
**User's
Manual**

**SL2000
High-Speed Data Acquisition Unit
Getting Started Guide**

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 SL2000 High-Speed Data Acquisition Unit.

The SL2000 is a plug-in modular measuring instrument that allows monitoring of changes in electric signals in the form of waveforms.*

Up to eight plug-in modules can be installed according to the electric signals you want to measure. This allows simultaneous measurement of various types of data. In addition, you can use the measured data to perform various computations and analysis and save it to storage devices.

* To display measured waveforms and various setup menus, you can use the IS8000 Integrated Software and Web server feature.

This getting started guide primarily explains the handling precautions and basic operations of this instrument. To ensure correct use, please read this manual thoroughly before operation.

Keep this manual in a safe place for quick reference in the event that a question arises. The manuals for this instrument are listed on the page iii. Please read all manuals.

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 improvements to the product's performance and functionality. Refer to our website to view our latest manuals.
- The figures given in this manual may differ from those that actually appear on your screen.
- 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.
- The TCP/IP software of this product and the documents concerning it have been developed/created by YOKOGAWA based on the BSD Networking Software, Release 1 that has been licensed from the Regents of the University of California.

Trademarks

- Microsoft, MS-DOS, Windows, Windows 8.1, Windows 10, and Windows 11 are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Adobe and Acrobat are either registered trademarks or trademarks of Adobe Systems Incorporated.
- VJE is a registered trademark of Yahoo Japan Corporation.
- MATLAB is a registered trademark of The MathWorks, Inc. in the United States.
- ScopeCorder and GIGAZoom ENGINE are registered trademarks of Yokogawa Electric Corporation.
- In this manual, the TM and ® symbols do not accompany their respective registered trademark or trademark names.
- Other company and product names are trademarks or registered trademarks of their respective holders.

Updating the Firmware

It is recommended to update the firmware to the latest version to improve the features and usability of this instrument.

Download the latest firmware from the YOKOGAWA website, or contact your nearest YOKOGAWA dealer for details.

Revisions

- 1st Edition: May 2025

Manuals

The following manuals, including this one, are provided as manuals for this instrument. Please read all manuals.

Manuals Included with the Product

Manual Title	Manual No.	Description
SL2000 High-Speed Data Acquisition Unit Getting Started Guide	IM SL2000-03EN	This document. This guide explains the handling precautions, common operations, troubleshooting measures, and specifications of this instrument.
DL950, SL2000 Input Module User's Manual	IM DL950-51EN	This manual explains the specifications of the input modules that can be installed in this instrument.
DL950 ScopeCorder, SL2000 High-Speed Data Acquisition Unit Request to Download Manuals	IM DL950-73Z2	Describes the manuals provided on the website.
Precautions Concerning the Modules	IM 701250-04E	The manual explains the precautions concerning the modules. This manual is included if you ordered modules.
DL950 ScopeCorder, SL2000 High-Speed Data Acquisition Unit	IM DL950-92Z1	Document for China
Safety Instruction Manual	IM 00C01C01-01Z1	Safety manual (European languages)

Manuals Provided on the Website

Download the following manuals from the YOKOGAWA website.

Manual Title	Manual No.	Description
DL950 ScopeCorder, SL2000 High-Speed Data Acquisition Unit Features Guide	IM DL950-01EN	This manual explains all the instrument's features other than the communication interface features.
DL950 ScopeCorder, SL2000 High-Speed Data Acquisition Unit User's Manual	IM DL950-02EN	The manual explains how to operate this instrument.
DL950 ScopeCorder, SL2000 High-Speed Data Acquisition Unit Communication Interface User's Manual	IM DL950-17EN	The manual explains the functions of this instrument's communication interface, how to configure it, and the commands used to control this instrument from a PC through the interface.
DL950 ScopeCorder, SL2000 High-Speed Data Acquisition Unit Operation Guide	IM DL950-04EN	This section describes the basic operation flow of this instrument.

For details on downloading manuals, see Request to Download Manuals (IM DL950-73Z2). To view the PDF data, you need Adobe Acrobat Reader or a software application that can open PDF data.

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

Refer to the "Optional Accessories (Sold Separately)" about the accessory's manual number.

Online Help

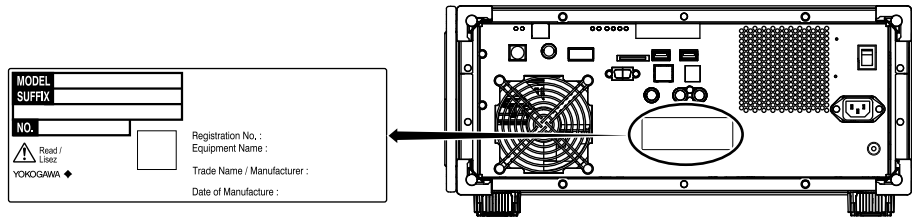
The content similar to the Features Guide, IM DL950-01EN, is included in this instrument as a help file (some the content may be omitted). For instructions on how to use the help, see chapter 26 in the User's Manual, IM DL950-02EN.

Checking the Contents of the Package

Unpack the box, and check the following before operating the instrument. If the wrong items have been delivered, if items are missing, or if there is a problem with the appearance of the items, contact your nearest YOKOGAWA dealer.

SL2000

Check that the product that you received is what you ordered by referring to the model name and suffix code given on the name plate on the rear panel.



MODEL	Suffix Code ¹	Specifications
SL2000		Main unit, 8-slot, 1 G points memory, including IS8002
Power cord ²	-D	UL/CSA Standard and PSE compliant, Rated voltage: 125 V
	-F	VDE/Korean standard, Rated voltage: 250 V
	-R	Australian standard, Rated voltage: 250 V
	-Q	British standard, Rated voltage: 250 V
	-H	Chinese standard, Rated voltage: 250 V
	-N	Brazilian standard, Rated voltage: 250 V
	-T	Taiwanese standard, Rated voltage: 125 V
	-B	Indian standard, Rated voltage: 250 V
	-U	IEC Plug Type B, Rated voltage: 250 V
	-Y	No power cord included. ³
Language	-HJ	Japanese (menu)
	-HE	English (menu)
	-HC	Chinese (menu)
	-HK	Korean (menu)
	-HG	German (menu)
	-HF	French (menu)
	-HL	Italian (menu)
	-HS	Spanish (menu)
	-HR	Russian (menu)
Options	/M1	Memory expansion to 4 G Points ⁴
	/M2	Memory expansion to 8 G Points ⁴
	/ST1	Internal storage (512 GB) ⁵
	/ST2	Internal storage (512 GB) + Flash Acquisition function ⁵
	/C35	IRIG and GPS interface
	/C40	IEEE 1588 Master function
	/C50	Multi-unit synchronization interface
	/C60	10 Gbps Ethernet interface
	/G02	User-defined math function
	/G03	Real time math function ⁶
	/G05	Power math function (including Real time math function) ⁶
	/MT1	Motor dq analysis function (including Power math function) ⁶
	/P4	Four probe power outputs ⁷
	/P8	Eight probe power outputs ⁷
	/VCE	Vehicle edition
	/SN	No software (no IS8002)

- 1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.
- 2 Make sure that the attached power cord meets the designated standards of the country and area that you are using it in.
- 3 Prepare a power cord that complies with the standard specified by the country or region that the instrument will be used in.
- 4 The /M1 and /M2 options cannot be installed on the same instrument.
- 5 The /ST1 and /ST2 options cannot be installed on the same instrument.
- 6 The /G03, /G05, and /MT1 options cannot be installed on the same instrument.
- 7 The /P4 and /P8 options cannot be installed on the same instrument.

No. (Instrument number)

When contacting the dealer from which you purchased the instrument, please give them the instrument number.

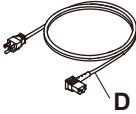
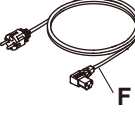
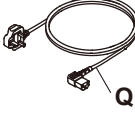
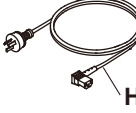
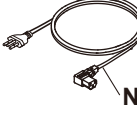
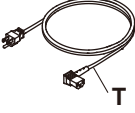
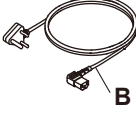
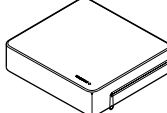
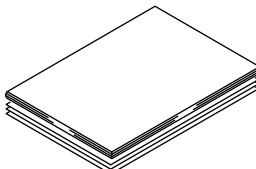
Standard Accessories

The standard accessories below are supplied with the instrument. Check that all contents are present and undamaged.

Item	Model or Part No.	Quantity	Specifications and Notes
Power cord ¹	A1006WD	1	UL/CSA standard and PSE compliant
	A1009WD		VDE/Korean standard
	A1024WD		Australian standard
	A1054WD		British standard
	A1064WD		Chinese standard
	A1103WD		Brazilian standard
	A1100WD		Taiwanese standard
	A1101WD		Indian standard
	A1102WD		IEC Plug Type B
Soft case	B8059GG	1	—
Cover panel	B8073CY	8	—
Rubber stoppers ²	A9088ZM	1	1 sheet (2 pieces), attached to the rear feet
Product information ³	IS8002	1	Contains the license code for the IS8002 software
Manuals	IM SL2000-03EN	1	Getting Started Guide (this guide)
	IM DL950-73Z2	1	Request to Download Manuals
	IM 701250-04E	1	Module Handling Precautions (This manual is included if you ordered modules.)
	IM DL950-92Z1	1	Document for China
	IM 00C01C01-01Z1	1	Safety manual (European languages)
	PIM 113-01Z2	1	List of worldwide contacts

Standard accessories are not covered by warranty.

Checking the Contents of the Package

Power cord (1 cord included, according to suffix code) ¹				
UL/CSA standard and PSE compliant A1006WD	VDE/Korean standard A1009WD	Australian standard A1024WD	British standard A1054WD	
				
Chinese standard A1064WD	Brazilian standard A1103WD	Taiwanese standard A1100WD	Indian standard A1101WD	IEC Plug Type B A1102WD
				
Soft case B8059GG	Cover panel B8073CY 8 pcs.	Rubber stoppers ² A9088ZM	Product Information ³ IS8002	Manuals
				

1 Make sure that the attached power cord meets the designated standards of the country and area that you are using it in. If the suffix code is -Y, a power cord is not included.

2 For instructions on how to attach the rubber stoppers, see section 2.2.

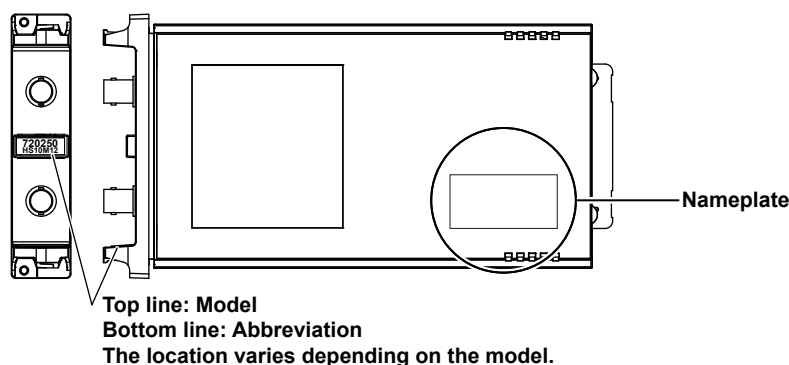
3 Not included with the /SN option.

Input Modules (Sold Separately)

To make sure that an input module is the module that you ordered, check the module name written on it.

Model	Name	Abbreviation
720212	High-Speed 200MS/s 14bit Isolation Module	HS200M14
720211	High-Speed 100 MS/s 12-bit Isolation Module	HS100M12
720250	High-Speed 10 MS/s 12-bit Isolation Module	HS10M12
701251	High-Speed High-Resolution 1 MS/s, 16-Bit Isolation Module	HS1M16
720256	4CH 10MS/s 16bit Isolation Module	4CH 10M16
720254	4CH 1MS/s 16bit Isolation Module	4CH 1M16
701255	High-Speed 10 MS/s 12-bit Non-Isolation Module	NONISO_10M12
720268	High-Voltage 1 MS/s 16-Bit Isolation Module (with AAF and RMS)	HV(AAF, RMS)
720220	16-CH Voltage Input Module	16CH VOLT
701261	Universal (Voltage/Temp.) Module	UNIVERSAL
701262	Universal (Voltage/Temp.) Module (with AAF)	UNIVERSAL(AAF)
701265	Temperature, High Precision Voltage Isolation Module	TEMP/HPV
720266	Temperature, High Precision Voltage Isolation Module (low noise)	TEMP/HPV
720221	16-CH Temperature/Voltage Input Module	16CH TEMP/VOLT
701270	Strain Module (NDIS)	STRAIN_NDIS
701271	Strain Module (DSUB, Shunt-Cal)	STRAIN_DSUB
701275	Acceleration/Voltage Module (with AAF)	ACCL/VOLT
720281	Frequency Module	FREQ
720230	Logic Input Module	LOGIC
720245	CAN FD/LIN Monitor Module*	CAN FD/LIN
720243	SENT Monitor Module*	SENT

* The CAN FD/LIN monitor and SENT monitor modules can be used on models with the /VCE option.



In this manual, input modules are referred to by their model names and abbreviations.

For example, the High-Speed 10 MS/s, 12-Bit Isolation Module is referred to as the 720250 (HS10M12). However, if a module has already been referred to previously, it may be referred to only by its model name (for example, 720250).

Optional Accessories (Sold separately)

The optional accessories below are available for purchase separately. For information about ordering accessories, contact your nearest YOKOGAWA dealer.

- Use the following accessories within the ranges indicated in the Notes column of each accessory. When using several accessories together, use them within the specification range of the accessory with the lowest rating.
- If you use accessories other than those below, YOKOGAWA assumes no responsibility or liability for the specifications of this instrument or any damage caused by the use of this instrument.
- Accessories (sold separately) are not covered by this instrument's warranty.

Group 1

Compliance with EN standards is achieved by using the following in combination with the instrument.

Item	Model	Safety Standards	Notes	Manual No.
1:1 BNC safety adapter lead	701901	1000 Vrms CAT II	For the 720256, 701250, 720250, 701251, 720212, 720211, and 720254. Used with the following items (which are sold separately): 701954, 758928, 758922, 758929, or 758921	—
1:1 safety adapter lead	701904	1000 Vrms CAT II 600 Vrms CAT III	For the 720268. Used with the following items (which are sold separately): 701954, 758928, 758922, 758929, or 758921.	—
Measurement lead	758933	1000 Vrms CAT III	1 m in length; for the 720268. Used with the following items (which are sold separately): 701954, 758928, 758922, 758929, or 758921.	—
Alligator clip (dolphin type)	701954	1000 Vrms CAT III	Two pieces in one set (red/black)	—
Safety miniclip (hook type)	758928	1000 Vrms CAT III	Two pieces in one set (red/black)	IM 758928-01EN
Alligator clip adapter	758922	300 Vrms CAT II	Two pieces in one set	—
	758929	1000 Vrms CAT II	Two pieces in one set	—
Fork terminal adapter	758921	1000 Vrms CAT II	Two pieces in one set (red/black). For 4 mm screws.	—
BNC alligator clip*	366926	—	For measuring low voltage of less than or equal to 42 V	—
Banana-alligator clip cable	366961	—	For measuring low voltage of less than or equal to 42 V for the 701261, 701262, 701265, or 720266	—
High-speed logic probe	700986	—	42 V or less, 8 bits, non-isolated, response speed of 1 μ s	—
Isolated logic probe	700987	250 Vrms CAT II	8 bits, each channel isolated, response speed of 20 ms (for AC)	IM 700987-01E
1 m logic probe	702911	—	8 bits, non-isolated	—
3 m logic probe	702912	—	8 bits, non-isolated	—
Isolated logic measurement lead	758917	1000 Vrms CAT II	Two leads in one set. Used with the 758922 or 758929 adapter (sold separately).	—
1 m safety BNC cable	701902	1000 Vrms CAT II	—	—
2 m safety BNC cable	701903	1000 Vrms CAT II	—	—
1 m BNC cable	366924	—	42 V or less	—

Checking the Contents of the Package

Item	Model	Safety Standards	Notes	Manual No.
2 m BNC cable	366925	—	42 V or less	—
Safety BNC-to-banana adapter	758924	500 Vrms CAT II	For the 701250, 720250, 701251, 701255, 720212, 720211	—
16-CH scanner box	701953-L1	—	For the 720221; cable length: 1 m	—
	701953-L3	—	For the 720221; cable length: 3 m	—
	Accessories: Protection cover 1, Protection cover screw 1, Attaching plate 1, Binding screw 2			
Connection cable	705926	—	1 m in length; for connecting the 720221 and 701953	—
	705927	—	3 m in length; for connecting the 720221 and 701953	—
Bridgehead	701955	—	NDIS, bridge resistance: 120 Ω	IM 701955-01E
	701956	—	NDIS, bridge resistance: 350 Ω	
	701957	—	DSUB, bridge resistance: 120 Ω , shunt-cal support	IM 701957-01E
	701958	—	DSUB, bridge resistance: 350 Ω , shunt-cal support	
Plug-on clip	701948	1000 Vrms CAT II	For the 700929/701947	IM 701948-01E
Long test clip	701906	1000 Vrms CAT II	Two pieces in one set (red/black)	IM 701906-01E
Terminal block	A1833JD or A1800JD	—	For the 720220	—
Optical transceiver module	720941	—	1000BASE-SX SFP Module 850 nm	IM 720941-01EN
Optical fiber cord	720942	—	Multi mode optical fiber (LC-LC/3 m)	IM 720942-01EN
Rack mount kit	751542-E4	—	For EIA single mount	IM 751542-E4-01EN
	751542-J4	—	For JIS single mount	IM 751542-J4-01EN
The minimum purchase quantity is 1 piece.				

* Use BNC alligator clips (366926) that YOKOGAWA has been shipping since February 4, 1998. BNC alligator clips (366926) shipped before this date cannot be used in combination with this instrument's input modules.

Group 2

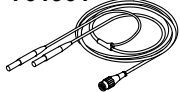
The following accessories by themselves comply with EN standards.

Item	Model	Safety Standards	Notes	Manual No.
10:1 safety probe	700929	1000 Vrms CAT II	For isolated BNCs. For the 720256, 701250, 720250, 701251, 701281, 720281, 720212, 720211, 720254	IM 700929-01E
100:1 safety probe	701947	1000 Vrms CAT II	For isolated BNCs. For the 720256, 701250, 720250, 701251, 720212, 720211, 720254	IM 701947-01E
Current probe	701930 ¹	—	150 Arms, DC to 10 MHz	IM 701930-01E
	701931 ¹	—	500 Arms, DC to 2 MHz	IM 701931-01E
	701932 ¹	—	30 Arms, DC to 100 MHz	IM 701932-01E
	701933 ¹	—	30 Arms, DC to 50 MHz	IM 701933-01E
	701917 ¹	—	5 Arms, DC to 50 MHz	IM 701917-01EN
	701918 ¹	—	5 Arms, DC to 120 MHz	IM 701917-01EN
	702915 ¹	—	0.5, 5, 30 Arms, DC to 50 MHz	IM 702915-01EN
	702916 ¹	—	0.5, 5, 30 Arms, DC to 120 MHz	IM 702915-01EN
Clamp-on probe	720930	300 Vrms CAT III	0 to 50 Arms AC (10 mV/A)	IM 720930-01EN
	720931	600 Vrms CAT III	0 to 200 Arms AC (2.5 mV/A)	IM 720930-01EN
AC/DC Split Core Current Sensor	CT1000S-L03	—	Cable length: 3 m	IM CT1000S-01EN
	CT1000S-L05	—	Cable length: 5 m	
	CT1000S-L10	—	Cable length: 10 m	
10:1 passive probe	701940	—	Non-isolated input on the 701255: 600 V or less, isolated input other than the above: 42 V or less	IM 701940-01E

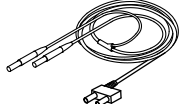
Checking the Contents of the Package

Item	Model	Safety Standards	Notes	Manual No.
10:1 safety probe (wide temperature range type)	702902	1000 V (DC+ACpeak) CAT II	For isolated BNCs. For the 720256, 701250, 720250, 701251, 720212, 720211, 720254	IM 702902-01EN
Differential probe	701977 ^{1, 2}	1000 Vrms CAT III 5000 Vrms and 7000 Vpeak (Measurement Category Other (O))	100:1: 700 Vpeak (500 Vrms) 1000:1:7000 Vpeak (5000 Vrms)	IM 701977-01EN
	701978 ^{1, 2}	1000 Vrms CAT III	50:1: ± 150 V (DC+ACpeak) 500:1: ± 1500 V (DC+ACpeak)	IM 701978-01EN
Conversion cable	701905	—	For the 701977/701978	IM 701905-01EN
Probe power supply	701934	—	High current output power supply for external probes (four outputs)	IM 701934-01E
GPS unit	720940	—	Not sold in some countries.	IM 720940-01EN
The minimum purchase quantity is 1 piece. 1 Used by connecting to a probe power terminal (/P4 or /P8 option) or a probe power supply (701934; sold separately). 2 Can only be used on a 701255 Non-Isolation Module. Can also be used on an isolation module if connected to a 701905 conversion cable (sold separately) and grounded with a GND lead.				

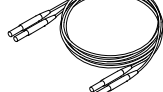
**1:1 BNC safety adapter lead
701901¹**



**1:1 safety adapter lead
701904¹**



**Measurement leads
758933¹**



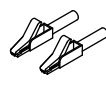
**Alligator clip (dolphin type)
701954**



**Safety miniclip (hook type)
758928**



**Alligator clip adapter
758922**



**Alligator clip adapter
758929**



**Fork terminal adapter
758921**



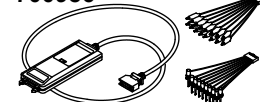
**BNC alligator clip
366926**



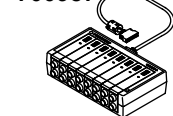
**Banana-alligator clip cable
366961**



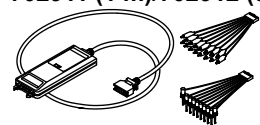
**High-speed logic probe
700986**



**Isolated logic probe
700987**



**Logic probe
702911 (1 m)/702912 (3 m)**



**Isolated logic measurement lead
758917**



**Safety BNC cable
701902(1m)
701903 (2m)**



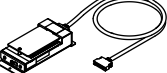
**BNC cable
366924(1m)
366925(2m)**



**Safety BNC-to-banana adapter
758924**



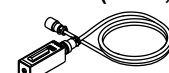
**16-CH scanner box
701953²**



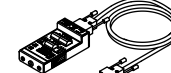
**Connection cable
705926 (1 m)
705927 (3 m)**



**Bridgehead
701955 (NDIS, 120 Ω)
701956 (NDIS, 350 Ω)**

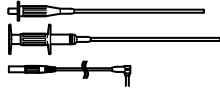


**Bridgehead
701957 (DSUB, 120 Ω)
701958 (DSUB, 350 Ω)**

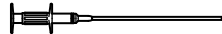


- 1 The 1:1 BNC safety adapter lead (701901), 1:1 safety adapter lead (701904) and the measurement lead (758933) must be used with one of the following accessories (which are sold separately): alligator clip (dolphin type: 701954), safety miniclip (hook type: 758928), alligator adapter (758922 or 758929), or fork terminal adapter (758921).
- 2 The length of the 16-CH scanner box (701953) cable varies depending on the 16-CH scanner box suffix code.

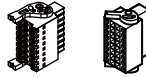
Plug-on clip
701948



Long test clip
701906



Terminal block
A1833JD or
A1800JD



Optical transceiver
module
720941



Optical fiber cord
720942



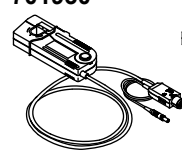
10:1
Safety probe
700929



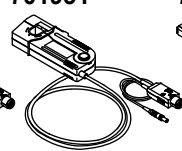
100:1
Safety probe
701947



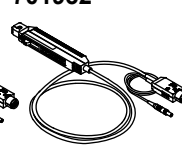
Current probe
701930



Current probe
701931



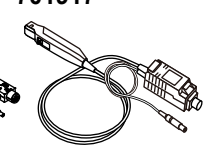
Current probe
701932



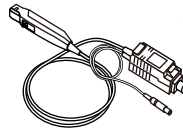
Current probe
701933



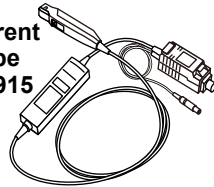
Current probe
701917



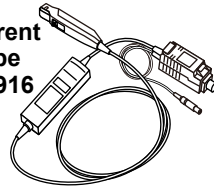
Current probe
701918



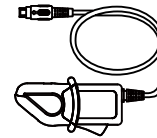
Current
probe
702915



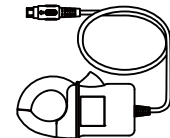
Current
probe
702916



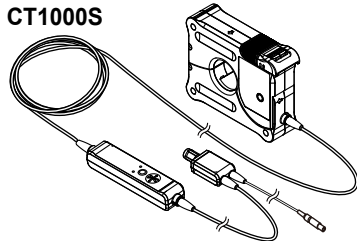
Clamp-on probe
720930



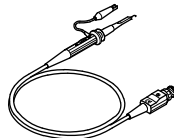
Clamp-on probe
720931



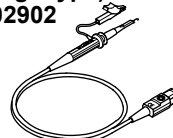
AC/DC split core
current sensor
CT1000S



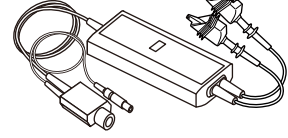
10:1 passive probe
701940



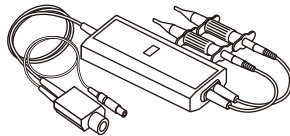
10:1 safety probe
(wide temperature
range type)
702902



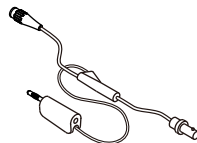
Differential probe
701977



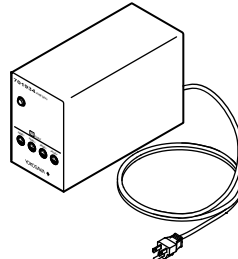
Differential probe
701978



Conversion cable
701905



Probe power supply
701934



GPS unit
720940



Spare Parts (Sold separately)

The following consumables are available for purchase separately. For information about ordering consumables, contact your nearest YOKOGAWA dealer.

Item	Part No.	Minimum Q'ty	Notes
Terminal block	A1833JD or A1800JD	1	For the 720220 input module

Conventions Used in This Manual

Prefixes k and K

Prefixes k and K used before units are distinguished as follows:

k: Denotes 1000. Example: 100 kS/s (sample rate)

K: Denotes 1024. Example: 720 KB (file size)

Displayed Characters

Bold characters in procedural explanations are used to indicate panel keys and soft keys that are used in the procedure and menu items that appear on the screen.

Notes and Cautions

The notes and cautions in this manual are categorized using the following symbols.



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 the proper operation of the instrument.

Safety Precautions

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

This instrument is an IEC protection class I instrument (provided with a terminal for protective earth grounding).

The general safety precautions described herein must be observed during all phases of operation.

If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. 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. 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.

The following symbols are used on this instrument.



Warning: 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.



Risk of electric shock



Protective earth ground or protective earth ground terminal



Ground or the functional ground terminal (do not use as the protective earth ground terminal)



Alternating current



ON (power)



OFF (power)

French



Avertissement: 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.



Risque de choc électrique



Mise à la terre de protection ou borne de mise à la terre de protection



Borne de terre ou borne de terre fonctionnelle (ne pas utiliser cette borne comme prise de terre.)



Courant alternatif



Marche (alimentation)



Arrêt (alimentation)

Failure to comply with the precautions below could lead to injury or death or damage to the instrument.

WARNING

Use the Instrument Only for Its Intended Purpose

This instrument is a waveform measuring device that monitors and measures electrical signals. Do not use this instrument for anything other than as a waveform measuring device.

Check the Physical Appearance

Do not use the instrument if there is a problem with its physical appearance.

Use the Correct Power supply

First, ensure that the source voltage matches the rated supply voltage of the instrument and that it is within the maximum rated voltage of the power cord you will use. Then connect the power cord.

Use the Correct Power Cord and Plug

To prevent electric shock and fire, be sure use the power cord for this instrument. The main power plug must be plugged into an outlet with a protective earth terminal. Do not invalidate this protection by using an extension cord without protective earth grounding. Further, do not use the power cord with other instruments.

Connect the Protective Ground Terminal

To prevent electric shock, make sure to connect the instrument to a protective ground (earth) before turning on the power. A three-prong power cord can be used with this instrument. Connect the power cord to a properly grounded three-prong outlet.

Do Not Impair the Protective Grounding

Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so may result in electric shock or damage to the instrument.

Do Not Use When the Protection Functions Are Defective

Before using this instrument, check that the protection functions, such as the protective grounding and fuse, are working properly. If you suspect a defect, do not use the instrument.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or vapors. Doing so is extremely dangerous.

Do Not Remove the Covers or Disassemble or Alter the Instrument

Only qualified YOKOGAWA personnel may remove the covers and disassemble or alter the instrument. The inside of the instrument is dangerous because parts of it have high voltages.

Ground the Instrument before Making External Connections

Securely connect the protective grounding before connecting to the item under measurement or to an external control circuit. Before touching a circuit, turn off its power and check that it has no voltage.

Precautions to Be Taken When Using the Modules

- Do not apply voltage exceeding the maximum input voltage or maximum rated voltage to ground.
- To avoid electric shock, be sure to ground the instrument.
- To prevent the possibility of electric shock, be sure to fasten the module screws. Otherwise, the electrical and mechanical protection functions will not be activated.
- Avoid continuous connection in an environment where a surge voltage may occur.

Precautions to Be Taken When Using the Probes

- When measuring high voltage with a 720212 (HS200M14), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 720256 (4CH 10M16), or 720254 (4CH 1M16), use an isolation probe (700929, 701947), passive probe (702902), 1:1 safety cable (701901+701954 combination), differential probe (700924, 700925, 701926), or differential probe (701977+701905 combination, 701978+701905 combination).
- Be sure to connect the ground lead of the differential probe (700924, 700925, 701926) to the functional grounding terminal of the instrument before connecting to the measurement target. Not doing so may cause high voltage to appear in the BNC connector of the differential probe.

Safety Precautions

- When using a differential probe (701977, 701978) on an isolation module, before connecting to the DUT, be sure to connect a conversion cable (701905) and connect the GND lead to the functional ground terminal on the front panel of the instrument. Not doing so may cause high voltage to appear in the BNC connector of the differential probe. When you are not connecting a conversion cable (701905), the 701977 and 701978 differential probes can only be used on the 701255 (NONISO_10M12) Non-Isolation Module. Using them on an isolation module without grounding with the GND lead may cause high voltage to appear in the BNC connector of the differential probe.
- When using the 701255 (NONISO_10M12), be sure to fasten the module screws firmly. The protection functions and non-isolation functions are enabled when the module screws are tightened. It is extremely dangerous if you do not fasten the screws. If you want to measure high voltages at 42 V or higher, be sure to use the 701940 passive probe or the 700924, 700925, 701926, 701977 or 701978 differential probe for this instrument.
- The 701940 passive probe has metal BNC parts. If you want to use it for isolated input (e.g., 701250 (HS10M12), 701251 (HS1M16), 720212 (HS200M14)), use it under 42 V for safety reasons. (Do not connect either the high or low side to an electric potential at 42 V or higher.)
For non-isolated input (e.g., 701255 (NONISO_10M12)), fasten the module screws.
- When measuring high voltages using the 720268 (HV (AFF, RMS)), use a measurement lead 758933 or a 1:1 safety adapter lead 701904 and alligator clip 701954.

Measurement Category

The measurement category of this instrument's signal input terminals varies depending on the modules that are installed. Use the instrument within the scope of the measurement category that corresponds to the module specifications. Do not use the instrument outside the scope of the measurement category that corresponds to the module specifications.

Install or Use the Instrument in Appropriate Locations

- Do not install or use the instrument outdoors or in locations subject to rain or water.
- Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

CAUTION

Operating Environment Limitations

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

AVERTISSEMENT**Utiliser l'instrument aux seules fins pour lesquelles il est prévu**

Cet instrument est un appareil de mesure de forme d'onde pour le contrôle et la mesure des signaux électriques. Ne pas utiliser cet instrument à d'autres fins que celles de mesure de forme d'onde.

Inspecter l'apparence physique

Ne pas utiliser l'instrument si son intégrité physique semble être compromise.

Vérifier l'alimentation

Assurez-vous que la tension d'alimentation correspond à la tension d'alimentation nominale de l'appareil et qu'elle ne dépasse pas la plage de tension maximale du cordon d'alimentation à utiliser.

Utiliser le cordon d'alimentation et la fiche adaptés

Pour éviter tout risque de choc électrique, utiliser exclusivement le cordon d'alimentation prévu pour cet instrument. La fiche doit être branchée sur une prise secteur raccordée à la terre. En cas d'utilisation d'une rallonge, celle-ci doit être impérativement reliée à la terre. Par ailleurs, ne pas utiliser ce cordon d'alimentation avec d'autres instruments.

Brancher la prise de terre

Avant de mettre l'instrument sous tension, pour éviter tout choc électrique, veillez à raccorder l'instrument à une mise à la terre de protection. Le cordon d'alimentation à utiliser est un cordon d'alimentation à trois broches. Brancher le cordon d'alimentation sur une prise de courant à trois plots et mise à la terre.

Ne pas entraver la mise à la terre de protection

Ne jamais neutraliser le fil de terre interne ou externe, ni débrancher la borne de mise à la terre. Cela pourrait entraîner un choc électrique ou endommager l'instrument.

Ne pas utiliser lorsque les fonctions de protection sont défectueuses

Avant d'utiliser l'instrument, vérifier que les fonctions de protection, telles que le raccordement à la terre et le fusible, fonctionnent correctement. En cas de dysfonctionnement possible, ne pas utiliser l'instrument.

Ne pas utiliser dans un environnement explosif

Ne pas utiliser l'instrument en présence de gaz et de vapeur inflammables. Cela pourrait être extrêmement dangereux.

Ne pas retirer le capot, ni démonter ou modifier l'instrument

Seul le personnel YOKOGAWA qualifié est habilité à retirer le capot et à démonter ou modifier l'instrument. Certains composants à l'intérieur de l'instrument sont à haute tension et par conséquent, représentent un danger.

Relier l'instrument à la terre avant de le brancher sur des connexions externes

Toujours relier l'instrument à la terre avant de le brancher aux appareils à un circuit de commande externe. Avant de toucher un circuit, mettre l'instrument hors tension et vérifier l'absence de tension.

Précautions à prendre lors de l'utilisation des modules

- Ne pas appliquer une tension dépassant la tension d'entrée maximum ou la tension nominale à la terre maximum.
- Pour éviter tout risque de choc électrique, l'instrument doit impérativement être relié à la terre.
- Pour éviter tout risque de choc électrique, toujours serrer les vis des modules, à défaut de quoi les fonctions de protection électrique et de protection mécanique ne seront pas activées.
- Évitez un branchement continu dans un environnement pouvant être soumis à une surtension.

Précautions à prendre lors de l'utilisation de sondes

- Lors de la mesure de la haute tension avec un 720212 (HS200M14), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 720256 (4CH 10M16), ou 720254 (4CH 1M16), utilisez une sonde d'isolement (700929, 701947), une sonde passive (702902), un câble de sécurité 1:1 (combinaison 701901+701954), une sonde différentielle (700924, 700925, 701926) ou une sonde différentielle (combinaison 701977+701905, combinaison 701978+701905).
- Veiller à connecter le fil de terre de la sonde différentielle (700924, 700925, 701926) à la borne de mise à la terre fonctionnelle de l'instrument avant de le connecter à la cible de mesure. Sinon, une haute tension pourrait causer dans le connecteur BNC de la sonde différentielle. Le fait de ne pas respecter cette consigne risque d'entraîner l'apparition d'une tension élevée au niveau du connecteur BNC de la sonde différentielle.
- Lors de l'utilisation d'une sonde différentielle (701977, 701978) sur un module d'isolation, avant de connecter au DUT, assurez-vous de connecter un câble adaptateur (701905) et connectez le câble GND à la borne de mise à la terre fonctionnelle sur le panneau avant de l'instrument. Dans le cas contraire, une tension élevée peut apparaître dans le connecteur BNC de la sonde différentielle.

Lorsque vous ne raccordez pas de câble adaptateur (701905), les sondes différentielles 701977 et 701978 peuvent seulement être utilisées sur le module non isolant 701255 (NONISO_10M12). Leur utilisation sur un module d'isolation sans mise à la terre avec le fil GND peut provoquer l'apparition d'une haute tension dans le connecteur BNC de la sonde différentielle.

- Lors de l'utilisation du 701255 (NONISO_10M12), veiller à bien serrer les vis du module. Les fonctions de protection et les fonctions de non-isolation sont activées lorsque les vis du module sont serrées. Il est extrêmement dangereux si vous ne serrez pas les vis. Si vous souhaitez mesurer des tensions élevées à 42 V ou plus, veillez à utiliser la sonde passive 701940 ou la sonde différentielle 700924, 700925, 701926, 701977 ou 701978 pour cet instrument.

- La sonde passive 701940 comporte des pièces BNC métalliques. Si vous souhaitez l'utiliser pour une entrée isolée (par exemple, 701250 (HS10M12), 701251 (HS1M16), 720212 (HS200M14)), utilisez-la sous 42 V pour la sécurité. (Ne connectez ni le côté haut ni le côté bas à un potentiel électrique de 42 V ou plus.)
Pour une entrée non-isolée (par exemple, 701255 (NONISO_10M12)), serrez les vis du module.
- Lors de la mesure de hautes tensions avec le 720268 (HV (AFF, RMS)), utiliser un cordon de mesure 758933 ou un cordon adaptateur de sécurité 1: 1 701904 et une pince crocodile 701954.

Catégorie de mesure

La catégorie de mesure de ces bornes d'entrée de signal de l'instrument varie en fonction des modules installés. Utilisez l'instrument dans les limites de la catégorie de mesure qui correspondent aux spécifications du module. N'utilisez pas l'instrument en dehors des limites de la catégorie de mesure qui correspondent aux spécifications du module.

Installer et utiliser l'instrument aux emplacements appropriés

- Ne pas installer, ni utiliser l'instrument à l'extérieur ou dans des lieux exposés à la pluie ou à l'eau.
- Installer l'instrument de manière à pouvoir immédiatement le débrancher du secteur en cas de fonctionnement anormal ou dangereux.

ATTENTION

Limitations relatives à l'environnement opérationnel

Ce produit est un produit de classe A (pour environnements industriels). L'utilisation de ce produit dans une 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

Batteries and Waste Batteries



(EU Battery Directive/Regulation valid only in the EEA and UK Battery Regulation in the UK)

Batteries are included in this product. This marking indicates they shall be sorted out and collected as ordained in the EU battery Directive/Regulation and UK battery Regulation.

Battery type: Lithium battery

When you need to replace batteries, contact your local Yokogawa office in the EEA or UK respectively.

Authorized Representative in the EEA

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.

Environmental Standard*

This instrument complies with the EU RoHS Directive, but it will not comply with the standard if an incompliant module is installed.

For details on modules that do not comply with the EU RoHS Directive, see section 6.14.

* For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office.

關於在台灣銷售

This section is valid only in Taiwan.

關於在台灣所販賣的符合其相關規定的電源線 A1100WD 的限用物質含量信息，請至下麵的網址進行查詢

<https://tmi.yokogawa.com/support/service-warranty-quality/product-compliance/>

Disposal

When disposing of YOKOGAWA products, follow the laws and ordinances of the country or region where the products will be disposed of.

Contents

Manuals	iii
Checking the Contents of the Package.....	iv
Conventions Used in This Manual	xii
Safety Precautions.....	xiii
Regulations and Sales in Various Countries and Regions.....	xx
 Chapter 1 Component Names and Functions	
1.1 SL2000 Main Unit and Input Modules	1-1
1.2 Operation keys and Indicators	1-5
1.3 Display Screen	1-6
1.4 System Configuration.....	1-9
 Chapter 2 Measurement Preparation	
2.1 Handling Precautions.....	2-1
2.2 Installing the Instrument.....	2-3
▲ 2.3 Installing Input Modules	2-8
▲ 2.4 Connecting the Power Supply.....	2-15
2.5 Turning the Power Switch On and Off.....	2-17
▲ 2.6 Connecting Probes.....	2-19
▲ 2.7 Correcting the Probe Phase.....	2-35
▲ 2.8 Connecting Measurement Leads	2-38
▲ 2.9 Connecting Thermocouples	2-42
▲ 2.10 Connecting Bridgeheads.....	2-45
▲ 2.11 Connecting a Logic Probe to the Logic Input Module	2-48
▲ 2.12 Connecting an Acceleration Sensor	2-52
▲ 2.13 Connecting Sensors to the Frequency Module	2-55
▲ 2.14 Connecting Wires to the 16-CH Voltage Input Module.....	2-58
▲ 2.15 Connecting Wires to the 16-CH Temperature/ Voltage Input Module	2-64
▲ 2.16 Connecting a Cable to the CAN Bus Monitor or CAN/CAN FD Bus Monitor Module...	2-69
▲ 2.17 Connecting a Cable to the CAN & LIN Bus Monitor or CAN FD/LIN Monitor Module..	2-71
2.18 Connecting the GPS Unit (/35 option).....	2-73
▲ 2.19 Installing a Optical Transceiver Module and Connecting an Optical Fiber Cord (/C50, /C60 option).....	2-74
 Chapter 3 Waveform Acquisition	
3.1 Displaying Measured Waveforms and Setup Menu	3-1
3.2 Starting and Stopping Waveform Acquisition	3-5
 Chapter 4 External Signal I/O	
▲ 4.1 External Trigger Input (TRIGGER IN)	4-1
▲ 4.2 Trigger Output (TRIGGER OUT).....	4-2
▲ 4.3 External Clock Input (EXT CLK IN)	4-4
▲ 4.4 Sample Clock Output (CLKO)	4-5
▲ 4.5 GO/NO-GO Determination Output (GO/NOGO)	4-7
▲ 4.6 External Start/Stop/Event Input (START/EVENT).....	4-9
▲ 4.7 Video Signal Output (VIDEO OUT (XGA))	4-11
▲ 4.8 IRIG Signal Input (IRIG)/(/C35 option)	4-13
4.9 GPS Signal Input (GPS)/(/C35 option).....	4-14

Chapter 5 Troubleshooting, Maintenance, and Inspection

5.1	If a Problem Occurs	5-1
5.2	Carrying Out Self-Tests	5-2
5.3	Viewing System Information (Overview)	5-4
5.4	Recommended Part Replacement	5-5

Chapter 6 Specifications

6.1	Signal Input Section	6-1
6.2	Scope Mode Features	6-1
6.3	Recorder Mode Features	6-5
6.4	Real Time Math (/G03, /G05, /MT1)	6-7
6.5	Time Axis	6-15
6.6	Display	6-15
6.7	Saving Data	6-15
6.8	PC Data Streaming	6-15
6.9	Multi-Unit Synchronization (/C50)	6-16
6.10	Storage	6-16
6.11	USB Ports for Peripherals	6-17
6.12	Auxiliary I/O Section	6-18
6.13	Computer Interface	6-20
6.14	General Specifications	6-21
6.15	External Dimensions	6-24

Appendix

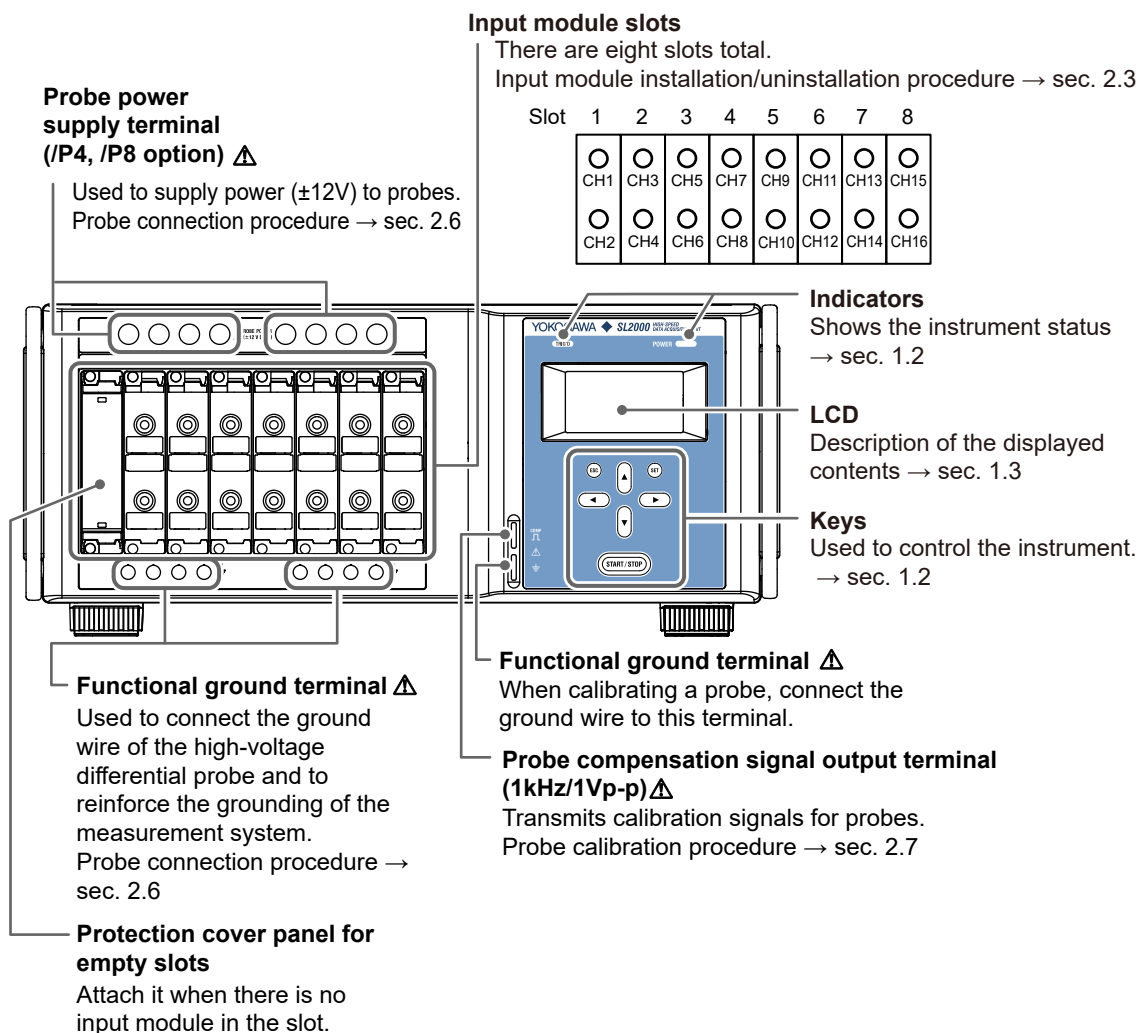
Appendix	Modules' Maximum Input Voltages	App-1
----------	---------------------------------------	-------

Index

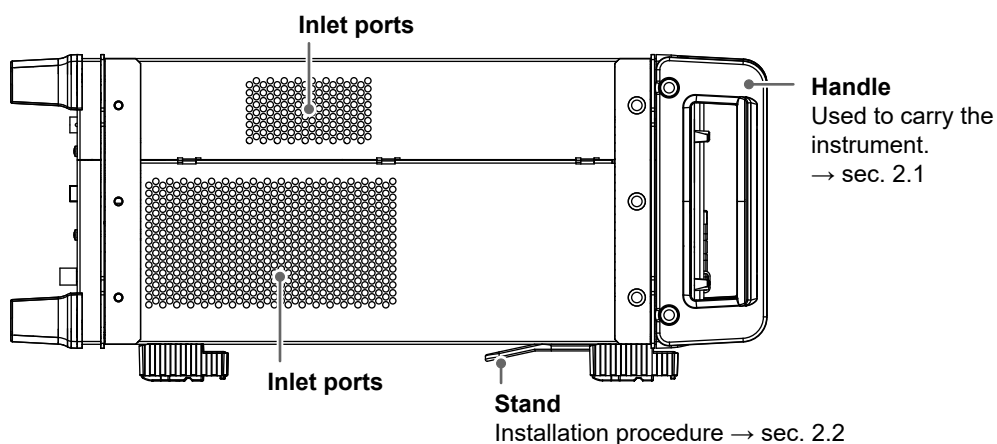
1.1 SL2000 Main Unit and Input Modules

SL2000

Front Panel



Left Side Panel



Rear Panel

SFP+ port

(10GBASE-R) (/C60 option)

Used for 10 Gbps Ethernet communication.
Optical transceiver module installation
procedure and optical fiber cord connection
procedure → sec. 2.19

Manual event input

Receives manual event
signals. → sec. 4.6

External start/stop input

Starts and stops the instrument
using external signals. → sec. 4.6

GO/NO-GO output

Transmits GO/NO-GO
determination output
signals. → sec. 4.5

Sample clock output

Outputs clock signal from the
instrument. → sec. 4.4

SFP port (for multi-unit synchronization)

(/C50 option)

Synchronizes SL2000 or DL950 units
(up to five).
Optical transceiver module installation
procedure and optical fiber cord
connection procedure → sec. 2.19

USB ports for peripherals

Connect a USB keyboard, mouse,
printer, or storage device.
Usage → sec. User's Manual

Functional ground

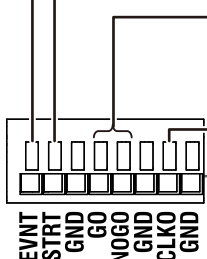
Use this in a noisy environment to
reduce operation errors and adverse
effects on measurements caused by
noise. → sec. 2.2

Power connector

Power connection → sec. 2.4

Power switch

Turns the power on and off
→ sec. 2.5



Video signal output

Outputs displayed
images in XGA format
using RGB signals.
Usage → sec. 4.7

Outlet ports

SD memory card slot

Connect a SD memory card.
Usage → User's Manual

IRIG input

(/C35 option)

Receives sync signals (IRIG
signals) from an external
source.
Usage → sec. 4.8

GPS input (/C35 option)

Receives external GPS signals.
Usage → sec. 2.18

Ethernet port

(1000BASE-T/100BASE-TX/10BASE-T)

Connect to a LAN.
Usage → User's Manual and Communication
Interface User's Manual

Trigger input

Receives external trigger signals.
Usage → sec. 4.1

External clock input

Receives external clock signals.
Usage → sec. 4.3

Trigger output

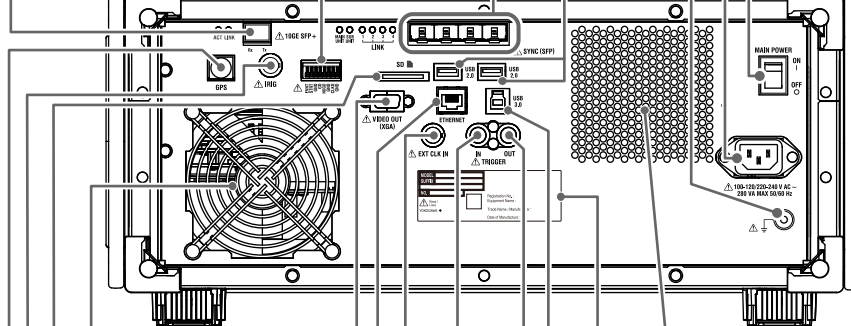
Outputs trigger signals.
Usage → sec. 4.2

Outlet ports

Name plate

USB port for PCs

Connect to a PC with a USB port.
Usage → communication interface
user's manual



Input Module

The following input modules are available.

