

SL1000

High-Speed Data Acquisition Unit

U S E R ' S M A N U A L

GiGAZoom
ENGINE™

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 SL1000 High-Speed Data Acquisition Unit. This user's manual contains useful information about the instrument's functions and operating procedures and lists the handling precautions of the SL1000. To ensure correct use, please read this manual thoroughly before beginning operation. Keep this manual in a safe place for quick reference in the event a question arises. This manual will come in handy when you are unsure of how to operate the product.

List of Manuals

The following manuals, including this one, are provided as manuals for the SL1000. Please read all of them.

| Manual Title | Manual No. | Description |
|-------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------|
| SL1000 High-Speed Data Acquisition Unit User's Manual | IM 720120-01E | This manual. Explains all functions and procedures of the SL1000 excluding the communication functions. |
| SL1000 Acquisition Software User's Manual | IM 720120-61E | Explains all functions and procedures of the Acquisition Software used to configure and control the SL1000. |
| SL1000 Input Module User's Manual | IM 720120-51E | Explains the specifications of the input modules that can be installed in the SL1000. |
| Precautions Concerning the Modules | IM 701250-04E | The manual explains the precautions concerning the modules. |
| 701992 Xviewer Install Manual | IM 701992-02E | This manual explains how to install the Xviewer [®] setup software. |
| SL1000 High-Speed Data Acquisition Unit | IM 720120-92 | Document for China |
| Safety Instruction Manual | IM 00C01C01-01Z1 | Safety manual (European languages) |

The "E" in the manual numbers are the language codes.

* The Xviewer user's manual is included in the Xviewer help.

Refer to the "Optional Accessories (Sold Separately)" about the accessory's manual No..

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 YOKOGAWA's permission is strictly prohibited.
- The TCP/IP software of this product and the document concerning the TCP/IP software have been developed/created by YOKOGAWA based on the BSD Networking Software, Release 1 that has been licensed from University of California.

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.

Trademarks

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Revisions

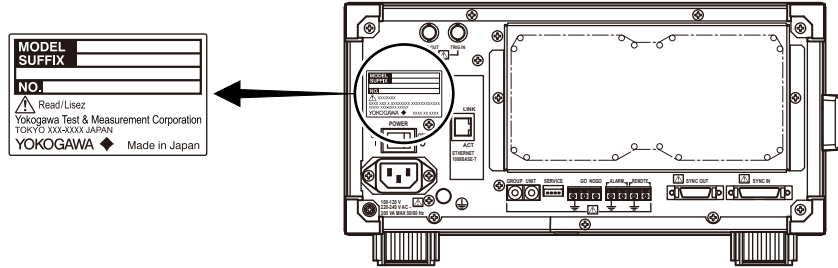
- 1st Edition: December 2007
- 2nd Edition: September 2008
- 3rd Edition: July 2012
- 4th Edition: September 2013
- 5th Edition: July 2014
- 6th Edition: October 2015
- 7th Edition: February 2016
- 8th Edition: July 2017
- 9th Edition: October 2017
- 10th Edition: November 2018
- 11th Edition: July 2019
- 12th Edition: January 2021
- 13th Edition: April 2021
- 14th Edition: June 2021
- 15th Edition: November 2021
- 16th Edition: January 2023

Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument. If some of the contents are not correct or missing or if there is physical damage, contact the dealer from which you purchased them.

SL1000

Check that the model name and suffix code given on the name plate on the rear panel match those on your order.



| MODEL | Suffix Code ¹ | Description |
|-------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 720120 | | SL1000 High-Speed Data Acquisition Unit 8 slots, up to 128 MW memory With 1 license for the Xviewer Standard Edition (701992-SP01) |
| Power cord ² | -D | UL/CSA Standard power cord, Maximum rated voltage: 125 V |
| | -F | VDE Standard power cord, Maximum rated voltage: 250 V |
| | -Q | BS Standard power cord, Maximum rated voltage: 250 V |
| | -R | AS Standard power cord, Maximum rated voltage: 250 V |
| | -H | GB Standard power cord, Maximum rated voltage: 250 V |
| | -N | Brazilian Standard power cord, Maximum rated voltage: 250 V |
| | -T | Taiwanese Standard power cord, Maximum rated voltage: 125 V |
| | -B | Indian Standard power cord, Maximum rated voltage: 250 V |
| | -U | IEC Plug Type B power cord, Maximum rated voltage: 250 V |
| | -Y | No power cord included. ³ |
| Options | /HD1 | 500-GB internal HDD |
| | /C10 | Ethernet interface |
| | /P4 | Four probe power outputs |
| | /XV0 | Xviewer Less ^{4, 5} |
| | /XV1 | Xviewer MATH Edition (701992-GP01) ⁵ |

- For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.
- Make sure that the attached power cord meets the designated standards of the country and area that you are using it in.
- Prepare a power cord that complies with the standard specified by the country or region that the instrument will be used in.
- Xviewer required to access the internal hard disk via USB.
- The /XV0 and /XV1 options cannot be specified simultaneously.

No. (Instrument No.)

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

Checking the Contents of the Package

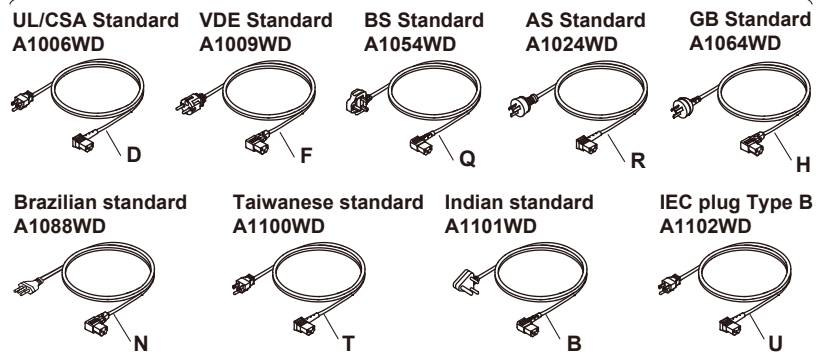
Standard Accessories

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

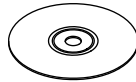
| Model | Part Number | Qty. | Specifications |
|----------------------------------------|------------------|------|--------------------------------------------------------------------------------------------|
| Power cord ¹ | A1006WD | 1 | UL/CSA Standard power cord Maximum rated voltage: 125 V, Maximum rated current: 7 A |
| | A1009WD | | VDE Standard power cord Maximum rated voltage: 250 V, Maximum rated current: 10 A |
| | A1054WD | | BS Standard power cord Maximum rated voltage: 250 V, Maximum rated current: 10 A |
| | A1024WD | | AS Standard power cord Maximum rated voltage: 250 V, Maximum rated current: 10 A |
| | A1064WD | | GB Standard power cord Maximum rated voltage: 250 V, Maximum rated current: 10 A |
| | A1088WD | | Brazilian Standard power cord Maximum rated voltage: 250 V, Maximum rated current: 10 A |
| | A1100WD | | Taiwanese Standard power cord Maximum rated voltage: 125 V, Maximum rated current: 10 A |
| | A1101WD | | Indian Standard power cord Maximum rated voltage: 250 V, Maximum rated current: 10 A |
| | A1102WD | | IEC Plug Type B power cord Maximum rated voltage: 250 V, Maximum rated current: 7 A |
| Acquisition Software (CD) ² | B8073ZA | 1 | Acquisition software used to configure and control the SL1000. |
| Soft case | B8081HG | 1 | For storing accessories. |
| Cover panels | B8073CY | 8 | For protecting empty module slots. |
| Rubber feet | A9088ZM | 1 | 1 sheet (2 pcs.), Attached to the rear feet. |
| Manuals | IM 720120-01E | 1 | High-Speed Data Acquisition Unit User's Manual (this manual) |
| | IM 720120-61E | 1 | Acquisition Software User's Manual |
| | IM 720120-51E | 1 | Input Module User's Manual |
| | IM 701250-04E | 1 | Precautions Concerning the Modules |
| | IM 701992-02E | 1 | Xviewer Install Manual ³ |
| | IM 720120-92 | 1 | User's Manual 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 of this instrument.

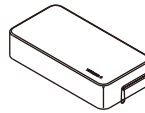
Power Cord¹ (one of the following power cords is supplied according to the instrument's suffix codes)



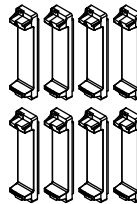
Acquisition Software
B8073ZA (CD)²



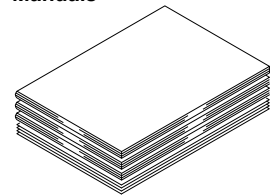
Soft case
B8081HG



Cover panels
B8073CY 8 pieces



Manuals



Rubber feet
A9088ZM

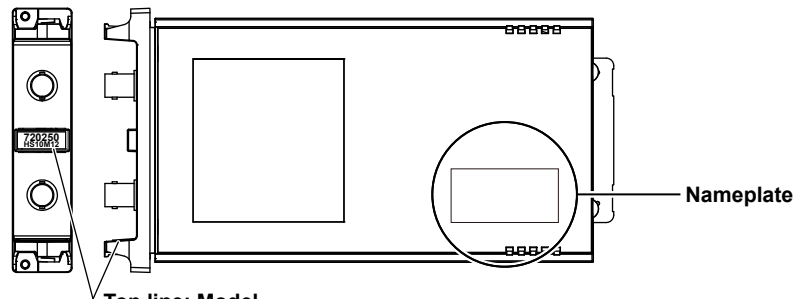


- 1 Make sure that the attached power cord meets the designated standards of the country and area that you are using it in. If the suffix code is -Y, a power cord is not included.
- 2 The CD includes 1 license for the Xviewer Standard Edition in addition to the SL1000 Acquisition Software.
The /XV1 option includes 1 license for the Xviewer MATH Edition.
The /XV0 option does not include a license for Xviewer.
- 3 Not included with the /XV0 option.

Modules (Sold Separately)

Check that the MODEL indicated on the module is what you ordered.

| MODEL | Name | Minimum Q'ty | Abbreviation |
|--------|------------------------------------------------------------------|--------------|----------------|
| 720211 | High-Speed 100 MS/s, 12-Bit Isolation Module (2CH) | 1 | HS100M12 |
| 720250 | High-Speed 10 MS/s, 12-Bit Isolation Module | 1 | HS10M12 |
| 701251 | High-Speed High-Resolution 1 MS/s, 16-Bit Isolation Module | 1 | HS1M16 |
| 701255 | High-Speed 10 MS/s, 12-Bit Non-Isolation Module | 1 | NONISO_10M12 |
| 720268 | High-Voltage 1 MS/s, 16-Bit Isolation Module (with AAF, RMS) | 1 | HV(AAF, RMS) |
| 701261 | Universal (Voltage/Temp.) Module | 1 | UNIVERSAL |
| 701262 | Universal (Voltage/Temp.) Module (with AAF) | 1 | UNIVERSAL(AAF) |
| 701265 | Temperature, High Precision Voltage Isolation Module | 1 | TEMP/HPV |
| 720266 | Temperature, High Precision Voltage Isolation Module (low noise) | 1 | TEMP/HPV |
| 701270 | Strain Module (NDIS) | 1 | STRAIN_NDIS |
| 701271 | Strain Module (DSUB, Shunt-Cal) | 1 | STRAIN_DSUB |
| 701275 | Acceleration/Voltage Module (with AAF) | 1 | ACCL/VOLT |
| 720281 | Frequency Module | 1 | FREQ |



Top line: Model
Bottom line: Abbreviation
The location varies depending on the module.

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.

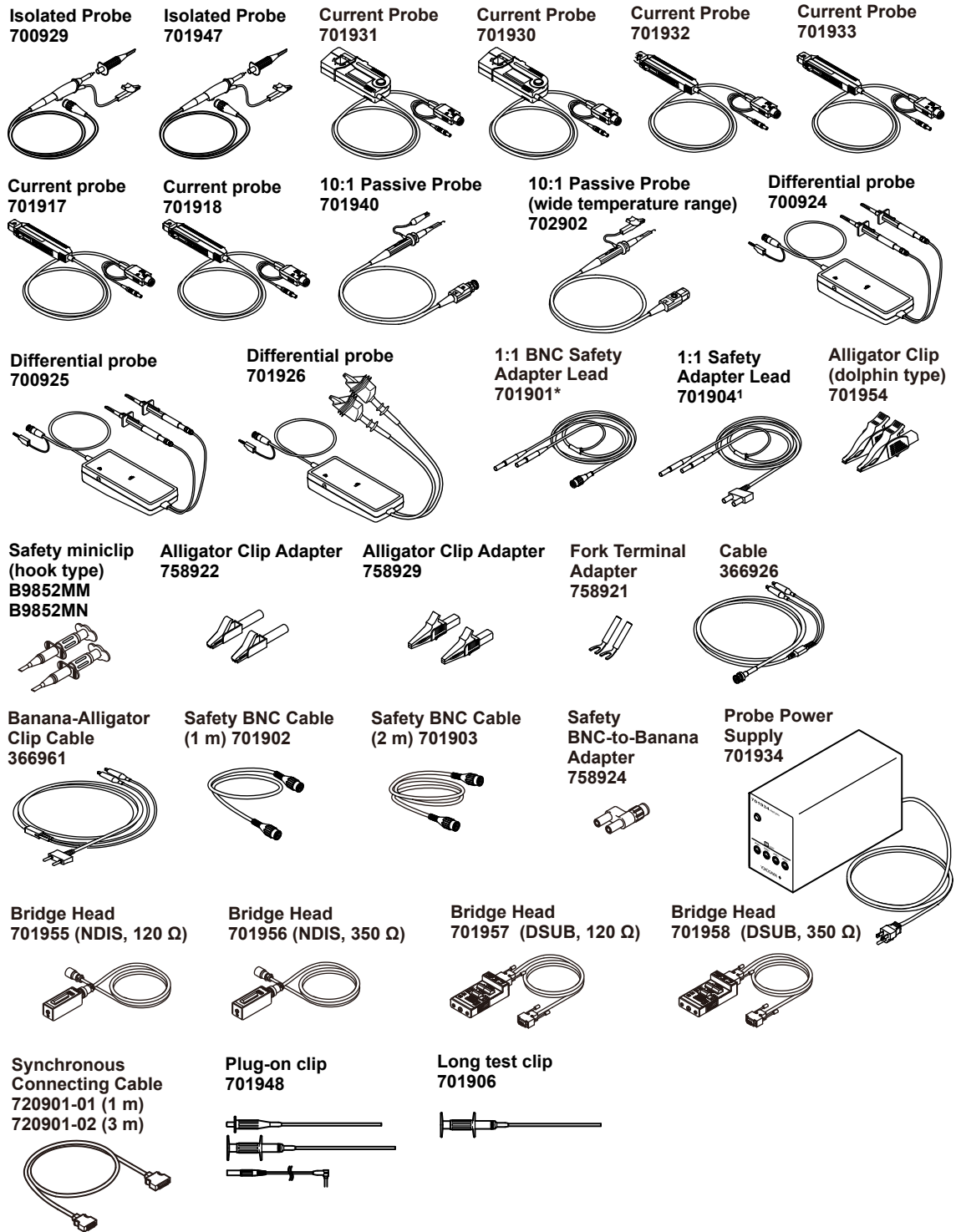
- Use the accessories specified in this manual. Moreover, use the accessories of this product only with Yokogawa products that specify them as accessories.
- Use the accessories of this product within the rated range of each accessory. When using several accessories together, use them within the specification range of the accessory with the lowest rating.

| Name | Part Number | Safety standard | Specifications | Manual No. |
|-------------------------------|-------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Isolated Probe | 700929 | 1000Vrms-CAT II | For the 701250, 701251, 720210, and 720211, (10:1) | IM 700929-01E |
| | 701947 | 1000 Vrms CAT II | 100:1 safety probe for the 701250, 701251, 720210, and 720211 | IM 701947-01E |
| Current Probe | 701930 | 300 Vrms CAT III | 150 Arms, DC to 10 MHz, used by connecting to the Probe Power Terminal (/P4 option) or the Probe Power Supply (701934) sold separately | IM 701930-01E |
| | 701931 | 300 Vrms CAT III | 500 Arms, DC to 2 MHz, used by connecting to the Probe Power Terminal (/P4 option) or the Probe Power Supply (701934) sold separately | IM 701931-01E |
| | 701932 | 300 Vrms | 30 Arms, DC to 100 MHz. Used by connecting to a probe power terminal (/P4 option) or a probe power supply (701934; sold separately). | IM 701932-01E |
| | 701933 | 300 Vrms | 30 Arms, DC to 50 MHz, used by connecting to the Probe Power Terminal (/P4 option) or the Probe Power Supply (701934) sold separately | IM 701933-01E |
| | 701917 | Vrms | 5 Arms, DC to 50 MHz. Used by connecting to a probe power terminal (/P4 option) or a probe power supply (701934; sold separately). | IM 701917-01EN |
| | 701918 | Vrms | 5 Arms, DC to 120 MHz. Used by connecting to a probe power terminal (/P4 option) or a probe power supply (701934; sold separately). | IM 701917-01EN |
| 10:1 Passive Probe | 701940 | — | For non-isolated input on the 701255: 600 V or less For isolated input other than above: 42 V or less | IM 701940-01E |
| | 702902 | 1000V (DC+ACpeak) CAT II | 10:1 safety probe, wide temperature range, for isolated BNC input, for the 701250, 701251, 720210, and 720211 | IM 702902-01E |
| Differential Probe | 700924 | 1000 Vrms CAT III | Switchable between 1000:1 and 100:1 Measurable voltage: 1400 Vpeak (1000 Vrms) | IM 700924-01E |
| | 700925 | 1000V (DC+ACpeak) CAT III | Switchable between 100:1 and 10:1 Measurable voltage: 500 Vpeak (350 Vrms) | IM 700925-01E |
| | 701926 | 1000 Vrms CAT III | Switchable between 1000:1 and 100:1 Measurable voltage: 7000 Vpeak (5000 Vrms) | IM 701926-01E |
| 1:1 BNC Safety Adapter Lead | 701901 | 1000Vrms-CAT II | For the 701250, 701251, 720210, and 720211. Used with the 701954, B9852MM, B9852MN, 758922, 758929, or 758921 sold separately | — |
| 1:1 Safety Adapter Lead | 701904 | 1000 Vrms CAT II 600 Vrms CAT III | For use with the 701267 and 720268. Used with the following items (which are sold separately): the 701954, B9852MM, B9852MN, 758922, 758929, or 758921. | — |
| Measurement Lead | 758933 | 1000Vrms CAT III | 1 m, for the 701260. Used with the 701954, B9852MM, B9852MN, 758922, 758929, or 758921 sold separately | — |
| Alligator Clip (dolphin type) | 701954 | 1000Vrms CAT III | Two pieces in one set (red/black) | — |
| Safety Mini-clip (hook type) | B9852MM | 1000 Vrms CAT III | Black | — |
| | B9852MN | 1000 Vrms CAT III | Red | — |
| Alligator Clip Adapter | 758922 | 300Vrms CAT II | Two pieces in one set | — |
| | 758929 | 1000Vrms CAT II | Two pieces in one set | — |
| Fork Terminal Adapter | 758921 | 1000Vrms CAT II | Two pieces in one set (red/black). For 4 mm screws. | — |

Checking the Contents of the Package

| Name | Part Number | Safety standard | Specifications | Manual No. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------|---------------------------------------------------------------------------------------------|------------------|
| Cable* | 366926 | — | Non-isolated: 42 V or less, for the 701250, 720250, 701251, 701255, 720210, and 720211, 1 m | — |
| Banana-Alligator Clip Cable | 366961 | — | Non-isolated: 42 V or less, for the 701261, 701262, 701265, and 720266, 1.2 m | — |
| Safety BNC Cable (1 m) | 701902 | 1000Vrms CAT II | 1000Vrms-CAT II (BNC-BNC) | — |
| Safety BNC Cable (2 m) | 701903 | 1000Vrms CAT II | 1000Vrms-CAT II (BNC-BNC) | — |
| Safety BNC-to-Banana Adapter | 758924 | 500Vrms CAT II | For the 701250, 701251, 701255, 720210, and 720211 | — |
| Probe Power Supply | 701934 | — | Large current output, power supply for external probes (4 outputs) | IM 701934-01E |
| Shunt Resistor | 438920 | — | 250 $\Omega \pm 0.1\%$ | — |
| | 438921 | — | 100 $\Omega \pm 0.1\%$ | — |
| | 438922 | — | 10 $\Omega \pm 0.1\%$ | — |
| Bridge Head | 701955 | — | NDIS, bridge resistance: 120 Ω , with a 5-m cable | IM 701955-01E |
| | 701956 | — | NDIS, bridge resistance: 350 Ω , with a 5-m cable | — |
| | 701957 | — | DSUB, bridge resistance: 120 Ω , shunt-cal support, with a 5-m cable | IM 701957-01E |
| | 701958 | — | DSUB, bridge resistance: 350 Ω , shunt-cal support, with a 5-m cable | — |
| Plug-on clip | 701948 | 1000Vrms CAT II | For the 700929/701947 | IM 701948-01E |
| Long test clip | 701906 | 1000Vrms CAT II | For the 700924/701926 | IM 701906-01E |
| Synchronous Connecting Cable | 720901 | — | -01: for synchronous SL1000 operation (1 m) | — |
| | | | -02: for synchronous SL1000 operation (3 m) | — |
| Rack Mounting Kit | 751541 | — | -J4: Rack mounting kit for SL1000 (JIS) | IM 751541-J4-01E |
| | | | -E4: Rack mounting kit for SL1000 (EIA) | IM 751541-E4-01E |
| Sold individually. | | | | |
| * Use cables (366926) that YOKOGAWA has been shipping since February 4, 1998. Cables (366926) shipped before this date cannot be used in combination with the SL1000 input modules. | | | | |
| Optional accessories(sold separately) are not covered by warranty of this instrument. | | | | |

Checking the Contents of the Package



* The 1:1 BNC safety adapter lead (701901/701904) is used in combination with the following accessories sold separately: alligator clip (dolphin type 701954), safety mini-clip (hook type: B9852MM and B9852MN), alligator adapter (758922 or 758929), and/or the fork terminal adapter (758921).

Safety Precautions

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

This instrument is an IEC safety 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.



Protective grounding or protective grounding terminal



Ground (earth) or functional ground terminal (do not use this terminal as a protective ground terminal.)



Alternating current



Direct 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.



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



Courant direct



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 data acquisition device that measures electrical signals. Do not use this instrument for anything other than as a data acquisition device.

Check the Physical Appearance

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

Use the Correct Power Supply

Make sure that the power supply voltage matches the instrument's rated supply voltage and that it does not exceed the maximum voltage range of the power cord to use.

Use the Correct Power Cord and Plug

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

Connect the Protective Grounding Terminal

Be sure to connect the protective earth to prevent electric shock before turning ON the power. The power cord that you can use for the instrument is a three-prong cord. Connect the power cord to a properly grounded three-prong outlet.

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 poses a potential shock hazard.

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 liquids or vapors. Operation in such an environment constitutes a safety hazard.

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 unit. If you are going to touch the circuit, make sure to turn OFF the circuit and check that no voltage is present.

Precautions to Be Taken When Using the Modules

- Do not apply input voltage exceeding the maximum input voltage, withstand voltage, or allowable surge voltage.
- To prevent electric shock, be sure to furnish protective earth grounding of the instrument.
- To prevent electric shock, be sure to fasten the module screws. Otherwise, the electrical protection function and the mechanical protection function will not be activated.

Safety Precautions

- Avoid continuous connection under an environment in which the allowable surge voltage or greater voltage may occur.
- Be careful not to exceed the maximum input voltage of a module in the following cases.
 - When the probe attenuation is 1:1.
 - When the module input coupling is set to AC.A DC voltage at the same electric potential as the probe input is applied to the module input.

Precautions to Be Taken When Using the Probes

- To measure high voltage with the 720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), or 701251 (HS1M16), use the isolated probes (700929, 701947), passive probes 702902, or 1:1 safety cables (combination of 701901 and 701954).
- If you are using the 701255 (NONISO_10M12), be sure to fasten the module screws. Fastening the module screws activates the protection function and the non-isolation function. It is extremely dangerous if you do not fasten the screws. In addition, if you are measuring high voltage above 42 V, be sure to use the passive probe 701940.
- The BNC part of the passive probe 701940 is made of metal. Therefore, use the probe at 42 V or less for isolated inputs (720210 (HS100M12), 701250 (HS10M12), 701251 (HS1M16)), etc.) for safety reasons. (Do not connect voltage above 42 V to both the High and Low sides.) For non-isolated inputs (701255 (NONISO_10M12), etc.), fasten the module screws as described before.
- If you are measuring high voltages using the 701267 (HV (with RMS)), or 720268 (HV (AAF, RMS)), use the measurement leads (combination of 758933 and 701954) or 1:1 safety cables (combination of 701904 and 701954).
- The measurement category of the 701267 (HV (with RMS)) is 400V-CAT II for the low side and 700V-CAT II for the high side. Use caution because the overvoltage tolerance differs between the low and high sides.

