YOKOGAWA ◆

Test & Measurement Instruments
All Products Guide

DC Source & Measure

Power Measurements

Waveform Measurements

Optical Device Testing

Optical Network Testing

(T Ed:)
Vol.1

Yokogawa Meters & Instruments Corporation

Catalog YMI120-E

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Internet Website

http://www.yokogawa.com/ymi/

http://tmi.yokogawa.com/

The Yokogawa website offers not only product and technical information but also campaign information, user registration, document download, free software download, e-mail news subscription, catalog request, price inquiry, and lots of other content.

Test & Measurement Instruments ALL PRODUCTS GUIDE Vol.1
(T Edition)

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Oscilloscopes

Digital Power Analyzers

Generators, Sources, Manometers etc.

Optical Measureing Instruments

CE Products with this mark conform to the EMC standards (regulations on electromagnetic interference) of European Community.

Waveform Measuring

ScopeCorder Series Selection Guide

■ The ScopeCorder series can be used to capture single-shot or infrequently recurring signals.
They can also execute computations on repetitive waveforms, and automatically extract waveform parameters.
The ScopeCorder series offers an extensive selection with large-capacity memories, powerful triggering functions, and internal printers. It also can save and load data to and from internal or external media.
DL750P and SL1400 can provide big paper output capability for many applications in the field.

	Model	DL850/DL850V	DL750	DL750P	SL1400
Item		...P4	...P3	...P3	...P6
Features		100 MS/s high-speed, 12-bit high-resolution, 1 kV(*2) isolated voltage measurement 128 multi-channel voltage and 128-bit logic measurement Continuous and simultaneous saving of 100 KS/s, 16-channel signals to the hard disk (when the option is specified) CAN bus monitoring and trend waveform display (only DL850V) A variety of 15 plug-in modules	Compact, 16 ch isolated inputs (8 module slots) GigaZoomEngine and Max 1 GW Dual Capture Eleven kinds of plug-in input modules Web server functions A6 (112 mm) printer Probe power connectors	Compact, 16 ch isolated inputs (8 module slots) GigaZoomEngine and Max 1 GW Dual Capture Eleven kinds of plug-in input modules Web server functions A4 (210 mm) Big Printer Probe power connectors	Compact, 16 ch isolated inputs (8 module slots) Eleven kinds of plug-in input modules Web server functions A4 (210 mm) Big Printer Probe power connectors
Max. sampling rate		100 MS/s (*2)	10 MS/s (*2)	10 MS/s (*2)	10 MS/s (*2)
Bandwidth		20 MHz (*2)	3 MHz (*2)	3 MHz (*2)	3 MHz (*2)
Number of analog input channels		128 ch max (when using eight 720220 modules)	Plug-in module: 16 ch (isolation)	Plug-in module: 16 ch (isolation)	Plug-in module: 16 ch (isolation)
Logic input		128 bits max (when using eight 720230 modules)	St'd: 16 (8 bits × 2)	St'd: 16 (8 bits × 2)	St'd: 16 (8 bits × 2)
Max. vertical sensitivity (1:1)		100 µV/div (*2)	100 µV/div (*2)	100 µV/div (*2)	1 mV range
Vertial axis resolution		16 bit (*2)	Max. 16 bits (*2)	Max. 16 bits (*2)	Max. 16 bits (*2)
Max. sweep sensitivity		100 ns/div (*2)	500 ns/div (*2)	500 ns/div (*2)	100 µs Setting
Max. record length	St'd	250 Mpts (MW) max/10 Mpts (MW) (16 ch)	50 MW max/2.5 MW (16 ch)	50 MW max/2.5 MW (16 ch)	50 MW max/2.5 MW (16 ch)
	Optional	2 Gpts (GW) max / 100 Mpts (MW) (16 ch)	1 GW max/50 MW (16 ch)	1 GW max/50 MW (16 ch)	—
Internal media drive	selectable	SD memory card slot	PC card, FDD and Zip	PC card, FDD	PC card
Internal HDD	Optional	Internal 160 GB (FAT32) or external HDD	40 GB (FAT32)	40 GB (FAT32)	40 GB (FAT32)
Interface	St'd	USB2.0/ Ethernet (1000BASE-T)	USB/GP-IB/RS232/SCSI	USB/GP-IB/RS232/SCSI	USB/GP-IB/RS232/SCSI
	Optional	GPIB	Ethernet	Ethernet	Ethernet
Internal printer		112 mm width (optional)	112 mm width (st'd)	210 mm width (st'd)	210 mm width (st'd)
Others	Optional	• 15 types of plug-in modules • IRIG interface • User-defined math function • Probe power (4-output)	DSP channels User-defined Math computations Probe Power Connectors DC 12 V model available	DSP channels User-defined Math computations Probe Power Connectors	Probe Power Connectors
Display (TFT LCD)		10.4-inch color XGA	10.4-inch color, SVGA	10.4-inch color, SVGA	10.4-inch color, SVGA
External dimensions W × H × D (mm)		355 × 259 × 180	355 × 250 × 180	355 × 250 × 225	355 × 250 × 225
Weight (kg)		Approx. 6.5 (*3)	Approx. 6.6 *3	Approx. 8.0 *3	Approx. 8.0 *3

*1: See each product catalog for more detaled specifications   *2: Depends on input module   *3: Plug-in modules are not included

Plug-in Module Selection Guide

Input	Model No.	Sample Rate / Resolution	Channel Number	Isolation	Maximum Input Voltage (DC + ACpeak)	DC Accuracy	Features
Analog Voltage	720210 *8	100 MS/s	2	Isolated	1000V *2 200V *3	± 0.5%	High speed · High voltage · Isolated
	701250	10MS/s, 12-bit	2	Isolated	600V *4 250V *5	± 0.5%	10 MS/s, 12 bit, broad bandwidth (3 MHz), high accuracy (0.5%), high noise immunity
	701251	1MS/s, 16-bit	2	Isolated	600V *4 140V *5	± 0.25%	1 MS/s, 16 bit, bandwidth: 300 kHz, high accuracy (0.25%) High sensitivity range (10 mV), low noise (±100 µVtyp), and high noise immunity
	701260	100kS/s, 16-bit	2	Isolated	1000V *4 850V *5	± 0.25%	High voltage (direct 850 V input), high accuracy (0.25%), with RMS, and high noise immunity
	720220 *8	200kS/s	16	Isolated (GND-terminal) non-isolated (CH-CH)	42V *3	±0.3%	16CH voltage measurement (Scan-type)
Temperature	701261/62	100kS/s (Voltage), 500S/s (Temperature)	2	Isolated	42V	± 0.25% (Voltage)	Universal modules (voltage/temperature), voltage 100 kS/s, 16-bit, temperature 500 S/s Voltage (50 mV to 200 V range), thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel), with AAF (701262)
	701255	10MS/s, 12-bit	2	Non-isolated	600V *4 *6 250V *5	± 0.5%	10 MS/s, 12-bit Non-Isolation (non-isolation version of model 701250)
Temperature	701265	500S/s, 16-bit	2	Isolated	42V	± 0.08% (Voltage)	Both temperature and voltage input, frequency range of 100 Hz, thermocouple (K, E, J, T, L, U, N, R, S, B, W, iron-doped gold/chromel), High accuracy voltage (0.08%), high sensitivity range (1 mV), and low noise (±4µVtyp)
Acceleration	701275	100kS/s, 16-bit	2	Isolated	42V	± 0.25% (Voltage) ± 0.5% (Acceleration)	Both acceleration and voltage input, built-in anti-aliasing filter Supports built-in amp type acceleration sensors (4 mA/22 V)
Strain	701270	100kS/s, 16-bit	2	Isolated	42V	± 0.5% (Strain)	Supports strain NDIS, high accuracy (0.5%), 2, 5, 10 V built-in bridge power supply
	701271	100kS/s, 16-bit	2	Isolated	42V	± 0.5% (Strain)	Supports strain DSUB, high accuracy (0.5%), 2, 5, 10 V built-in bridge power supply, and shunt CAL
Frequency	701280	25kS/s, 16-bit	2	Isolated	420V *4 42V *5	± 0.1% (Frequency)	Measurement frequency of 0.01 Hz to 200 kHz, Measured parameters (frequency, rpm, period, duty, power supply frequency, distance, speed)
Logic	720230 *8	10 MS/s	8-bit x 2 ports	non-isolated	—	—	(8-bit/port) x 2, compatible with four-type logic probe (sold separately)
CAN	720240 *9	100 kS/s	(16signalsx2) port	Isolated	10V	—	CAN Data of max. 16-bit allowable

*4: When using the Isolation probe (700929 or 701947).   *5: When using the 1:1 safety adapter lead (701901).   *6: When using the 10:1 passive probe (701940)   *7: Probes not included with any modules.

Model	Description
701250	High-speed 10 MS/s 12-bit Isolation module (2 CH)
701251	High-speed 1 MS/s 16-bit Isolation module (2 CH)
701255	High-speed 10 MS/s 12-bit non-Isolation module (2 CH)
701260	High-voltage 100 kS/s 16-bit Isolation module (2 CH, with RMS)
701261	Universal module (2 CH)
701262	Universal module (with anti-aliasing filter, 2 CH)
701265	Temperature/high-precision voltage module (2 CH)
701270	Strain module (NDIS, 2 CH)

Model	Description
701271	Strain module (DSUB, Shunt-CAL, 2 CH)
701275	Acceleration module (with anti-aliasing filter, 2 CH)
701280	Frequency module (2 CH)
720210 *8	High-speed 100 MS/s 12-Bit Isolation Module (2 CH)
720220 *8	Voltage Input Module(16 CH)
720230 *8	Logic Input Module (16 CH)
720240 *9	CAN Bus Monitor Module (32 CH, available DL850V only)

*8: Available for only DL850/DL850V.   *9: Available for only DL850V.