High-Speed 100 MS/s 12-bit
Isolation Module
HS100M12 (720211)

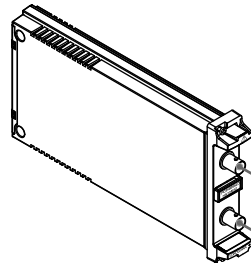
High-Speed 10 MS/s 12-bit
Isolation Module
HS10M12 (701250)

High-Speed High-Resolution
1 MS/s, 16-Bit Isolation Module
HS1M16 (701251)

High-Speed 10 MS/s 12-bit
Non-Isolation Module
NONISO_10M12 (701255)

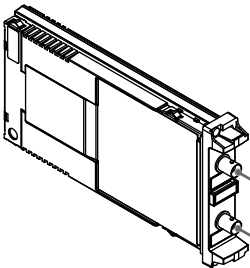
Acceleration/Voltage Module
(with AAF)
ACCL/VOLT (701275)

Frequency Module
FREQ (701281)



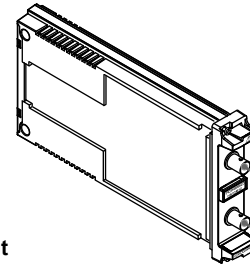
Signal input
terminal
(2ch)

High-Speed 200 MS/s 14-bit
Isolation Module
HS200M14 (720212)



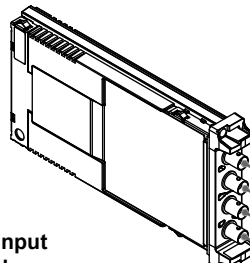
Signal input
terminal
(2ch)

High-Speed 10 MS/s 12-bit
Isolation Module
HS10M12 (720250)



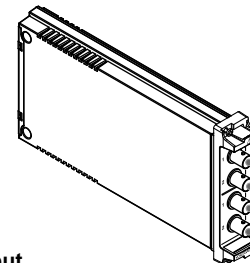
Signal input
terminal
(2ch)

4CH 10MS/s 16bit
Isolation Module
4CH 10M16 (720256)



Signal input
terminal
(4ch)

4-CH, 1 MS/s, 16-Bit
Isolation Module
4CH 1M16 (720254)



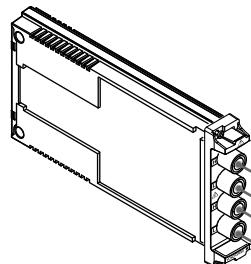
Signal input
terminal
(4ch)

Universal (Voltage/Temp.) Module
UNIVERSAL (701261)

Universal (Voltage/Temp.)
Module (with AAF)
UNIVERSAL (AAF) (701262)

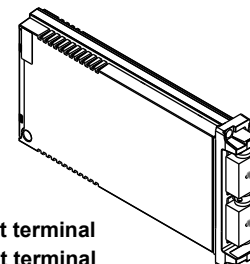
Temperature, High Precision Voltage
Isolation Module
TEMP/HPV (701265, 720266)

High-Voltage 1 MS/s 16-Bit
Isolation Module
(with AAF and RMS)
HV (AAF, RMS) (720268)

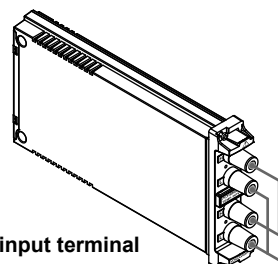


H input terminal
L input terminal
(2ch)

16-CH Voltage Input Module
16CH VOLT (model: 720220)



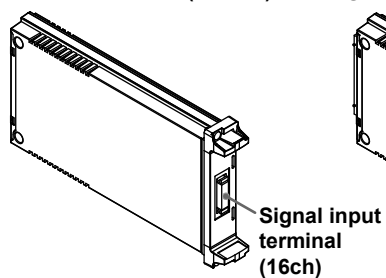
Signal input terminal
(16ch)



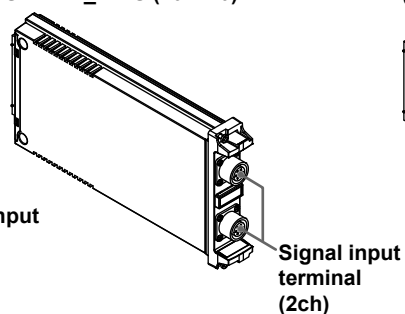
H input terminal
L input terminal
(2ch)

1.1 SL2000 Main Unit and Input Modules

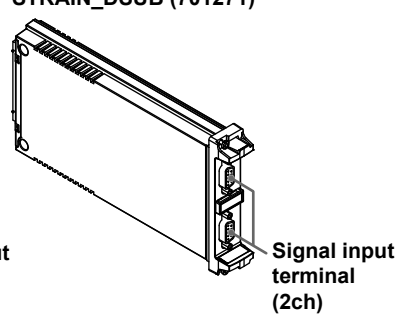
**16-CH Temperature/Voltage
Input Module**
16CH TEMP/VOLT (720221)



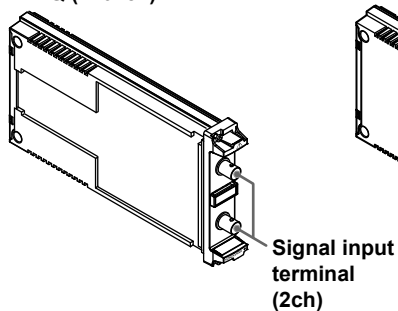
**Strain Module
(NDIS)**
STRAIN_NDIS (701270)



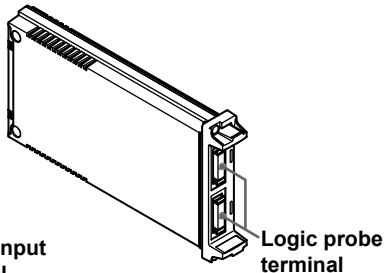
**Strain Module
(DSUB, shunt-cal support)**
STRAIN_DSUB (701271)



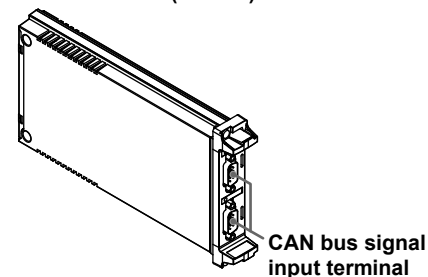
Frequency Module
FREQ (720281)



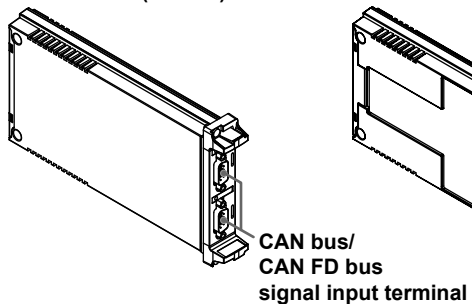
Logic Input Module
LOGIC (720230)



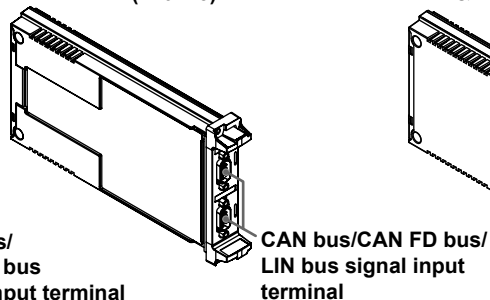
CAN Bus Monitor Module
CAN MONITOR (720240)



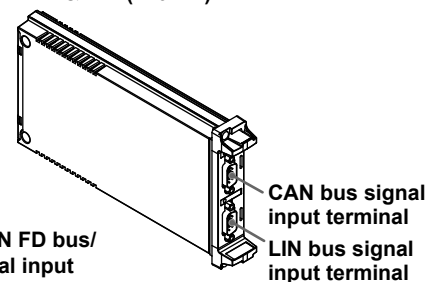
CAN/CAN FD Monitor Module
CAN/CAN FD (720242)



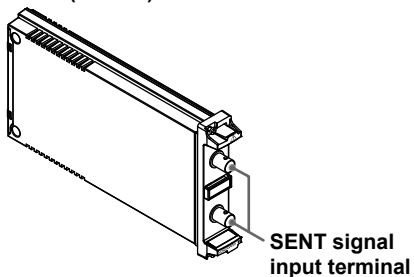
CAN FD/LIN Monitor Module
CAN FD/LIN (720245)



CAN & LIN Bus Monitor Module
CAN & LIN (720241)



SENT Monitor Module
SENT (720243)



1.2 Operation keys and Indicators

Indicators

POWER indicator

The power supply state is indicated.

- On: Power supply on
- Off: Power supply off

TRIG'D indicator

The trigger status is indicated.

- On: Trigger activated
- Off: Trigger not activated



Menu Operation and Waveform Acquisition Start/Stop

ESC Key

Use this key to cancel settings and return to a menu one level higher.

SET Key

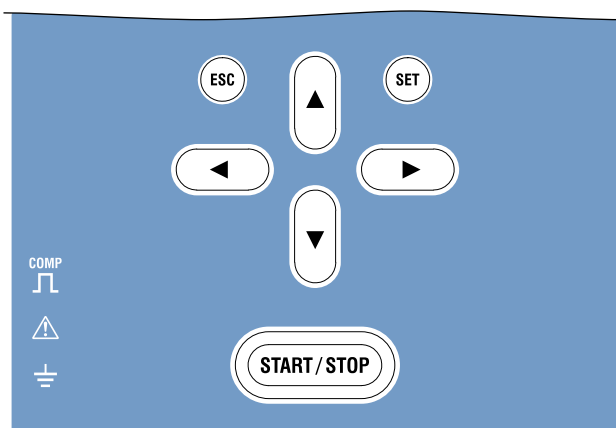
Confirms menu item selection states and settings.

Arrow Keys (▲▼▶◀ keys)

Use the ▶◀ keys to switch the display screen. Use the ▲▼ keys to select a menu item or scroll the screen. When entering numeric values, use the ▶◀ keys to move the digit (cursor) left or right and the ▲▼ keys to increase or decrease the value to be entered.

START/STOP Key

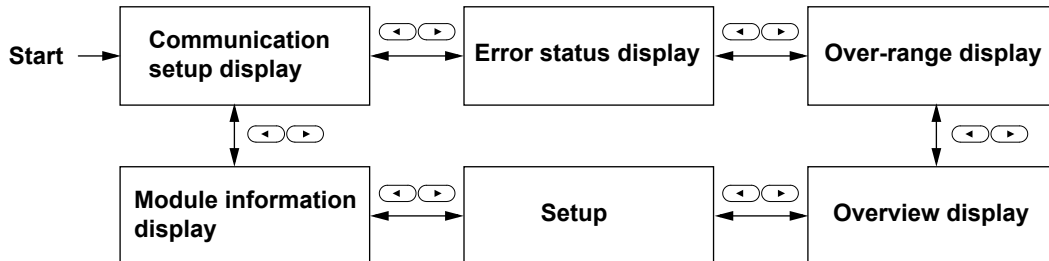
Starts and stops waveform acquisition according to the trigger mode. The key is illuminated while the instrument is acquiring waveforms.



1.3 Display Screen

Switching the Display Screen

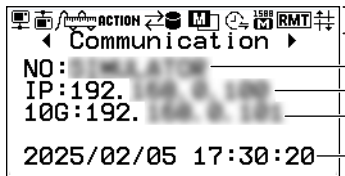
The LCD screen of this instrument displays the following six types of screens. Press the arrow keys (▶/◀) to switch the screen. At startup, the screen for communication setup display appears.



Display Screen

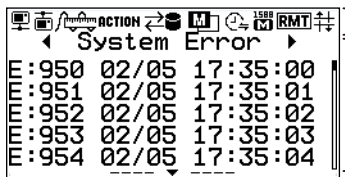
Communication Setup Display

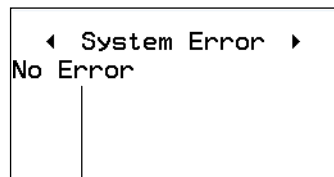
Displays the instrument number, IP address, and date and time of the instrument.

	Status indication
NO: 192.168.1.1	Instrument number
IP: 192.168.1.1	IP address (1G)
10G: 192.168.1.1	IP address (10G) (/C60 option)
2025/02/05 17:30:20	Date and time

Error Status Display

Displays the message code (E: error, I: information) and the date and time of occurrence. If there is no error information, “No Error” is displayed. Press the arrow keys (▲/▼) to scroll the screen.

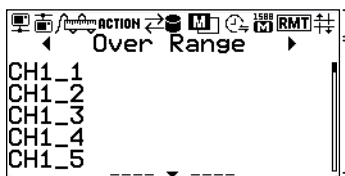
	Status indication
E: 950 02/05 17:35:00	Message code, time of occurrence
E: 951 02/05 17:35:01	
E: 952 02/05 17:35:02	
E: 953 02/05 17:35:03	
E: 954 02/05 17:35:04	

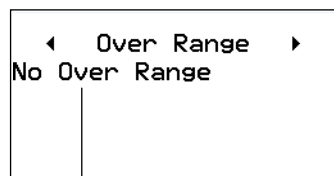

--

When there is no error information

Over-Range Display

Displays channels in an over-range state. If there are no over-range channels, “No Over Range” is displayed. Press the arrow keys (▲/▼) to scroll the screen.

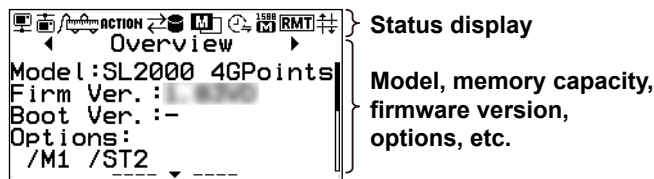
	Status indication
CH1_1	Channels in over-range state
CH1_2	
CH1_3	
CH1_4	
CH1_5	


--

When there are no over-range channels

Overview Display

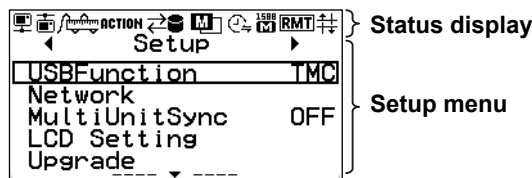
Displays information about the instrument, such as memory capacity and firmware version.
Press the arrow keys (▲/▼) to scroll the screen.



Setup

Displays the following setup menu.

- USB communication function settings (USBFunction)
- Ethernet communication settings (Network)
- Multi-unit synchronization settings (MultiUnitSync) (/C50 option)
- LCD settings (LCD Setting)
- Update (Upgrade)
- Self-test (SelfTest)



How to Operate Setup Menus

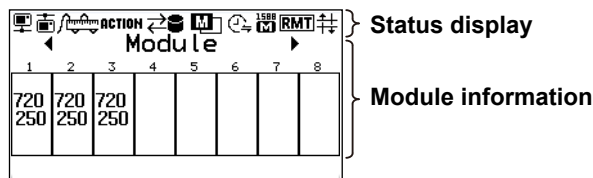
1. Press the arrow keys (▲/▼) to select a menu item.
2. Press **SET** to confirm the selection.
Press **ESC** to return to the previous state.
3. To set a numeric value, use the arrow keys (▶/◀) to move the cursor and the arrow keys (▲/▼) to set the value. Press **ESC** to cancel the setting and return to the previous state.

Note

- For details on how to operate setup menus, see the User's Manual.
- For details on the self-test, see section 5.2.

Module Information Display

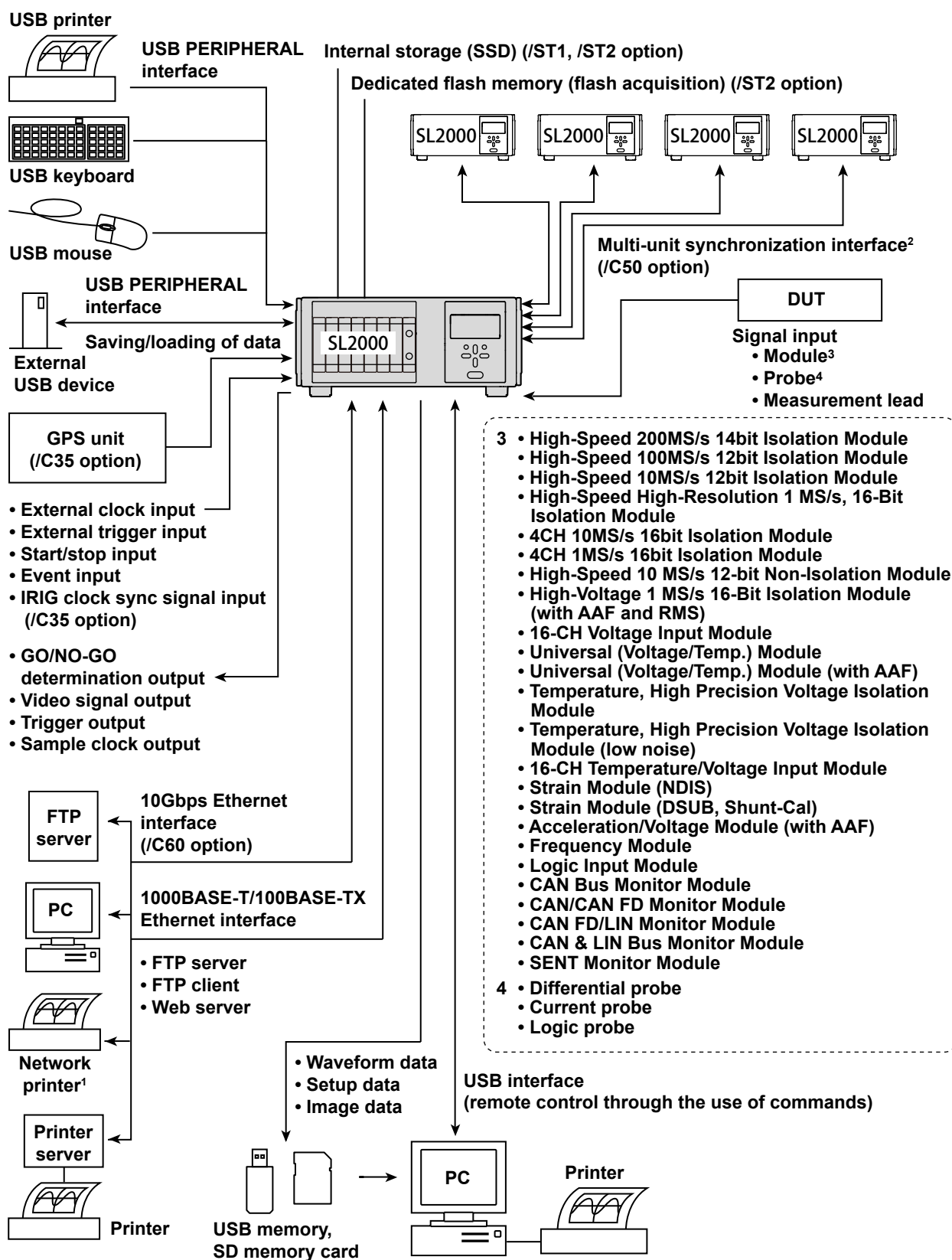
Displays the module models installed in slots 1 to 8.



Status Display

Icon Display	Description
	Illuminates when the instrument is connected to a network drive.
	Illuminates when the instrument is connected to an FTP client.
	Blinks while automated measurement of waveform parameters or waveform search is in progress.
	Blinks when files are being accessed.
	Blinks when printing is in progress.
	Blinks when waveforms are being recorded using SSD recording (ST1, /ST2 option) or flash acquisition (/ST2 option).
ACTION	Blinks when an action is in progress.
	Blinks when math and FFT waveforms are being computed.
	Illuminates when the input signal is over-range. Over-range channels can be identified by the channel number shown to the right of the icon.
RMT	Illuminates in remote mode.
	Displays the time synchronization state. Each of the icons illuminates respectively when a sync signal is being received (Lock), when time synchronization is established (Stable), and when time synchronization is not established (UnLock).
	Displays the instrument status multi-unit synchronization operation (/C50 option). Each of the icons illuminates respectably when the instrument is running as a main or sub unit.
	Illuminates when the instrument is a IEEE1588 master (/C40 option).

1.4 System Configuration



1 10Gbps Ethernet is not supported.

2 Multi-unit synchronization is also possible with DL950 ScopeCorders (/C50 option).

2.1 Handling Precautions

Safety Precautions

If you are using this instrument for the first time, make sure to thoroughly read the safety precautions given on page xiii.

Do Not Remove the Case

Do not remove the case from the instrument. Some sections inside the instrument have high voltages and are extremely dangerous. For internal inspection and adjustment, contact your nearest YOKOGAWA dealer.

Unplug If Abnormal Behavior Occurs

If you notice smoke or unusual odors coming from the instrument, immediately turn off the power and unplug the power cord. Then, contact your nearest YOKOGAWA dealer.

Do Not Damage the Power Cord

Nothing should be placed on top of the power cord, and it should be kept away from any heat sources. When removing the plug from the power outlet, do not pull on the cord. Pull from the plug. If the power cord is damaged or if you are using the instrument in a location where the power supply specifications are different, purchase a power cord that matches the specifications of the region that the instrument will be used in.

Operating Environment and Conditions

This instrument complies with the EMC standard under specific operating environment and operating conditions. If the installation, wiring, and so on are not appropriate, the compliance conditions of the EMC standard may not be met. In such cases, the user will be required to take appropriate measures.

General Handling Precautions

Do Not Place Objects on Top of the Instrument

Never place other instruments or objects containing water on top of the instrument, otherwise a breakdown may occur.

Do Not Apply Shock or Vibration

Do not apply shock or vibration. Doing so may damage the instrument. Applying shock to the input connectors, probes, and the like, can cause electrical noise to enter the instrument through the signal lines.

Do Not Damage the LCD

Because the LCD is very vulnerable and can be easily scratched, do not allow any sharp objects near it. Also it should not be exposed to vibrations and shocks.

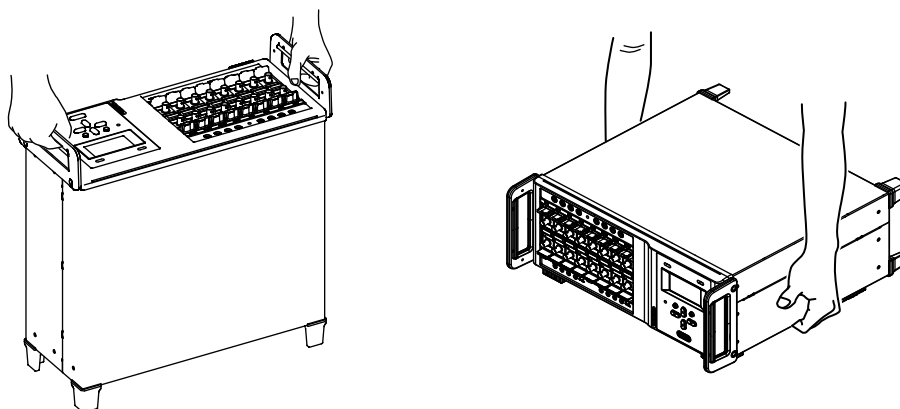
Unplug during Extended Non-Use

Unplug the power cord from the outlet.

2.1 Handling Precautions

When Carrying the Instrument

Remove the power cord and connecting cables. When carrying the instrument, use the handle as shown in the following figure, or use both hands to hold the instrument firmly.



WARNING

When you carry the instrument, be careful not to get your hand caught between the wall, installation surface, or other objects and the instrument.

French

AVERTISSEMENT

Lorsque vous déplacez l'instrument, veillez à ne pas vous coincer la main entre l'instrument et le mur, la surface d'installation ou tout autre objet.

When Cleaning the Instrument

When cleaning the case or the operation panel, first remove the power cord from the outlet, and then wipe with a dry, soft, clean cloth. Do not use chemicals such as benzene or thinner. These can cause discoloring and deformation.

2.2 Installing the Instrument

WARNING

- Do not install the instrument outdoors or in locations subject to rain or water.
- Install the instrument so that you can immediately remove the power cord if an abnormal or dangerous condition occurs.

CAUTION

If you block the inlet or outlet holes on the instrument, it will become hot and may break down.

French

AVERTISSEMENT

- Ne pas installer l'instrument à l'extérieur ou dans des endroits exposés à la pluie ou à l'eau.
- Installer l'instrument de manière à pouvoir immédiatement le débrancher du secteur en cas de fonctionnement anormal ou dangereux.

ATTENTION

Ne pas boucher les orifices d'entrée ou de sortie de l'instrument pour éviter toute surchauffe et panne éventuelle.

Installation Conditions

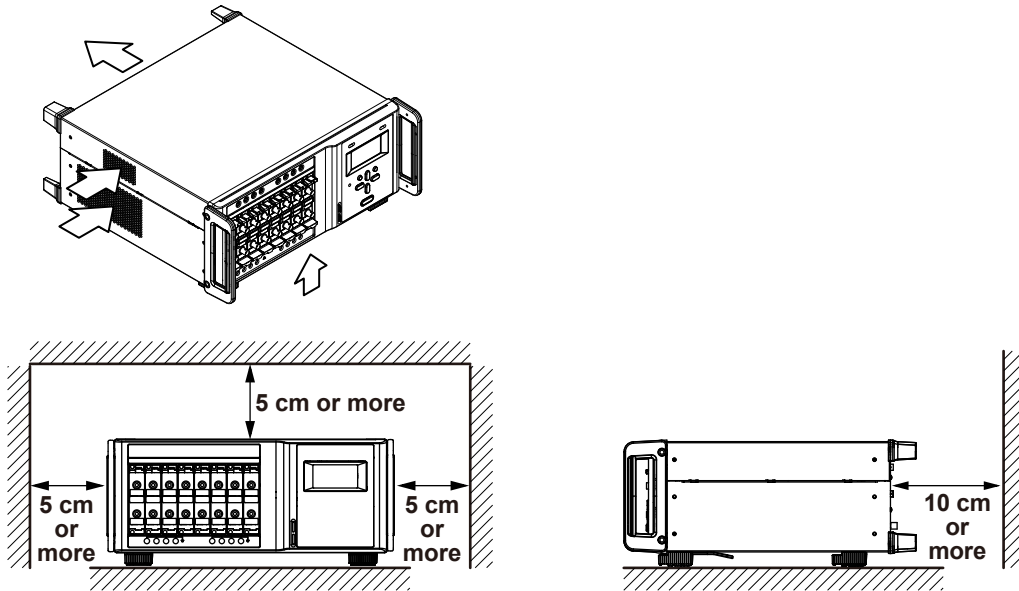
Install the instrument in a place that meets the following conditions.

Flat, Even Surface

Install the instrument in the correct orientation (see page 2-5) in a safe place, with no tilting from front to back or left to right. However, tilted installation using the stand is allowed.

Well-Ventilated Location

There are inlet ports on the left side panel and bottom panel of the instrument. In addition, there are outlet ports for the cooling fan on the rear panel. To prevent internal overheating, allow for enough space around the instrument (see the figure below), and do not block the inlet and outlet holes.



When connecting cables, allow for enough space, above and beyond the space shown in the figure above, to carry out the procedure.

Ambient Temperature and Humidity

Ambient temperature: 5 to 40 °C

Ambient humidity: 20 to 80 % RH; no condensation

Note

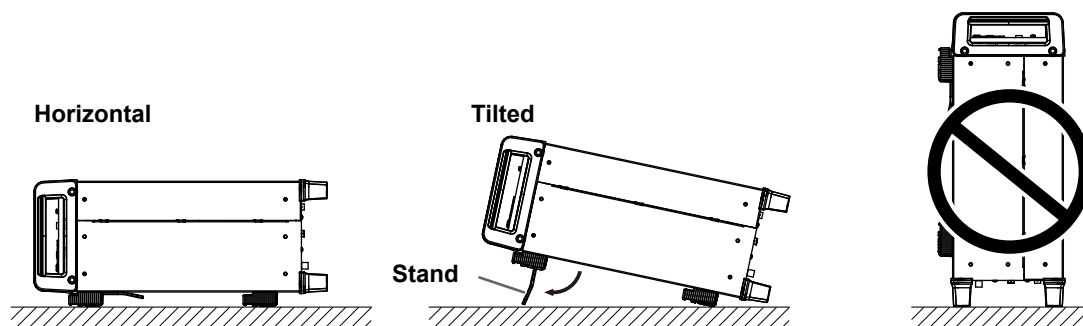
- To ensure high measurement accuracy, operate the instrument in the $23 \pm 5^\circ\text{C}$ temperature range and 20 to 80% RH.
- Condensation may occur if the instrument is moved to another place where the ambient temperature or humidity is higher, or if the temperature changes rapidly. In such cases, allow the instrument adjust to the new environment for at least an hour before using the instrument.

Do not install the instrument in the following places.

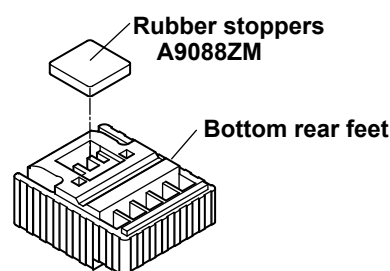
- Outdoors
- In direct sunlight or near heat sources
- Where the instrument is exposed to water or other liquids
- Where an excessive amount of soot, steam, dust, or corrosive gas is present.
- Near strong electromagnetic field sources
- Near high voltage equipment or power lines
- Where the level of mechanical vibration is high
- On an unstable surface

Installation Orientation

- As shown in the following figure, horizontal installation, and tilted installation are possible.
- When deploying the stand, push it out until it locks into place. To fold the stand, push it inward while returning it to its original position.
- When installing the instrument on a slippery surface, attach the included rubber stoppers (2 pcs.) to the rear feet at the bottom of the instrument.



Rubber Stoppers



WARNING

- To prevent fire, never use the instrument with the rear panel facing down. There are outlet ports for the cooling fan on the rear panel. Placing the instrument with the rear panel facing down may cause a fire when the instrument malfunctions.
- When you fold the stand, be careful not to get your hand caught between the stand and the instrument.
- Handling the stand without firmly supporting the instrument can be dangerous. Please take the following precautions.
 - Only handle the stand when the instrument is on a stable surface.
 - Do not handle the stand when the instrument is tilted.
- Do not place the instrument in any position other than those shown in the above figures. Also, do not stack the instrument.

CAUTION

Do not apply excessive force or shock to the stand. Doing so may break the stand support.

French

AVERTISSEMENT

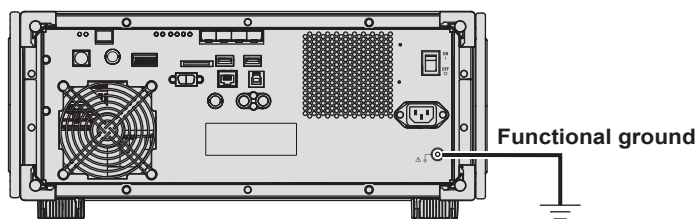
- Pour éviter un incendie, n'utilisez jamais l'instrument avec le panneau arrière orienté vers le bas. Des orifices de sortie pour le ventilateur de refroidissement se trouvent sur le panneau arrière. Si l'instrument est placé avec le panneau arrière orienté vers le bas, cela peut causer un incendie lorsque l'instrument ne fonctionne pas correctement.
 - Lorsque vous repliez le support, faites attention à ne pas vous coincer la main entre le support et l'instrument.
 - Il peut être dangereux de tenir le support sans soutenir l'instrument fermement. Veuillez à observer les précautions suivantes.
 - Manipulez le support uniquement lorsque l'instrument est sur une surface stable.
 - Ne manipulez pas le support lorsque l'instrument est incliné.
 - Ne pas placer l'instrument dans des positions autres celles indiquées ci-dessus. Ne pas empiler l'instrument.
-

ATTENTION

Évitez d'appliquer une force excessive ou des chocs sur le support. Le système de soutien du support peut se casser.

Functional Ground

If you use this instrument in a noisy environment, measurement results may be affected by the noise, or interface communication may not operate properly. These problems may be alleviated by connecting the functional ground terminal to ground.



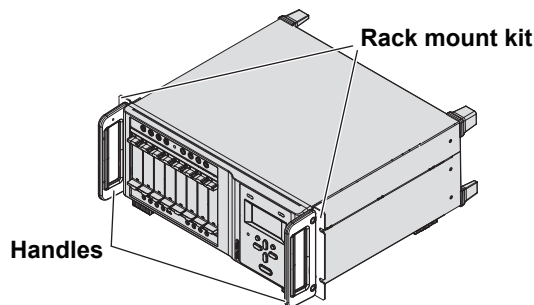
Rack Mounting

To mount the instrument on a rack, use a rack mount kit (sold separately).

Item	Model	Notes
Rack mount kit	751542-E4	For EIA
Rack mount kit	751542-J4	For JIS

The rack mount kit can be installed on either the front or rear panel side. A summary of the procedure for mounting the instrument on a rack is given below. For detailed instructions, see the manual that is included with the rack mount kit.

Example of mounting on front panel side



1. Remove the four feet from the bottom of the instrument.
Do not remove the handles. The fixing screws for the handles are glued to prevent them from coming off.
2. Remove the seal covers from the rack mount mounting holes on both sides of the instrument.
3. Place stickers in the bottom leg holes.
4. Attach the rack mount kit to the instrument.
5. Mount the instrument on a rack.

Note

- Rack mount in the following manner to prevent internal heating.
 - Leave at least 1U or 50 mm of clearance on the bottom side and at least 100 mm of clearance on the rear side between the inlet and outlet ports and the installation surface.
 - Do not allow warm air from surrounding equipment to hit this instrument.
- Make sure to provide adequate support from the bottom. The support should not block the inlet and outlet ports.
- You can perform a self-test to confirm that the instrument's internal temperature is within the appropriate range (see Section 5.2).

2.3 Installing Input Modules



WARNING

- To prevent electric shock and damage to the instrument, be sure to turn the power off before you install or remove input modules.
- Check that the input cable is not connected to the input terminals before installing or removing the input module.
- To prevent electric shock, be sure to attach the supplied cover panels to unused slots. This is also necessary as using the instrument without the cover panels allows dust to enter the instrument, which may cause a malfunction due to internal overheating.
- If the input module happens to come out of the slot while it is in use, it may cause electric shock or cause damage to the instrument as well as the input module. Make sure to screw the input module in place at the two locations (top and bottom).
- There are protrusions in the slot. Do not put your hand in the slot. If you put your hand in the slot, the protrusions may cut your hand.
- Use the accessories of this product within the rated range of each accessory (see page viii). When using several accessories together, use them within the specification range of the accessory with the lowest rating.

Precautions to Be Taken When Using the Modules

- Do not apply voltage exceeding the maximum input voltage or maximum rated voltage to ground.
- To avoid electric shock, be sure to ground the instrument.
- To prevent the possibility of electric shock, be sure to fasten the module screws. Failing to do so is extremely dangerous because the electrical and mechanical protection functions will not be activated.
- Avoid continuous connection in an environment where a surge voltage may occur.
- When measuring high voltage with a 720212 (HS200M14), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 720256 (4CH 10M16), or 720254 (4CH 1M16), use an isolation probe (700929, 701947), passive probe (702902), 1:1 safety cable (701901+701954 combination), differential probe (700924, 700925, 701926), or differential probe (701977+701905 combination, 701978+701905 combination).
- Be sure to connect the ground lead of the differential probe (700924, 700925, 701926) to the functional grounding terminal of the instrument before connecting to the measurement target. Not doing so may cause high voltage to appear in the BNC connector of the differential probe.
- When using a differential probe (701977, 701978) on an isolation module, before connecting to the DUT, be sure to connect a conversion cable (701905) and connect the GND lead to the functional ground terminal on the front panel of the instrument. Not doing so may cause high voltage to appear in the BNC connector of the differential probe. When you are not connecting a conversion cable (701905), the 701977 and 701978 differential probes can only be used on the 701255 (NONISO_10M12) Non-Isolation Module. Using them on an isolation module without grounding with the GND lead may cause high voltage to appear in the BNC connector of the differential probe.
- The protection functions and non-isolation functions of the 701255 (NONISO_10M12) are enabled when the module screws are tightened. It is extremely dangerous if you do not fasten the screws. If you want to measure high voltages at 42 V or higher, be sure to use the 701940 passive probe or the 700924, 700925, 701926, 701977 or 701978 differential probe for this instrument.
- The 10 MHz 701940 passive probe has metal BNC parts. If you want to use it for isolated input (e.g., 720256 (4CH 10M16), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 701275 (ACCL/VOLT), 701281 (FREQ), 720281 (FREQ), 720212 (HS200M14), 720211 (HS100M12), 720254 (4CH 1M16)), use it under 42 V for safety reasons. (Do not connect either the high or low side to an electric potential at 42 V or higher.)
- When measuring high voltages using the 720268 (HV (AAF, RMS)), use a measurement lead 758933 or 701904 and alligator clip 701954.
- To measure high voltage with the 701281 (FREQ) or 720281 (FREQ), use an isolated probe (700929, 701947) or passive probe 702902.

- The protection functions and non-isolation functions of the 720230 (LOGIC) are enabled when the module screws are tightened. It is extremely dangerous if you do not fasten the screws. Also, be sure to only use one of the recommended YOKOGAWA logic probes (700986, 700987, 702911, or 702912) with the logic module.

French



AVERTISSEMENT

- Pour éviter tout risque de choc électrique et d'endommagement de l'instrument, veiller à mettre l'instrument hors tension avant d'installer ou de retirer des modules d'entrée.
- Avant d'installer ou de retirer des modules d'entrée, vérifier que le câble d'entrée n'est pas connecté aux bornes d'entrée.
- Pour éviter le choc électrique, veiller à fixer les panneaux de couverture fournis dans les fentes inutilisées.
Cela est également nécessaire car l'utilisation de l'instrument sans les panneaux de couverture permet à la poussière de pénétrer dans l'instrument, ce qui pourrait causer un dysfonctionnement à cause d'une surchauffe interne.
- Si le module d'entrée venait à sortir de son slot pendant son utilisation, cela pourrait entraîner un choc électrique ou endommager l'instrument et le module d'entrée. Veiller à bien visser le module d'entrée aux deux emplacements prévus (haut et bas).
- Les sots présentent des rebords en saillie. Ne pas insérer les doigts dans les slots, car les saillies pourraient vous blesser.
- Utilisez les accessoires de ce produit en fonction des valeurs nominales de chacun (reportez-vous à la page viii). Lorsque vous employez plusieurs accessoires en même temps, utilisez les valeurs de l'accessoire ayant les valeurs nominales les plus faibles.

Précautions à prendre lors de l'utilisation des modules

- Ne pas appliquer une tension dépassant la tension d'entrée maximum ou la tension nominale à la terre maximum.
- Pour éviter tout risque de choc électrique, l'instrument doit impérativement être relié à la terre.
- Pour éviter tout risque de choc électrique, toujours serrer les vis des modules, à défaut de quoi les fonctions de protection électrique et de protection mécanique ne seront pas activées.
- Évitez un branchement continu dans un environnement pouvant être soumis à une surtension.
- Lors de la mesure de la haute tension avec un 720212 (HS200M14), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 720256 (4CH 10M16), ou 720254 (4CH 1M16), utilisez une sonde d'isolement (700929, 701947), une sonde passive (702902), un câble de sécurité 1:1 (combinaison 701901+701954), une sonde différentielle (700924, 700925, 701926) ou une sonde différentielle (combinaison 701977+701905, combinaison 701978+701905).
- Veiller à connecter le fil de terre de la sonde différentielle (700924, 700925, 701926) à la borne de mise à la terre fonctionnelle de l'instrument avant de le connecter à la cible de mesure. Sinon, une haute tension pourrait causer dans le connecteur BNC de la sonde différentielle. Le fait de ne pas respecter cette consigne risque d'entraîner l'apparition d'une tension élevée au niveau du connecteur BNC de la sonde différentielle.
- Lors de l'utilisation d'une sonde différentielle (701977, 701978) sur un module d'isolation, avant de connecter au DUT, assurez-vous de connecter un câble adaptateur (701905) et connectez le câble GND à la borne de mise à la terre fonctionnelle sur le panneau avant de l'instrument. Dans le cas contraire, une tension élevée peut apparaître dans le connecteur BNC de la sonde différentielle.
Lorsque vous ne raccordez pas de câble adaptateur (701905), les sondes différentielles 701977 et 701978 peuvent seulement être utilisées sur le module non isolant 701255 (NONISO_10M12). Leur utilisation sur un module d'isolation sans mise à la terre avec le fil GND peut provoquer l'apparition d'une haute tension dans le connecteur BNC de la sonde différentielle.
- Lors de l'utilisation du 701255 (NONISO_10M12), veillez à serrer les vis du module. Le serrage des vis de module active la fonction de protection et celle de non-isolation. Il est extrêmement dangereux si vous ne serrez pas les vis. Si vous souhaitez mesurer des tensions élevées à 42 V ou plus, veillez à utiliser la sonde passive 701940 ou la sonde différentielle 700924, 700925, 701926, 701977 ou 701978 pour cet instrument.

2.3 Installing Input Modules

- La sonde passive 10 MHz 701940 comporte des pièces BNC métalliques. Si vous souhaitez l'utiliser pour une entrée isolée (par exemple, 720256 (4CH 10M16), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 701275 (ACCL / VOLT), 701281 (FREQ), 720281 (FREQ), 720212 (HS200M14), 720211 (HS100M12), 720254 (4CH 1M16)), utilisez-le sous 42 V pour la sécurité. (Ne connectez ni le côté haut ni le côté bas à un potentiel électrique de 42 V ou plus.)
- Lors de la mesure de hautes tensions avec le 720268 (HV (AAF, RMS)), utiliser un cordon de mesure 758933 ou 701904 et une pince crocodile 701954.
- Pour mesurer la tension élevée avec 701281 (FREQ) ou 720281 (FREQ), utiliser une sonde isolée (700929, 701947) ou une sonde passive 702902.
- Les fonctions de protection et les fonctions de non-isolation de 720230 (LOGIC) sont activées lorsque les vis du module sont serrées. Il est extrêmement dangereux si vous ne serrez pas les vis. S'assurer également de bien utiliser uniquement une sonde logique YOKOGAWA recommandée (700986, 700987, 702911 ou 702912) avec le module logique.