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.

Damaged Signal Cable

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

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.

French

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, penser à brancher la prise de terre pour éviter tout choc électrique. Le cordon d'alimentation que vous utilisez pour l'instrument est un cordon 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 ou de vapeurs 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 mesurer ou à une 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 dépasser les valeurs maximales de tension d'entrée, de tension de maintien ou de surtension admissible.
- Pour éviter tout risque de choc électrique, toujours relier le SL1000 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.

- Ne pas laisser les modules branchés à l'instrument dans des environnements dans lesquels la tension pourrait dépasser la surtension admissible.
- Faire attention de ne pas dépasser la tension d'entrée maximale d'un module dans les cas suivants.
 - Si l'atténuation de la sonde est de 1:1.
 - Si le couplage d'entrée du module est paramétré sur le CA.Une tension CC de même potentiel électrique que l'entrée de sonde s'applique à l'entrée du module.

Précautions à prendre lors de l'utilisation de sondes

- Pour mesurer la tension élevée avec 720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12) ou 701251 (HS1M16), utiliser une sonde isolée (700929 ou 701947), des sondes passives 702902 ou des câbles de sécurité 1:1 (combinaison de 701901 et 701954).
- 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. La situation est extrêmement dangereuse lorsque les vis ne sont pas serrées. Lorsque vous mesurez des hautes tensions supérieures à 42 V, veillez également à utiliser la sonde passive 701940.
- La partie BNC de la sonde passive 701940 est composée de métal. Utiliser, par conséquent, la sonde à 42 V ou moins pour les entrées isolées (720210 (HS100M12), 701250 (HS10M12), 701251 (HS1M16)) etc.) pour des raisons de sécurité. (Ne pas utiliser une tension supérieure à 42 V à la fois en haut et en bas.) Pour les entrées non-isolées (701255 (NONISO_10M12) etc.), serrer les vis du module comme décrit précédemment.
- Lorsque vous appliquez de hautes tensions au 701267 (HV (avec RMS)) ou 720268 (HV (AAF, RMS)), utilisez un cordon de mesure (758933 et 701954 conjointement) ou un câble de sécurité 1:1 (701904 et 701954 conjointement)
- La catégorie de mesure de 701267 (HV (avec RMS)) est CAT II - 400 V pour le bas et CAT II - 700 V pour le haut. Procéder avec soin, car la tolérance de surtension diffère entre le bas et le haut.

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.

Câble de signal endommagé

Si le câble de signal est déchiré et que le métal intérieur est exposé ou si une couleur différente de la gaine externe est visible, arrêter immédiatement d'utiliser ce câble.

ATTENTION

Limitations relatives à l'environnement opérationnel

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

Regulations and Sales in Various Countries and Regions

Waste Electrical and Electronic Equipment (WEEE)



(EU WEEE Directive valid only in the EEA* and UK WEEE Regulation in the UK)
This product complies with the WEEE marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste. When disposing of products in the EEA or UK, contact your local Yokogawa office in the EEA or UK respectively.

* EEA: European Economic Area

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 7.7.

* 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 product will be disposed of.

How to Use This Manual

Structure of the Manual

This user's manual consists of the following sections.

| Chapter | Title | Description |
|---------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Names and Uses of Parts | Describes the names and uses of each part and the screen display. |
| 2 | Explanation of Functions | Describes the measurement principles and the functions of the instrument. Operational details are not given in this chapter. However, reading this chapter will help you understand the operating procedures given in the chapters that follow. |
| 3 | Before Starting Measurements | Describes handling precautions, how to install the instrument, how to connect to the power supply, how to turn ON/OFF the power switch, how to install modules, how to connect probes, and so on. |
| 4 | Starting/Stopping Measurements | Describes how to connect the instrument to a PC and how to start/stop measurements. |
| 5 | External I/O Terminals | Describes external trigger input, trigger output, external clock, alarm output, GO/NO-GO output, etc. |
| 6 | Maintenance | Gives troubleshooting advice; explains screen messages and self-test operation. |
| 7 | Specifications | Summarizes the main specifications of the instrument in tables. |
| | Appendix | Provides information about the TCP and UDP port numbers used in the Ethernet communications; and so on. |
| | Index | |

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 (sampling rate)

K: Denotes 1024k. Example: 710 KB (file size)

Bold Characters

Bold characters used in the procedural explanations indicate characters that are marked on the panel keys or the characters of the soft keys displayed on the screen menu.

Markings

The following markings are used in this manual.



Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the users 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 attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

French

AVERTISSEMENT

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

ATTENTION

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

Note

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

Subheadings

On pages that describe the operating procedures in chapters 3 and 4, the following symbols are used to distinguish the procedures from their explanations.

Procedure

Carry out the procedure according to the step numbers. All procedures are written with inexperienced users in mind;experienced users may not need to carry out all the steps.

Explanation

This section describes the setup items and the limitations regarding the procedures. It may not give a detailed explanation of the function. For a detailed explanation of the function, see chapter 2.

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1.1 Front Panel and Rear Panel

Front Panel

Handle

Used to carry the SL1000.
→ **Section 3.1**

Input module installation slots

A total of 8 slots.
For the procedure to install or remove input modules, see **section 3.3**.

LCD

For a description of the indicated information, see **section 1.3**.

Indicators

Displays the SL1000 status.
→ **Section 1.2**

Keys

Used to control the SL1000.
→ **Section 1.2**

USB connector for connecting to a PC

Used to connect a PC with a USB interface. → **Section 4.1**

Probe compensation signal output terminal (1 kHz/1 Vp-p)

Outputs the probe compensation signal.
For the probe compensation procedure, see **section 3.6**.

Functional ground terminal

Connect the ground cable when compensating the probe.
→ **Section 3.6**

Probe power supply terminal (option)

Used to supply power (± 12 V) to a current probe.
For the probe connection procedure, see **section 3.5**.

Cover panels for protecting empty slots

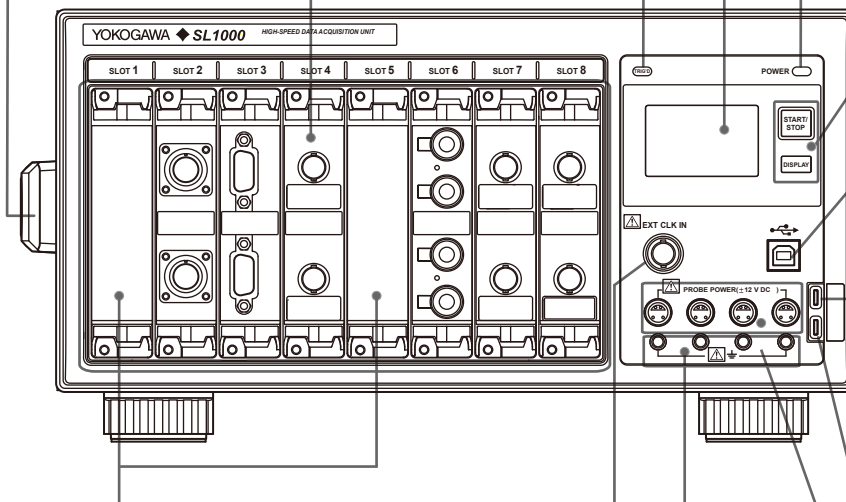
Attached to slots that are not used.

External clock input terminal

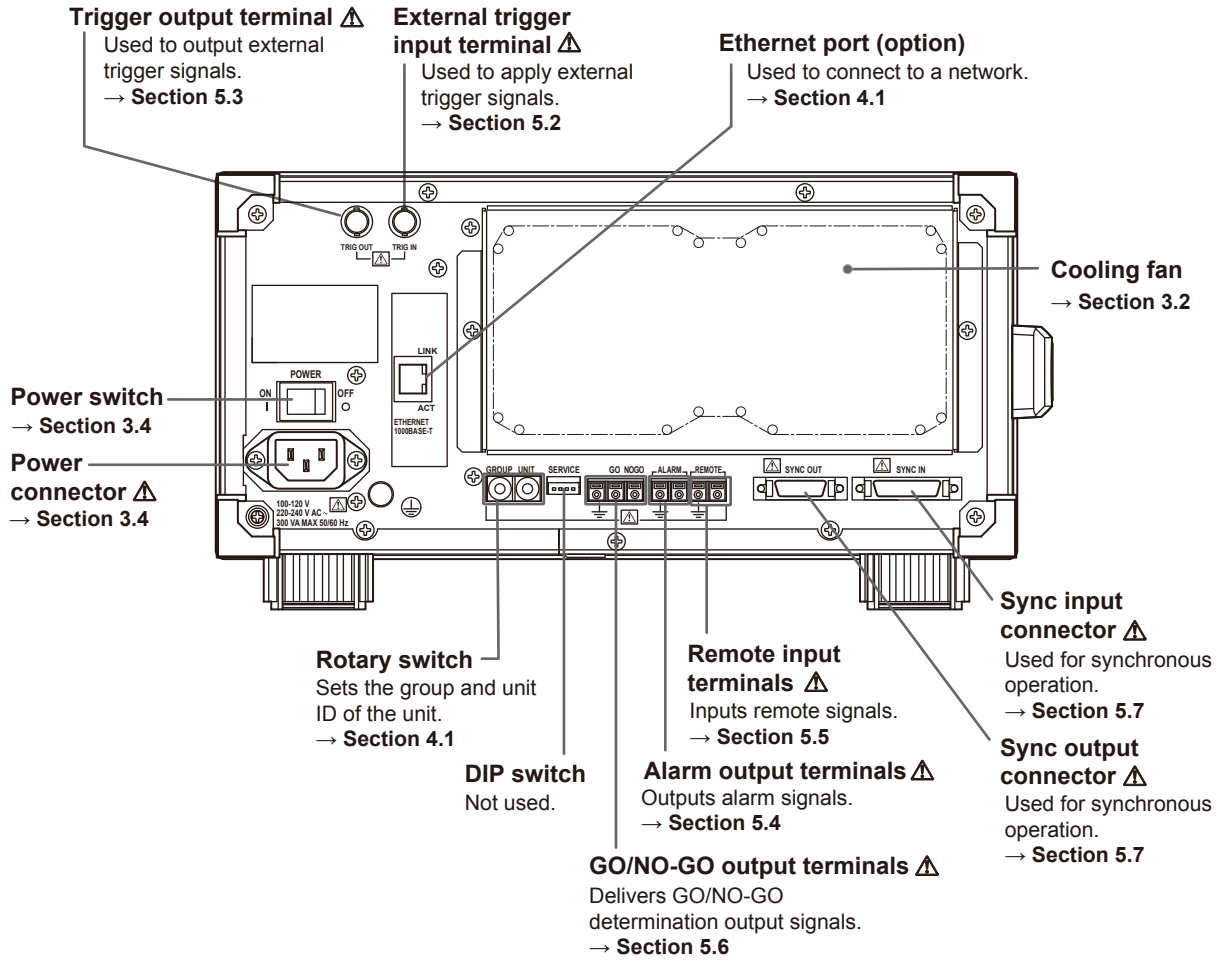
Used to apply an external clock signal.
→ **Section 5.1**

Functional ground terminal

Used to connect the ground line of the high-voltage differential probe or enhance the grounding of the measurement system. For the probe connection procedure, see **section 3.5**.

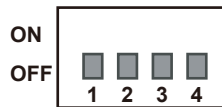


Rear Panel



Note

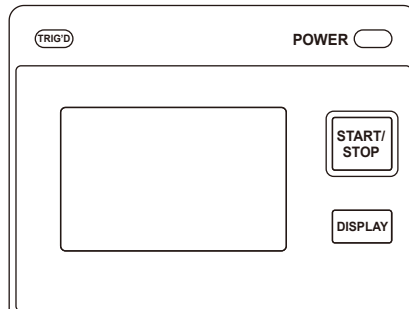
Be sure to use the DIP switch at the factory default setting. If you change the setting, the SL1000 may not operate properly.



Factory default settings

| bit | 1 | 2 | 3 | 4 |
|--------|-----|-----|-----|-----|
| Status | OFF | OFF | OFF | OFF |

1.2 Keys and Indicators



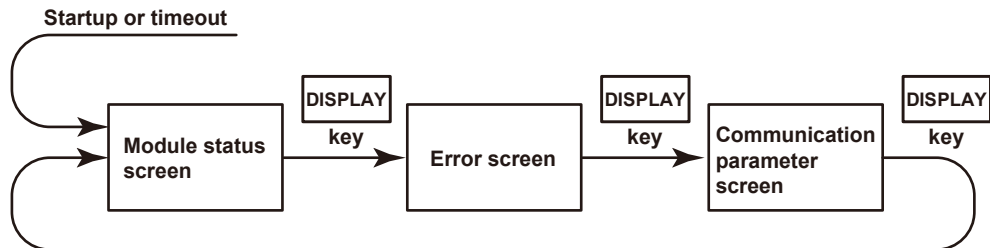
| Name | Function |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| START/STOP key ¹ | Starts or stops the measurement or measurement and recording. ³ The key illuminates while measurement is in progress. ON: Measuring OFF: Stopped |
| DISPLAY key ² | Switches the screen. Module status screen, system error screen, and communication parameter screen |
| POWER indicator | Displays the power status. ON: Power ON OFF: Power OFF |
| TRIG'D indicator | Indicates the trigger status. ON: Trigger activated OFF: Trigger not activated |

- 1 If keys are locked, you cannot operate the keys. Hold down DISPLAY to release key lock.
- 2 You can operate the keys even when the keys are locked.
- 3 Varies depending on the specified measurement conditions.

1.3 Display

Screens

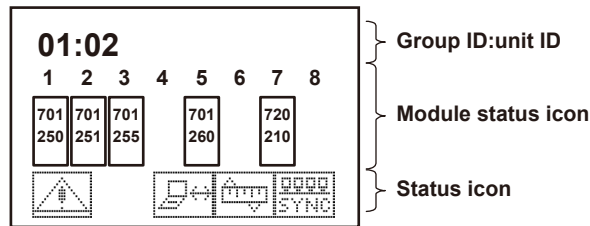
The available SL1000 screens are the module status screen, error screen, and communication parameter screen.



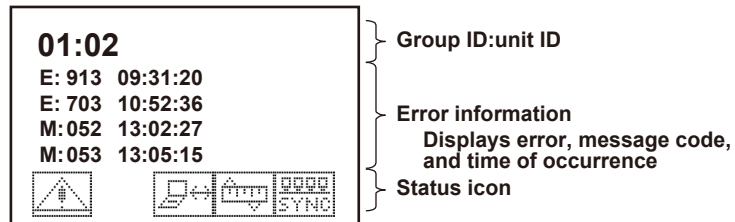
- At startup, the module status screen appears.
- Press DISPLAY to switch screens.
- If there is no key operation for 30 seconds, the screen returns to the module status screen.

Screen Description

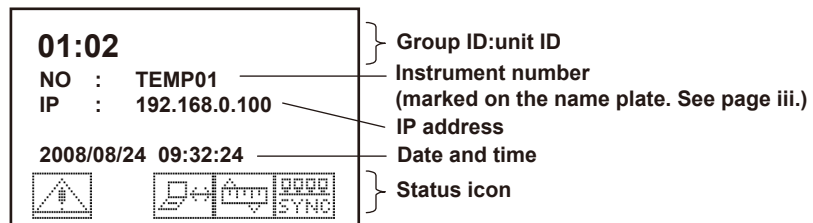
Module status screen



Error screen



Communication parameter screen



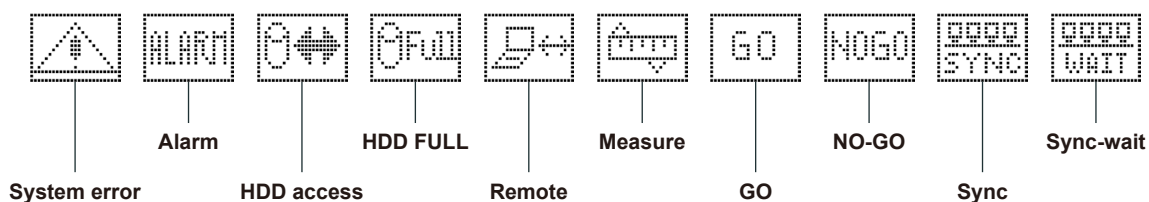
| Displayed Items | Function |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group ID | Displays the group ID of the unit that you have set using the rotary switch (GROUP) on the rear panel. |
| Unit ID | Displays the unit ID that you have set using the rotary switch (UNIT) on the rear panel. |
| Module status icon | Displays the module installation status for each slot using icons. With model display: Indicated module installed No display: No module installed |
| Error information | Displays an error or message code and the time of occurrence An error is indicated with "E:" before the code. A message is indicated with "M:" before the code. The time of occurrence is expressed in hour:minute:second (hh:mm:ss). Displays the most recent four errors. For details on errors and messages, see section 6.2. |
| Instrument No. | Displays the SL1000 unit's instrument number. |
| IP address | Displays the IP address setting of the SL1000. |
| Date and time | Displays the SL1000 unit's date and time. YYYY/MM/DD hh:mm:ss |
| Status icon | Indicates the SL1000 status using icons. <ul style="list-style-type: none"> • System error icon ON: System error status¹ OFF: Normal system status • Alarm icon ON: Channel alarm occurring OFF: Channel alarm not occurring • HDD access icon Blinking: Internal hard disk in access OFF: Internal hard disk not in access • HDD FULL icon ON: No free space on the internal hard disk OFF: Free space available on the internal hard disk • Remote icon ON: Remote mode OFF: Local mode • Measure icon ON: Measuring OFF: Stopped • GO icon ON: Delivering GO output OFF: Not delivering GO output • NO-GO icon ON: Delivering NO-GO output OFF: Not delivering NO-GO output • Sync icon ON: Synchronous operation state² A state in which synchronization has been established between SL1000 units after starting synchronous operation in the Acquisition Software's system configuration. OFF: Independent operation state • Sync-wait icon ON: Sync wait state^{2,3} A state in which the sync cable has been disconnected during synchronous operation or when the power switch has been turned off and turned back on during synchronous operation. OFF: Independent operation state |

1 HDD full, buffer overrun, fan stop, or sync error.

2 Displayed on all units in the group.

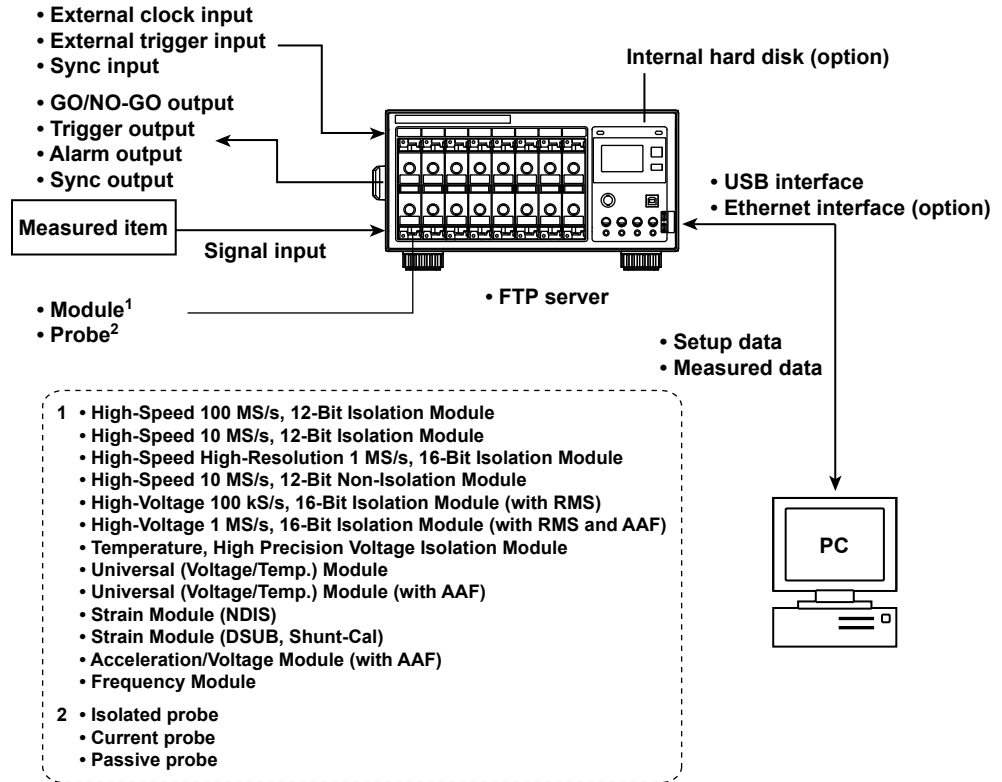
3 To switch from the sync-wait state to the sync state, start synchronous operation in the Acquisition Software's system configuration.

Status icon

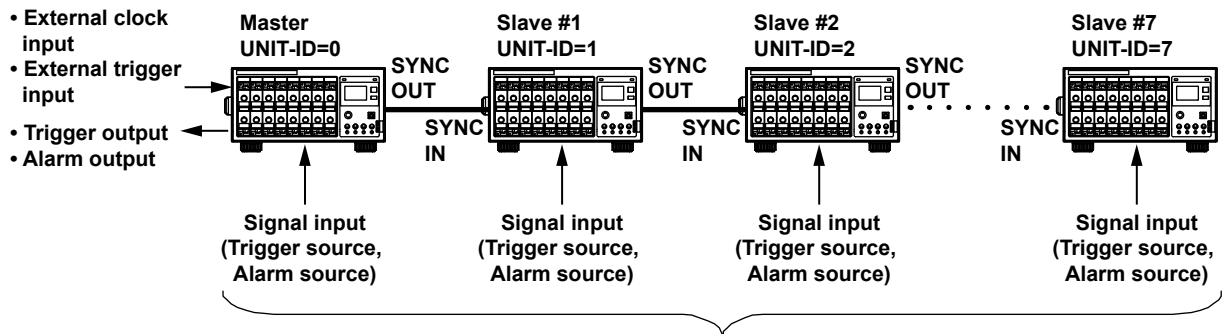


2.1 System Configuration and Block Diagram

System Configuration



Synchronous Operation



Trigger sources and alarm sources can be combined between units (using AND or OR logic).

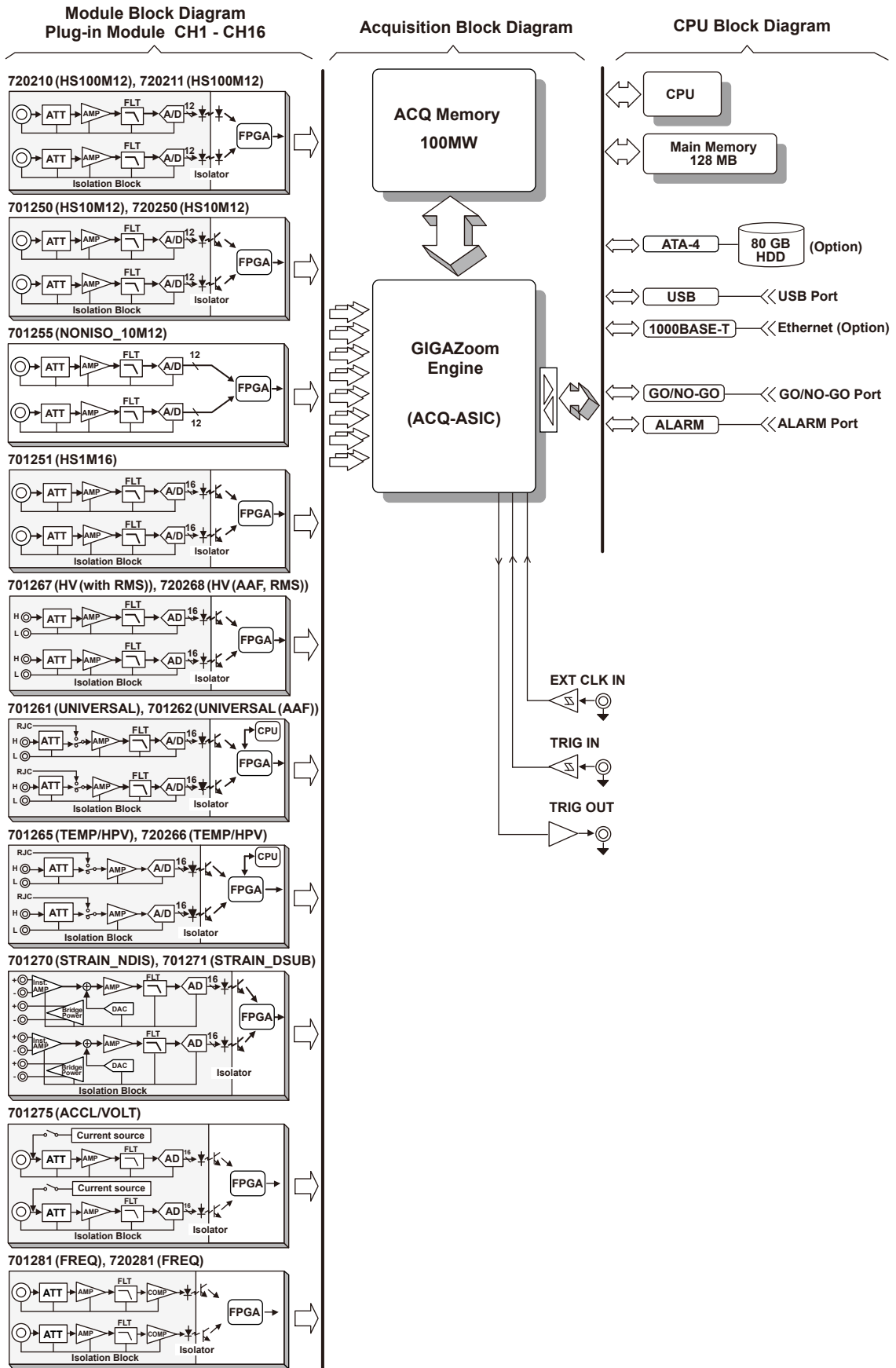
During synchronous operation, the master unit's GO/NO-GO output is invalid. The slave units' external clock input, external trigger input, trigger output, alarm output, and GO/NO-GO output are invalid.

