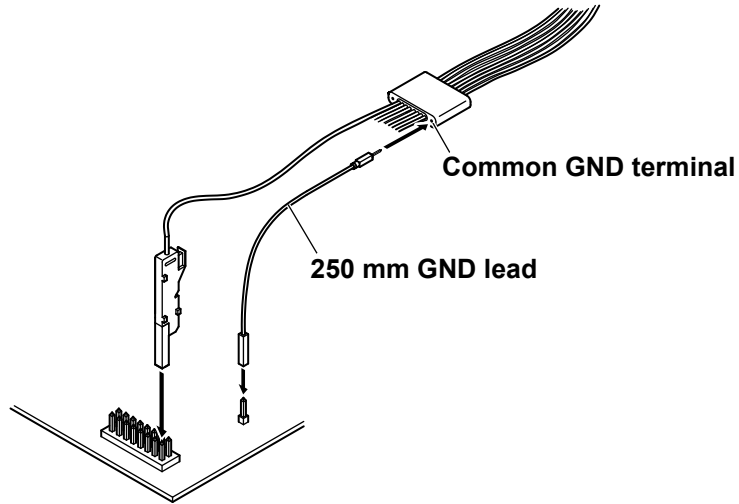
Connection Using a 75 mm GND Lead



Connects to a separated GND using a 75 mm GND lead

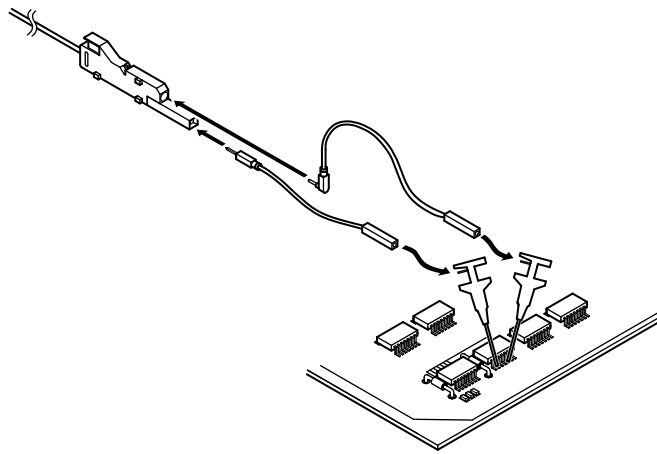
Connection Using a 250 mm GND Lead

Connect a 250 mm GND lead to a common GND terminal, then connect to GND on the PCB. The GND terminal can be removed to attach the lead. Using a longer GND lead lowers performance.

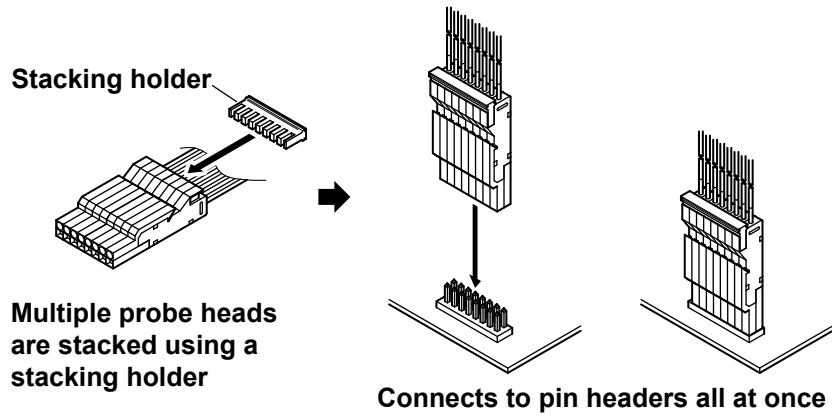


Connecting to an IC Using Microclips

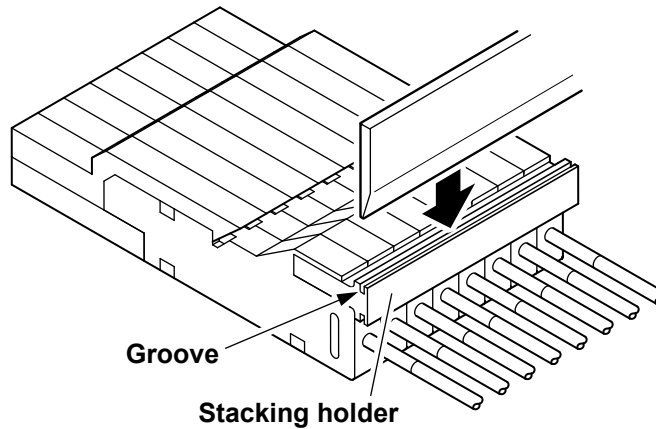
Connect a 50 mm clip lead to the signal input terminal and a 75 mm GND lead to the GND terminal, then connect microclips to the ends of both leads.



