
**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

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the product's performance and functionality. The figures given in this manual may differ from those that actually appear on your product.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without the permission of YOKOGAWA is strictly prohibited.

Revisions

- 1st Edition November 2008
- 2nd Edition August 2014
- 3rd Edition January 2016
- 4th Edition April 2021
- 5th Edition January 2022
- 6th Edition April 2022

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.

French

AVERTISSEMENT

Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures graves (voire mortelles), et sur les précautions de sécurité pouvant prévenir de tels accidents.

ATTENTION

Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d'endommager l'instrument ou les données de l'utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

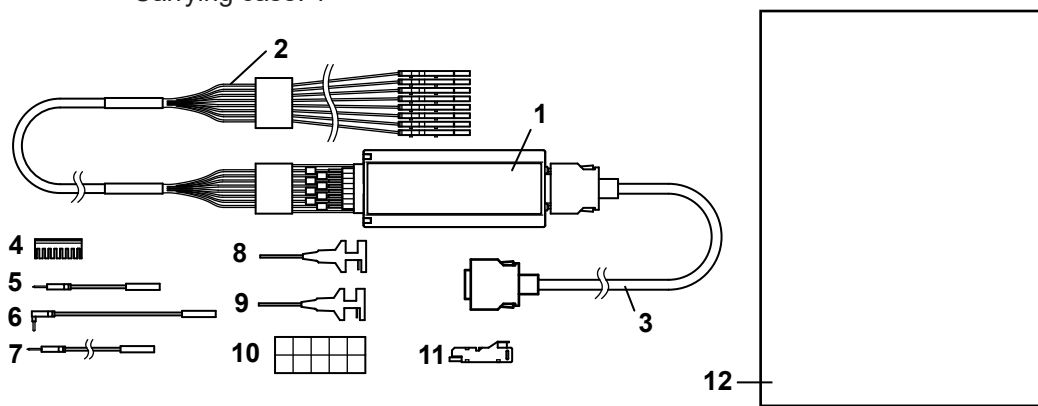
Note

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

This product is designed to be used by a person with specialized knowledge. 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.

This manual is part of the product and contains important information. Store this manual in a safe place close to the instrument so that you can refer to it immediately. Keep this manual until you dispose of the instrument.

Safety Symbols and Wording Used in This Manual



Handle with care. Refer to the user's manual or service manual. This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.

French



À manipuler délicatement. Toujours se reporter aux manuels d'utilisation et d'entretien. Ce symbole a été apposé aux endroits dangereux de l'instrument pour lesquels des consignes spéciales d'utilisation ou de manipulation ont été émises. Le même symbole apparaît à l'endroit correspondant du manuel pour identifier les consignes qui s'y rapportent.

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 ± 40 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.

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- 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.
 - 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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AVERTISSEMENT

- Veillez à éviter toute électrocution lors de la connexion de la sonde au circuit à tester.
- Ne déconnectez jamais la sonde de l'oscilloscope lorsqu'elle est connectée au circuit à tester.
- Veillez à ce que la sonde se soit pas mouillée et ne manipulez pas la sonde avec les mains mouillées. Cela peut provoquer une électrocution.
- Avant de connecter le jeu de fils de la sonde au circuit testé, vérifiez que l'oscilloscope est correctement mis à la terre et que le câble de la sonde est connecté au port d'entrée du signal logique de l'oscilloscope.
- Mettez l'oscilloscope à la terre
Assurez-vous que l'oscilloscope est bien mis à la terre.
- Maintenez des tensions d'entrée non destructives
N'appliquez pas de tension entre l'entrée et la terre supérieure à ± 40 V (CC + CApeak).
- N'utilisez pas la sonde dans des endroits humides
Pour éviter tout risque d'électrocution, n'utilisez jamais la sonde dans des zones très humides.
- N'utilisez pas la sonde à proximité de gaz inflammables.
Pour éviter toute blessure et incendie, n'utilisez pas la sonde à proximité de gaz ou de vapeurs inflammables ou explosifs.
- Évitez les circuits exposés.
Pour éviter toute blessure lorsque l'appareil est sous tension, ne touchez aucun point de contact ou composant exposé.