The external clock input and external trigger input synchronize with the signals from the master unit.

Trigger sources and alarm sources are combined using AND or OR logic between units, and are transmitted from the master unit's trigger output and alarm output.

2.1 System Configuration and Block Diagram

Block Diagram



Signal Flow on the SL1000

The flow of the signal applied to the input terminal varies depending on the input module. Here, the High-Speed 100 MS/s, 12-Bit Isolation Module (720210 (HS100M12)) will be used as an example to describe the signal flow. (For details on the signal flow on each module, see the block diagram.)

The signals applied to the two input terminals are first processed by the input section of each module.

The 720210 (HS100M12) attenuates or amplifies the input signal using the attenuator (ATT) and amplifier (AMP) to normalize it to a voltage level that the A/D converter can process.

Then, the filter (FLT) limits the bandwidth, and the A/D converter samples the input signal at 100 MS/s and converts the samples into digital data through quantization.

The digital data passes through the isolator and ASIC and enters the waveform processing ASIC (ACQ-ASIC).

The 16-channel digital data collected at the ACQ board passes through the waveform processing ASIC (ACQ-ASIC) and are stored in the acquisition memory (ACQ Memory). The digital data stored in the ACQ Memory is compressed by the high-speed waveform processing ASIC (ACQ-ASIC) and is transferred to a PC as waveform display data at a high data rate via the USB or Ethernet interface. If data is recorded to the hard disk in real time, the digital data stored in the ACQ Memory is transferred to the internal hard disk using a high-speed internal bus separately from the waveform display data. At the same time, the data is also transferred to a PC via the USB or Ethernet interface and stored to the PC internal hard disk.

2.2 Input Modules

The SL1000 supports the following input modules.

| MODEL | Name | Abbreviation |
|--------------|------------------------------------------------------------------|---------------------|
| 720210 | High-Speed 100 MS/s, 12-Bit Isolation Module | HS100M12 |
| 720211 | High-Speed 100 MS/s, 12-Bit Isolation Module | HS100M12 |
| 701250 | High-Speed 10 MS/s, 12-Bit Isolation Module | HS10M12 |
| 720250 | High-Speed 10 MS/s, 12-Bit Isolation Module | HS10M12 |
| 701251 | High-Speed 1 MS/s, 16-Bit Isolation Module | HS1M16 |
| 701255 | High-Speed 10 MS/s, 12-Bit Non-Isolation Module | NONISO_10M12 |
| 701267 | High-Voltage 100 kS/s, 16-Bit Isolation Module (with RMS) | HV (with RMS) |
| 720268 | High-Voltage 1 MS/s, 16-Bit Isolation Module (with AAF, RMS) | HV (AAF, RMS) |
| 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 |
| 701270 | Strain Module (NDIS) | STRAIN_NDIS |
| 701271 | Strain Module (DSUB, Shunt-Cal) | STRAIN_DSUB |
| 701275 | Acceleration/Voltage Module (with AAF) | ACCL/VOLT |
| 701281 | Frequency Module | FREQ |
| 720281 | Frequency Module | FREQ |

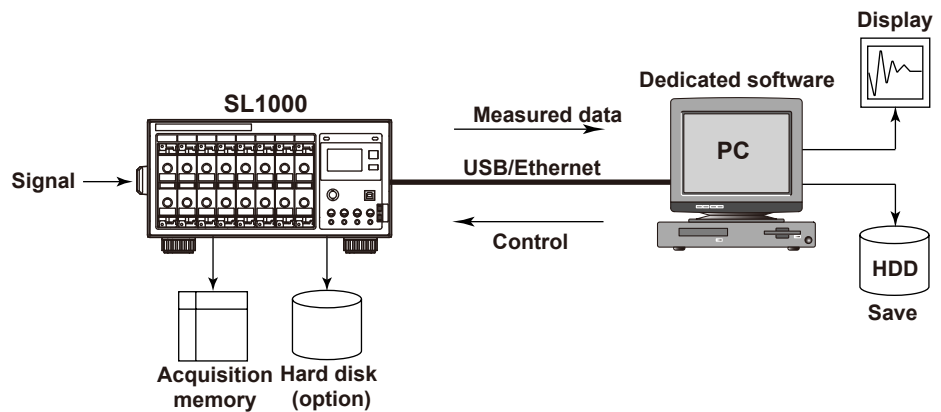
2.3 Operating Configuration

Online Operation

In this configuration, you connect the SL1000 to a PC via the USB or Ethernet (option) interface and use a dedicated software program to specify measurement conditions and carry out measurements.¹

You use a dedicated software program to start or stop measurements. The SL1000 measures and holds the data in its acquisition memory, and the PC reads it. The software shows the data on the PC display and saves it to the hard disk. The data can also be saved to the SL1000 internal hard disk (option) by configuring the settings.² If you lock the SL1000 keys using the software during online operation, the SL1000 enters Remote mode, which prohibits the SL1000 to be controlled from the front panel. You can use the dedicated software program to display and analyze the data saved to the PC.

For the operating procedures in online operation, see the *Acquisition Software User's Manual IM720120-61E*. For the procedure to display and analyze the saved data, see the *Xviewer User's Manual IM 701992-01E*.

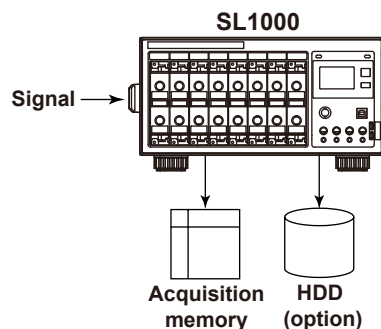


- 1 Specifying and controlling measurement conditions: Acquisition Software
Displaying and analyzing saved data: Xviewer
- 2 Waveform data, waveform parameters, and setup data can be saved to the internal hard disk.

Standalone Operation

In this configuration, you make measurements on the SL1000 without connecting it to a PC.

You start or stop measurements using the START/STOP key on the SL1000 front panel. The measured data can be stored to the SL1000 acquisition memory or saved to the internal hard disk (option). If you turn the SL1000 power OFF, the measured data stored in the acquisition memory will be lost.



2.3 Operating Configuration

Note

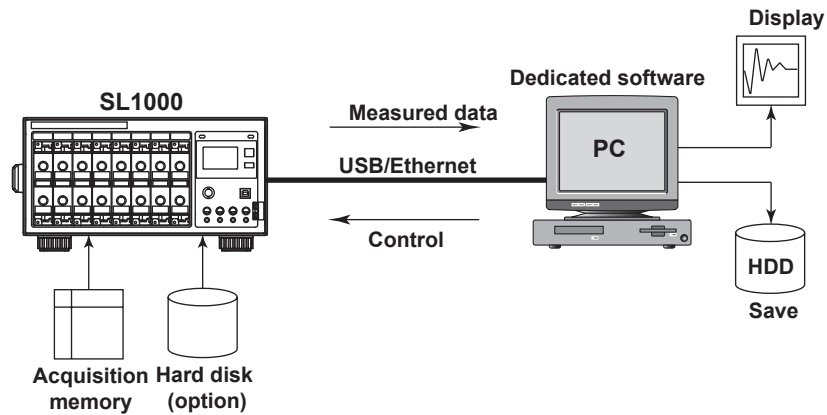
You cannot specify measurement conditions directly on the SL1000. To make measurements in the standalone configuration, specify the SL1000 measurement conditions online in advance.

In standalone configuration, you can connect the SL1000 to a PC via the USB or Ethernet (option) interface after measurements are complete and read the measured data on a PC.

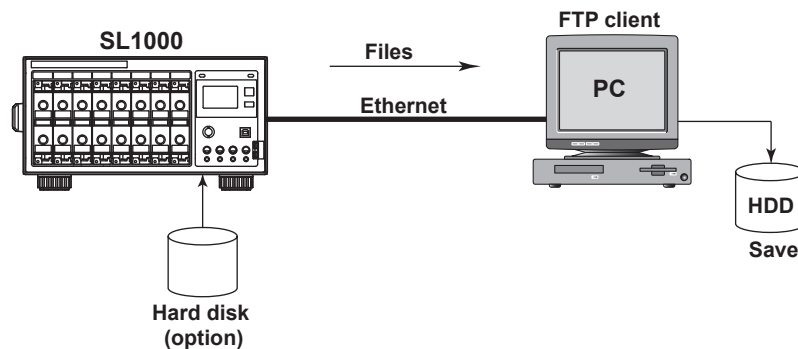
You can use the dedicated software program or an FTP connection to read the data. For the procedure to read the data using the dedicated software program and the procedure to configure an FTP server, see the *Acquisition Software User's Manual IM720120-61E*.

| Method | Connection | SL1000 Readout Destination |
|--------------------|-----------------|---------------------------------|
| Dedicated software | USB or Ethernet | Acquisition memory or hard disk |
| FTP connection | Ethernet | Hard disk |

Dedicated Software



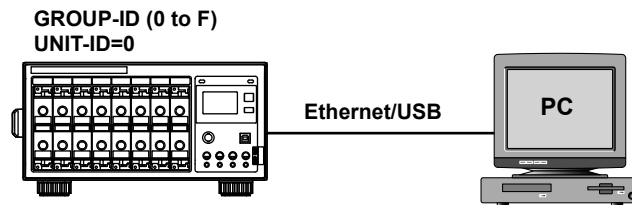
FTP Connection



2.4 Independent Operation and Synchronous Operation

Independent Operation

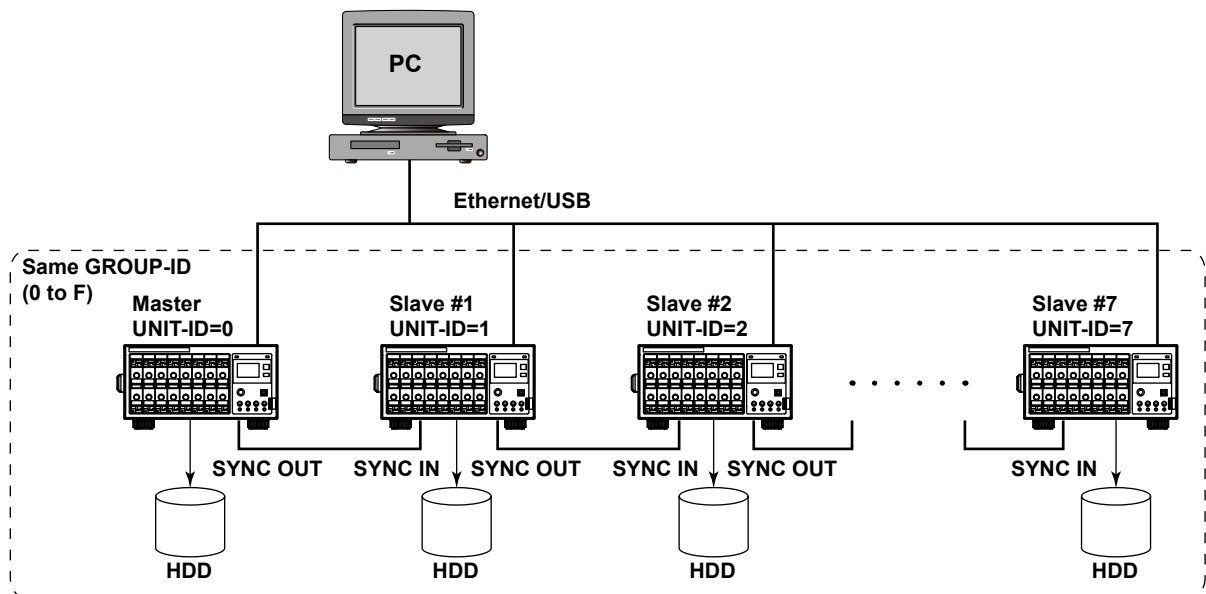
Independent operation refers to making measurements on a single SL1000.



- During independent operation, set the group ID to a value from 0 to F and the unit ID to 0. For the setup procedure, see section 4.1.
- Independent operation can be used in online or standalone mode. However, to measure in standalone mode, configure the SL1000 system and measurement conditions in online mode beforehand.

Synchronous Operation

Synchronous operation refers to synchronizing up to eight SL1000s for taking measurements.



- During synchronous operation, there are limitations on the input and output terminals that can be used on the master and slave units. For details, see section 2.1.
- Keep the total length of sync cables to 10 m or less. Otherwise, the SL1000s may not operate properly.
- For the procedure to connect sync I/O connectors using sync cables, see section 5.7.
- To perform synchronous operation, set the master and slave units to the same group ID (from 0 to F). Set the master unit's unit ID to 0, and slave units' unit IDs in ascending order from 1 to 7. For details, see section 4.1.
- When the save destination is set to the units' HDD, the recording files are saved to each unit's hard disk.

2.4 Independent Operation and Synchronous Operation

- Synchronous operation can be used in online or standalone mode. However, to measure in standalone mode, configure the SL1000 system and measurement conditions in online mode beforehand.
- For the synchronous operation procedure and notes about using the Acquisition Software, see the *Acquisition Software User's Manual IM720120-61E*.

Synchronized Items

- Measurement and recording start and stop
- Clock
Slave units synchronize to the master unit's external or internal clock.
- Time
- Triggering
The AND or OR logic of the master unit's external trigger input and slave units' trigger sources.
When the SL1000 triggers, the trigger signal is transmitted from the master unit's trigger output.
- Alarms
The AND or OR logic of the slave units' channel alarm conditions or the OR logic of the slave units' system alarm conditions.
When an alarm occurs, an alarm signal is transmitted from the master unit's alarm output.
- Detection of sync cable disconnection and of units powering-off

3.1 Handling Precautions

Safety Precautions

If you are using this instrument for the first time, make sure to thoroughly read “Safety Precautions” on pages viii to x.

Do Not Remove the Case

Do not remove the case from the instrument. Some parts of the instrument use high voltages, which are extremely dangerous. For internal inspection and adjustment, contact your nearest YOKOGAWA dealer.

Unplug If Abnormal Behavior Occurs

If you notice any symptoms of trouble such as unusual odors or smoke coming from the instrument, immediately turn OFF the power switch and unplug the power cord. If these symptoms occur, contact your nearest YOKOGAWA dealer.

Handle the Power Cord with Care

Do not place objects on top of the power cord and keep it away from any heat sources. When unplugging the power cord from the outlet, never pull by the cord itself. Be sure to hold and pull by 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 to the Input Section

Applying shock to the input connectors or probes may turn into electrical noise and enter the instrument via the signal lines.

Do Not Damage the LCD

Because the LCD screen 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

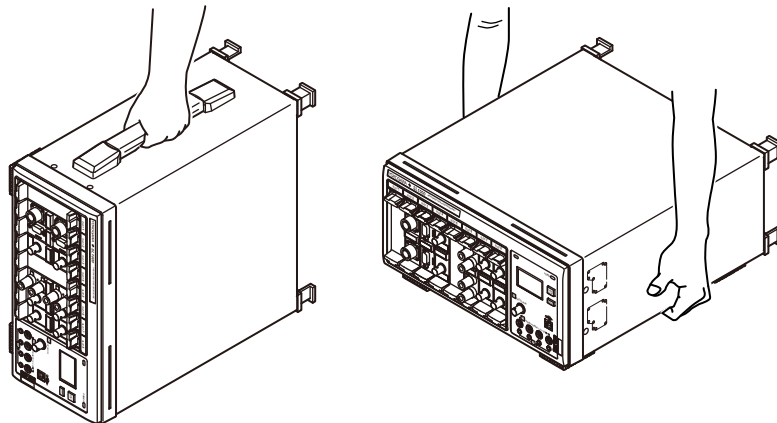
Unplug the power cord from the outlet.

3.1 Handling Precautions

Carry the Instrument Properly

First, remove the power cord and connection cables. The instrument weighs approximately 6 kg without any modules installed and 9 kg when eight modules are installed.

Carry the instrument by the handles as shown below or carry it with both hands.



Cleaning

When cleaning the case or the operation panel, first remove the power cord from the outlet. Then, wipe with a dry, soft, clean cloth. Do not use volatile chemicals such as benzene or thinner for cleaning, as this may lead to discoloration or deformation.

3.2 Installing the Instrument

WARNING

- 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

If you block the inlet or outlet holes on the SL1000, the SL1000 will become hot and may break down.

French

AVERTISSEMENT

- 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

Ne pas boucher les orifices d'entrée ou de sortie du SL1000 pour éviter toute surchauffe et panne éventuelle.

Installation Orientation



WARNING

To prevent fire, never use the instrument with the rear panel facing down. There are vent holes for the cooling fan on the rear panel. Placing the instrument with the rear panel down can cause a fire when the instrument malfunctions.

French

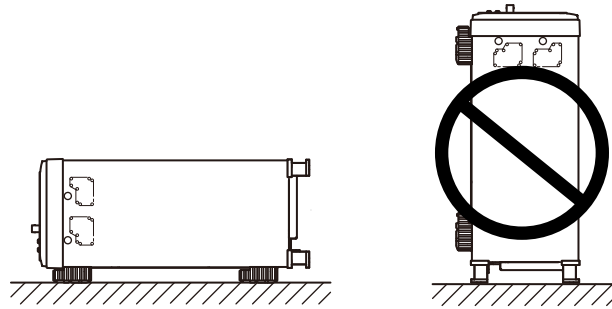


AVERTISSEMENT

Pour éviter tout incendie, n'utilisez jamais l'instrument lorsque le panneau arrière est orienté vers le bas. En effet, le panneau arrière comprend des orifices destinés au ventilateur de refroidissement. S'il est orienté vers le bas, un incendie risque de survenir en cas de dysfonctionnement de l'instrument.

3.2 Installing the Instrument

- Place the instrument in a horizontal position as shown below.
- If you are installing the instrument on a slippery surface, attach the rubber feet (two pieces) to the rear feet on the bottom panel.

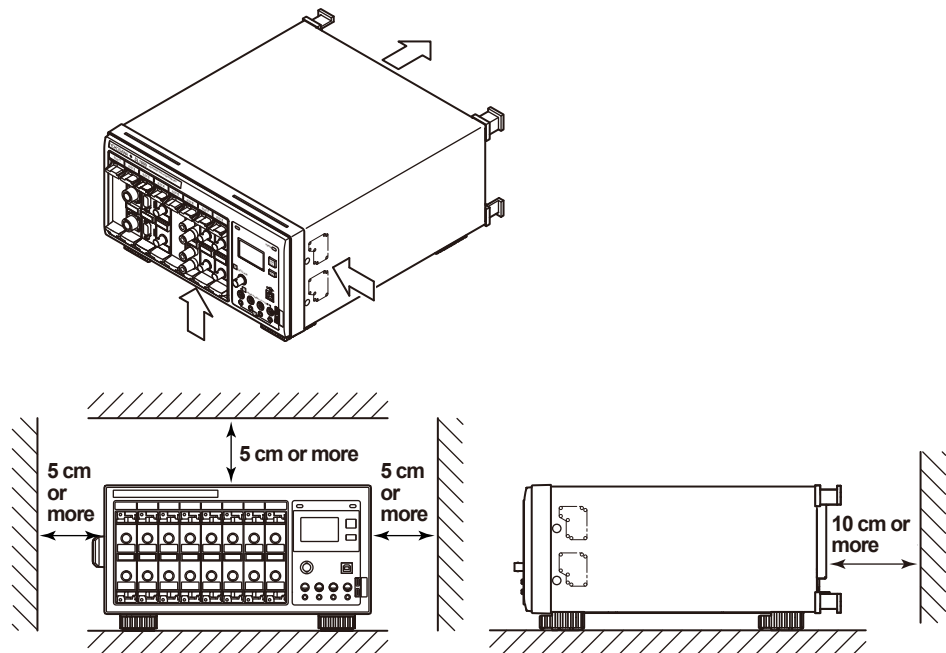


Installation Conditions

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

Well-Ventilated Location

There are vent holds on the right and bottom panels of this instrument. In addition, there are exhaust holes 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 vent and inlet holes.



When you are installing modules or connecting cables, allow extra working space.

Ambient Temperature and Humidity

Use the instrument in the following environment.

- Ambient temperature: 5 to 40°C
- Ambient humidity: 20 to 85%RH, no condensation.

Note

- To ensure high measurement accuracy, operate the instrument in the $23 \pm 5^\circ\text{C}$ temperature range and $55 \pm 10\%$ RH.
- Condensation may occur if the instrument is moved to another place where the ambient temperature is higher, or if the temperature changes rapidly. If condensation occurs, allow the instrument adjust to the ambient temperature 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 magnetic field sources.
- Near high voltage equipment or power lines.
- Where the level of mechanical vibration is high.
- In an unstable location.

Storage Location

- We strongly recommend you store the SL1000 in an environment with a temperature between 5 and 40°C and a relative humidity between 20 to 80%RH.
- When storing the SL1000, avoid the following locations.
- In direct sunlight.
- Where the temperature is 60°C or higher.
- Where the relative humidity is 80% or more.
- Near heat sources.
- Where the level of mechanical vibration is high.
- Where corrosive or explosive gas is present.
- Where an excessive amount of soot, dust, salt, and iron are present.
- Where water, oil, or chemicals may splash.

3.3 Installing Modules



WARNING

- To prevent electric shock and damage to the instrument, make sure to turn OFF the power before installing or removing an input module.
- Check that the input cable is not connected to the input terminals before installing or removing an input module.
- To prevent electric shock and to satisfy the specifications, make sure to put the accessory cover panel on the slots that are not being used. Otherwise, dust may enter the instrument and may cause malfunction due to a rise in the internal temperature.
- If an 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 or 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 vi). 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 input voltage exceeding the maximum input voltage, withstand voltage, or allowable surge voltage.
- To prevent electric shock, be sure to furnish protective earth grounding of the instrument.
- To prevent 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 measure high voltage with the 720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), or 701251 (HS1M16), use the isolated probes (700929, 701947), passive probes 702902, or 1:1 safety cables (combination of 701901 and 701954).
- If you are using the 701255 (NONISO_10M12), be sure to fasten the module screws. Fastening the module screws activates the protection function and the non-isolation function. It is extremely dangerous if you do not fasten the screws. In addition, if you are measuring high voltage above 42 V, be sure to use the passive probe 701940.
- The BNC part of the passive probe 701940 is made of metal. Therefore, use the probe at 42 V or less for isolated inputs (720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 701251 (HS1M16), 701260 (HV (with RMS)), 701275 (ACCL/VOLT), or 701281 (FREQ)) for safety reasons. (Do not connect voltage above 42 V to both the High and Low sides.) For non-isolated inputs (701255 (NONISO_10M12), etc.), fasten the module screws as described before.
- If you are measuring high voltages using the 701267 (HV (with RMS)), or 720268 (HV (AAF, RMS)), use the measurement leads (combination of 758933 and 701954) or 1:1 safety cables (combination of 701904 and 701954).
- The measurement category of 701267 (HV (with RMS)) when used with 758933 measurement leads or 701904 1:1 safety cables, and 701954 alligator clips is 400V-CAT II on the low side and 700V-CAT II on the high side. Be careful because the overvoltage tolerance between the low and high sides is different.
- To measure high voltage with the 701281 (FREQ), use an isolated probe (700929, 701947), or passive probe 702902.

