
**User's
Manual**

**Model 701924
PBDH1000 Differential Probe**

User Registration

YOKOGAWA provides registered users with useful information and services. Please allow us to serve you best by completing the user registration form accessible from our website.

<https://tmi.yokogawa.com/support/>



Contact Us

If you want to resolve a technical support issue or need to contact YOKOGAWA, please fill out the inquiry form on our website.

<https://tmi.yokogawa.com/contact/>



Thank you for purchasing the PBDH1000 Differential Probe (Model 701924). This user's manual explains usage, specifications, and the handling precautions of the 701924. To ensure correct use, please read this manual thoroughly before beginning operation. After reading this manual, keep it in a safe place.

List of Manuals

The following manuals are provided for the 701924.

Manual Title	Manual No.	Notes
Model 701924 PBDH1000 Differential Probe User's Manual	IM 701924-01E	This manual. Explains usage, specifications, and the handling precautions of the 701924.
Model 701924 PBDH1000 Differential Probe	IM 701924-92	Document for China
Model 701924 PBDH1000 Differential Probe	IM 701924-93Z2	Document for Korea
Safety Instruction Manual	IM 00C01C01-01Z1	Safety manual (European languages)

The "E", "Z1" and "Z2" in the manual numbers are the language codes.

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

Document No.	Description
PIM113-01Z2	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: February 2008

2nd Edition: March 2008

3rd Edition: April 2009

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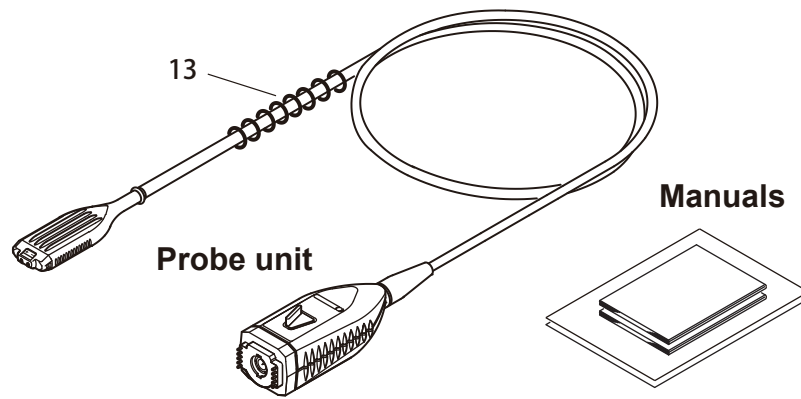
6th Edition: June 2021

7th Edition: March 2022

Checking the Contents of the Package

The following accessories are included. If some of the contents are not correct or missing or if there is physical damage, contact the dealer that you purchased them from.

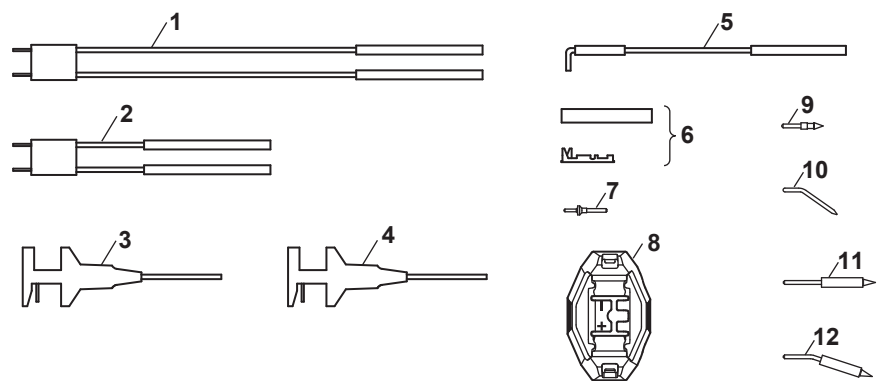
- Probe unit: 1
- Attachments: 1 set (see below)
- Manuals: 1 set (see “List of Manuals” provided earlier)
- Carrying case: 1



Probe unit

Manuals

Attachments



No.	Attachment Item	Quantity
1	10-cm pair leads ¹	2
2	5-cm pair leads ¹	2
3	Red micro clip	1
4	Black micro clip	2
5	6-cm ground extension lead	2
6	Contact, heat-shrink tube ^{1, 2}	1 pack (10 each)
7	Flanged input pin ²	10
8	Retaining cover ²	2
9	Straight pin	4
10	Angled pin	4
11	Spring-type straight pin	4
12	Spring-type angled pin	4
13	Marker tip ³	8 colors x 1 each

- 1 Connectable to a 0.64-mm square pin (recommended compatible pin diameter: 0.65 mm)
- 2 Extension lead kit
- 3 Attached to the probe unit

Optional Accessories (Sold Separately)

Part Name	Part Number	Quantity
Ground extension lead	B8099KQ	5
5-cm pair leads	B8099KV	5
10-cm pair leads	B8099KU	5
Black micro clip	B9852VX	1 pack (10 pieces)
Red micro clip	B9852VY	1 pack (8 pieces)
Straight pin	B8099DL	10
Angled pin	B8099DM	10
Spring-type straight pin	B8099DJ	5
Spring-type angled pin	B8099DK	5
Flanged input pin	B8099KX	5
Retaining cover	B8099KY	2
Contact, heat-shrink tube	B8099KW	1 pack (10 pieces)

Safety Precautions

This product is designed to be used by a person with specialized knowledge. To use this product correctly and safely, the general safety precautions described herein must be observed during all phases of operation. YOKOGAWA assumes no liability for the customer's failure to comply with these requirements.

This manual is part of the product and contains important information. Keep this manual in a safe place so that you can refer to it immediately when using the product until you dispose of the product. In addition, before using the probe, read the manuals of the oscilloscope to thoroughly familiarize yourself with its specifications and operation.

The following symbols are used on this instrument.



Warning: Handle with care. Refer to the user's 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.)

Notes about Usage



WARNING

Purpose of the product

The product is used in combination with an oscilloscope to observe and measure electrical signals. Do not use for any other purpose.

Ground the measuring instrument

The protective grounding terminal of the oscilloscope must be connected to ground.

Check the grounding

Before connecting the probe input terminal to the device under measurement, ensure that the oscilloscope is properly grounded and that the probe's BNC connector is connected to the oscilloscope input.

Observe the maximum input voltage

Do not apply a voltage exceeding the following maximum values instantaneously or continuously between an input and ground.