ATTENTION

- Assurez-vous d'utiliser le jeu de fils de la sonde accessoire lors de la connexion au circuit à tester.
- Le fil GND de l'instrument a le même potentiel électrique que la mise à la terre de l'oscilloscope connecté.
- Il s'agit d'un instrument de précision. Des dommages peuvent survenir à la suite de changements soudains de température ambiante ou de chocs physiques. Manipulez avec précaution.
- Pour éviter des problèmes tels que des ruptures ou des défauts de contact, veuillez noter ce qui suit lors de la manipulation du câble connecté à l'instrument.
 - N'appliquez pas de force sur les connecteurs.
 - Ne pliez jamais le câble à un rayon inférieur à 60 mm.
 - N'appliquez jamais de force sur une petite partie du câble, et ne déformez pas le câble.
- Ne tordez jamais ou ne tirez jamais les fils de la sonde ni le fil GND plus que nécessaire. Les fils à l'intérieur peuvent casser et provoquer un dysfonctionnement.

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- Évitez les vibrations, les chocs et l'électricité statique lors du transport ou de la manipulation de l'instrument. Faites particulièrement attention à ne pas heurter l'instrument, en le faisant tomber par exemple.
 - Évitez de stocker ou d'utiliser la sonde à la lumière directe du soleil ou dans des zones à forte chaleur, humidité ou condensation. La sonde peut se déformer ou son isolation peut se détériorer, ce qui fait que la sonde ne répond pas à ses spécifications.
 - Avant toute utilisation, inspectez et vérifiez le fonctionnement de la sonde pour confirmer qu'aucun problème n'a été provoqué par des conditions de stockage ou de transport difficiles. Si des problèmes sont détectés, veuillez contacter votre revendeur ou représentant YOKOGAWA le plus proche.
 - Cet instrument n'est pas étanche aux gouttes d'eau ou à la poussière. Ne l'utilisez pas dans des zones où il peut entrer en contact avec de l'eau ou une grande quantité de poussière.
-

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.

French

ATTENTION

Ce produit est classé dans classe A (pour utilisation dans des environnements industriels). L'utilisation de ce produit dans un zone résidentielle peut entraîner une interférence radio que l'utilisateur sera tenu de rectifier.

Regulations and Sales in Various Countries and Regions

Waste Electrical and Electronic Equipment (WEEE)



(EU WEEE Directive valid only in the EEA* and UK WEEE Regulation in the UK)

■ This product complies with the WEEE marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste. When disposing of products in the EEA or UK, contact your local Yokogawa office in the EEA or UK respectively.

* EEA: European Economic Area

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.

Disposal

When disposing of this instrument, follow the laws and ordinances of the country or region where the product will be disposed of.

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Overview

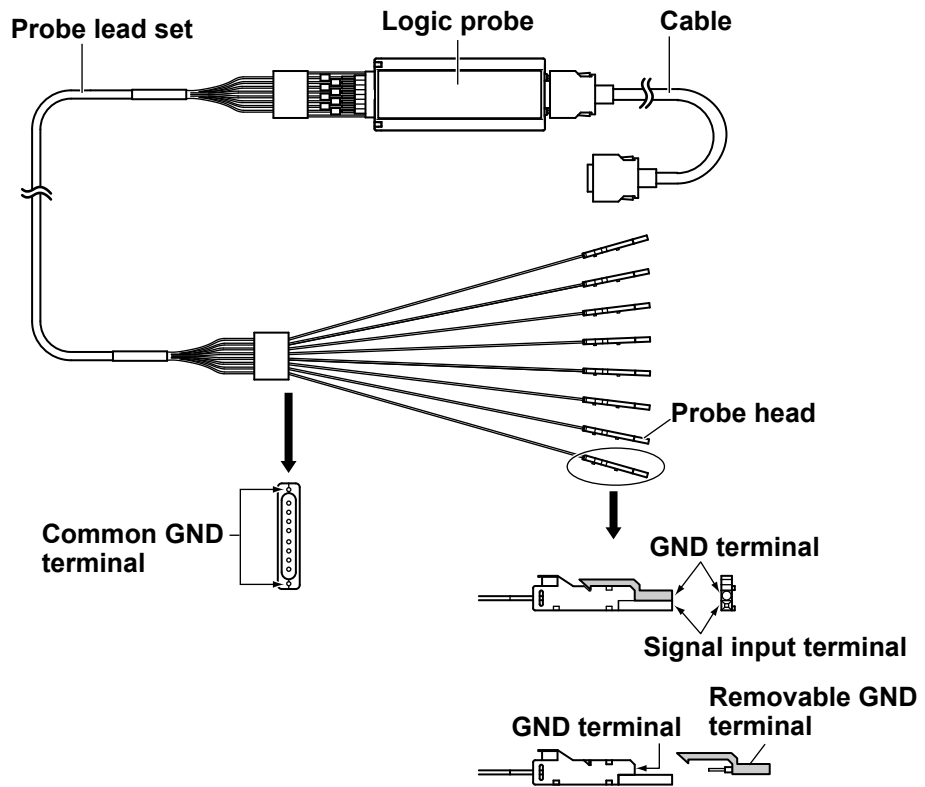
The PBL250 is an 8-bit input logic probe with a maximum toggle frequency of 250 MHz that is used with oscilloscopes equipped with logic input.*