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 tout risque de choc électrique et respecter les spécifications, penser à recouvrir les slots qui ne sont pas utilisés à l'aide du cache de recouvrement prévu à cet effet. L'utilisation de l'instrument sans le cache de recouvrement favorise l'introduction de poussière dans l'instrument et peut entraîner un dysfonctionnement due à une température excessive à l'intérieur de l'instrument.
- 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 vi). 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 dépasser les valeurs maximales de tension d'entrée, de tension de maintien ou de surtension admissible.
- 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.
- Pour mesurer la tension élevée avec 720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12) ou 701251 (HS1M16), utiliser une sonde isolée (700929 ou 701947), des sondes passives 702902 ou des câbles de sécurité 1:1 (combinaison de 701901 et 701954).
- 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. La situation est extrêmement dangereuse lorsque les vis ne sont pas serrées. Lorsque vous mesurez des hautes tensions supérieures à 42 V, veillez également à utiliser la sonde passive 701940.
- La partie BNC de la sonde passive 701940 est composée de métal. Utiliser, par conséquent, la sonde à 42 V ou moins pour les entrées isolées (720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 701260 (HV (avec RMS)), 701275 (ACCL/VOLT) ou 701281 (FREQ)) pour des raisons de sécurité. (Ne pas utiliser une tension supérieure à 42 V à la fois en haut et en bas.) Pour les entrées non-isolées (701255 (NONISO_10M12) etc.), serrer les vis du module comme décrit précédemment.
- Lorsque vous appliquez de hautes tensions au 701267 (HV (avec RMS)) ou 720268 (HV (AAF, RMS)), utilisez un cordon de mesure (758933 et 701954 conjointement) ou un câble de sécurité 1:1 (701904 et 701954 conjointement).
- La catégorie de mesure du 701267 (HV (avec RMS)) est 400 V-CAT II dans la partie basse et 700V-CAT II dans la partie haute. Faites attention car la tolérance de surtension diffère entre les côtés bas et haut.
- Pour mesurer la tension élevée avec 701281 (FREQ) ou 720281(FREQ), utiliser une sonde isolée (700929 ou 701947) ou une sonde passive 702902.

Types of Input Modules

The following types of input modules are available.

| Name | Model |
|-----------------------------------------------------------------------|--------------------------|
| High-Speed 100 MS/s, 12-Bit Isolation Module* | 720210 (HS100M12) |
| High-Speed 100 MS/s, 12-Bit Isolation Module | 720211 (HS100M12) |
| High-Speed 10 MS/s, 12-Bit Isolation Module* | 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) |
| High-Speed 10 MS/s, 12-Bit Non-Isolation Module | 701255 (NONISO_10M12) |
| High-Voltage 100 kS/s, 16-Bit Isolation Module (with RMS)* | 701267 (HV (with RMS)) |
| High-Voltage 1 MS/s, 16-Bit Isolation Module (with AAF, RMS) | 720268 (HV (AAF, RMS)) |
| 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 type) | 720266 (TEMP/HPV) |
| Strain Module (NDIS) | 701270 (STRAIN_NDIS) |
| Strain Module (DSUB, Shunt-Cal) | 701271 (STRAIN_DSUB) |
| Acceleration/Voltage Module (with AAF) | 701275 (ACCL/VOLT) |
| Frequency Module* | 701281 (FREQ) |
| Frequency Module | 720281 (FREQ) |

For details on the standard compliance of each module, see section 7.7.

* Discontinued.

Precautions to Be Taken When Installing or Removing Input Modules

Switching the installed input module with a different module and turning ON the power initializes the settings on that channel. If you want to save the settings, use the SL1000 Acquisition Software to specify the save destination medium and save the settings. For details, see section 8.2 in the *Acquisition Software User's Manual IM720120-61E*.



CAUTION

Insert or remove an input module along the guide straight and slowly. Inserting or removing a module at an angle can cause failure and damage.

French

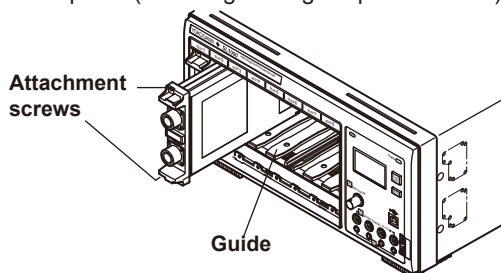


ATTENTION

Insérer ou retirer tout droit et lentement un module d'entrée le long du guidage. Le fait d'insérer ou de retirer un module de manière inclinée risque de causer une défaillance et des dégâts.

Installation Procedure of Modules

1. Check that the power switch on the rear panel of the instrument is OFF.
2. Check the slot number indicated above the slots for installing the input modules on the front panel of the instrument. Then, install the module along the guide. Holding the handles on the top and bottom of the input module, press firmly 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. Make sure to screw the two locations, top and bottom, of the input module firmly into place (screw tightening torque: 60 N•cm).



Removal Procedure of Modules

1. Check that the power switch is OFF.
2. Loosen the two screws holding the input module in place.
3. Holding the handles on the top and bottom of the input module, pull out the module.

About the High-Speed 100 MS/s, 12-Bit Isolation Module

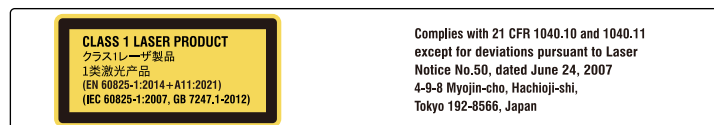
Safety Precautions for Laser Products

The High-Speed 100 MS/s, 12-Bit Isolation Module (720210 (HS100M12) and 720211 (HS100M12)) has a laser light source on the inside. The 720210 (HS100M12) and 720211 (HS100M12) are a Class 1 laser product as defined by IEC/EN60825-1 Safety of Laser Products-Part 1: Equipment Classification, Requirements and User's Guide.

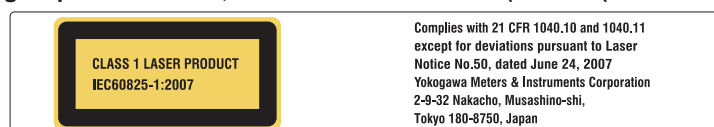
In addition, this instrument complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

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.

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



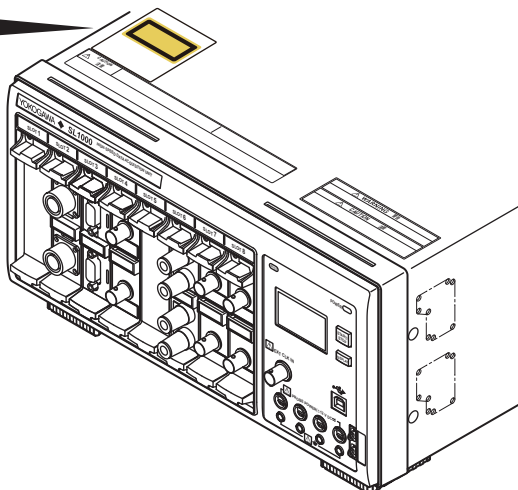
High-Speed 100 MS/s, 12-Bit Isolation Module (720210 (HS100M12))



The above label is affixed to the 720210, but it complies with EN 60825-1:2014+A11:2021.

3.3 Installing Modules

SL1000



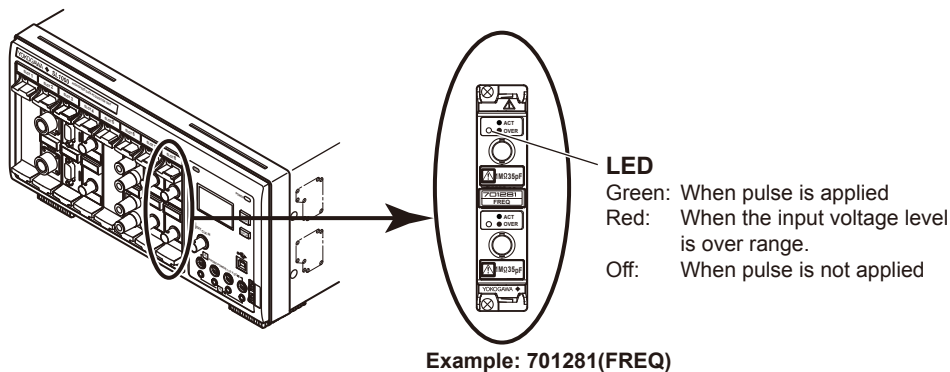
Laser Specifications

- Center wavelength: 850 nm
- PULSE width: ≤ 10 ms (100 MHz), ≤ 2.5 ns (2 GHz)
- Output: ≤ 1 mW

If you use the instrument in a manner not specified in this manual, the protection provided by the instrument may be impaired. Yokogawa Electric Corporation assumes no liability for the customer's failure to comply with these requirements.

LEDs on the Frequency Module

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



Note

- The LEDs on the frequency module illuminate 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 the waveform acquisition of the SL1000.
- If the frequency module preset (see the *Acquisition Software User's Manual IM720120-61E*) is set to "EM Pickup (electromagnetic pickup)," the LED does not illuminate in red even if the input voltage level is over range.

3.4 Connecting the Power Supply

Before Connecting the Power Supply

Make sure that you observe the following points before connecting the power. Failure to do so may cause electric shock or damage to the instrument.



WARNING

- Make sure that the power supply voltage matches the instrument's rated supply voltage and that it does not exceed the maximum voltage range of the power cord to use.
- Make sure that the power switch of the instrument is turned OFF before connecting the power cord.
- To prevent electric shock or fire, use the power cord for the instrument.
- Make sure to connect protective earth grounding to prevent electric shock. Connect the power cord to a three-prong power outlet with a protective earth terminal.
- Do not use an extension cord without protective earth ground. The protective features of the instrument will be rendered ineffective.
- 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.
- Relier l'instrument à la terre pour éviter tout risque de choc électrique. 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.

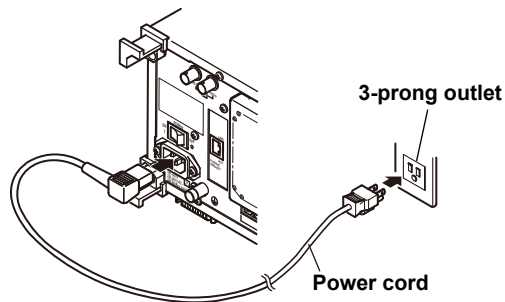
3.4 Connecting the Power Supply

Connecting the Power Cord

1. Check that the power switch on the rear panel is OFF.
2. Connect the power cord plug to the power connector on the rear panel.
3. Connect the plug on the other end of the power cord to the outlet that meets the conditions below. The AC outlet must be of a three-prong type with a protective earth ground terminal.

| Item | |
|----------------------------------------|-----------------------------------------------------------|
| Rated supply voltage* | 100 to 120 VAC or 220 to 240 VAC (automatic switching) |
| Permitted supply voltage range | 90 to 132 VAC, 198 to 264 VAC |
| Rated power supply frequency | 50/60 Hz |
| Permitted power supply frequency range | 48 to 63 Hz |
| Maximum power consumption | Approx. 300 VA |

* The instrument can use a 100-V or a 200-V system for the power supply. The maximum rated voltage of the power cord varies depending on its type. 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.



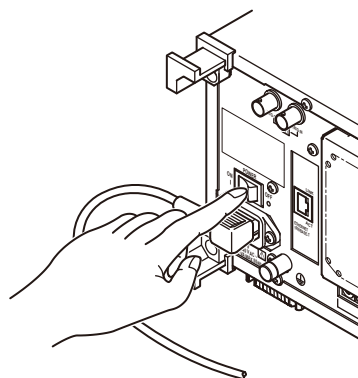
Turn ON the Power Switch

Items to Be Checked before Turning ON the Power

- Check that the instrument is properly installed. For details, see section 3.2, "Installing the Instrument."
- Check that the power cord is properly connected. For details, see the previous page.

Turn ON the Power Switch

1. Press the ON (I) side of the power switch on the rear panel.



Turning OFF the Power Switch

CAUTION

If you suddenly turn OFF the power switch or remove the power cord while data is being saved, the save destination medium (internal hard disk) may break. The contents of the data being saved may also be corrupt. Be sure to turn OFF the power switch after the data save operation is complete.

French

ATTENTION

Si l'alimentation est coupée de manière brutale ou que le cordon d'alimentation est retiré alors que les données sont en cours d'enregistrement, le support de destination de l'enregistrement (disque dur interne) risque de crasher. Le contenu des données en cours d'enregistrement risque également d'être corrompu. Bien couper l'alimentation une fois l'enregistrement de données terminé

Turning OFF the Power Switch

1. Press the OFF (O) side of the power switch on the rear panel.

Power Up Operation

Self-test and calibration start automatically when the power switch is turned ON. This procedure takes approximately 30 seconds. If the procedure completes successfully, the module status display appears. Check that the SL1000 has started normally before you use it.

If the SL1000 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.
- Check that the correct voltage is coming to the power outlet. (See the previous page.)

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

Note

Allow at least 10 seconds after you turn the power switch OFF to turn it back ON.

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 the *Acquisition Software User's Manual IM720120-61E*). If auto calibration is turned ON, the calibration starts automatically at the start of waveform acquisition.

Power Down Operation

The settings that exist immediately before the power switch is turned OFF are saved. The instrument powers up using those settings the next time the power switch is turned ON.

Note

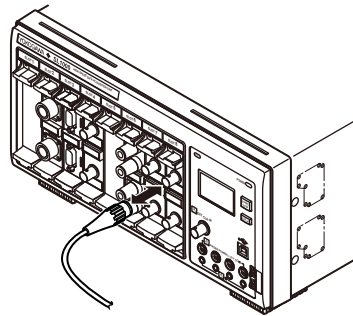
The settings are stored using an internal lithium battery. The battery lasts for approximately 5 years if it is used at an ambient temperature of 23°C. The user cannot replace the battery. Contact your nearest YOKOGAWA dealer to have the battery replaced.

3.5 Connecting the Probes

Connecting the Probe

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

- High-Speed 100 MS/s, 12-Bit Isolation Module:
720210 (HS100M12) and 720211 (HS100M12)
- High-Speed 10 MS/s, 12-Bit Isolation Module:
701250 (HS10M12) and 720250 (HS10M12)
- High-Speed High-Resolution 1 MS/s, 16-Bit Isolation Module: 701251 (HS1M16)
- 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) and 720281 (FREQ)



WARNING

When connecting an item to be measured to the SL1000, be sure to turn OFF the power to the item. Connecting or disconnecting the measuring lead while the item being measured is turned ON is very dangerous.

Precautions to Be Taken When Using the Modules

- Do not apply input voltage exceeding the maximum input voltage, withstand voltage, or allowable surge voltage.
- To prevent electric shock, be sure to furnish protective earth grounding of the instrument.
- To prevent 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.
- Be careful not to exceed the maximum input voltage of a module in the following cases.
 - When the probe attenuation is 1:1.
 - When the module input coupling is set to AC.
A DC voltage at the same electric potential as the probe input is applied to the module input.
- Use only the specified cables. Using cable that does not comply with the safety standards is extremely dangerous (especially when using high voltages (42 V or higher)).

- To measure high voltage with the 720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), or 701251 (HS1M16), use the isolated probes (700929, 701947), passive probes 702902, or 1:1 safety cables (combination of 701901 and 701954).
- The BNC part of the passive probe 701940 is made of metal. Therefore, use the probe at 42 V or less for isolated inputs (720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 701275 (ACCL/VOLT), or 701281 (FREQ)) for safety reasons. (Do not connect voltage above 42 V to both the High and Low sides.) For non-isolated inputs (701255 (NONISO_10M12), etc.), fasten the module screws.
- To measure high voltage with the 701281 (FREQ) or 720281 (FREQ), use an isolated probe (700929 or 701947) or passive probe 702902.

Maximum Input Voltages and Maximum rated voltage to earths for the Modules

Applying a voltage exceeding the value indicated below may damage the input section. If the frequency is above 1 kHz, the input section may be damaged even if the voltage is less than the indicated values.

• For the 720210 (HS100M12) and 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)
- Safety cable (1:1) (combined with 701901+701954)³
200 V (DC + ACpeak)
- Direct input (cable that does not comply with the safety standards)⁵
42V (DC + ACpeak)

Maximum rated voltage to earth (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)

• For the 701250 (HS10M12) and 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)
- Safety cable (1:1) (combined with 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
42V (DC + ACpeak) (CAT II, 30 Vrms)

Maximum rated voltage to earth (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
Or safety cable (1:1) (combined with 701901+701954)⁴
400 Vrms (Measurement Category Other (O)), 300 Vrms (CAT II)
- Direct input(cable that does not comply with the safety standards)⁶
42 V (DC + ACpeak) (CAT II, 30 Vrms)

3.5 Connecting the Probes

- **For the 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)
- Safety cable (1:1) (combined with 701901+701954)³
140 V (DC + ACpeak)
- Direct input (cable that does not comply with the safety standards)⁵
42V (DC + ACpeak)

Maximum rated voltage to earth (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
Or safety cable (1:1) (combined with 701901+701954)⁴
400 Vrms (Measurement Category Other (O)), 300 Vrms (CAT II)
- Direct input (cable that does not comply with the safety standards)⁶
42V (DC + ACpeak) (CAT II, 30 Vrms)

- **For the 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 dedicated 701940 non-isolated passive probe (10:1).

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

- Combined with the 701940 passive probe (10:1)
600 V (DC + ACpeak)
- Direct input(cable that does not comply with the safety standards)⁵
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)

- **For the 701275 (ACCL/VOLT)**

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

- Combined with the 701940 passive probe (10:1)⁷ or direct input(cable that does not comply with the safety standards)⁵
42 V (DC + ACpeak)

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

- Combined with the 701940 passive probe (10:1)⁸ or direct input (cable that does not comply with the safety standards)⁶
42 V (DC + ACpeak) (CAT II, 30 Vrms)

- **For the 701281 (FREQ) and 720281 (FREQ)**

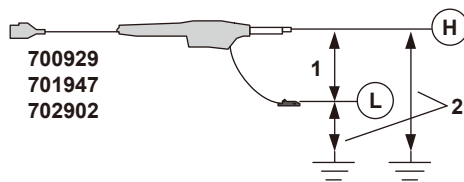
Maximum input voltage (at a frequency of 1 kHz or less)

- 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)

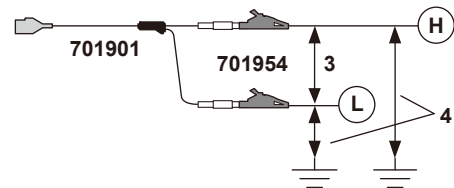
Maximum rated voltage to earth (at a frequency of 1 kHz or less)

- 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) (combined with 701901+701954)⁴ or direct input(cable that does not comply with the safety standards)⁶
42 V (DC + ACpeak) (CAT II, 30 Vrms)

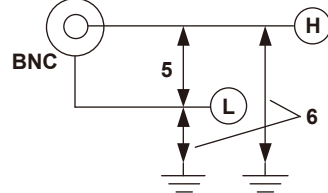
Combined with the 700929, 701947, or 702902



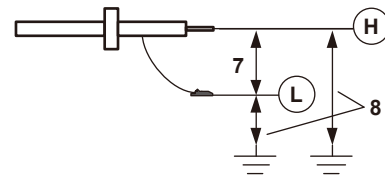
Combined with the 701901+701954



Direct input (cable not complying with the safety standard)



Combined with the 10:1 passive probe (701940)

**Over-Range Indication**

If over-range is indicated on the display of SL1000, the SL1000 may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the measuring range so that the entire amplitude of the waveform is displayed within the waveform display area of the SL1000 Acquisition Software, and check the input voltage level.

Range Out Slot1_L >>

Indicate ">>" when over-range is occurring on multiple channels. Indicates the smallest number among the slot that over-range is occurring on.

Channel

U: Upper channel of the slot

L: Lower channel of the slot

Slot No.

French**AVERTISSEMENT**

Au moment de brancher l'appareil à mesurer sur l'instrument, veiller à ce que l'appareil soit hors tension. Il est extrêmement dangereux de brancher ou de débrancher des câbles 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 de maintien ou de surtension admissible.
- 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.
- Faire attention de ne pas dépasser la tension d'entrée maximale d'un module dans les cas suivants.
 - Si l'atténuation de la sonde est de 1:1.
 - Si le couplage d'entrée du module est paramétré sur le CA.

Une tension CC de même potentiel électrique que l'entrée de sonde s'applique à l'entrée du module.

3.5 Connecting the Probes

- 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).
- Pour mesurer la tension élevée avec 720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12) ou 701251 (HS1M16), utiliser des sondes isolées (700929, 701947), des sondes passives 702902 ou des câbles de sécurité 1:1 (combinaison de 701901 et 701954).
- La partie BNC de la sonde passive 701940 est composée de métal. Utiliser, par conséquent, la sonde à 42 V ou moins pour les entrées isolées (720210 (HS100M12), 720211 (HS100M12), 701250 (HS10M12), 720250 (HS10M12), 701251 (HS1M16), 701260 (HV (avec RMS)), 701275 (ACCL/VOLT), 701281 (FREQ)) ou 720281 (FREQ)) pour des raisons de sécurité. (Ne pas utiliser une tension supérieure à 42 V à la fois en haut et en bas.) Pour les entrées non-isolées (701255 (NONISO_10M12) etc.), serrer les vis du module comme décrit précédemment.
- Pour mesurer la tension élevée avec 701281 (FREQ) ou 720281 (FREQ)), utiliser une sonde isolée (700929 or 701947) ou une sonde passive 702902.

Tensions d'entrée maximales et tension nominale maximale à la terre 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, une tension inférieure à cette valeur pourra tout de même endommager la section d'entrée.

• Pour 720210 (HS100M12) et 720211 (HS100M12)

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

- En cas d'utilisation avec la sonde isolée 700929 (10:1) ou (100:1) 701947 ou la sonde passive 702902 (10:1).¹
1000 V (c.c. + crête c.a.) (CAT II)
- Avec le câble de sécurité (1:1; 701901 et 701954 conjointement)³
200 V (c.c. + crête c.a.)
- Entrée directe (câble non conforme aux normes de sécurité)⁵
42V (c.c. + crête c.a.)

Tension nominale maximale à la terre (à une fréquence 1 kHz ou inférieure)

- Si utilisé avec la sonde isolée 700929 (10:1) ou 701947 (100:1).² Ou si utilisé avec le câble de sécurité (1:1; 701901 et 701954 conjointement).⁴
1000 Vrms (CAT II)
- En combinaison avec une sonde passive (10:1) 702902²
1000 V (c.c. + crête c.a.)
- Entrée directe (câble non conforme aux normes de sécurité)⁶
42 V (c.c. + crête c.a.) (CAT II, 30 Vrms)

• Pour 701250 (HS10M12) et 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) 702902¹
701250: 600 V (c.c. + crête c.a.)
720250: 800 V (c.c. + crête c.a.)
- Câble de sécurité (1:1) (associé à 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 non conforme aux normes de sécurité)⁵
42V (c.c. + crête c.a.) (CAT II, 30 Vrms)

Tension nominale maximale à la terre (à une fréquence 1 kHz ou inférieure)

- En cas d'utilisation avec la sonde isolée 700929 (10:1) ou (100:1) 701947 ou la sonde passive 702902 (10:1)²

Ou si utilisé avec le câble de sécurité (1:1; 701901 et 701954 conjointement).⁴

701250: 400 Vrms (Measurement Category Other (O)), 300 Vrms (CAT II)
720250: 400 Vrms (CAT II)

- Entrée directe (câble non conforme aux normes de sécurité)⁶
42 V (c.c. + crête c.a.) (CAT II, 30 Vrms)

- **Pour 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 (c.c. + crête c.a.)

- Câble de sécurité (1:1) (associé à 701901 + 701954)³

140 V (c.c. + crête c.a.)

- Entrée directe (câble non conforme aux normes de sécurité)⁵

42V (c.c. + crête c.a.)

Tension nominale maximale à la terre (à une fréquence 1 kHz ou inférieure)

- En combinaison avec une sonde isolée (10:1) 700929 ou (100:1) 701947 ou une sonde passive (10:1) 702902²

Ou si utilisé avec le câble de sécurité (1:1; 701901 et 701954 conjointement).⁴

400 Vrms (catégorie de mesure Autre (O)), 300 Vrms (CAT II)

- Entrée directe (câble non conforme aux normes de sécurité)⁶

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

- **Pour 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)

- Associé à la sonde passive 701940 (10:1)

600 V (c.c. + crête c.a.)

- Entrée directe (câble non conforme aux normes de sécurité)⁵

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)

- **Pour 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 (c.c. + crête c.a.)