ScopeCorder

DL750/DL750P

*Scope**Corder***

Innovative Solutions for Long-Term Recording to both Memory and Paper
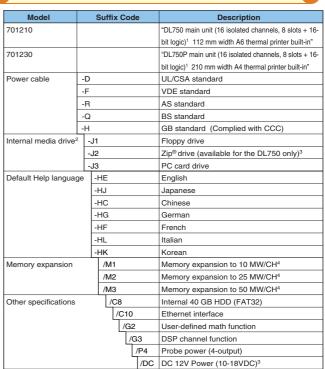
DL750 $C\epsilon$ DL750P $C\epsilon$

Overview

ScopeCorder is a new measurement tool combining the functions of an oscilloscope for capturing instantaneous phenomena and a data recorder for monitoring long-term trends

Features

- Standard high resolution A4 thermal printer (DL750P)
- Effective print width is 200 mm (1600-dot resolution) (DL750P)
- Compact body and isolated 16 analog channels, 8 slots and 16-bits logic input.
- Eleven kind of plug-in modules offers high accuracy and low noise measurement and also offer various measurement (Voltage/Current/Temperature/Strain/Vibration/Frequency)
- 1 GW large memory and 30 days observation.
- 1 GW instantaneous display (GigaZoom Function)
- Simultaneous high-speed and low-speed recording using Dual Capture
- Cycle statistical calculation
- Many Ethernet functions (Web server/FTP server/Email)
- Various communication interfaces (USB/Ethernet/GPIB/RS232/SCSI)
- PC card drive available
- 40GB internal hard drive

Basic Specifications

Input
 Type   Isolated plug-in module
 Slots   8 (16 channels)
 Logic inputs 16 (8 bits × 2)
Sweep time   500 ns to 3 days/div (10 div)
Display   10.4-inch color TFT liquid crystal display
Built-in printer
 Printing method Thermal line-dot printing
 Paper width   112 mm (DL750)
               210 mm (Effective print width 200mm) (DL750P)
Communication interfaces
               GP-IB, USB peripheral equipment jacks (USB keyboards and USB printers), USB (complies with Rev. 1.1, for connection to PC), Ethernet (complies with 100BASE-TX and 10BASE-T; with /C10 option), serial (RS232), and SCSI
Internal media drives
               Floppy drive, Zip® drive (DL750), or PC card (choose one), and 40 GB hard drive (with /C8 option)
External dimensions
               355 (W) × 250 (H) × 180 (D) mm (DL750)
               355 (W) × 250 (H) × 225 (D) mm (DL750P)
Weight   Approx. 6.6 kg (DL750), 8.0 kg (DL750P), (main unit with full options, including M3, C8, C10, and P4)
               Approx. 9 kg (DL750), 10.3 kg (DL750P), (main unit and eight 701250 modules)

1 GW Memory for full-length display and instantaneous zooming (to user-specified size)

	Maximum Recording Time			
Sample Rate	Seconds	Minutes	Hours	Days
10 MS/s	100	1.67	0.028	0.001
1 MS/s	600	10	0.167	0.007
100 kS/s	9000	150	2.5	0.10
10 kS/s	72000	1200	20	0.83
1 kS/s	864000	14400	240	10
200 S/s	2592000	43200	720	30

Model Number and Suffix Codes

Model	Suffix Code		Description
701210			"DL750 main unit (16 isolated channels, 8 slots + 16-bit logic)[1] 112 mm width A6 thermal printer built-in"
701230			"DL750P main unit (16 isolated channels, 8 slots + 16-bit logic)[1] 210 mm width A4 thermal printer built-in"
Power cable	-D		UL/CSA standard
	-F		VDE standard
	-R		AS standard
	-Q		BS standard
	-H		GB standard (Complied with CCC)
Internal media drive[2]	-J1		Floppy drive
	-J2		Zip® drive (available for the DL750 only)[3]
	-J3		PC card drive
Default Help language	-HE		English
	-HJ		Japanese
	-HC		Chinese
	-HG		German
	-HF		French
	-HL		Italian
	-HK		Korean
Memory expansion		/M1	Memory expansion to 10 MW/CH[4]
		/M2	Memory expansion to 25 MW/CH[4]
		/M3	Memory expansion to 50 MW/CH[4]
Other specifications		/C8	Internal 40 GB HDD (FAT32)
		/C10	Ethernet interface
		/G2	User-defined math function
		/G3	DSP channel function
		/P4	Probe power (4-output)
		/DC	DC 12V Power (10-18VDC)[3]

1. Plug-in modules are not included.
2. Choose only one.
3. Zip drive and DC12V power supply cannot be specified together with the DL750P.
4. Cannot be specified together.

ScopeCorder

DL850/DL850V

ScopeCorder

Achieve New Measurement Capabilities with Higher Speeds, Isolation, Channel Count, and CAN
Introducing Our Ultra-Fast Memory Recorder!

DL850 CE   **DL850V** CE

Overview

The DL850 ScopeCorder Series are modular, waveform recording instruments that can measure voltage, current, strain, acceleration, and other phenomena simultaneously. With high speed sampling, high isolation withstand voltage, and multichannel measurements, the DL850 Series offers powerful support in the development, evaluation, and quality control of energy efficient devices.
With 15 unique plug-in module types, the DL850 can handle nearly any measurement task. The DL850 is backwards-compatible with all modules of its predecessor, the DL750. In addition, four new modules have been added to the lineup. Combine modules at will to measure anything from minute voltages to high-speed, high withstand voltages.

- High-speed voltage **NEW!** ● High voltage ● High-precision voltage
- Multichannel voltage **NEW!** ● Temperature ● Strain ● Acceleration
- Frequency ● Logic input **NEW!** ● CAN monitoring (with the DL850V) **NEW!**

Basic Specifications

Max. sampling rate	100 MS/s (720210)[*1]
Frequency bandwidth	20 MHz (720210)[*1]
Number of channels	Max. 128 ch,
	Number of slots for the plug-in module: 8
Logic input	Max. 128 bits
	(When using eight 720230 modules)
A/D conversion resolution	16 or 12 bits [*1]
DC accuracy	±(0.5% of 10 div)
	(701250 and 701255)[*1]
Time axis setting	100 ns/div to 30 days/div
Time axis accuracy	±0.005%
Max. record length	Standard 10 Mpts (MW)/ch, total 250 Mpts
	(MW) (with /M2 option)
	100 Mpts (MW)/ch, total 2 Gpts (GW)
Channel-to-channel calculation function	Definable math waveforms 8
Automatic measurement of waveform parameters	Maximum number of measured waveforms 24
Cycle statistical/historic process	Maximum number of cycles 64,000
	Maximum number of parameters 64,000
Internal media drive	SD memory card slot (standard)
	160 GB internal hard drive (option)
	External hard drive can be connected (option)
Communication interface	USB 2.0 (standard)/1000BASE-T Ethernet (standard)
	GP-IB (option)
Built-in printer(option)	112-mm width, A6 thermal printer
Other options	IRIG interface
	User defined computation
	Four probe power outputs
Display	10.4-inch TFT color LCD monitor
Display resolution	1024 × 768 pixels (XGA)
External dimensions	355 (W) × 259 (H) × 180 (D) mm
	(excluding handle and protrusions)
Weight	Approx. 6.5 kg to 9 kg (varies depending on the types and the number of modules used)

(*1): Varies depending on the module.

● **High-speed 100 MS/s, high-resolution 12-bit, 1 kV isolated measurements**

* With a combination of the high-speed isolation module 720210 and the 700929 or 701947 isolation probe

Yokogawa's isoPRO technology offers industry leading isolation performance at the highest speeds. The isoPRO core technology is designed with energy savings applications in mind. It gives you the performance needed to develop high efficiency inverters, which employ high voltages, large currents, and high operating speeds.

iSoPRO **(High-speed & high withstand voltage isolation technology)**

Using high speed optical fiber-based transmissions, the module achieves high speed ADC clock and data isolation.

720210 High-speed Isolation Module

Rising waveform not completely captured   **Rising waveform completely captured**

10MS/s   **100MS/s**

Example: Same inverter output waveform measured at 10 MS/s and 100 MS/s

● **Up to 128 channels of voltage input, and 128 bits of logic input**

The 16-channel Voltage Input Module (scanner type) can measure at 10 kS/s sample rate even when using all 16 channels. With this module populating all 8 input module slots, the DL850 performs 128-channel voltage measurements. The Logic Input Module supports everything from TTL levels to contact inputs. With eight logic modules, the DL850 can monitor and capture 128 bits of logic.

*A response time for the logic input varies depending on the logic probe used.

Power supplies used in home computing electronics have many outputs; therefore, there are many measurement points. With a multichannel module, you are not limited to voltage measurements; a single unit can also measure everything from PC control signals to AC fan operation and slow to high-speed signals.
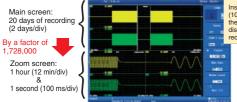
720230 Logic Input Module (left photo)
720220 16-channel Voltage Input Module (right photo)

● **Large 2-GPoint memory (option) offers long duration measurement and two instantaneous zoom locations**

Comes standard with 250 MPoints of memory, expandable with 1 or 2 GPoint options. Large capacity memory does not simply provide longer durations of measurement. It makes it possible to measure at a higher sampling rate at the same measurement time.

Zoom to 2 locations instantaneously
GiGAZoom 2 ENGINE®

Main screen:
20 days of recording (2 days/div)

By a factor of 1,728,000

Zoom screen:
1 hour (12 min/div)
&
1 second (100 ms/div)

Instantly zooms 1 second (100 ms/div) even when the main screen is displaying 20 days of recording (2 days/div)

Long memory does not guarantee better efficiency if the memory handling and display engine is slow. Our faster than ever GIGAZoom 2 Engine instantaneously zooms into two locations.

● **Long Duration, Continuous Saving of Waveforms**

– Continuous hard disk recording (/HD0, /HD1 option) –

Measured data can be streamed directly to a built-in 160 GB hard disk (option) or through the external HDD interface (option). With long duration evaluation testing, measurements can be performed at 100 kS/s on 16 channels simultaneously for 10 hours*.

* The /HD0 and /HD1 options cannot be specified together. The measurement time depends on the performance of the hard drive connected through the external HDD interface.