Instantaneous voltage: ± 100 V

Continuous voltage: ± 35 V (DC + ACpeak)

Be careful of electric shock

Never use the probe with wet hands or when the probe itself is wet. Doing so may cause electric shock. Be careful of electric shock when you connect the probe to the device under measurement.

Avoid exposed circuitry

To prevent electric shock, remove metal and jewelry such as watches and rings. Do not touch exposed connections or components when power is present on the device.

Precautions when connecting and disconnecting the probe

Do not disconnect the probe from the oscilloscope while the probe is connected to the device under measurement. Doing so may cause electric shock.

Do not operate in wet or damp conditions

To prevent electric shock, do not operate the probe in wet or damp conditions.

Do not operate in explosive atmosphere

To prevent injury or fire hazard, do not operate the probe in an atmosphere of flammable or explosive gases or vapors.

Do not operate with suspected failures

Stop using the probe if you suspect that the probe is damaged. Consult your nearest YOKOGAWA dealer.

Do not operate with a damaged signal cable

If the signal cable is torn and the inner metal is exposed or if a color different from the outer sheath appears, stop using the cable.

Do not disassemble or modify

Do not disassemble or modify the product. YOKOGAWA assumes no liability if you disassemble or modify the product.



CAUTION

Protective structure

The product is not dust or water resistant. Do not use it in areas with a lot of dust or near water.

Usage and storage environment

Avoid using or storing the product in an environment that does not meet the specifications, such as direct sunlight, high temperature and humidity, or condensation. Deformation or insulation deterioration can occur resulting in failure to retain the product specifications.

Handling the probe

Avoid vibration, shock, and static electricity when handling the probe. Do not bend or pull the cables excessively. Doing so may damage or disconnect the probe.

French



AVERTISSEMENT

But du produit

Le produit est utilisé en association avec un oscilloscope pour observer et mesurer des signaux électriques. Ne l'utilisez pas à d'autres fins.

Mettez l'instrument de mesure à la terre

La borne de terre de protection de l'oscilloscope doit être connectée à la terre.

Vérifiez la mise à la terre

Avant de connecter la borne d'entrée de la sonde à l'appareil sous mesure, assurez-vous que l'oscilloscope est correctement mis à la terre et que le connecteur BNC de la sonde est connecté à l'entrée de l'oscilloscope.

Respectez la tension d'entrée maximale

Ne pas appliquer une tension supérieure aux valeurs maximales suivantes de manière instantanée ou continue entre une entrée et la terre.

Tension instantanée: ± 100 V

Tension continue: ± 35 V (DC + AC_{peak})

Faites attention au choc électrique

N'utilisez jamais la sonde les mains mouillées ou lorsque la sonde elle-même est mouillée. Cela pourrait provoquer un choc électrique. Faites attention au choc électrique lorsque vous connectez la sonde à l'appareil à mesurer.

Évitez les circuits exposés

Pour éviter un choc électrique, retirez le métal et les bijoux tels que les montres et les bagues. Ne touchez pas les connexions ou composants exposés en présence de courant sur l'appareil.

Précautions lors de la connexion et de la déconnexion de la sonde

Ne déconnectez pas la sonde de l'oscilloscope lorsque la sonde est connectée à l'appareil en cours de mesure. Cela pourrait provoquer un choc électrique.

N'opérez pas dans des conditions mouillées ou humides

Pour éviter un choc électrique, ne faites pas fonctionner la sonde dans des conditions mouillées ou humides.

N'opérez pas dans une atmosphère explosive

Pour éviter les blessures et les risques d'incendie, n'utilisez pas la sonde dans une atmosphère de gaz ou des vapeurs inflammables ou explosifs.

N'opérez pas en cas de défaillances suspectées

Arrêtez d'utiliser la sonde si vous pensez qu'elle est endommagée.

Consultez votre revendeur YOKOGAWA le plus proche.

N'opérez pas avec le câble de signal endommagé

Si le câble de signal est coupé et que le métal interne est exposé ou si une couleur différente de la gaine extérieure apparaît, arrêtez d'utiliser le câble.

Ne démontez ou modifiez pas

Ne démontez ou modifiez pas le produit. YOKOGAWA n'assume aucune responsabilité si vous démontez ou modifiez le produit.



ATTENTION

Structure de protection

Le produit n'est pas résistant à la poussière ou à l'eau. Ne l'utilisez pas dans des zones très poussiéreuses ou près de l'eau.

Environnement d'utilisation et de stockage

Évitez d'utiliser ou de stocker le produit dans un environnement qui ne répond pas aux spécifications, comme la lumière directe du soleil, les températures et l'humidité élevées ou la condensation. Une déformation ou une détérioration de l'isolation peut se produire, entraînant le non-respect des spécifications du produit.

Manipulation de la sonde

Évitez les vibrations, les chocs et l'électricité statique lors de la manipulation du produit. Ne pliez pas et ne tirez pas les câbles de manière excessive. Cela pourrait endommager ou déconnecter la sonde.

Operating environmental limitations

Note the following operating environmental limitations.

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 un produit de classe A (pour les environnements industriels). Le fonctionnement de ce produit dans une zone résidentielle peut provoquer des interférences radio, auquel cas l'utilisateur devra corriger les interférences.

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 Regulations 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 (AR)

Yokogawa Europe B.V. is the authorized representative of Yokogawa Test & Measurement 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 YOKOGAWA products, follow the laws and ordinances of the country or region where the product will be disposed of.

Conventions 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 injury or death to the user, and precautions that can be taken to prevent such occurrences.

CAUTION

Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or the 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.

Contents

- List of Manuals..... i
- Checking the Contents of the Package..... ii
- Safety Precautions..... iv
- Regulations and Sales in Various Countries and Regions.....viii
- Conventions Used in This Manual ix
- Product Overview..... 1
- Features..... 1
- Component Names..... 2
- Usage Precautions..... 3
- Operating Procedures..... 4
- Product Specifications 12
- Appendix 1 Frequency Characteristics of Each Attachment..... App-1
- Appendix 2 Input Equivalent Circuit and DC Voltage Accuracy..... App-4

Product Overview

The PBDH1000 Differential Probe is a 1-GHz bandwidth, differential-input, active probe that is used in combination with a digital oscilloscope that has a YOKOGAWA probe interface (hereafter referred as digital oscilloscope with a probe interface).