Tension nominale maximale à la terre (à une fréquence 1 kHz ou inférieure)

- Associé à la sonde passive 701940 (10:1)⁸ ou à l'entrée directe (câble non conforme aux normes de sécurité)⁶

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

3.5 Connecting the Probes

- **Pour 701281 (FREQ) et 720281 (FREQ)**

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

- En cas d'utilisation avec la sonde isolée 700929 (10:1) ou (100:1) 701947 ou la sonde passive 702902 (10:1).¹

420 V (c.c. + crête c.a.)

- Câble de sécurité (1:1) (associé à 701901 + 701954)³ ou entrée directe (câble non conforme aux normes de sécurité)⁵

42 V (c.c. + crête c.a.)

Tension nominale maximale à la terre (à une fréquence 1 kHz ou inférieure)

- En cas d'utilisation avec la sonde isolée 700929 (10:1) ou (100:1) 701947 ou la sonde passive 702902 (10:1).²

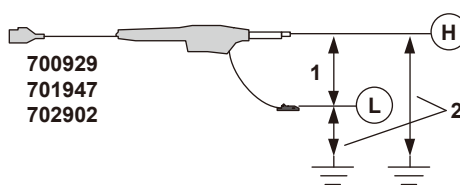
701281: 300 Vrms (CAT II)

720281: 400 Vrms (CAT II)

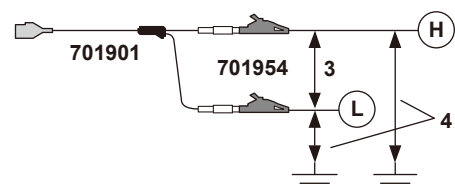
- Câble de sécurité (1:1) (associé à 701901 + 701954)⁴ ou entrée directe (câble non conforme aux normes de sécurité)⁶

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

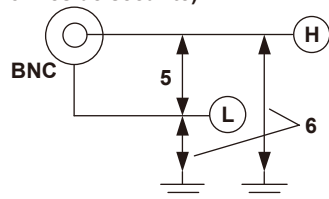
Avec 700929, 701947 ou 702902



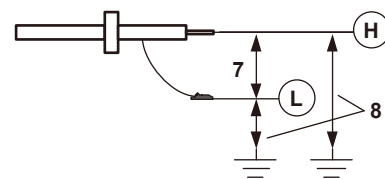
Avec 701901 et 701954



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 indiqué à l'écran du SL1000, ce dernier risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter tout choc électrique, modifiez la plage de mesure afin que l'amplitude totale de la forme d'onde s'affiche dans la zone d'affichage correspondante du logiciel d'acquisition SL1000, et vérifiez la tension d'entrée.

Range Out Slot1_L >>

Indique >> lorsque le dépassement de plage concerne plusieurs canaux.

Indique la valeur la plus faible du logement présentant un dépassement de plage.

Canal

U : canal supérieur du logement

L : canal inférieur du logement

N° de canal

Precautions to Be Taken When Connecting the Cable

- When connecting a probe to the instrument for the first time, perform phase correction of the probe as described in section 3.6, “Compensating the Probe (Phase Correction).” Perform the phase correction for each channel to which a probe is to be connected.
- You cannot perform phase correction of the probe on the frequency module (701281 (FREQ) et 720281 (FREQ)). Perform phase correction of the probe on another module before connecting the probe to the 701281 (FREQ) ou 720281 (FREQ).
- If the object to be measured is connected to the instrument directly, without using a probe, correct measurement cannot be performed due to the input impedance.
- Note that if you use a voltage probe other than an isolated probe (700929 or 701947) or passive probe (702902), correct measurements cannot be displayed when the attenuation is not 1:1, 10:1, 100:1, or 1000:1.

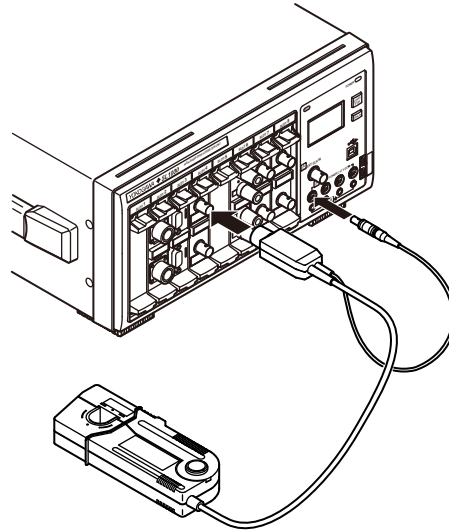
3.5 Connecting the Probes

Connecting a Current Probe

If you are using a YOKOGAWA's current probe*, use the probe power supply (option) on the front panel or a probe power supply sold separately (701934) to supply power to the probe.

* YOKOGAWA current probes: the 701930, 701931, 701932, 701933, 701917, and 701918

For details on the connection procedure, see the manual that comes with each probe.



CAUTION

Use the probe power supply (option) on the front panel of the SL1000 only to supply power to the current probes. Also, be sure to use only the number of probes allowed. Otherwise, the SL1000 or the device connected to the probe power supply terminal may break.

French



ATTENTION

Utiliser l'alimentation de la sonde (option) du panneau frontal de SL1000 uniquement pour alimenter les sondes de courant. De plus, s'assurer que seul le nombre de sondes autorisé est utilisé. Le dispositif SL1000 ou l'appareil relié à la borne d'alimentation de la sonde risquerait sinon de casser.

Precautions to Be Taken When Using the Current Probes

When connecting the current probe to the probe power supply terminal (option) on the front panel, make sure that the current does not exceed the range shown below. Otherwise, the SL1000 operation may become unstable due to the activation of the excessive current protection circuit of the power supply.

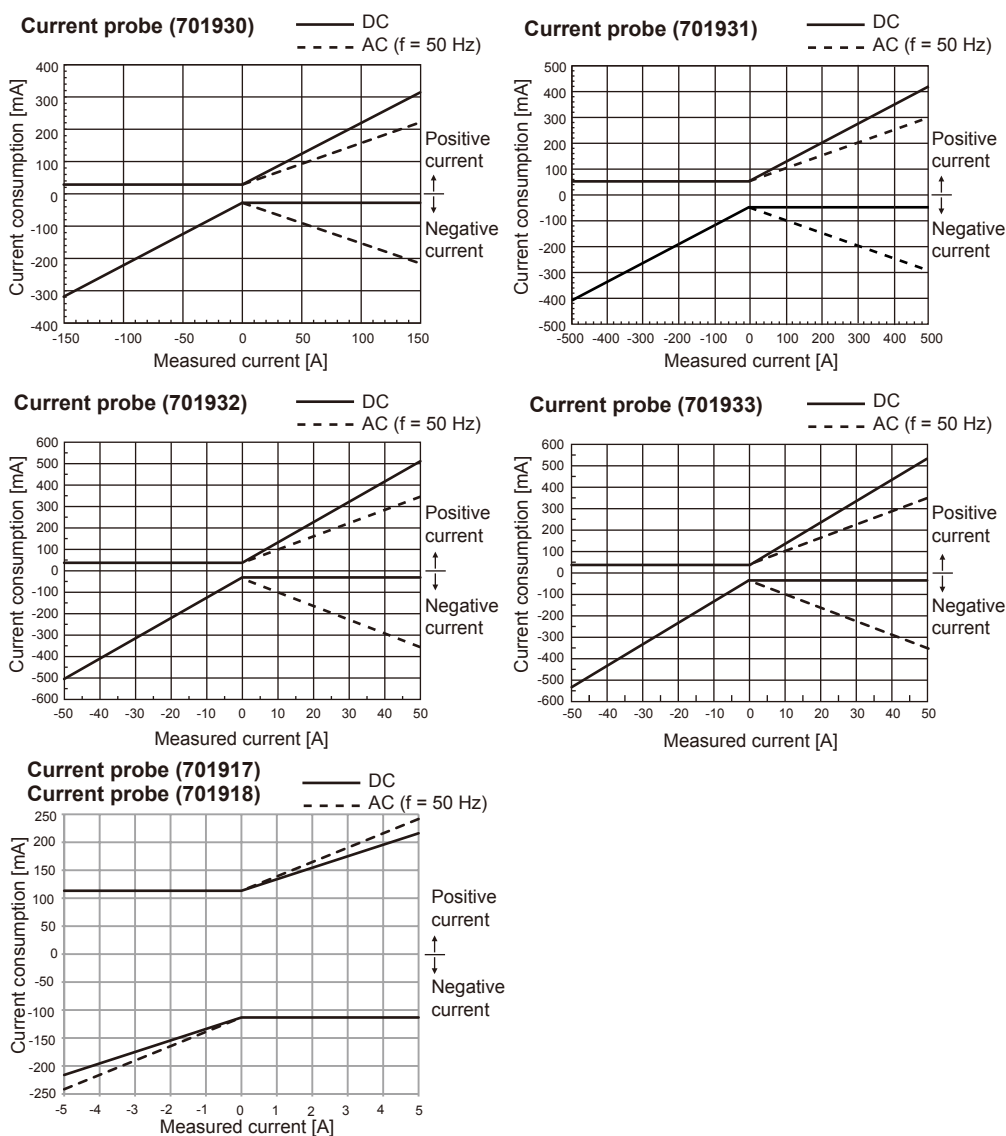


When each terminal is assigned names A through D
(Total current consumption by A through D) < 1300 mA

Specifications of the Probe Power Supply (Option)

| Item | Specifications |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Number of probes that can be used | 4 |
| Compatible probes | Current probe (701930, 701931, 701932, or 701933) |
| Number of current probes that can be used | 701930 (150 A): 3 701931 (500 A): 2 701932 (30 A): 3 701933 (30 A): 3 701917 (5 A): 3 701918 (5 A): 3 |
| Supplied voltage | ±12 V 2 outputs (up to a total of 1300 mA) |

When using current probes, the number of probes that can be used is limited by the current that runs through the device under measurement (current measured by the current probe). The characteristics of the measured current versus the current consumption of a current probe that can be connected to the SL1000 are shown below.

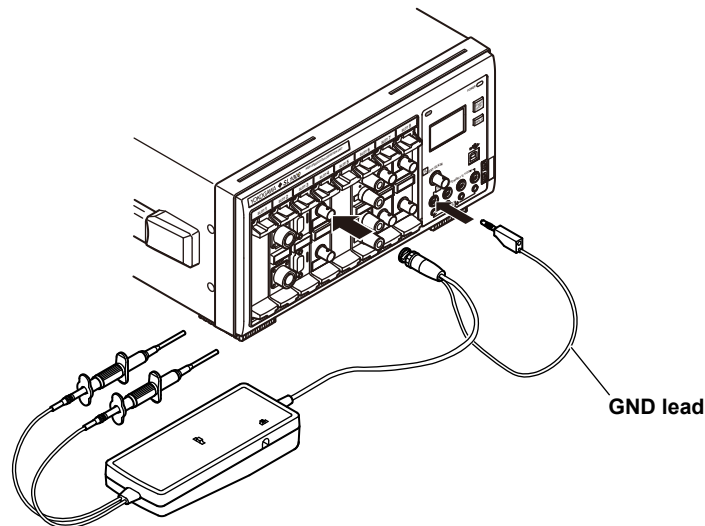


For details about each current probe, contact your nearest YOKOGAWA dealer.

Connecting Differential Probes

When using Yokogawa differential probes (700924, 700925, 701926), connect the BNC output connector to the oscilloscope's input terminal. Also, be sure to connect the GND lead to the functional ground terminal of the DL850E/DL850EV. If necessary, use the auxiliary grounding lead extension.

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 right side panel of the DL850E/DL850EV before connecting to the measurement target. Not doing so may cause high voltage to appear in the BNC connector of the differential probe.

French



AVERTISSEMENT

Utilisation de sondes différentielles haute tension

Bien relier le fil de terre de la sonde différentielle (700924, 700925, 701926) à la borne de mise à la terre opérationnelle, sur le panneau droit de DL850E/DL850EV avant de le relier à la cible de la mesure. 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.

3.6 Compensating the Probe (Phase Correction)

When making measurements using a probe on the following modules, be sure to perform phase correction of the probe first.

- High-Speed 100 MS/s, 12-Bit Isolation Module:
720210 (HS100M12) and 720211 (HS100M12)
- High-Speed 10 MS/s, 12-Bit Isolation Module:
701250 (HS10M12) and 720250 (HS10M12)
- High-Speed High-Resolution 1 MS/s, 16-Bit Isolation Module: 701251 (HS1M16)
- 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) and 720281 (FREQ)



CAUTION

Do not apply external voltage to the probe compensation signal output terminal, as it may damage the internal circuit.

French

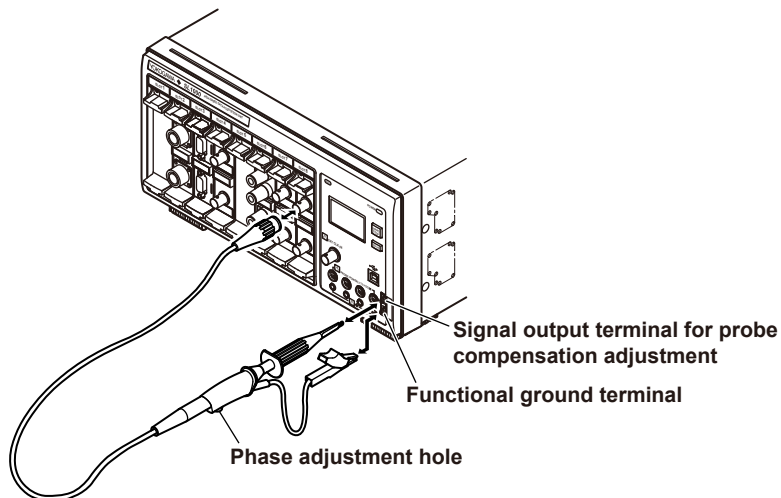


ATTENTION

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.

Procedure

1. Turn ON the power switch.
2. Connect the probe to the input terminal to which the signal is to be applied.
3. Connect the probe's tip to the probe compensation signal output terminal on the front panel and connect the earth wire to the functional earth terminal.
4. Insert a flat-blade screwdriver to the phase correction hole and turn the variable capacitor to make the displayed waveform a correct rectangular wave.



Explanation

Why Phase Correction of the Probe Is Necessary

The probe comes with its phase corrected approximately to match the input capacitance of the relevant measuring instrument. However, there is some error in the input resistance and input capacitance of each input channel of individual measuring instruments. This results in a mismatch in the voltage divider ratio between low and high frequency signals and causes uneven frequency characteristics.

The probe is equipped with a variable capacitor used to adjust the voltage divider ratio (trimmer) for high frequency signals. This trimmer is used to correct the phase so that even frequency characteristics are obtained.

When using a probe for the first time, make sure to perform phase correction.

Because the input capacitance varies on each channel, probe compensation is also required when the probe is switched from one channel to another.

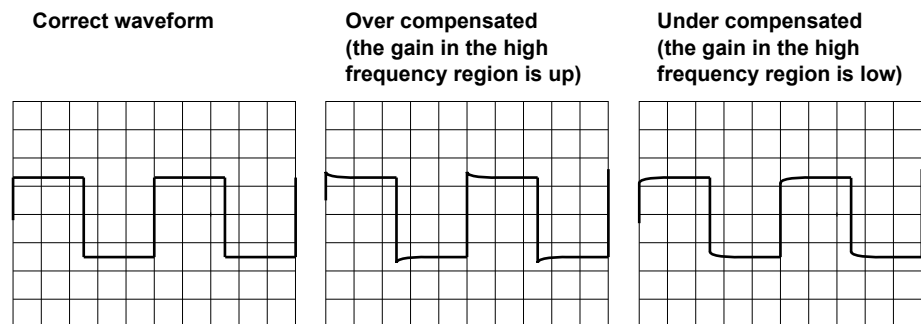
Phase Compensation Signal

The probe compensation signal output terminal delivers the following rectangular wave signal.

Frequency: Approx. 1 kHz

Amplitude: Approx. 1 V

Differences in the Waveform Caused by the Phase Correction of the Probe



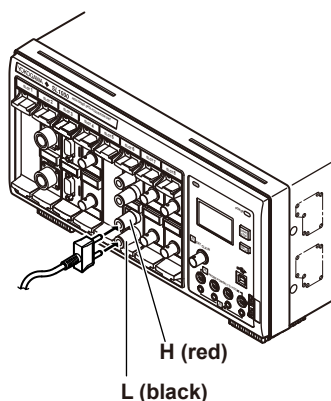
Precautions to Be Taken When Using a Probe on the Frequency Module (701281 (FREQ) and 720281 (FREQ))

You cannot perform phase correction of the probe on the frequency module. Perform phase correction of the probe on another module before connecting the probe to the frequency module for use.

3.7 Connecting Measuring Leads

Connecting Measuring leads

If measuring the voltage on the 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 701267 (HV (with RMS)), 720268 (HV (AAF, RMS)), 701265 (TEMP/HPV), or 720266 (TEMP/HPV), connect the measuring leads of a bipolar banana plug terminal to the input terminal (binding post terminal) as shown below.



WARNING

- When connecting an item to be measured to the SL1000, be sure to turn OFF the power to the item. Connecting or disconnecting the measuring lead while the item being measured is turned ON is very dangerous.
- Do not connect a plug-in type terminal with exposed conducting parts to the input terminal to be used as a measuring lead. It is very dangerous, if the connector comes loose.
- If a measuring lead comes loose from a module's connector, do not touch the measuring lead terminal. Doing so can cause electric shock. If a measuring lead comes loose, turn OFF the device under measurement.

Using the Module

- To prevent electric shock, make sure to use a measuring lead suitable for the voltage range being measured on the input terminals of the 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 701265 (TEMP/HPV) or 720266 (TEMP/HPV).
- If you are measuring high voltages using the 701267 (HV (with RMS)) or 720268 (HV (AAF, RMS)), use a measurement lead (combination of 758933 and 701954) or 1:1 safety cables (combination of 701904 and 701954).

Maximum Input Voltage and Maximum rated voltage to earth

Applying a voltage exceeding the value indicated below may damage the input section. If the frequency is above 1 kHz, the input section may be damaged even if the voltage is less than the indicated values.

• For the 701261, 701262, 701265 and 720266

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

42 V (DC + AC_{peak})

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

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

3.7 Connecting Measuring Leads

- **For the 701267 (HV (with RMS)) and 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
850 V (DC + ACpeak)
- Direct input (cable that does not comply with the safety standards)⁶
42 V (DC + ACpeak)

Maximum rated voltage to earth (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
(Use caution because the overvoltage tolerance of 701267 differs between the low and high sides.)

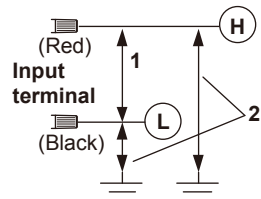
701267: 700 Vrms (CAT II) on the H side,⁴ 400 Vrms (CAT II)⁵ on the L side

720268: 1000 Vrms (CAT II)^{4, 5}, 600 Vrms(CATIII)^{4, 5}

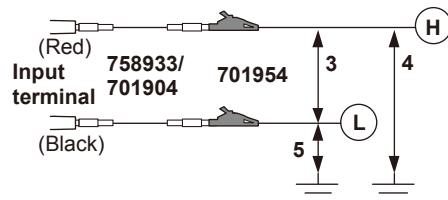
- Direct input (cable that does not comply with the safety standards)⁷
42 V (DC + ACpeak) (CAT II, 30 Vrms)

- The measurement category of the 701267 (HV (with RMS)) is 400V-CAT II for the low side and 700V-CAT II for the high side. Use caution because the overvoltage tolerance differs between the low and high sides.

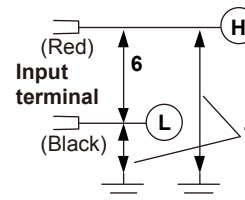
For the 701261, 701262, 701265, and 720266



For the 701267 and 720268
Combined with the 758933+701954 or 701904+701954



Direct input (cable not complying with the safety standard)



Over-Range Indication

If over-range is indicated on the display of SL1000, the SL1000 may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the measuring range so that the entire amplitude of the waveform is displayed within the waveform display area of the SL1000 Acquisition Software, and check the input voltage level.

Range Out Slot1_L >>

Indicate ">>" when over-range is occurring on multiple channels. Indicates the smallest number among the slot that over-range is occurring on.

Channel

U: Upper channel of the slot

L: Lower channel of the slot

Slot No.

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.
- 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.
- Si un fil de mesure se détache d'un connecteur du module, ne pas toucher la borne du fil de mesure. Cela risquerait d'entraîner un choc électrique. Si un fil de mesure se détache, éteindre l'appareil en cours de mesure.

Précautions à prendre lors de l'utilisation des modules

- Afin d'éviter le risque de choc électrique, toujours connecter les fils de mesure correspondant à la plage de tensions en cours de mesure aux bornes d'entrée de signal de 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 701267 (HV (avec RMS)), 720268 (HV (AAF, RMS)), 701265 (TEMP/HPV) et 720266 (TEMP/HPV).
- Lorsque vous appliquez de hautes tensions au 701267 (HV (avec RMS)) et 720268 (HV (AAF, RMS)), utilisez un cordon de mesure (combinaison de 758933 et 701954) ou des câbles de sécurité 1:1 (combinaison de 701904 et 701954).

Tensions d'entrée maximales et tension nominale maximale à la terre 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, une tension inférieure à cette valeur pourra tout de même endommager la section d'entrée.

- **Pour 701261, 701262, 701265 et 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 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)

- **Pour 701267 (HV (avec RMS)) et 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 Alligator³ 701954 ou combinaison de câble de sécurité 1:1 701904 et de pinces alligator 701954 850 V (c.c. + crête c.a.)

- Entrée directe (câble non conforme aux normes de sécurité⁶)

42 V (c.c. + crête c.a.)

Tension nominale maximale à la terre (à une fréquence 1 kHz ou inférieure)

- Combinaison de fils de mesure 758933 et de pinces Alligator⁵ 701954 ou combinaison de câble de sécurité 1:1 701904 et de pinces alligator 701954 (Procéder avec soin, car la tolérance de surtension diffère entre le bas et le haut.)

701267: 700 Vrms (CAT II) sur le côté H,⁴ 400 Vrms (CAT II)⁵ sur le côté L
720268: 1000 Vrms (CAT II)^{4,5}, 600 Vrms (CAT III)^{4,5}

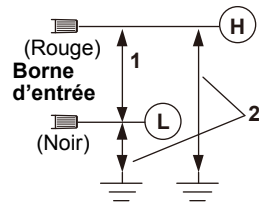
- Entrée directe (câble non conforme aux normes de sécurité⁷)

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

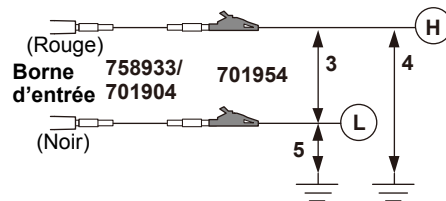
3.7 Connecting Measuring Leads

- La catégorie de mesure de 701267 (HV (avec RMS)) est CAT II - 400 V pour le bas et CAT II - 700 V pour le haut. Procéder avec soin, car la tolérance de surtension diffère entre le bas et le haut.

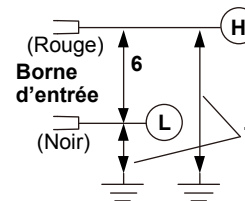
Pour 701261, 701262 701265 et 720266



Pour 701267 et 720268
Avec 758933 et 701954 ou
701904 et 701954



Entrée directe (câble non conforme
aux normes de sécurité)



Dépassement de plage

En cas de dépassement de plage indiqué à l'écran du SL1000, ce dernier risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter tout choc électrique, modifiez la plage de mesure afin que l'amplitude totale de la forme d'onde s'affiche dans la zone d'affichage correspondante du logiciel d'acquisition SL1000, et vérifiez la tension d'entrée.

Range Out Slot1_L >>

Indique >> lorsque le dépassement de plage concerne plusieurs canaux.

Indique la valeur la plus faible du logement présentant un dépassement de plage.

Canal

U : canal supérieur du logement

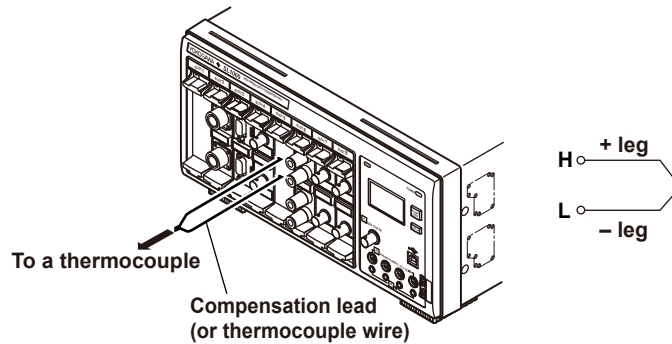
L : canal inférieur du logement

N° de canal

3.8 Connecting Thermocouples

Connecting a Thermocouple

To connect 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 on the display of SL1000, the SL1000 may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, check the input voltage level.