Data being continuously recorded on the DL850/DL850V's built-in HDD (/HD1 option) can be transferred to a PC without stopping measurement*. You can display and analyze the transferred waveform data using Xviewer, an accessory program for the PC.

* This function is an option of the optional software Xviewer.

Divides and saves measured data across multiple files!

Xviewer

Divided files are automatically uploaded and linked.

Ethernet or USB

Key Point 1

If an abnormality occurs during a long duration continuous test, you can analyze the saved measured data with a PC without having to stop measurement !

Key Point 2

Critical measured data can be easily duplicated on the main unit and a PC.

DL850V Vehicle Edition
ScopeCorder Vehicle Edition

The ScopeCorder Vehicle Edition can use a CAN Monitor Module (model 720240) to display CAN protocol communication data as analog values, from which triggers can also be activated.

■ Number of input channels: 16 signal × 2 ports
■ Input connector: D-Sub 9-pin (male)
■ DBC database available
* Up to two modules can be installed in the DL850V main unit.

720240
CAN Bus
Monitor Module

Model Number and Suffix Codes

Models and Suffix Codes

Model	Suffix Codes		Description
DL850			DL850 main unit, 250MPts(W) memory*1
DL850V			DL850V main unit, 250MPts(W) memory*1
Power Code	-D		UL and CSA standard
	-F		VDE standard
	-R		AS standard
	-Q		BS standard
	-H		GB standard
Languages	-HE		English menu and panel
	-HJ		Japanese menu and panel
	-HC		Chinese menu and panel
	-HK		Korean menu and panel
	-HG		German menu and panel
	-HF		French menu and panel
	-HL		Italian menu and panel
	-HS		Spanish menu and panel
Options	/B5		Built-in printer (112mm)
	/M1		Memory expansion to 1GPts(W)*2
	/M2		Memory expansion to 2GPts(W)*2
	/HD0		External HDD interface*3
	/HD1		Internal HDD (160GB)*3
		/C1	GP-IB interface*4
		/C20	IRIG and GP-IB interface*4
		/G2	User-defined math function
		/G3	Real time math function (coming soon)
		/P4	Four probe power outputs

*1: Plug-in modules are not included.
*2, *3, *4: Choose either one for each item when specified.

Models of dedicated Plug-in Modules for DL850/DL850V

Model	Description
720210	High-speed 100 MS/s 12-bit Isolation Module
720220	Voltage Input Module (16 channels)
720230	Logic Input Module
720240*2	CAN Bus Monitor Module*2

*1: Probes are not included with any modules.
*2: The 720240 module is for DL850V only.
*3: For other common modules, see page 2.

ScopeCorder LITE

SL1400

ScopeCorder

Easily & Quickly Saves Data to Memory and Paper

SL1400

CE

Overview

A plug-in module type chart recorder with a large built-in A4 sized high-resolution thermal printer

Features

- Easy-to-operate
- Standard high resolution A4 size thermal printer
- Effective print width is 200 mm (1600-dot resolution)
- Compact body and isolated 16 analog channels, 8 slots and 16-bits logic input
- Eleven kinds of plug-in modules offers high accuracy and low noise measurement and also offer various measurement, Voltage/ Current/Temperature/Strain/Vibration/Frequency
- 50MW large memory and 30 days observation
- Cycle statistical calculation
- Many Ethernet functions (Web server/FTP server/E-mail)
- Various communication interface USB/Ethernet/GP-IB/RS-232/ SCSI
- PC card drive is available
- 40 GB internal hard drive
- USB storage function is available

Basic Specifications

Input
  Type   Isolated plug-in module
  Slots   8 (16 channels)
  Logic inputs   16 (8 bits × 2)
Sweep time   100 us to 30 days
Display   10.4-inch color TFT liquid crystal display
Built-in printer
  Printing method Thermal line-dot printing
  Paper width   210 mm (Effective print width 200 mm)
Communication interface
          GP-IB, USB peripheral equipment jacks
          (USB keyboards and USB printers), USB (compiles
          with Rev. 1.1, for connection to PC), Ethernet (complies
          with 100 BASE-TX and 10 BASE-T; with /C10 option),
          serial (RS232), and SCSI
Internal media drives
          PC card or Drive less (choose one), and 40GB hard drive
          (with /C8 option)
External dimensions
          355(W) × 250(H) × 225(D) mm
Weight   Approx. 8.0 kg (main unit with full options, including
          C8, C10 and P4)
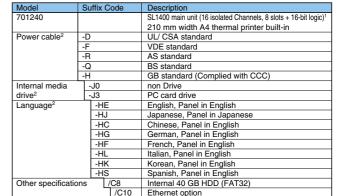   Approx. 10.3 kg (main unit and eight 701250 modules)

Model Number and Suffix Codes

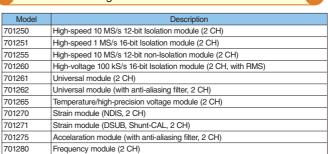| Model	Suffix Code			Description
701240				SL1400 main unit (16 isolated Channels, 8 slots + 16-bit logic)[1] 210 mm width A4 thermal printer built-in
Power cable[2]	-D			UL/ CSA standard
	-F			VDE standard
	-R			AS standard
	-Q			BS standard
	-H			GB standard (Complied with CCC)
Internal media drive[2]	-J0			non Drive
	-J3			PC card drive
Language[2]		-HE		English, Panel in English
		-HJ		Japanese, Panel in Japanese
		-HC		Chinese, Panel in English
		-HG		German, Panel in English
		-HF		French, Panel in English
		-HL		Italian, Panel in English
		-HK		Korean, Panel in English
		-HS		Spanish, Panel in English
Other specifications		/C8		Internal 40 GB HDD (FAT32)
			/C10	Ethernet option
			/P4	Probe power (4-output)

1. Plug-in modules are not included.
2. Choose only one.

Module Selection

* Above plug-in modules can be used among all ScopeCorder series.

Plug-in Module Model Numbers

Model	Description
701250	High-speed 10 MS/s 12-bit Isolation module (2 CH)
701251	High-speed 1 MS/s 16-bit Isolation module (2 CH)
701255	High-speed 10 MS/s 12-bit non-Isolation module (2 CH)
701260	High-voltage 100 kS/s 16-bit Isolation module (2 CH, with RMS)
701261	Universal module (2 CH)
701262	Universal module (with anti-aliasing filter, 2 CH)
701265	Temperature/high-precision voltage module (2 CH)
701270	Strain module (NDIS, 2 CH)
701271	Strain module (DSUB, Shunt-CAL, 2 CH)
701275	Accelaration module (with anti-aliasing filter, 2 CH)
701280	Frequency module (2 CH)

* Probes not included with any modules.

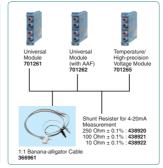**Waveform Measuring** **ScopeCorder Accessories**

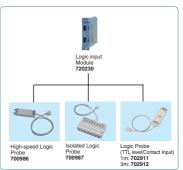| Product	Model No.	Description*1	
Differential Probe	700925	DC to 15 MHz, 1/10-1/100 selector switch, max. allowable differential voltage ±500 V (DC + ACpeak)	
Differential Probe	700924	DC to 100 MHz, 1/100-1/1000 selector switch, max. allowable differential voltage ±1400 V (DC + ACpeak) or 1000 Vrms (1/1000 range)	
Current Probe	701933	30 Arms, DC to 50 MHz, supports probe power	
Current Probe	701930	150 Arms, DC to 10 MHz, supports probe power	
Current Probe	701931	DC to 2MHz, , 500Arms	
Current Probe	701932	DC to 100MHz, 30Arms	
Probe Power Supply	701934	Supply (4 outputs),large current output, external probe power	
10:1 Probe (for Isolated BNC Input)	700929	1000 Vrms-CAT II	
1:1 Safety BNC Adapter Lead (in combination with followings)	701901	1000 Vrms-CAT II	
Safety Mini-Clips (Hook type)	701959	1000 Vrms-CAT II, 1 set each of red and black	
Large Alligator-Clips (Dolphin type)	701954	1000 Vrms-CAT II, 1 set each of red and black	
Passive Probe (10:1)*2	701940	Non-isolated 600 Vpk	
1:1 BNC-Alligator Cable	366926	Non-isolated 42 V or less, 1m	

*1 Actual allowable voltage is the lower of the voltages specified for the main unit, probe and cable.
*2 42 V is safe when using the 701940 with an isolated type BNC input.

Accessories Combinations

High-Speed Data Acquisition Unit

SL1000

Fast Acquisition, Transfer, and Storage High-Performance Data Acquisition Unit

SL1000

GiGAZoom
E N G I N E ™

Features

● **Fast Acquisition**
 – Up to 100 MS/s on all channels (10 ns sampling interval)
 – Supports parallel testing: Perform measurements with up to four simulta-neously independent sample rates
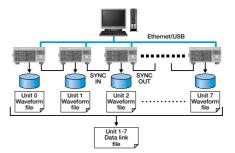● **Fast Transfer and Storage**
 – Stream data to PC via high speed USB 2.0 or 1000BASE-T Gigabit Ether-net
 – Stream data to a PC hard disk or the SL1000's internal hard disk in real time (at speeds of 1.6 MS/s = 100 kS/s × 16ch)[1]
 – Maximum 8 synchronized units
 1: Speed depends on PC performance and measuring conditions.
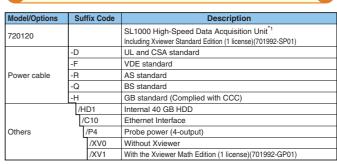● **Easy to use**
 – Easy to use Standard Acquisition Software
● **Max 128ch Synchronized (16ch x 8 units)**
 – Data files recorded my multiple units, in synchronized mode, are all linked together by a common LINK file, thereby facilitating batch processing. Using this LINK file, data from all units can be processed and analyzed, as one, at the same time.
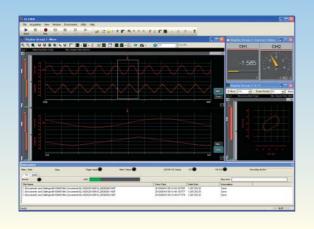
Basic Specifications