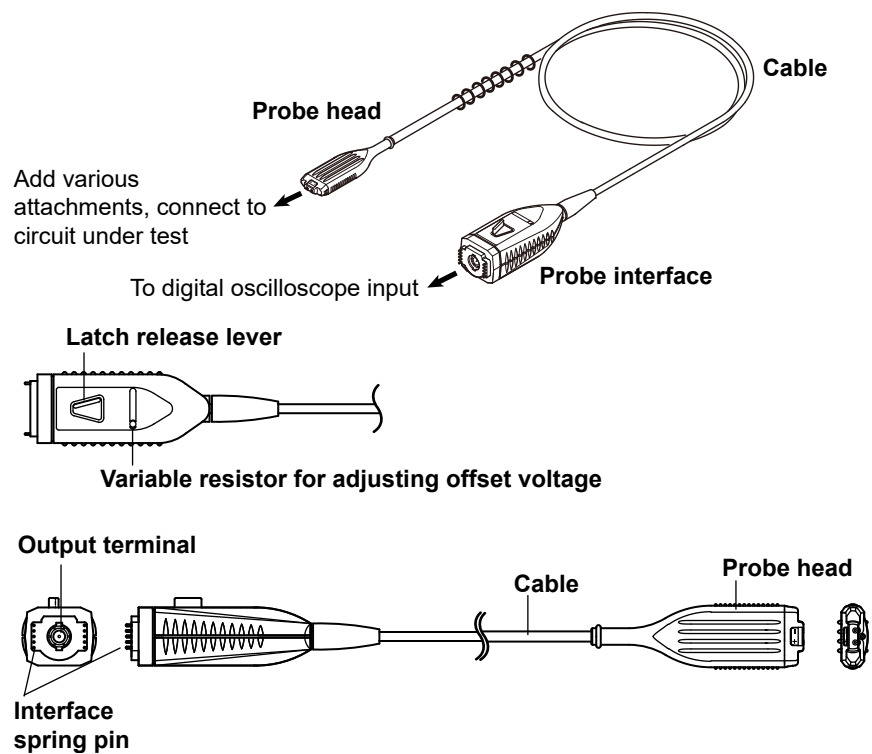
To use the probe, you simply connect it to a BNC input terminal on a digital oscilloscope with a probe interface.

* For information about digital oscilloscopes with a probe interface, contact your nearest YOKOGAWA dealer.

Features

- Allows direct observation of differential signals
- Common mode rejection capability
- Wide frequency bandwidth from DC to 1 GHz
- High input impedance (1 M Ω , approx. 1.1 pF between each input terminal and ground)
- Able to receive power from a digital oscilloscope with a probe interface
- Allows a digital oscilloscope with a probe interface to automatically detect the probe
- Comes with various attachments that can be changed according to the item that you want to measure
- Compact and lightweight

Component Names



Probe interface

Connects to a digital oscilloscope input.

Interface spring pins

When the probe output terminal is connected, these pins touch the pad on the oscilloscope interface board. The probe's power is supplied through these interface pins. The interface pins are also used to supply an offset voltage and for the oscilloscope to automatically detect the probe.

Cable

Connects the probe interface and the probe head.

Probe head

Connect various attachments to the signal input terminals, and then connect to the item you want to measure.

Latch release lever

Releases the lock connecting the probe output terminal to the oscilloscope input.

Output terminal

The output terminal is a BNC connector. It connects to an oscilloscope input BNC connector.

Variable resistor for adjusting offset voltage

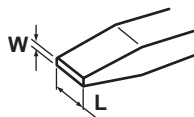
You can adjust the offset voltage using an appropriate driver as described below.

Adjustment driver

Use an adjustment driver that fits into the adjustment groove. Using a driver with a large grip or a driver with a small head can damage the adjustment turn stop or groove.

Recommended adjustment driver bit dimensions

Head thickness (W): 0.2 to 0.35 mm; head width (L): 1.3 to 1.5 mm;
head shape: flat or Philips



Usage Precautions



WARNING

Use this probe only with YOKOGAWA's oscilloscopes with probe interface. Even with YOKOGAWA's oscilloscopes, this probe can be used only when specified as a connectable accessory. Also, use this probe only with standard or optional accessories sold separately.

CAUTION

- This probe is designed to measure the voltage difference between two points on the device under measurement. It does not electrically isolate the device under measurement from the measuring instrument.
- When cleaning the probe, wipe with a piece of soft cloth to prevent damaging the probe. Do not immerse the probe body in liquid. Do not use abrasive cleaners or volatile solvents such as benzene on the probe.

French



AVERTISSEMENT

Utilisez la sonde uniquement avec les oscilloscopes de YOKOGAWA avec interface de sonde. Même avec les oscilloscopes de YOKOGAWA, la sonde ne peut être utilisée que si spécifiée comme accessoire connectable. Et utilisez la sonde uniquement avec des accessoires standard ou des accessoires en option vendus séparément.

ATTENTION

- Le produit n'est pas étanche à la poussière ni à l'eau. N'utilisez pas le produit dans des zones très poussiéreuses ou dans lesquelles de l'eau pourrait être renversée.
- Lors du nettoyage de la sonde, essuyez avec un morceau de chiffon doux pour éviter d'endommager la sonde. Ne plongez pas le corps de la sonde dans un liquide. N'utilisez pas de nettoyants abrasifs ni de solvants volatils tels que la benzène sur la sonde.

Do not bring the probe near transformers, circuits with large currents, wireless devices, or other objects emitting large electric or magnetic fields. Doing so may produce inaccurate measurement results.

Operating Procedures

Preparation

1. Have the probe and a digital oscilloscope with a probe interface ready.
2. Insert the probe interface completely into the oscilloscope input, and confirm that the BNC connector and interface pin are securely fastened. You will hear the latch click when the connectors lock into place.
3. When you connect the probe to a digital oscilloscope with a probe interface, the probe's attenuation ratio and input coupling are set automatically.
4. Attach any of the provided attachments or attachments that you constructed to the probe head signal input terminals.

Note

If the digital oscilloscope does not detect the probe automatically, manually configure the following settings on the oscilloscope.