Range Out Slot1_L >>

Indicate ">>" when over-range is occurring on multiple channels. Indicates the smallest number among the slot that over-range is occurring on.

Channel

U: Upper channel of the slot

L: Lower channel of the slot

Slot No.



CAUTION

- The 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 701265 (TEMP/HPV), or 720266 (TEMP/HPV) is isolated from the SL1000. However, applying a voltage exceeding the value below may damage the input section. If the frequency is above 1 kHz, the input section may be damaged even if the voltage is less than the indicated values.

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 earth (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 made if the positive and negative legs of the thermocouple are reversed.
- 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.

3.8 Connecting Thermocouples

- In an environment where the air from the air conditioning is directly applied to the measurement 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 indiqué à l'écran du SL1000, ce dernier risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter tout choc électrique, vérifiez la tension d'entrée.

Range Out Slot1_L >>

Indique >> lorsque le dépassement de plage concerne plusieurs canaux.

Indique la valeur la plus faible du logement présentant un dépassement de plage.

Canal

U : canal supérieur du logement

L : canal inférieur du logement

N° de canal



ATTENTION

- 701261 (UNIVERSAL), 701262 (UNIVERSAL (AAF)), 701265 (TEMP/HPV) ou 720266 (TEMP/HPV) est isolé de SL1000. 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, cela risque d'entraîner des dégâts, même si 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 dix 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.

3.9 Connecting a Bridge Head

Strain is measured 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 earth (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

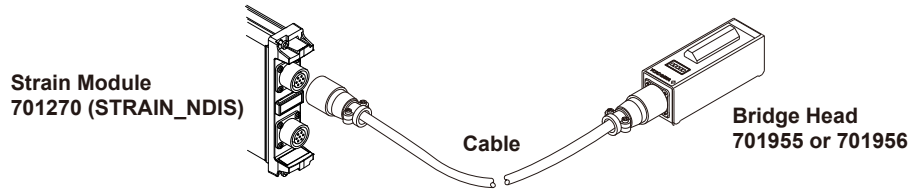
The bridge head (701955, 701956, 701957, and 701958) supports six types of connection methods: single-gauge method, single-gauge three-wire method, adjacent-side two-gauge method, opposite-side two-gauge method, opposite-side two-gauge three-wire method, and four-gauge method. For details, see the manual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

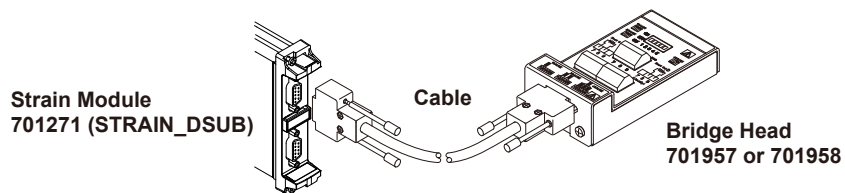
When Using the Strain Module (701270) and the Bridge Head (701955 or 701956)

Connect the bridge head to the 701270 (STRAIN_NDIS) using the cable that comes with the bridge head (701955 or 701956).



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

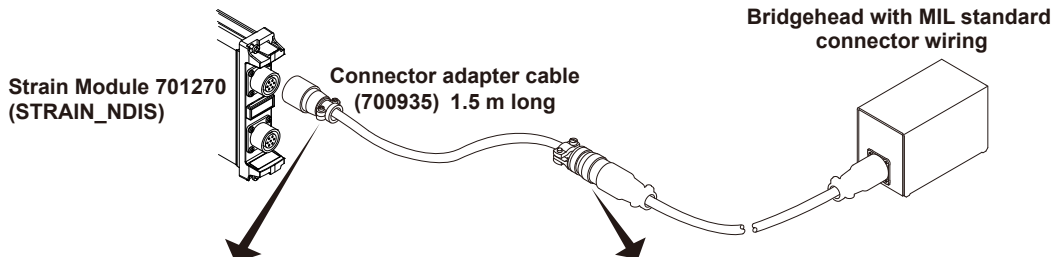
Connect the bridge head to the 701271 (STRAIN_DSUB) using the cable that comes with the bridge head (701957 or 701958).



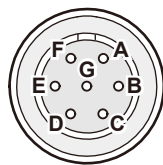
If Using a Bridge Head with a MIL Standard (MIL-C-26482) Connector Wiring

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 the bridge head to the Strain Module (701270).

* A connector recommended by JSNDI (The Japanese Society for Non-destructive Inspection)

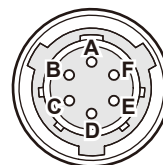


NDIS connector pinout



- A: Bridge+ (positive bridge voltage)
- B: Input- (negative measurement signal)
- C: Bridge- (negative bridge voltage)
- D: Input+ (positive measurement signal)
- E: Floating common
- F: Sense+ (positive bridge voltage sensing)
- G: Sense- (negative bridge voltage sensing)

MIL standard connector pinout



- A: Signal+
- B: Signal-
- C: Excitation+
- D: Excitation-
- E: NC (no connection)
- F: NC (no connection)

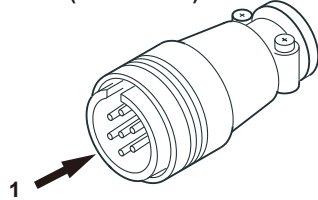
Corresponding terminals

| NDIS | MIL |
|------|-----|
| A | C |
| B | B |
| C | D |
| D | A |

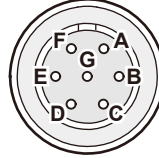
If Using the A1002JC Connector by YOKOGAWA

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 gauge transducer to the strain module.

**A1002JC NDIS connector
(two in a set)**



Pinouts as viewed in the direction of arrow 1



- A: Bridge+ (positive bridge voltage)
- B: Input- (negative measurement signal)
- C: Bridge- (negative bridge voltage)
- D: Input+ (positive measurement signal)
- E: Floating common
- F: Sense+ (positive bridge voltage sensing)
- G: Sense- (negative bridge voltage sensing)

Note

- The connector shell is connected to the case potential (earth) of the SL1000.
- Signals A through G are isolated inside 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 SL1000 or other instruments that are connected it.

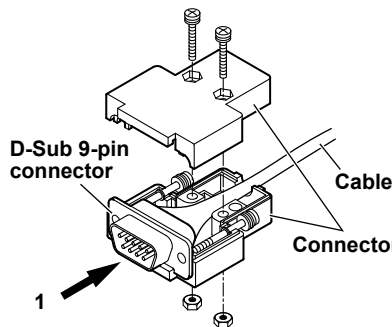
French



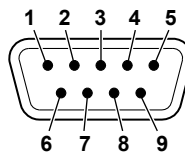
ATTENTION

Redoubler de vigilance lors du câblage des connecteurs. Si le câblage est shunté ou incorrect, il risque d'endommager le dispositif SL1000 ou d'autres instruments reliés à SL1000.

Pin Arrangement of the D-Sub Connector



As viewed in the direction of arrow 1



- 1: Floating common
- 2: Sense- (negative bridge voltage sensing)
- 3: Shuntcal- (negative shunt signal)
- 4: Shuntcal+ (positive shunt signal)
- 5: Sense+ (positive bridge voltage sensing)
- 6: Bridge- (negative bridge voltage)
- 7: Input- (negative measurement signal)
- 8: Input+ (positive measurement signal)
- 9: Bridge+ (positive bridge voltage)

3.10 Connecting Acceleration Sensors

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



WARNING

If over-range is indicated on the display of SL1000, the SL1000 may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the measuring range so that the entire amplitude of the waveform is displayed within the waveform display area of the SL1000 Acquisition Software, and check the input voltage level.

Range Out Slot1_L >>

Indicate ">>" when over-range is occurring on multiple channels. Indicates the smallest number among the slot that over-range is occurring on.

Channel

U: Upper channel of the slot

L: Lower channel of the slot

Slot No.



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 + AC_{peak})
- Connect acceleration sensors without supplying bias current to the sensor. Otherwise, damage to the internal circuitry of the acceleration sensors may result.
- The SL1000 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 indiqué à l'écran du SL1000, ce dernier risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter tout choc électrique, modifiez la plage de mesure afin que l'amplitude totale de la forme d'onde s'affiche dans la zone d'affichage correspondante du logiciel d'acquisition SL1000, et vérifiez la tension d'entrée.

Range Out Slot1_L >>

Indique >> lorsque le dépassement de plage concerne plusieurs canaux.

Indique la valeur la plus faible du logement présentant un dépassement de plage.

Canal

U : canal supérieur du logement

L : canal inférieur du logement

N° de canal



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 maximale : 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.
- SL1000 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 the Acceleration Sensor

When Connecting Built-in Amplifier Type Acceleration Sensors

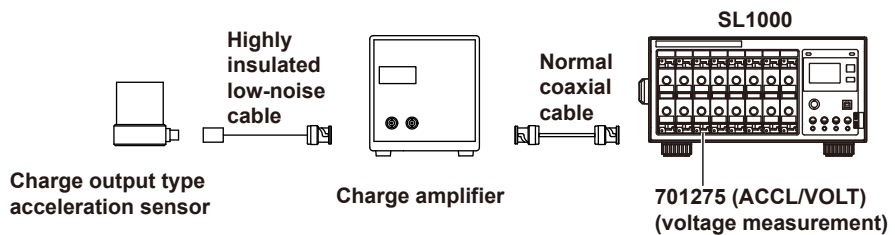
The SL1000 allows built-in amplifier type (low impedance) acceleration sensors to be directly connected. To connect built-in amplifier type acceleration sensors, use BNC cables. Use cables that are appropriate for the acceleration sensors being used. Connect the acceleration sensors with the bias current turned OFF. After connection, turn ON the supply current to the acceleration sensors to make measurements.

When Connecting Charge Output Type Acceleration Sensors

Since the charge output type (high impedance) acceleration sensors do not have a built-in amplifier circuit, they cannot be directly connected to the SL1000. Use either of the following two methods to connect the sensors.

Using the Charge Amplifier

Connect the charge output type acceleration sensor to a charge amplifier using a highly insulated low-noise cable. The acceleration signal (charge signal) that has been converted to a voltage signal by the charge amplifier is applied to the SL1000 using a normal coaxial cable. The SL1000 measures the signal in the voltage measurement mode. The measured data can be converted to acceleration values using the scale conversion function of the SL1000.

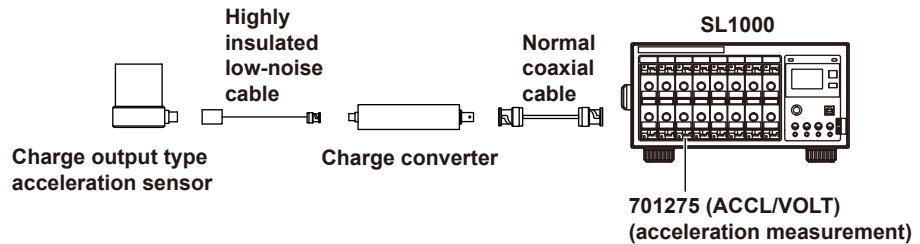


3.10 Connecting Acceleration Sensors

When Using the Charge Converter

Connect the charge output type acceleration sensor to a charge converter using a highly insulated low-noise cable. By driving the charge converter using a constant current from the SL1000, voltage signals similar to those of the built-in amplifier type acceleration sensor can be obtained. The SL1000 measures the signals in the acceleration measurement mode and supplies bias current to the charge converter. Set the input sensitivity of the SL1000 according to the charge converter gain and the sensitivity of the charge output type acceleration sensor.

The SL1000 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 SL1000 is m/s^2 . The sensitivity is sometimes expressed in units of mV/G depending on the acceleration sensor. In such cases, convert the unit. ($1 G = 9.81 m/s^2$)

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 ON/OFF setting of the bias current is retained even when you turn OFF the SL1000.

3.11 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 the procedure to set presets, see the *Acquisition Software User's Manual IM720120-61E*.

| 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 power supply (connected through the isolated probe 700929 or passive probe 702902) | AC100V |
| 200-VAC power supply (connected through the isolated probe 700929 or passive probe 702902) | AC200V |
| Power-generating electromagnetic pickup | EM Pickup |
| Open collector output (0 to 5 V output) and contact output | Pull-up 5V |



WARNING

If over-range is indicated on the display of SL1000, the SL1000 may be receiving a voltage higher than the observed waveform or measured waveform values. To prevent electric shock, change the measuring range so that the entire amplitude of the waveform is displayed within the waveform display area of the SL1000 Acquisition Software, and check the input voltage level.

Range Out Slot1_L >>

Indicate ">>" when over-range is occurring on multiple channels. Indicates the smallest number among the slot that over-range is occurring on.

Channel

U: Upper channel of the slot

L: Lower channel of the slot

Slot No.

French



AVERTISSEMENT

En cas de dépassement de plage indiqué à l'écran du SL1000, ce dernier risque de recevoir une tension supérieure à la forme d'onde observée ou aux valeurs de forme d'onde mesurées. Pour éviter tout choc électrique, modifiez la plage de mesure afin que l'amplitude totale de la forme d'onde s'affiche dans la zone d'affichage correspondante du logiciel d'acquisition SL1000, et vérifiez la tension d'entrée.

Range Out Slot1_L >>

Indique >> lorsque le dépassement de plage concerne plusieurs canaux. Indique la valeur la plus faible du logement présentant un dépassement de plage.

Canal

U : canal supérieur du logement

L : canal inférieur du logement

N° de canal

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. If you are applying high voltage that exceeds 42 V, be sure to use the 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

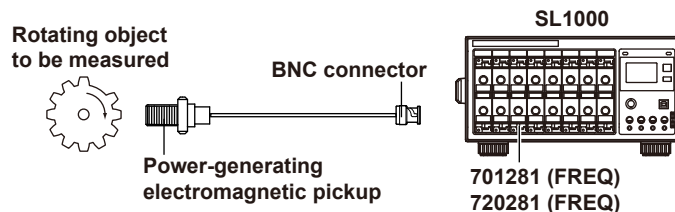


ATTENTION

- 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 plus de 42 V, bien utiliser la sonde isolée (700929 ou 701947) ou la sonde passive 702902.
Maximum input voltage: 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

- SL1000 allows power-generating electromagnetic pickup to be connected directly. SL1000 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 3-9) do not illuminate even when the input voltage level is over range.



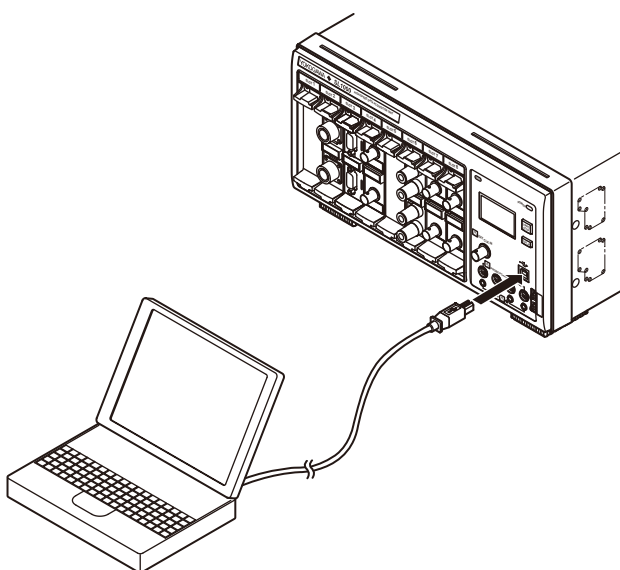
4.1 Connecting to a PC

Connecting Using the USB

USB Interface Specifications

There is a USB port on the front panel of the SL1000.

| Item | Specifications |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electrical and mechanical specifications | Conforms to USB Rev. 2.0 |
| Connector | Type B connector (receptacle) |
| Number of ports | 1 |
| Power supply | Self-powered |
| Compatible PC systems | A PC running Windows XP (Service Pack 2 or higher), Windows Vista, Windows 7, Windows 8, or Windows 8.1 with a standard USB port (a separate device driver is necessary to connect to a PC) |



Connection via the USB Interface

Precautions to Be Taken When Connecting the Cable

- Connect the USB cable by inserting the connector firmly into the USB connector.
- When connecting multiple devices using USB hubs, connect the SL1000 to the USB hub that is closest to the controller.

Note

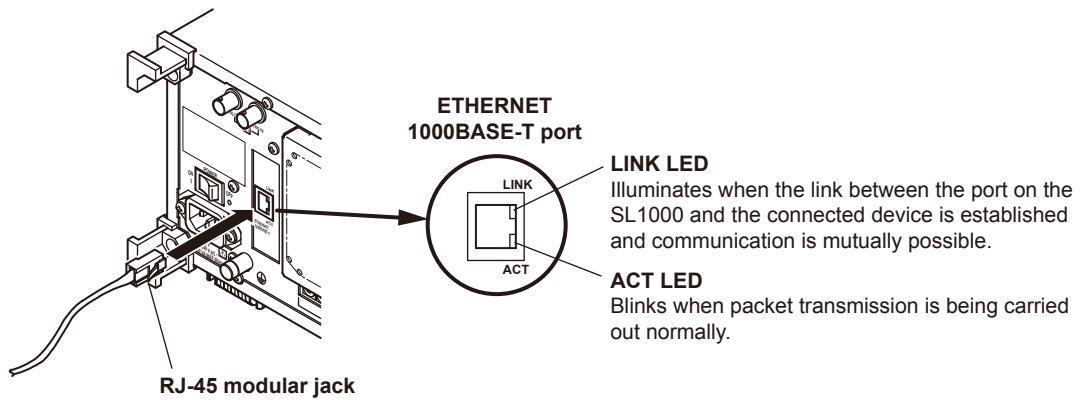
Remove the USB cable that is connecting the SL1000 to the PC only after you have exited the Acquisition Software or after you have disconnected the communication between the SL1000 and the PC. For details, see the *Acquisition Software User's Manual IM720120-61E*.

Connecting Using the Ethernet Interface (Option)

Ethernet Interface Specifications

There is a 1000BASE-T port on the rear panel of the SL1000.

| Item | Specifications |
|------------------------------------------|---------------------------------------------------------------------------|
| Number of Ethernet ports | 1 |
| Electrical and mechanical specifications | Conforms to IEEE802.3 |
| Transmission system | Ethernet (1000BASE-T/100BASE-TX) |
| Communication protocol | TCP/IP |
| Supported services | DHCP client, DNS client, FTP server, SMTP client, SNMP client, and VXI-11 |
| Connector type | RJ-45 connector |



Items Necessary for Connection

Be sure to use an STP (Shielded Twisted-Pair) cable (category 6 or better).

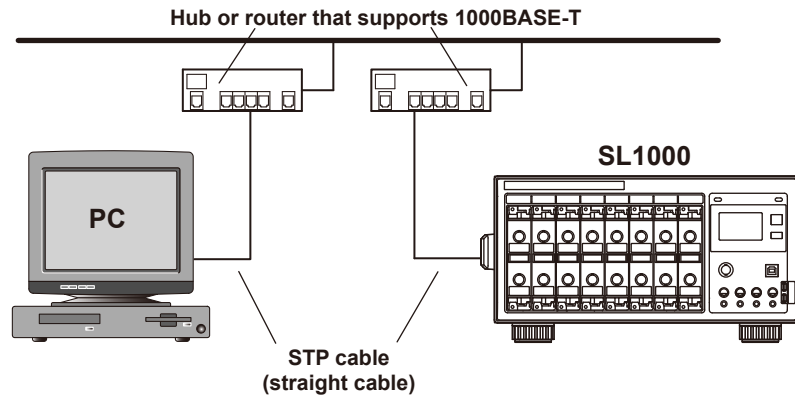
Note

The TCP/IP is configured using the Acquisition Software. For details, see section 3.2 in the *Acquisition Software User's Manual IM720120-61E*.

Connection Procedure

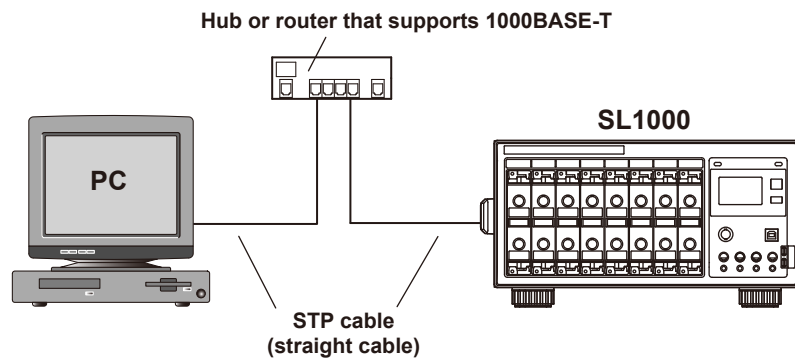
To Connect to a PC on a Network

1. Turn OFF the SL1000.
2. Connect one end of an STP cable to the ETHERNET 1000BASE-T port on the rear panel.
3. Connect the other end of the STP cable to a hub or router.
4. Turn ON the SL1000.



To Make a One-to-One Connection with a PC

1. Turn OFF the SL1000 and the PC.
2. Connect one end of an STP cable to the ETHERNET 1000BASE-T port on the rear panel.
3. Connect the other end of the STP cable to a hub or router.
4. Likewise, connect the PC to a hub or router.
5. Turn ON the SL1000.



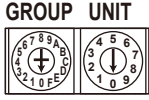
Note

- To make a one-to-one connection with a PC, the NIC in the PC must support auto negotiation (auto switching between 1000BASE-T and 100BASE-TX).
- Use only an STP cable (straight cable) of Category 6 or better.
- Avoid connecting the PC directly to the SL1000 without going through the hub or router. Operations are not guaranteed for communications using direct connection.
- You can connect the SL1000 to a network that has DHCP turn ON without having to change the Ethernet settings of the SL1000.
- You must change the Ethernet settings of the SL1000 if the network DHCP is turned OFF. For a description of Ethernet settings, see section 3.2 in the *Acquisition Software User's Manual IM720120-61E*.
- Remove the Ethernet cable that is connecting the SL1000 to the PC only after you have exited the Acquisition Software or after you have disconnected the communication between the SL1000 and the PC. For details, see the *Acquisition Software User's Manual IM720120-61E*.

Setting the Group and Unit IDs

Set the group and unit IDs that are used to search using the Acquisition Software.

Procedure



Setting the Group ID

1. Turn OFF the SL1000.
2. Insert a screwdriver in the rotary switch (GROUP) on the rear panel and set the group number.

Setting the Unit ID

3. Insert a screwdriver in the rotary switch (UNIT) on the rear panel and set the unit ID.
4. Turn ON the SL1000.

Explanation

Group ID

Set the group ID to which the unit belongs.

Selectable range: 0 to F

Unit ID

Set the unit ID.

During independent operation

Set the unit ID to "0".

During synchronous operation

- Master unit's unit ID: 0
- Slave units' unit IDs: 1 to 7

Note

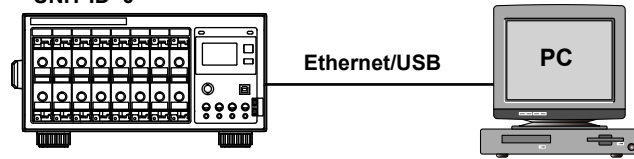
- Rotary switch (UNIT) positions 8 and 9 are invalid.
- The group and unit IDs are not changed while the SL1000 is turned ON. To change the group or unit ID, set them after you turn OFF the SL1000.
- To perform synchronous operation, set the master and slave units to the same group ID (from 0 to F). Set the master unit's unit ID to 0 and the slave units' unit IDs to values from 1 to 7 in ascending order starting with the slave unit that is closest to the master unit. Note that the SL1000s will not operate properly if you assign incorrect values.

Example when four SL1000s are synchronized using group ID 1.