Types of Input Modules

The following types of input modules are available.

Name	Model
High-Speed 200 MS/s 14-bit Isolation Module	720212(HS200M14)
High-Speed 100 MS/s 12-bit Isolation Module	720211(HS100M12)
High-Speed 10 MS/s 12-bit Isolation Module ¹	701250(HS10M12)
High-Speed 10 MS/s 12-bit Isolation Module	720250(HS10M12)
High-Speed High-Resolution 1 MS/s, 16-Bit Isolation Module	701251(HS1M16)
4CH 10MS/s 16bit Isolation Module	720256(4CH10M16)
4CH 1MS/s 16bit Isolation Module	720254(4CH 1M16)
High-Speed 10 MS/s 12-bit Non-Isolation Module	701255(NONISO_10M12)
High-Voltage 1 MS/s 16-Bit Isolation Module (with AAF and RMS)	720268(HV(AAF, RMS))
16-CH Voltage Input Module	720220(16CH VOLT)
Universal (Voltage/Temp.) Module	701261(UNIVERSAL)
Universal (Voltage/Temp.) Module (with AAF)	701262(UNIVERSAL(AAF))
Temperature, High Precision Voltage Isolation Module	701265(TEMP/HPV)
Temperature, High Precision Voltage Isolation Module (low noise)	720266(TEMP/HPV)
16-CH Temperature/Voltage Input Module	720221(16CH TEMP/VOLT)
Strain Module (NDIS)	701270(STRAIN_NDIS)
Strain Module (DSUB, Shunt-Cal)	701271(STRAIN_DSUB)
Acceleration/Voltage Module (with AAF)	701275(ACCL/VOLT)
Frequency Module ¹	701281(FREQ)
Frequency Module	720281(FREQ)
Logic Input Module	720230(LOGIC)
CAN Bus Monitor Module ^{1, 2}	720240(CAN MONITOR)
CAN/CAN FD Monitor Module ^{1, 2}	720242(CAN/CAN FD)
CAN FD/LIN Monitor Module ²	720245(CAN FD/LIN)
CAN & LIN Bus Monitor Module ^{1, 2}	720241(CAN & LIN)
SENT Monitor Module ²	720243(SENT)

For details on the standard compliance of each module, see section 6.14.

¹ Discontinued.

² CAN bus, CAN/CAN FD monitor, CAN FD/LIN monitor, CAN & LIN bus monitor, and SENT monitor modules can be used on models with the /VCE option.

Note

Input modules 701250 and 701255 that have been shipped between August 2006 and July 2007 can be used with this instrument only if the input modules have already been updated. If error code 916 appears when you turn the instrument on, the firmware of the input module is not up to date.

Orders (paid service) for updating the above input modules are no longer being accepted as of June 2019.

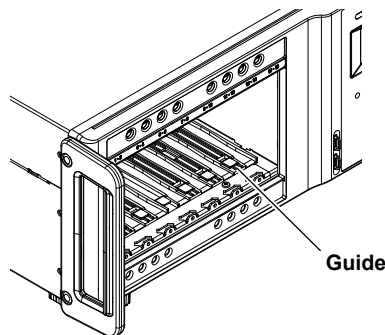
Precautions to Be Taken When Installing or Removing Input Modules

If you replace one installed input module with another, the settings for the channel will be reset to their defaults when the power is turned on. If you want to keep the settings, specify a save destination and save them.

Installation Procedure of Modules

1. Make sure that the instrument's power switch is turned off.
2. Check the channel number displayed on the input module installation slot on the front panel of the instrument, and then install the input module along the guide.

Holding the handles on the top and bottom of the input module, press hard until it clicks in place. If there is a cover panel on the slot in which to install the module, remove the cover panel, first.



3. Firmly fasten the screws at top and bottom of the input module to fix the module in place. Screw tightening torque: 0.6 N·m
4. Turn on the instrument's power switch.
5. On the module information screen, check that the name of the input module that you installed is displayed correctly at the appropriate slot. If it is not correct, remove the module according to the steps in "Removal" shown below, and reinstall the module according to steps 1 to 3 shown above. For details on the module Information screen, see section 1.3.

Note

- You can install up to four 720243 SENT Bus Monitor Modules in slots 5 to 8.
- You can install up to two 720240 CAN bus monitor modules (CAN MONITOR), 720242 CAN/CAN FD monitor modules (CAN/CAN FD), 720245 CAN FD/LIN monitor modules (CAN FD/LIN) or 720241 CAN & LIN bus monitor modules (CAN & LIN). These monitor modules can only be installed in slots 7 and 8.

Removal

1. Make sure that the instrument's power switch is turned off.
2. Loosen the two screws that are fastened to the input module.
3. Hold the two handles at the top and bottom of the input module, and pull it out.

Safety Precautions for Laser Products

The High-Speed, 200 MS/s, 14-bit Isolated Module (720212 (HS200M14)) and High-Speed 100 MS/s, 12-Bit Isolation Module (720211 (HS100M12)) use an internal laser light source.

The 720212 (HS200M14)) and 720211 (HS100M12) are Class 1 laser products as defined by IEC 60825-1:2014 Safety of Laser Products—Part1: Equipment Classification and Requirements. In addition, this instrument complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed.3., as described in Laser Notice No. 56, dated May 8, 2019.

High-Speed 200MS/s, 14bit Isolation Module (720212 (HS200M14))

The following information is printed on the side.



Complies with 21 CFR 1040.10 and 1040.11
except for conformance with IEC 60825-1 Ed. 3.,
as described in Laser Notice No. 56, dated May 8, 2019.
4-9-8 Myojin-cho, Hachioji-shi, Tokyo 192-8566, Japan

EN 60825-1:2014+A11:2021, IEC 60825-1:2014, GB/T 7247.1-2024

Laser Specifications

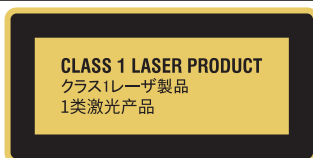
Center wavelength: 850 nm

Pulse width: ≤ 1.25 ns (4 GHz)

Output: ≤ 8 mW

High-Speed 100 MS/s, 12-Bit Isolation Module (720211 (HS100M12))

The following information is printed on the side.



Complies with 21 CFR 1040.10 and 1040.11
except for conformance with IEC 60825-1 Ed. 3.,
as described in Laser Notice No. 56, dated May 8, 2019.
4-9-8 Myojin-cho, Hachioji-shi,
Tokyo 192-8566, Japan

EN 60825-1:2014+A11:2021, IEC 60825-1:2014, GB/T 7247.1-2024

Laser Specifications

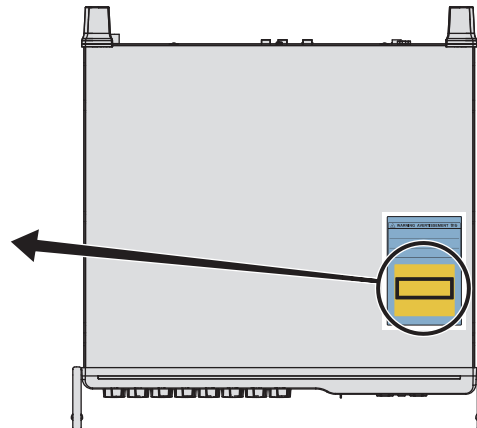
Center wavelength: 850 nm

Pulse width: ≤ 10 ms (100 MHz), ≤ 2.5 ns (2 GHz)

Output: ≤ 8 mW

SL2000

The following information is printed on the top panel.



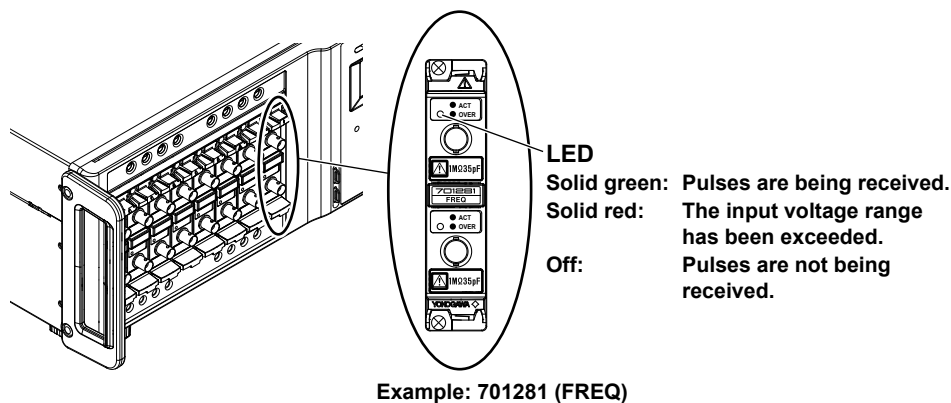
EN 60825-1:2014+A11:2021, IEC 60825-1:2014, GB/T 7247.1-2024

Laser classes differ depending on the standard number and year. Take safety measures according to the laser class corresponding to standard number and year of the country or region that the instrument will be used in.

If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. YOKOGAWA assumes no liability for the customer's failure to comply with these warnings and requirements.

LEDs on the Frequency Module and SENT Monitor Module

On the front panel of the frequency module (701281 (FREQ)/720281 (FREQ)) and SENT monitor module (720243 (SENT)) are LEDs for each channel. These LEDs allow you to check the input condition of the pulse.



Note

- The LEDs on the frequency module and SENT monitor module illuminates in green when pulse is applied and red when the input voltage level is over range. It is independent of the start/stop condition of waveform acquisition of the instrument.
- When the preset of the frequency module is set to EM Pickup (electromagnetic pickup), the LED will not illuminate in red when the range is exceeded.

For information about presets, see section 4.7, "Configuring Frequency, Revolution, Period, Duty Cycle, Power Supply Frequency, Pulse Width, Pulse Integration, and Velocity Measurements," in the user's manual.

Connection Cables

The following table shows the cables that can be used with various input modules.

Input Module	Voltage Probe ¹		Current probe ¹ 701930, 701931, 701932, 701933, 701917, 701918, 702915, 702916 Current sensor ¹ CT1000S Clamp-on probe ¹ 720930, 720931	Differential Probe ¹		Safety Cable, ¹ Measurement Lead ²			Other ⁴
	700929, 702902, 701947	701940		700924, ³ 700925, ³ 701926 ³	701977, 701978	701901	366926	758933, 701904	
720212	Y	—	Y	Y	— ⁵	Y	—	—	—
720211	Y	—	Y	Y	— ⁵	Y	—	—	—
701250	Y	—	Y	Y	— ⁵	Y	—	—	—
720250	Y	—	Y	Y	— ⁵	Y	—	—	—
701251	Y	—	Y	Y	— ⁵	Y	—	—	—
720256	Y	—	Y	Y	— ⁵	Y	—	—	—
720254	Y	—	Y	Y	— ⁵	Y	—	—	—
701255	—	Y	Y	Y	Y	—	Y	—	—
720268	—	—	—	—	—	—	—	Y	—
720220	—	—	—	—	—	—	—	—	Y
701261	—	—	—	—	—	—	—	—	Y
701262	—	—	—	—	—	—	—	—	Y
701265	—	—	—	—	—	—	—	—	Y
720266	—	—	—	—	—	—	—	—	Y
720221	—	—	—	—	—	—	—	—	Y
701270	—	—	—	—	—	—	—	—	Y
701271	—	—	—	—	—	—	—	—	Y
701275	—	Y	Y	Y	— ⁵	—	Y	—	—
701281	Y	—	—	—	—	Y	—	—	—
720281	Y	—	—	—	—	Y	—	—	—
720230	—	—	—	—	—	—	—	—	Y
720240	—	—	—	—	—	—	—	—	Y
720242	—	—	—	—	—	—	—	—	Y
720245	—	—	—	—	—	—	—	—	Y
720241	—	—	—	—	—	—	—	—	Y
720243	Y	—	—	—	—	Y	—	—	—

¹ For instructions on how to connect probes or BNC cables, see section 2.6.

² For instructions on how to connect measurement leads, see section 2.8.

³ Discontinued.

⁴ Connect a thermocouple, bridgehead, sensor, and so on depending on the input module. For the connection procedure, see sections 2.9 to 2.17.

⁵ Can also be used on an isolation module if connected to a 701905 conversion cable (sold separately) and grounded with a GND lead.

2.4 Connecting the Power Supply

Before Connecting the Power Supply

Make sure to follow the warnings below when connecting the power supply. Failure to do so may cause electric shock or damage to the instrument.



WARNING

- First, ensure that the source voltage matches the rated supply voltage of the instrument and that it is within the maximum rated voltage of the power cord you will use. Then connect the power cord.
- Connect the power cord after checking that the power switch of the instrument is turned off.
- To prevent electric shock and fire, use the power cord for this instrument.
- To prevent electric shock, make sure to connect the instrument to a protective ground (earth). Connect the power cord to a three-prong power outlet with a protective earth terminal.
- Do not use an ungrounded extension cord. If you do, the instrument will not be grounded.
- If there is no AC outlet that is compatible with the power cord that you will be using and you cannot ground the instrument, do not use the instrument.

French



AVERTISSEMENT

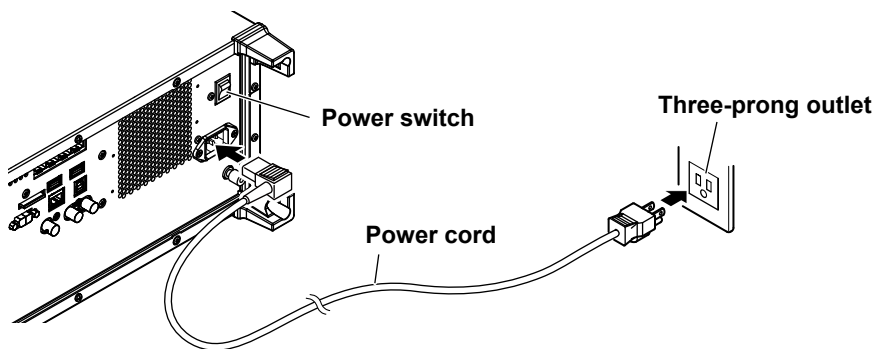
- Assurez-vous que la tension d'alimentation correspond à la tension d'alimentation nominale de l'appareil et qu'elle ne dépasse pas la plage de tension maximale du cordon d'alimentation à utiliser.
- Brancher le cordon d'alimentation après avoir vérifié que l'interrupteur d'alimentation de l'instrument est sur OFF.
- Pour éviter tout risque de choc électrique, utiliser exclusivement le cordon d'alimentation prévu pour cet instrument.
- Pour éviter les chocs électriques, assurez-vous de connecter l'instrument à une terre de protection. Brancher le cordon d'alimentation sur une prise de courant à trois plots reliée à la terre.
- Toujours utiliser une rallonge avec broche de mise à la terre, à défaut de quoi l'instrument ne serait pas relié à la terre.
- Si une sortie CA conforme au câble d'alimentation fourni n'est pas disponible et que vous ne pouvez pas relier l'instrument à la terre, ne l'utilisez pas.

Connecting the Power Cord

1. Check that the power switch on the rear panel of the instrument is turned off.
2. Connect the power cord plug to the power inlet on the rear panel.
3. Connect the other end of the cord to an outlet that meets the following conditions. Use a grounded three-prong outlet.

Rated supply voltage*	100 to 120 VAC/200 to 240 VAC
Permitted supply voltage range	90 to 132 VAC/198 to 264 VAC
Rated supply frequency	50/60 Hz
Permitted supply frequency range	48 to 63 Hz
Maximum power consumption	Approx. 280 VA

* This instrument can use a 100 V or a 200 V power supply. The maximum rated voltage differs according to the type of power cord. Check that the voltage supplied to the instrument is less than or equal to the maximum rated voltage of the power cord that you will be using before use.



2.5 Turning the Power Switch On and Off

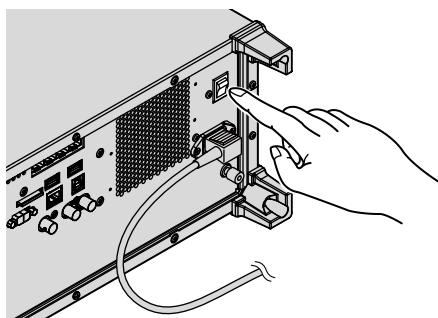
Turning On the Power Switch

Before Turning On the Power, Check That:

- The instrument is installed properly. See section 2.2, “Installing the Instrument”
- The power cord is connected properly. See page 2-16.

Turning On the Power Switch

1. Switch the power switch on the rear panel to the ON (|) position.



Operations Performed When the Power Is Turned On

When the power switch is turned on, a self-test and calibration start automatically. This period lasts approximately 30 seconds, and upon successful startup, the communication setup display appears on the LCD screen. Check that the instrument has started normally before you use it.

If the Instrument Does Not Start Normally When the Power Is Turned On

Turn off the power switch, and check the following items.

- Check that the power cord is securely connected.
- The correct voltage is coming to the power outlet. See page 2-16.
- When the power switch is turned on, open the Start menu and select **Power On Reset** to restore the settings to the factory defaults.

See “Using the Start Menu to Start the Instrument” on the next page for more information about the Start menu. For details on initializing settings, see section 3.2, “Initializing the Settings,” in the User’s Manual, IM DL950-02EN.

If the instrument still does not work properly after checking these items, contact your nearest YOKOGAWA dealer for repairs.

Note

- After turning the power off, wait at least 10 seconds before you turn it on again.
- It may take a few seconds for the startup screen to appear.

Using the Start Menu to Start the Instrument

When the Start menu is displayed, you can select the action to be performed at startup.

1. While holding down the **SET** key, turn on the power switch.
A start menu appears on the LCD.
2. Press the arrow keys (▲/▼) to select a menu item, and press **SET**.
 - Normal Start: Starts normally
 - Power On Reset: Resets to the factory default setting
 - Update FW (SD): Displays a confirmation screen. Select **Execute** and press **SET** to start a firmware update using the SD memory card.
 - Update FW (USB): Displays a confirmation screen. Select **Execute** and press **SET** to start a firmware update using the USB memory device.

Turning Off the Power Switch

CAUTION

Turning off the power switch or unplugging the power cord while the instrument is saving data may corrupt the media on which data is being saved. Also, the data being saved is not guaranteed. Be sure to turn the power switch off after data has been saved.

French

ATTENTION

Le fait d'éteindre l'interrupteur d'alimentation ou de débrancher le cordon d'alimentation pendant que l'instrument enregistre des données peut corrompre le support sur lequel les données sont enregistrées. De plus, les données enregistrées ne sont pas garanties. Assurez-vous de mettre l'interrupteur hors tension une fois les données enregistrées.

Turning Off the Power Switch

1. Switch the power switch on the rear panel to the OFF (O) position.

Power-off Operation

The settings immediately before the power switch is turned off are stored. This means that if you turn the power switch on and begin measurement, the instrument will perform measurements using the settings from immediately before the instrument was last turned off.

Note

The instrument stores the settings using an internal lithium battery. The battery lasts for approximately five years when the ambient temperature is 23 °C. When the lithium battery voltage falls below a specified value and you turn on the power, a message (error 901) appears on the screen. If this message appears frequently, you need to replace the battery soon. You cannot replace batteries by yourself. Contact your nearest YOKOGAWA dealer to have the battery replaced.

To Make Accurate Measurements

- Allow the instrument to warm up for at least 30 minutes after turning on the power switch.
- After warm-up, calibrate the instrument (see section 26.2 in the User's Manual, IM DL950-02EN).
If auto calibration is turned on, auto calibration is executed when you start waveform acquisition.

2.6 Connecting Probes

Modules That Probes Can Be Connected To

Connect the probes (or other input cables such as BNC cables) to any of the input terminals of the following modules. The input impedance is $1\text{ M}\Omega \pm 1\%$ and approximately 35 pF.

- High-Speed 200MS/s, 14bit Isolation Module: 720212 (HS200M14)
- High-Speed 100 MS/s, 12-Bit Isolation Module: 720211 (HS100M12)
- High-Speed 10 MS/s, 12-Bit Isolation Module: 701250 (HS10M12), 720250 (HS10M12)
- High-Speed High-Resolution 1 MS/s, 16-Bit Isolation Module: 701251 (HS1M16)
- 4-CH 10 MS/s, 16-Bit Isolation Module: 720256 (4CH 10M16)
- 4-CH 1 MS/s, 16-Bit Isolation Module: 720254 (4CH 1M16)
- High-Speed 10 MS/s, 12-Bit Non-Isolation Module: 701255 (NONISO_10M12)
- Acceleration/Voltage Module (with AAF): 701275 (ACCL/VOLT)
- Frequency Module: 701281 (FREQ), 720281 (FREQ)
- SENT Monitor Module: 720243 (SENT)

Before Connecting a Probe

Be sure to follow the warnings below when connecting a probe. Failure to do so may cause electric shock or damage to the instrument.

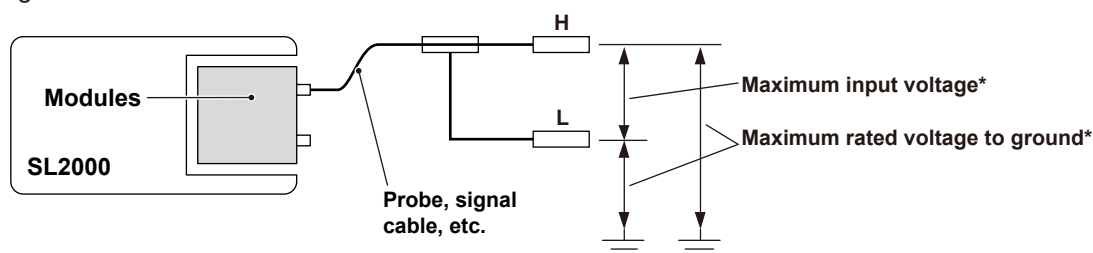


WARNING

When connecting a device under measurement to the instrument, be sure to turn off the device. It is extremely dangerous to connect or remove measurement leads while the device under measurement is on.

Precautions to Be Taken When Using the Modules

- Do not apply voltage exceeding the maximum input voltage or maximum rated voltage to ground.



- * When using a probe, do not allow the input voltage at the probe tip to exceed the probe's maximum input voltage or maximum rated voltage to ground. In addition, do not allow the input voltage that has been attenuated according to the probe attenuation to exceed the module's maximum input voltage or maximum rated voltage to ground.
- To avoid electric shock, be sure to ground the instrument.
- To prevent the possibility of electric shock, be sure to fasten the module screws. Otherwise, the electrical and mechanical protection functions will not be activated.
- Avoid continuous connection in an environment where a surge voltage may occur.
- Use only specified cables. It is extremely dangerous to use cables that do not meet the safety standards. (Especially when you are handling high voltages of 42 V or more.)

2.6 Connecting Probes

- When measuring high voltage with a 720212 (HS200M14), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 720256 (4CH 10M16), or 720254 (4CH 1M16), use an isolation probe (700929, 701947), passive probe (702902), 1:1 safety cable (701901+701954 combination), differential probe (700924, 700925, 701926), or differential probe (701977+701905 combination, 701978+701905 combination).
- The 10 MHz 701940 passive probe has metal BNC parts. If you want to use it for isolated input (e.g., 720212 (HS200M14), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 701275 (ACCL/VOLT), 701281 (FREQ), 720281 (FREQ), 720256 (4CH 10M16), 720254 (4CH 1M16)), use it under 42 V for safety reasons. (Do not connect either the high or low side to an electric potential at 42 V or higher.) For non-isolated input (e.g., 701255 (NONISO_10M12)), fasten the module screws.
- To input high voltage with the 701281 (FREQ) or 720281 (FREQ), use an isolated probe (700929, 701947) or passive probe 702902.

In Using the High Voltage Differential Probes

- Be sure to connect the ground lead of the differential probe (700924, 700925, 701926) to the functional grounding terminal on the front panel of the instrument. Not doing so may cause high voltage to appear in the BNC connector of the differential probe.
- When using a differential probe (701977, 701978) on an isolation module, before connecting to the DUT, be sure to connect a conversion cable (701905) and connect the GND lead to the functional ground terminal on the front panel of the instrument. Not doing so may cause high voltage to appear in the BNC connector of the differential probe. When you are not connecting a conversion cable (701905), the 701977 and 701978 differential probes can only be used on the 701255 (NONISO_10M12) Non-Isolation Module. Using them on an isolation module without grounding with the GND lead may cause high voltage to appear in the BNC connector of the differential probe.

Modules' Maximum Input Voltages and Maximum Rated Voltage to Ground

Applying a voltage exceeding the value indicated below may damage the input section. If the frequency is above 1 kHz, damage may occur even when the voltage is below this value. The maximum input voltage may vary depending on the actual input voltage. For details, see appendix in this manual.

720212 (HS200M14)

Maximum input voltage (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902¹
1000 V (DC+ACpeak) CAT II
- In combination with a safety cable (1:1) (701901+701954)³
200 V (DC+ACpeak) CAT II
- Direct input (cable that does not comply with the safety standards)⁵
42 V (DC+ACpeak)

Maximum rated voltage to ground (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902,² or a safety cable (1:1) (701901+701954)⁴
1000 Vrms (CAT II)
 - Direct input (cable that does not comply with the safety standards)⁶
42 V (DC+ACpeak)
-

720211 (HS100M12)

Maximum input voltage (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902¹
1000 V (DC+ACpeak) CAT II
- In combination with a safety cable (1:1) (701901+701954)³
200 V (DC+ACpeak)
- Direct input (cable that does not comply with the safety standards)⁵
42 V (DC+ACpeak)

Maximum rated voltage to ground (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947,² or a safety cable (1:1) (701901+701954)⁴
1000 Vrms (CAT II)
- In combination with a passive probe (10:1) 702902²
1000 V (DC+ACpeak)
- Direct input (cable that does not comply with the safety standards)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

701250 (HS10M12) or 720250 (HS10M12)

Maximum input voltage (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902¹
701250: 600 V (DC+ACpeak)
720250: 800 V (DC+ACpeak)
- In combination with a safety cable (1:1) (701901+701954)³
200 V (DC+ACpeak) (as a value that meets the safety standard)
250 V (DC+ACpeak) (maximum allowable voltage, as a value that does not damage the instrument when applied)
- Direct input (cable that does not comply with the safety standards)⁵
42 V (DC+ACpeak)

Maximum rated voltage to ground (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902,² or a safety cable (1:1) (701901+701954)⁴
701250: 400 Vrms (measurement category Other (O) 1500 V transient overvoltage), 300 Vrms (CAT II)
720250: 400 Vrms (CAT II)
- Direct input (cable that does not comply with the safety standards)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

701251 (HS1M16)

Maximum input voltage (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902¹
600 V (DC+ACpeak)
- In combination with a safety cable (1:1) (701901+701954)³
140 V (DC+ACpeak)
- Direct input (cable that does not comply with the safety standards)⁵
42 V (DC+ACpeak)

Maximum rated voltage to ground (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902,² or a safety cable (1:1) (701901+701954)⁴
400 Vrms (measurement category Other (O) 1500 V transient overvoltage), 300 Vrms (CAT II)
- Direct input (cable that does not comply with the safety standards)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

2.6 Connecting Probes

720256 (4CH 10M16)

Maximum input voltage (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902¹
600 V (DC+ACpeak)
- In combination with a safety cable (1:1) (701901+701954)³
200 V (DC+ACpeak)
- Direct input (cable that does not comply with the safety standards)⁵
42 V (DC+ACpeak)

Maximum rated voltage to ground (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902,² or a safety cable (1:1) (701901+701954)⁴
400 Vrms (measurement category Other (O) 1500 V transient overvoltage), 300 Vrms (CAT II)
 - Direct input (cable that does not comply with the safety standards)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)
-

720254 (4CH 1M16)

Maximum input voltage (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902¹
600 V (DC+ACpeak)
- In combination with a safety cable (1:1) (701901+701954)³
200 V (DC+ACpeak) (as a value that meets the safety standard)
400 V (DC+ACpeak) (maximum allowable voltage, as a value that does not damage the instrument when applied)
- Direct input (cable that does not comply with the safety standards)⁵
42 V (DC+ACpeak)

Maximum rated voltage to ground (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902,² or a safety cable (1:1) (701901+701954)⁴
400 Vrms (measurement category Other (O) 1500 V transient overvoltage), 300 Vrms (CAT II)
 - Direct input (cable that does not comply with the safety standards)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)
-

701255 (NONISO_10M12)

This module is non-isolated. Be sure to fasten the module screws when measuring a voltage above 42 V on this module. In addition, use the 701940 (10:1) dedicated non-isolated passive probe.

Maximum input voltage (at a frequency of 1 kHz or less)

- In combination with a passive probe (10:1) 7019402
600 V (DC+ACpeak)
 - Direct input⁵
200 V (DC+ACpeak) (as a value that meets the safety standard)
250 V (DC+ACpeak) (maximum allowable voltage, as a value that does not damage the instrument when applied)
-

701275 (ACCL/VOLT)

Maximum input voltage (at a frequency of 1 kHz or less)

- Combined with the 701940 (10:1) passive probe⁷ or direct input (cable that does not comply with the safety standards)⁵
42 V (DC+ACpeak)

Maximum rated voltage to ground (at a frequency of 1 kHz or less)

- Combined with the 701940 (10:1) passive probe⁸ or direct input (cable that does not comply with the safety standards)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)
-

701281 (FREQ) and 720281 (FREQ)

Maximum input voltage (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902¹
420 V (DC+ACpeak)
- Safety cable (1:1) (combined with 701901+701954)³ or direct input (cable that does not comply with the safety standards)⁵
42 V (DC+ACpeak)

Maximum rated voltage to ground (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or (100:1) 701947, or a passive probe (10:1) 702902²
701281: 300 Vrms (CAT II)
720281: 400 Vrms (CAT II)
- Safety cable (1:1) (701901+701954) passive probe⁴ or direct input (cable that does not comply with the safety standards)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

720243 (SENT)

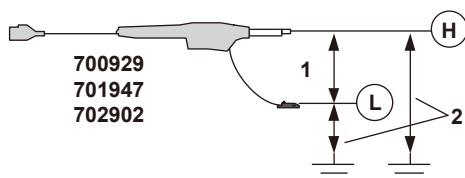
Maximum input voltage (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or a passive probe (10:1) 702902¹
420 V (DC+ACpeak)
- Safety cable (1:1) (combined with 701901+701954)³ or direct input (cable that does not comply with the safety standards)⁵
42 V (DC+ACpeak)

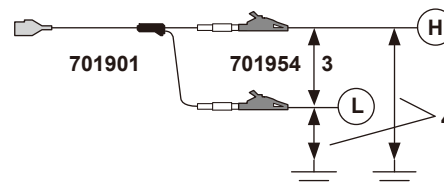
Maximum rated voltage to ground (at a frequency of 1 kHz or less)

- In combination with an isolated probe (10:1) 700929 or a passive probe (10:1) 702902²
300 Vrms (CAT II)
- Safety cable (1:1) (701901+701954) passive probe⁴ or direct input (cable that does not comply with the safety standards)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

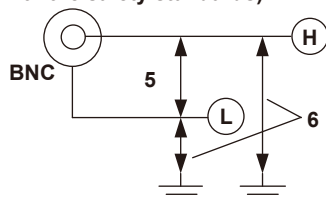
With the 700929, 701947, or 702902



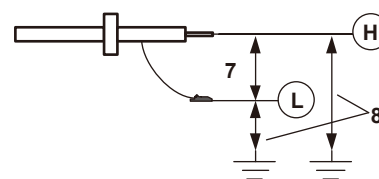
With the 701901 and 701954



Direct input (cable that does not comply with the safety standards)



With the 10:1 passive probe (701940)



2.6 Connecting Probes

Over-Range Indication

If over-range is indicated,* the instrument may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the vertical scale so that the entire amplitude of the waveform is displayed within the waveform display area, and check the input voltage level.

* If the input coupling is set to AC, the over-range indicator may not be displayed. For details, see section 4.1, "Setting the Input Coupling," in the user's manual, IM DL950-02EN.

Module		4	5	6	7	8
0	701	701	720	720	720	720
10	270	275	281	245	266	



Over-range indication

Indicates that over-range is occurring.

Press the arrow keys (►/◄) to display the Over Range display to see the channels that over-range is occurring on (see section 1.3). For details on the over-range display on the waveform display screen, see section 3.2.

French

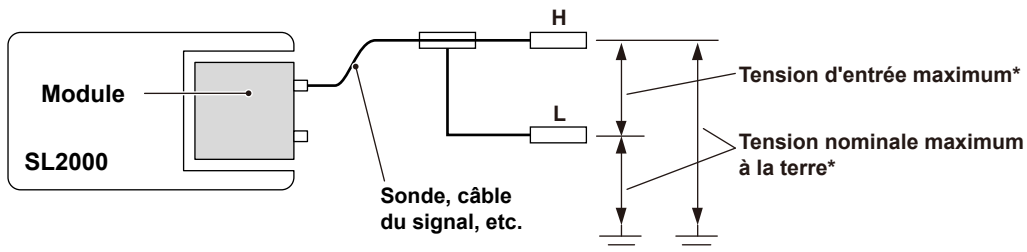


AVERTISSEMENT

Lors de la connexion à l'instrument d'un appareil faisant l'objet de la mesure, éteindre impérativement l'appareil. Il est extrêmement dangereux de brancher un câble de mesure lorsque l'appareil à mesurer est sous tension.

Précautions à prendre lors de l'utilisation des modules

- Ne pas appliquer une tension dépassant la tension d'entrée maximum ou la tension nominale à la terre maximum.



- * Lors de l'utilisation d'une sonde, ne laissez pas la tension d'entrée à l'extrémité de la sonde dépasser la tension d'entrée maximale de la sonde ou la tension nominale maximale à la terre. De plus, ne laissez pas la tension d'entrée atténuée en fonction de l'atténuation de la sonde dépasser la tension d'entrée maximale du module ou la tension nominale maximale à la terre.
- Pour éviter tout risque de choc électrique, l'instrument doit impérativement être relié à la terre.
- Pour éviter tout risque de choc électrique, toujours serrer les vis des modules, à défaut de quoi les fonctions de protection électrique et de protection mécanique ne seront pas activées.
- Évitez un branchement continu dans un environnement pouvant être soumis à une surtension.
- Utilisez uniquement les câbles préconisés. Il est extrêmement dangereux d'utiliser des câbles n'étant pas conformes aux normes de sécurité. (notamment lorsque vous travaillez avec de hautes tensions de 42 V, voire supérieures).

- Lors de la mesure de la haute tension avec un 720212 (HS200M14), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 720256 (4CH 10M16), ou 720254 (4CH 1M16), utilisez une sonde d'isolement (700929, 701947), une sonde passive (702902), un câble de sécurité 1:1 (combinaison 701901+701954), une sonde différentielle (700924, 700925, 701926) ou une sonde différentielle (combinaison 701977+701905, combinaison 701978+701905).
- La sonde passive 10 MHz 701940 comporte des pièces BNC métalliques. Si vous souhaitez l'utiliser pour une entrée isolée (par exemple, 720212 (HS200M14), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 701275 (ACCL / VOLT), 701281 (FREQ), 720281 (FREQ), 720256 (4CH 10M16), 720254 (4CH 1M16)), utilisez-le sous 42 V pour la sécurité. (Ne connectez ni le côté haut ni le côté bas à un potentiel électrique de 42 V ou plus.) Pour une entrée non-isolée (par exemple, 701255 (NONISO_10M12)), serrez les vis du module.
- Pour entrer la tension élevée avec 701281 (FREQ) ou 720281(FREQ), utiliser une sonde isolée (700929, 701947) ou une sonde passive 702902.

Utilisation de sondes différentielles haute tension

- Assurez-vous de connecter le câble de terre de la sonde différentielle (700924, 700925, 701926) à la borne de mise à la terre fonctionnelle sur le panneau avant de l'instrument. Sinon, une haute tension pourrait causer dans le connecteur BNC de la sonde différentielle.
- Lors de l'utilisation d'une sonde différentielle (701977, 701978) sur un module d'isolation, avant de connecter au DUT, assurez-vous de connecter un câble adaptateur (701905) et connectez le câble GND à la borne de mise à la terre fonctionnelle sur le panneau avant de l'instrument. Dans le cas contraire, une tension élevée peut apparaître dans le connecteur BNC de la sonde différentielle.

Lorsque vous ne raccordez pas de câble adaptateur (701905), les sondes différentielles 701977 et 701978 peuvent seulement être utilisées sur le module non isolant 701255 (NONISO_10M12).. Leur utilisation sur un module d'isolation sans mise à la terre avec le fil GND peut provoquer l'apparition d'une haute tension dans le connecteur BNC de la sonde différentielle.

Tension d'entrée maximum et tension nominale à la terre maximum pour les modules

L'application d'une tension supérieure à la valeur indiquée ci-dessous pourrait endommager la section d'entrée. Si la fréquence est supérieure à 1 kHz, des dommages risquent de survenir même lorsque la tension est inférieure à cette valeur. La tension d'entrée maximale pourrait varier selon la tension d'entrée réelle. Pour plus de détails, voir l'appendice dans ce manuel.

720212 (HS200M14)

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947, ou une sonde passive (10:1) 702902¹
1000 V (DC+ACpeak) CAT II
- En combinaison avec un câble de sécurité (1:1) (701901 + 701954)³
200 V (DC+ACpeak) CAT II
- Entrée directe (câble qui non conforme aux normes de sécurité)⁵
42 V (DC+ACpeak)

Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947 ou une sonde passive (10:1) 702902.² Ou si utilisé avec le câble de sécurité (1:1; 701901 et 701954 conjointement).⁴
1000 Vrms (CAT II)
- Entrée directe (câble qui non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak)

2.6 Connecting Probes

720211 (HS100M12)

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947, ou une sonde passive (10:1) 702902¹
1000 V (DC+ACpeak) CAT II
- En combinaison avec un câble de sécurité (1:1) (701901 + 701954)³
200 V (DC+ACpeak)
- Entrée directe (câble qui non conforme aux normes de sécurité)⁵
42 V (DC+ACpeak)

Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947,² ou un câble de sécurité (1:1) (701901 + 701954)⁴
1000 Vrms (CAT II)
- En combinaison avec une sonde passive (1:1) (702902 + 701954)²
1000 V (DC+ACpeak) CAT II
- Entrée directe (câble qui non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

701250 (HS10M12) ou 720250 (HS10M12)

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947 ou une sonde passive (10:1) 701250¹
701250: 600 V (c.c. + crête c.a.)
720250: 800 V (c.c. + crête c.a.)
- En combinaison avec un câble de sécurité (1:1) (701901 + 701954)³
200 V (c.c. + crête c.a.) (comme valeur conforme à la norme de sécurité).
250 V (c.c. + crête c.a.) (tension maximale admise, comme valeur qui n'endommage pas l'instrument lorsqu'elle est appliquée).
- Entrée directe (câble qui non conforme aux normes de sécurité)⁵
42 V (DC+ACpeak)

Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947 ou une sonde passive (10:1) 702902.² Ou si utilisé avec le câble de sécurité (1:1; 701901 et 701954 conjointement).⁴
701250: 400 Vrms (catégorie de mesure Autre (O) surtension transitoire 1500 V), 300 Vrms (CAT II)
720250: 400 Vrms (CAT II)
- Entrée directe (câble qui non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

701251 (HS1M16)

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947, ou une sonde passive (10:1) 702902¹
600 V (DC+ACpeak)
- En combinaison avec un câble de sécurité (1:1) (701901 + 701954)³
140 V (DC+ACpeak)
- Entrée directe (câble qui non conforme aux normes de sécurité)⁵
42 V (DC+ACpeak)

Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947 ou une sonde passive (10:1) 702902.² Ou si utilisé avec le câble de sécurité (1:1; 701901 et 701954 conjointement).⁴
400 Vrms (catégorie de mesure Autre (O) surtension transitoire 1500 V), 300 Vrms (CAT II)
 - Entrée directe (câble qui non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)
-

720256 (4CH 10M16)

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947, ou une sonde passive (10:1) 702902¹
600 V (DC+ACpeak)
- En combinaison avec un câble de sécurité (1:1) (701901 + 701954)³
200 V (DC+ACpeak)
- Entrée directe (câble qui non conforme aux normes de sécurité)⁵
42 V (DC+ACpeak)

Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947 ou une sonde passive (10:1) 702902.² Ou si utilisé avec le câble de sécurité (1:1; 701901 et 701954 conjointement).⁴
400 Vrms (catégorie de mesure Autre (O) surtension transitoire 1500 V), 300 Vrms (CAT II)
- Entrée directe (câble qui non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

720254 (4CH 1M16)

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947, ou une sonde passive (10:1) 702902¹
600 V (DC+ACpeak)
- En combinaison avec un câble de sécurité (1:1) (701901 + 701954)³
200 V (c.c. + crête c.a.) (comme valeur conforme à la norme de sécurité).
400 V (c.c. + crête c.a.) (tension maximale admise, comme valeur qui n'endommage pas l'instrument lorsqu'elle est appliquée).
- Entrée directe (câble qui non conforme aux normes de sécurité)⁵
42 V (DC+ACpeak)

Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947 ou une sonde passive (10:1) 702902.² Ou si utilisé avec le câble de sécurité (1:1; 701901 et 701954 conjointement).⁴
400 Vrms (catégorie de mesure Autre (O) surtension transitoire 1500 V), 300 Vrms (CAT II)
- Entrée directe (câble qui non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

701255 (NONISO_10M12)

Ce module n'est pas isolé. Veuillez à serrer les vis du module lors de la mesure d'une tension supérieure à 42 V sur ce module. En outre, utilisez la sonde passive isolée et non isolée 701940 (10:1).

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde passive (10:1) 7019402
600 V (DC+ACpeak)
- Entrée directe⁵
200 V (c.c. + crête c.a.) (comme valeur conforme à la norme de sécurité).
250 V (c.c. + crête c.a.) (tension maximale admise, comme valeur qui n'endommage pas l'instrument lorsqu'elle est appliquée).

701275 (ACCL/VOLT)

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- Associé à la sonde passive 701940 (10:1)⁷ ou à l'entrée directe (câble non conforme aux normes de sécurité)⁵
42 V (DC+ACpeak)

Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- Associé à la sonde passive 701940 (10:1)⁸ ou à l'entrée directe (câble non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

2.6 Connecting Probes

701281 (FREQ) et 720281 (FREQ)

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947, ou une sonde passive (10:1) 702902¹
420 V (DC+ACpeak)
- Câble de sécurité (1:1) (associé à 701901 + 701954)³ ou entrée directe (câble non conforme aux normes de sécurité)⁵
42 V (DC+ACpeak)

Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947 ou une sonde passive (10:1) 701281²
701250: 300 Vrms (CAT II)
720281: 400 Vrms (CAT II)
- En combinaison avec un câble de sécurité (1: 1) (701901 + 701954)⁴ ou à l'entrée directe (câble non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

720243 (SENT)

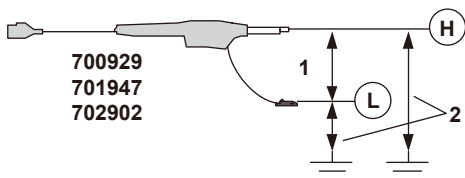
Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou une sonde passive (10:1) 702902¹
420 V (DC+ACpeak)
- Câble de sécurité (1:1) (associé à 701901 + 701954)³ ou entrée directe (câble non conforme aux normes de sécurité)⁵
42 V (DC+ACpeak)

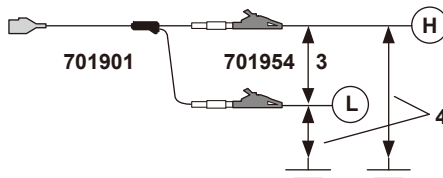
Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- En combinaison avec une sonde isolée (10:1) 700929 ou une sonde passive (10:1) 702902²
300 Vrms (CAT II)
- En combinaison avec un câble de sécurité (1: 1) (701901 + 701954)⁴ ou à l'entrée directe (câble non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak) (CAT II, 30 Vrms)

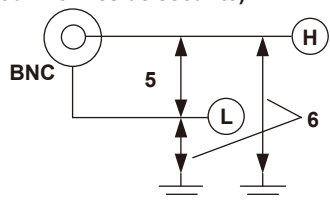
Avec 700929, 701947 ou 702902



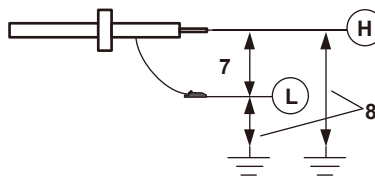
Avec 701901 et 701954



Entrée directe (câble non conforme aux normes de sécurité)



Avec la sonde passive 10:1 (701940)



Dépassement de plage

En cas de dépassement de plage,* l'instrument risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter une électrocution, changez l'échelle verticale de sorte que l'amplitude de la forme d'onde soit affichée dans la zone d'affichage de forme d'onde, et vérifiez le niveau de tension d'entrée.

* Si le couplage d'entrée est réglé sur AC, le voyant de dépassement de plage risque de ne pas s'afficher. Pour plus de détails, voir la section 4.1, « Réglage du couplage d'entrée », dans le manuel d'utilisation IM DL950-02EN.

Module					
	4	5	6	7	8
0	701	701	720	720	720
10	270	275	281	245	266

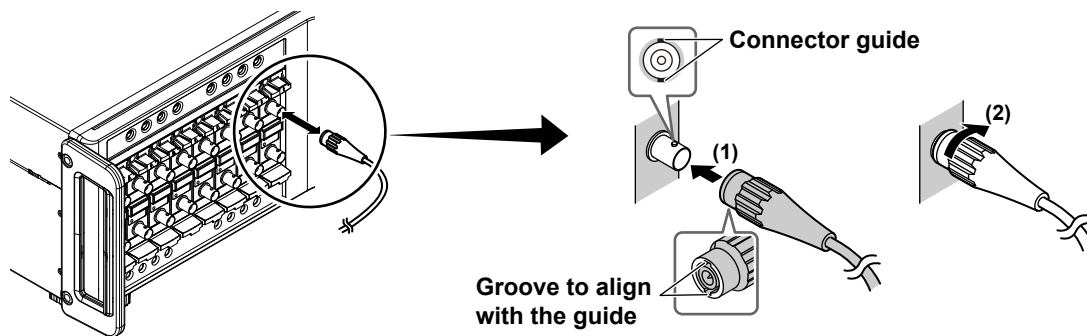


Dépassement de plage

Indique qu' un dépassement de plage se produit.
Appuyez sur les touches fléchées (►/◄) pour afficher le dépassement de plage et voir les canaux sur lesquels le dépassement de plage se produit (voir section 1.3).
Pour plus de détails sur l' affichage de dépassement de plage sur l' écran d' affichage de forme d' onde, voir la section 3.2.