Plug & Play: Auto-recognition of units and modules
Input type: Plug-in module
 (A/D converters built in to each unit)
Maximum number of input channels:
 16 (One unit operation)
 128 (8 units synchronous operation)
Maximum sample rate: 100 MS/s on all channels
Measuring mode: Free Run and Triggered
Clock source: Internal and external
Maximum record length (internal memory):
 In Free Run mode 1 module: 32 MW/ch
 2 modules: 16 MW/ch
 3 to 4 modules: 8 MW/ch
 5 to 8 modules: 4 MW/ch
 In Single Trigger mode 1 module: 50 MW/ch
 2 modules: 25 MW/ch
 3 to 4 modules: 10 MW/ch
 5 to 8 modules: 5 MW/ch
Measuring groups: Up to 4 groups definable with independent sample rates
Trigger mode: Normal, Single, and Single(N)
Trigger source: Input channel, External, LINE , Time
Record conditions:
 For Free Run mode Immediate, abs. time, time divided, alarm, and external trigger
 For Trigger mode Each trigger
Internal hard disk: 40 GB (with the /HD1 option)
Maximum real-time hard disk recording speed:
 Internal hard disk 1.6 MS/s
 (= 200kS/s × 8ch = 100 kS/s × 16ch)

Ethernet/USB network diagram showing Unit 0–Unit 7 Waveform files, SYNC IN / SYNC OUT, and Unit 1-7 Data link file.

Model Number and Suffix Codes

Model/Options	Suffix Code			Description
720120				SL1000 High-Speed Data Acquisition Unit[1] Including Xviewer Standard Edition (1 license)(701992-SP01)
Power cable	-D			UL and CSA standard
	-F			VDE standard
	-R			AS standard
	-Q			BS standard
	-H			GB standard (Complied with CCC)
Others		/HD1		Internal 40 GB HDD
		/C10		Ethernet Interface
		/P4		Probe power (4-output)
			/XV0	Without Xviewer
			/XV1	With the Xviewer Math Edition (1 license)(701992-GP01)

*1: Plug-in modules and PC not included with the SL1000.

Model	Description
720210	High-speed 100MS/s 12-Bit Isolation Module (2ch)
701250	High-speed 10MS/s 12-Bit Isolation Module (2ch)
701251	High-speed 1MS/s 16-Bit Isolation Module (2ch)
701255	High-speed 10MS/s 12-Bit non-Isolation Module (2ch)
701260	High-voltage 100kS/s 16-Bit Isolation Module (with RMS, 2ch)
701261	Universal Module (2ch)
701262	Universal Module (with Anti-Aliasing Fileter, 2ch)
701265	Temparature / High-precision voltage Module (2ch)
701275	Acceleration / Voltage Module (with Anti-Aliasing Filter 2ch)
701270	Strain Module (NDIS, 2ch)
701271	Strain Module (DSUB, Shunt-CAL, 2ch)
701280	Frequency Module

Product	Model No.	Description
Synchronized connection cable	720901-01	For SL1000 (1 m)
	720901-02	For SL1000 (3 m)
Rack mounting kit	751541-E4	EIA standard
	751541-J4	JIS standard

Maximum measuring time (unit: sec) at Single triggered measurement

		Number of Measuring Channels			
		2ch	4ch	8ch	16ch
Sampling rate	100MS/s	0.5	0.25	0.1	0.05
	50MS/s	1	0.5	0.2	0.1
	10MS/s	2.5	1.25	0.5	0.25
	1MS/s	25	12.5	5	2.5
	500kS/s	100	50	20	10
	200kS/s	250	125	50	25
	1kS/s	50000	25000	10000	5000

High-Speed Data Acquisition Unit

SL1000 Acquisition Software

Easy to Use

Main Specifications of Acquisition Software

Plug and Play	Auto-recognition of units and modules
Measurement modes	Freerun and Triggered
ACQ modes	Normal, envelope, and box average
Clock sources	Internal and external
Measurement groups	Up to 4 groups definable with independent sample rates
Trigger modes	Normal, single, and single(N)
Trigger sources	CH1-CH16, LINE, Time, and External
Other trigger functions	Combination trigger, hold-off, pretriggers, and trigger delay
Save conditions	Manual operation, or based on time, or alarms
Other save functions	Manual save (file division), specify no. of saves, save all data in memory, and save simultaneously to PC's hard disk and SL1000's internal hard disk (with /HD1 option)
Save format	Binary data file (original, *.wdf)
Waveform data conversion (Xviewer)	Binary data file(s) can be converted to ASCII (*.csv) or Excel (*.xls) format
Maximum speed for saving in real time	
PC hard disk	1.6 MS/s (= 100 kS/s × 16 channels)[1]
Waveform monitor	Trend display (displays measured waveforms of different sample rates simultaneously)[2], and instantaneous value displays (digital, bar graph, meter, and thermometer)
X-Y display	X-axis channel settings, selection of main or zoomed waveform (in Triggered mode), and selection of the number of data points to draw (2 K, 10 K, 100 K)
Mark display (Free run mode)	Setting of marks (up to 128 marks, each mark can display up to 16 characters), display color setting, mark editing, deletion of marks, mark list, collectively saving mark data with the same file name as the waveform data, and loading mark data into Xviewer.
Accumulation display	Accumulates T-Y and X-Y waveforms
Snapshot	Waveform that is currently being displayed can be retained on the screen as a snapshot waveform. Display color setting and snapshot waveform deletion
Display groups	Up to 4 display groups
Other display functions	History waveform, arbitrary axis divisions, and horizontal axis scaling + specifiable units (external clock)
Waveform analysis	Cursor and parameter measurement[3]
Offline waveform computation (with /XV1 option)	
Max. Number of displayed waveforms (CHs)	
	10 waveforms (Math1 to Math 10)
Operations	+, -, ×, /, trigonometry, differentiation/integration, FFT, and others
Alarms	Channel (alarm display and alarm history analysis)[4], system alarm, and alarm output
GO/NO-GO determination[3]	Waveform parameter judgment and judgment output
System requirements	
OS	Windows XP (SP2 or later) or Windows Vista
CPU	Pentium 4, 2 GHz or faster (3.2 GHz or faster when using the auto-save function)
Memory	1 GB or more
Hard disk	500 MB or more of free space (40 GB or more when using the auto-save function)
Communication interfaces	USB 2.0/Ethernet 1000BASE-T (with /C10 option)
Display	XGA or better, Color: 65536 colors or better
Other	CD-ROM drive and mouse

[1]: Typical values. Actual values depend on PC performance and measurement conditions.
[2]: When the measurement mode is Free run, the trigger mode is Single(N), and the number of measurements is Infinite, there may be a limit to the number of channels that can be trend-displayed during measurement.
[3]: Triggered measurement
[4]: Free run measurement

Intuitive Operation

Setup Wizard Makes It Easy

The four screens of the Setup Wizard guide you easily through detailed settings for configuring the system, measuring, saving, and displaying. You can save and recall your settings at any time.
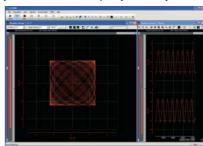

Setup Wizard

Start measurement

Control Buttons—Just Like Your DVD Remote

Measurement and saving can be started and stopped using the same familiar buttons found on a DVD remote control. Start using the instrument on the same day you receive it, with absolutely no programming required.
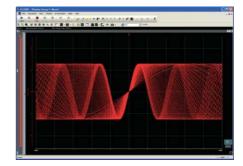

Displaying X-Y Waveforms

You can view both T-Y waveform display and X-Y waveform display. Using its fast update feature, you can evaluate data quickly and easily.
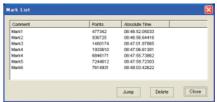

Accumulating Waveforms

Using the accumulation feature, you easily view unevenness of repetitive data.

Setting Marks

You can enter comments in the Mark area when monitoring over long periods of time (Free run mode).

Oscilloscopes

PC-Based Measuring Instruments

WE7000

Modular Type Measuring Instruments for Easy Operation

WE500   **WE900**   CE

only on sale in the United States, the United Kingdom, Germany, France, the Netherlands, Spain, Italy, South Korea, Australia, and Japan.

Features

- Modular Design for easy operation
- Modules for a Variety of Signals and Extensive Features
- Easily Control All Modules Using the Control Software
- Control Software that brings out the full functionality of the WE7000
- Network-Friendly Measuring Instrument

  USB2.0

  Simply connect a USB cable and communication is ready

  Provides high-speed data communication using USB 2.0 (up to 480 Mbps)

  Ethernet (100Base-TX/10Base-T)

  Enables remote monitoring and measurement using the network such as a corporate LAN
- Utility Software for More Convenience
- Transformation into Dedicated Measuring Instrument by Customization
- Embedded Modules That Enable High Speed and Independent Processing (Option)

Overview

- **Simple data acquisition without any software development**
  Each WE7000 system includes the standard control software and each module has its firmware resident within the module.
- **Isolation and noise immunity**
  Isolation and noise immunity are very important for mechanical electronics. WE7000 has great isolation from the base station to the input modules as well as channel to channel (depending on the module) isolation.
- **Various precision modules with traceability**
  WE7000 has various modules from 2 Hz to 20 MS/sec digitizing rates. There are also modules with signal output capability, including a precision D/A and a function generator.
- **Remote control and monitoring using Ethernet Communication**
  WE7000 control, monitoring, and real time saving of data are all available using Ethernet communication.