* 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 benzine or other volatile solvents.
-

French

ATTENTION

- Le câble et le jeu de fils de la sonde sont connectés à la sonde lors de l'expédition. Ne les retirez pas avant d'utiliser la sonde. Des mesures précises ne peuvent pas être garanties si le câble ou le jeu de fils de la sonde est retiré et remplacé par un autre destiné à un autre modèle d'instrument.
 - Lors du nettoyage, utilisez un chiffon doux et veillez à ne pas endommager la sonde. De plus, n'immergez jamais l'instrument dans un liquide et n'utilisez jamais de produits de nettoyage abrasifs. De même, n'utilisez jamais d'essence ou d'autres solvants volatils.
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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

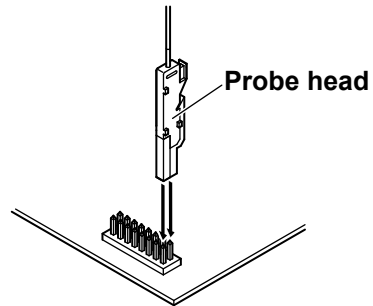
Preparing for Measurement

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.

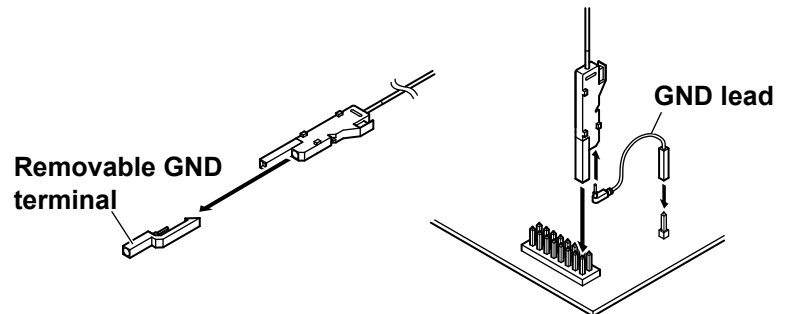
* For oscilloscope models that are compatible with this logic probe, please contact your nearest YOKOGAWA representative.