Connecting a Probe

1. Align the groove of the BNC connector on the probe side with the connector guide on the module side, and insert the connector straight.
Before connecting the probe, make sure that the BNC connector is not deformed or damaged.
2. Turn the probe connector to the right to secure it.



Precautions to Be Taken When Connecting Probes

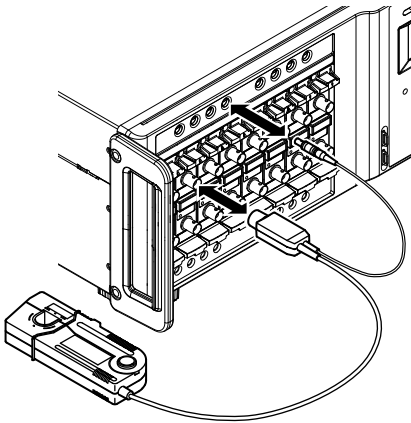
- When connecting a resin BNC connector to a metal BNC connector, the resin BNC connector may be deformed or damaged. When removing and inserting the BNC connector, insert and remove it straight.
- When connecting a probe to the instrument for the first time, perform phase correction of the probe as described in section 2.7, “Correcting a Probe Phase.” Make the phase correction on each channel to which the probe is to be connected.
- You cannot perform phase correction of the probe on the frequency module (701281 (FREQ) or 720281 (FREQ)) or SENT monitor module (720243 (SENT)). When connecting a probe to the 701281 (FREQ), 720281 (FREQ), or 720243 (SENT), first perform phase correction on the probe using another module.
- Please note that if the circuit being measured is directly connected to the instrument without the use of a probe, correct measurements may not be possible because of the effect of the input impedance of the instrument.
- Follow the instructions given in section 4.1, “Configuring Voltage Measurements (on modules other than 16-CH voltage input modules and 16-CH temperature/voltage input modules),” in the user’s manual to set the probe attenuation or the current-to-voltage conversion ratio to match the actual value using the setup menu. If they do not match, measured values cannot be read correctly.
- Note that if you use a probe with an attenuation ratio that cannot be set with this instrument, correct measurements cannot be displayed.

Connecting Current Probes

When using current probes or current sensors made by YOKOGAWA,* use the probe power supply (optional) terminals on the front panel of the instrument.

* 701930, 701931, 701932, 701933, 701917, 701918, 702915, 702916, CT1000S

For details on the connection procedure, see the manual that came with the current probe or current sensor.



CAUTION

Do not use the probe power supply terminals (/P4, /P8 option) on the front panel of the instrument for purposes other than supplying power to the probes.

French



ATTENTION

N'utilisez pas les bornes d'alimentation de la sonde (option /P4, /P8) sur le panneau avant de l'instrument à d'autres fins que l'alimentation des sondes.

Specifications of the Probe Power Supply Terminals (/P4, /P8 option)

Item	
Number of probes that can be used	4 (/P4 option), 8 (/P8 option)
Probes that can be used	Current probe (701917, 701918, 701930, 701931, 701932, 701933, 702915, 702916) Current sensor (CT1000S) Differential probe (701977, 701978)
Output voltage	±12 V
Output current	4 outputs (/P4 option): Total current up to 2.4 A 8 outputs (/P8 option): Total current up to 4.8 A*

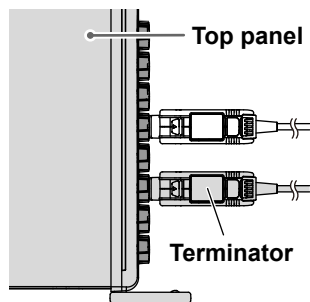
* There are two sets (left and right) of probe power supply terminals on the front panel. Each set consists of four outputs. The maximum output current per set is 2.4 A.

Notes When Connecting 701917, 701918, 702915, or 702916 Current Probes

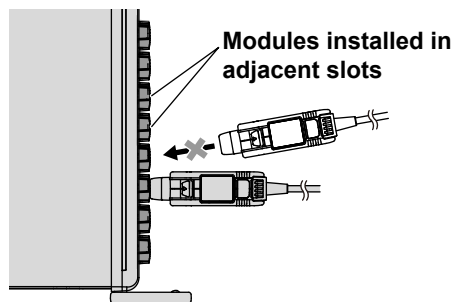
The following limitations apply when connecting 701917, 701918, 702915, and 702916 current probes to modules due to the structure of the terminators.

- It is not possible to connect two of these current probes to channels at the same positions of modules installed in adjacent slots.
- When using a 4-CH module, other BNC connectors cannot be connected to channels that are vertically adjacent to channels that these current probes are connected to.

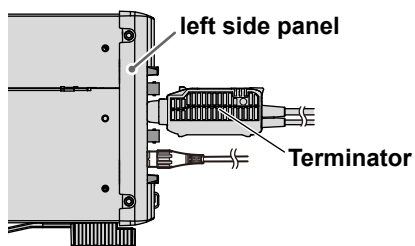
Possible



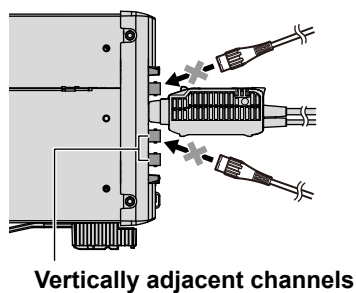
Not possible



**4-CH module
Possible**



Not possible



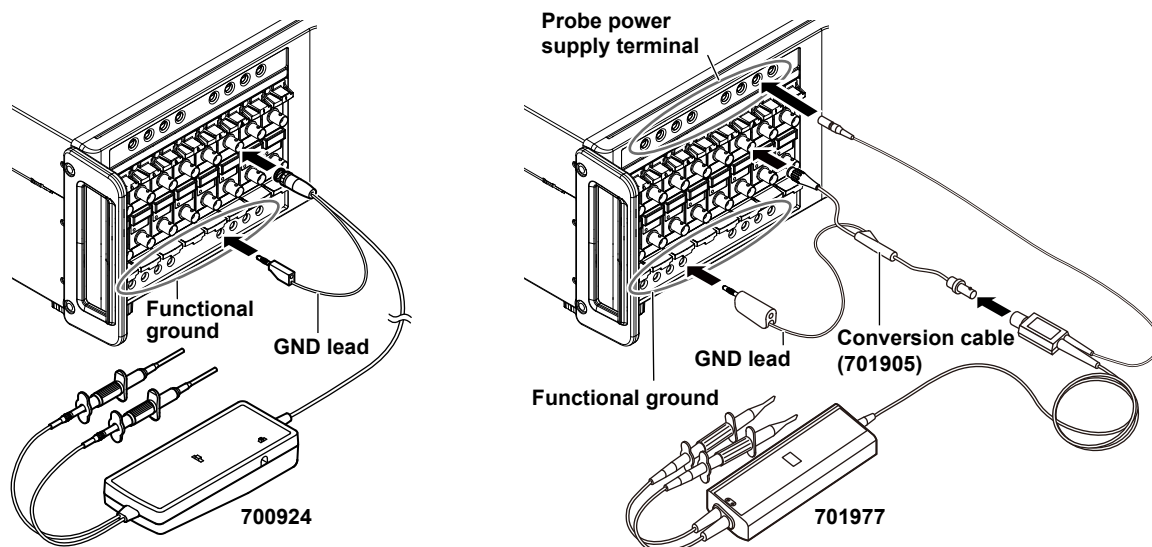
Connecting Differential Probes

When using Yokogawa differential probes (700924, 700925, 701926), connect the GND lead to the instrument's functional ground terminal. If necessary, use the auxiliary grounding lead extension.

When using a YOKOGAWA differential probe (701977, 701978) on an isolation module, be sure to connect a conversion cable (701905) and connect the GND lead to the functional ground terminal of the instrument. When you are not connecting a conversion cable (701905), the 701977 and 701978 differential probes can only be used on the 701255 Non-Isolation Module.

To supply power to a probe, use the probe power supply terminal (optional) on the front panel of the instrument. For the specifications of the probe power supply terminal (option), see page 2-31.

For details on the connection procedure, see the manual that came with the differential probe.



WARNING

In Using the High Voltage Differential Probes

- Be sure to connect the ground lead of the differential probe (700924, 700925, 701926) to the functional grounding terminal on the front panel of the instrument before connecting to the measurement target. Not doing so may cause high voltage to appear in the BNC connector of the differential probe.
- When using a differential probe (701977, 701978) on an isolation module, before connecting to the DUT, be sure to connect a conversion cable (701905) and connect the GND lead to the functional ground terminal on the front panel of the instrument. Not doing so may cause high voltage to appear in the BNC connector of the differential probe. When you are not connecting a conversion cable (701905), the 701977 and 701978 differential probes can only be used on the 701255 (NONISO_10M12) Non-Isolation Module. Using them on an isolation module without grounding with the GND lead may cause high voltage to appear in the BNC connector of the differential probe.



CAUTION

Do not use the probe power supply terminals (/P4, /P8 option) on the front panel of the instrument for purposes other than supplying power to the probes.

French



AVERTISSEMENT

Utilisation de sondes différentielles haute tension

- Veillez à connecter le fil de terre de la sonde différentielle (700924, 700925, 701926) à la borne de mise à la terre fonctionnelle sur le panneau avant de l'instrument avant de le connecter à la cible de mesure. Sinon, une haute tension pourrait causer dans le connecteur BNC de la sonde différentielle.
- Lors de l'utilisation d'une sonde différentielle (701977, 701978) sur un module d'isolation, avant de connecter au DUT, assurez-vous de connecter un câble adaptateur (701905) et connectez le câble GND à la borne de mise à la terre fonctionnelle sur le panneau avant de l'instrument. Dans le cas contraire, une tension élevée peut apparaître dans le connecteur BNC de la sonde différentielle.

Lorsque vous ne raccordez pas de câble adaptateur (701905), les sondes différentielles 701977 et 701978 peuvent seulement être utilisées sur le module non isolant 701255 (NONISO_10M12). Leur utilisation sur un module d'isolation sans mise à la terre avec le fil GND peut provoquer l'apparition d'une haute tension dans le connecteur BNC de la sonde différentielle.



ATTENTION

N'utilisez pas les bornes d'alimentation de la sonde (option /P4, /P8) sur le panneau avant de l'instrument à d'autres fins que l'alimentation des sondes.

2.7 Correcting the Probe Phase

For the following modules, always correct the probe phase before you use a probe for measurement.

- High-Speed 200MS/s, 14bit Isolation Module: 720212 (HS200M14)
- High-Speed 100 MS/s, 12-Bit Isolation Module: 720211 (HS100M12)
- High-Speed 10 MS/s, 12-Bit Isolation Module: 701250 (HS10M12), 720250 (HS10M12)
- High-Speed High-Resolution 1 MS/s, 16-Bit Isolation Module: 701251 (HS1M16)
- 4-CH 10 MS/s, 16-Bit Isolation Module: 720256 (4CH 10M16)
- 4-CH 1 MS/s, 16-Bit Isolation Module: 720254 (4CH 1M16)
- High-Speed 10 MS/s, 12-Bit Non-Isolation Module: 701255 (NONISO_10M12)
- Acceleration/Voltage Module (with AAF): 701275 (ACCL/VOLT)
- Frequency Module: 701281 (FREQ), 720281 (FREQ)
- SENT Monitor Module: 720243 (SENT)



CAUTION

Do not apply external voltage to the probe compensation signal output terminal. This may cause damage to the internal circuitry.

French

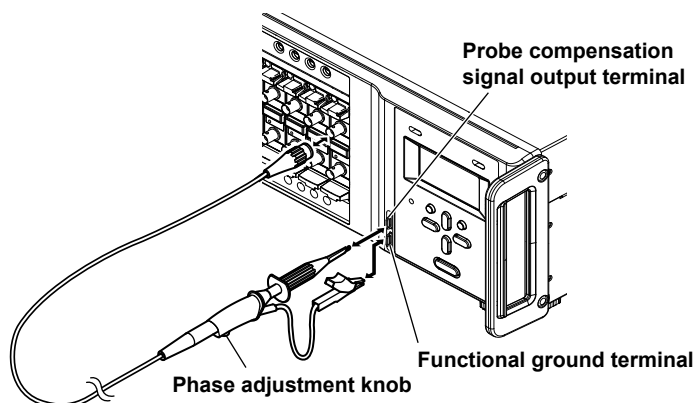


ATTENTION

Ne pas appliquer de tension externe sur la borne de sortie de signal afin d'ajuster la compensation de sonde. Cela pourrait endommager le circuit interne.

2.7 Correcting the Probe Phase

1. Turn on the power switch.
2. Connect the probe to a signal input terminal (the terminal that you will actually apply the signal to measure to).
3. Connect the tip of the probe to the probe compensation signal output terminal on the front panel of the instrument, and connect the ground wire to the functional ground terminal.
4. Follow the instructions in section 3.2, "Performing Auto Setup," to perform auto setup.
5. Turn the phase adjustment knob with your fingertip to set the displayed waveform to the correct square wave.



Necessity of Probe Phase Correction

If the probe's input capacitance is not within the appropriate range, the gain will not be steady in relation to the frequency, and waveforms will not be displayed correctly. Also, because the input capacitance is not the same for each probe, the probe's have variable capacitors (trimmers) that need to be adjusted. This adjustment is referred to as phase correction.

Always correct the phase of a probe that you are using for the first time.

Also, because the matching input capacitance range is different for each channel, you need to perform phase correction when you change the channel that a probe is connected to.

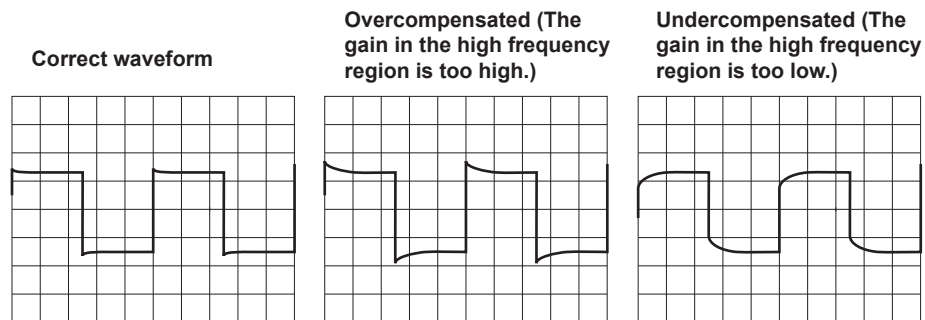
Phase Compensation Signal

The instrument generates the following square wave signal from the COMP signal output terminal.

Frequency: 1 kHz $\pm$ 1 %

Amplitude: 1 V $\pm$ 10 %

Differences in the Waveform due to the Phase Correction of the Probe



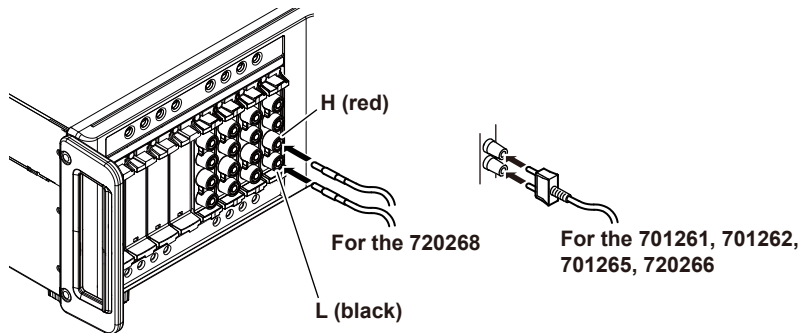
Notes about Using Probes with the Frequency Module or SENT Monitor Module

You cannot perform phase correction on a probe connected to the frequency module and SENT monitor module. To use a probe with the frequency module or SENT monitor module, first perform phase correction on the probe using another module.

2.8 Connecting Measurement Leads

Connecting Measurement Leads

When you measure voltage using the 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 720268 (HV (AAF, RMS)), 701265 (TEMP/HPV), or 720266 (TEMP/HPV), connect the measurement leads of a plug-in type terminal to the input terminal.



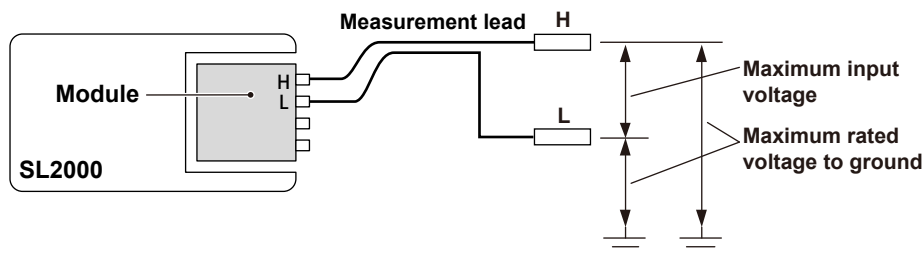
WARNING

- When connecting a device under measurement to the instrument, be sure to turn off the device. It is extremely dangerous to connect or remove measurement leads while the device under measurement is on.
- When measuring high voltages, do not connect a plug-in type terminal with exposed conducting parts to the input terminal to be used as a measurement lead. It is very dangerous, if the connector comes loose.

Precautions to Be Taken When Using the Modules

- To prevent the possibility of electric shock, always connect measurement leads that match the voltage range that you are measuring to the signal input terminals of the 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 720268 (HV (with RMS)), 701265 (TEMP/HPV), or 720266 (TEMP/HPV).
- When measuring high voltages using the 720268 (HV (with RMS)), use a measurement lead 758933 or a 1:1 safety adapter lead 701904 and alligator clip 701954.

Modules' Maximum Input Voltages and Maximum Rated Voltage to Ground



Applying a voltage exceeding the value indicated below may damage the input section. If the frequency is above 1 kHz, damage may occur even when the voltage is below this value. The maximum input voltage may vary depending on the actual input voltage. For details, see appendix in this manual.

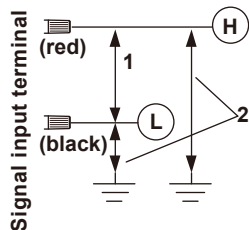
701261, 701262, 701265, 720266

- Maximum input voltage (across the input terminals, H and L,¹ at a frequency of 1 kHz or less)
 - 42 V (DC+ACpeak)
- Maximum rated voltage to ground (across the input terminals, H or L, and earth,² at a frequency of 1 kHz or less)
 - 42 V (DC+ACpeak) (CAT II, 30 Vrms)

720268 (HV (AAF, RMS))

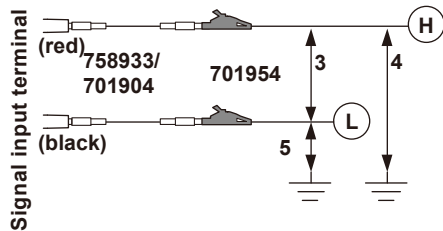
- Maximum input voltage (at a frequency of 1 kHz or less)
 - Combination of 758933 measurement leads and 701954 alligator clips or combination of 701904 1:1 safety cables and 701954 alligator clips³
 - 1000 Vrms (1000 VDC or 1414 Vpeak MAX)
 - Direct input (cable that does not comply with the safety standards)⁶
 - 42 V (DC+ACpeak)
- Maximum rated voltage to ground (at a frequency of 1 kHz or less)
 - Combination of 758933 measurement leads and 701954 alligator clips or combination of 701904 1:1 safety cables and 701954 alligator clips⁵
 - 1000 Vrms (CAT II)^{4, 5}, 600 Vrms (CAT III)^{4, 5}
 - Direct input (cable that does not comply with the safety standards)⁷
 - 42 V (DC+ACpeak) (CAT II, 30 Vrms)

For the 701261, 701262, 701265, or 720266

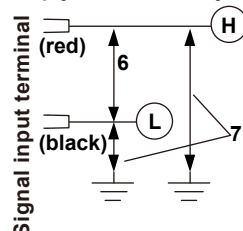


For the 720268

With the 758933+701954 or 701904+701954



Direct input (cable that does not comply with the safety standards)



Over-Range Indication

If over-range is indicated,* the instrument may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the vertical scale so that the entire amplitude of the waveform is displayed within the waveform display area, and check the input voltage level.

* If the input coupling is set to AC, the over-range indicator may not be displayed. For details, see section 4.1, "Setting the Input Coupling," in the user's manual, IM DL950-02EN.

Module							
4	5	6	7	8			
0 701	701	720	720	720			
10 270	275	281	245	266			

Over-range indication

Indicates that over-range is occurring. Press the arrow keys (►/◄) to display the Over Range display to see the channels that over-range is occurring on (see section 1.3). For details on the over-range display on the waveform display screen, see section 3.2.

French



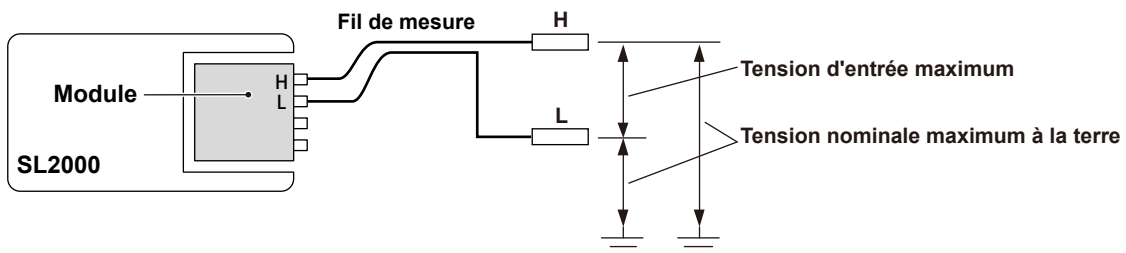
AVERTISSEMENT

- Lors de la connexion à l'instrument d'un appareil faisant l'objet de la mesure, éteindre impérativement l'appareil. Il est extrêmement dangereux de brancher un câble de mesure lorsque l'appareil à mesurer est sous tension.
- Lors de la mesure de tension élevées, ne pas relier une borne de type enfichable, avec des parties conductrices exposées, à la borne d'entrée à utiliser comme un fil de mesure. Il est très dangereux que le connecteur se détache.

Précautions à prendre lors de l'utilisation des modules

- Pour éviter la possibilité de choc électrique, connecter toujours les cordons de mesure correspondants à la plage de tension que vous mesurez aux bornes d'entrée de signal du 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 720268 (HV (with RMS)), 701265 (TEMP/HPV) ou 720266 (TEMP/HPV).
- Lors de la mesure de hautes tensions avec le 720268 (HV (with RMS)), utiliser un cordon de mesure 758933 ou un cordon adaptateur de sécurité 1: 1 701904 et une pince crocodile 701954.

Tension d'entrée maximum et tension nominale à la terre maximum pour les modules



L'application d'une tension supérieure à la valeur indiquée ci-dessous pourrait endommager la section d'entrée. Si la fréquence est supérieure à 1 kHz, des dommages risquent de survenir même lorsque la tension est inférieure à cette valeur. La tension d'entrée maximale pourrait varier selon la tension d'entrée réelle. Pour plus de détails, voir l'appendice dans ce manuel.

701261, 701262, 701265, 720266

Tension d'entrée maximale (via les bornes d'entrée, H et L,¹ à une fréquence d'1 kHz ou moins)
42 V (c.c. + crête c.a.)

Tension nominale à la terre maximum (via les bornes d'entrée, H ou L, et la terre,² à une fréquence de 1 kHz ou moins)

42 V (c.c. + crête c.a.) (CAT II 30 Vrms)

720268 (HV (AAF, RMS))

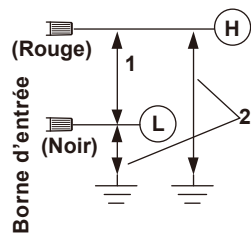
Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- Combinaison de fils de mesure 758933 et de pinces alligator 701954 ou combinaison de câble de sécurité 1:1 701904 et de pinces alligator 701954.³
1000 Vrms (1000 VDC or 1414 Vpeak MAX)
- Entrée directe (câble qui non conforme aux normes de sécurité)⁶
42 V (DC+ACpeak)

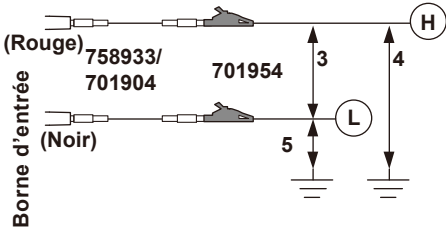
Tension nominale à la terre maximum (à une fréquence de 1 kHz ou moins)

- Combinaison de fils de mesure 758933 et de pinces alligator 701954 ou combinaison de câble de sécurité 1:1 701904 et de pinces alligator 701954.⁵
1000 Vrms (CAT II),^{4, 5} 600 Vrms (CAT III)^{4, 5}
- Entrée directe (câble qui non conforme aux normes de sécurité)⁷
42 V (DC+ACpeak) (CAT II, 30 Vrms)

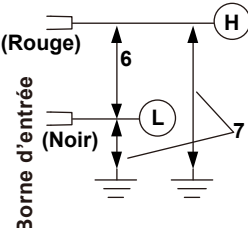
Pour 701261, 701262, 701265 et 720266



Pour 701268
Avec 758933+701954 ou 701904+701954



Entrée directe (câble non conforme
aux normes de sécurité)



Dépassement de plage

En cas de dépassement de plage,* l'instrument risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter une électrocution, changez l'échelle verticale de sorte que l'amplitude de la forme d'onde soit affichée dans la zone d'affichage de forme d'onde, et vérifiez le niveau de tension d'entrée.

* Si le couplage d'entrée est réglé sur AC, le voyant de dépassement de plage risque de ne pas s'afficher. Pour plus de détails, voir la section 4.1, « Réglage du couplage d'entrée », dans le manuel d'utilisation IM DL950-02EN.

Module							
	4	5	6	7	8		
0	701	701	720	720	720		
10	270	275	281	245	266		

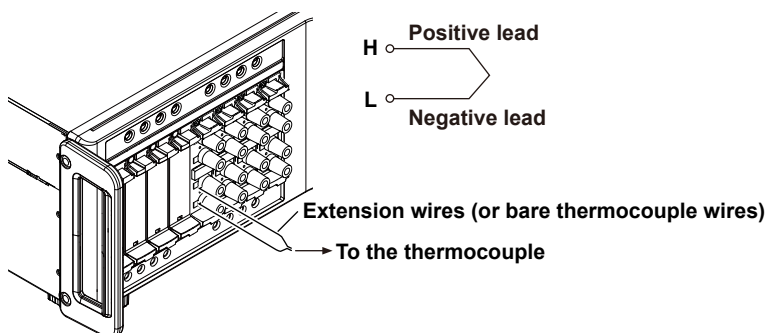
Dépassement de plage

Indique qu' un dépassement de plage se produit.
Appuyez sur les touches fléchées (►/◄) pour afficher le dépassement de plage et voir les canaux sur lesquels le dépassement de plage se produit (voir section 1.3).
Pour plus de détails sur l' affichage de dépassement de plage sur l' écran d' affichage de forme d' onde, voir la section 3.2.

2.9 Connecting Thermocouples

Connecting Thermocouples

If you are connecting the compensation lead of the thermocouple to the input terminal (binding post terminal) of the 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 701265 (TEMP/HPV), or 720266 (TEMP/HPV), loosen the terminal knob, pass the lead through the terminal, and tighten the knob.



WARNING

If over-range is indicated, the instrument may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, check the input voltage level.

Module		4		5		6		7		8	
0	701	701	720	720	720	720	720	720	720	720	720
10	270	275	281	245	266						



Over-range indication

Indicates that over-range is occurring.

Press the arrow keys (►/◄) to display the Over Range display to see the channels that over-range is occurring on (see section 1.3).

For details on the over-range display on the waveform display screen, see section 3.2.



CAUTION

- 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 701265 (TEMP/HPV), or 720266 (TEMP/HPV) is isolated from the instrument. However, applying a voltage exceeding the value below may damage the input section. If the frequency is above 1 kHz, damage may occur even when the voltage is below this value.

Maximum input voltage (across the input terminals, H and L, at a frequency of 1 kHz or less)
42 V (DC+ACpeak)

Maximum rated voltage to ground (across the input terminal L and earth at a frequency of 1 kHz or less)
42 V (DC+ACpeak) (CAT II, 30 Vrms)

- Correct measurements cannot be obtained when the positive and negative thermocouple leads are connected in reverse.
- Immediately after connecting the thermocouple, the heat balance may be disturbed at the input terminal section and may cause measurement errors. Therefore, wait about 10 minutes before making a measurement.
- In an environment where the air from the air conditioning is directly applied to the signal input terminals or where there are effects from a heat source, the heat balance may be disturbed at the input terminal section and cause measurement errors.
When making measurements in this type of environment, take preventive measures such as changing the position.

French



AVERTISSEMENT

En cas de dépassement de plage, l'instrument risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter tout risque de choc électrique, vérifier le niveau de tension d'entrée.

Module					
	4	5	6	7	8
0	701	701	720	720	720
10	270	275	281	245	266



Dépassement de plage

Indique qu' un dépassement de plage se produit.
Appuyez sur les touches fléchées (►/◄) pour afficher le dépassement de plage et voir les canaux sur lesquels le dépassement de plage se produit (voir section 1.3).
Pour plus de détails sur l' affichage de dépassement de plage sur l' écran d' affichage de forme d' onde, voir la section 3.2.



ATTENTION

- 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 701265 (TEMP/HPV), ou 720266 (TEMP/HPV) est isolé de l'instrument. Cependant, le fait d'appliquer une tension dépassant la valeur inférieure risque d'endommager la section d'entrée. Si la fréquence est supérieure à 1 kHz, des dommages risquent de survenir même lorsque la tension est inférieure à cette valeur.

Tension d'entrée maximale (via les bornes d'entrée, H et L, à une fréquence d'1 kHz ou moins)

42 V (c.c. + crête c.a.)

Tension nominale maximale à la terre (via la borne d'entrée L et la terre à une fréquence d'1 kHz ou moins)

42 V (c.c. + crête c.a.) (CAT II 30 Vrms)

- Il est impossible d'obtenir des mesures correctes si les fils de thermocouple positifs et négatifs sont branchés à l'envers.
 - Immédiatement après avoir branché le thermocouple, l'équilibreur thermique risque d'être perturbé dans la zone de la borne d'entrée, ce qui risque de causer des erreurs de mesure. C'est pourquoi, il faut attendre environ 10 minutes avant d'effectuer une mesure.
 - Dans un environnement dans lequel l'air provenant de la climatisation est directement appliqué sur les bornes d'entrée ou dans lequel il existe des effets provenant de la source de chaleur, l'équilibreur de chaleur risque d'être perturbé dans la zone de la borne d'entrée, ce qui risque de causer des erreurs de mesure.
Si des mesures sont réalisées dans ce type d'environnement, prendre des mesures préventives telles que le changement de position.
-

2.10 Connecting Bridgeheads

You can measure strain by connecting a strain gauge bridge (bridge head) or a strain gauge transducer to the strain module (701270 (STRAIN_NDIS) or 701271 (STRAIN_DSUB)). This section will mainly describe the procedures and precautions related to the connection of the bridge head (Model 701955, 701956, 701957, and 701958). For the connection of other strain gauge bridges or strain gauge transducers, see the respective manuals.

CAUTION

Only connect a strain gauge bridge (bridge head) or a strain gauge transducer to the strain module. Connecting other devices or applying a voltage that exceeds the values indicated below to the strain module may damage the input section.

Maximum input voltage (between Input+ and Input-)

10 V (DC+AC_{peak})

Maximum rated voltage to ground (between each terminal and earth ground)

42 V (DC+AC_{peak}) (CAT II, 30 V_{rms})

French

ATTENTION

Brancher seulement un pont de jauge de contrainte (tête de pont) ou un transducteur de jauge de contrainte au module de contrainte. Le fait de brancher d'autres appareils ou d'appliquer une tension dépassant les valeurs indiquées ci-dessous sur le module de contrainte risque d'endommager la zone d'entrée.

Tension d'entrée maximale (entre l'entrée + et l'entrée -)

10 V (c.c. + crête c.a.)

Tension nominale maximale à la terre (entre chaque borne et mise à la terre)

42 V (c.c. + crête c.a.) (CAT II 30 V_{rms})

Connecting the Strain Gauge

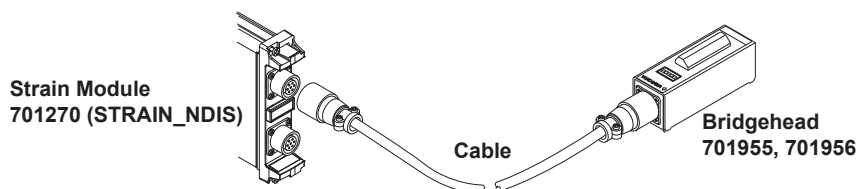
The bridge head (701955, 701956, 701957, and 701958) supports six types of connection methods: single-gauge method, single-gauge three-wire method, adjacent-side two-gauge method, opposite-side two-gauge method, opposite-side two-gauge three-wire method, and four-gauge method. For details, see the manual that came with the bridge head (701955, 701956, 701957, or 701958).

If you are using a strain gauge bridge or a strain gauge transducer other than the bridge head (701955, 701956, 701957, and 701958), see the respective manuals.

Connecting the Strain Module and the Bridge Head

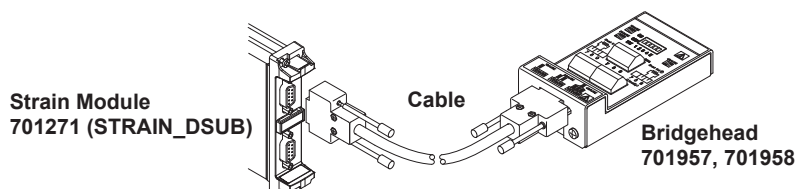
When Using the Strain Module (701270) and the Bridge Head (701955 or 701956)

Using the cable that came with the bridge head (701955 or 701956), connect the 701270 (STRAIN_NDIS) and the bridge head.



When Using the Strain Module (701271) and the Bridge Head (701957 or 701958)

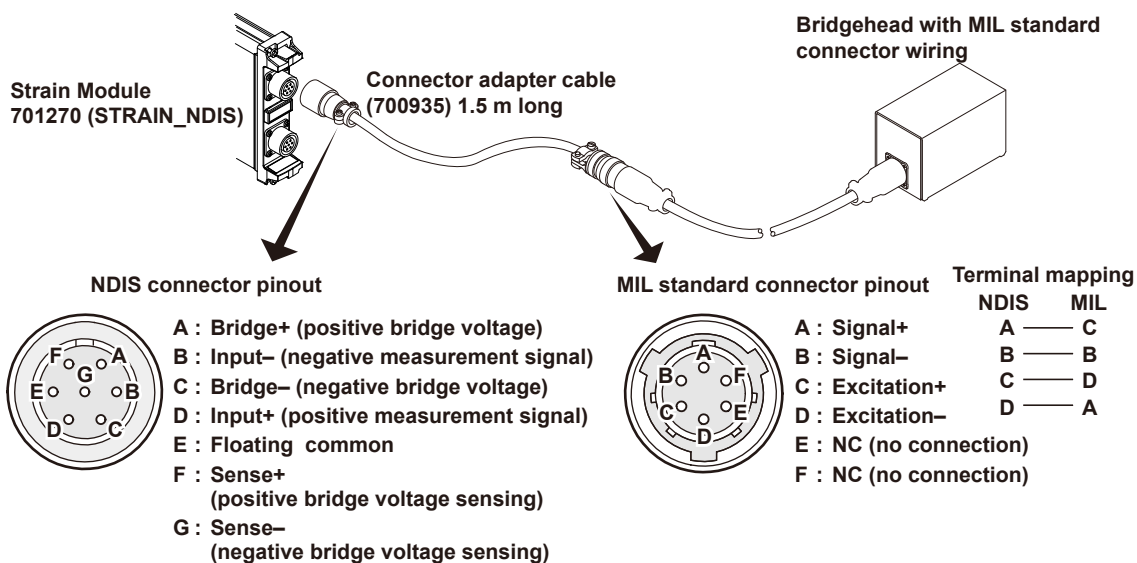
Using the cable that came with the bridge head (701957 or 701958), connect the 701271 (STRAIN_DSUB) and the bridge head.



When Using a Bridge Head with a MIL Standard (MIL-C-26482) Connector Wiring

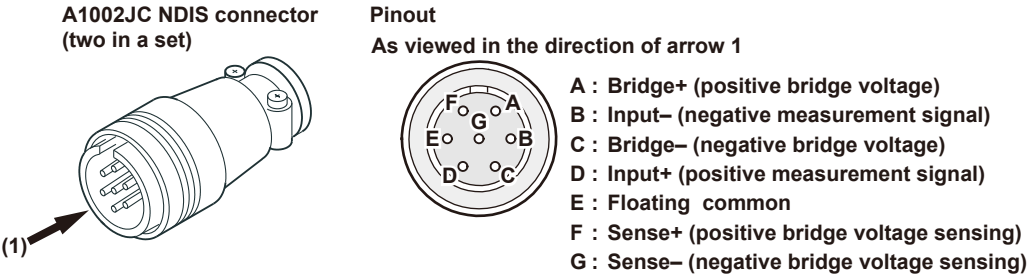
The connector on the 701270 (STRAIN_NDIS) is an NDIS connector.* Use a connector adapter cable (700935) by YOKOGAWA to make a MIL-NDIS conversion and connect to the 701270.

* Connector recommended by JSNDI (Japanese Society for Non-Destructive Inspection)



When Using the A1002JC Connector by YOKOGAWA

You can create your own cable by using the YOKOGAWA A1002JC connector that is compatible with the strain module and use the cable to connect a strain gauge bridge or a strain gage transducer to the strain module.



Note

- The connector shell is connected to the case potential of the instrument.
- Each of the signals from A to G is isolated within the module.
- When creating your own cable, we recommend that you use a shielded cable in order to shut out external noise.



CAUTION

Take extra care when wiring the connectors. If the wiring is shorted or incorrect, it can damage the instrument or other instruments that are connected to the instrument.

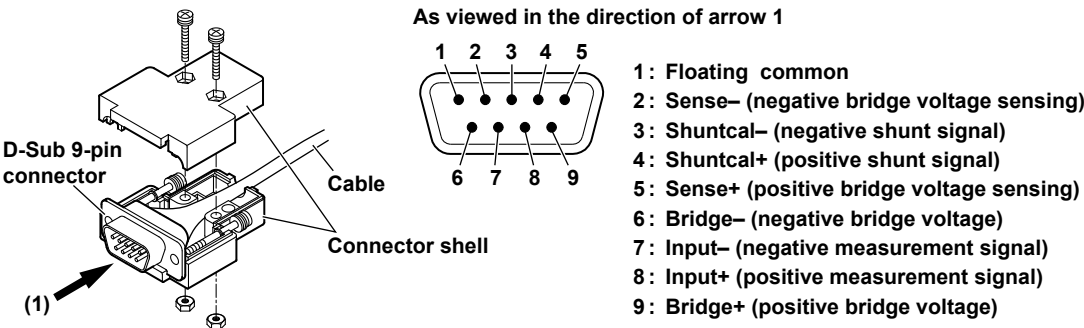
French



ATTENTION

Redoubler de vigilance lors du câblage des connecteurs. Si le câblage est shunté ou incorrect, il risque d'endommager l'instrument ou d'autres instruments reliés à cet instrument.

Pinout of the D-Sub Connector



2.11 Connecting a Logic Probe to the Logic Input Module

To measure logic signals, connect a logic probe (the 702911, 702912, 700986, or 700987) to a logic input module (the 720230).



CAUTION

- Applying a voltage greater than the limits listed below may damage the logic probe, logic input module, or the instrument. If the frequency is above 1 kHz, damage may occur even when the voltage is below this value.

Maximum input voltage (at a frequency of 1 kHz or less)

- Logic probes (702911 and 702912): 35 V
 - High-speed logic probe 700986: 42 V (DC+ACpeak)
 - Isolated logic probe 700987: 250 Vrms (however, ACpeak must be less than 350 V, and DC must be less than 250 V)
- For logic probes (702911 and 702912), and high-speed logic probe 700986, the eight input lines of a single pod share the same ground. Also, the instrument's ground and the grounds of each pod are connected. Do not apply signals with different common voltages to each input line. Doing so may damage the instrument, logic input modules, logic probes, or connected devices.
 - The input terminals of an isolated logic probe (700987) are isolated from each other and from the instrument.
 - Turn off the instrument before you connect or remove a 26-pin connector from the logic input module.
 - Do not stack the isolated logic probes (700987) during use. Also, allow enough space around the probes to avoid a temperature increase inside the probes.
 - Do not use the YOKOGAWA 700985 logic probe with the instrument. The 700985 is shaped so that it can be connected to a Logic Input Module (720230), but it is not electrically compatible with the instrument, so connecting the two could damage the logic input module, the instrument, or the 700985.

French

**ATTENTION**

- L'application d'une tension supérieure aux limites listées ci-dessous pourrait endommager la sonde logique, le module d'entrée logique ou l'instrument. Si la fréquence est supérieure à 1 kHz, des dommages risquent de survenir même lorsque la tension est inférieure à cette valeur.

Tension d'entrée maximale (à une fréquence de 1 kHz ou moins)

- Sondes logiques 702911 et 702912 : 35 V
 - Sonde logique à grande vitesse 700986 : 42 V (c.c. + crête c.a.)
 - Sonde logique isolée 700987 : 250 Vrms (cependant, la valeur crête c.a. doit être inférieure à 350 V et c.c. à 250 V)
-
- Pour les sondes logiques 702911, 702912 et la sonde logique à grande vitesse 700986, les huit lignes d'entrée d'une cosse unique partagent la même terre. De plus, la terre de l'instrument et celles de chaque cosse sont reliées. Ne pas émettre de signaux de tensions communes différentes vers chaque ligne d'entrée. Cela pourrait endommager l'instrument, les modules d'entrées logiques, les sondes logiques ou les appareils connectés.
 - Les bornes d'entrée d'une sonde logique isolée (700987) sont isolées les unes des autres et de l'instrument.
 - Éteindre l'instrument avant de connecter ou de retirer un connecteur à 26 broches du module d'entrée logique.
 - Ne pas empiler les sondes logiques isolées (700987) lors de leur utilisation. Laisser également suffisamment d'espace autour des sondes pour éviter une augmentation de température à l'intérieur des sondes.
 - Ne pas utiliser la sonde logique YOKOGAWA 700985 avec l'instrument. Ne pas utiliser la sonde logique YOKOGAWA 700985 avec l'instrument. Le 700985 est conçu pour pouvoir être connecté à un module d'entrée logique (720230), mais il n'est pas compatible électriquement avec l'instrument, donc la connexion des deux pourrait endommager le module d'entrée logique, l'instrument ou le 700985.

About the Logic Probe

Types of Logic Probes

YOKOGAWA provides the following four types of probes (as accessories) for connecting to the logic input module.

- Logic probe 702911 (1 m)
- Logic probe 702912 (3 m)
- High-Speed Logic Probe 700986
- Isolated Logic Probe 700987

Types of Measurement Leads That Can Be Used

Use the following leads to connect to the point of measurement.

Types of Connection Leads That Can Be Used with Logic Probes (702911, 702912) and High-Speed Logic Probe 700986

The following two types are available.

- Connecting lead (alligator clip, parts No. B9879PX)
This lead is primarily for connecting to contact circuits. The lead consists of 8 signal lines (red) and 8 earth lines (black).
- Connecting lead (IC clip, parts No. B9879KX)
This lead is primarily for connecting to electronic circuits. The lead consists of 8 signal lines (red) and 2 earth lines (black).

Types of Measurement Leads That Can Be Used on the Isolated Logic Probe 700987

Use the following measurement lead.

- For measuring voltages of 42 V or more: Measurement lead for isolation logic 758917
An alligator adapter (758922), alligator adapter (758929), or alligator clip (dolphin type, 701954) is needed to make measurements.

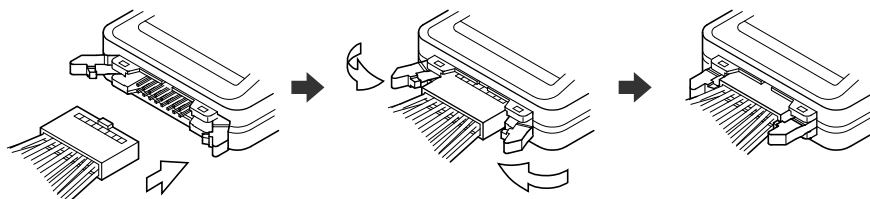
Note

Do not modify the connecting leads. Doing so may degrade their specifications.

Connecting Logic Probes

Logic Probes (702911, 702912) and High-Speed Logic Probe 700986

1. Attach the connecting lead (IC clip or alligator clip) that came with the logic probe, and push the logic probe levers inwards to lock the connector into place. To remove the connecting leads from the logic probe, push both of the levers outwards. Proceed to step 3.

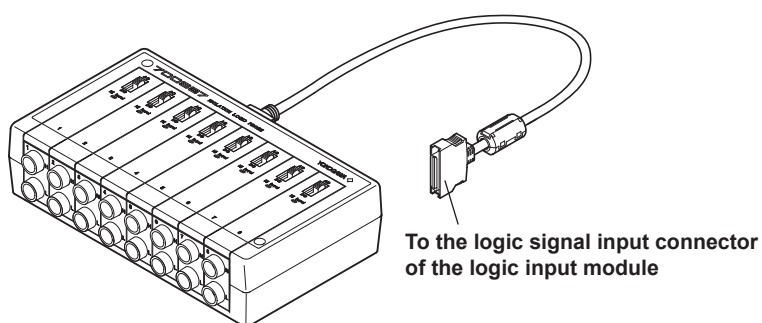


Isolated Logic Probe 700987

1. Connect the measurement leads to the logic probe's input terminal.
2. Set the input switch. When you set it to AC, the threshold levels are 50 VAC $\pm$ 50 % (Hi: 80 to 250 VAC, Lo: 0 to 20 VAC); when you set it to DC, the threshold levels are 6 V $\pm$ 50 % (Hi: 10 to 250 VDC, Lo: 0 to 3 VDC).

Connecting the Logic Probe to a Logic Input Module

3. Turn the instrument's power switch off.
4. Connect to the logic signal input connector of the logic input module (720230) the end of the logic probe's 26-pin connector that has a clamp filter (ferrite core; part number: A1190MN).
5. Turn on the instrument.



Note

- When a logic probe is not connected to the instrument, each bit is indicated as being at the high level.
- For the logic probe specifications, see section 6.15, "Logic Probe Specifications."
- Before using logic probes (702911, 702912) or isolated logic probe 700987, flip the switch back and forth several times. The switch's electrical contacts can weaken if not used for long periods of time.