Specifications

Number of slots:

WE500:

5 measurement modules

WE900:

9 measurement modules

Interface for communicating with the PC:

USB (Complies with USB Rev. 2.0), Ethernet (10Base-T or 100Base-TX)

External dimensions:

WE500:

Approx. 213 (W) × 266 (H) × 360 (D) mm (projections excluded)

WE900:

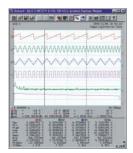Approx. 350 (W) × 266 (H) × 360 (D) mm (projections excluded)

List of Measurement Module Features

Product	Model Number	Bandwidth	Number of Channels	Isolation	Input Coupling	Range	Resolution bit	Maximum Memory (point)	Memory Partition	I/O Connector	Link Feature	Maximum number of waveforms displayed simultaneously	Scaling Feature	Other Features	Power Consumption	Number of Used Slots Weight
WE7116 2-CH, 20 MS/s Digitizer Module	7071 16/HE	DC to 8 MHz	2	No	DC/AC /GND	±100 mV to 50 V (1-2-5 steps)	12	4 M	Up to 1024	BNC	Yes	18 When 9 modules are linked	Yes	Calibration signal output	Approx. 10 VA	1 Approx. 0.7 kg
WE7275 2-CH, 1 MS/s Isolated Digitizer Module	7072 75/HE	DC to 400 kHz	2	Yes	DC/AC	±100 mV to 200 V (1-2-5 steps), 350 V	14	4 M	Up to 256	BNC	Yes	18 When 9 modules are linked	Yes	Anti-aliasing filter OFF/20 Hz to 40 kHz (2-4-8 steps)	Approx. 14 VA	1 Approx. 0.8 kg
WE7273 8-CH, 100 kS/s Isolated Digitizer Module	7072 73/HE	DC to 40 kHz	8	Yes	DC/AC	±50 mV to 50 V (1-2-5 steps)	16	8 M	Up to 256	Clamp terminal	Yes	72 When 9 modules are linked	Yes		Approx. 20 VA	1 Approx. 0.9 kg
WE7271 4-CH, 100 kS/s Isolated Digitizer Module	7072 71/HE	DC to 40 kHz	4	Yes	DC	±1 V to 20 V (1-2-5 steps), ±35 V	16	4 M	Up to 256	Clamp terminal	Yes	36 When 9 modules are linked	Yes		Approx. 12 VA	1 Approx. 0.7 kg
WE7272 4-CH, 100 kS/s Isolated Digitizer Module	7072 72/HE	DC to 40 kHz	4	Yes	DC	±1 V to 20 V (1-2-5 steps), ±35 V	16	4 M	Up to 256	BNC	Yes	36 When 9 modules are linked	Yes		Approx. 12 VA	1 Approx. 0.7 kg
WE7251 10-CH, 100 kS/s Digitizer Module	7072 51/HE	DC to 10 kHz	10	No L end common	DC	±1 V to 20 V (1-2-5 steps)	16	1 M	Up to 256	Input unit sold separately	Yes	90 When 9 modules are linked	Yes	Multiplex type	Approx. 8 VA	1 Approx. 0.7 kg
WE7241 10-CH Thermometer Module	7072 41/HE	Scan interval 0.5 s or longer	10	Yes	DC	K, E, J, T, L, U, N, R, S, B, W, KPvsAU7Fe ±50 mV to 50 V (1-2-5 steps)	14	None	––	Input unit sold separately	Yes	90 When 9 modules are linked	Yes	Multiplex type	Approx. 7 VA	1 Approx. 0.8 kg
WE7245 4-CH, 100 kS/s Strain Module	7072 45/HE	DC to 20 kHz	4	Yes	DC	1000 μ to 20000 μ strain, ±100 mV to ±20 V (1-2-5 steps)	15	4 M	Up to 256	Dsub (9-pin)	Yes	36 When 9 modules are linked	Yes	1, 2, or 4 gauges, DC bridge Gauge resistance 120 to 1 kΩ, auto balance	Approx. 15 VA	1 Approx. 1 kg
WE7235 4-CH, 100 kS/s Accelerometer Module	7072 35/HE	DC to 40 kHz	4	No	DC (voltage only) /AC	Gain: x1 (5 V) to x100 (50 mV) (1-2-5 steps)	16	4 M	Up to 256	BNC	Yes	36 When 9 modules are linked	Yes	Anti-aliasing filter OFF/20 Hz to 40 kHz (2-4-8 steps)	Approx. 12 VA	1 Approx. 0.8 kg
WE7521 4-CH Timing Measurement Module	7075 21/HE	100 ns to 20 s	4	No	DC/AC	Period, time interval, totalize count, up and down count, and frequency ratio measurements	––	4 M	Up to 256	BNC	Yes	32 When 8 modules are linked	Yes	Time stamp measurement	Approx. 8 VA	1 Approx. 0.7 kg
WE7281 4-CH, 100 kS/s D/A module	7072 81/HE	DC to 20 kHz	4	Yes	––	±1 V to 10 V (1-2-5 steps)	16	4 M	Up to 256	Clamp terminal	Yes	––	––	Sweep function, arbitrary waveform output	Approx. 15 VA	1 Approx. 0.9 kg
WE7282 4-CH, 100 kS/s D/A Module	7072 82/HE	DC to 20 kHz	4	Yes	––	±1 V to 10 V (1-2-5 steps)	16	4 M	Up to 256	BNC	Yes	––	––	Sweep function, arbitrary waveform output	Approx. 15 VA	1 Approx. 0.7 kg
WE7262 32-Bit Digital I/O Module	7072 62/HE	––	32	No	––	TTL level (input), CMOS level (output)	––	None	––	Dsub (25-pin)	No	32	––	2-MHz counter feature Connect the 707823/707824 and input/output contact signals	Approx. 4 VA	1 Approx. 0.6 kg
WE7081 CAN Bus Interface Module	7070 81/HE									Dsub (9-pin)		64	Yes	CAN data I/O	Approx. 5 VA	1 Approx. 0.7 kg
WE7562 Multi-Channel Analyzer Module	7075 62/HE	2 inputs, 0 to 10 V, AD channels: 512 to 16 k 6 stages, shaping time > 500 ns					2000 frames (1 kCH)			BNC	Yes	2	Yes	PHA, MCS, LIST Mode	Approx. 15 VA	1 Approx. 0.8 kg

Oscilloscopes

Application Software for WE7000

7077 02/7077 03/7077 14/7077 51/7077 61

Ethernet or optical communications
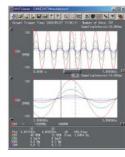

7077 02
Computation Function Setup Software

• Software utility that adds data computation function to the WE7000 Control Software.
• Enables four arithmetic operations, FFT analysis, filter functions, waveform parameter measurement, etc.
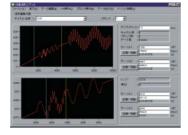
7077 03
Remote Monitor Add-On Software

• Multiple PCs can use a single measuring station.
• Other PCs can monitor the waveform while one PC is performing measurements. Measurement parameters can also be viewed.
• Able to block other PCs from starting or stopping measurements or changing measurement parameters while one PC is using the measuring station (Access Authority Control).
• Able to block other PCs from controlling or viewing the measuring instrument (Lock function).
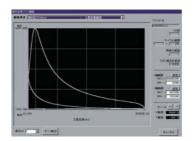
7077 14
Computation Waveform Viewer

• Can display waveforms of the WE7000 or DL Series data as well as compute and analyze the data on the PC
• Equipped with extensive computation functions

7077 51
Arbitrary Waveform Editor

• Create and edit data for the WE7121 and WE7281/82
• Can edit waveforms of up to 4 M data points
• Can load measured data (WVF format) and Excel (CSV format) files
• Edit data within the specified interval (functions and dots)

7077 61
Engine Combustion Pressure Analysis Package

• Offline analysis software for the measured data for the WE7275
• Supports 4- to 8-cyclinder engines
• Equipped with standard analysis items (functions) required for the combustion pressure analysis

WE7000 Utility Software

Type	Product	Model Number	Specifications
Added on to the Control Software	Computation Function Setup Software	707702	Adds computation functions to the Control Software
	Remote Monitor Add-On Software	707703	Adds remote monitor function to the Control Software
Package software	Computation Waveform Viewer	707714	Waveform Viewer for the WE7000, DL, etc.
	Arbitrary Waveform Editor	707751	Arbitrary waveform data editor for the WE7121 and WE7281/82
	Engine Combustion Pressure Analysis Package	707761	Offline combustion pressure analysis for the WE7275

Software for developing user application programs

Product	Model Number	Specifications
WVF File Access API	707712	API for accessing WVF
WVF File Access Tool Kit for MATLAB	707713	MATLAB toolkit for accessing WVF
WE Control API	707741	Functions for controlling the WE7000
Add On Tool for WE API Vol. 1	707742	ActiveX controls for Visual Basic
Add On Tool for WE API Vol. 2	707743	ActiveX controls for Visual Basic (for display)
Control Tool Kit for LabVIEW	707746	Toolkit for LabVIEW
Control Tool Kit for MATLAB	707747	Toolkit for MATLAB

Waveform Measuring

Digital and Mixed Signal Oscilloscopes Selection Guide

■ The DL series digital oscilloscopes have high-speed sampling and a wide range of bandwidths that can be utilized for design and development of electronic devices.

They can also execute computations on repetitive waveforms and automatically extract waveform parameters.

The DL Series offers an extensive selection of digital oscilloscopes with large-capacity memories, powerful triggering functions, unique History Memory function and internal printers. It also can save and load data to and from internal or external media.