Usage Example

Connecting Directly to 2.54 mm Pitch Pin Headers on the PCB



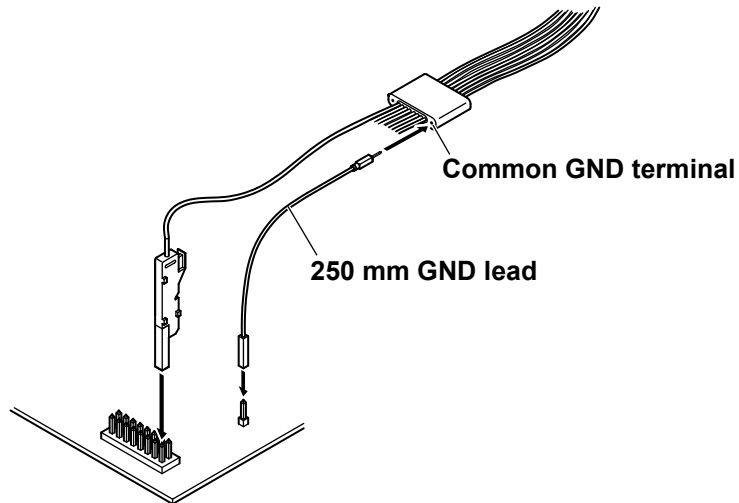
Connection Using a 75 mm GND Lead



Connects to a separated GND using a 75 mm GND lead

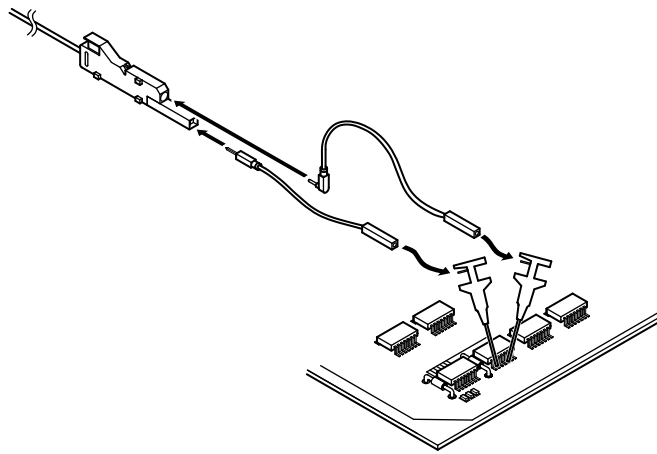
Connection Using a 250 mm GND Lead

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.

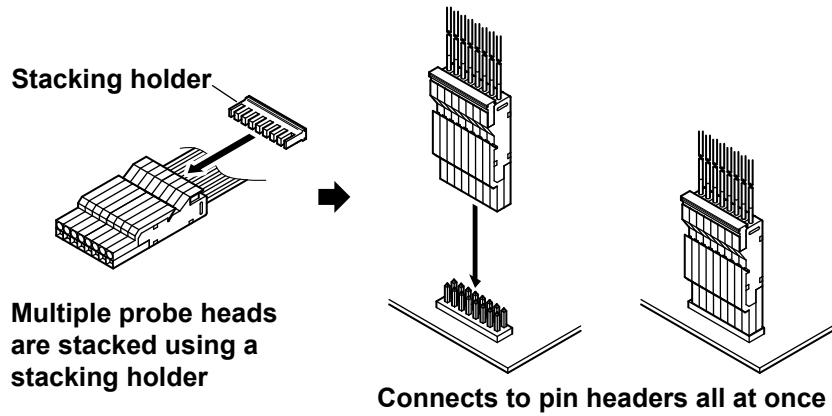


Connecting to an IC Using Microclips

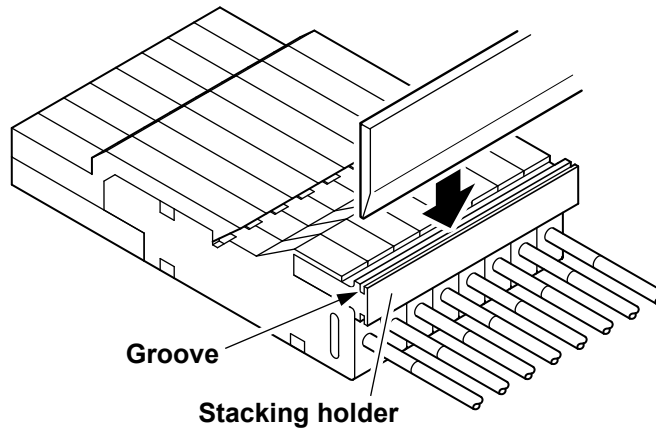
Connect a 50 mm clip lead to the signal input terminal and a 75 mm GND lead to the GND terminal, then connect microclips to the ends of both leads.