2.12 Connecting an Acceleration Sensor

An acceleration sensor is connected when measuring acceleration on the acceleration/voltage module (with AAF) (701275 (ACCL/VOLT)). For a details on acceleration sensors, see the respective manuals.



WARNING

If over-range is indicated, the instrument may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the vertical scale so that the entire amplitude of the waveform is displayed within the waveform display area, and check the input voltage level.

Module		4	5	6	7	8
0	701	701	720	720	720	
10	270	275	281	245	266	



Over-range indication

Indicates that over-range is occurring.

Press the arrow keys (►/◄) to display the Over Range display to see the channels that over-range is occurring on (see section 1.3). For details on the over-range display on the waveform display screen, see section 3.2.



CAUTION

- Applying a voltage that exceeds the values indicated below to the 701275 (ACCL/VOLT) may damage the input section.
Maximum input voltage: 42 V (DC+ACpeak)
- When connecting acceleration sensors, do it without the bias current being supplied to the sensor. Otherwise, damage to the internal circuitry of the acceleration sensors may result.
- This instrument only supports acceleration sensors that are driven by constant current with driving current of 4 mA and driving voltage of 22 V.

French



AVERTISSEMENT

En cas de dépassement de plage, l'instrument risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter une électrocution, changez l'échelle verticale de sorte que l'amplitude de la forme d'onde soit affichée dans la zone d'affichage de forme d'onde, et vérifiez le niveau de tension d'entrée.

Module		4	5	6	7	8
0	701	701	720	720	720	
10	270	275	281	245	266	



Dépassement de plage

Indique qu' un dépassement de plage se produit.

Appuyez sur les touches fléchées (►/◄) pour afficher le dépassement de plage et voir les canaux sur lesquels le dépassement de plage se produit (voir section 1.3).

Pour plus de détails sur l' affichage de dépassement de plage sur l' écran d' affichage de forme d' onde, voir la section 3.2.



ATTENTION

- Le fait d'appliquer une tension dépassant les valeurs indiquées ci-dessous sur 701275 (ACCL/VOLT) risque d'endommager la zone d'entrée.
Tension d'entrée maximum: 42 V (c.c. + crête c.a.)
- Lors du branchement des capteurs d'accélération, faire en sorte que le courant de polarisation n'alimente pas le capteur. Cela risquerait en effet d'endommager les circuits internes des capteurs d'accélération.
- Cet instrument ne prend en charge que les capteurs d'accélération alimentés par un courant constant avec un courant d'entraînement de 4 mA et une tension d'entraînement de 22 V.

Connecting Acceleration Sensors

When Connecting Built-in Amplifier Type Acceleration Sensors

This instrument allows built-in amplifier type (low impedance) acceleration sensors to be directly connected. To connect built-in amplifier type acceleration sensors, use BNC cables. Use cables that are appropriate for the acceleration sensors being used.

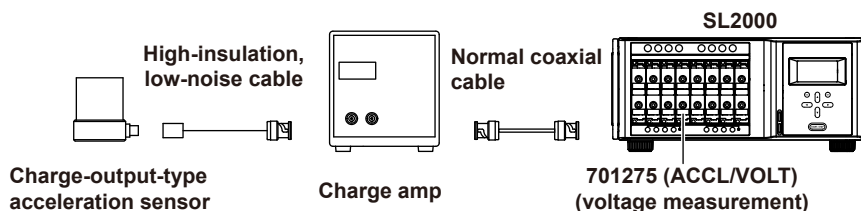
Connect the acceleration sensors with the bias current turned off. After connection, turn on the supply current to the acceleration sensors for making measurements.

When Connecting Charge Output Type Acceleration Sensors

Since the charge output type (high impedance) acceleration sensors do not have built-in amplifier circuit, they cannot be directly connected to this instrument. Use either of the following two methods to connect the sensors.

Using the Charge Amplifier

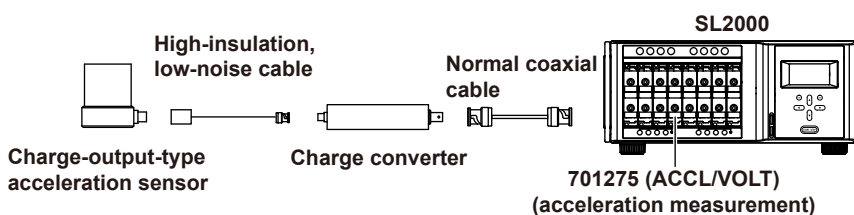
Connect a charge-output-type acceleration sensor to the charge amplifier using a high-insulation, low-noise cable. The acceleration signal (charge signal) that has been converted to a voltage signal by the charge amplifier is input to the instrument using a normal coaxial cable. The instrument measures the signal in the voltage measurement mode. The measured data can be converted to acceleration values using the scale conversion function of the instrument.



Using the Charge Converter

Connect a charge-output-type acceleration sensor to the charge converter using a high-insulation, low-noise cable. By driving the charge converter using a constant current from the instrument, voltage signals similar to those of the built-in amplifier type acceleration sensor can be obtained. This instrument measures the signals in the acceleration measurement mode and supplies bias current to the charge converter. Set the input sensitivity of the instrument according to the charge converter gain and the sensitivity of the charge output type acceleration sensor.

This instrument only supports charge converters that are driven by constant current with driving current of 4 mA and driving voltage of 22 V.



Note

The unit of measurement of acceleration on the instrument is m/s^2 . If the sensitivity is indicated in mV/G for the acceleration sensor that you are using, convert it. ($1 \text{ G} = 9.81 \text{ m/s}^2$)

Precautions

- Do not apply shock outside the specifications (see the manual for the acceleration sensor) to the acceleration sensors. Doing so can damage the sensors.
- Do not impose drastic temperature changes on the acceleration sensors. Temperature changes may affect the output value of the acceleration sensors.
- By default, the bias current on the acceleration sensors is turned off. Be sure to turn it on before using the acceleration sensors. Bias current is valid only when measuring acceleration. When measuring other parameters, it is automatically turned off. The bias current on/off setting is saved when the instrument is turned off.

2.13 Connecting Sensors to the Frequency Module

Sensors and Signal Output Sources That Can Be Connected

The table below shows the sensor and signal output source that can be connected. Appropriate input presets are provided for each sensor and signal output source. For information on how to set presets, see “Input Settings (Input Setup)” in section 4.7, “Configuring Frequency, Revolution, Period, Duty Cycle, Power Supply Frequency, Pulse Width, Pulse Integration, and Velocity Measurements,” in the user’s manual.

Sensor and Signal Output Source	Preset Name
5-V logic signal, 5-V output sensor, and sensor with TTL output	Logic 5V
3-V logic signal and 3-V output sensor	Logic 3V
12-V driven relay/sequence circuit and 12-V driven sensor	Logic 12V
24-V driven relay/sequence circuit and 24-V driven sensor	Logic 24V
Sensor/Encoder that outputs positive and negative voltages and sensor that outputs sine waves	ZeroCross
100-VAC (connected through the isolated probe (700929 or 701947) or passive probe power supply 702902)	AC100V
200-VAC (connected through the isolated probe (700929 or 701947) or passive probe power supply 702902)	AC200V
Power-generating electromagnetic pickup	EM Pickup
Open collector (0 to 5 V) output sensor, contact output	Pull-up 5V*

* For the internal equivalent circuit when the preset setting is Pull-up 5V, see the “Frequency Measurement” section in chapter 2, “Channel Setup” in the feature’s guide (IM DL950E-01EN).



WARNING

If over-range is indicated,* the instrument may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the vertical scale so that the entire amplitude of the waveform is displayed within the waveform display area, and check the input voltage level.

When a measurement is made with the frequency module, over-range is also displayed when the calculated value exceeds the display range of the screen (10 div). When the input voltage level is over-range, the module LED illuminates in red (see page 2-13).

* If the input coupling is set to AC, the over-range indicator may not be displayed. For details, see section 4.1, “Setting the Input Coupling,” in the user’s manual, IM DL950-02EN.

Module					
	4	5	6	7	8
0	701	701	720	720	720
10	270	275	281	245	266



Over-range indication

Indicates that over-range is occurring.

Press the arrow keys (►/◄) to display the Over Range display to see the channels that over-range is occurring on (see section 1.3). For details on the over-range display on the waveform display screen, see section 3.2.

French

**AVERTISSEMENT**

En cas de dépassement de plage,* l'instrument risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter une électrocution, changez l'échelle verticale de sorte que l'amplitude de la forme d'onde soit affichée dans la zone d'affichage de forme d'onde, et vérifiez le niveau de tension d'entrée. Lorsqu'une mesure est effectuée avec le module de fréquence, le dépassement de plage est également affiché lorsque la valeur calculée dépasse la plage d'affichage de l'écran (10 div). Lorsque le niveau de tension d'entrée dépasse la plage, la LED du module s'allume en rouge (voir la page 2-13).

* Si le couplage d'entrée est réglé sur AC, le voyant de dépassement de plage risque de ne pas s'afficher. Pour plus de détails, voir la section 4.1, « Réglage du couplage d'entrée », dans le manuel d'utilisation IM DL950-02EN.

Module		4		5		6		7		8	
0	701	701	720	720	720	720	720	720	720	720	720
10	270	275	281	245	266						

**Dépassement de plage**

Indique qu'un dépassement de plage se produit.

Appuyez sur les touches fléchées (►/◄) pour afficher le dépassement de plage et voir les canaux sur lesquels le dépassement de plage se produit (voir section 1.3).

Pour plus de détails sur l'affichage de dépassement de plage sur l'écran d'affichage de forme d'onde, voir la section 3.2.

Precautions to Be Taken When Connecting to Sensors or Signal Output Sources

**CAUTION**

- The maximum input voltage for direct input is indicated below. Applying a voltage exceeding this value can damage the input section. To apply high voltage that is 42 V or higher, be sure to connect through an isolated probe (700929 or 701947) or passive probe 702902.
Maximum input voltage: 42 V (DC+ACpeak) (CAT II)
- The minimum input voltage is 0.2 Vpp. At voltage amplitude less than 0.2 Vpp, the measured values may be unstable.
- Attach/Remove the sensors after confirming that the rotating object to be measured is stopped.
- Set the preset to electromagnetic pickup (EM Pickup) only when using the electromagnetic pickup.

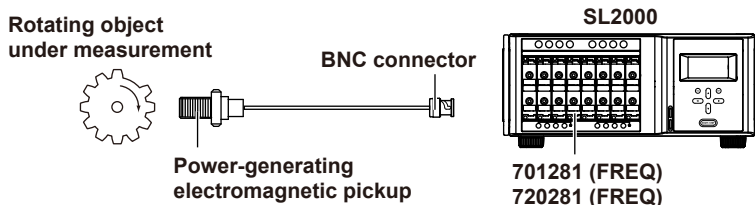
French

**ATTENTION**

- La tension d'entrée maximale de l'entrée directe est indiquée ci-dessous. Le fait d'appliquer une tension dépassant cette valeur risque d'endommager la section d'entrée. Pour appliquer une tension élevée de 42 V au moins, bien réaliser le branchement à l'aide d'une sonde isolée (700929 ou 701947) ou d'une sonde passive 702902.
Tension d'entrée maximum: 42 V (c.c. + crête c.a.) CAT II
- La tension d'entrée minimale est 0,2 Vpp. Pour une amplitude de tension inférieure à 0,2 Vpp, les valeurs mesurées risquent d'être instables.
- Brancher/retirer les capteurs après avoir confirmé que l'objet rotatif à mesuré a été arrêté.
- Prérégler le paramétrage sur détection électromagnétique (EM Pickup) uniquement lors de l'utilisation de la détection électromagnétique.

Connecting the Electromagnetic Pickup

- This instrument allows power-generating electromagnetic pickup to be connected directly. It does not support electromagnetic pickups that require external power supply or those that require a terminator at the output.
- To connect electromagnetic pickups, use BNC cables. Use cables that are appropriate for the electromagnetic pickups being used.
- When the input is set to electromagnetic pickup, determination is not made on whether the input voltage level exceeds the specified input voltage range. Therefore, the LEDs (see page 2-13) do not illuminate in red even when the input voltage level is over range.



2.14 Connecting Wires to the 16-CH Voltage Input Module

To measure voltages with the 16-CH voltage input module (720220 (16CH VOLT)), connect wires to the terminal block.



WARNING

When connecting a device under measurement to the instrument, be sure to turn off the device. It is extremely dangerous to connect or remove wires while the device under measurement is on.

Precautions to Be Taken When Using the Modules

- Do not apply input voltage exceeding the maximum input voltage or maximum rated voltage to earth.
- To avoid electric shock, be sure to ground the instrument.
- To prevent the possibility of electric shock, be sure to fasten the module screws. Otherwise, the electrical protection function and the mechanical protection function will not be activated.
- Avoid continuous connection under an environment in which the surge voltage may occur.
- To prevent electric shock, connect wires to the terminal block that match the voltage range that you are measuring.
- Applying a voltage exceeding the value indicated below may damage the input section. If the frequency is above 1 kHz, damage may occur even when the voltage is below this value.

Maximum input voltage (across the input terminals, H and L,¹ at a frequency of 1 kHz or less)

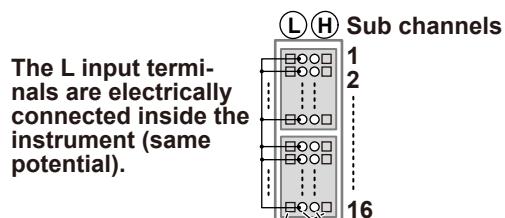
- 42 V (DC+ACpeak)

Maximum rated voltage to ground (across the input terminals, H or L, and earth,² at a frequency of 1 kHz or less)

- 42 V (DC+ACpeak) (CAT II, 30 Vrms)

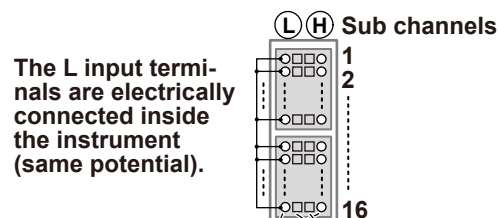
- Wire the L input terminals for all of the sub channels on the same module to the same potential. The L input terminals of the sub channels are all common. Because the L input terminals are electrically connected inside the instrument, connecting different potentials to them could result in short circuiting and damage to the 16-CH voltage input module.

A1833JD terminal block

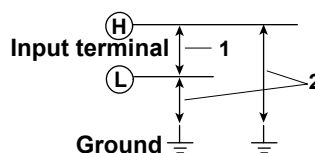


Push button Wire insertion hole

A1800JD terminal block



Wire insertion hole Screwdriver insertion hole



- When you release or lock the terminal block release levers, be careful not to injure yourself on the levers' protrusions.

Over-Range Indication

If over-range is indicated,* the instrument may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the vertical scale so that the entire amplitude of the waveform is displayed within the waveform display area, and check the input voltage level.

* If the input coupling is set to AC, the over-range indicator may not be displayed. For details, see section 4.1, “Setting the Input Coupling,” in the user’s manual, IM DL950-02EN.

Module		4	5	6	7	8
0	701	701	720	720	720	
10	270	275	281	245	266	

**Over-range indication**

Indicates that over-range is occurring.

Press the arrow keys (►/◄) to display the Over Range display to see the channels that over-range is occurring on (see section 1.3). For details on the over-range display on the waveform display screen, see section 3.2.

**CAUTION**

When you attach the terminal block, if you try to attach it upside down, you may damage the terminal block and the module. Check the vertical orientation of the block before you install it.

French**AVERTISSEMENT**

Toujours mettre l'appareil à mesurer hors tension avant de le brancher sur l'instrument. Il est extrêmement dangereux de brancher un câble de mesure lorsque l'appareil à mesurer est sous tension.

Précautions à prendre lors de l'utilisation des modules

- Ne pas dépasser les valeurs maximales de tension d'entrée, de tension nominale maximale à la terre.
- Pour éviter tout risque de choc électrique, l'instrument doit impérativement être relié à la terre.
- Pour éviter tout risque de choc électrique, toujours serrer les vis des modules, à défaut de quoi les fonctions de protection électrique et de protection mécanique ne seront pas activées.
- Éviter les connexions continues dans les environnements pouvant être soumis à surtension.
- Afin d'éviter un risque de choc électrique, raccorder les câbles au bornier qui correspondent à la plage de tensions en cours de mesure.
- L'application d'une tension supérieure à la valeur indiquée ci-dessous pourrait endommager la section d'entrée. Si la fréquence est supérieure à 1 kHz, une tension inférieure à cette valeur pourra tout de même endommager la section d'entrée.

Tension d'entrée maximale (via les bornes d'entrée, H et L,¹ à une fréquence d'1 kHz ou moins)

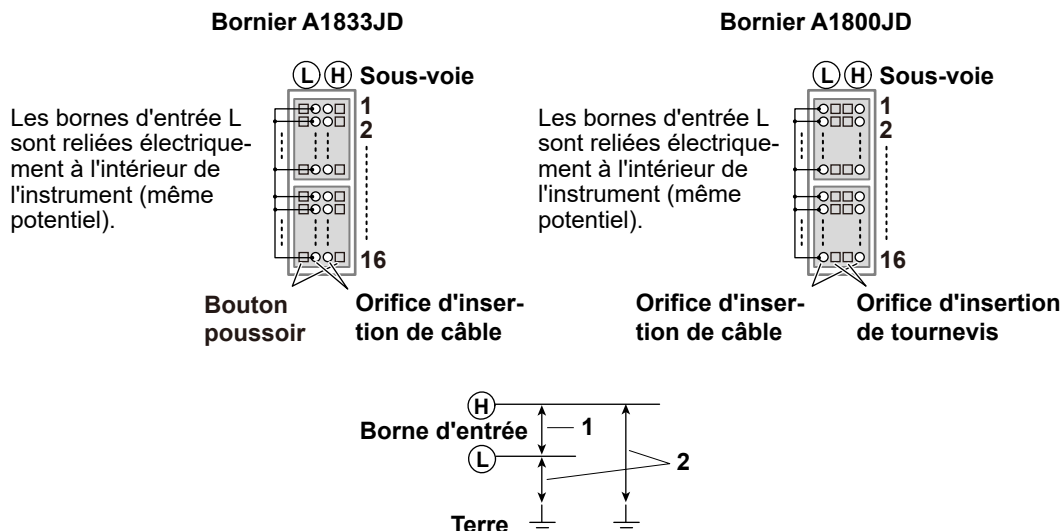
- 42 V (c.c. + crête c.a.)

Tension nominale maximale à la terre (via les bornes d'entrée, H ou L et la terre,² à une fréquence d'1 kHz ou moins)

- 42 V (c.c. + crête c.a.) (CAT II 30 Vrms)

2.14 Connecting Wires to the 16-CH Voltage Input Module

- Câbler les bornes d'entrée L pour toutes les sous-voies sur le même module, au même potentiel. Les bornes d'entrée L des sous-voies sont toutes communes. Les bornes d'entrée L étant reliées électriquement à l'intérieur de l'instrument, le fait d'y relier différents potentiels risque d'entraîner un court-circuit et d'endommager le module d'entrée de la tension 16-CH.



- Lors du déblocage ou blocage des leviers de desserrage du bornier, faire attention de ne pas se blesser contre les leviers.

Dépassement de plage

En cas de dépassement de plage, * l'instrument risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter une électrocution, changez l'échelle verticale de sorte que l'amplitude de la forme d'onde soit affichée dans la zone d'affichage de forme d'onde, et vérifiez le niveau de tension d'entrée.

- * Si le couplage d'entrée est réglé sur AC, le voyant de dépassement de plage risque de ne pas s'afficher. Pour plus de détails, voir la section 4.1, « Réglage du couplage d'entrée », dans le manuel d'utilisation IM DL950-02EN.

Module		4	5	6	7	8
0	701	701	720	720	720	720
10	270	275	281	245	266	



Dépassement de plage

Indique qu'un dépassement de plage se produit.

Appuyez sur les touches fléchées (►/◄) pour afficher le dépassement de plage et voir les canaux sur lesquels le dépassement de plage se produit (voir section 1.3).

Pour plus de détails sur l'affichage de dépassement de plage sur l'écran d'affichage de forme d'onde, voir la section 3.2.



ATTENTION

Lors du branchement du bornier, s'il est branché à l'envers, cela risque d'endommager le bornier et le module. Vérifier l'orientation verticale du bornier avant de l'installer

What to Prepare

Wiring

Remove approximately 7 mm of the insulation from the ends of the wires.

Electrical wire: 0.20 mm² to 1.00 mm² recommended (solid wire or thin stranded wire).

AWG size: 24-18.



Flat-blade Screwdriver

Tip size: 0.4 mm (thickness) × 2.5 mm (width)

Shape: DIN5264-A (Use a straight driver.)

Connecting Wires to the Terminal Block

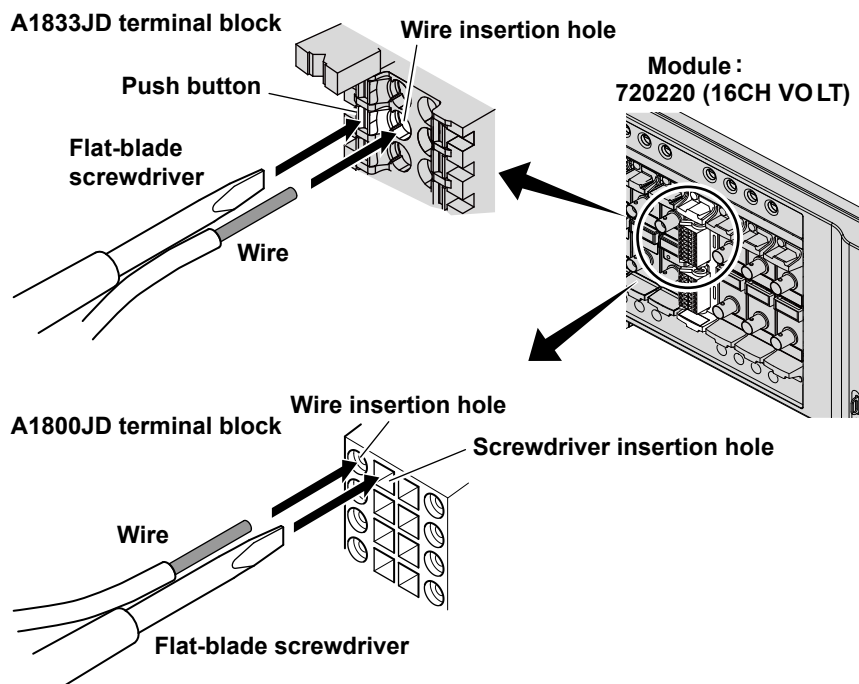
First, turn off the instrument. Make sure that the other end of the wire that you are connecting to the terminal block is not connected to the device under measurement, or make sure that the device under measurement that you are going to connect to is turned off.

A1833JD terminal block

1. With a flat-blade screwdriver, push in the push button right next to the wire insertion hole. Push the flat-blade screwdriver firmly until the wire insertion hole opens.
2. Insert the wire that you prepared into the wire insertion hole. Insert the wire until it reaches the back of the wire insertion hole.
3. Remove the flat-blade screwdriver from the push button. Hold the wire so that it does not come loose, then remove the flat-blade screwdriver.
4. Pull lightly on the wire to make sure that it doesn't come out. When you finish connecting the wire, turn on the instrument and the device under measurement.

A1800JD terminal block

1. Insert the flat-blade screwdriver into the screwdriver insertion hole right next to the wire insertion hole. Insert the flat-blade screwdriver into the hole firmly until the wire insertion hole will open.
2. Insert the wire that you prepared into the wire insertion hole. Insert the wire until it reaches the back of the wire insertion hole.
3. Pull the flat-blade screwdriver out of the screwdriver insertion hole. When you pull out the flat-blade screwdriver, hold the wire in place so that it does not come out with the screwdriver.
4. Pull lightly on the wire to make sure that it doesn't come out. After you have finished connecting the wires, turn on the instrument and the device under measurement.



Note**Removing and Attaching the Terminal Block**

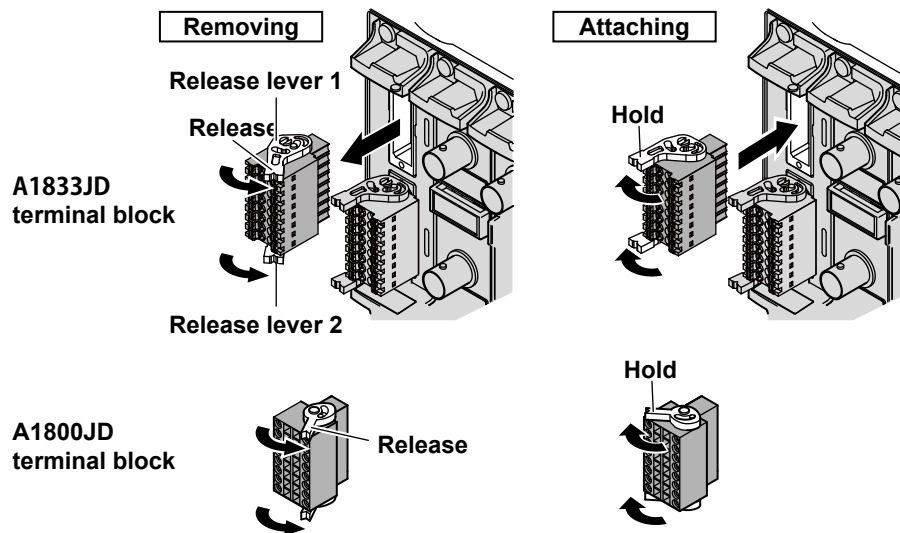
It is normally not necessary to remove the terminal block, but it is possible to do so.

Removal

Push terminal block release levers 1 and 2 to their release positions, and pull out the terminal block.

Attachment

Push terminal block release levers 1 and 2 to their lock positions, and insert the terminal block. Push the terminal block firmly all the way to the back. However, the terminal block will not go all the way to the back if it is upside down. Do not try to force the terminal block all the way to the back.



2.15 Connecting Wires to the 16-CH Temperature/Voltage Input Module

If you are using the 720221 (16CH TEMP/VOLT) to measure temperature and voltage, connect thermocouples or wires to the 16-channel scanner box.



WARNING

When connecting a device under measurement to the instrument, be sure to turn off the device. It is extremely dangerous to connect or disconnect thermocouples or wires while the device under measurement is on.

Precautions to Be Taken When Using the Modules

- To avoid electric shock, be sure to ground the instrument.
- To prevent the possibility of electric shock, be sure to fasten the module screws. Otherwise, the electrical and mechanical protection functions will not be activated.

Precautions to Be Taken When Using the 16-CH Scanner Box

- Do not connect or disconnect the 16-CH scanner box or the cables that are connected to it while the power is on.
- Do not apply voltage exceeding the maximum input voltage or maximum rated voltage to ground.
- Avoid continuous connection in an environment where a surge voltage may occur.
- To prevent electric shock, connect wires to the terminal block that match the voltage range that you are measuring.
- Applying a voltage exceeding the value indicated below may damage the input section. If the frequency is above 1 kHz, damage may occur even when the voltage is below this value.

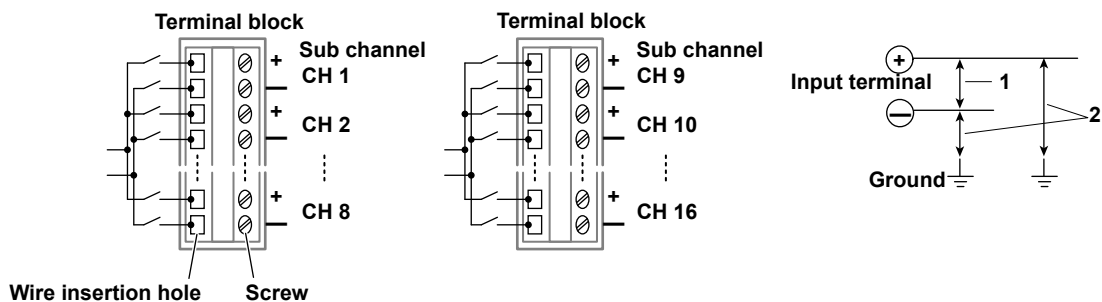
Maximum input voltage (across the input terminals, + and –,¹ at a frequency of 1 kHz or less)

- 42 V (DC+ACpeak)

Maximum rated voltage to ground (across the input terminals, + or –, and earth,² at a frequency of 1 kHz or less)

- 42 V (DC+ACpeak) (CAT II, 30 Vrms)

- The – input terminals of the sub channels are electrically insulated inside the scanner box. If you connect a wire that has a potential difference greater than 42 V (DC+ACpeak) between sub channels, the insulation may be damaged, which will lead to the 16-CH scanner box being damaged.



Over-Range Indication

If over-range is indicated,* the instrument may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the vertical scale so that the entire amplitude of the waveform is displayed within the waveform display area, and check the input voltage level.

* If the input coupling is set to AC, the over-range indicator may not be displayed. For details, see section 4.1, "Setting the Input Coupling," in the user's manual, IM DL950-02EN.

Module		4	5	6	7	8
0	701	701	720	720	720	
10	270	275	281	245	266	

**Over-range indication**

Indicates that over-range is occurring.

Press the arrow keys (►/◄) to display the Over Range display to see the channels that over-range is occurring on (see section 1.3). For details on the over-range display on the waveform display screen, see section 3.2.

**CAUTION**

- Correct measurements cannot be obtained when the positive and negative thermocouple leads are connected in reverse.
- Immediately after connecting the thermocouple, the heat balance may be disturbed at the input terminal section and may cause measurement errors. Therefore, wait about 10 minutes before making a measurement.
- In an environment where the air from the air conditioning is directly applied to the input terminals or where there are effects from a heat source, the heat balance may be disturbed at the input terminal section and cause measurement errors.

When making measurements in this type of environment, take preventive measures such as changing the position.

French**AVERTISSEMENT**

Lors de la connexion à l'instrument d'un appareil faisant l'objet de la mesure, éteindre impérativement l'appareil. Il est extrêmement dangereux de brancher ou débrancher des thermocouples ou des câbles lorsque l'appareil en cours de mesure est allumé.

Précautions à prendre lors de l'utilisation des modules

- Pour éviter tout risque de choc électrique, l'instrument doit impérativement être relié à la terre.
- Pour éviter tout risque de choc électrique, toujours serrer les vis des modules, à défaut de quoi les fonctions de protection électrique et de protection mécanique ne seront pas activées.

Précautions à prendre lors de l'utilisation de boîtier de scanner 16-CH

- Ne pas brancher ou débrancher le boîtier de scanner 16-CH ou les câbles qui y sont reliés s'ils sont sous tension.
- Ne pas appliquer une tension dépassant la tension d'entrée maximum ou la tension nominale à la terre maximum.
- Évitez un branchement continu dans un environnement pouvant être soumis à une surtension.
- Afin d'éviter un risque de choc électrique, raccorder les câbles au bornier qui correspondent à la plage de tensions en cours de mesure.

2.15 Connecting Wires to the 16-CH Temperature/ Voltage Input Module

- L'application d'une tension supérieure à la valeur indiquée ci-dessous pourrait endommager la section d'entrée. Si la fréquence est supérieure à 1 kHz, des dommages risquent de survenir même lorsque la tension est inférieure à cette valeur.

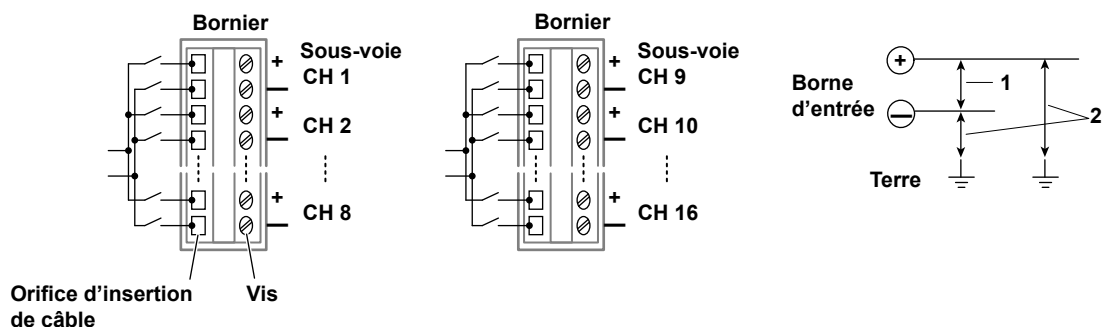
Tension d'entrée maximale (via les bornes d'entrée, + et –,¹ à une fréquence d'1 kHz ou moins)

- 42 V (c.c. + crête c.a.)

Tension nominale maximale à la terre (via les bornes d'entrée, + ou –, et la terre,² à une fréquence d'1 kHz ou moins)

- 42 V (c.c. + crête c.a.) (CAT II 30 Vrms)

- Les bornes d'entrée – des sous-voies sont électriquement isolées à l'intérieur du boîtier de scanner. En cas de branchement d'un câble présentant une différence de potentiel supérieure à 42 V (c.c. + crête c.a.) entre les sous-voies, l'isolation risque d'être endommagée, ce qui causera des dégâts sur le boîtier de scanner 16-CH.



Dépassement de plage

En cas de dépassement de plage,* l'instrument risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter une électrocution, changez l'échelle verticale de sorte que l'amplitude de la forme d'onde soit affichée dans la zone d'affichage de forme d'onde, et vérifiez le niveau de tension d'entrée.

- * Si le couplage d'entrée est réglé sur AC, le voyant de dépassement de plage risque de ne pas s'afficher. Pour plus de détails, voir la section 4.1, « Réglage du couplage d'entrée », dans le manuel d'utilisation IM DL950-02EN.

Module				
4	5	6	7	8
0	701	701	720	720
10	270	275	281	245
				266

Dépassement de plage

Indique qu'un dépassement de plage se produit.

Appuyez sur les touches fléchées (►/◄) pour afficher le dépassement de plage et voir les canaux sur lesquels le dépassement de plage se produit (voir section 1.3).

Pour plus de détails sur l'affichage de dépassement de plage sur l'écran d'affichage de forme d'onde, voir la section 3.2.



ATTENTION

- Il est impossible d'obtenir des mesures correctes si les fils de thermocouple positifs et négatifs sont branchés à l'envers.
 - Immédiatement après avoir branché le thermocouple, l'équilibreur thermique risque d'être perturbé dans la zone de la borne d'entrée, ce qui risque de causer des erreurs de mesure. C'est pourquoi, il faut attendre environ 10 minutes avant d'effectuer une mesure.
 - Dans un environnement dans lequel l'air provenant de la climatisation est directement appliqué sur les bornes d'entrée ou dans lequel il existe des effets provenant de la source de chaleur, l'équilibreur de chaleur risque d'être perturbé dans la zone de la borne d'entrée, ce qui risque de causer des erreurs de mesure.
- Si des mesures sont réalisées dans ce type d'environnement, prendre des mesures préventives telles que le changement de position.

What to Prepare

Thermocouple or Wiring

Remove approximately 7 mm of the insulation from the ends of the thermocouple or wires.
Electrical wire: 0.14 mm² to 1.5 mm² recommended (solid wire or thin stranded wire).
AWG size: 26-16.

←→ Approx. 7 mm

Flat-blade Screwdriver

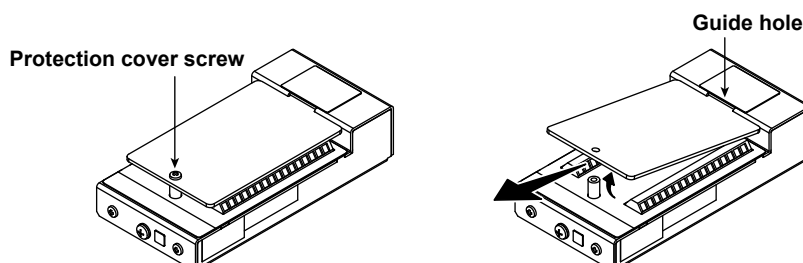
Tip size: 0.6 mm (thickness) × 3.5 mm (width)
Screw tightening torque: 0.5 to 0.6 N·m

Connecting Wires to the Terminal Block

First, turn off the instrument, and make sure that the other end of the wire that you are connecting to the terminal block is not connected to the device under measurement or that the device under measurement that you are going to connect to is turned off.

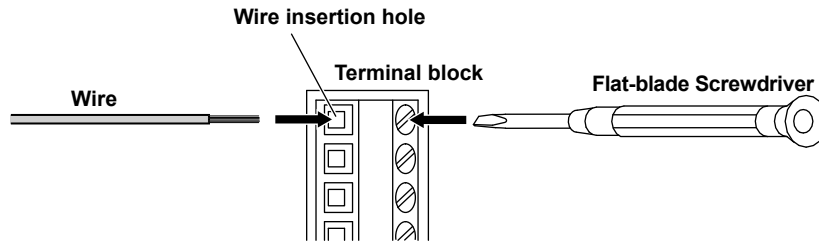
When you first use the 16-CH scanner box, follow the procedure from step 3.

1. Remove the protection cover screw using a screwdriver.
2. Pull the protection cover up, and pull it out from the guide hole.



2.15 Connecting Wires to the 16-CH Temperature/ Voltage Input Module

3. Loosen the terminal block screw using a flat-blade screwdriver.
4. Insert the thermocouple or wire that you prepared into the wire insertion hole. Insert the thermocouple or wire until its end reaches the back of the wire insertion hole.
5. Tighten the terminal block screw using a flat-blade screwdriver.

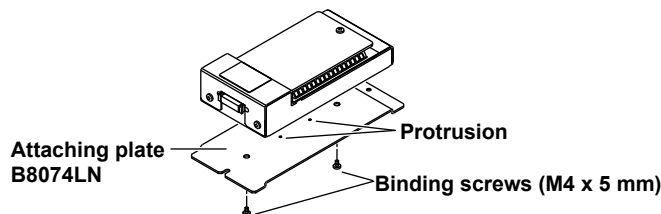


6. Pull lightly on the thermocouple or wire to make sure that it doesn't come out.
7. Insert the protection cover into the guide hole.
8. Tighten the protection cover screw using a screwdriver.

Fixing the Scanner Box in Place

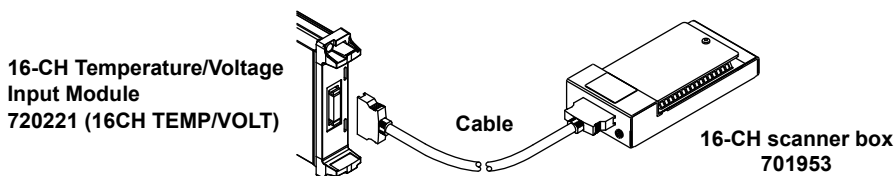
If necessary, you can use the accessory attaching plate, B8074LN, to fix the scanner box to the panel.

1. Align the small holes on the bottom side of the scanner box to the small projections of the attaching plate.
2. Screw the scanner box and the attaching plate together using the accessory binding screws (M4 × 5 mm).
Screw tightening torque: 1.2 N·m



Connecting the 16-CH Temperature/Voltage Input Module and the Scanner Box

Using the cable that came with the 16-CH scanner box (701953), connect the 720221 (16CH TEMP/VOLT) and the 16-CH scanner box.

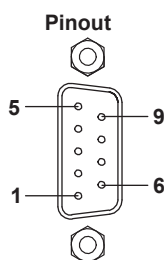


2.16 Connecting a Cable to the CAN Bus Monitor or CAN/CAN FD Bus Monitor Module

To monitor CAN bus signals, connect a cable to D-sub connector of the CAN bus monitor or CAN/CAN FD monitor module. To monitor CAN/CAN FD bus signals, connect a cable to the D-sub connector of the CAN/CAN FD monitor module.

Connector Pinout

The pinout of the D-sub connector (9 pin, male) is shown below.



Pin No.	Signal	Function
1	(NC)	Not used (cannot be connected to)
2	CAN_L	CAN low signal
3	GND	Ground
4	(NC)	Not used (cannot be connected to)
5	(NC)	Not used (cannot be connected to)
6	GND	Ground
7	CAN_H	CAN high signal
8	(NC)	Not used (cannot be connected to)
9	(NC)	Not used (cannot be connected to)

* One-inch screws (number 4-40 UNC) are used.

Note

The connector shell is connected to GND. Additionally, GND and the connector shell are isolated from the electric potential of the SL2000 case (earth).



CAUTION

Applying a voltage greater than the maximum input voltage may damage the input section.

French



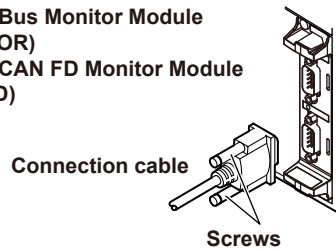
ATTENTION

Le fait d'appliquer une tension dépassant la tension d'entrée maximale risque d'endommager la section d'entrée.

Connecting the Cable (Signal wires)

When you connect a cable to the D-sub connector, be sure to tighten the screws to ensure that the cable is connected securely.

720240 CAN Bus Monitor Module
(CAN MONITOR)
720242 CAN/CAN FD Monitor Module
(CAN/CAN FD)



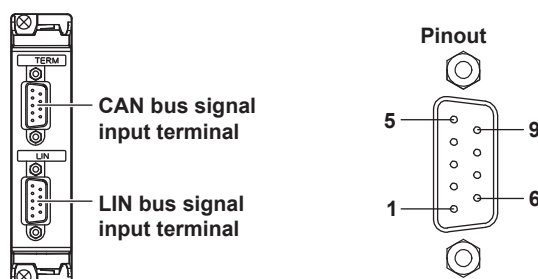
2.17 Connecting a Cable to the CAN & LIN Bus Monitor or CAN FD/LIN Monitor Module

To monitor CAN or LIN bus signals, connect a cable to the CAN & LIN bus monitor module's D-sub connector. To monitor CAN/CAN FD or LIN bus signals, connect a cable to the CAN FD/LIN monitor module's D-sub connector.

Connector Pinout

The pinout of the D-sub connector (9 pin, male) is shown below.

CAN & LIN Bus Monitor Module



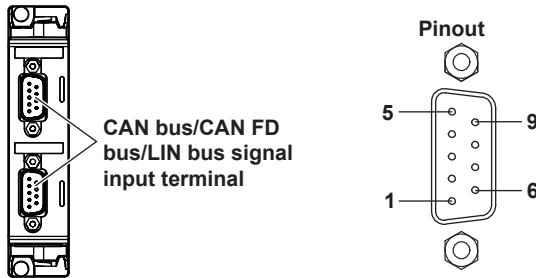
Pin No.	CAN bus signal input terminal		LIN bus signal input terminal	
	Signal	Function	Signal Name	Function
1	(NC)	Not used (cannot be connected to)	LIN	LIN signal
2	CAN_L	CAN low signal	(NC)	Not used (cannot be connected to)
3	CAN_GND	Ground	LIN_GND	Ground
4	(NC)	Not used (cannot be connected to)	VBAT	Battery supply voltage
5	(NC)	Not used (cannot be connected to)	(NC)	Not used (cannot be connected to)
6	CAN_GND	Ground	LIN_GND	Ground
7	CAN_H	CAN high signal	(NC)	Not used (cannot be connected to)
8	(NC)	Not used (cannot be connected to)	(NC)	Not used (cannot be connected to)
9	(NC)	Not used (cannot be connected to)	(NC)	Not used (cannot be connected to)

* One-inch screws (number 4-40 UNC) are used.

Note

The shell of the CAN bus signal input connector is connected to CAN_GND. The shell of the LIN bus signal input connector is connected to LIN_GND. Additionally, CAN_GND and its connector shell and LIN_GND and its connector shell are isolated from the electric potential of the SL2000 case (earth).

CAN FD/LIN Monitor Module



CAN bus/CAN FD bus/LIN bus signal input terminal		
Pin No.	Signal	Function
1	LIN	LIN signal
2	CAN_L	CAN low signal
3	GND	Ground
4	VBAT	Battery supply voltage
5	(NC)	Not used (cannot be connected to)
6	GND	Ground
7	CAN_H	CAN high signal
8	(NC)	Not used (cannot be connected to)
9	(NC)	Not used (cannot be connected to)

* One-inch screws (number 4-40 UNC) are used.

Note

The connector shell is connected to GND. Additionally, GND and the connector shell are isolated from the electric potential of the SL2000 case (earth).



CAUTION

Applying a voltage greater than the maximum input voltage may damage the input section.

French



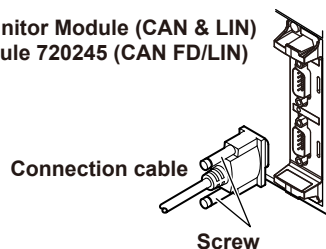
ATTENTION

Le fait d'appliquer une tension dépassant la tension d'entrée maximale risque d'endommager la section d'entrée.

Connecting the Cable (Signal wires)

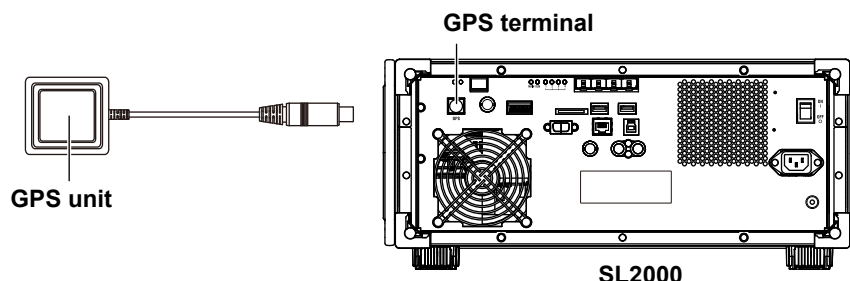
When you connect a cable to the D-sub connector, be sure to tighten the screws to ensure that the cable is connected securely.

720241 CAN&LIN Bus Monitor Module (CAN & LIN)
CAN FD/LIN Monitor Module 720245 (CAN FD/LIN)



2.18 Connecting the GPS Unit (/35 option)

To measure the position or synchronize the clock using GPS, connect the GPS unit, sold separately, to the GPS terminal.



CAUTION

- Attach or remove the GPS unit from the instrument with the power turned off.
- If installed indoors, place the GPS unit near a window or a location where it has a good line of sight to GPS satellites. Otherwise, time synchronization may not work properly.

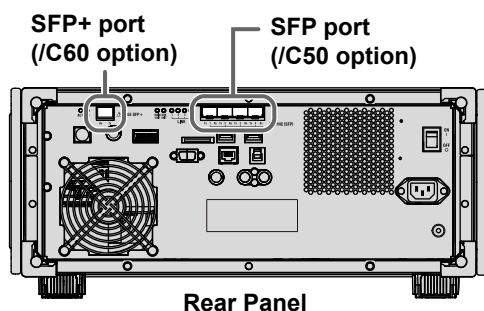
French

ATTENTION

- Brancher l'unité GPS à l'instrument ou l'en retirer lorsque l'appareil est hors tension.
- Si elle est installée à l'intérieur, placer l'unité GPS à proximité d'une fenêtre ou d'un endroit où la réception des satellites GPS est bonne. Sinon, la synchronisation des durées risque de ne pas se faire correctement.