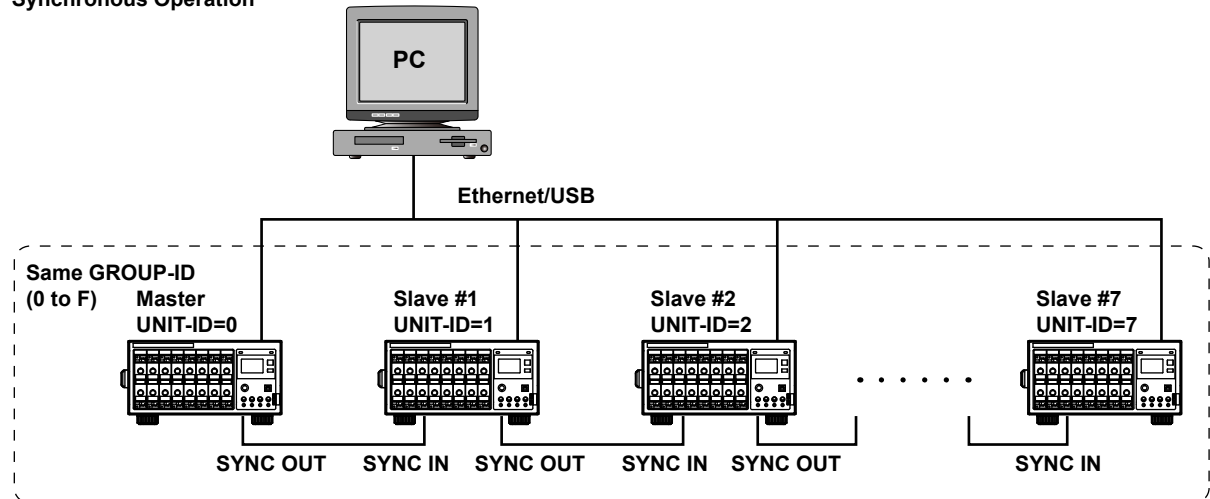
Master: GROUP-ID = 1 and UNIT-ID = 0
Slave #1: GROUP-ID = 1 and UNIT-ID = 1
Slave #2: GROUP-ID = 1 and UNIT-ID = 2
Slave #3: GROUP-ID = 1 and UNIT-ID = 3

Independent operation

GROUP-ID (0 to F)
UNIT-ID=0



Synchronous Operation

**Note**

- For details on the synchronous operation feature, see section 2.4.
- For the procedure to connect sync I/O connectors using sync cables, see section 5.7.
- For the synchronous operation procedure and notes about using the Acquisition Software, see the *Acquisition Software User's Manual IM720120-61E*.

4.2 Starting/Stopping Measurements

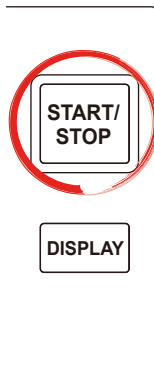
You start or stop measurements in standalone mode.

You can carry out this procedure during independent operation or on the master unit during synchronous operation.

For the operating procedures in online mode, see the *Acquisition Software User's Manual IM720120-61E*.

Procedure

Starting the Measurement



Note

Set the connection and group settings and measurement conditions in advance using a dedicated software before starting a measurement. For the setup procedure, see the *Acquisition Software User's Manual IM720120-61E*.

1. Press **START/STOP**. The measurement starts, and the START/STOP key illuminates.

Stopping the Measurement

2. Press **START/STOP**. The measurement stops, and the START/STOP key turns OFF.

Explanation

If you start a measurement by pressing the START/STOP key, measuring start and recording start are executed. If you stop a measurement by pressing the START/STOP key, measuring stop and recording stop are executed. However, recording start and recording stop change depending on the measurement conditions that were set in online mode.

For details, see the *Acquisition Software User's Manual IM720120-61E*.

5.1 Connecting the External Clock Input Terminal (EXT CLK IN)



CAUTION

Only input signals that meet the specifications below. Otherwise, undesirable signal such as excessive voltage may damage the SL1000.

French



ATTENTION

Appliquer uniquement des signaux respectant les spécifications ci-dessous. Les signaux ne respectant pas les spécifications risquent d'endommager SL1000, à cause de facteurs tels que la surtension.

External Clock Input Terminal

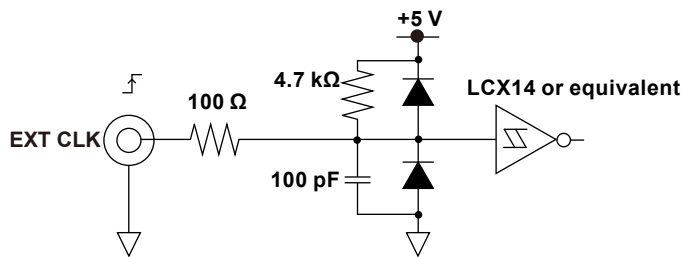
Use this terminal if you want to operate the SL1000 using an external clock signal.

 EXT CLK IN



| Item | Specifications |
|--------------------------------|-----------------------------------|
| Connector type | BNC |
| Input level | TTL level (0 to 5 V) |
| Valid edge | Rising edge |
| Minimum pulse width | 100 ns or more for high and low |
| External clock frequency range | 5 MHz maximum |
| Sampling jitter | Within (100 ns + 1 sample period) |

Circuit Diagram of the External Clock Input



5.2 Connecting the External Trigger Input Terminal (TRIG IN)



CAUTION

Only input signals that meet the specifications below. Otherwise, undesirable signal such as excessive voltage may damage the SL1000.

French



ATTENTION

Appliquer uniquement des signaux respectant les spécifications ci-dessous. Les signaux ne respectant pas les spécifications risquent d'endommager SL1000, à cause de facteurs tels que la surtension.

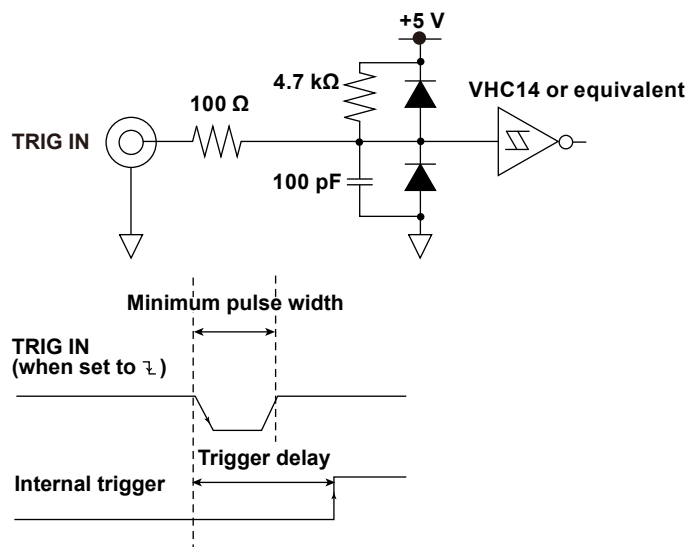
External Trigger Input Terminal

Use this terminal to use an external signal for the trigger source.



| Item | Specifications |
|---------------------|-----------------------------------|
| Connector type | BNC |
| Input level | TTL level (0 to 5 V) |
| Minimum pulse width | 100 ns |
| Valid edge | Rising edge or falling edge |
| Trigger delay | Within (100 ns + 1 sample period) |

Circuit Diagram and Timing Chart of the External Trigger Input



5.3 Connecting the Trigger Output Terminal (TRIG OUT)



CAUTION

Do not apply external voltage to the TRIG OUT terminal. If you do, the SL1000 may malfunction.

French



ATTENTION

Ne pas court-circuiter la borne TRIG OUT et ne pas appliquer de tension de sortie. Cela pourrait endommager l'instrument.

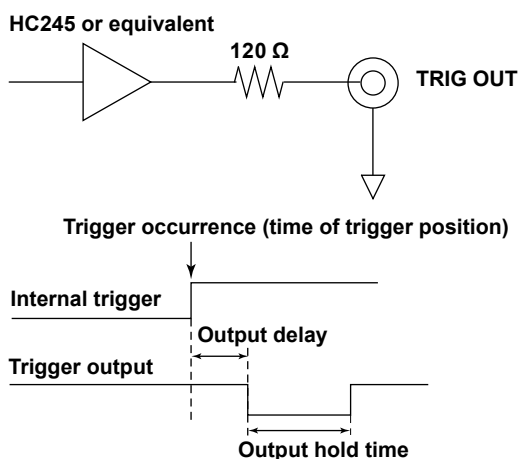
Trigger Output Terminal

This terminal outputs a CMOS signal when a trigger occurs. The signal level is normally high and switches to low when a trigger is activated.

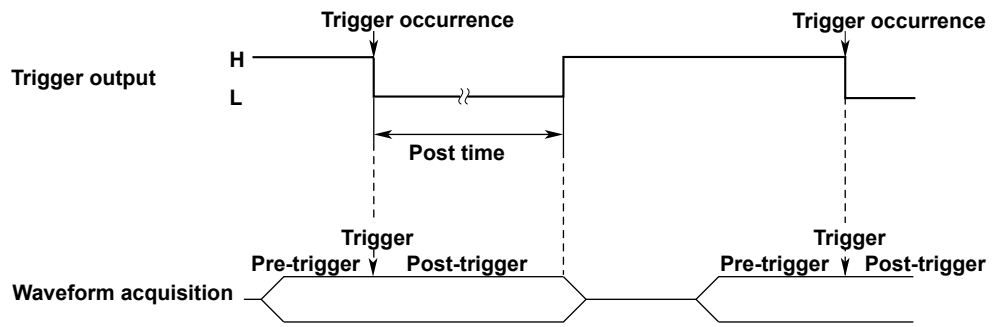


| Item | Specifications |
|------------------|-------------------------------------------------------------------------|
| Connector type | BNC |
| Output level | CMOS level (0 to 5 V) |
| Logic | Falls when the trigger is activated, rises after completing acquisition |
| Output delay | Within (100 ns + 1 sample period) |
| Output hold time | 100 ns or longer |

Circuit Diagram and Timing Chart of the Trigger Output



Hold Time of the Low and High Level Signals



5.4 Connecting the Alarm Output Terminals (ALARM)



CAUTION

- Do not apply external voltage to the alarm output terminals. If you do, the SL1000 may malfunction.
- Do not short between alarm output terminals. If you do, the SL1000 may malfunction.
- Be sure to turn OFF the power switch when connecting (or removing) signal wires to the alarm output terminals.

French

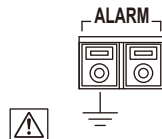


ATTENTION

- Ne pas appliquer une tension externe aux bornes de sortie d'alarme. Le dispositif SL1000 risquerait alors de mal fonctionner.
- Ne pas créer de court-circuit entre les bornes de sortie d'alarme. Le dispositif SL1000 risquerait alors de mal fonctionner.
- Bien couper l'alimentation lors du branchement (ou du débranchement) des câbles de signal aux bornes de sortie d'alarme.

Alarm Output Terminals

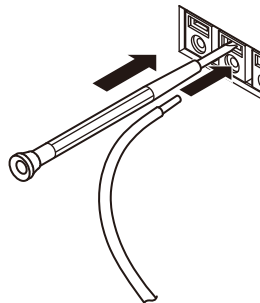
Outputs a TTL signal when an alarm occurs. The signal level is normally high and switches to low when an alarm occurs.



| Item | Specifications |
|----------------|---------------------------------------------------------|
| Connector type | Screwless terminal |
| Output level | TTL level (0 to 5 V) |
| Logic | High level when normal, low level when an alarm occurs. |

Connecting the Signal Wires

Press down on the top section of the screwless terminal with a flat-blade screwdriver and insert the stripped tip of the signal wire into the terminal. Check that the signal wire is securely locked to the terminal.



5.4 Connecting the Alarm Output Terminals (ALARM)

To remove a signal wire, press down on the top section of the screwless terminal with a flat-blade screwdriver and pull the wire out.

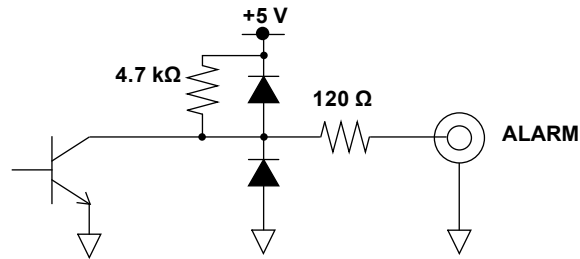
Note

Be sure to hold the SL1000 firmly while pressing down on the top section of the screwless terminal with a flat-blade screwdriver.

Use the following signal wires for the alarm output.

- Signal wire thickness (single wire): $\varnothing 0.4$ to 1.0 (AWG26 to 18)
(stranded wire): 0.3 to 0.75 mm² (AWG22 to 20)
- Recommended length of stripped wire: 10 mm

Circuit Diagram of the Alarm Output



5.5 Connecting the Remote Input Terminals (REMOTE)



CAUTION

- Only input signals that meet the specifications below. Otherwise, undesirable signal such as excessive voltage may damage the SL1000.
- Be sure to turn OFF the power switch when connecting (or removing) signal wires to the remote input terminals.

French

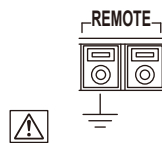


ATTENTION

- Appliquer uniquement des signaux d'entrée respectant les spécifications ci-dessous. Un signal indésirable, tel qu'une surtension, risque sinon d'endommager SL1000.
- Bien couper l'alimentation lors du branchement (ou du débranchement) des câbles de signal aux bornes d'entrée distantes.

Remote Input Terminals

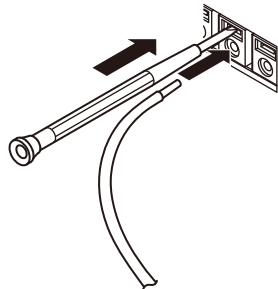
The remote input terminal is used to start/stop acquisition with a remote signal. A low-level signal starts acquisition, and a high-level signal stops it.



| Item | Specifications |
|----------------|------------------------------------------------------|
| Connector type | Screwless terminal |
| Output level | TTL level (0 to 5 V) |
| Logic | Low-level signal to start, high-level signal to stop |

Connecting the Signal Wires

Press down on the top section of the screwless terminal with a flat-blade screwdriver and insert the stripped tip of the signal wire into the terminal. Check that the signal wire is securely locked to the terminal.



To remove a signal wire, press down on the top section of the screwless terminal with a flat-blade screwdriver and pull the wire out.

5.5 Connecting the Remote Input Terminals (REMOTE)

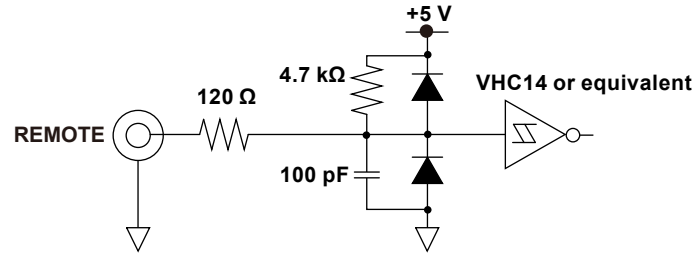
Note

Be sure to hold the SL1000 firmly while pressing down on the top section of the screwless terminal with a flat-blade screwdriver.

Use the following signal wires for the remote input.

- Signal wire thickness (single wire): $\varnothing 0.4$ to 1.0 (AWG26 to 18)
(stranded wire): 0.3 to 0.75 mm² (AWG22 to 20)
- Recommended length of stripped wire: 10 mm

Circuit Diagram of the Remote Input



5.6 Connecting the GO/NO-GO Output Terminals



CAUTION

- Do not apply external voltage to the GO/NO-GO output terminals. If you do, the SL1000 may malfunction.
- Do not short between GO/NO-GO output terminals. If you do, the SL1000 may malfunction.
- Be sure to turn OFF the power switch when connecting (or removing) signal wires to the GO/NO-GO output terminals.

French

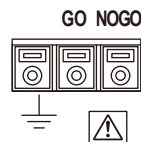


ATTENTION

- Ne pas appliquer une tension externe aux bornes de sortie GO/NO-GO. Le dispositif SL1000 risquerait alors de mal fonctionner.
- Ne pas créer de court-circuit entre les bornes de sortie GO/NO-GO. Le dispositif SL1000 risquerait alors de mal fonctionner.
- Bien couper l'alimentation lors du branchement (ou du débranchement) des câbles de signal aux bornes de sortie GO/NO-GO.

GO/NO-GO Output Terminals

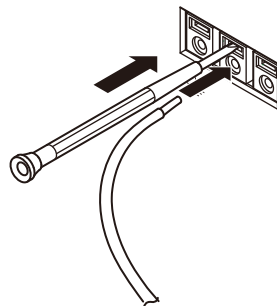
The GO/NO-GO judgement result on the SL1000 can be output externally.



| Item | Specifications |
|----------------|-----------------------------------------------------------------|
| Connector type | Screwless terminal |
| Output level | TTL level (0 to 5 V) |
| Logic | High level when normal, low level when a given judgment is made |

Connecting or Removing the Signal Wires

Press down on the top section of the screwless terminal with a flat-blade screwdriver and insert the stripped tip of the signal wire into the terminal. Check that the signal wire is securely locked to the terminal.



5.7 Sync I/O connectors (SYNC IN and SYNC OUT)



CAUTION

- To perform synchronous operation, be sure to use the following sync cables (sold separately), 720901-01 (1 m in length) and 720901-02 (3 m in length).
- Do not apply signals that do not meet the following specifications to the sync input connector. Otherwise, undesirable signal such as excessive voltage may damage the SL1000.
- Do not apply external voltage to the sync output connector. If you do, the SL1000 may malfunction.
- Do not short the sync output connector terminals. If you do, the SL1000 may malfunction.
- Be sure to turn off the power switch when connecting or disconnecting sync cables from the sync I/O connectors. Otherwise, the SL1000 may malfunction.

French

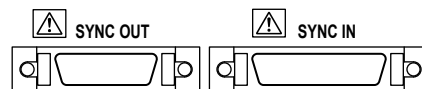


ATTENTION

- Pour une opération synchrone, bien utiliser les câbles de synchronisation suivants (vendus séparément), 720901-01 (1 m de long) et 720901-02 (3 m de long).
- Ne pas appliquer des signaux ne respectant pas les spécifications suivantes au connecteur d'entrée de synchronisation. Un signal indésirable, tel qu'une surtension, risque sinon d'endommager SL1000.
- Ne pas appliquer une tension externe au connecteur de sortie de synchronisation. Le dispositif SL1000 risquerait alors de mal fonctionner.
- Ne pas créer de court-circuit entre les bornes du connecteur de sortie de synchronisation. Le dispositif SL1000 risquerait alors de mal fonctionner.
- Bien couper l'alimentation lors du branchement ou du débranchement des câbles de synchronisation aux connecteurs E/S de synchronisation. Le dispositif SL1000 risquerait alors de mal fonctionner.

Sync I/O Connectors

These connectors are used to synchronize up to eight SL1000s.

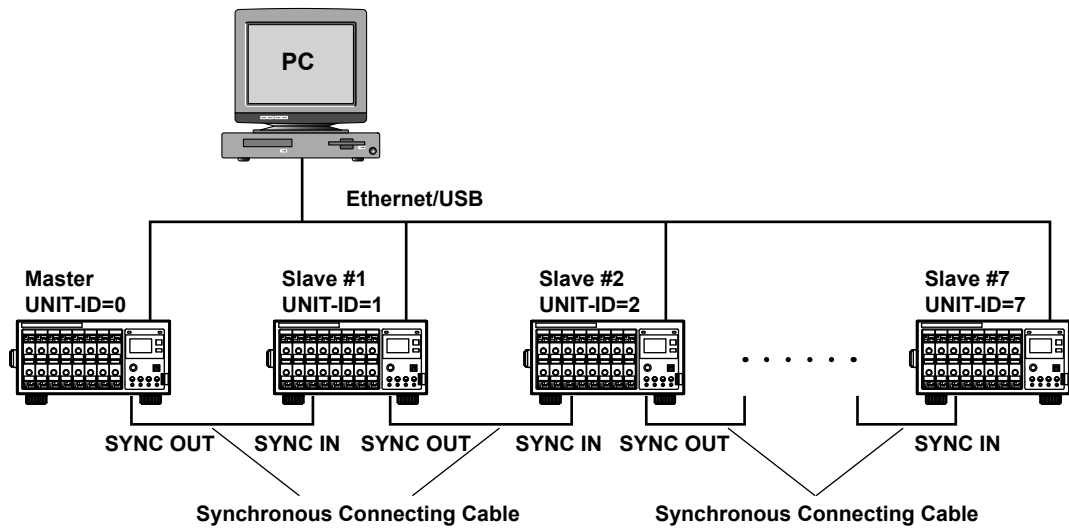


| Connector Name | Item | Specifications |
|----------------|----------------|----------------------------|
| SYNC IN | Connector type | 36-pin half pitch (female) |
| SYNC OUT | Connector type | 26-pin half pitch (female) |

5.7 Sync I/O connectors (SYNC IN and SYNC OUT)

Synchronous Operation

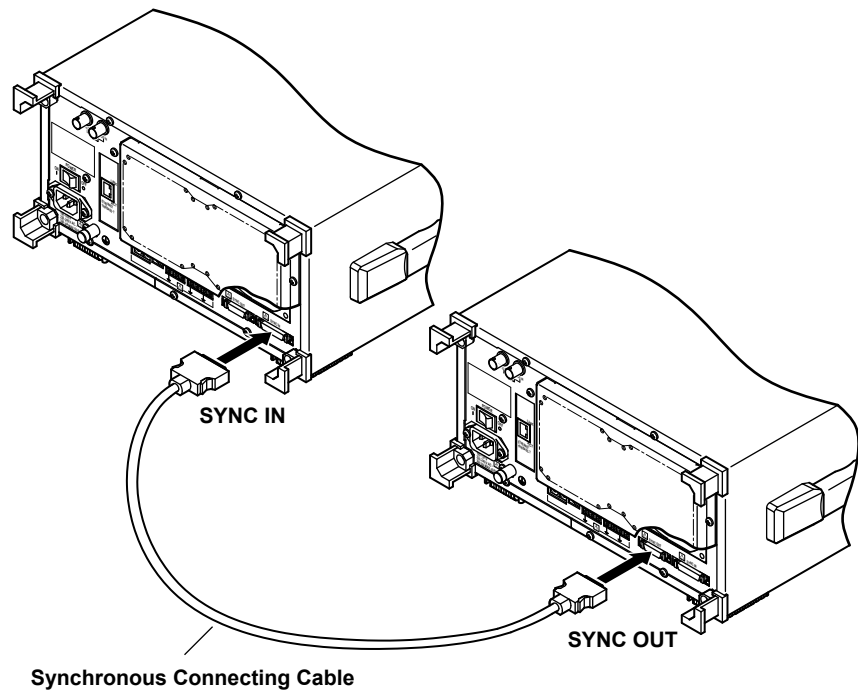
Connect the sync I/O connectors (SYNC IN and SYNC OUT) of multiple SL1000s using sync cables in a daisy-chain pattern.



Specifications

- Maximum number of SL1000s: 8
- Total sync cable length: 10 m or less total

Connecting a Sync Cable



- Connect the 26-pin end of the sync cable to the SYNC OUT connector. Connect the 36-pin end of the sync cable to the SYNC IN connector.
- Securely connect the sync cable to the sync I/O connectors and lock it in place.
- Leave the master unit's SYNC IN connector and the last slave unit's SYNC OUT connector open. Otherwise, the SL1000s may not operate properly.
- Keep the total length of sync cables to 10 m or less. Otherwise, the SL1000s may not operate properly.

Note

- For details on the synchronous operation feature, see section 2.4.
 - For the procedure to set the group ID and unit ID, see section 4.1.
 - For the synchronous operation procedure and notes about using the Acquisition Software, see the *Acquisition Software User's Manual IM720120-61E*.
-

6.1 Troubleshooting

Troubleshooting

- If a message is displayed on the screen, read the next section.
- If servicing is necessary, or if the instrument is not operating correctly after performing the corrective actions, contact your nearest YOKOGAWA dealer.

| Description | Probable Cause | Corrective Action | Reference Section |
|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------|
| The power does not turn ON. | Using a power supply outside the ratings. | Use a correct power supply. | 3.4 |
| The display is strange. | The system is not operating properly. | Power-cycle the SL1000. | 3.4 |
| Keys do not work. | The SL1000 is in remote mode. | Hold down START/STOP to switch to local mode. | 1.2 |
| | Other causes. | Servicing is required. | — |
| Trigger does not activate. | The trigger settings are not appropriate. | Set the trigger conditions correctly. | * |
| Measured values are not correct. | Insufficient warm-up. | Warm up the SL1000 for 30 minutes after turning ON the power. | — |
| | Not calibrated. | Perform a calibration. | * |
| | The probe's phase has not been corrected. | Correct the phase properly. | 3.6 |
| | The probe attenuation is not correct. | Set an appropriate value. | * |
| Cannot save to the specified medium. | Other causes. | Perform a calibration. If the measured value is still odd, servicing is required. | * |
| | The medium is not formatted. | Format the medium. | — |
| Cannot change settings or control the operation of the SL1000 via the communication interface. | No more free space on the medium. | Delete unneeded files. | — |
| | The address of the SL1000 used by the program is different from the specified address. | Match the address used in the program to the address of the SL1000. | * |
| | The interface is not used in a way that conforms to the electrical or mechanical specifications. | Use it in a way that conforms to the specifications. | * |

* See the *Acquisition Software User's Manual IM720120-61E*.

6.2 Codes and Corrective Actions

Error Codes

An error code may appear on the screen during operation. This section describes the meanings of the messages and their corrective actions. If the corrective action indicates servicing, contact your nearest YOKOGAWA dealer for repairs.

In addition to the error codes below, there are Acquisition Software error messages. These are described in the *Acquisition Software User's Manual IM720120-61E*.