Stacking Multiple Probe Heads for Connecting to Pin Header



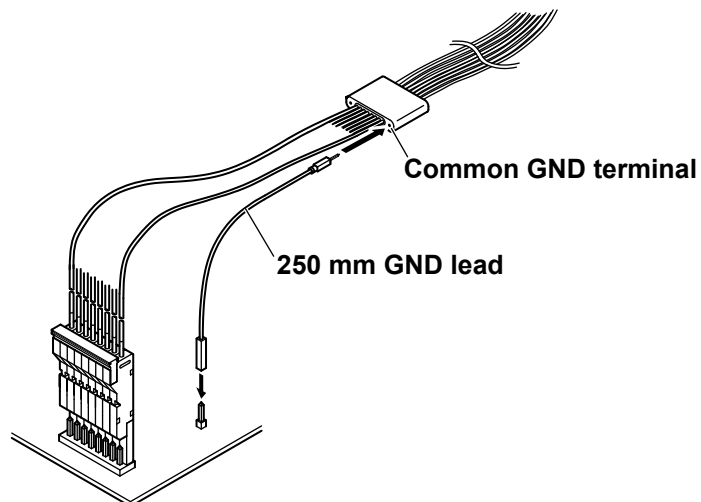
To remove the stacking holder, pinch the grooved portion with your fingertips. If the stacking holder is difficult to remove, insert a thin flat object such as a ruler into the groove.



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.

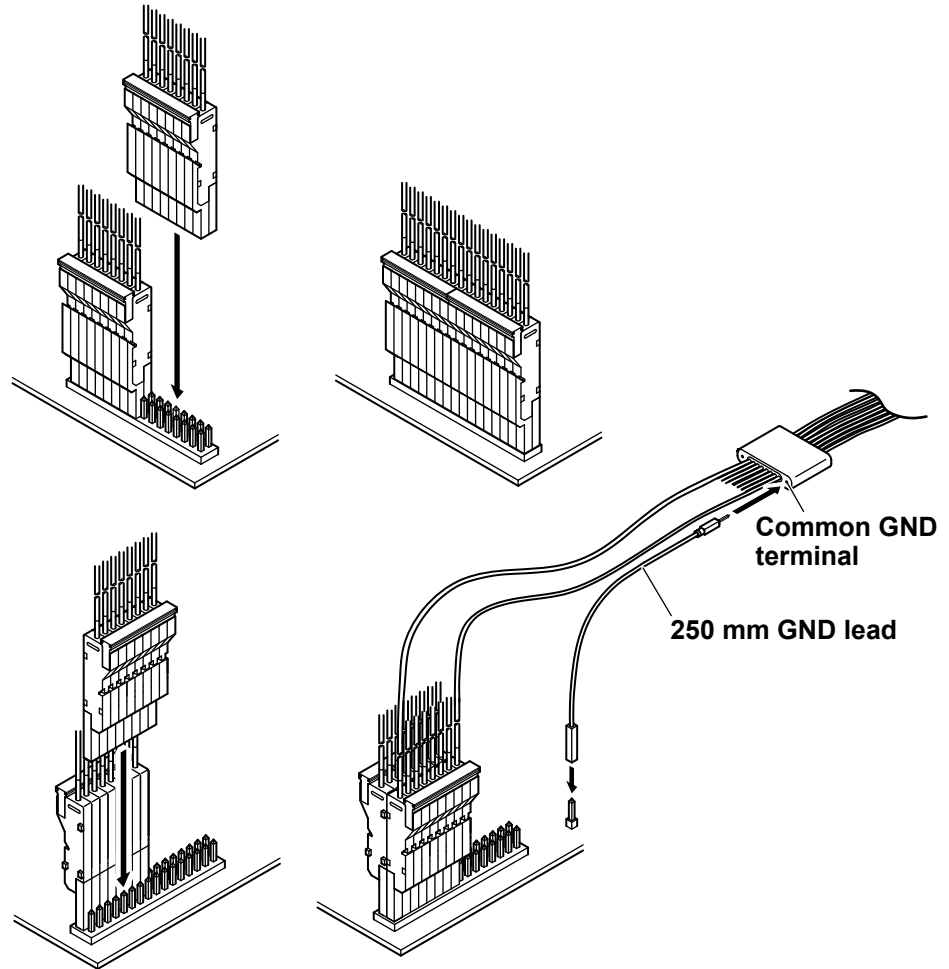
Using a longer GND lead lowers performance.