- Set the probe attenuation ratio to 50:1.
 - Set the input coupling to 50 Ω .
-

Attachment Handling

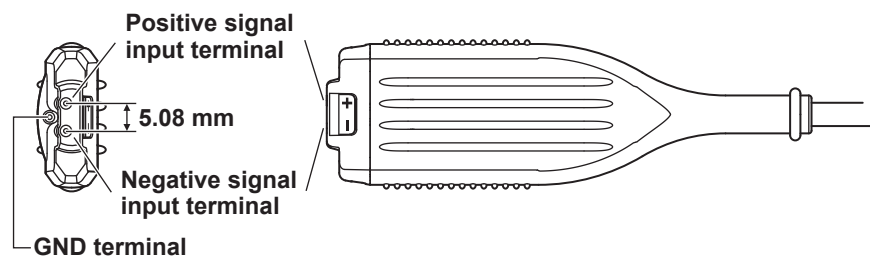
Connect attachments that are suitable for the item that you want to measure to the signal input terminals illustrated below. Select attachments from the following list (see page 9 for attachment application examples).

- 5-cm pair lead
Can connect directly to a pin header or the item you want to measure. It includes a damping resistor that takes pin header connection into account.
- 10-cm pair lead
Used in combination with a micro clip. It includes a damping resistor that takes the micro clip into account. It is suitable for measuring relatively low-frequency signals.
- Pin
The following four types are available. They are suitable for measuring relatively high-frequency signals.
 - Straight pin
 - Angled pin
 - Spring-type straight pin
 - Spring-type angled pin
- A lead that you created using a kit
Create your own lead when you need a lead that is longer than the ones included in the accessories, or when you want to prevent the lead from coming loose from the probe head by using the retaining cover. For instructions on how to create your own lead, see the next page.

Note

- The provided pair leads include the following damping resistors. These pair leads can connect to a 0.64-mm square pin.

5-cm pair lead:	100 Ω , 1/4 W, 1%
10-cm pair lead:	150 Ω , 1/4 W, 1%
- For typical frequency characteristics of attachments, see appendix 1.



Because the probe input is high impedance, the inductance from the probe head to the circuit under test has a large effect on the measured results of high frequency signal components. When measuring signals that include frequency components of 100 MHz or higher, we recommend that you use the shortest attachments possible for both the positive and negative input terminals.

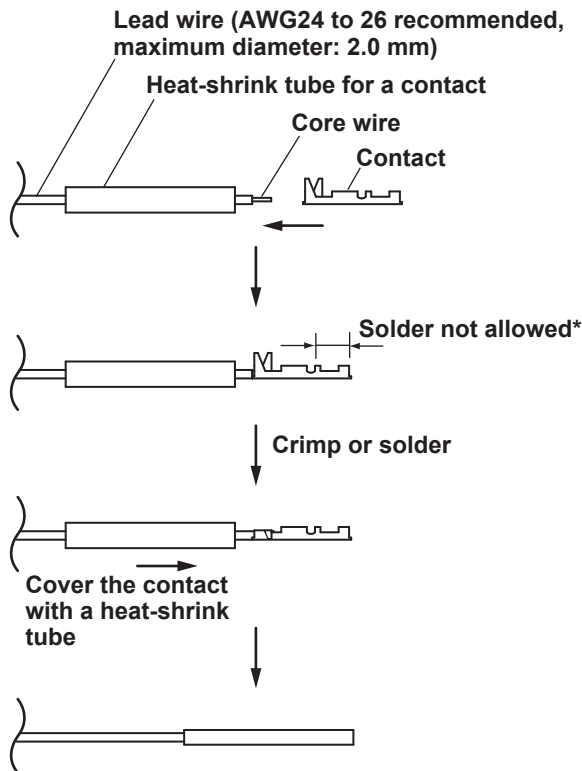
Creating an Extension Lead

You can create your own extension lead using the accessory kit.

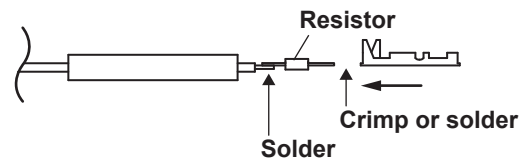
At the Circuit-under-Test End

1. Pass the lead wire through a heat-shrink tube for a contact.
2. Crimp or solder the lead wire's core wire to the contact.
3. Cover the contact with the heat-shrink tube, and then apply heat with a drier to fix the tube in place.

In step 2, you can insert a damping resistor between the lead wire and contact as shown in the illustration below on the right.



<When inserting a resistor>



Examples of resistances that you can insert (when using a micro clip)

Lead Wire Length	Resistance
5 cm	150Ω
10 cm	150Ω
20 cm	180Ω

* If solder gets into this section, the contact or the circuit under test may break.

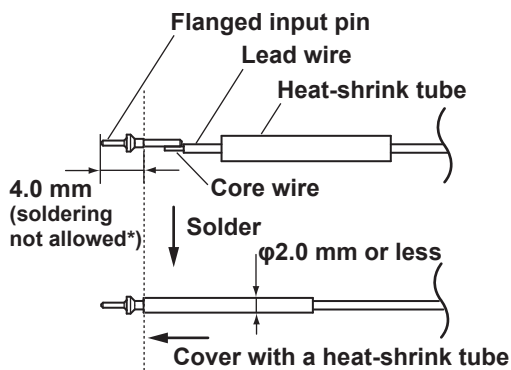
Note

A dedicated crimping tool is needed to crimp the lead wires (SST-017 by Stack Electronics Co, Ltd.).

Probe-Head End

4. Pass the lead wire through the heat-shrink tube.
 - * The heat-shrink tube for the probe-head end is not included. It must be obtained separately.
5. Solder the lead wire's core wire to the flanged input pin.
6. Cover the flanged input pin with a heat-shrink tube, and then apply heat with a drier to fix the tube in place.

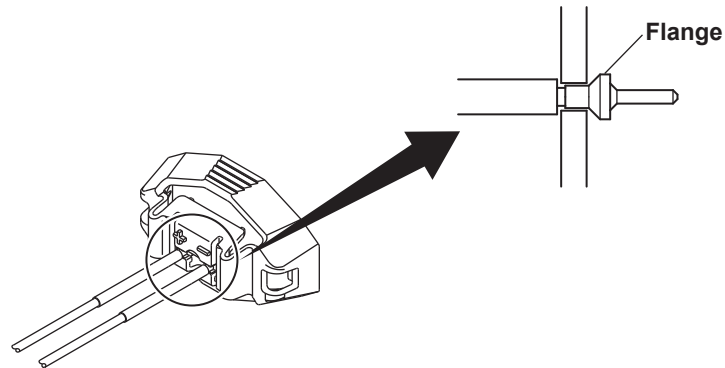
Do not cover the section of the flanged input pin to the left of the broken lines shown in the following figure with the heat-shrink tube. Make sure that the diameter of the tube after shrinking is 2.0 mm or less. If the maximum diameter exceeds 2.0 mm, the lead wire will not be able to pass through the retaining cover.