Item \ Model	DLM2000 Series ...P14	DL6000 Series ...P16	DLM6000 Series ...P16	DL7400 Series ...P19	DL9040/9140/9240 Series ...P20	DL9700L/DL9500L Series ...P21
Features	Fast screen update & all points display Compact & lightweight Analog 4ch/Analog 3ch+Logic 8bits Max, 2.5GS/s UART,I2C,SPI,CAN and LIN bus analysis functions Power supply analysis functions Probe power connectors Supports USB Storage	Easy to use and high performance, and 32-bit logic Analog 4 channels 500 MHz/1 GHz/1.5 GHz bandwidths, max 10 GS/s High-speed acquisition: max 2.5 million waveforms/sec/channel Sophisticated waveform computation, analysis and fast screen update Max 6.25 Mpoints memory, history function and search & replay Probe interface (auto-recognition and power supply when combined with the dedicated probe)	Analog 4 channels + logic 32/16-bit 500 MHz/1 GHz bandwidths, max 5 GS/s	Fast screen update & all points display High speed 8 ch + 16 bits logic input Max. 2 GS/s Web server function Serial bus analysis functions Power analysis functions USB mouse/keyboard Probe power connectors Supports USB Storage FlexRay Signal Analyzer	Fast screen update & all points display Compact & lightweight, 4 ch Max. 10 GS/s I2C, SPI, CAN, LIN and UART bus analysis functions Probe power connectors Supports USB Storage USB mouse/keyboard Power supply analysis functions	Analog 4ch+Logic 32/16bits input Max. 5GS/s Serial bus analysis functions Power supply analysis functions "Virtual DA" functions Probe power connectors Supports USB Storage USB mouse/keyboard
Max. sampling rate	2.5 GS/s	10 GS/s[*3]	5 GS/s	2 GS/s	10 GS/s[*2]	5GS/s
Bandwidth	500 MHz[*2]	1.5 GHz[*3]	1.0 GHz[*3]	500 MHz	1.5 GHz[*2]	1.0GHz[*2]
Number of analog input channels	DLM2022,DLM2032,DLM2052:2ch DLM2024,DLM2034,DLM2054:4ch	4		DL7440/7480: 4 ch/8 ch	4	4
Logic input	DLM2024, DLM2034, DLM2054: St'd 8 bits	None	Standard: 16 bits (8 bits × 2) Option: 32 bits (8 bits × 4)	St'd: 16 bits (8 bits × 2)	—	DL9705L, DL9710L: St'd:32 (8bits × 4) DL9505L, DL9510L: St'd:16 (8bits × 2)
Max. vertical sensitivity (1:1)	2 mV/div	2 mV/div		2 mV/div	2 mV/div	2 mV/div
Vertial axis resolution	8 bits	8 bits		8 bits	8 bits	8 bits
Max. sweep sensitivity	1 ns/div	500 ps/div		1 ns/div	500 ps/div	500 ps/div
Max. record length — St'd	12.5 Mpoints	6.25 Mpoints		701450, 701470: 4 MW 701460, 701480: 16 MW	DL9040, DL9140, DL9240:2.5 MW DL9040L, DL9140L, DL9240L:6.25 MW	6.25 MW
Max. record length — Optional	62.5 Mpoints 125 Mpoints	2				
Internal media drive — St'd	—	1		PC card	PC card	PC card (2)
Internal media drive — selectable	—	None		FDD, Zip®	—	—
Internal HDD — St'd	100 MB	Flash ROM standard: Approx. 390 MB, Option: Approx. 3.7 GB		—	90MB[*3]	90MB[*3]
Internal HDD — Optional	1.8 GB			—	40 GB (HDD, FAT32)	40 GB (HDD, FAT32)
Interface — St'd	USB	Standard: USB/GP-IB[*5] Option: Ethernet		USB/GP-IB	USB	USB
Interface — Optional	Ethernet/GP-IB			Ethernet/SCSI	Ethernet (LXI compliant)	Ethernet (LXI compliant)
Internal printer — St'd/ Optional	Optional: 112 mm width	112 mm width		Optional: 112 mm width	Optional: 112 mm width	Optional: 112 mm width
Others — Optional	I²C bus analysis SPI bus analysis CAN & LIN bus analysis FlexRay bus analysis UART bus analysis 2/4 Output Probe Power Power supply analysis functions User-defined math functions	• I²C bus analysis • SPI bus analysis • CAN & LIN bus analysis • UART bus analysis • User-defined math • Power supply analysis • Probe power		I²C bus analysis CAN bus analysis SPI bus analysis User-defined Math Power Analysis Four additional probe power (total: 8, DL7480 only) [*4] FlexRay bus analysis	I²C bus analysis SPI bus analysis CAN & LIN bus analysis UART bus analysis Probe power connectors Power Supply analysis functions User define math functions	I²C bus analysis SPI bus analysis CAN & LIN bus analysis UART bus analysis Probe power connectors Power supply analysis functions User define math functions
Display (TFT LCD)	8.4-inch color, XGA	8.4-inch color, XGA		8.4-inch color, VGA	8.4-inch color, XGA	8.4-inch color, XGA
External dimensions W × H × D (mm)	226 × 293 × 193	350 × 200 × 178	350 × 200 × 285	373 × 210.5 × 355.3	350 × 200 × 178	350 × 200 × 285
Weight (kg)	Approx. 4.2	6.5	7.7	Approx. 10	Approx. 6.5	Approx. 7.7

*1: See each product catalog for more detailed specifications.
*2: Depends on model
*3: Flash Mem: Approx. 30 MB. System memory: Approx. 60 MB.Flash Mem is the part of the memory in which the user can load and save data through file operations.
*4: The DL7400 series comes standard with four probe power connectors.
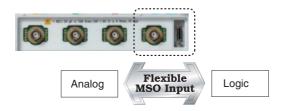
DL Series Serial Bus Analyzer Selection Guide

Bus Types	Functions \ Models	SB5000 Series ...P18	DLM2000 Series ...P14	DLM6000/DL6000 Series ...P16	DL7400 Series ...P19	DL9000/DL9700/DL9500 Series ...P20
I²C	Triggers	◎	○	○	○	◎
	Trigger Types	Every Start, Non-Ack Address&Data, General Call Start Byte/HS mode	Every Start, Non-Ack Address&Data, General Call Start Byte/HS mode	Every Start, Non-Ack Address&Data, General Call Start Byte/HS mode	Start, Non-Ack, Address&Data	Every Start, Non-Ack Address&Data, General Call Start Byte/HS mode
	Analysis & Search	◎[*1]	○	○	○	○[*1]
CAN	Triggers	◎	○	○	○	◎
	Trigger Types	SOF, Error Frame ID Std/Data, ID Ext/Data ID/Data OR	SOF, Error(Frame, Stuff, CRC) ID Std/Data, ID Ext/Data ID/Data OR	SOF, Error Frame, ID/DATAorRTR, ID/DATAorRTR(OR), Message/Signal	SOF, ID, RTR Data Field, Error Frame	SOF, Error Frame ID Std/Data, ID Ext/Data ID/Data OR
	Analysis & Search	◎[*1]	○	○	○	○[*1]
	CAN dbc files	◎	○	○	×	×
LIN	Triggers	◎	○	○		◎
	Trigger Types	Break Synch ID/Data, ID/Data OR Error	Break Synch ID/Data, ID/Data OR Error	Synch Break	×	Break Synch
	Analysis & Search	◎[*1]	○	○		○[*1]
SPI	Triggers	◎	○	○	○	◎
	Trigger Types	Data1 pattern (3W) Data1&Data2 pattern (4W)	Data1 pattern (3W) Data1&Data2 pattern (4W)	Data1 pattern (3W) Data1&Data2 pattern (4W)	A Data pattern, B Data pattern A→B Data pattern, Byte count	Data1 pattern (3W) Data1&Data2 pattern (4W)
	Analysis & Search	◎[*1]	○	○	◎	○[*1]
UART	Triggers	◎	○			◎
	Trigger Types	Every Data Data Error(Framing/Parity)	Every Data Data Error(Framing/Parity)	Every Data	×	Every Data
	Analysis & Search	◎[*1]	○	○		○[*1]
FlexRay	Triggers	◎	○			
	Trigger Types	Frame Start Indicator, Frame ID Cycle Count, Data Indicator, Frame ID Cycle Count, Data (OR) BSS/FES/CRC Error (OR)	Frame Start, Indicator(Payload preamble/Null Frame/Sync Frame/Startup Frame), ID, Cycle Count, DATA, ID(OR), CRC/BSS/FES Error (OR)	×	Frame Start Payload preamble indicator Null Frame indicator Sync Frame indicator Startup frame indicator Frame ID Cycle count, Data, CRC Error	×
	Analysis & Search	◎[*1]	○			
	FIBEX database files	◎	×		×	
Serial Bus Auto Setup Function		◎	○	○	×	○

◎ : Standards, ○ : Optional, × : NA *1: Real-time Analysis and Display

Common Features of DL/DLM Series

Multichannel

This feature meets the need to measure as many signals as possible simultaneously with one oscilloscope.

● DLM2000 series

The DLM2000 series usually functions as 4 channel analog, and is able to switch CH 4 of analog input to 8-bit logic quickly whenever the need arises.

Analog → **Flexible MSO Input** → Logic

● DLM6000 and DL9700 series

Up to 32-bit logic signals and 4 channels of analog signals can be measured simultaneously at high speed.

● DL7400 series

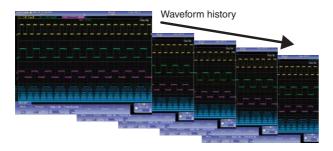Up to 16-bit logic signals and 8 channels of analog signals can be measured.

ScopeCorder Series is available for customers that require more channels for measurement (see page 2). The DL850 supports up to 128 channel measurement.

Long Memory

When the sample rate is increased with oscilloscopes with less memory, the observation time may run out. All of Yokogawa's oscilloscope models are equipped with large capacity memory. For example, the DLM2000 offers long memory of up to 125 Mpoints for measurement. Even at a fast sample rate of 1.25 GS/s, waveforms for 0.1 seconds can be captured.
The history memory function that divides the long memory can redisplay past waveforms that have disappeared from the screen.
With the DLM2000 series, up to 20,000 previously captured waveforms can be saved in memory.
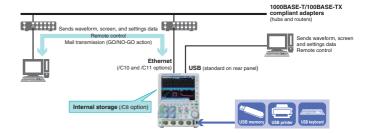
Waveform history

Since a large amount of data is also processed at high speed by dedicated hardware, the long memory can be used comfortably without sacrificing response time.

Connection with a PC

To facilitate the use of a PC, various interfaces such as USB, Ethernet, and GP-IB are available as standard or an option.
In addition, various software is available to support remote control, file transfer, and data processing on a PC.
USB memory and peripheral devices, such as a printer, keyboard, and mouse, can be connected, and connecting to a PC using a USB cable enables it to be used as the external storage of the PC (with the exception of some models).