2.19 Installing a Optical Transceiver Module and Connecting an Optical Fiber Cord (/C50, /C60 option)

This instrument has two types of optical ports (SFP and SFP+ port). Because the transmission speed varies depending on the optical port, install and use the appropriate optical transceiver module.



Optical Port	Transfer rate	Port Position	Number of Ports	Purpose
SFP port (/C50 option)	1Gbps	rear panel	4	Multi-unit synchronization operation (up to five units)
SFP+ port (/C60 option)	10Gbps	rear panel	1	10 Gbps Ethernet communication

Note

- Attach a 720941 optical transceiver module, an accessory sold separately, to this instrument's SFP port. If you use a different optical transceiver module, the instrument's functions and performance are not guaranteed.
- If you are using the instrument's SFP+ port, purchase an off-the-shelf optical transceiver module (10GBASE-R SFP+ compatible), and attach that to the port. The 720941 optical transceiver module, an accessory sold separately, does not support SFP+(10GBASE-R).



CAUTION

When using multi-unit synchronization, connect the main unit and all the sub units to be synchronized with optical fiber cords first and then execute the multi-unit synchronization connection procedure. The instrument may not operate properly if you insert or remove optical transceiver modules or optical fiber cords after executing the connection procedure.

French



ATTENTION

Lors de l'utilisation de la synchronisation des multiunités, connecter d'abord l'unité principale et toutes les sous-unités à synchroniser avec des cordons de fibre optique, ensuite exécuter la procédure de connexion de synchronisation des multiunités. L'instrument ne pourrait pas fonctionner correctement si vous insérez ou retirez des modules d'émetteur-récepteur optique ou des cordons de fibre optique après avoir exécuté la procédure de connexion.

Installing the Optical Transceiver Module



CAUTION

- Be extremely careful of static electricity when you install or remove optical transceiver modules. Electrostatic discharges during the installation or removal of these modules may cause them to malfunction.
- Do not install or remove optical transceiver modules while optical fiber cords are connected to them. Doing so may damage the instrument.
- Do not install or remove optical transceiver modules while a measurement is in progress. Doing so may damage the instrument. When installing or removing an optical transceiver module, turn off the instrument.

French



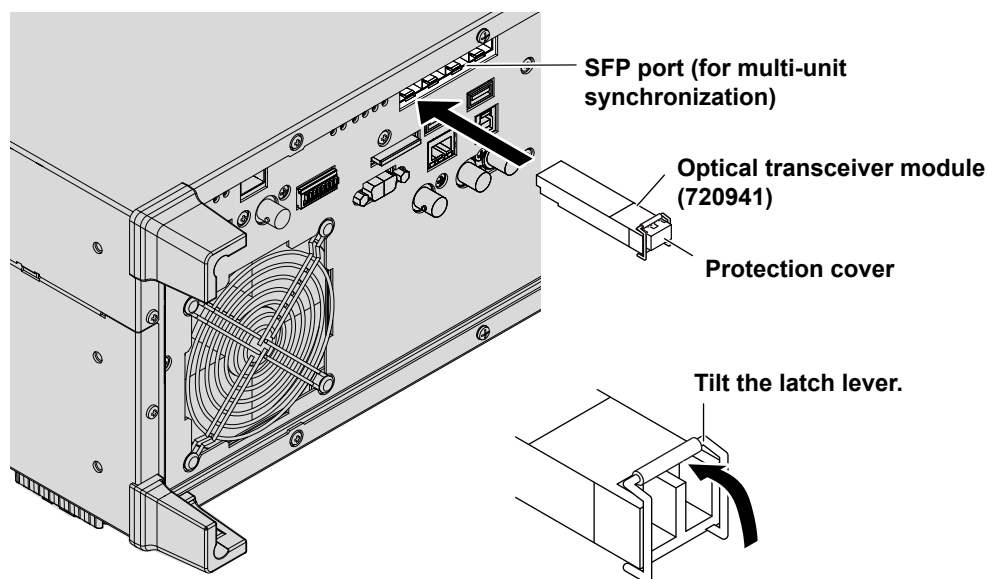
ATTENTION

- Se méfier extrêmement de l'électricité statique lors d'installer ou retirer des modules d'émetteur-récepteur optiques. La décharge électrostatique lors de l'installation ou du retrait de ces modules pourrait causer leur dysfonctionnement.
- Ne pas installer ou ne pas retirer les modules d'émetteur-récepteur optique lorsque des cordons de fibre optique y sont connectés. Cela pourrait endommager l'instrument.
- Ne pas installer ou ne pas retirer les modules d'émetteur-récepteur optiques lorsqu'une mesure est en cours. Cela pourrait endommager l'instrument. Lors de l'installation ou du retrait d'un module d'émetteur-récepteur optique, éteindre l'instrument.

How to Install the Optical Transceiver Module

1. Make sure that the instrument's power switch is turned off.
2. Tilt the latch lever of the optical transceiver module as shown below.
A protection cover is attached to the optical transceiver module (720941), an accessory sold separately. Remove it when connecting the optical fiber cord.
3. Check that the optical transceiver module is in the correct orientation, and slowly insert the module into the instrument's SFP or SFP+ port.
4. Push the optical transceiver module in until you hear a click.

Example of Installing to an SFP Port (/C50 option)

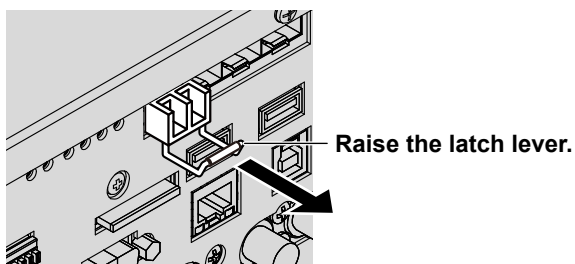


Note

When connecting a main unit and sub units in a multi-unit synchronization connection (/C50 option), be sure to use the leftmost SFP port among the four SFP ports on the sub unit side. On the main unit side, all SFP ports can be used.

How to Remove the Optical Transceiver Module

1. Make sure that the instrument's power switch is turned off.
If an optical fiber cord is connected, be sure to remove it.
2. Raise the latch lever to release the lock.
3. Pull the optical transceiver module straight out.



Connecting an Optical Fiber Cord



WARNING

- If optical transceiver modules are installed in the instrument, light is emitted from the optical ports when the instrument is turned on. Do not disconnect the connected optical fiber cord. Visual impairment may occur if the light enters the eye.
- If an optical fiber cord is not connected, attach the protection cover to the optical transceiver module. Visual impairment may occur if light that is mistakenly emitted from the optical ports enters the eye.



CAUTION

- Do not pull, twist, or bend optical fiber cords with excessive force. Doing so may break the cord.
- Insert the optical fiber cord connector slowly and straight into the optical port by holding the connector part. If you shake the connector to the left and right or force it into the port, the connector or optical port may be damaged.

French



AVERTISSEMENT

- Si des modules d'émetteur-récepteur optiques sont installés dans l'instrument, de la lumière est émise par les orifices optiques lorsque l'instrument se démarre. Ne pas déconnecter le cordon de fibre optique connecté. Une déficience visuelle pourrait se présenter si la lumière pénètre dans l'œil.
- Si un cordon de fibre optique n'est pas connecté, attachez le couvercle de protection au module d'émetteur-récepteur optique. Une déficience visuelle pourrait se présenter si de la lumière émise par les orifices optiques pénètre accidentellement dans l'œil.



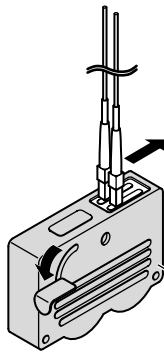
ATTENTION

- Ne pas tirer, ne pas tordre ou ne pas plier les cordons de fibre optique avec une force excessive. Cela pourrait casser le cordon.
- Insérer lentement et droit le connecteur du cordon de fibre optique dans l'orifice optique en tenant le connecteur. Si vous secouez le connecteur vers la gauche et la droite ou si vous le forcez dans l'orifice, le connecteur ou l'orifice optique pourrait être endommagé.

Clean the Connector End Face

Clean the connector end face of the optical fiber cord before connecting it to the instrument. If dust is adhered to the connector end face, it may damage the optical port. If this happens, the instrument will not be able to make correct measurements.

1. Firmly press the connector end face of the optical fiber cord against the cleaning surface of the cleaner.
2. With the end face pressed, rub it several times, turning it in small amounts.
3. With the end face pressed, slide it along the cleaning surface.
4. Repeat steps 1 to 3.



You can purchase an optical fiber cord cleaner from NTT-AT Corporation.

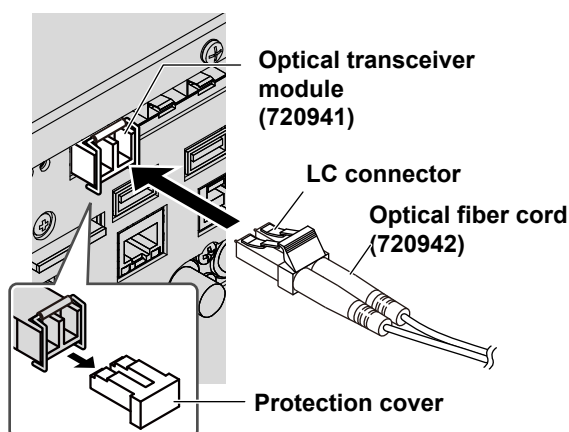
Note

- Connect 720942 optical fiber cords, sold separately, to SFP ports that have 720941 optical transceiver modules, which are also accessories sold separately, installed. When connecting an off-the-shelf optical fiber cord, use a multi-mode LC connector type cord (up to 20 m). Single-mode optical fiber cords cannot be used.
 - When using the optical transceiver module (10GBASE-R SFP+ compatible) that you purchased, purchase an appropriate off-the-shelf optical fiber cord to connect to its SFP+ port.
-

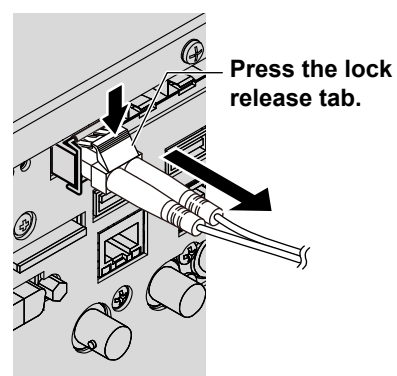
How to Connect an Optical Fiber Cord

1. Make sure that the instrument's power switch is turned off.
2. Make sure that the fiber optic cord connector is oriented correctly, and then slowly insert it into the fiber optic module installed in the instrument.
 - For details on how to install the optical transceiver module, see page 2-76.
 - If a protection cover is attached to the optical transceiver module, remove it.
3. Push the connector until you hear a click.
4. When removing the optical fiber cord, pull the connector out slowly while pressing the lock release tab.

• When connecting

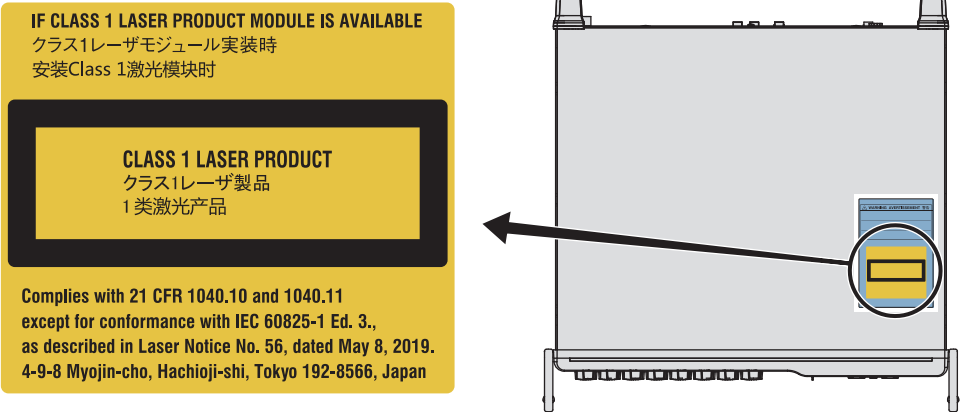


• When removing



Safety Precautions for Laser Products

When an optical transceiver module (SFP, SFP+) is installed in this instrument, the instrument is a Class 1 laser product as defined by IEC 60825-1:2014 Safety of Laser Products—Part1: Equipment Classification and Requirements. In addition, this instrument complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed.3., as described in Laser Notice No. 56, dated May 8, 2019.



EN 60825-1:2014+A11:2021, IEC 60825-1:2014, GB/T 7247.1-2024

Laser Specifications

SFP Optical Transceiver Module (720941)

Class	Center Wavelength	Maximum Output Power*	Beam Divergence Angle (all angles @ 1/e ²)	Pulse Duration and Repetition Frequency	Supplier Code
1	850 nm	0.7 mW	20 deg	CW	FTLF8519P3BNL

* Under single fault conditions.

SFP+ Optical Transceiver Module (purchase an off-the-shelf product)

For the laser specifications, see the manual for the SFP+ optical transceiver module that you purchased.

Laser classes differ depending on the standard number and year. Take safety measures according to the laser class corresponding to standard number and year of the country or region that the instrument will be used in.

If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. YOKOGAWA assumes no liability for the customer’s failure to comply with these warnings and requirements.

3.1 Displaying Measured Waveforms and Setup Menu

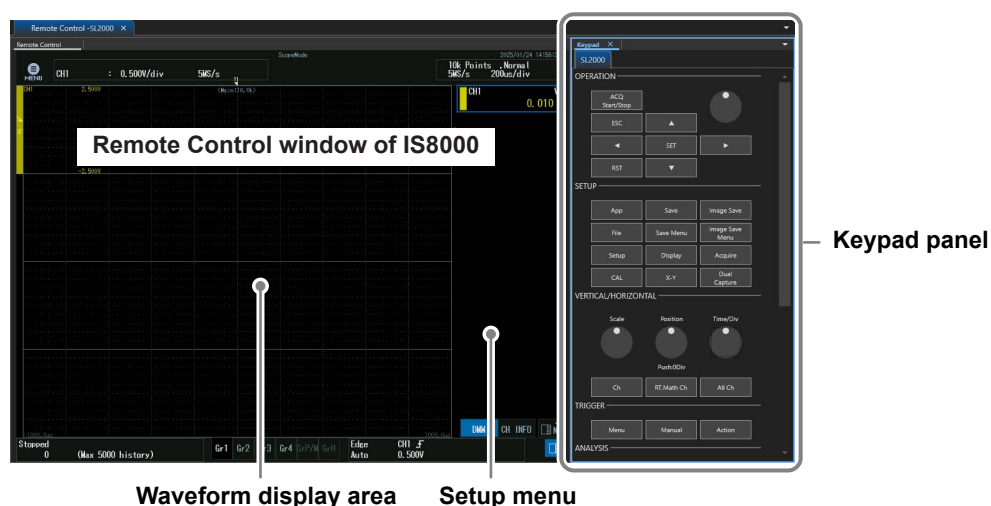
The following methods are available for displaying waveforms measured with this instrument and for displaying the setup menu.

- Using the Integrated Software (IS8000)
- Using the Web Server Feature
- Connecting a Monitor to This Instrument

Using the Integrated Software (IS8000)

Note

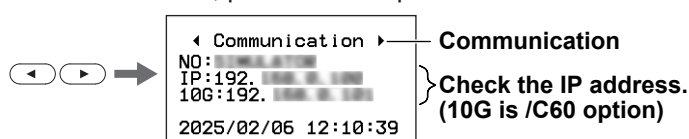
- A PC with YOKOGAWA's Integrated Software IS8000 installed is required. See the IS8000 manual for installation instructions.
- A network connection between this instrument and a PC is required (not required if this instrument is connected to a PC via USB cable).
- For details on how to connect to the network and how to set the IP address, see chapter 22, "Ethernet Communication," in the User's Manual (IM DL950-02EN).



Waveforms and setup menus displayed on IS8000 can be controlled directly in the waveform display area or with the keypad panel. For details, see chapter 1 in the User's Manual, IM DL950-02EN.

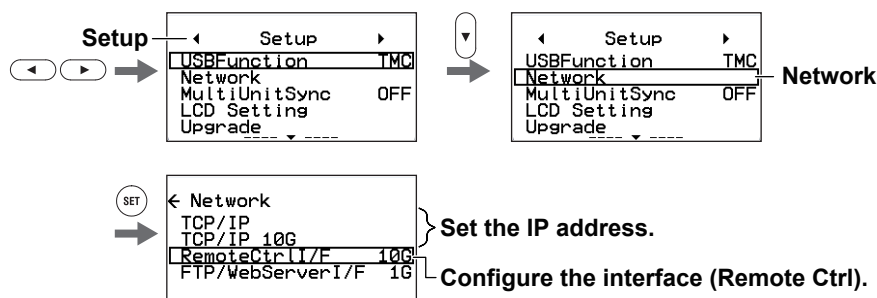
Connecting the Instrument to IS8000

1. Connect the instrument to a PC with a USB cable or connect to a network via Ethernet. The USB and Ethernet ports are located on the rear panel of this instrument (see page 1-2).
2. If the instrument is connected to a network, press the arrow keys (see page 1-5) to open the Communication screen, and verify the instrument's IP address. If you connect with a USB cable, proceed to step 3.

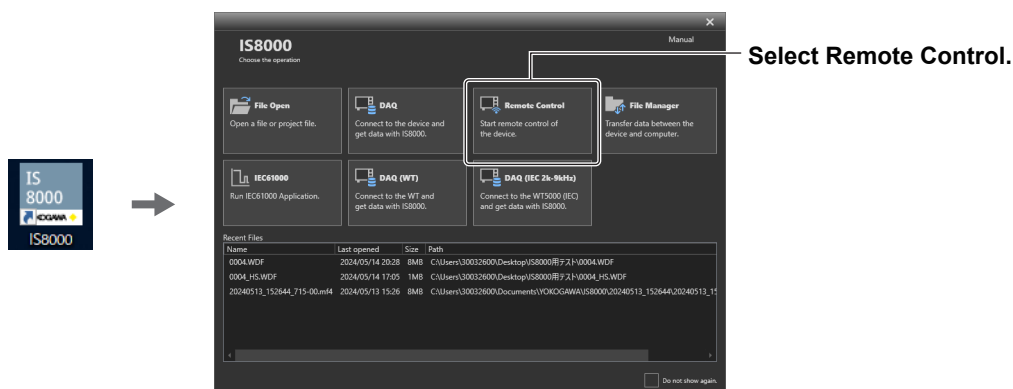


3.1 Displaying Measured Waveforms and Setup Menu

- To set the IP address, open the Setup screen, and use the Network menu. For information on how to set values, see section 1.3.
- When using 10 Gbps Ethernet (/C60 option), set the Remote Ctrl interface to 10G.



3. Run IS8000 installed in the PC, and select **Remote Control** on the launcher window.

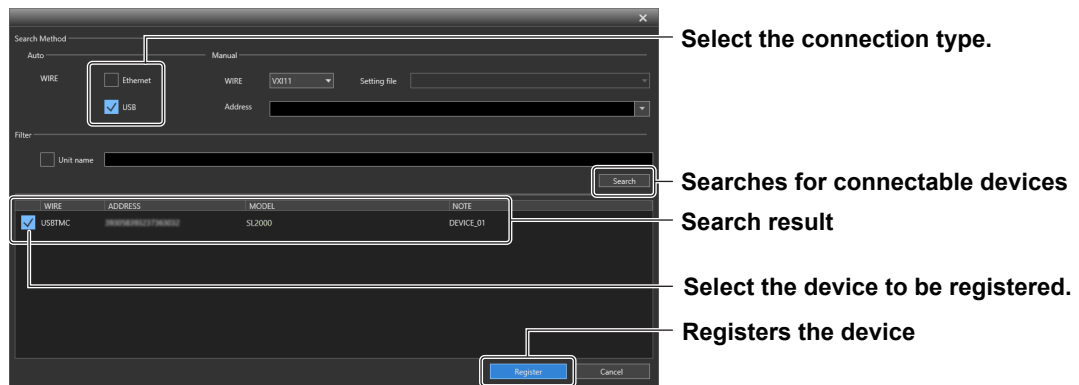


4. Select this instrument, and click **OK**.
 Devices connected to the network can be identified by the IP address that you confirmed or set in step 2.
 When connecting for the first time, click **Add** and follow the procedure in step 5 to register the device to be connected.



5. Select **Ethernet** or **USB**, and click **Search**.

The search will find devices that can be connected. Select the device you wish to register and click **Register**. The screen shown in step 4 appears.



Using the Web Server Feature

Note

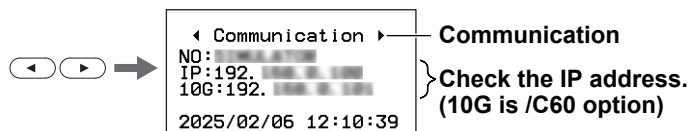
- A network connection between this instrument and a PC is required.
- For details on how to connect to the network and how to set the IP address, see chapter 22, "Ethernet Communication," in the User's Manual (IM DL950-02EN).



Waveforms and setup menus displayed on the Web server can be controlled directly in the waveform display area or with the keys on the right side of the screen. For details, see chapter 1 in the User's Manual, IM DL950-02EN.

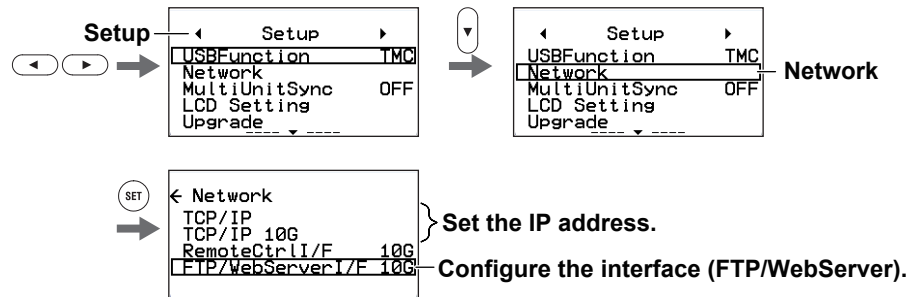
Connecting to the Web Server

- Connect the instrument to a network via Ethernet.
The Ethernet port is located on the rear panel of this instrument (see page 1-2).
- Press the arrow keys (see page 1-5) to open the Communication screen, and verify the instrument's IP address.

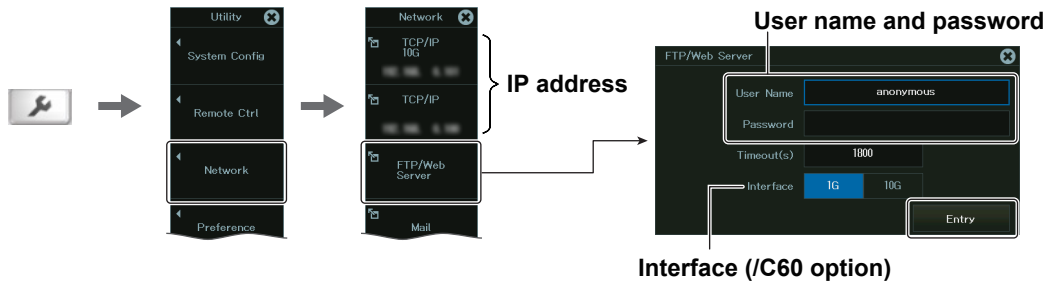


3.1 Displaying Measured Waveforms and Setup Menu

- To set the IP address, open the Setup screen, and use the Network menu. For information on how to set values, see section 1.3.
- When using 10 Gbps Ethernet (/C60 option), set the FTP/WebServer interface to 10G.

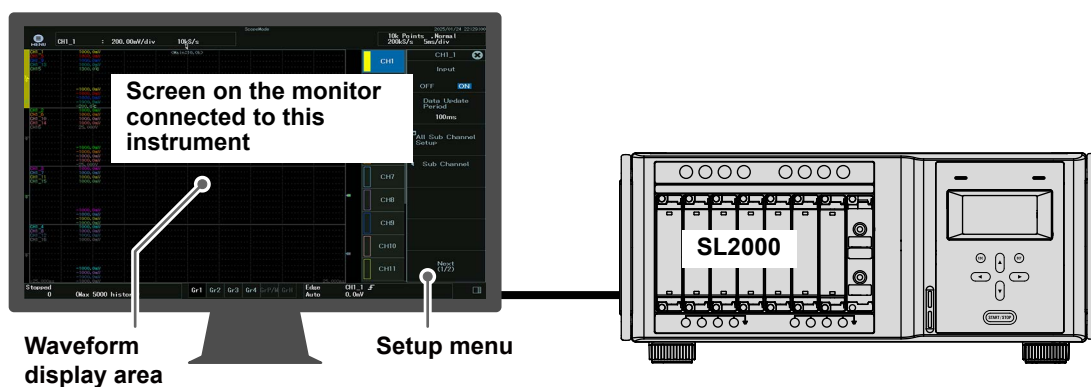


3. Run a Web browser on a PC connected to the network, enter in the address bar this instrument's IP address that you confirmed or entered in step 2, and press **Enter**.
4. On the login screen, enter the user name "anonymous" (default value), and click **Sign In**. If you set the user name to "anonymous" (default value), you can omit the password. When the Web server screen appears, we recommend you press **UTILITY** (🔧) and set the user name and password according to the steps below.



5. A Web server screen appears. On the Web server menu, click **Remote View** or **Remote Control**.
To control this instrument, select Remote Control.

Connecting a Monitor to This Instrument



When you connect a monitor to the instrument, you will be able to display measured waveforms and a menu related to measurement. For instructions on how to connect a monitor, see section 4.7, "Video Signal Output (VIDEO OUT (XGA))."

You can control the waveforms and setup menus displayed on the monitor by connecting a USB mouse or USB keyboard to the instrument. For details, see chapter 1 in the User's Manual, IM DL950-02EN.

3.2 Starting and Stopping Waveform Acquisition

Starting and Stopping Waveform Acquisition

Press **START/STOP**. Waveform acquisition starts or stops.

The key is illuminated while the instrument is acquiring waveforms.

Waveform Acquisition and Indicators

- When the START/STOP key is illuminated, the instrument is acquiring waveforms. “Running” is displayed at the lower left of the screen displaying the waveforms (see section 3.1).
- When the START/STOP key is not illuminated, waveform acquisition is stopped. “Stopped” is displayed at the lower left of the screen displaying the waveforms (see section 3.1).

Over-Range Indication

When the input signal is over-range, the over-range icon and the channel number on which the over-range is occurring are displayed at the top right of the screen displaying the waveform (see section 3.1).

If over-range is occurring on multiple channels, the smallest channel number among them is indicated as follows: **CH3>>**.



Scope Mode

Instrument Operation When the Acquisition Mode Is Set to Averaging

- Averaging stops when you stop waveform acquisition.
- If you restart waveform acquisition again, averaging starts from the beginning.

START and STOP Operations during Accumulation

- Accumulation stops when you stop acquisition.
- When waveform acquisition is resumed, accumulation continues from where it left off.

Note

You can use the snapshot feature to retain the displayed waveform on the screen. This feature allows you to retain the waveform that you have taken a snapshot of on the screen while the instrument continues signal acquisition.

Recorder Mode

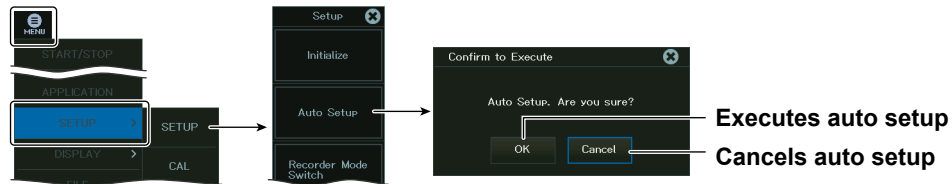
Holding the Waveform Display

- In Recorder mode, the waveform display on the screen can be held while continuing waveform acquisition. For the procedure, see section 7.6, “Holding the Waveform Display (Recorder mode)” in the User’s Manual, IM DL950-02EN.
- Cursor measurements can be displayed while the waveform display is held.

Performing Auto Setup

Auto setup automatically sets the vertical axis (V/div), horizontal axis (time/div), trigger level, and other settings to values that are most suitable for the input signals.

Open the waveform screen using one of the methods described in section 3.1, click  (MENU) in the top left corner of the screen, and follow the steps below.



- In Scope mode, waveform acquisition starts after the auto setup execution.
- For details, see chapter 3 in the User's Manual, IM DL950-02EN.

4.1 External Trigger Input (TRIGGER IN)



CAUTION

Only apply signals that meet the specifications below. Excessive voltage or the like may damage the instrument.

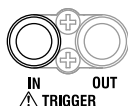
French



ATTENTION

Les signaux ne correspondant pas aux spécifications risquent d'endommager cet instrument, à cause de facteurs tels qu'une tension excessive.

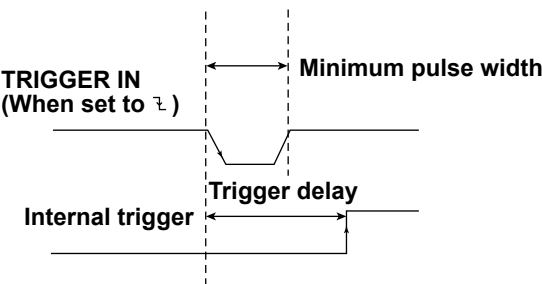
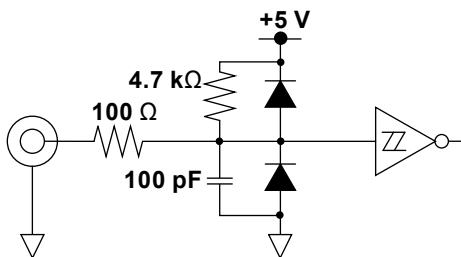
External Trigger Input Terminal



This terminal is used when an external signal is used as the trigger source.

Item	Specifications
Connector type	BNC
Input level	TTL (0 to 5 V)
Minimum pulse width	100 ns
Detected edge	Rising or falling

Circuit Diagram and Timing Chart for External Trigger Input



4.2 Trigger Output (TRIGGER OUT)



CAUTION

Do not short the TRIGGER OUT terminal or apply external voltage to it. If you do, the instrument may malfunction.

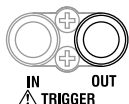
French



ATTENTION

Ne pas mettre la borne TRIGGER OUT en court-circuit et ne pas y appliquer une tension externe. Si vous le faites, l'instrument pourrait mal fonctionner.

Trigger Output Terminal



The following CMOS level signals can be transmitted.

Trigger Output (Normal)

When the output format is set to normal, the terminal transmits a falling signal when a trigger occurs. The signal level is normally high but goes low when a trigger occurs.

Trigger Output (Pulse)

When the output format is set to pulse, the terminal transmits a pulse signal when a trigger occurs. You can set the pulse width.

Specifications

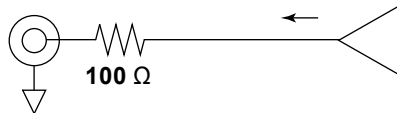
Item	Specifications	
Connector type	BNC	
Output level	5 V CMOS	
Output delay time	(1.8 μ s to 4.5 μ s) + 1 sample (typical value) Applies to 1 MS/s or faster modules. Depends on the installed module.* However, during multi-unit synchronization (/C50 option), the delay is 5.2 μ s + 1 sample (typical value) (can only be output from the main unit).	
Output type		
• Normal	Logic	Falls when a trigger occurs and rises when a signal acquisition is completed
	Output hold time	100 ns or more
• Pulse	Logic	Transmits a pulse when a trigger occurs
	Pulse width	1 ms, 50 ms, 100 ms, 500 ms

* The trigger output signal delay varies depending on the installed module as follows: When a combination of these modules are installed, the delay time is that of the module with the greatest delay time.

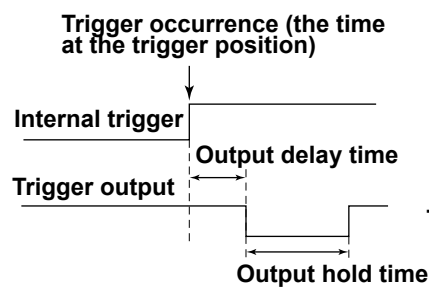
Module	Trigger Output Delay (typical value)
720211	1.8 μ s + 1 sample
720212	2.5 μ s + 1 sample
720256	2.2 μ s + 1 sample
701250	2.1 μ s + 1 sample
720250	
701255	
720254	4.5 μ s + 1 sample
701251	
720268	

Circuit Diagram and Timing Chart for Trigger Out

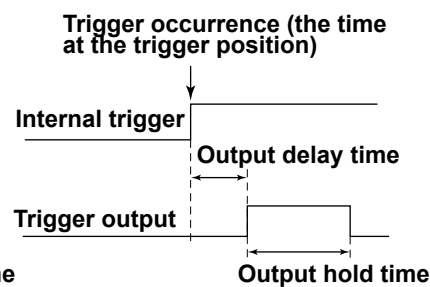
TRIGGER OUT



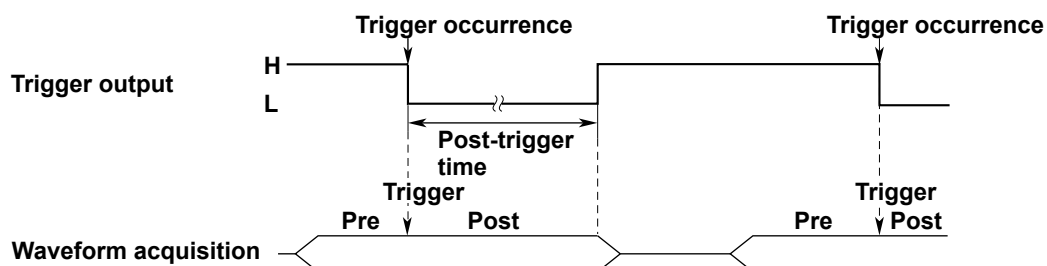
• Normal mode



• Pulse mode



Low Level and High Level Hold Times (In normal mode)



4.3 External Clock Input (EXT CLK IN)



CAUTION

Only apply signals that meet the specifications below. Excessive voltage or the like may damage the instrument.

French



ATTENTION

Les signaux ne correspondant pas aux spécifications risquent d'endommager cet instrument, à cause de facteurs tels qu'une tension excessive.

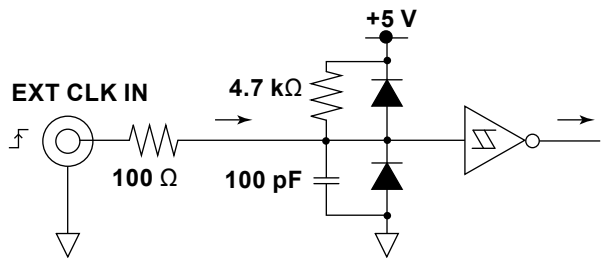
External Clock Input Terminal



Use this terminal to operate the instrument using an external clock signal.

Item	Specifications
Connector type	BNC
Input level	TTL (0 to 5 V)
Maximum input frequency	9.5 MHz
	100 kHz (for envelope)
Minimum pulse width	50 ns
Detected edge	Rising

Circuit Diagram for External Clock Input



4.4 Sample Clock Output (CLKO)



CAUTION

Do not short the CLKO terminal or apply external voltage to it. If you do, the instrument may malfunction.

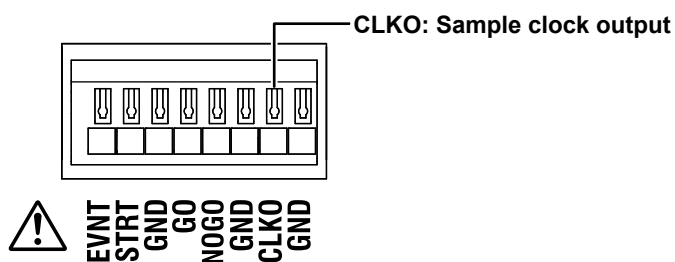
French



ATTENTION

Ne pas court-circuiter la borne CLKO et ne pas appliquer de tension de sortie. Si vous le faites, l'instrument pourrait mal fonctionner.

Sample Clock Output (CLKO)



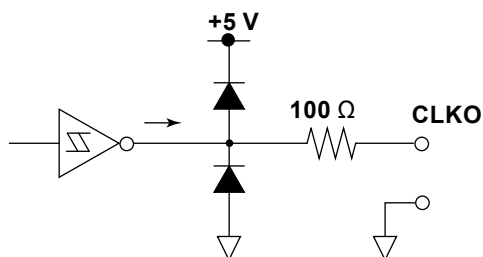
EVNT
STRT
GND
GO
NOGO
GND
CLKO
GND

Periodic pulse signals can be output according to the following settings. You can set the pulse rate.

- OFF: Pulse signals are not output.
- Acquisition: Pulse signals are output only while the instrument is acquiring waveforms.
- Free run: Pulse signals are output constantly.

Item	Specifications
Connector type	Screwless terminal block
Output level	5 V CMOS
Output operation	Outputs a clock signal at the specify frequency
Frequency range	5 Hz to 200 kHz (1-2-5 steps)

Circuit Diagram of Sample Clock Output

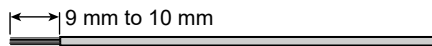


Connecting a Wire to the Terminal

What to Prepare

Wiring

- Remove 9 mm to 10 mm of the insulation from the end of the wire.
- Wire: Solid wire or thin stranded wire, AWG size: 22 to 28

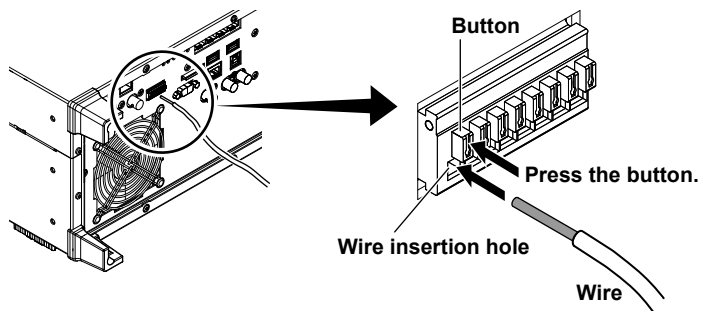


Connecting Wires to the Terminal Block

First, turn off the instrument. Next, make sure that the other end of the wire that you are connecting to the terminal block is not connected to a device, or make sure that the device that you are going to connect to is turned off.

1. Press the button next to the wire insertion hole with a flat-blade screwdriver or the like. Insert firmly to open the wire insertion hole.
2. Insert the wire that you prepared into the wire insertion hole. Insert the wire until it reaches the back of the wire insertion hole.
3. Pull lightly on the wire to make sure that it doesn't come out.

When you finish connecting the wire, turn on the instrument and the other device.



4.5 GO/NO-GO Determination Output (GO/NOGO)



CAUTION

- Do not apply external voltage to the NO-GO or GO output terminal. If you do, the instrument may malfunction.
- When connecting the GO/NO-GO determination signal output to another device, do not connect the wrong signal terminal. Doing so may damage this instrument or the connected instrument.

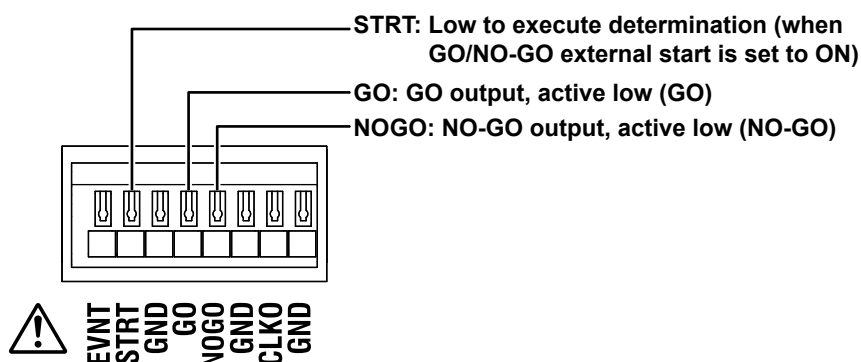
French



ATTENTION

- Ne pas appliquer de tension externe à la borne de sortie NO-GO ou GO. Si vous le faites, l'instrument pourrait mal fonctionner.
- Lors de la connexion de la sortie de signal de détermination GO/NO-GO à un autre appareil, veiller à ne pas connecter la mauvaise borne de signal. Cela pourrait endommager cet instrument ou l'instrument connecté.

GO/NO-GO Determination Output (GO/NOGO)



GO/NO-GO determination results can be output from the instrument's GO/NO-GO output terminal. GO/NO-GO determination can also be performed in sync with a signal received through the START terminal.

Item	Specifications
Connector type	Screwless terminal block
Output level	5 V CMOS

Input signal

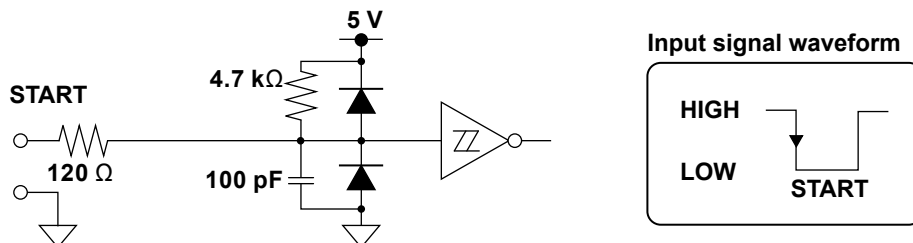
START (negative logic)

When the input signal changes to low level, the instrument starts. When a trigger occurs, the instrument acquires waveforms and performs GO/NO-GO determination. After GO/NO-GO determination, the instrument does not acquire waveforms until the next time the input signal changes to low level.

4.5 GO/NO-GO Determination Output (GO/NOGO)

This feature is enabled only when Remote is set to ON in the judgment conditions of the GO/NO-GO determination feature. If Remote is set to OFF, GO/NO-GO determination is performed regardless of the external signal input (the GO/NOGO determination result is output).

Signal Input Circuit



Output Signal

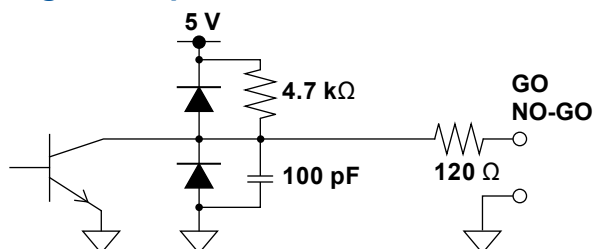
NOGO (Negative logic)

When the determination result is NO-GO (fail), the output signal level temporarily changes from high (H) to low (L).

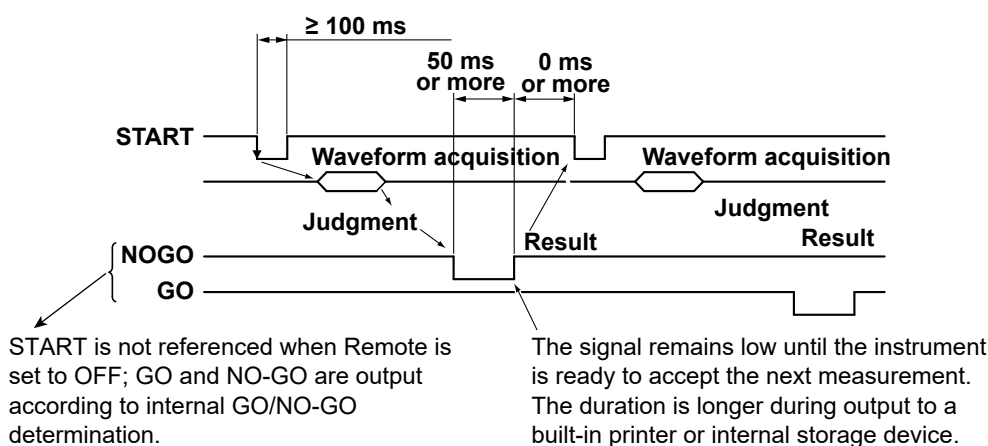
GO (negative logic)

When the determination result is GO, the output signal level temporarily changes from high (H) to low (L).

Signal Output Circuit



START Input and GO/NO-GO Output Timing



Connecting a Wire to the Terminal

For instruction on how to connect a wire to the terminal, see page 4-6.

4.6 External Start/Stop/Event Input (START/ EVENT)



CAUTION

Only apply signals that meet the specifications below. Excessive voltage or the like may damage the instrument.

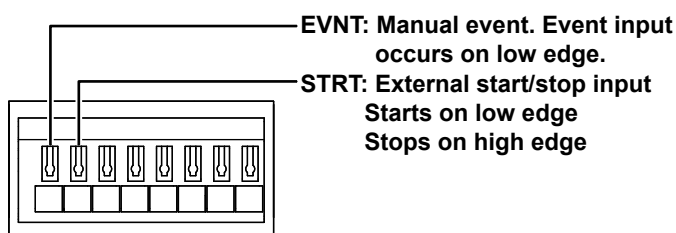
French



ATTENTION

Les signaux ne correspondant pas aux spécifications risquent d'endommager cet instrument, à cause de facteurs tels qu'une tension excessive.

External Start/Stop/Event Input (START/ EVENT)



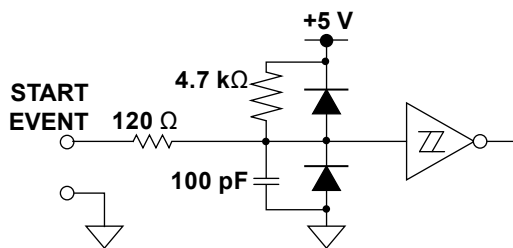
EVNT
STRT
GND
GO
NOGO
GND
CLKO
GND

The START terminal can be used to externally control the starting and stopping of the instrument. The EVENT terminal can receive manual event signals.

The START terminal is the same terminal as the external signal input terminal for GO/NO-GO determination. If Remote is set to ON in the judgment conditions of the GO/NO-GO determination feature, the terminal is used as a signal input for GO/NO-GO determination (see page 4-7).