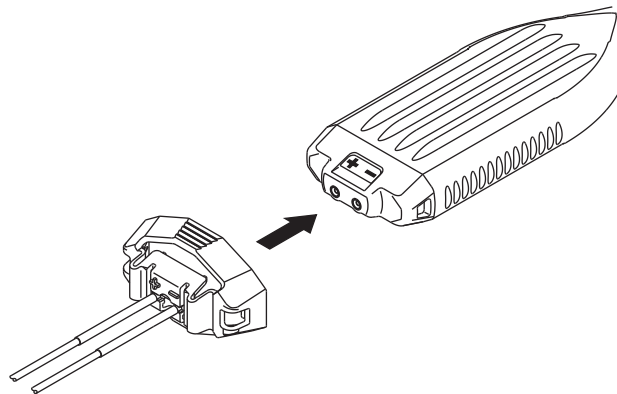
* If solder gets on this section (4 mm from the tip), the probe may break.

Attaching the Retaining Cover

7. Pass the flanged sections of the two input pins through the center retaining-cover holes, and place the input pins on the holders on either side.

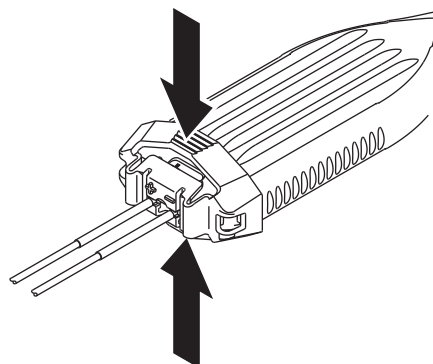


8. Align the + and - markings on the retaining cover to those on the probe head, and attach the retaining cover to the probe head. Check that the retaining cover's left and right latches are securely locked.



Removing the Retaining Cover

9. While pinching the retaining cover at the top and bottom, remove the cover from the probe head.

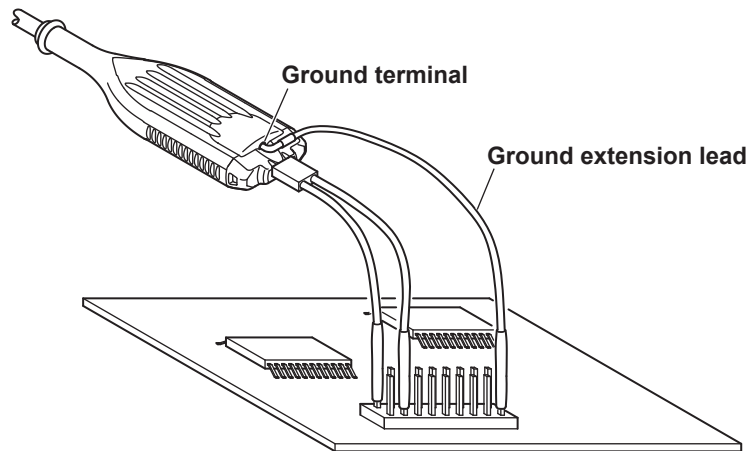


Note

- The retaining cover can only be used with a flanged input pin that is included in the package.
- You cannot use the probe's ground terminal if you use the retaining cover.

How to Use the Ground Extension Lead

Example



Connecting the probe ground terminal to the common ground on the circuit under test using the ground extension lead may reduce noise when measuring low-frequency signals.



CAUTION

Connect the ground extension lead only to the common ground. If measuring a floating circuit, do not use the ground terminal. Doing so may damage the measuring system or the device under measurement.

French

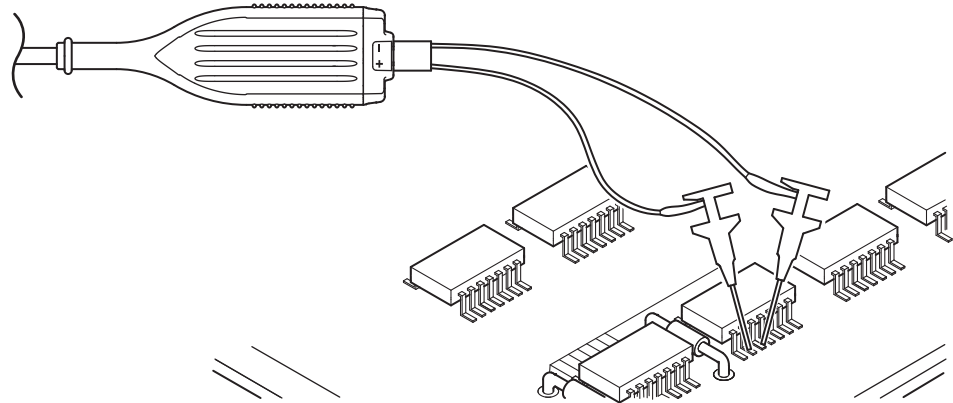


ATTENTION

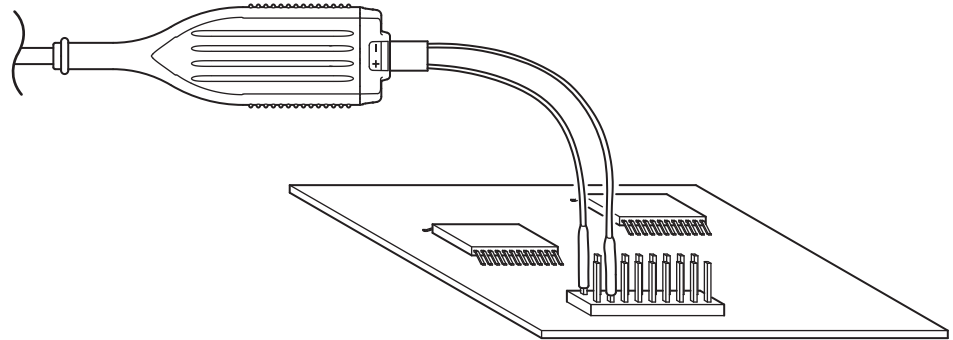
Connectez le câble d'extension de terre uniquement à la terre commune. N'utilisez pas la borne de terre si vous mesurez un circuit flottant. Cela pourrait endommager le système de mesure ou l'appareil sous mesure.