Stacking Multiple Probe Heads for Connecting to Pin Header



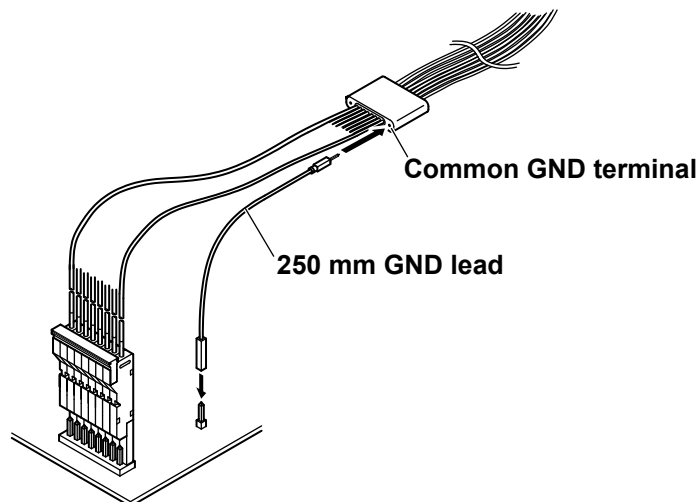
To remove the stacking holder, pinch the grooved portion with your fingertips. If the stacking holder is difficult to remove, insert a thin flat object such as a ruler into the groove.



Connection Using a 250 mm GND Lead (Inserting/Removing Multiple Bits at Once)

Connect a 250 mm GND lead to a common GND terminal, then connect to GND on the PCB.

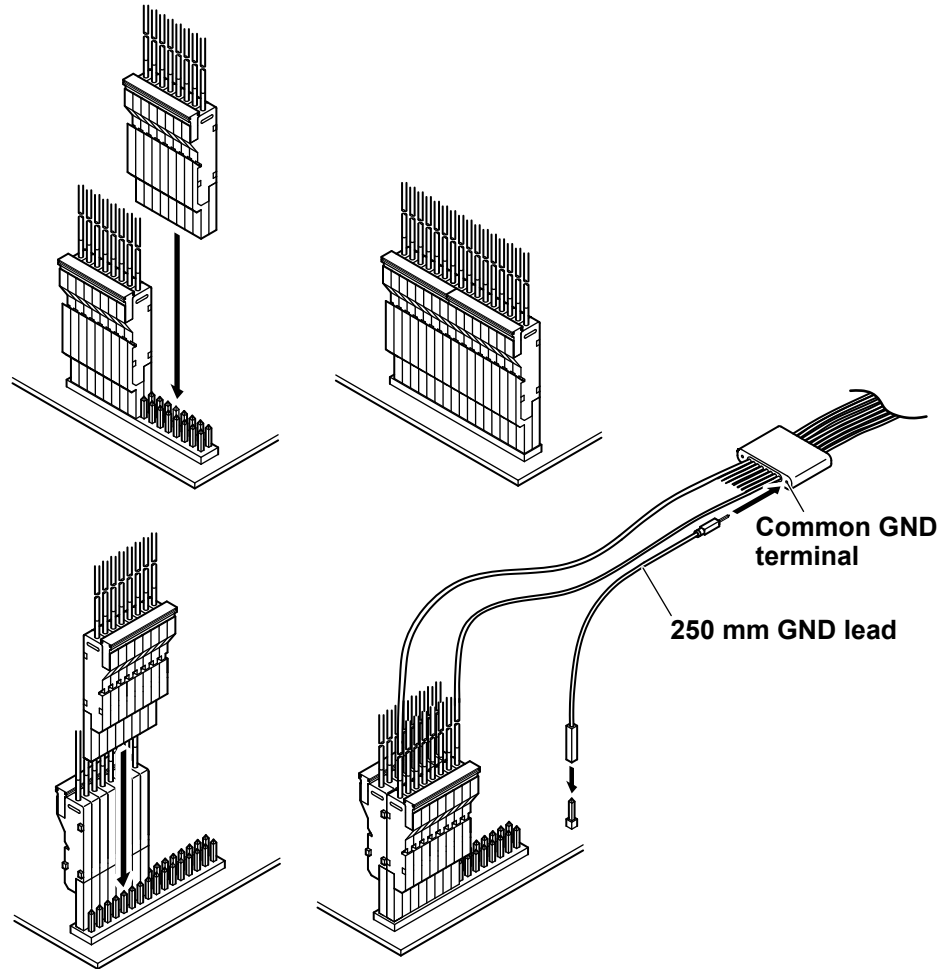
Using a longer GND lead lowers performance.



Inserting/Removing Multiple Adjacent Probe Head Stacks

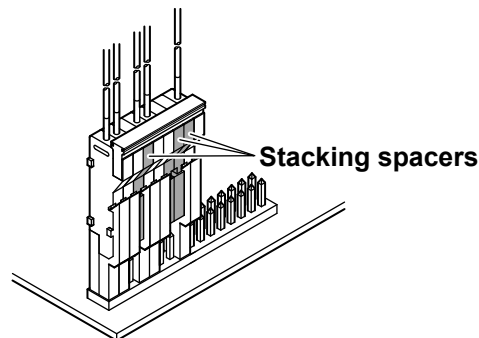
When connecting multiple PBL250 Logic Probes, you can arrange probe head stacks side-by-side or back-to-back. If the GND terminal is separated, connect a 250 mm GND lead to a common GND terminal, then connect to GND on the PCB.