1000BASE-T/100BASE-TX compliant adapters (hubs and routers)

Sends waveform, screen, and settings data
Remote control
Mail transmission (GO/NO-GO action)

Sends waveform, screen and settings data
Remote control

Ethernet (/C10 and /C11 options)   USB (standard on rear panel)

Internal storage (/C8 option)

USB memory   USB printer   USB keyboard

Built-in Printer

With a small built-in printer, measured waveforms can be printed on the spot to paper (option with the exception of some models).

YOKOGAWA ◆ DLM2054 2.5GS/s 500MHz

A Variety of Triggers and Analysis Functions

- **A variety of triggers capture complex waveforms**
- **Real time digital filter with optimum noise reduction**
- **Zooms into two different points simultaneously**
- **Automated measurement of waveform parameters and statistical processing function**
- **Frequency analysis by FTT computation**
- **GO/NO GO function and action on trigger function to determine abnormal waveforms and save files.**
- **Analysis functions for specific applications, such as serial bus analysis and power supply analysis**

(* Not available for some models)

Mixed Signal
Oscilloscope

DLM2000 Series

signal X plorer™

Easy-to-Use, Portrait Body, Compact, and Large Screen Personal Mixed Signal Oscilloscope Offers Convenience with Logic Inputs

DLM2000

CE

Basic Specifications

Analog Signal input

Input channels	Analog input	DLM20x2: CH1, CH2
		DLM20x4: CH1 to CH4
		(CH1 to CH3 when using logic input)
Input coupling setting		AC, DC, DC50 Ω, GND
Input impedance	Analog input	1 MΩ ±1.0%, approximately 20 pF
		50 Ω ±1.0% (VSWR 1.4 or less, DC to 500MHz)
Voltage axis sensitivity	1 MΩ	2 mV/div to 10 V/div (steps of 1-2-5)
setting range	50 Ω	2 mV/div to 500 mV/div (steps of 1-2-5)
Max. input voltage	1 MΩ	150 Vrms (CAT I)
	50 Ω	Must not exceed 5 Vrms or 10 Vpeak

Frequency characteristics (-3 dB attenuation when inputting a sinewave of amplitude ±3div)[1][2]

	DLM202x	DLM203x	DLM205x
1 MΩ (when using passive probe)			
100 mV to 100 V/div	DC to 200 MHz	DC to 350 MHz	DC to 500 MHz
20 mV to 50 mV/div	DC to 150 MHz	DC to 300 MHz	DC to 400 MHz
50 Ω			
10 mV to 500 mV/div	DC to 200 MHz	DC to 350 MHz	DC to 500 MHz
2 mV to 5 mV/div	DC to 150 MHz	DC to 300 MHz	DC to 400 MHz

Maximum sample rate		
Real time sampling mode	Interleave OFF	1.25 GS/s
	Interleave ON	2.5 GS/s
Repetitive sampling mode		125 GS/s
Maximum record length	2 ch model	Repeat/Single/Single Interleave:
	(Standard)	1.25 M/6.25 M/12.5 MPoints
	2 ch model	Repeat/Single/Single Interleave:
	(/M1S)	6.25 M/25 M/62.5 MPoints
	4 ch model	Repeat/Single/Single Interleave:
	(Standard)	1.25 M/6.25 M/12.5 MPoints
	4 ch model	Repeat/Single/Single Interleave:
	(/M1)	6.25 M/25 M/62.5 MPoints
	4 ch model	Repeat/Single/Single Interleave:
	(/M2)	12.5 M/62.5 M/125 MPoints

Logic Signal Input (4 ch model only)

Number of inputs	8 bit (excl. 4 ch input and logic input)
Maximum toggle frequency[1]	Model 701988: 100 MHz
	Model 701989: 250 MHz
Compatible probes	701988, 701989 (8 bit input)
	(701980, 701981 are available)
Display	8.4-inch TFT color liquid crystal
	display 1024 × 768 (XGA)
Rated supply voltage	100 to 240 VAC
Rated supply frequency	50 Hz/60 Hz
Maximum power consumption	170 VA
External dimensions	226 (W) × 293 (H) × 193 (D) mm (when
	printer cover is closed, excluding
	protrusions)
Weight	Approx.4.2kg With no options
Operating temperature range	5°C to 40°C

*1 Measured under standard operating conditions after a 30-minute warm-up followed by calibration.
*2 Value in the case of repetitive phenomenon.

Features

Easy-to-Use & Easy-to-See

● Easy to use. Portrait body + large screen makes display easy to see.

We elevated the large (8.4-inch) LCD screen up into the line of sight. Also, the portrait format saves space on the desk or test bench. A compact personal oscilloscope designed for easy viewing and ease of use.
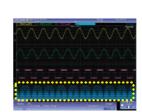
Horizontal Postion and Scale Knob
Dedicated Zoom Keys
Four-Direction Selector Button
Select key moves the cursor up/down/left/right
Jog Shuttle and Rotary Knob
Logic input connector
Vertical Postion and Scale   Trigger Control Keys and Level Knob

Signal observation on 4 channels or more...

● Flexible MSO Input

Four channels is not sufficient to view the functioning of digital control circuits. The DLM2000 series converts 4 channels of analog input to 8-bit logic, and functions as a 3 channel analog + 8-bit logic MSO (mixed signal oscilloscope).
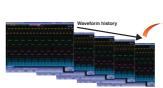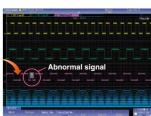
You can replay waveforms later on, so you'll never miss an abnormal waveform

● History function

With the DLM2000 series, up to 20,000 previously captured waveforms can be saved in the acquisition memory. With the History function, you can display just one or all of the previously captured waveforms (history waveforms) on screen. You can also perform cursor measurement, computation, and other operations on history waveforms. Using the History function, you can analyze rarely-occurring abnormal signals.
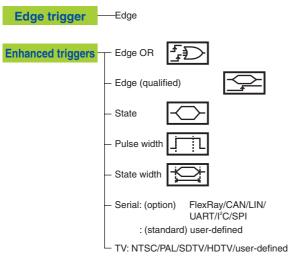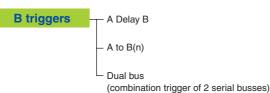
Waveform history

Abnormal signal

Even complex waveforms can be captured

● Variety of triggers combining analog and logic inputs

The DLM2000 series comes with a variety of triggers ranging from an easy and simple Edge trigger through to sophisticated Enhanced and B triggers. In particular, its ability to freely combine analog and logic inputs is a great feature of this mixed signal oscilloscope equipped with a hybrid channel.

Edge trigger — Edge

Enhanced triggers —
- Edge OR
- Edge (qualified)
- State
- Pulse width
- State width
- Serial: (option)   FlexRay/CAN/LIN/UART/I²C/SPI
  : (standard) user-defined
- TV: NTSC/PAL/SDTV/HDTV/user-defined

B triggers —
- A Delay B
- A to B(n)
- Dual bus (combination trigger of 2 serial busses)

Optimum noise reduction

● Real time filters and filters based on MATH functions

The DLM2000 series has two types of filters, one real time processed at the input circuit and one based on MATH functions. Since the cutoff frequency can also be finely set, these filters are effective in rejecting unwanted signals and observing only the desired signals.
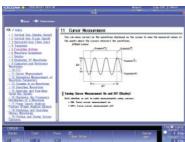
Waveform zoom and search functions

● Zoom two locations simultaneously, zoom search and history search

Because the DLM2000 series lets you set zoom factors independently, you can display two zoomed waveforms with different time axis scales at the same time. Also, using the search functions, you can search the long memory and history memory and instantaneously find desired waveforms that meet the search criteria.

Can check functions with graphical help

● Graphical online help

You can view detailed graphical explanations of the oscilloscope's functions and operations by pressing the "?" key in the lower left of the screen. This lets you get help on functions and operations on screen without having to consult the user's manual.

Analysis Functions

FlexRay/UART/CAN/LIN/I2C/SPI

● Serial analysis function options

A wide variety of trigger conditions can be set, such as ID/Data trigger combinations and combinations of serial bus triggers with normal edge triggers. Two busses with different types and speeds can be analyzed simultaneously and decode display can be shown in real time.

Switching loss, joule integral, SOA analysis, and harmonic current based on EN61000-3-2

● Power supply analysis option

Voltage and current waveforms can be input to the 62.5 MW (max.) long memory (/M2 models) for computation of switching loss (V(t) X i(t)). A wide variety of switching loss analyses are supported, including turn on/off loss calculation, loss including conduction loss, and loss over long cycles (50 Hz/60 Hz). Using the cycle mode, you can perform more accurate analysis by cutting out the area of integration to calculate the loss by the switching period. Various other power supply analysis functions are also available.