Example

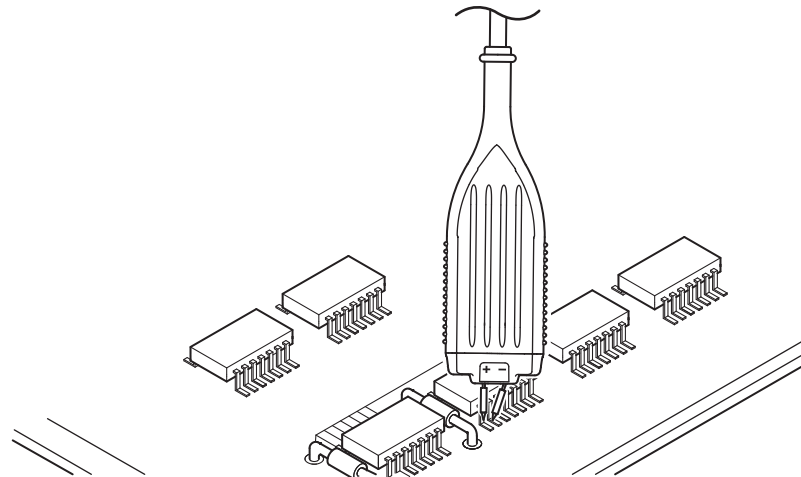
10-cm pair lead with micro chip



5-cm pair lead



Pin (straight, angled, spring-type straight or angled)



Warm-up and Offset Adjustment

Warm-up

Immediately after connecting the probe, the heat emitted by the probe itself causes the offset voltage to drift. Warm up the probe for at least 30 minutes after applying power to stabilize the probe.

Offset Adjustment

You can turn the offset voltage adjustment variable resistor on the probe interface by using an appropriate adjustment driver (see page 2 for details) to adjust the residual offset voltage that remains even after warm-up.

CAUTION

Do not apply excessive force to the offset voltage adjustment part. Doing so may damage the variable resistor.

French

ATTENTION

N'appliquez pas une force excessive sur la partie de réglage de la tension de décalage. Cela pourrait endommager la résistance variable.

Note

- The offset voltage drifts depending on the ambient temperature. Pay attention to changes in the ambient temperature when making continuous measurements.
 - Only use the offset voltage adjustment variable resistor to adjust the residual offset voltage. If you deliberately change the offset voltage for some other purpose, the probe may no longer meet the specifications.
-

Product Specifications

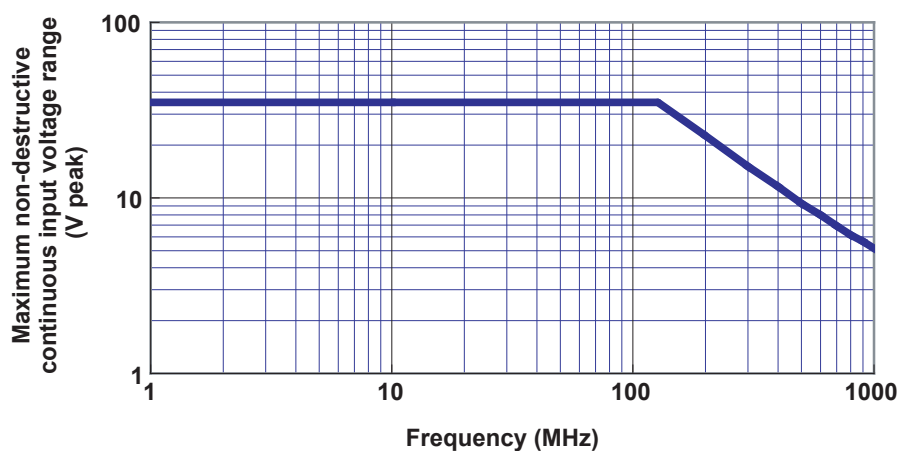
Electrical Specifications

(The electrical specifications are based on standard operating environment after 30-minute warm-up.)

Frequency bandwidth	DC to 1 GHz (–3 dB or higher)
Attenuation ratio	50:1
DC voltage accuracy ¹	±2 % of differential input voltage (at 50 Ω load) ²
Input capacitance	Approx. 1.1 pF (relative to ground, typical value ³)
Input resistance	1 MΩ ± 3% (relative to ground)
Output impedance	Approx. 50 Ω (typical value ³)
Maximum operating input voltage ^{4,5}	±35 V (DC + ACpeak)
Maximum differential input voltage ⁴	±25 V (DC + ACpeak)
Maximum non-destructive input voltage ⁶	±100 V (instantaneous)
Maximum non-destructive continuous input voltage ⁵	±35 V (DC + ACpeak)
Rise time	350 ps or less (excluding characteristics of the oscilloscope, typical value ³)
Residual noise	500 μVrms or less (at probe output, typical value ³)
Residual offset ⁷	±10 mV
Common mode rejection ratio	DC to 1 MHz: –35 dB or less 1 MHz to 10 MHz: –30 dB or less 10 MHz to 100 MHz: –26 dB or less 100 MHz to 300 MHz: –20 dB or less

- 1 Excluding the residual offset voltage. See Appendix 2 for details.
- 2 Under the standard operating environment. Excluding the oscilloscope errors.
- 3 Typical values represent typical or average values. They are not strictly guaranteed.
- 4 For the relationship between the differential input voltages and the operating input voltages, see the figure “Input voltage range” on the next page.
- 5 Depending on the frequency. See the figure “Derating of the input voltage by frequency” below.
- 6 Maximum instantaneous voltage that will not break the probe. It is not the rated voltage that you can use continuously. For continuous usage, use it within the maximum operating input voltage.
- 7 When 0 V is applied to both positive and negative input terminals. After offset adjustment.

Derating of the input voltage by frequency





WARNING

As the frequency of the input signal increases, the maximum input voltage of the probe decreases.