Using a longer GND lead lowers performance.



Connection Using a Stacking Spacers

When stacking the probe heads, you can connect probe heads to only the desired pins by using stacking spacers.

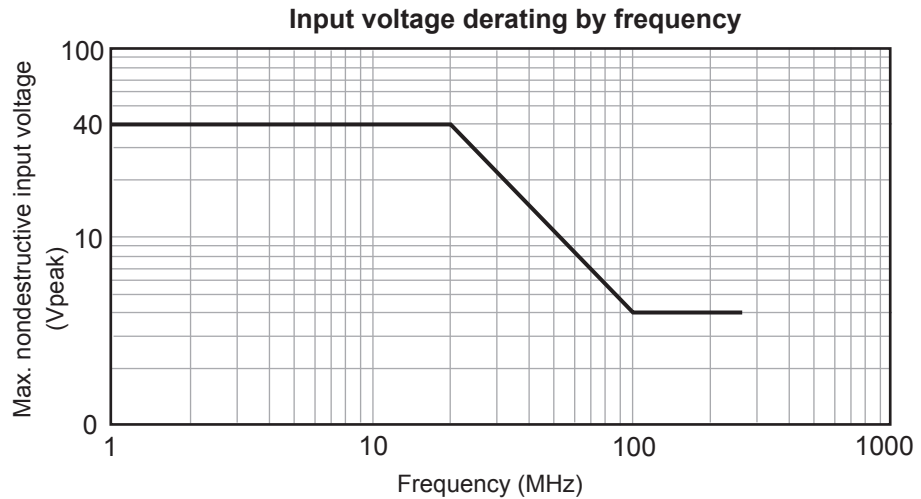


Product Specifications

Electrical Specifications

Inputs	8
Vertical resolution	1 bit
Max. nondestructive input voltage range ¹	±40 V (DC + ACpeak) or 28 Vrms
Threshold level range	±6 V
Threshold level resolution ²	0.05 V
Threshold level accuracy ³	±(100 mV + 3% of setting)
Input voltage range	±6 V around the threshold level setting value
Min. input voltage ³	300 mVp-p
Hysteresis voltage	With noise rejection OFF: 100 mV (typical) ⁴ With noise rejection ON: 250 mV (typical) ^{4, 5}
Input impedance	100 kΩ/3 pF (typical) ⁴
Max. toggle frequency ³	250 MHz or more
Min. pulse width ³	2 ns
Bit-to-bit skew	1 ns

1. See derating of input voltage by frequency
2. When connected to the DLM2000 series.
3. Standard operating conditions, after warm-up.
4. A *typical value* is a typical or average value. It is not strictly guaranteed.
5. Can be set when connecting to the DLM2000 series.



General Specifications

Standard operating conditions	Temperature	23±5°C
	Humidity ⁶	55 ±10% RH
Operating environment	Temperature	5 to 40°C
	Humidity ⁶	20 to 80% RH
	Altitude	2000 m or less
Storage environment	Temperature	-20 to 60°C
	Humidity ⁶	20 to 80% RH
	Altitude	3000 m or less
Interface and power supply		Dedicated logic probe interface Power supplied from a dedicated logic probe interface
Calibration cycle		1 year
Warm-up time		30 minutes or more
Ext. dimensions (main body)		94.5 mm × 40 mm × 15 mm
Total length		Approximately 1.7 m
Weight		Approximately 200 g (excluding accessories)

6. No condensation

Standards Compliance

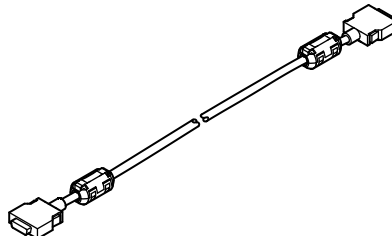
EMC	Emissions	Conforming standards EN61326-1 ClassA EN55011 Class A Group1 EMC standards of Australia and New Zealand EN55011 Class A, Group1 Korea Electromagnetic Conformity Standard (한국 전자파적합성기준) This is a Class A product. Operation of this product in a residential area may cause electromagnetic interference in which case the user will be required to correct the interference.
	Immunity	Conforming standard EN61326-1 Table 2 (for use in industrial locations) Influence in the immunity testing environment The logic probe's polarity must not reverse ⁷
Environmental standard	Compliant Standard EN50581 Monitoring and control instruments	

7. Test conditions

Connected to the DLM2000 series mixed signal oscilloscope, with the logic probe's lead set terminated at 50 Ω.

Cable condition

Attach a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA part number: A1190MN) to both ends of the cable (see figure below).



Maintenance

Users can replace the cable or probe lead set themselves if they become damaged. Please use the following components.

Name	Part Number
Probe lead set	B8099BT
Cable (1 m)	B8099BZ

Replacing the Probe Lead Set

Remove the probe lead set from the logic probe, then align the new probe lead set with the guide on the probe and insert as shown in the figure below.