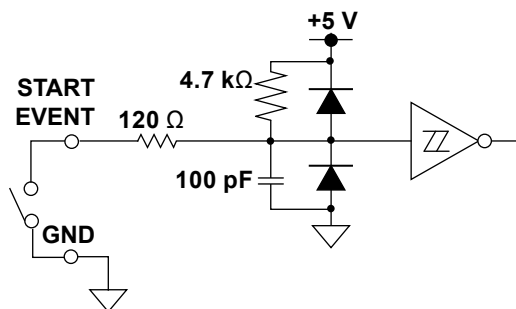
Item	Specifications
Connector type	Screwless terminal block
Input level	TTL (0 to 5 V) or contact input

Circuit Diagram for External Start/Stop/Event Input

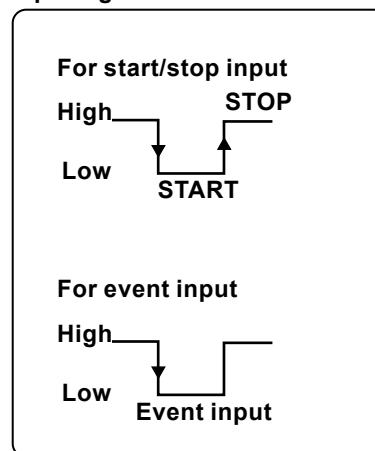


Contact input is possible

- For start/stop input Close to start, open to stop
- For event input Close to input event



Input signal waveform



Note

- Low and high edges are used to detect starts and stops.
- You can select whether to enable high edges (stops) in the external start/stop signal or disable. For details on the setup, see section 26.8, "Configuring the Environment Settings," in the user's manual, IM DL950-02EN.

Connecting a Wire to the Terminal

For instruction on how to connect a wire to the terminal, see page 4-6.

4.7 Video Signal Output (VIDEO OUT (XGA))



CAUTION

- Connect the cable after turning off this instrument and the monitor.
- Do not short the VIDEO OUT terminal or apply external voltage to it. If you do, the instrument may malfunction.

French



ATTENTION

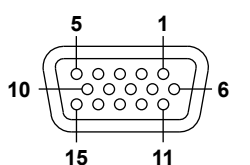
- Connecter le câble après avoir mis cet instrument et le moniteur hors tension.
- Ne pas court-circuiter la borne VIDEO OUT et ne pas appliquer de tension de sortie. Si vous le faites, l'instrument pourrait mal fonctionner.

Video Signal Output Terminal



You can use video signal output to display the instrument's screen on a monitor. Any multisync monitor that supports XGA can be connected.

Item	Specifications
Connector type	D-sub 15 pin, receptacle
Output type	Analog RGB
Output resolution	XGA-compliant output, 1024 × 768 dots Approx. 60-Hz Vsync (66-MHz dot clock frequency)



D-Sub 15-pin receptacle

Pin No.	Signal	Specifications
1	Red	0.7 V _{P-P}
2	Green	0.7 V _{P-P}
3	Blue	0.7 V _{P-P}
4	—	
5	—	
6	GND	
7	GND	
8	GND	
9	—	
10	GND	
11	—	
12	—	
13	Horizontal sync signal	Approx. 36.4 kHz, TTL positive logic
14	Vertical sync signal	Approx. 60 Hz, TTL positive logic
15	—	

Connecting to a Monitor

1. Turn off this instrument and the monitor.
2. Connect this instrument and the monitor using an analog RGB cable.
3. Turn on this instrument and the monitor.

4.8 IRIG Signal Input (IRIG)/(C35 option)



CAUTION

Only apply signals that meet the specifications below. Excessive voltage or the like may damage the instrument.

French



ATTENTION

Les signaux ne correspondant pas aux spécifications risquent d'endommager cet instrument, à cause de facteurs tels qu'une tension excessive.

IRIG Signal Input Terminal



You can use an IRIG (Inter Range Instrumentation Group) signal to set the time on the instrument.

Item	Specifications
Input connector	BNC
Number of input connectors	1
Compatible IRIG signals	A006, B006, A136, B126
Input impedance	50 Ω /5 k Ω switchable
Maximum input voltage	± 8 V
Function	Instrument clock synchronization Sample clock synchronization
Clock sync range	± 60 ppm
Post-sync accuracy	No drift from the input signal

4.9 GPS Signal Input (GPS)/(C35 option)

CAUTION

Only apply signals that meet the specifications below. Excessive voltage or the like may damage the instrument.

French

ATTENTION

Les signaux ne correspondant pas aux spécifications risquent d'endommager cet instrument, à cause de facteurs tels qu'une tension excessive.

GPS Signal Input Terminal



GPS

You can use a GPS (Global Positioning System) signal to measure the position of this instrument or set the time on this instrument.

Item	Specifications
Input connector	9-pin Mini DIN
Compatible GPS unit	720940 (optional accessory)
Function	Instrument clock synchronization Sample clock synchronization
Accuracy after synchronization*	± 200 ns (typical value when locked to GPS signal)*

* The figure is based on results obtained when the GPS unit is installed in a location with good line of sight to GPS satellites. The accuracy may not be attained depending on the measurement location, the location of satellites when the measurement is taken, the weather, and influence caused by obstruction.

5.1 If a Problem Occurs

Faults and Corrective Actions

If a message appears on the screen, see the appendix 9 in the user's manual.

If servicing is necessary, or if the instrument does not operate properly even after you have attempted to deal with the problem according to the instructions in this section, contact your nearest YOKOGAWA dealer.

Problem	Probable Cause	Corrective Action	Reference Section
The instrument does not turn on.	Using a power supply outside the ratings.	Use a correct power supply.	2.4
The text on the LCD screen is difficult to see.	The backlight is turned off.	Turn the backlight on in the LCD settings.	1.3
	The contrast is off.	Adjust the contrast in the LCD settings.	1.3
The LCD display is odd.	The system is not operating properly.	Turn off the instrument and then turn it back on.	2.5
Channels and MATH waveforms whose displays are turned on do not appear on the screen.	The display group containing the waveforms that you want to display is not selected.	From  (MENU) at the upper left of the waveform screen, select DISPLAY > DISPLAY > Select Group , and select a display group from 1 to 4.	4.1*, 7.1*
Keys do not work.	The instrument is in remote mode.	Hold down the ESC key to switch to local mode.	—
	The panel and keys are locked.	Hold down the ESC key.	26.9*
	Other causes.	Perform a key test. If the test fails, servicing is required.	5.2
Triggering does not work.	The trigger settings are not appropriate.	Set the trigger conditions correctly.	Chapter 6*
The measured values are not correct.	Insufficient warm-up.	Warm up the instrument for 30 minutes after turning on the power.	—
	The instrument has not been calibrated.	Calibrate the instrument.	26.2*
	The probe's phase has not been corrected.	Perform phase correction properly.	2.7
	The probe attenuation is not correct.	Set an appropriate value.	4.1*
	Other causes.	Calibrate the instrument. If the measured values are still not correct, servicing is required.	5.2, 26.2*
Cannot save to the specified storage device.	The storage device is not formatted.	Format the storage device.	21.3*
	The storage device is read-only.	Set the storage device so that it is not read-only.	—
	No more free space on the storage device.	Delete unneeded files or use another storage device.	21.10*
Unable to configure or control the instrument through the communication interface.	The instrument's IP address (in the case of a network connection) or serial number (in the case of a USB connection) is different from that referred to by the program.	Match the IP address or serial number used in the program to the actual IP address or serial number of the instrument.	Communication Interface User's Manual, IM DL950-17EN
	The interface is not used in a way that conforms to the electrical or mechanical specifications.	Use the interface in a way that conforms to the specifications.	

* User's Manual, IM DL950-02EN

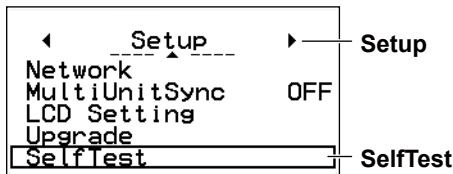
5.2 Carrying Out Self-Tests

This section describes how to test whether the operating keys on the instrument are working properly and whether the temperature is normal.

You can also perform self-tests on other items, such as whether the memory and SD card interface are working properly, by opening the waveform screen using one of the methods described in section 3.1.

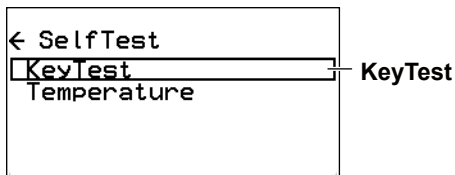
Testing on the SL2000 LCD Screen

1. Press the arrow keys (►/◄) several times to display the setup screen.
2. Press the arrow keys (▲/▼) to select the SelfTest item, and press **SET**.

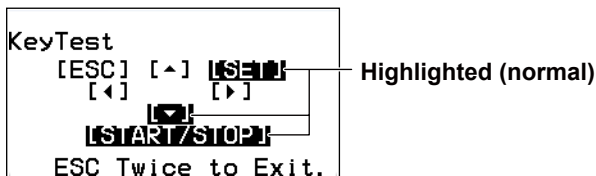


Testing the Keys

3. Press the arrow keys (▲/▼) to select the KeyTest item, and press **SET**.

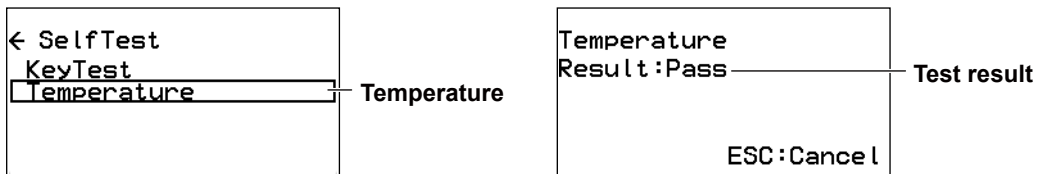


4. Press the arrow keys (►/◄/▲/▼), **ESC**, **SET**, and **START/STOP**.
 - If the instrument is working properly, the display of each key is highlighted.
 - To return to the previous screen, press **ESC** twice.



Testing the Temperature

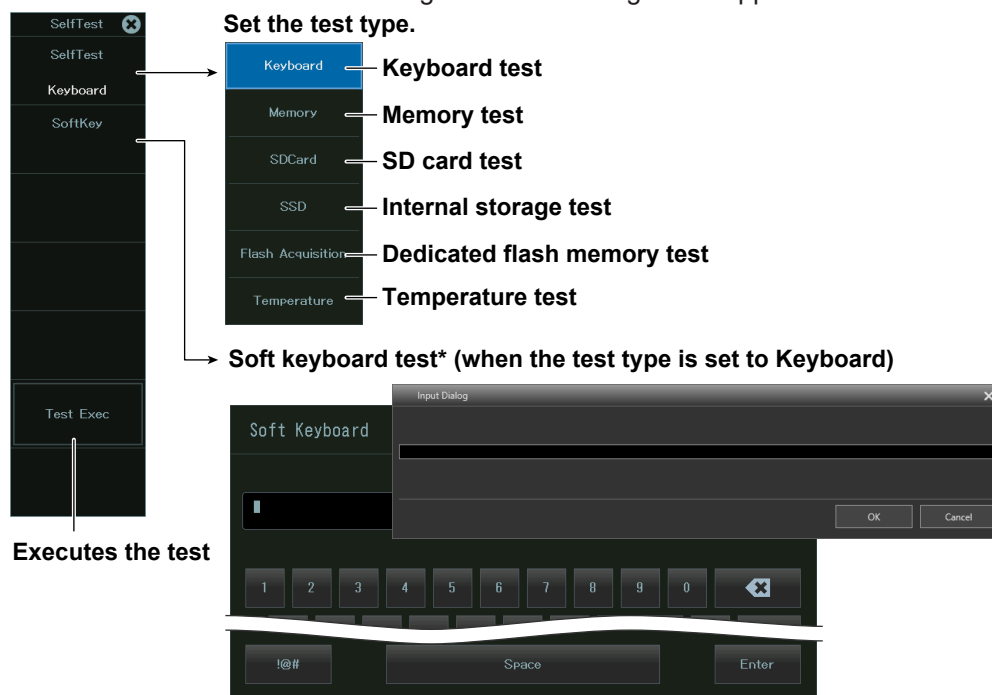
3. Press the arrow keys (▲/▼) to select the Temperature item, and press **SET**.



- Pass: The temperature is normal.
- Pass Low: The temperature is about to exceed the normal temperature range. Take care that the temperature does not drop any further.
- Pass High: The temperature is about to exceed the normal temperature range. Take care that the temperature does not rise any further.
- Fail Low: The temperature is below the normal temperature range. Turn the instrument off.
- Fail High: The temperature is above the normal temperature range. Turn the instrument off.

Testing Other Items (UTILITY Self Test menu)

1. Open the waveform screen using one of the methods described in section 3.1.
2. Click  (MENU) at the upper left of the screen to display the main menu, and click **OTHERS** and then **UTILITY**. The UTILITY menu appears.
3. Click **SelfTest** and then **SelfTest** again. The following menu appears.



* The text input screen depends on how the screen is displayed. The figure above shows an example when the IS8000 is used.

Setting the Test Type (Self Test)

Keyboard: Tests whether or not the front panel keys are operating correctly and whether or not the soft keyboard accepts input properly. A key is normal when the name of the key you press is highlighted on the screen that appears when you tap Test Exec (the screen closes when you press ESC twice). The soft keyboard is operating properly if you can enter the specified characters.

Memory: Tests whether or not the internal CPU board RAM and ROM are operating properly. If they are operating properly, "Pass" appears. If an error occurs, "Error" appears.

SD Card: Tests whether the SD card interface is operating properly. If an error occurs, "Error" appears.

SSD: Tests whether the internal storage (SSD) is operating properly. If an error occurs, "Error" appears.

Flash Acquisition: Tests whether the dedicated flash memory for flash acquisition is operating properly. If an error occurs, "Error" appears.

Temperature: Tests whether the temperature of the instrument is normal.

If an Error Occurs during a Self-Test

If an error occurs even after you carry out the following procedure, contact your nearest YOKOGAWA dealer.

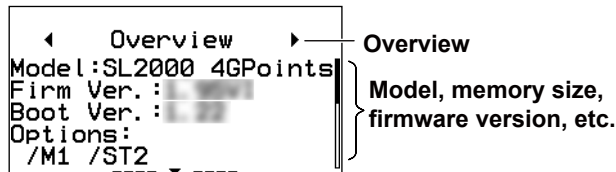
- Execute the self-test again several times.
- Confirm whether or not the media being tested is properly inserted.

5.3 Viewing System Information (Overview)

This section explains how to view this instrument's system information.

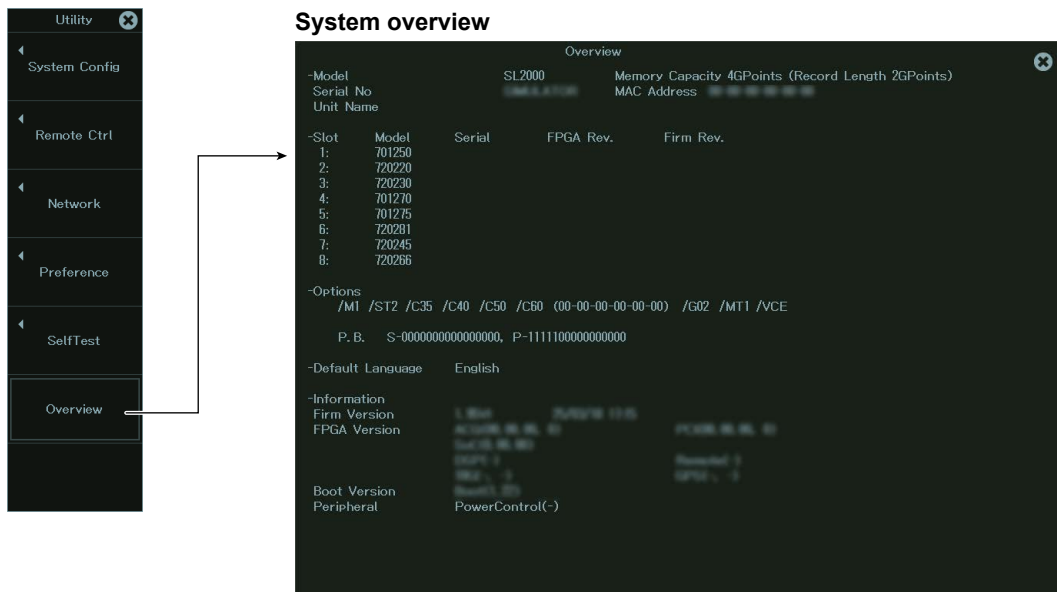
Verifying on the SL2000 LCD Screen

Press the arrow keys (►/◄) several times to display the overview screen. Press the arrow keys (▲/▼) to scroll the screen.



Verifying Other Items (UTILITY Overview menu)

1. Open the waveform screen using one of the methods described in section 3.1.
2. Click  (MENU) at the upper left of the screen to display the main menu, and click **OTHERS** and then **UTILITY**. The UTILITY menu appears.
3. Click **Overview**. A system information overview appears.



Displayed Information

Model, Memory Capacity (Record Length)	Model, memory size (record length)
Serial No	The instrument number and MAC address
Slot	The model and serial number of the module installed in each slot*
Options	The installed options
Default Language	The default language
Information	The firmware version number, date, etc.

* If the following modules are installed, their instrument numbers are also displayed at the corresponding slots.
720212, 720211, 720250, 720256, 720254, 720268, 720266, 720221, 701281, 720281, 720242, 720245, 720241, 720243
The instrument numbers of other modules are not displayed.

5.4 Recommended Part Replacement

The life and replacement period for expendable items varies depending on the conditions of use. Refer to the table below as a general guideline.

For part replacement and purchase, contact your nearest YOKOGAWA dealer. You cannot replace them by yourself.

Parts with Limited Service Life

Part Name	Service Life
LCD backlight	Under normal conditions of use, approximately 50000 hours
Flash memory (/ST2 option)	Number of write cycles: Approx. 20000 When the flash memory is nearing the end of its life, a message will be displayed informing you when it is time to replace it.

Consumable Parts

Part Name	Recommended Replacement Interval
Cooling fan	3 years
Backup battery (lithium battery)	5 years

6.1 Signal Input Section

Item	Specifications
Type	Plug-in input unit
Number of slots	8
Maximum number of input channels	32 channels (when 4-CH modules are used in all slots) 128 channels (when 16CH temperature/voltage modules are used in all slots)
Memory size	Standard 1 Gpoint (up to 500 Mpoint per channel) /M1 option 4 Gpoint (up to 2 Gpoint per channel) /M2 option 8 Gpoint (up to 4 Gpoint per channel)

6.2 Scope Mode Features

Waveform Acquisition and Display

Item	Specifications
Acquisition mode	Normal Normal waveform acquisition Envelope Holds peak values at the maximum sample rate, regardless of the time axis setting Averaging Average count: 2 to 65536 (2 ⁿ steps), Infinite (attenuation constant: 2 to 256, 2 ⁿ steps)
Record length	Standard model 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M (32Ch), 50 M (16Ch), 100 M (8Ch), 250 M (4Ch), 500 M (2Ch) /M1 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M (32Ch), 250 M (16Ch), 500 M (8Ch), 1 G (4Ch), 2 G (2Ch) /M2 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M, 250 M (32Ch), 500 M (16Ch), 1 G (8Ch), 2 G (4Ch), 4 G (2Ch)
Sample rate	Can be set up to the module's maximum sample rate for each channel (there are limits based on the record length)
Selectable time scale range	100 ns/div to 1 s/div (1-2-5 steps), 2 s/div, 3 s/div, 4 s/div, 5 s/div, 6 s/div, 10 s/div, 20 s/div, 30 s/div 1 min/div to 6 min/div (1 min steps), 10 min/div, 12 min/div, 30 min/div 1 h/div to 6 h/div (1 h steps), 8 h/div, 10 h/div, 12 h/div 1 day/div to 5 day/div (1 day steps)
Action performed at the end of acquisition	Waveform data saving (simultaneous saving in binary, ASCII, and MATLAB formats) Image saving, measurement result saving, mail transmission, buzzer notification, FFT saving
Event recording	Records up to 100 events using the event input terminal
Zoom	Two windows
Display format	1, 2, 3, 4, 5, 6, 8, 12, 16 split displays (set for each display group)
Maximum number of displayed traces	Up to 64 traces for each display group
Display interpolation	Off, sign interpolation, linear interpolation, pulse interpolation
X-Y display	Select X and Y axes from analog input waveforms and Math waveforms, up to four traces in two windows
Accumulation	Waveform accumulation: Infinite, 2, 4, 8, 16, 32, 64, 128
History function	Maximum number of histories 5000 Display mode Single waveform display, all waveform display, average display
Dual capture	Data acquisition of the same waveform is possible at two different sample rates
Low-speed sampling	Maximum sample rate 100 kS/s Selectable time scale range 1 s/div, 2 s/div, 3 s/div, 4 s/div, 5 s/div, 6 s/div, 10 s/div, 20 s/div, 30 s/div, 1 min/div to 6 min/div (1 min steps), 10 min/div, 12 min/div, 30 min/div, 1 h/div to 6 h/div (1 h steps), 8 h/div, 10 h/div, 12 h/div, 1 day/div to 5 day/div (1 day steps)

6.2 Scope Mode Features

Item	Specifications	
High-speed sampling	Maximum sample rate	Module's maximum sample rate
	Selectable time scale range	100 ns/div to 1 s/div (1-2-5 steps), 2 s/div, 3 s/div, 4 s/div, 5 s/div, 6 s/div, 10 s/div, 20 s/div, 30 s/div, 1 min/div
	Record length	Standard 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M model
		/M1 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M /M2 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M
SSD recording (/ST1, /ST2)	Maximum sample rate	Depends on the number of used channels. 2 MS/s (when 1CH is used), 200 kS/s (when 16CHs are used) maximum
	Record length	Standard 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M, 250 M, 500 M, 1 G model (32Ch), 2 G (16Ch), 4 G (8Ch), 5 G (8Ch), 10 G (4Ch), 20 G (2Ch)
		/M1 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M, 250 M, 500 M, 1 G, 2 G, 4 G (32Ch), 5 G (32Ch), 10 G (16Ch), 20 G (8Ch), 50 G (4Ch)
		/M2 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M, 250 M, 500 M, 1 G, 2 G, 4 G, 5 G, 10 G (32Ch), 20 G (16Ch), 50 G (8Ch)
Flash acquisition (/ST2)	Maximum sample rate	Depends on the number of used channels. 20 MS/s (when 8CHs are used), 10 kS/s (when 16CHs are used) maximum
	Record length	Standard 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M, 250 M, 500 M, 1 G model (32Ch), 2 G (16Ch), 4 G (8Ch), 5 G (8Ch), 10 G (4Ch)
		/M1 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M, 250 M, 500 M, 1 G, 2 G (32Ch), 4 G (16Ch), 5 G (16Ch), 10 G (8Ch), 20 G (4Ch)
		/M2 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M, 250 M, 500 M, 1 G, 2 G (32Ch), 4 G (16Ch), 5 G (16Ch), 10 G (8Ch), 20 G (4Ch)
Instrument free run	Maximum sample rate	Depends on the number of used channels. 2 MS/s (when 1CH is used), 200 kS/s (when 16CHs are used) maximum
	Record (/ST1, /ST2)	Divided recording available Cyclic recording available
	Display	Zoom display during measurement available (acquisition data in memory only)
PC free run DAQ (1GEther, USB)	Maximum sample rate	Depends on the number of used channels. 2 MS/s (when 1CH is used), 200 kS/s (when 16CHs are used) maximum
	Data redundancy	Simultaneous execution possible with instrument free run
	Apps on PC	IS8000, Acquisition API, LabVIEW
PC free run DAQ (10GEther)	Maximum sample rate	Depends on the number of used channels. 20 MS/s (when 8CHs are used), 10 MS/s (when 16CHs are used) maximum
	Data redundancy	Simultaneous execution not possible with instrument free run
	Apps on PC	IS8000, Acquisition API
PC trigger DAQ (1GEther, 10GEther, USB)	Data acquisition method	Synchronous and asynchronous
	Data redundancy	Simultaneous saving of WDF file to the internal SSD (/ST1 or /ST2 required)
	Apps on PC	IS8000, Acquisition API, LabVIEW

Vertical and Horizontal Control

Item	Specifications
Channel on/off	CHn, CHn_m, RTMATHn, and MATHn can be turned on and off separately.
Vertical axis zooming	×0.1 to ×100 (varies depending on the module type) By setting the scale using upper and lower limits
Vertical position setting	Waveforms can be moved in the range of ±5 div.
Linear scaling	Can be set to Ax+B mode or P1-P2 mode (only for voltage, stress, and frequency)
Roll mode display	When the trigger mode is set to auto, single, or on-start, and the time axis setting is greater than or equal to 100 ms/div
Deskewing	±1 μs (modules with sample rates at 10 MS/s or faster)

Triggering Section

Item	Specifications	
trigger mode	Auto, Auto Level, Normal, Single, Single (N), On-start	
Selectable trigger level range	0 $\pm$ 10 div	
Trigger hysteresis	When measuring voltage:	Select from $\pm$ 0.1 div, $\pm$ 0.5 div, $\pm$ 1 div.
	When measuring temperature:	Select from $\pm$ 0.5 $^{\circ}$ C, $\pm$ 1.0 $^{\circ}$ C, and $\pm$ 2.0 $^{\circ}$ C.
	When measuring strain:	Select from $\pm$ 2.5 %, $\pm$ 12.5 %, $\pm$ 25 % of range.
	When measuring acceleration:	Select from $\pm$ 0.1 div, $\pm$ 0.5 div, $\pm$ 1 div of range.
	When measuring frequency:	Select from $\pm$ 0.01 div, $\pm$ 0.5 div, $\pm$ 1 div of range.
	CAN/CAN FD/LIN/SENT:	$\pm$ 0.01 div, $\pm$ 0.5 div, $\pm$ 1.0 div of display span
	Real time math	$\pm$ 0.01 div, $\pm$ 0.5 div, $\pm$ 1.0 div of display span
	Power and harmonic computation	$\pm$ 0.01 div, $\pm$ 0.5 div, $\pm$ 1.0 div of display span
Selectable trigger position range	0 to 100 % (as a percentage of the display record length in 0.1 % steps)	
Selectable trigger delay range	0 to 10 s (resolution: 10 ns)	
Selectable hold-off time range	0 to 10 s (resolution: 10 ns)	
Manual trigger	Input through dedicated keys* or communication commands	
Simple trigger	trigger source	CHn, CHn_m (specified input channel, specified bit for logic), RTMATHn, external, time, line
	Trigger slope	Rising, falling, both edges (rising, falling only for logic)
	Clock trigger	Date (year/month/day), time (hour/minute/second), time interval (10 seconds to 24 hours)
Enhanced trigger	trigger source	CHn, CHn_m (specified input channel, specified bit for logic), RTMATHn, external
	Trigger type	
	A $\rightarrow$ B(N)	After condition A is met, the instrument triggers when condition B is met N times. Count specifications: 1 to 10000 Condition A: Enter/Exit Condition B: Enter/Exit
	A Delay B	After condition A is met, the instrument triggers when condition B is met for the first time after the specified time elapses. Specified time: 0 to 10 s (resolution: 10 ns) Condition A: Enter/Exit Condition B: Enter/Exit
	Edge on A	The instrument triggers on the logical OR of edges while condition A is met. Condition A: True/False
	AND	Triggers on the AND of multiple state conditions (including window triggers)
	OR	Triggers on the OR of multiple edge or state conditions (including window triggers)
	Period	Triggers when the period of condition T meets one of the following conditions.
	T > Time	Longer than the specified time, time range: 0.02 μ s to 10 s, resolution: 0.01 μ s
	T < Time	Shorter than the specified time, time range: 0.02 μ s to 10 s, resolution: 0.01 μ s
	T1 < T < T2	Within the specified time range, specified time T1: 0.02 μ s to 9999999.99 μ s, T2: 0.03 μ s to 10 s, resolution: 0.01 μ s
	T < T1, T2 < T	Outside the specified time range, specified time T1: 0.02 μ s to 9999999.99 μ s, T2: 0.03 μ s to 10 s, resolution: 0.01 μ s

6.2 Scope Mode Features

Item	Specifications	
Pulse Width		Triggers when the time from when trigger B conditions are met meets one of the following conditions.
	B > Time	Time for trigger B conditions to not be met is longer than the specified time, specified time: 0.01 μ s to 10 s, resolution: 0.01 μ s
	B < Time	Time for trigger B conditions to not be met is shorter than the specified time, specified time: 0.02 μ s to 10 s, resolution: 0.01 μ s
	B Time Out	Time when trigger B conditions continue to be met is longer than the specified time, specified time: 0.01 μ s to 10 s, resolution: 0.01 μ s
	B Between	Time when trigger B conditions continue to be met is within the specified time. Triggers when the conditions are no longer met Specified time T1: 0.01 μ s to 9999999.99 μ s, T2: 0.02 μ s to 10 s, resolution: 0.01 μ s
WaveWindow	Power supply waveform monitoring trigger, number of target channels: 8 max. Source frequency: 40 to 1 kHz, resolution: 1 Hz, operating sample rate: 10 k to 500 kS/s	

* Can be used with the Web server feature or the IS8000's remote control feature

Analysis

Item	Specifications	
Cursors	T-Y waveforms	Horizontal / Vertical / H&V / Marker / Degree
	X-Y waveforms	Horizontal / Vertical / H&V / Marker
	FFT waveforms	Marker / Peak / Peak List
Automated measurement of waveform parameters		
Measured parameters	Analog waveform, Math	PP, Amp, Max, Min, High, Low, Avg, Mid, Rms, Sdev, +Over, -Over Rise, Fall, Freq, Period, +Width, -Width, Duty, Pulse, Burst1, Burst2, Avg.Freq, AvgPeriod, Int1TY, Int2TY, Int1XY, Int2XY, Delay
	Logic waveform	Freq, Period, Pulse, Duty, Avg.Freq, Delay
Statistical processing	Statistical items:	Max, Min, Avg, Sdv, Cnt
	Maximum number of cycles	64,000
	Maximum measurement range	4 Gpoints (memory recording), 100 Mpoints (internal storage)
	Continuous statistical processing	Statistical processing is performed while waveforms are acquired.
	cyclic statistical processing	Automatically measures the waveform parameters once per cycle and performs statistical processing on the parameters.
	History statistical processing	Automatically measures the waveform parameters on the data of each history waveform and performs statistical processing on the parameters.
Waveform computation	Operators	Basic arithmetic with coefficients, binarization, shift
	Number of computations	Up to 8
	Computation length	Up to 2 Mpoint (when one waveform is used), 250 kpoint (when eight waveforms are used)
User-defined math function (/G02 option)	Operators	Equations can be created using the following operators. ABS, SQRT, LOG, EXP, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDIF, INTG, IINTG, BIN, P2, P3, F1, F2, FV, PWHH, PWHL, PWLH, PWLL, PWXX, DUTYH, DUTYL, FILT1, FILT2, HLBT, MEAN
	Average setting	Simple average, exponential average, cycle average, peak computation
FFT	Waveform to be computed	CHn, CHnm, RTMATHn, MATHn
	Number of windows	2
	Number of FFT waveforms	Up to eight waveforms (up to four waveforms/window)
	Computation range	From the specified computation time start point until the specified number of points have been computed
	Math points	1k/2k/5k/10k/20k/50k/100k

Item	Specifications	
	Type/sub type	PS-LOGMAG (For the /G02 option below) LS-MAG, LS-LOGMAG, LS-PHASE, LS-REAL, LS-IMAG RS-MAG, RS-LOGMAG PS-MAG PSD-MAG, PSD-LOGMAG CS-MAG, CS-LOGMAG, CS-PHASE, CS-REAL, CS-IMAG TF-MAG, TF-LOGMAG, TF-PHASE, TF-REAL, TF-IMAG CH-MAG
	Time window	Hanning, Hamming, FlatTop, Rectangle Exponential (/G02 option)
	Average setting (/G02 option)	Domain: Time axis, frequency axis Type: Simple average, exponential average, peak computation
	GO/NO-GO determination	A selected operation can be performed according to the determination condition on the acquired waveform.
Zone determination	Number of determination zones	Up to 6
	Number of source waveforms	Up to 16
	Combinations	AND, OR
Parameter determination	Number of determination parameters	Up to 16
	Combinations	AND, OR
Operation after determination	Screen capture data saving, waveform data saving, buzzer notification, mail transmission	
Zooming and searching	You can search for and then expand and display a portion of the displayed waveform.	
Type	Edge	Searches by counting the number of rising and falling edges
	Logic pattern	Searches by counting the logic pattern
	Event	Searches for an event number.
	Time	Searches for a date and time.
History search	Searches through history waveforms for specified conditions.	
Zone search	Number of determination zones	Up to 4
	Combinations	AND, OR
Parameter search	Number of determination parameters	Up to 4
	Combinations	AND, OR

6.3 Recorder Mode Features

Waveform Acquisition and Display

Item	Specifications	
Record conditions	Preset time recording	Records data for the specified time period from the start point
	Continuous recording	Records data for the specified time period before stopping
	Trigger recording	Records data based on trigger position setting
Acquisition mode	Memory recording	Records waveforms to internal memory
	Saving during and at the end of memory recording	Records to internal memory and then saves waveform data or screen capture data to files
	SSD recording (/ST1, /ST2)	Records waveforms to internal SSD storage
	Flash acquisition (/ST2)	Records waveforms in the storage for flash acquisition
Acquisition mode	Normal	Normal waveform acquisition
	Envelope	Holds peak values at the maximum sample rate, regardless of the time axis setting
Recording time	1 s to 50 days	
Sample interval	100 ns to 200 ms (1-2-5 series)	

6.3 Recorder Mode Features

Item	Specifications	
Action performed at the end of recording	Waveform data saving (binary, ASCII, and MATLAB formats) Screen capture data saving, measurement results saving, buzzer notification, mail transmission, FFT saving	
SSD recording (/ST1, /ST2)	Minimum sample interval	Depends on the number of used channels. 500 ns (when 1CH is used), 5 μ s (when 16CHs are used) minimum
	Maximum number of recorded points	20 Gpoint, 50 Gpoint (/M1, /M2) (there are limits based on the number of used channels)
Flash acquisition (/ST2)	Minimum sample interval	Depends on the number of used channels. 100 ns (when 16CHs are used), 200 ns (when 32CHs are used) minimum
	Maximum number of recorded points	10 Gpoint, 20 Gpoint (/M1, /M2) (there are limits based on the number of used channels)
Event recording	Records up to 100 events using the event input terminal	
Display time range	10 μ s to 10 s (1-2-5 steps), 20 s, 30 s, 40 s, 50 s, 60 s, 100 s, 200 s, 300 s 10 min to 60 min (10 min steps), 100 min 2 hour, 5 hour, 10 hour to 60 hour (10 hour steps), 80 hour, 100 hour 5 day, 10 day, 20 day, 30 day, 40 day, 50 day	
Zoom	One window	
Display format	1, 2, 3, 4, 5, 6, 8, 12, 16 split displays (set for each display group) of TY display	
Maximum number of displayed traces	Up to 64 traces for each display group	
X-Y display	Number of windows	2
	Number of X-Y traces	Up to eight traces (up to four traces/window)
	Select the X and Y axes from CHn, CHn_m, RTMATHn, MATHn.	

Vertical and Horizontal Control

Item	Specifications
Channel on/off	CHn, CHn_m, RTMATHn, and MATHn can be turned on and off separately.
Vertical axis zooming	By setting the scale using upper and lower limits
Linear scaling	Can be set to Ax+B mode or P1-P2 mode (only for voltage, stress, and frequency)
Deskewing	$\pm 1 \mu$ s (modules with sample rates at 10 MS/s or faster)

Triggering Section

Item	Specifications	
Selectable trigger level range	0 $\pm$ measurement range	
Trigger hysteresis	When measuring voltage:	Select from $\pm 1 \%$, $\pm 5 \%$, $\pm 10 \%$ of range.
	When measuring temperature:	Select from $\pm 0.5 ^\circ\text{C}$, $\pm 1.0 ^\circ\text{C}$, and $\pm 2.0 ^\circ\text{C}$.
	When measuring strain:	Select from $\pm 2.5 \%$, $\pm 12.5 \%$, $\pm 25 \%$ of range.
	When measuring acceleration:	Select from $\pm 1 \%$, $\pm 5 \%$, $\pm 10 \%$ of range.
	When measuring frequency:	Select from $\pm 0.1 \%$, $\pm 5 \%$, $\pm 10 \%$ of range.
	CAN/CAN FD/LIN/SENT:	Select from $\pm 0.1\%$, $\pm 5\%$, $\pm 10\%$ of span.
Manual trigger	Using a dedicated key*	
trigger source	CHn, CHn_m (specified input channel, specified bit for logic), RTMATHn, external trigger, time	
Trigger type	Edge	Rising, falling, rising and falling (rising, falling only for logic)
	Time	Date (year/month/day), time (hour/minute/second)
	OR	Triggers on the OR of multiple trigger source edges (including window triggers)
	AND	Triggers on the AND of multiple state conditions (including window triggers)

* Can be used with the Web server feature or the IS8000's remote control feature

Analysis

Item	Specifications	
Cursors	T-Y waveforms	Horizontal / Vertical / H&V / Marker / Degree
	X-Y waveforms	Horizontal / Vertical / H&V / Marker
	FFT waveforms	Marker / Peak / Peak List
Automated measurement of waveform parameters		
Measured parameters	Analog waveform, Math	PP, Amp, Max, Min, High, Low, Avg, Mid, Rms, Sdev, +Over, -Over Rise, Fall, Freq, Period, +Width, -Width, Duty, Pulse, Burst1, Burst2, Avg.Freq, AvgPeriod, Int1TY, Int2TY, Int1XY, Int2XY, Delay
	Logic waveform	Freq, Period, Pulse, Duty, Avg.Freq, Delay
Statistical processing	Statistical items:	Max, Min, Avg, Sdv, Cnt
	Maximum number of cycles	64,000
	Maximum measurement range	4 Gpoint (memory recording), 100 Mpoint (SSD recording)
	cyclic statistical processing	Automatically measures the waveform parameters once per cycle and performs statistical processing on the parameters.
Waveform computation	Operators	Basic arithmetic with coefficients, binarization, shift
	Number of computations	Up to 8
	Computation length	Up to 2 Mpoint (when one waveform is used), 250 kpoint (when eight waveforms are used)
User-defined math function (/G02 option)	Operators	Equations can be created using the following operators. ABS, SQRT, LOG, EXP, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDIF, INTG, IINTG, BIN, P2, P3, F1, F2, FV, PWHH, PWHL, PWLH, PWLL, PWXX, DUTYH, DUTYL, FILT1, FILT2, HLB, MEAN
	Average setting	None
FFT	Waveform to be computed	CHn, MATHn
	Number of windows	2
	Number of FFT waveforms	Up to eight waveforms (up to four waveforms/window)
	Computation range	From the specified computation time start point until the specified number of points have been computed
	Math points	1k/2k/5k/10k/20k/50k/100k
	Type/sub type	PS-LOGMAG (For the /G02 option below) LS-MAG, LS-LOGMAG, LS-PHASE, LS-REAL, LS-IMAG RS-MAG, RS-LOGMAG PS-MAG PSD-MAG, PSD-LOGMAG CS-MAG, CS-LOGMAG, CS-PHASE, CS-REAL, CS-IMAG TF-MAG, TF-LOGMAG, TF-PHASE, TF-REAL, TF-IMAG CH-MAG
	Time window	Hanning, Hamming, FlatTop, Rectangle Exponential (/G02 option)
	Average setting	None
Zooming and searching	You can search for and then expand and display a portion of the displayed waveform.	
Type	Edge	Searches by counting the number of rising and falling edges
	Logic pattern	Searches by counting the logic pattern
	Event	Searches for an event number.
	Time	Searches for a date and time.

6.4 Real Time Math (/G03, /G05, /MT1)

Item	Specifications
Math expression	Real time math using hardware
Max. number of math channels	16 (separate from the input channels)
Computation result storage format	Single-precision floating-point (32 bit)

6.4 Real Time Math (/G03, /G05, /MT1)

Item	Specifications
Real time math	
Math rate	Maximum computation rate: 10 MS/s (1 MS/s for quartic polynomial)
Math type	Basic arithmetic with coefficients: Expressions: +, -, ×, / Coefficients: A, B, and C can be defined. Addition: $(A*s1) + (B*s2) + C$ Subtraction: $(A*s1) - (B*s2) + C$ Multiplication: $(A*s1)*(B*s2) + C$ Division: $(A*s1)/(B*s2) + C$ Range of coefficients A, B, and C: $-9.9999E+30$ to $+9.9999E+30$
Angle math:	Expressions: +, -
Quartic polynomial:	$A*s^4 + B*s^3 + C*s^2 + D*s + E$ Range of coefficients A, B, C, D, and E: $-9.9999E+30$ to $+9.9999E+30$
Coefficient multiplied by addition or subtraction of sources:	$K * (s1 \pm s2 \pm s3 \pm s4)$ $A*s1 + B*s2 + C*s3 + D*s4$ Range of coefficients K, A, B, C, and D: $-9.9999E+30$ to $+9.9999E+30$
Logic signal/analog waveform conversion:	Uses the logic signal as an analog signal, and performs a scaling conversion
Differentiation:	Differentiation using a fifth order Lagrange interpolation formula
Integration:	Integration reset condition: When waveform acquisition starts, when a channel is turned on or off Selectable reset conditions: - Over Limit - Zero Cross to Positive: When the source signal is moving in the positive direction and crosses zero - Zero Cross to Negative: When the source signal is moving in the negative direction and crosses zero
Common logarithm	Log1: $Kx\text{Log}_{10}(s1/s2)$, Log2: $Kx\text{Log}_{10}(s1)$
Square root (Sqr1):	$\sqrt{s1^2 \pm s2^2}$
Square root (Sqr2):	$\sqrt{s}$
Frequency:	The period is measured, and the frequency is calculated as $1/\text{period}$.
Period:	The period from one edge condition to the next edge condition is measured. Resolution: 100 ns. Max. period: 10 s
Edge count:	Counts the specified edges
Demodulation of the pulse width modulated (PWM) signal:	The PWM-modulated signal is integrated over the modulation period and converted into analog signal.
Torque:	The torque is computed from the measured frequency and the specified coefficient.
Rms value:	$\sqrt{\frac{1}{N} \sum_{n=1}^N s(n)^2}$ The math period is from one zero crossing of the specified signal to the next zero crossing. Alternatively, the period is the specified time: 1 to 500 ms, resolution: 1 ms
Effective power:	$\frac{1}{T} \int_0^T (s1 \cdot s2) dt$ The math period is the integrated value of the time from one zero crossing of the specified signal to the next zero crossing.
Effective power integration	$\int_0^T (s1 \cdot s2) dt$ The value "s1xs2" is integrated over time.
Cosine:	$\cos(s)$
Sine:	$\sin(s)$
Arc tangent:	$\text{atan}(s1/s2)$

Item	Specifications
Angle of rotation:	Pulse integration is performed based on the specified A, B, and Z phase signals. The angle of the bit signal is computed as an absolute value from the logic input. The angle is calculated from the Z phase pulse. Max. setting of the number of pulses per rotation: 65535
Electrical angle:	Calculates the phase difference between (1) the angle that was determined from the signals that were specified for phases A, B, and Z, and (2) the fundamental wave component that was determined from the discrete Fourier transform of the waveform that was specified as the target. Calculates the phase difference (electrical angle) between the angle of rotation and drive current of the motor.
Knocking filter: (only when the /VCE option is installed)	When the signal level of the math source waveform that is being differentiated is less than or equal to the elimination level, the output is set to 0.
Resolver:	The angle of rotation is computed from the carrier signal, sine signal, and cosine signal. Supported carrier frequencies: 1 kHz to 20 kHz Tracking filter band setting: 2 kHz, 1 kHz, 250 Hz, 100 Hz Maximum measurable angle acceleration: 140000 rps² (when the tracking filter is set to 2 kHz) 54000 rps¹ (when the tracking filter is set to 2 kHz) 1800 rps² (when the tracking filter is set to 250 Hz) 180 rps² (when the tracking filter is set to 100 Hz) Demodulation: demodulates sin and cos signals excluding the carrier component
3 phase resolver:	Calculates the angle of rotation from the two sine signals that are generated from the detection coil of the 3 phase resolver depending on the angle of the rotor. Supported carrier frequencies: 1 kHz to 20 kHz Tracking filter band setting: 2 kHz, 1 kHz, 250 Hz, 100 Hz Demodulation: demodulates sin signals excluding the carrier component
IIR filter:	Applies filtering with the same characteristics as the digital IIR filter to the specified waveform
CAN ID: (only when the /VCE option is installed)	Detects the frame of the CAN bus signal with the specified ID.
Rotary speed:	Calculates the positive and negative rotating speeds from the specified A and B phase signals
Up down count:	Counts the number of positive and negative edges based on the specified phase A, B, and Z signals
Envelope:	Computes the envelope tangent to amplitude of the waveform by holding the peak value and attenuating it with a low-pass filter.
Edge sampling:	Holds the value at the edge condition point
Phase difference:	Calculates the phase difference the edges of two signals
Binartization:	Converts the specified waveform to a digital waveform of 0s and 1s based on the specified threshold level.
Peak:	Holds the maximum or minimum value within each specified segment
Clarke transform (only when the /MT1 option is installed):	Computes two-phase signals (α, β, 0) from three-phase signals (u, v, w)
Temperature correction of the resistance (only when the /MT1 option is installed):	$R=R_0\{1+\alpha(T-T_0)\}$ Calculates the temperature-corrected resistance based on the specified measured temperature signal
Math source waveforms	All input channels including sub channels. (there are limitations based on the operator) Math results can be specified as sources of another channel. However, you can only specify math results of channels whose numbers are smaller than the channel that you are specifying sources for.
Math delay	A uniform delay for each math operation, regardless of the number of math channels
Filter on math results	IIR low-pass filter all math results Full, cutoff frequencies (128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, 62.5 Hz)
Vertical scale	Set based on the specified top and bottom scale values, simultaneous use of zooming using the scale knob* and moving using the position knob*

6.4 Real Time Math (/G03, /G05, /MT1)

Item	Specifications
Digital filter	Digital filter for input channels. Math can be performed on up to 16 channels at the same time.
Target input modules	720212, 720211, 701250, 701255, 720250, 701251, 720268, 701261, 701262, 701265, 720266, 701275, 701270, 701271
Filter types	Mean (moving average) Filter format: FIR (moving average) Filter type: LPF Sample rate: Selectable from 1 M, 100 k, 10 k, 1 k [S/s] Number of moving average points: Selectable from 2, 4, 8, 16, 32, 64, 128 Gaus: Filter format: FIR Filter type: LPF Filter order: 5 to 49 Cutoff frequency: 300 kHz to 2 Hz Resolution: 300 kHz to 30 kHz, in steps of 2 kHz Resolution: 29.8 kHz to 3 kHz, in steps of 200 Hz Resolution: 2.98 kHz to 300 Hz, in steps of 20 Hz Resolution: 298 Hz to 30 Hz, in steps of 2 Hz Resolution: 29.8 Hz to 2 Hz, in steps of 0.2 Hz Cutoff characteristic: $-3.0 \times (f/f_c)^2$ (where f is the frequency and f_c is the cutoff frequency) Sharp: Filter format: FIR Filter type: LPF, HPF, BPF Filter order: 5 to 194 LPF: Cutoff frequency: 300 kHz to 2 Hz Resolution: 300 kHz to 30 kHz, in steps of 2 kHz Resolution: 29.8 kHz to 3 kHz, in steps of 200 Hz Resolution: 2.98 kHz to 300 Hz, in steps of 20 Hz Resolution: 298 Hz to 30 Hz, in steps of 2 Hz Resolution: 29.8 Hz to 2 Hz, in steps of 0.2 Hz HPF: Cutoff frequency: 300 kHz to 200 Hz Resolution: 300 kHz to 30 kHz, in steps of 2 kHz Resolution: 29.8 kHz to 3 kHz, in steps of 200 Hz Resolution: 2.98 kHz to 200 Hz, in steps of 20 Hz BPF: Center frequency: 300 kHz to 300 Hz Resolution: 300 kHz to 30 kHz, in steps of 2 kHz Resolution: 29.8 kHz to 3 kHz, in steps of 200 Hz Resolution: 2.98 kHz to 300 Hz, in steps of 20 Hz Bandwidth: 200 kHz, 150 kHz, 100 kHz, 50 kHz, 20 kHz, 15 kHz, 10 kHz, 5 kHz, 2 kHz, 1.5 kHz, 1 kHz, 500 Hz, 200 Hz (there are limits based on the center frequency) Cutoff characteristic: $-40 \text{ dB}@2f_c$ (LPF), $-40 \text{ dB}@0.5f_c$ (HPF) Phase: Linear phase characteristics IIR: Filter format: IIR (Butterworth) Filter type: LPF, HPF, BPF Filter order: 4 LPF: Cutoff frequency: 300 kHz to 2 Hz Resolution: 2 kHz for 300 kHz to 30 kHz Resolution: 200 Hz for 29.8 kHz to 3 kHz Resolution: 20 Hz for 2.98 kHz to 0.3 kHz Resolution: 2 Hz for 298 Hz to 2 Hz HPF: Cutoff frequency: 300 kHz to 20 Hz Resolution: 2 kHz for 300 kHz to 30 kHz Resolution: 200 Hz for 29.8 kHz to 3 kHz Resolution: 20 Hz for 2.98 kHz to 20 Hz BPF: Center frequency: 300 kHz to 60 Hz Resolution: 2 kHz for 300 kHz to 12 kHz Resolution: 200 Hz for 11.8 kHz to 1.2 kHz Resolution: 20 Hz for 1.18 kHz to 60 Hz Bandwidth: 200 kHz, 150 kHz, 100 kHz, 50 kHz, 20 kHz, 15 kHz, 10 kHz, 5 kHz, 2 kHz, 1.5 kHz, 1 kHz, 500 Hz, 200 Hz, 100 Hz (there are limits based on the center frequency) Cutoff characteristics: -24 dB/Oct Phase: Nonlinear phase characteristics

Item	Specifications
	IIR-Lowpass:
	Filter format: IIR (Butterworth)
	Filter type: LPF
	Filter order: 4
	Cutoff frequency: 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, 62.5 Hz (no limits based on the sample rate)

* Can be used with the Web server feature or the IS8000's remote control feature

Power Math (/G05, /MT1)

Item	Specifications
Math expression	Real time math using hardware
Math source channels	Voltage input channels except 720220 and 720221
Max. math rate	10 MS/s
Minimum analysis period	0.1 ms (10 kHz)
Math result output channels	Power analysis math: fixed to real time math RTMATH13, RTMATH14 (cannot be used simultaneously with motor analysis) Harmonic analysis math: fixed to real time math RTMATH15, RTMATH16
Computed result	Single-precision floating-point (32 bit)
Power analysis	Max. number of analyzable systems Up to two three-phase systems can be computed simultaneously.
	Max. number of simultaneous math parameters 118 when one system is measured 58 × 2 systems when two systems are measured
	Supported wiring systems Single-phase two-wire (1P2W), single-phase three-wire (1P3W), three-phase three wire [two-wattmeter method] (3P3W), three-phase three wire [three-voltage three-current method] (3V3A, 3V3AR, 3V3AS), three-phase four-wire (3P4W)
	Delta math function Three-phase three-wire (3P3W) → three-phase three-wire (3V3A) Three-phase three-wire (3V3A) → three-phase four-wire (3P4W) (delta → star) Three-phase four-wire (3P4W) → three-phase three-wire (3V3A) (star → delta) Three-phase three-wire (3P3W) → three-phase four-wire (3P4W) (delta → star) Three-phase three-wire (3V3AR) → three-phase four-wire (3P4W) (delta → star) Three-phase three-wire (3V3AS) → three-phase four-wire (3P4W) (delta → star)

6.4 Real Time Math (/G03, /G05, /MT1)

Item	Specifications
	Math items Rms voltage and current of each phase Voltage and current simple average of each phase (DC) AC voltage and current components of each phase (AC) Active power Apparent power Reactive power Power factor Current phase difference Voltage and current frequencies Maximum voltage and current, minimum voltage and current Maximum power, minimum power Integrated watt-hour, integrated watt-hour of each polarity (positive and negative) Integrated ampere-hour, integrated ampere-hour of each polarity (positive and negative) Apparent energy Reactive energy Impedance of the load circuit Series resistance of the load circuit Series reactance of the load circuit Parallel resistance of the load circuit Parallel reactance of the load circuit Three-phase voltage unbalanced factor Three-phase current unbalanced factor Motor output math Power efficiency (select motor output result and power math result or power math result of two systems)
	Rms math system
	Math sync mode Edge: Select a signal. Computed using zero-crossings. Auto Timer: Specify the time. Computed at specified time intervals. Transient: Select a signal. For the first measurement, computation starts on both zero-crossing edges. After that, computation is performed on the specified zero-crossing edge. Signal stop is determined by the stop prediction function. Switches to Auto Timer after stopping.
	Channel selection for edge
	Sync channel filter If sync mode is set to Edge, low-pass filter can be selected. Cutoff frequency: Select from 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, and 62.5 Hz.
	Delta-Star transformation waveform display
Harmonic analysis	Max. number of analyzable systems
	Max. number of analyzable frequencies
	FFT points
	Supported wiring systems
	Delta math function
	Math mode

Item	Specifications
Math items	Rms analysis mode: - Rms percentage content of the 1st to 40th harmonic - Phase angles of the 1st to 40th harmonic - Total rms value - Distortion factor (IEC) - Distortion factor (CSA) Power analysis mode - Active powers from the 1st to the 35th harmonic - Active power percentage content from the 1st to the 35th harmonic - Phase angles of the 1st to 35th harmonic - Total active powers - Total reactive powers - Total apparent powers - Power factor 1st harmonic rms voltage 1st harmonic rms current 1st harmonic voltage phase angle 1st harmonic current phase angle
Sync channel	Rms analysis mode: Analysis source channel Power analysis mode: Select one channel from voltage and current.
Sync channel filter	Low-pass filter can be selected. Cutoff frequency: Select from 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, and 62.5 Hz.