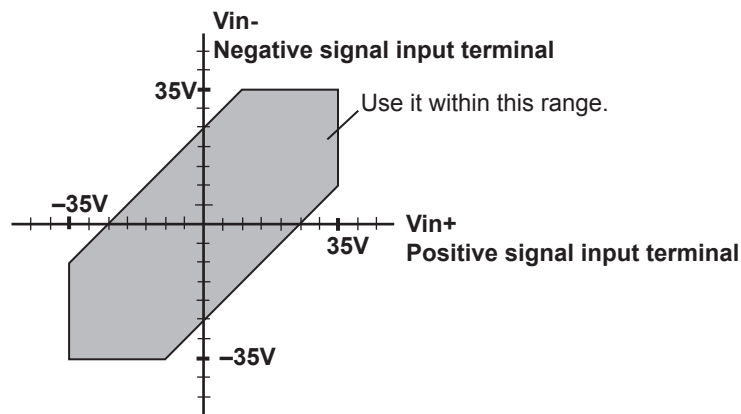
French



AVERTISSEMENT

Lorsque la fréquence du signal d'entrée augmente, la tension d'entrée maximale de la sonde diminue.

Input voltage range



General Specifications

Standard power supply voltage*		$\pm 5 \text{ V } \pm 5 \%$
Standard operating environment	Temperature range	$23 \pm 5^\circ\text{C}$
	Humidity range	$55 \pm 10\% \text{RH}$ (no condensation)
Operating environment	Temperature range	5 to 40°C
	Humidity range	20 to $80\% \text{RH}$ (no condensation)
	Altitude	2000 m or less
Storage environment	Temperature range	-20 to 60°C
	Humidity range	20 to $80\% \text{RH}$ (no condensation)
	Altitude	3000 m or less
Warm-up time		30 minutes or more
Calibration period		1 year recommended
Total length		Approx. 1.2 m
Weight		Approx. 90 g

* Supplied through the interface pins from an oscilloscope with dedicated probe interface.

Compliant Standards

EMC standards	Emission	EN 61326-1 Class A EN 55011 Class A Group 1 EMC standards of Australia and New Zealand EN 55011 Class A Group 1
	Immunity	EN 61326-1 Table 2 (for use in industrial locations) Influence in immunity test environment $ \text{Noise increase} \leq 2 \text{ V}^1$
Environmental standards ²		EU RoHS Directive compliant

1 Test conditions

Frequency bandwidth limit 20 MHz, using a digital oscilloscope with the input impedance set to 50 Ω , and both plus and minus probe tip inputs connected (terminated) to 50 Ω .

2 For conformity to environmental regulations and/or standards other than EU, contact your local Yokogawa office (PIM 113-01Z2).

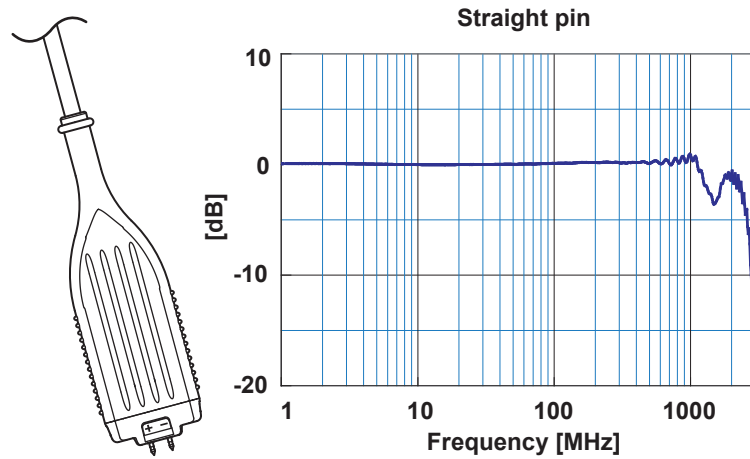
Appendix 1

Frequency Characteristics of Each Attachment

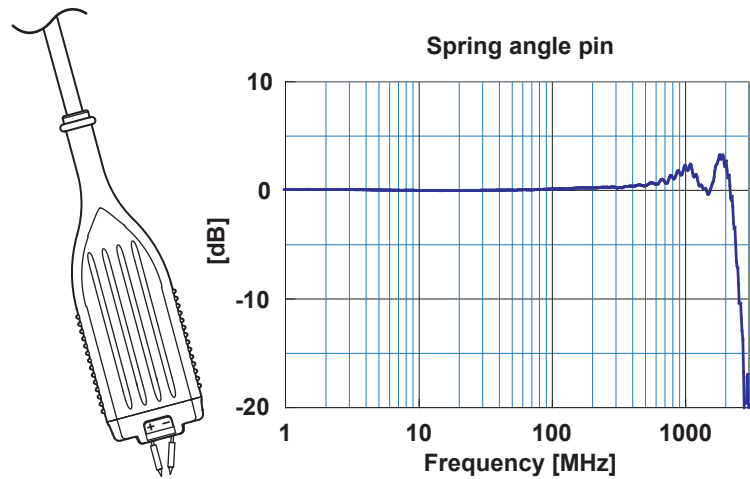
The probe's frequency characteristics vary depending on the attachment that is used and how the lead wires are connected. The frequency characteristics when using a typical attachment are given below.

The frequency characteristics for the case when pair leads or pair leads and micro clips are used have been measured with the two lead wires connected in a parallel manner.

When using a straight pin

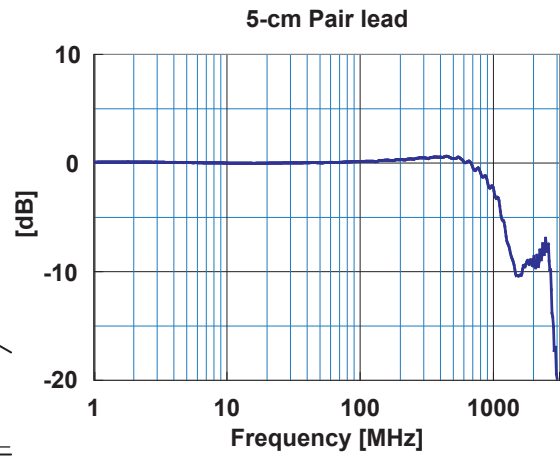
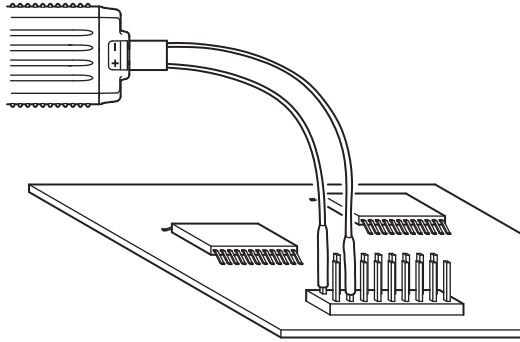