Status Messages

| Type | Code | Description | Corrective Action | Reference Section |
|------|------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------|
| M | 52 | Auto setup is in progress. | – | IM720120-61E |
| M | 53 | Auto setup is complete. | – | |
| M | 58 | Undoing auto setup. | – | |
| M | 59 | Auto setup has been undone. | – | |
| M | 66 | Strain balancing in progress. | – | |
| M | 67 | Strain balancing is complete. | – | |
| M | 69 | Calibrating (for manual calibration). | – | |
| M | 70 | Calibration is complete (for manual calibration). | – | |
| M | 70 | Internal hard disk formatting is complete. | – | |
| M | 78 | Undoing initialization. | – | |
| M | 79 | Initialization has been undone. | – | |
| M | 81 | The total sync cable length exceeds the maximum allowable length (10 m), and the sync clock delay tolerance has been exceeded.* | Connect the SL1000s so that the total length of all sync cables is less than or equal to 10 m. | Section 5.7 |
| M | 88 | Initializing settings. | – | IM720120-61E |
| M | 89 | Initialization is complete. | – | |

* The message appears during synchronous operation on all slave devices whose total cable length from the master unit exceeds 10 m.

Execution Errors

| Type | Code | Description | Corrective Action | Reference Section |
|------|------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------|
| E | 703 | Cannot undo because auto setup nor initialization is not in progress. | – | IM720120-61E |
| E | 713 | Auto calibration failed. | Check the input signal at the specified channel. | |
| E | 714 | Measurement start was executed even though the unit is not in sync operation mode. | Start the Acquisition Software, set the unit to sync operation mode, and then start measurement. | |
| E | 724 | Strain balancing failed. | Check the connection at the specified channel. | |
| E | 755 | The time base cannot be set to external clock for Envelope and Box Average. | Switch to internal clock. | |
| E | 777 | Range-over occurred during shunt calibration. | Increase the measuring range and execute the calibration again. | |

Configuration Errors

| Type | Code | Description | Corrective Action | Reference Section |
|------|------|---------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------|
| E | 806 | Cannot change settings while GO/NO-GO is in progress. | Abort GO/NO-GO and then change the settings. | IM720120-61E |
| E | 821 | Cannot change the trigger delay when using external clock. | Switch to internal clock. | |
| E | 877 | Cannot change settings because there are too many display channels for the current record length. | Shorten the record length. | |

System Errors

| Type | Code | Description | Corrective Action | Reference Section |
|------|------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------|
| E | 901 | Failed to backup setup data. Will initialize. Backup battery may be low. | Servicing is required. | Section 6.3 |
| E | 904 | Buffer overrun occurred. Could not write data within a specified time. | Lower the sample rate or reduce the number of measuring channels. | IM720120-61E |
| E | 905 | Buffer overrun occurred on internal hard disk. Could not write data within a specified time. | | |
| E | 906 | The cooling fan has stopped. | Turn OFF the power immediately. Servicing is required. | Section 3.4 |
| E | 913 | The disk is full. | Delete unnecessary files or move files to your PC to free up space. | IM720120-61E |
| E | 938 | Keys are locked. | Hold down START/STOP to release key lock. | Section 1.2 |
| E | 941 | Probe power error occurred. | Check the measured current and the number of probes that you are using. | Section 3.5 |
| E | 943 | The unit connection within the group changed, or the sync clock was lost.* | Check the sync cable connection, and check that all units in the group are turned on. | Section 5.7 |

* The message appears during sync operation on all units in the group that are turned on.

File Errors

| Type | Code | Description | Corrective Action | Reference Section |
|------|------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------|
| E | 1001 | File access failed. | Test the hard disk using the self-test feature of the Acquisition Software. If the test fails, servicing will be required. | IM720120-61E |
| E | 1002 | Invalid characters in file name. | Change the file name. | |
| E | 1003 | The file name is too long. | Change the file name length to 256 characters or less. | |
| E | 1004 | File comments are too long. | Change the file comment length to 250 characters or less. | |
| E | 1005 | Not enough free space on media. | Delete unneeded files or use another storage medium. | |
| E | 1117 | Measurement stopped because the maximum amount of auto recording data in Free Run mode has been reached. | To cancel recording, click abort. | |

Examples

E: 913 09:31:20

E: 703 10:52:36

M: 052 13:02:27

M: 053 13:05:15

Time of occurrence (hh:mm:ss)
 Error code
 Type
 E: Error
 M: Message

6.3 Recommended Replacement Parts

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.

Parts with Limited Service Life

| Part Name | Service Life |
|---------------|---------------------------------------|
| LCD backlight | Approx. 50,000 hours under normal use |

Consumable Parts

We recommend replacing them at the following intervals.

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

Warranty on the Internal Hard Disk

| Parts Name | Warranty Period |
|--------------------|--------------------------------------------|
| Internal hard disk | One year after purchase (data is excluded) |

7.1 Input Section

| Item | Specifications |
|----------------------------------|----------------------------------------|
| Maximum number of input channels | 16 |
| Type | Plug-in input unit |
| Number of slots | 8 |
| Maximum record length | Depends on the number of channels used |
| | 1 or 2 50 MW/CH |
| | 3 or 4 25 MW/CH |
| | 5 to 8 10 MW/CH |
| | 9 to 16 5 MW/CH |

7.2 Display Section

| Item | Specifications |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display | FSTN monochrome LCD |
| Effective display screen size | 45.2 mm × 27.0 mm |
| Display resolution | 128 × 64 |
| Displayed contents | Common area <ul style="list-style-type: none"> • SL1000 group ID and unit ID • Status icons Displays the following information one at a time (switched by pressing DISPLAY) <ul style="list-style-type: none"> • Module status • Error information • Communication parameters (when the /C10 option is installed) |

7.3 Storage

Internal Hard Disk (/HD1 Option)

| Item | Specifications |
|--------------------|---------------------------------------------|
| Number of drives | 1 |
| Size | 2.5 inch |
| Hard disk capacity | 500 GB FAT32 |
| Name | Supports long file names (ANK16 characters) |

7.4 External I/O Section

External Clock Input (EXT CLK IN)

| Item | Specifications |
|--------------------------------|-----------------------------------|
| Connector type | BNC |
| Input level | TTL (0 to 5 V) |
| Valid edge | Rising edge |
| Minimum pulse width | 100 ns or more for high and low |
| External clock frequency range | 5 MHz maximum |
| Sampling jitter | Within (100 ns + 1 sample period) |

External Trigger Input (TRIG IN)

| Item | Specifications |
|---------------------|-----------------------------------|
| Connector type | BNC |
| Input level | TTL (0 to 5 V) |
| Minimum pulse width | 100 ns |
| Valid edge | Rising edge or falling edge |
| Trigger delay | Within (100 ns + 1 sample period) |

Trigger Output (TRIG OUT)

| Item | Specifications |
|------------------|-----------------------------------------------------------------|
| Connector type | BNC |
| Output level | CMOS level (0 to 5 V) |
| Logic | Falls when a trigger occurs, rises after completing acquisition |
| Output delay | Within (100 ns + 1 sample period) |
| Output hold time | 100 ns or longer |

Alarm Output (ALARM)

| Item | Specifications |
|----------------|---------------------------------------------------------|
| Connector type | Screwless terminal |
| Output level | TTL level (0 to 5 V) |
| Logic | High level when normal, low level when an alarm occurs. |

Remote Input (REMOTE)

| Item | Specifications |
|----------------|------------------------------------------------------------------------|
| Connector type | Screwless terminal |
| Output level | TTL level (0 to 5 V) |
| Logic | Low-level signal to starts acquisition, high-level signal to stops it. |

GO/NO-GO Output

| Item | Specifications |
|----------------|----------------------------------------------------------|
| Connector type | Screwless terminal |
| Output level | TTL level (0 to 5 V) |
| Logic | High level when normal, low level when judgment is made. |

Sync Input/Output (SYNC IN and SYNC OUT)

| Item | Specifications |
|----------------|-----------------------------------------------------------------------------|
| Connector type | SYNC IN: 36-pin half pitch (female) SYNC OUT: 26-pin half pitch (female) |

COMP Output (Rectangular Signal Output for Probe Compensation)

| Item | Specifications |
|------------------|------------------------------|
| Output frequency | 1 kHz \pm 1% |
| Output amplitude | 1 V _{p-p} \pm 10% |

Probe Power Output (/P4 Option)

| Item | Specifications |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of output terminals | 4 |
| Output voltage | \pm 12 V 2 outputs (up to a total of 1300 mA) |
| Compatible probes | Current probe 701930 (150A) Up to 3 probes Current probe 701931 (500A) Up to 2 probes Current probe 701932 (30A) Up to 3 probes Current probe 701933 (30A) Up to 3 probes |

7.5 Computer Interface

USB-PC Connection

| Item | Specifications |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Connector type | USB type B connector (receptacle) |
| Electrical and mechanical specifications | Conforms to USB Rev. 2.0 |
| Supported transfer standards | HS (High Speed) mode (480 Mbps) and FS (Full Speed) mode (12 Mbps) |
| Number of ports | 1 |
| Supported protocols | USBTMC-USB488 (USB Test and Measurement Class Ver.1.0) |
| Compatible PC systems | A PC running Windows XP (Service Pack 2 or higher), Windows Vista, Windows 7, Windows 8, or Windows 8.1 with a USB port. |

Ethernet (/C10 Option)

| Item | Specifications |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Connector type | RJ-45 connector |
| Number of ports | 1 |
| Electrical and mechanical specifications | Conforms to IEEE802.3 |
| Transmission system | Ethernet (1000BASE-T/100BASE-TX) |
| Communication protocol | TCP/IP |
| Supported services | DHCP, DNS, SNMP client, SMTP client, FTP server, and VXI-11 |
| LED indicators | LINK (illuminates when a link is established) and ACT (illuminates when packets are transmitted or received) |

7.6 Synchronous Operation

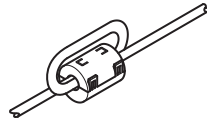
| Item | Specifications |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum connections | 8 |
| Maximum sync cable length | 10 m or less total |
| Sampling error between units | Triggered mode: \pm 10 ns or one sampling clock, whichever is longer Free Run mode: \pm 20 ns or one sampling clock, whichever is longer |
| Synchronized items | Measurement and recording start and stop, internal sampling clock, external sampling clock, time, trigger, and alarm |

7.7 General Specifications

| Item | Specifications |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard operating conditions | Ambient temperature: 23 ± 5 °C Ambient humidity: 20 to 80% RH Error in supply voltage and frequency: 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 |
| Storage conditions | Temperature: -20 to 60°C Humidity: 20 to 80% RH (no condensation) Altitude: 3000 m or less |
| Operating conditions | Temperature: 5 to 40°C Humidity: 20 to 80% RH (no condensation) Altitude: 2000 m or less |
| Rated supply voltage | 100 to 120 VAC, 220 to 240 VAC (automatic switching) |
| Permitted supply voltage range | 90 to 132 VAC, 198 to 264 VAC |
| Rated supply frequency | 50/60 Hz |
| Permitted power supply frequency range | 48 to 63 Hz |
| Power fuse | Built in (irreplaceable) |
| Maximum power consumption | Approx. 300 VA |
| Withstand voltage | 1500 VAC between power supply and case for 1 minute |
| Insulation resistance | 10 MΩ or higher at 500 VDC between power supply and case |
| External dimensions | 319 mm (W) × 154 mm (H) × 350 mm (D) (excluding projections) |
| Weight | Approx. 6 kg (the SL1000 only) Approx. 9 kg (the SL1000 + eight High-Speed 100 MS/s, 12-Bit Isolation Modules) |
| Cooling method | Forced air cooling, inlet on the right and bottom panels, exhaust from the rear panel |
| Battery backup | Backs up setup data and clock with the internal lithium battery |
| Backup battery life | Approx. 5 years (at ambient temperature of 25°C) |
| Safety standard | Complying standard ¹ EN 61010-1, EN IEC 61010-2-030, EN 61010-31, EN 60825-1 <ul style="list-style-type: none"> • Indoor use • Overvoltage category II² • Measurement category (See the specifications of each module (IM 720120-51E))³ • Pollution degree 2⁴ • Bridgehead for the strain module Use the 701955 or 701956 with the 701270, and use the 701957 or 701958 with the 701271. |
| Emissions | Complying standard EN 61326-1 Class A, EN 61326-2-1, EN 55011 Class A, Group 1 ⁵ , EMC Regulatory Arrangement in Australia and New Zealand EN 55011 Class A, Group 1 ⁵ , Korea Electromagnetic Conformity Standard (한국 전자파적합성기준) EN 61000-3-2, EN 61000-3-3 This product is a Class A (for industrial environment) product. Operation of this product in a residential area may cause radiointerference in which case the user is required to correct the interference. If the measurement lead or probe is connected to the input module, or if this instrument is connected to an object to be measured, emission requirements may not be satisfied. In this case, the user sometimes needs to take proper actions. |
| | Cable conditions <ul style="list-style-type: none"> • Current probe When connecting a current probe to the input terminal and probe power terminal of a module, pass the two cables together through a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA: A1190MN) at the SL1000 end. • USB cable Use a shielded cable (YOKOGAWA: A1421WL) and attach a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA: A1190MN) to the SL1000 end of the cable. Use a cable that is 3 m or less in length. |

| Item | Specifications |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <ul style="list-style-type: none"> External trigger input, external clock input, and external clock output Use a BNC cable and attach a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA: A1190MN) to the SL1000 end of the cable. Use a cable that is 3 m or less in length. Ethernet connector Use a category 6 or better STP cable that is 3 m or less in length. Attach a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA: A1190MN) to the instrument end of the cable. Power code Attach a ferrite core (TDK: ZCAT3035-1330, YOKOGAWA: A1179MN) to the SL1000 end of the cable. GO/NO-GO/ALARM/REMOTE I/O terminal Use a twisted-pair cable. Connect one cable to the I/O terminal and the other cable to the functional ground terminal within the terminal. In addition, pass the SL1000 end of the twisted-pair cable twice (the two sections of the same cable together) through the ferrite core (TDK: ZCAT1325-0530A, YOKOGAWA: A1181MN). Use a cable that is 3 m or less in length. Probe connected to a module When connecting 701904 to a module, attach a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA: A1190MN) to the SL1000 end of the cable. When connecting a probe to a module, pass the SL1000 end of the cable twice through the ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA: A1190MN). |

Example of passing the cable through twice



| | |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Immunity | <p>Complying standard EN 61326-1 Table 2 (for use in industrial locations), EN 61326-2-1</p> <p>If the measurement lead or probe is connected to the input module, or if this instrument is connected to an object to be measured, immunity requirements may not be satisfied. In this case, the user sometimes needs to take proper actions.</p> <p>Influence in the immunity environment (performance criterion A)</p> <p>Noise increase</p> <p>701250: $\leq \pm 5$ mV (1:1 input, 50 mV range conversion) 701251: $\leq \pm 3$ mV (1:1 input, 10 mV range conversion) 701255: $\leq \pm 25$ mV (1:1 input, 50 mV range conversion) 701267: $\leq \pm 30$ mV (1:1 input, 200 mV range conversion) 701261: $\leq \pm 3$ mV 701262: $\leq \pm 3$ mV 701265: $\leq \pm 0.05$ mV 701270: $\leq \pm 100$ μSTR (when equivalent to ± 100 mV, gauge factor = 2, and bridge voltage = 2 V) 701271: $\leq \pm 100$ μSTR (when equivalent to ± 100 mV, gauge factor = 2, and bridge voltage = 2 V) 701275: $\leq \pm 3$ mV (1:1 input, 50 mV range conversion) 701281: Within the specifications 720210: $\leq \pm 25$ mV (1:1 input, 100 mV range conversion) 720211: $\leq \pm 25$ mV (1:1 input, 100 mV range conversion) 720250: $\leq \pm 5$ mV (1:1 input, 50 mV range conversion) 720268: $\leq \pm 300$ mV (1:1 input, 500 mV range conversion) 720266: $\leq \pm 0.05$ mV 720281: Within the specifications</p> <p>Test condition</p> <p>701250: 10 MS/s, envelope mode, 500 mV range, no input filter, with the tip of the probe (700929 (10:1)) shorted 720250: 10 MS/s, envelope mode, 500 mV range, no input filter, with the tip of the probe (700929 (10:1)) shorted 701251: 1 MS/s, envelope mode, 100 mV range, no input filter, with the tip of the probe (700929 (10:1)) shorted 701255: 10 MS/s, envelope mode, 500 mV range, no input filter, with the tip of the probe (701940 (10:1)) shorted 701267: 1M S/s, envelope mode, 2 V range, no input filter, with the tip of the measuring lead shorted 720268: 100 kS/s, envelope mode, 2 V range, no input filter, with the tip of 701904 shorted 701261: 100 kS/s, envelope mode, 50 mV range, no input filter, with the end of the 3-m twisted-pair cable shorted</p> |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

7.7 General Specifications

| Item | Specifications |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 701262: 100 kS/s, envelope mode, 50 mV range, no input filter, with the end of the 3-m twisted-pair cable shorted |
| | 701265: 100 kS/s, envelope mode, 1 mV range, no input filter, with the end of the 3-m twisted-pair cable shorted |
| | 720266: 100 kS/s, envelope mode, 1 mV range, no input filter, with the end of the 3-m twisted-pair cable shorted |
| | 701270: 100 kS/s, envelope mode, 500 μ STR, gauge factor: 2.0, no input filter 701955 bridge voltage: 2 V 701956 bridge voltage: 10 V |
| | 701271: 100 kS/s, envelope mode, 500 μ STR, gauge factor: 2.0, no input filter 701957 bridge voltage: 2 V 701958 bridge voltage: 10 V |
| | 701275: 100 kS/s, envelope mode, 500 mV range, no input filter, with the tip of the probe (700929 (10:1)) shorted |
| | 701281: 1 MS/s, envelope mode, Frequency, 1 Hz range, no input filter User (± 1 V, threshold level: 0 V, hysteresis: $\pm 1\%$), with the tip of the probe (700929 (10:1)) shorted |
| | 720281: 1 MS/s, envelope mode, Frequency, 1 Hz range, no input filter User (± 1 V, threshold level: 0 V, hysteresis: $\pm 1\%$), with the tip of the probe (700929 (10:1)) shorted |
| | 720210: 100 MS/s, envelope mode, 1 V range, no input filter, with the tip of the probe (700929 (10:1)) shorted |
| | 720211: 100 MS/s, envelope mode, 1 V range, no input filter, with the tip of the probe (700929 (10:1)) shorted |
| | Test Item |
| | 1. Electrostatic discharge EN 61000-4-2 Air discharge: ± 8 kV, contact discharge: ± 4 kV, criteria B |
| | 2. Radiated immunity EN 61000-4-3 80 MHz to 1 GHz, 1.4 GHz to 2 GHz, 10 V/m Criteria A 2 GHz to 2.7 GHz, 3 V/m Criteria A Criteria A |
| | 3. Conducted immunity EN 61000-4-6 3 V, criteria A |
| | 4. Electrical fast transient/burst EN 61000-4-4 Power line: ± 2 kV, signal line: ± 1 kV, criteria B |
| | 5. Power frequency magnetic field EN 61000-4-8 30 A/m, 50 Hz, criteria A |
| | 6. Surge immunity EN 61000-4-5 Between lines: ± 1 kV, common: ± 2 kV, criteria B |
| | 7. Voltage dip and interruption EN 61000-4-11 1 cycle, both polarities, 100%, criteria A 10 cycle, both polarities, 60%, criteria A 25 cycle, both polarities, 30%, criteria A 250 cycle, both polarities, 100%, criteria C |
| | Definitions of criteria A, B and C |
| | Criteria A: Aforementioned "Influence in the immunity environment" is met during the test. |
| | Criteria B: This apparatus continues to operate without hang-up or falling into uncontrollable conditions during the test. No change of actual operating state or stored data is allowed. |
| | Criteria C: When the noise is applied, temporary degradation or less of function is observed and to recover the normal condition, an operator intervention or system reset is required. |

Environmental Standards⁶ EU RoHS Directive compliant⁷

1. If the 701260 module is inserted into the SL1000, it will not comply with safety standard EN 61010-1:2010 or EN 61010-2-030:2010.
2. The Overvoltage Category is a value used to define the transient overvoltage condition and includes the impulse withstand voltage regulation. I applies to electrical equipment that is powered by a circuit with overvoltage control. II applies to electrical equipment that is powered through a fixed installation such as a wall outlet wiring to 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. The scope of each measurement category is as follows.

Measurement category Other (O) 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. If the module specifications fall under measurement category O, the estimated transient voltage that may appear at the signal input terminals is 1500 V.

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

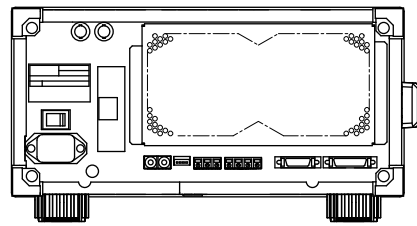
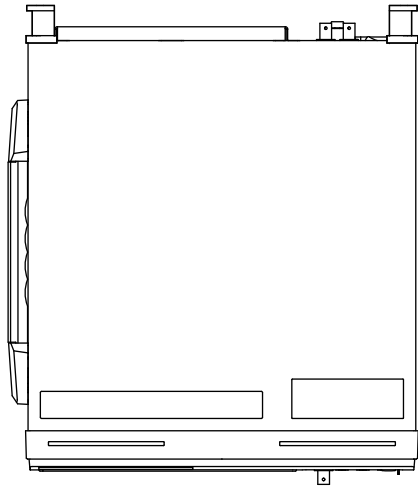
4. Pollution Degree: Applies to the degree of adhesion of a solid, liquid, or gas which deteriorates withstand voltage or surface resistivity. Pollution Degree 2 applies to normal indoor atmospheres (with only non-conductive pollution).
- 5 Group 1: Equipment that does not intentionally generate or use radio-frequency (RF) energy
- 6 For conformity to environmental regulations and/or standards other than EU, contact your nearest YOKOGAWA office (PIM 113-01Z2).
- 7 If any of the following modules is inserted into this instrument, the instrument will not comply with the EU RoHS Directive (environmental standard).

| MODEL | Name |
|--------|-----------------------------------------------------------|
| 720210 | High-Speed 100 MS/s, 12-Bit Isolation Module |
| 701250 | High-Speed 10 MS/s, 12-Bit Isolation Module |
| 701260 | High-Voltage 100 kS/s, 16-Bit Isolation Module (with RMS) |
| 701267 | High-Voltage 100 kS/s, 16-Bit Isolation Module (with RMS) |
| 701280 | Frequency Module |
| 701281 | Frequency Module |

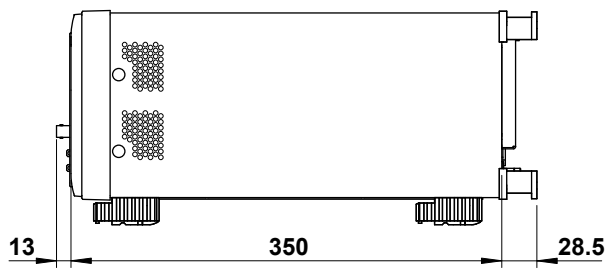
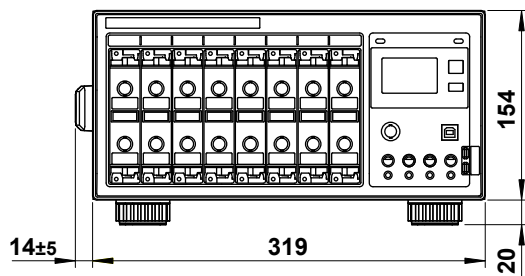
7.8 External Dimensions

SL1000

Unit: mm



Rear View



Unless otherwise specified, tolerance is $\pm 3\%$ (however, tolerance is ± 0.3 mm when below 10 mm).

Appendix 1 TCP and UDP Port Numbers Used in Ethernet Communications

The TCP and UDP port numbers that the SL1000 Ethernet interface uses are as follows:

TCP Port Numbers That the SL1000 Uses

| Port Number | Description | Function |
|-------------|-------------------------------|-------------------------------------------|
| 20 | File Transfer [Default Data] | FTP server |
| 21 | File Transfer [Control] | FTP server |
| 25 | Simple Mail Transfer Protocol | SMTP client |
| 111 | VXI-11 | SL1000 control via the Ethernet interface |
| 1024 | | |
| 1025 | | |

UDP Port Numbers That the SL1000 Uses

| Port Number | Description | Function |
|-------------|---------------------------|-------------------------------------------|
| 67 | Bootstrap Protocol Server | DHCP client |
| 68 | Bootstrap Protocol Client | (receive wait port) |
| 123 | Network Time Protocol | SNTP client |
| 111 | VXI-11 | SL1000 control via the Ethernet interface |

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