Motor dq Analysis (/MT1)

Item	Specifications
Math type	Real time math using hardware
Math source channels	Voltage input channels except 720220 and 720221
Max. math rate	10 MS/s
Minimum analysis period	0.1 ms (10 kHz)
Math result output channels	Fixed to real time math RTMATH13, RTMATH14 (cannot be used simultaneously with power analysis)
Math results	Single-precision floating-point (32 bit)
Motor analysis	Max. number of analyzable systems Up to two systems can be computed simultaneously. Max. number of simultaneous math parameters 118 when one system is measured 62 × 2 systems when two systems are measured Supported wiring systems Three-phase three wire [two-wattmeter method] (3P3W), three-phase three wire [three-voltage three-current method] (3V3A, 3V3AR, 3V3AS), three-phase four-wire (3P4W) Delta math function Three-phase three-wire (3P3W) → three-phase four-wire (3P4W) (delta → star) Three-phase three-wire (3V3A) → three-phase four-wire (3P4W) (delta → star) Three-phase three-wire (3V3AR) → three-phase four-wire (3P4W) (delta → star) Three-phase three-wire (3V3AS) → three-phase four-wire (3P4W) (delta → star) Supported position sensors Incremental encoder, absolute encoder, resolver, 3 phase resolver, hall sensor (transformation into rotation angle with the RT.Math function) Math items Rms voltage and current of each phase Active power Apparent power Reactive power Power factor Current phase difference Maximum power, minimum power

6.4 Real Time Math (/G03, /G05, /MT1)

Item	Specifications
	Integrated power, integrated power of each polarity (positive and negative) Integrated current, integrated current of each polarity (positive and negative) Apparent energy Reactive energy Maximum and minimum of voltage and current Rotation frequency Fundamental component of voltage and current Fundamental component phase difference of voltage and current dq axis current dq axis voltage dq axis inductance Saliency ratio dq axis flux linkage Torque Motor output (drive efficiency) Motor workload DC voltage, DC current DC power Integrated DC power Integrated DC current Efficiency 1, efficiency 2 Integration time Electrical angle frequency
Rms math system	Select true rms value or rectified mean value calibrated to the rms value
Math sync mode	Edge: Select a signal. Computed using zero-crossings. Transient: Same behavior as when Edge is selected when edges are detected. The calculation switches for each specified update period when a stop is detected when no edges have been detected. Detected on both slopes regardless of the settings for the first edge detection.
Channel selection for edge	Select a single channel: voltage, current, or rotation period.
Sync channel filter	If sync mode is set to Edge, low-pass filter can be selected. Cutoff frequency: Select from 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, and 62.5 Hz.
Delta-Star transformation waveform display	When the delta math function is used, the waveforms after voltage and current conversion are output to RTMATH channels.
dq voltage and current waveform display	Voltage and current waveforms (id, iq, vd, vq) after dq transformation are output to RTMATH channels.

6.5 Time Axis

Item	Specifications
Time axis accuracy	± 4.6 ppm
External clock input	Clock input through the external clock input terminal

6.6 Display

Item	Specifications
Display	50 mm×30 mm monochrome LCD
Display format	Menu text, status icon
Display resolution	256×128
Resolution of the waveform display	No waveform display

6.7 Saving Data

Saving Data

Item	Specifications
Types of saved data	Measured data, analysis results, settings, screen capture
Measured data format	Binary (.WDF), MATLAB (.MAT), text (.CSV) Maximum file size (MAT, CSV format): 2 GB
Data storage device	Internal storage, SD memory card, USB storage, network drive

Saving Screen Captures

Item	Specifications
Screen capture data format	PNG, JPEG, BMP
Screen capture data color	Monochrome, color, color (reverse), grayscale
Data storage device	Internal storage, SD memory card, USB storage, network drive

6.8 PC Data Streaming

Item	Specifications
Connection type	USB, Ethernet, 10G Ethernet (/C60)

6.9 Multi-Unit Synchronization (/C50)

Item	Specifications
Connector type	SFP
Ports	4 (up to four sub units can be connected to a main unit)
Synchronization accuracy	$\pm(30 \text{ ns} + 1 \text{ sample})$ (typical value)
Function	Start and stop from the main unit, combination trigger across units
Maximum cable length	20 m

6.10 Storage

Internal storage (/ST1, /ST2 option)

Item	Specifications
Number of drives	1
Media type	SSD
Available space	512 GB

Storage for flash acquisition (/ST2 option)

Item	Specifications
Available space	Acquisition data 160 GB

SD memory card

Item	Specifications
Number of slots	1
Compatible cards	SD, SDHC, and SDXC memory cards

USB storage

Item	Specifications
Compatible USB storage devices	Mass storage devices that comply with USB Mass Storage Class Ver. 1.1
Available space	8 TB max. Partition format: MBR, GPT; format type: FAT16/FAT32/exFAT

6.11 USB Ports for Peripherals

Item	Specifications
Connector type	USB type A (receptacle)
Electrical and mechanical	USB Rev. 2.0 compliant
Supported transfer modes	HS (High Speed; 480 Mbps), FS (Full Speed; 12 Mbps), LS (Low Speed; 1.5 Mbps)
Compatible devices	Mass storage devices that comply with USB Mass Storage Class Ver. 1.1 104 or 109 keyboards that comply with USB HID Class Ver. 1.1 Mouse devices that comply with USB HID Class Ver. 1.1 HP Inkjet printers compatible with USB Printer Class Ver. 1.0, BrotherPocketJET printers
Number of ports	2
Power supply	5 V, 500 mA (each port)

External Printer Output

Item	Specifications
Supported models	Brother Pocket JET printers, 300 dpi models HP inkjet printers, single function models For details on models, see the catalog or website.
Output format	Screen hard copy, monochrome or color (color available only with HP printers)

6.12 Auxiliary I/O Section

External Trigger Input Terminal

Item	Specifications
Connector type	BNC
Input level	TTL (0 to 5 V)
Minimum pulse width	100 ns
Detected edge	Rising or falling

Trigger Output Terminal

Item	Specifications		
Connector type	BNC		
Output level	5 V CMOS		
Output delay time	(1.8 μ s to 4.5 μ s) + 1 sample (typical value)		
	Applies to 1 MS/s or faster modules. Depends on the installed module.		
Output type	Normal format	Logic:	Falls when a trigger occurs and rises when a signal acquisition is completed
		Output hold time:	100 ns or more
	Pulse format	Logic:	Transmits a pulse when a trigger occurs
		Pulse width:	1 ms, 50 ms, 100 ms, 500 ms

External Clock Input Terminal

Item	Specifications
Connector type	BNC
Input level	TTL (0 to 5 V)
Maximum input frequency	9.5 MHz 100 kHz (for envelope)
Minimum pulse width	50 ns
Detected edge	Rising

Video Signal Output

Item	Specifications
Connector type	D-sub 15 pin, receptacle
Output format	Analog RGB
Output resolution	XGA-compliant output, 1024 $\times$ 768 dots Approx. 60-Hz Vsync (66-MHz dot clock frequency)

GO/NOGO Output

Item	Specifications
Connector type	Screwless terminal block
Output level	5 V CMOS

External Start/Stop Input

Item	Specifications
Connector type	Screwless terminal block
Input level	TTL (0 to 5 V) or contact input

Event Input

Item	Specifications
Connector type	Screwless terminal block
Input level	TTL (0 to 5 V) or contact input

Sample Clock Output

Item	Specifications
Connector type	Screwless terminal block
Output level	5 V CMOS
Output operation	Outputs a clock signal at the specify frequency
Frequency range	5 Hz to 200 kHz (1-2-5 steps)

COMP Output (Probe Compensation Signal Output Terminal)

Item	Specifications
Output signal frequency	1 kHz ± 1 %
Output amplitude	1 V _{p-p} ± 10 %

Probe Power (/P4 or /P8 option)

Item	Specifications
Output terminals	4(/P4), 8(/P8)
Output voltage	± 12 V
Output current	Up to a total of 2.4 A (/P4), up to a total of 4.8 A (/P8)*

* 2.4 A per four outputs

GPS Interface (/C35 option)

Item	Specifications
Input connector	9-pin Mini DIN
Compatible GPS unit	720940 (optional accessory)
Function	Instrument clock synchronization Sample clock synchronization GPS data acquisition (latitude, longitude, altitude, velocity, movement direction, GPS position information)
Synchronization accuracy*	± 200 ns (typical value when locked to GPS signal)*

* The figure is based on results obtained when the GPS unit is installed in a location with good line of sight to GPS satellites. The accuracy may not be attained depending on the measurement location, the location of satellites when the measurement is taken, the weather, and influence caused by obstruction.

IRIG Interface (/C35 option)

Item	Specifications
Input connector	BNC
Number of input connectors	1
Compatible IRIG signals	A006, B006, A136, B126
Input impedance	50 Ω /5 k Ω switchable
Maximum input voltage	± 8 V
Function	Instrument clock synchronization Sample clock synchronization
Clock sync range	± 60 ppm
Synchronization accuracy	No drift from the input signal

6.13 Computer Interface

USB-PC Connection

Item	Specifications
Connector type	USB type B (receptacle)
Electrical and mechanical specifications	USB Rev. 3.0 compliant
Supported transfer modes	FS (Full Speed) mode (12 Mbps), HS (High Speed) mode (480 Mbps), SS (Super Speed) mode (5 Gbps)
Number of ports	1
Supported protocols	Functions as a device that conforms to one of the following two protocols. USBTMC-USB488 (USB Test and Measurement Class Ver. 1.0)* Communication commands can be used through USB. Mass Storage Class Ver.1.1 Only reading is possible from the instrument's internal storage through PC access. (Operations, such as formatting, are not possible.)
PC system requirements	Windows 10, Windows 11

* A separate driver is required.

Ethernet

Item	Specifications
Connector type	RJ-45 modular jack
Ports	1
Electrical and mechanical specifications	IEEE802.3 compliant
Transmission system	Ethernet (1000BASE-T/100BASE-TX/10BASE-T)
Communication protocol	TCP/IP
Supported services	DHCP, DNS, SNTP client, SMTP client, FTP client, FTP server, Web server, LPR, VXI-11, HiSLIP, Socket PTP slave, PTP master (/C40 option)
Time synchronization feature	Sync source: Supports IEEE1588-2008 (PTP v2) Supports PTP packets of Layer3 (UDP/IPv4) and Layer2 (Ethernet) Slave feature only (without the /C40 option) Slave and master features (with the /C40 option) Supports Ordinary Clock Supports E2E delay correction Supports 2-step Sync messages Sync targets: Instrument clock, sample clock Synchronization accuracy: ± 150 ns (typical value) when 1000BASE-T is used and an Ethernet switch is not used Master sync clock (/C40 option): Internal clock, GPS (/C35 option)

10G Ethernet (/C60)

Item	Specifications
Connector type	SFP+
Ports	1
Electrical and mechanical specifications	IEEE802.3 compliant
Transmission system	Ethernet (10GBASE-R)
Communication protocol	TCP/IP
Supported services	DHCP, DNS, SNTP client, SMTP client, FTP client, FTP server, Web server, Socket, VXI-11 HiSLIP

6.14 General Specifications

Item	Specifications	
Standard operating conditions	Ambient temperature:	23 ±5 °C
	Ambient humidity:	20 to 80 %RH
	Supply voltage and frequency errors	Within ±1 % of rating
	After a 30 minute warm-up and after calibration	
Recommended calibration period	1 year	
Warm-up time	At least 30 minutes	
Operating environment	Temperature:	5 °C to 40 °C
	Humidity:	20 to 85 %RH (no condensation)
	Altitude:	2000 m or less
Storage environment	Temperature:	-20 °C to 60 °C
	Humidity:	20 to 85 %RH (no condensation)
Power supply	Rated supply voltage	100 to 120 VAC, 220 to 240 VAC (auto switching)
	Permitted supply voltage range	90 to 132 VAC, 198 to 264 VAC
	Rated supply frequency range:	48 Hz to 63 Hz
	Maximum power consumption	280 VA
	Withstand Voltage	1500 VAC for 1 minute between the power supply and case
	Insulation Resistance	10 MΩ or higher at 500 VDC between the power supply and case
Installation orientation	Horizontal, tilted	
External dimensions	Approx. 426 mm (W) × 177 mm (H) × 380 mm (D), excluding the handle and protrusions	
Weight	Approx. 8.5 kg (main unit only, no options)	
Instrument cooling method	Forced air cooling (rear panel, exhaust)	
Battery backup	Settings and clock are backed up with the internal lithium battery.	
	Life: Approx. five years (at an ambient temperature of 23 °C)	
Safety standards	Compliant standards	EN 61010-1, EN IEC 61010-2-030, EN 61010-031, EN 60825-1
		Indoor use
		Pollution degree 2 ¹
		Overvoltage category II ²
		Measurement category: See the specifications of each module (IM DL950-51EN). ³
Emissions ⁴	Compliant standards	EN 61326-1 Class A Table 2 (for use in industrial locations), EN 61326-2-1, EN 55011 Class A, Group 1 ⁵
		EN 61000-3-2, EN 61000-3-3
		EMC Regulatory Arrangement in Australia and New Zealand EN 61326-1: Class A Table2 (for use in industrial locations), EN 55011 Class A, Group 1 ⁵
		Korea Electromagnetic Conformity Standard (한국 전자파적합성기준)
		This product is classified as Class A (for use in industrial environments). Operation of this product in a residential area may cause radio interference. Further, when a measurement lead or probe is connected to an input module or when connected to the device under measurement, the emission requirements may be exceeded. In such cases, the user will be required to correct the interference.

6.14 General Specifications

Item	Specifications
Cable conditions	USB port Use a shielded USB cable that is 3 m or less in length. Attach a ferrite core⁶ to the instrument side of the cable. Ethernet port (Ethernet) Use a category 5 or better STP cable that is 30 m or less in length. Attach a ferrite core⁶ to the instrument end of the cable. I/O port Use a shielded USB cable that is 3 m or less in length. Attach a ferrite core⁷ by passing the instrument end of the cable twice through the core. I/O port (BNC terminal) Use a shielded BNC cable that is 3 m or less in length. Attach a ferrite core⁶ to the instrument side of the cable. Video signal output cable Use a shielded cable that is 3 m in length or less. GPS port Use the dedicated accessory. Attach a ferrite core⁶ to the instrument end of the cable. Probe power cable Use the dedicated cable. Attach a ferrite core⁷ by passing the instrument end of the cable twice through the core. Measurement cable (720245) Use a shielded cable that is 3 m or less in length. Attach a ferrite core⁸ by passing the instrument end of the cable twice through the core. Bridgehead functional ground cable Use a cable that is 3 m or less in length to connect to ground.

Example of passing the cable through twice



Immunity ⁴	Compliant standards	EN 61326-1 Table 2 (for use in industrial locations), EN 61326-2-1 When a measurement lead or probe is connected to an input module or when connected to the device under measurement, the immunity requirements may not be met. In such cases, the user will be required to correct the interference.
	Influence in the immunity environment (criteria A)	720211 $\leq \pm 50$ mV (Input 1:1, 10 mV/div) 720212 $\leq \pm 50$ mV (Input 1:1, 10 mV/div) 701250 $\leq \pm 20$ mV (Input 1:1, 5 mV/div) 720250 $\leq \pm 20$ mV (Input 1:1, 5 mV/div) 701251 $\leq \pm 3$ mV (Input 1:1, 1 mV/div) 720254 $\leq \pm 15$ mV (Input 1:1, 10 mV/div) 701255 $\leq \pm 25$ mV (Input 1:1, 5 mV/div) 720256 $\leq \pm 15$ mV (Input 1:1, 5 mV/div) 720268 $\leq \pm 300$ mV (Input 1:1, 50 mV/div) 720220 $\leq \pm 20$ mV (0.2V/div range conversion) 701261 $\leq \pm 3$ mV (Input 1:1, 5 mV/div) 701262 $\leq \pm 3$ mV (Input 1:1, 5 mV/div) 701265 $\leq \pm 0.05$ mV (Input 1:1, 0.1 mV/div) 720266 $\leq \pm 0.05$ mV (Input 1:1, 0.1 mV/div) 720221 $\leq \pm 2$ mV (Input 1:1, 1 mV/div, data update period =100 ms) 701270 $\leq \pm 100$ μSTR (± 500 μSTR range, gauge factor 2) 701271 $\leq \pm 100$ μSTR (± 500 μSTR range, gauge factor 2) 701275 $\leq \pm 6$ mV (Input 1:1, 5 mV/div) 701281 $\leq \pm 0.01$ Hz (Frequency, 0.1 Hz/div) 720281 $\leq \pm 0.01$ Hz (Frequency, 0.1 Hz/div) 720230 No bit errors 720240 No errors 720242 No errors 720241 No errors 720243 No errors 720245 No errors
	Cable conditions	Same as the emission cable conditions

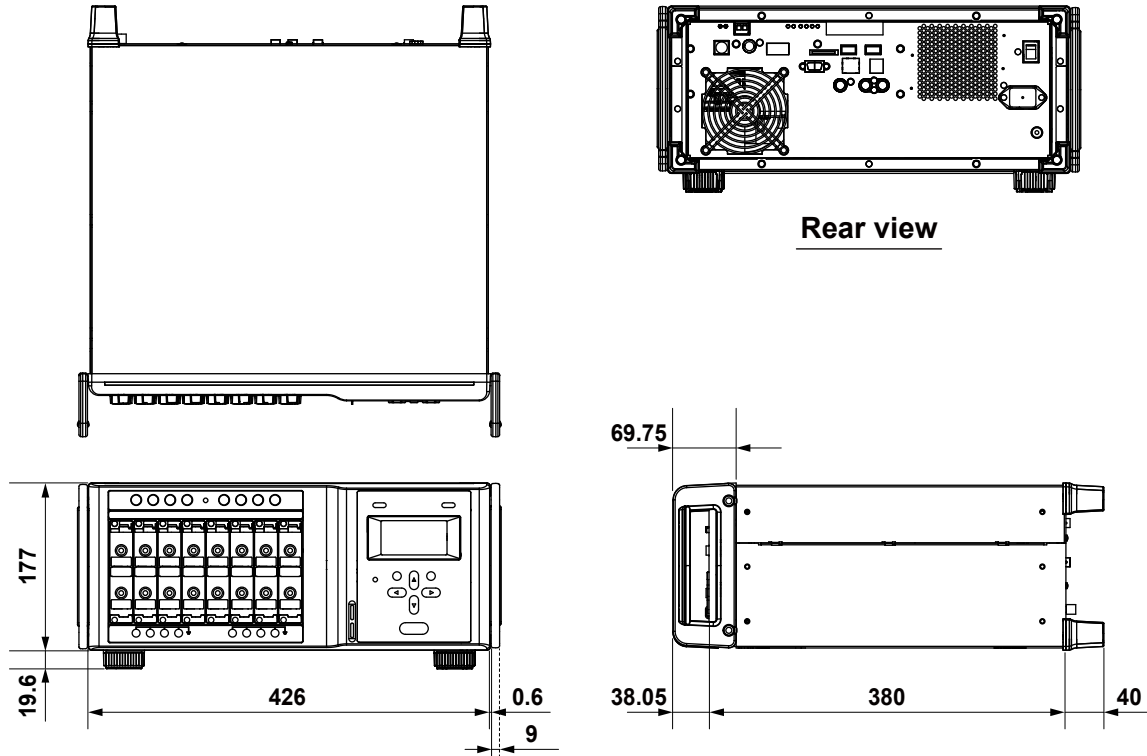
Item	Specifications								
	Definitions of criteria Criteria A: During testing, "influence in the immunity environment" described above is met. Criteria B: The instrument continues to function and is controllable throughout testing. The instrument does not change operation modes, and data changes do not persist. Criteria C: Temporary losses of functionality (such as measurement stopping, etc.) are recovered from through the intervention of the operator.								
Environmental standards ⁹	EU RoHS Directive compliant ¹⁰								
1	Pollution Degree applies to the degree of adhesion of a solid, liquid, or gas that deteriorates withstand voltage or surface resistivity. Pollution degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).								
2	The overvoltage category is a value used to define the transient overvoltage condition and includes the rated impulse withstand voltage. II applies to electrical equipment that is powered through a fixed installation, such as a switchboard.								
3	The measurement category (CAT) of this instrument's signal input terminals varies depending on the modules that are installed. Use the instrument within the scope of the measurement category that corresponds to the module specifications. Do not use the instrument outside the scope of the measurement category that corresponds to the module specifications. For the module specifications, see the Input Module User's Manual, IM DL950-51EN. The scope of each measurement category is as follows. Measurement category O (Other) applies to measurement of circuits that are not directly connected to a main power supply. This category applies to measurement of secondary electric circuits in equipment across a transformer. Measurement category II applies to measurement of circuits, such as household electric appliances and portable electric tools, that are connected to low-voltage installations. Measurement category III applies to measurement of facility circuits, such as distribution boards and circuit breakers. Measurement category IV applies to measurement of power source circuits, such as entrance cables to buildings and cable systems, for low-voltage installations.								
4	If the following module shipped before June 2025 is inserted into this instrument, this instrument will not comply with CE marking (EMC). <table> <tr> <th>Model</th><th>Name</th></tr> <tr> <td>720254</td><td>4CH 1MS/s 16bit Isolation Module</td></tr> </table> If the following module shipped before July 2023 is inserted into this instrument, this instrument will not comply with CE marking (EMC). <table> <tr> <th>Model</th><th>Name</th></tr> <tr> <td>720211</td><td>High-Speed 100 MS/s 12-bit Isolation Module</td></tr> </table>	Model	Name	720254	4CH 1MS/s 16bit Isolation Module	Model	Name	720211	High-Speed 100 MS/s 12-bit Isolation Module
Model	Name								
720254	4CH 1MS/s 16bit Isolation Module								
Model	Name								
720211	High-Speed 100 MS/s 12-bit Isolation Module								
5	Group 1: Equipment that does not intentionally generate or use radio-frequency (RF) energy								
6	(TDK ZCAT2035-0930A, YOKOGAWA part No.: A1190MN)								
7	(TDK ZCAT1325-0530A, YOKOGAWA part No.: A1181MN)								
8	(TDK ZCAT3035-1330, YOKOGAWA part No.: A1179MN)								
9	For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).								
10	If any of the following modules is inserted into this instrument, the instrument will not comply with the EU RoHS Directive (environmental standard). <table> <tr> <th>Model</th><th>Name</th></tr> <tr> <td>701250</td><td>High-Speed 10 MS/s, 12-Bit Isolation Module</td></tr> <tr> <td>701281</td><td>Frequency Module</td></tr> <tr> <td>720240</td><td>CAN Bus Monitor Module</td></tr> </table>	Model	Name	701250	High-Speed 10 MS/s, 12-Bit Isolation Module	701281	Frequency Module	720240	CAN Bus Monitor Module
Model	Name								
701250	High-Speed 10 MS/s, 12-Bit Isolation Module								
701281	Frequency Module								
720240	CAN Bus Monitor Module								

6.15 External Dimensions

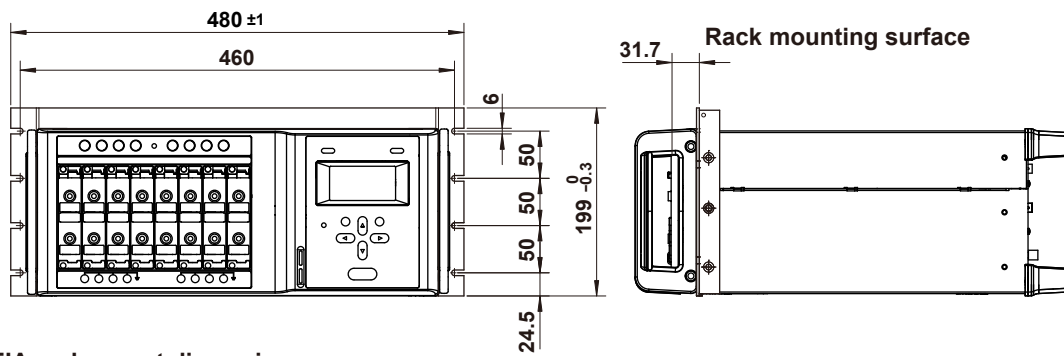
Instrument

Unit: mm

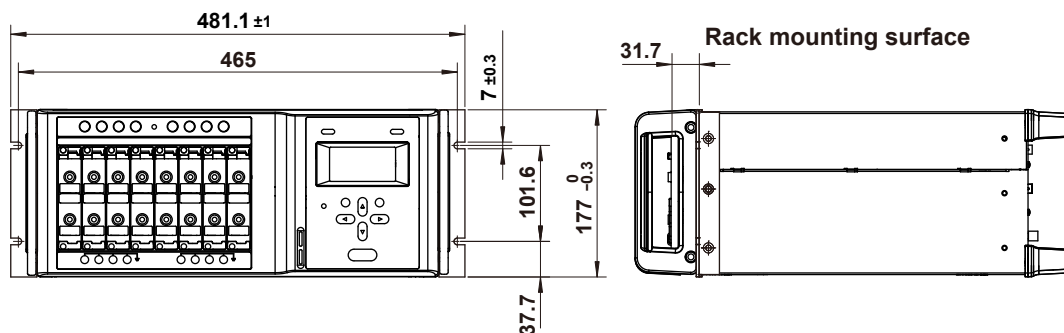
Unless otherwise specified, tolerances are $\pm 3\%$ (however, tolerances are ± 0.3 mm when below 10 mm).



JIS rack mount dimensions



EIA rack mount dimensions

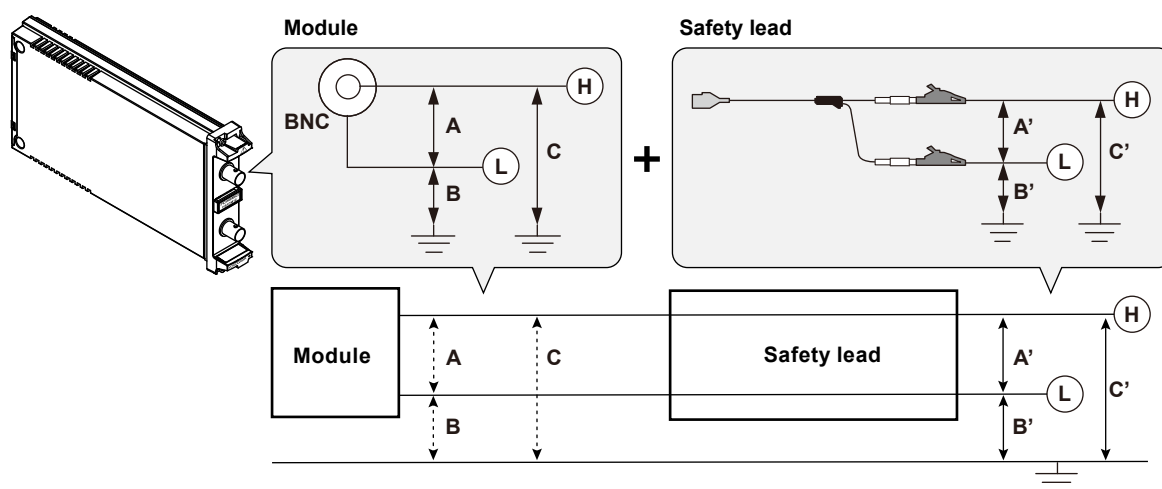


Appendix Modules' Maximum Input Voltages

When checking the maximum input voltage of a module, you need to consider not only the voltage across input terminals but also the isolation voltage of each terminal. In addition, the voltage that can be measured varies depending on the connection cable used in combination with the module.

When Combining with a Safety Lead

When you use a safety lead, you can measure up to the maximum input voltage given in the module specifications. However, the isolation voltage of each input terminal needs to be less than the maximum rated voltage to ground.



Module Specifications

- Input voltage across terminals ($A=A'$) $\leq$ Maximum input voltage
- L terminal's isolation voltage ($B=B'$) $\leq$ Maximum rated voltage to ground
- H terminal's isolation voltage ($C=A+B$) $\leq$ Maximum rated voltage to ground

Example of Calculating Whether the Module Can Be Used

The following is an example of determining whether a module can be used based on the actual input voltage.

- When an isolation module (720250) is used in combination with the 701901 + 701954 (1:1)
- If any of the determination results is NG, the module cannot be used.

Actual Input Voltage			Example 1		Example 2 ²		Example 3 ³	
Voltage at the safety lead tip	A'		180 V		220 V		200 V	
	B'		200 V		180 V		250 V	
Determination Result		Upper Limit ¹	Voltage	Judgment	Voltage	Judgment	Voltage	Judgment
Module terminal voltage	A = A'	Maximum input voltage: 200 V (DC+ACpeak)	180 V	OK	220 V	NG	200 V	OK
	B = B'	Maximum rated voltage to ground: 400 Vrms	200 V	OK	180 V	OK	250 V	OK
	C = A+B	Maximum rated voltage to ground: 400 Vrms	380 V	OK	400 V	OK	450 V	NG
Whether the Module Can Be Used			Yes		No		No	

¹ For the upper value limit, see section 6.13, "Module Specifications."

If an rms value is indicated, multiplied by $\sqrt{2}$ (1.4) to convert to a peak value. If the value varies depending on the measurement category, calculate it by applying the category value to be used.

² Cannot be used because the maximum input voltage is exceeded.

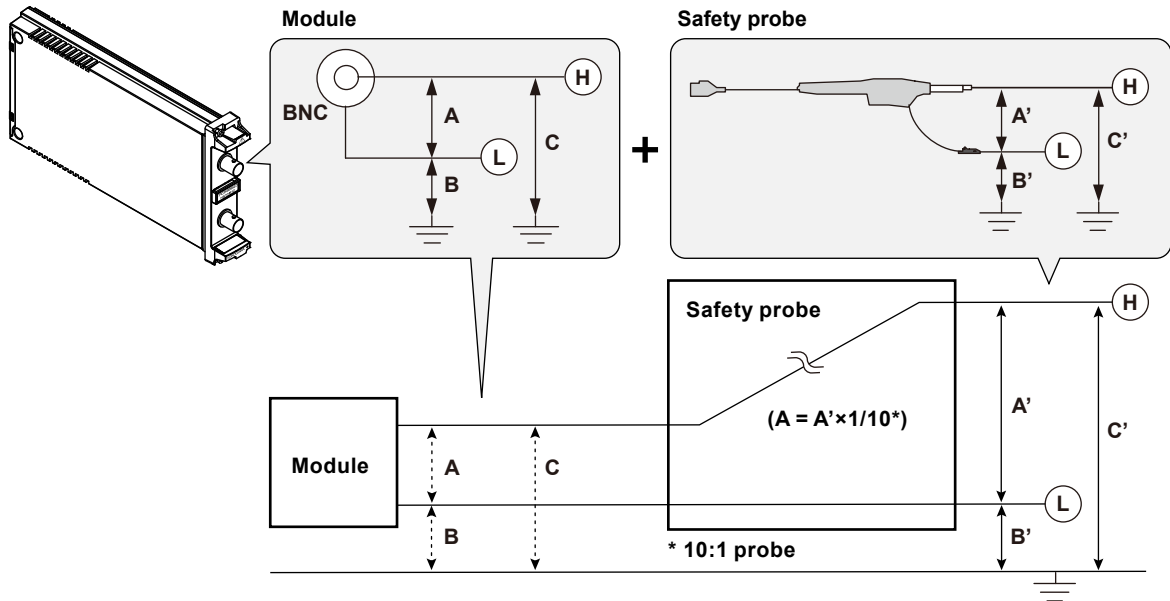
³ Cannot be used because the H terminal's isolation voltage is greater than the maximum rated voltage to ground.

When Combining with a Safety Probe

When you use a safety probe, you can measure up to the voltage that corresponds to the probe attenuation (when the attenuation is 10:1, up to 10 times the maximum input voltage given in the module specifications).

However, the isolation voltage of each input terminal needs to be less than the maximum rated voltage to ground.

In addition, the probe tip input voltage must be less than or equal to the maximum input voltage given in the probe specifications and the maximum rated voltage to ground.



Module Specifications

- Input voltage across terminals ($A = A' \times 1/10$ (for a 10:1 probe)) $\leq$ Maximum input voltage
- L terminal's isolation voltage ($B=B'$) $\leq$ Maximum rated voltage to ground
- H terminal's isolation voltage ($C=A+B$) $\leq$ Maximum rated voltage to ground

Probe Specifications

- Between the pincher tip and safety ground lead (A') $\leq$ Maximum input voltage
- Between the safety ground lead and ground (B') $\leq$ Maximum rated voltage to ground
- Between the pincher tip and ground ($C'=A'+B'$) $\leq$ Maximum rated voltage to ground

Example of Calculating Whether the Module Can Be Used

The following is an example of determining whether a module can be used based on the actual input voltage.

- When an isolation module (720250) is used in combination with the 700929 (10:1 safety probe)
- If any of the determination results is NG, the module cannot be used.

Actual Input Voltage			Example 1		Example 2 ³		Example 3 ⁴	
Probe tip voltage	A'		700 V		400 V		1000 V	
	B'		300 V		390 V		300 V	
Determination Result	Upper Limit ¹		Voltage	Judgment	Voltage	Judgment	Voltage	Judgment
Probe tip voltage	A'	Maximum input voltage: ² 1000 Vrms	700 V	OK	400 V	OK	1000 V	OK
	B'	Maximum rated voltage to ground: ² 1000 Vrms	300 V	OK	390 V	OK	300 V	OK
	C' = A' + B'	Maximum rated voltage to ground: ² 1000 Vrms	1000 V	OK	790 V	OK	1300 V	NG
Module terminal voltage	A = A' × 1/10	Maximum input voltage: 200 V (DC+ACpeak)	70 V	OK	40 V	OK	100 V	OK
	B = B'	Maximum rated voltage to ground: 400 Vrms	300 V	OK	390 V	OK	300 V	OK
	C = A+B	Maximum rated voltage to ground: 400 Vrms	370 V	OK	430 V	NG	400 V	OK
Whether the Module Can Be Used			Yes		No		No	

- 1 For the upper module terminal voltage limit, see section 6.13, "Module Specifications." However, calculate the maximum input voltage using the combined value of 701901 + 701954 (1:1). It will be 200 V in the case of an isolation module (720250).
If an rms value is indicated, multiplied by $\sqrt{2}$ (1.4) to convert to a peak value. If the value varies depending on the measurement category, calculate it by applying the category value to be used.
For the upper probe tip voltage, see the manual for the probe.
- 2 The higher the input signal frequency, the lower the maximum probe input voltage and maximum rated voltage to ground. For details, see the manual for the probe.
- 3 Cannot be used because the H terminal's isolation voltage is greater than the maximum rated voltage to ground.
- 4 Cannot be used because the voltage between the probe pincher tip and ground is greater than the maximum rated voltage to ground.

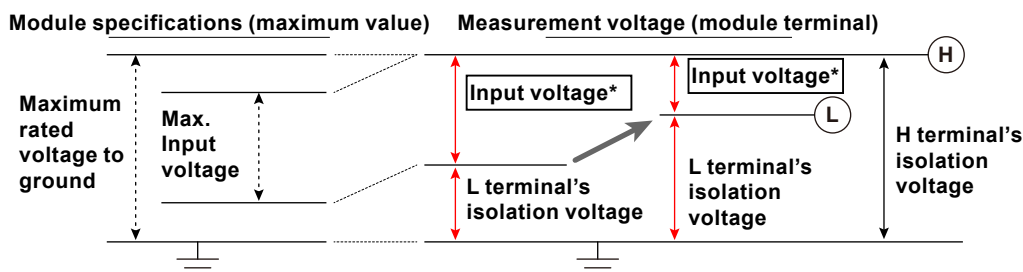
Note

When Using Direct Input

When a signal is directly applied to a module terminal (using a cable not complying with the safety standard), the maximum input voltage is 42 V (DC+ACpeak) and the maximum rated voltage to ground is 42 V (DC+ACpeak) (CAT II 30 Vrms), regardless of the module specifications.

L Terminal's Isolation Voltage and Maximum Input Voltage

Even when the module and the connection cable in use are the same, if the H terminal's isolation voltage has reached the maximum rated voltage to ground, the higher the L terminal's isolation voltage, the lower the voltage that can be applied (less than the maximum voltage given in the module specifications).



- * When using the safety probe, if the probe attenuation is 10:1, you can apply up to 10 times the input voltage to the probe tip. However, input exceeding the probe tip's maximum input voltage or maximum rated voltage to ground is not allowed.

Index

Numerics Page

16-CH scanner box..... 2-64

A Page

accurate measurements 2-4, 2-18
acquisition mode..... 3-5
arrow keys 1-5

C Page

CAN Bus Monitor Module 2-69
CAN/CAN FD Bus Monitor Module..... 2-69
CAN FD/LIN Monitor Module 2-71
CAN & LIN Bus Monitor Module 2-71
communication setup display 1-6
component names 2-59, 2-65
 display screen 1-6
 front panel 1-1
 left side panel 1-1
connection
 16-CH Temperature/Voltage Input Module 2-64
 acceleration sensor 2-52
 bridgehead 2-45
 CAN Bus Monitor, CAN/CAN FD Monitor Module 2-69
 CAN & LIN Bus Monitor or CAN FD/LIN Monitor
 Module 2-71
 frequency module 2-55
 GPS Unit 2-73
 logic probe 2-48
 measurement lead 2-38
 Optical Fiber Cord 2-74
 probe 2-19
 thermocouple 2-42
connection cables 2-14
contents of the package, checking iv

E Page

error status display 1-6
ESC key 1-5
event input 4-9
external clock input 4-4
external start/stop 4-9
external trigger input 4-1

F Page

faults and corrective actions 5-1
frequency module 2-13, 2-37, 2-55

G Page

GPS signal input 4-14
GPS unit 2-73

H Page

Handle 2-2

I Page

input module
 installation 2-11
 type vii, 2-10, 1-3
installation conditions 2-3
installation orientation 2-5
instrument number v
IRIG signal input 4-13
IS8000 3-1

K Page

keys 1-5

L Page

Laser Specifications 2-12, 2-80

M Page

maximum input voltage xv, App-1
maximum rated voltage to ground xv, App-1
module information display 1-7

N Page

numeric monitor 1-6

O Page

optical fiber cord ix, 2-77
optical transceiver module ix, 2-75
optional accessories (sold separately) viii
over-range indication
 2-24, 1-6, 2-39, 2-42, 2-52, 2-55, 2-59, 2-65
overview 5-4
overview display 1-7

P Page

phase compensation signal 2-36
phase correction 2-35
power cord v, 2-1, 2-16
power switch 2-17

R Page

rear panel 1-2
recommended part replacement 5-5
rubber stoppers v, 2-5

S Page

Safety Precautions for Laser Products 2-12, 2-80
sample clock output 4-5
self-test 5-2
self-test, if an error occurs during 5-3
SENT Monitor Module 2-13, 2-37
SET key 1-5
setup menu 1-7
soft keyboard 5-3
standard accessories v
START/STOP key , 1-5
suffix code iv
system configuration 1-9
system information 5-4

Index

T	Page
terminal block	4-6
test type	5-3
tilted installation	2-5
trademarks.....	i
trigger output	4-2
U	Page
UTILITY Overview menu	5-4
UTILITY Self Test menu	5-3
V	Page
video signal output.....	4-11
W	Page
waveform acquisition	3-5
Web server	3-3

This document describes changes to the Getting Started Guide IM SL2000-03EN. Please review them before using the manual.

■ Page xx Regulations and Sales in Various Countries and Regions

Add the following explanation.

Compliance with the Radio Waves Act (Republic of Korea)

This product complies with the Radio Waves Act (Republic of Korea).

- 1) Trade Name: Yokogawa Test & Measurement Corporation
- 2) Model & Model Name: See the table below.
- 3) Date of Manufacture: Listed on the instrument
- 4) Manufacturer: Yokogawa Test & Measurement Corporation
- 5) Country of origin: Japan

Model	Model Name	Registration Website URL
SL2000	High-Speed Data Acquisition Unit	http://www.rra.go.kr/selform/IMY-EEN541-1