When using a spring-type angle pin

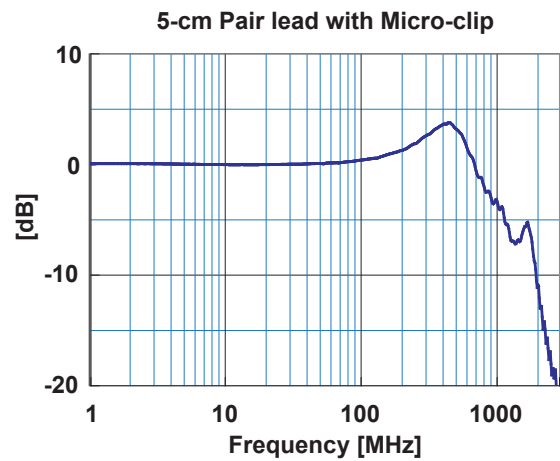
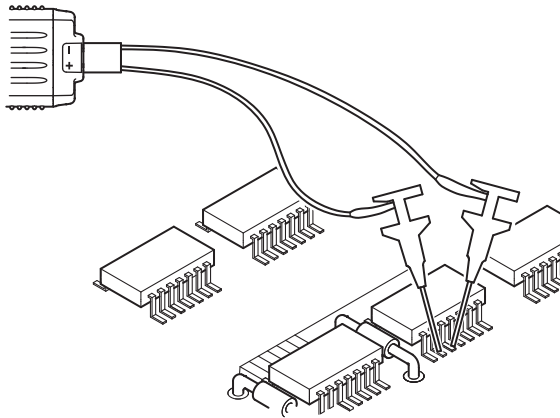


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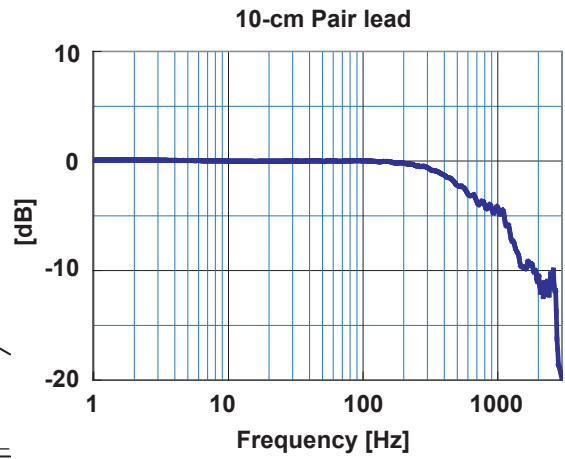
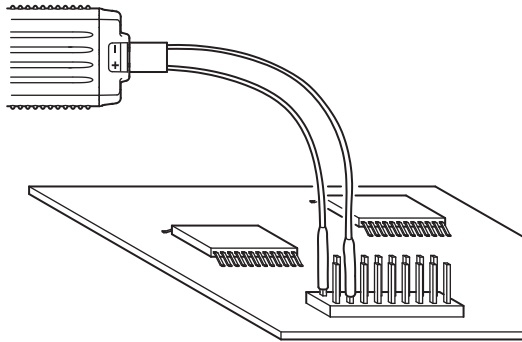
When using a 5-cm pair lead



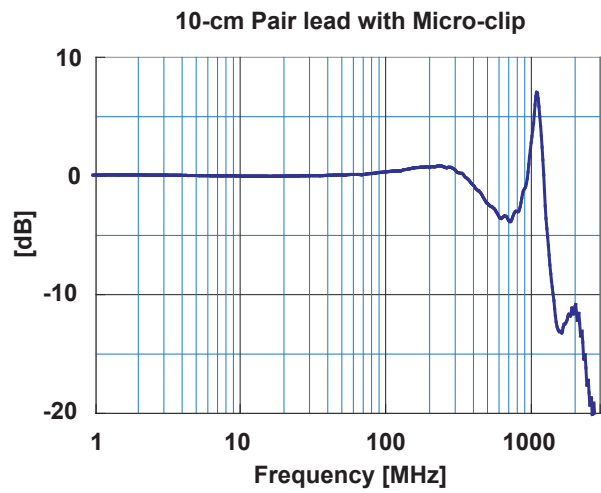
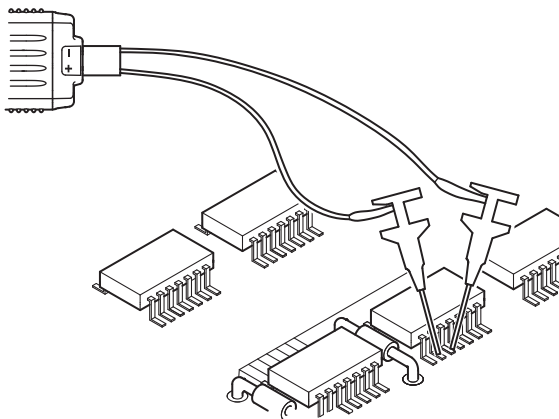
When using a 5-cm pair lead with micro clip



When using a 10-cm pair lead

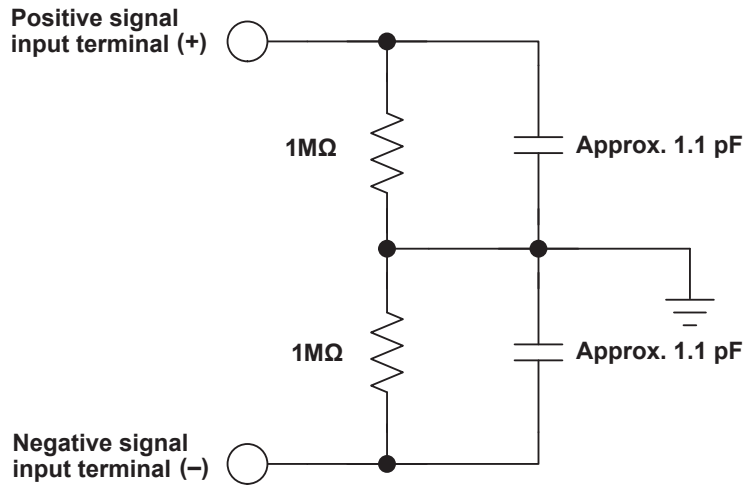


When using a 10-cm pair lead with micro clip



Appendix 2 Input Equivalent Circuit and DC Voltage Accuracy

Input equivalent circuit



Conceptualization of DC Voltage Accuracy