Inserting/Removing Multiple Adjacent Probe Head Stacks

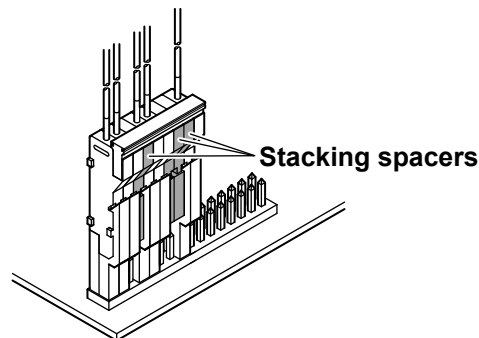
When connecting multiple PBL250 Logic Probes, you can arrange probe head stacks side-by-side or back-to-back. If the GND terminal is separated, connect a 250 mm GND lead to a common GND terminal, then connect to GND on the PCB.

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.



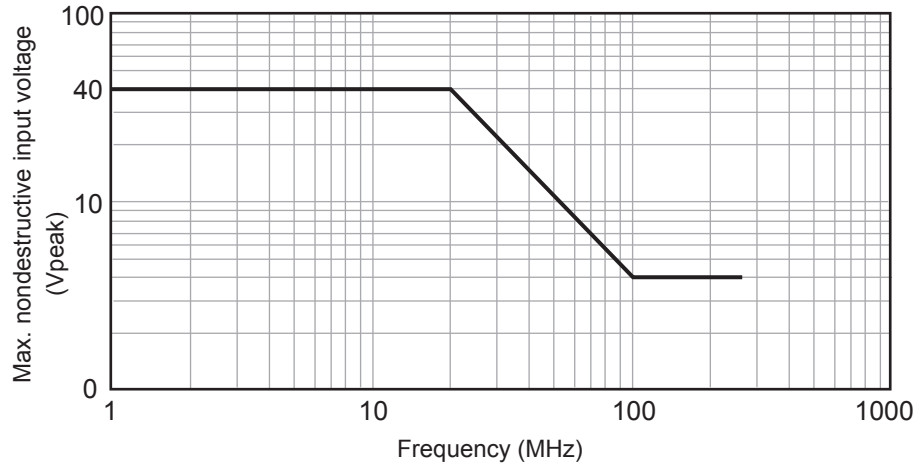
Product Specifications

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	0.05 V
Threshold level accuracy ²	±(100 mV + 3% of setting)
Input voltage range	±6 V around the threshold level setting value
Min. input voltage ²	300 mVp-p
Hysteresis voltage	With noise rejection OFF: 100 mV (typical) ³ With noise rejection ON: 250 mV (typical) ³
Input impedance	100 kΩ/3 pF (typical) ³
Max. toggle frequency ²	250 MHz or more
Min. pulse width ²	2 ns
Bit-to-bit skew	1 ns

1. See derating of input voltage by frequency
2. Standard operating conditions, after warm-up.
3. A *typical value* is a typical or average value. It is not strictly guaranteed.

Input voltage derating by frequency



General Specifications

Standard operating conditions	Temperature	23±5°C
	Humidity ⁴	55 ±10% RH
Operating environment	Temperature	5 to 40°C
	Humidity ⁴	20 to 80% RH
	Altitude	2000 m or less
Storage environment	Temperature	-20 to 60°C
	Humidity ⁴	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
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)

4. No condensation

Standards Compliance

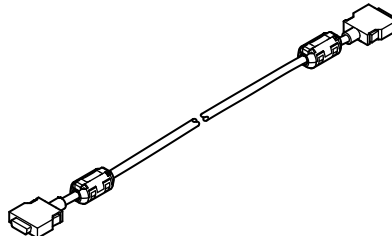
EMC standards	Emissions	Conforming standards EN61326-1 ClassA EN55011 Class A Group1 EMC standards of Australia and New Zealand EN55011 Class A, Group1 Korea Electromagnetic Conformity Standard (한국 전자파적합성기준) This is a Class A product. Operation of this product in a residential area may cause electromagnetic 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 ⁵
Environmental standards ⁶	EU RoHS Directive compliant	

5. 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).



⁶ For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM113-01Z2).

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.