Models and Suffix Codes

Model	Suffix code	Description
710105		Digital Oscilloscope DLM2022 2ch, 200MHz
710110[*1]		Mixed Signal Oscilloscope DLM2024 4ch, 200MHz
710115		Digital Oscilloscope DLM2032 2ch, 350MHz
710120[*1]		Mixed Signal Oscilloscope DLM2034 4ch, 350MHz
710125		Digital Oscilloscope DLM2052 2ch, 500MHz
710130[*1]		Mixed Signal Oscilloscope DLM2054 4ch, 500MHz
Power cable	-D	UL/CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	AS standard
	-H	GB standard
Language	-HE	English Menu and Panel
	-HC	Chinese Menu and Panel
	-HK	Korean Menu and Panel
	-HG	German Menu and Panel
	-HF	French Menu and Panel
	-HL	Italian Menu and Panel
	-HS	Spanish Menu and Panel
Option	/LN	No switchable logic input (4 ch model only)
	/B5	Built-in printer
	/M1[*2]	"Memory expansion option (4 ch model only) During continuous measurement: 6.25 Mpoints; Single mode: 25 Mpoints (when interleave mode ON: 62.5 Mpoints)"
	/M2[*2]	"Memory expansion option (4 ch model only) During continuous measurement: 12.5 Mpoints; Single mode: 62.5 Mpoints (when interleave mode ON: 125 Mpoints)"
	/M1S	"Memory expansion option (2 ch model only) During continuous measurement: 6.25 Mpoints; Single mode: 25 Mpoints (when interleave mode ON: 62.5 Mpoints)"
	/P2[*3]	Probe power for 2 ch models
	/P4[*3]	Probe power for 4 ch models
	/C1[*4]	GP-IB Interface
	/C10[*4]	Ethernet Interface
	/C11[*4]	GP-IB + Ethernet Interface
	/C8	Internal storage (1.8 GB)
	/G2[*5]	User defined math (4 ch model only)
	/G4[*5]	"Power supply analysis function (includes /G2) (4 ch model only)"
	/F1[*6]	UART trigger and analysis (4 ch model only)
	/F2[*6]	I²C + SPI trigger and analysis (4 ch model only)
	/F3[*6]	UART + I²C + SPI trigger and analysis (4 ch model only)
	/F4[*7]	CAN + LIN trigger and analysis (4 ch model only)
	/F5[*7]	FlexRay trigger and analysis (4 ch model only)
	/F6[*7]	FlexRay+CAN+LIN trigger and analysis (4 ch model only)

*1: Logic probes sold separately. Please order the model 701988/701989 accessory logic probes separately.
*2: Only one of these may be selected at a time.
*3: Specify this option when using current probes or other differential probes such as models 701920 or 701922.
*4: Only one of these may be selected at a time.
*5: Only one of these may be selected at a time.
*6: Only one of these may be selected at a time.
*7: Only one of these may be selected at a time.

Mixed Signal Oscilloscope
Digital Oscilloscope

DLM6000 Series
DL6000 Series

signal **X**plorer™

Easy-to-Use, Compact and Lightweight, Wide Bandwidth Oscilloscope with a Wide Variety of Functions
Your Best Tool for Developing Embedded Systems

Features

Never miss the waveforms you want
● **High acquisition rate unchanged even when displaying logic signals**
 • During continuous measurement: Up to 25,000 times per second per channel
 • In N Single mode: Up to 2.5 million times per second per channel
Maximize your probability of catching anomalies with the high-speed acquisition rate, which does not change even when you observe analog and logic signals simultaneously.

● **Never miss abnormal waveforms with high-speed acquisition and history memory**
You can preserve up to 2,000 captures of actual waveform data (not screen images), and after measurement has stopped, you can review past waveforms individually for detailed analysis.
 • Search and Zoom
 • Automated measurement of waveform parameters
 • Variety of advanced computations

Basic Specifications

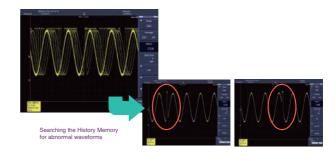|	
Input channels	DL6000 series 4 analog
	DLM6000 series 4 analog + 16 or 32 logic
Analog Input	
Frequency bandwidth	DLM6054/DL6104: 500 MHz
	DLM6104/DL6104: 1.0 GHz
	DL6154: 1.5 GHz
Voltage axis sensitivity setting range	1 M Ω : 2 mV/div to 5 V/div
	50 Ω : 2 mV/div to 500 mV/div
Voltage axis DC accuracy	±(1.5% of 8 div + offset voltage accuracy)
A/D conversion resolution	8 bits
Logic Input	
Maximum toggle frequency	100 MHz (701988), 250 MHz (701989)
Compatible probes	701988, 701989 (701980 and 701981 can also be used)
Minimum input voltage	500 mVp-p (701988), 300 mVp-p (701989)
Input range	±40 V (701988); Threshold level ±6 V (701989)
Maximum nondestructive input voltage	±40 V (DC + ACpeak) or 28 Vrms (701989)
Threshold level setting range	±40 V (701988), ±6 V (701989)
Common Specifications	
Maximum sampling rate	
Real time sampling mode	
	Interleave mode OFF: 10 GS/s (DL6154), 5 GS/s (others)
	Interleave mode ON: 5 GS/s (DL6154), 2.5 GS/s (others)
Equivalent time sampling mode	
	25 TS/s
Time axis setting range	500 ps/div to 50 s/div
Maximum record length	6.25 Mpoints
History memory maximum data	2,000 (2.5 kPoints)
Trigger modes	Auto, Auto Level, Normal, Single, N Single
Trigger types	Edge, Edge/State, Width, Serial Bus (I²C/SPI/UART/CAN/LIN/User defined), TV, Event Interval, A Delay B, A to B (N)
Internal storage	390 MB (standard), 3.7 GB (with /C9 option)
PC card interface	1
Interface	USB peripheral connection interface × 2, USB-PC connection interface × 1 (standard), Ethernet, GP-IB (using a PCMICA card)
Built-in printer	112 mm width, monochrome, thermal
Display	8.4-inch color TFT LCD 1024 × 768 (XGA)
External dimensions	350 (W) × 200 (H) × 178 (D) mm (DL6000)
	350 (W) × 200 (H) × 285 (D) mm (DLM6000)
Weight	Approx. 6.5 kg (DL6000, including printer)
	Approx. 7.7 kg (DLM6000, including printer)

● **You can analyze any past waveforms in detail by recalling them from memory**
On most oscilloscopes, to observe and analyze abnormalities such as unpredictable noise in detail, you have to devise clever trigger settings and re-measure the event. But with the DL6000/DLM6000, there is no need to re-measure the phenomena because once the event occurs, you can use the History Memory function to review past waveforms that were originally displayed on screen.
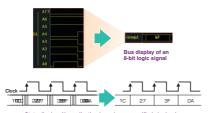

Searching the History Memory for abnormal waveforms

Making 32-bit logic signals easy to read and understand
● Logic signal measurement and analysis

■ Observing up to 32-bit logic signals together with analog signals
Observing many signals simultaneously and checking their correlations and timing is an effective means of verifying increasingly complex embedded systems.
With the DLM6000 series, you can measure up to 32-bit logic signals and 4 channels of analog waveforms simultaneously, and investigate hidden data in waveforms using bus analysis and computation functions.

■ Grouping logic signals to make them easy to read and understand
As many as 5 groups of logic signals can be defined. You can enter display settings for each group, and specify bit arrangement in each group regardless of the bit arrangement of the logic probe. This means that even if pin assignments or signal arrangements change, you only need to change settings rather than to repeat the probing of the circuit.
- Easy-to-read address bus and data bus displays
- Even if device pin assignments or signal arrangements change, you only need to change settings

Displayed for each group in the bit order defined for the group. The logic signals within each group and their bit orders are not restricted to the bit arrangement of the logic probe.
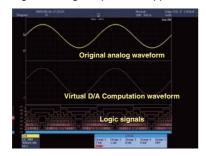
■ Bus and State displays make logic signals easy to read and analyze
The DL6000/DLM6000 can show logic signals assigned to groups in a Bus display, or specified clock signals in a State display. With clock synchronization, you can display logic signals in binary or hexadecimal format, so parallel output values of an address bus or A/D converter can be analyzed easily, and operating checks of the device under test can be performed more quickly and accurately.

Bus display of an 8-bit logic signal

State display: Normalization based on a specified clock edge

■ Virtual D/A Computation function displays up to 32-bit logic signals as analog waveforms
Even a one-bit error of digital signals is a big problem. It is difficult to find such a digital error with logic waveforms alone.
With a Virtual D/A Computation function, you can convert digital data into analog waveforms and display them to make data verification easier.
- Easy verification of address bus and data bus
- Real time comparison and verification of analog waveforms and digital values prior to and after A/D or D/A conversion.
- D/A converted waveforms can undergo FFT analysis or have additional digital filtering computations applied to them.

Original analog waveform
Virtual D/A Computation waveform
Logic signals

Analysis Functions

UART/CAN/LIN/I2C/SPI
● Serial bus analysis function (option)
With an Auto Setup function for serial bus analysis, the DL6000/DLM6000 series automatically performs the tedious task of entering settings. You just need to select the bus type and input channel, and the oscilloscope will automatically recognize the waveform, set parameters such as a bit rate, and display analysis results instantaneously. Also, two different busses can be analyzed at the same time. For example, you can analyze a CAN and LIN bus simultaneously.

Analyzing switching circuit characteristics
● Power supply analysis function (option)
By using combinations of differential and current probes, you can evaluate the switching loss or analyze the safe operating area (SOA) in power supply waveforms. Through statistical computation you can also measure multiple switching waveforms and display the loss on a per-period basis in lists and trends, or display statistics on the aggregate loss of up to 2,000 switching waveforms stored in History Memory. If precise calculations are required, a correction function and High Resolution mode are available.

Models and Suffix Codes

■ DL6054/6104/6154

Model	Suffix Code		Description
DL6054			4CH 500MHz,Max. 5GS/s(2.5GS/s/CH), 6.25 Mpts/CH
DL6104			4CH 1GHz,Max. 5GS/s(2.5GS/s/CH), 6.25 Mpts/CH
DL6154			4CH 1.5GHz,Max. 10GS/s(5GS/s/CH), 6.25 Mpts/CH
Power cable	-D		UL/CSA standard
	-F		VDE standard
	-Q		BS standard
	-R		AS standard
	-H		GB standard
Help language	-HE		English Help (Menu and Panel)
	-HC		Chinese Help (Menu and Panel)
	-HK		Korean Help (Menu and Panel)
	-HG		German Help (Menu and Panel)
	-HF		French Help (Menu and Panel)
	-HL		Italian Help (Menu and Panel)
	-HS		Spanish Help (Menu and Panel)
Option	/B5		Built-in printer
	/P2 *3		Probe power
		/C9 *4	Internal storage + LXI compliant LAN
		/C12 *4	LXI compliant LAN
		/G2 *5	User defined Math
		/G4 *5	Power supply analysis function (includes /G2)
		/F3	UART+I2C+SPI trigger and analysis
		/F4	UART+CAN+LIN trigger and analysis

■ DLM6054/6104

Model	Suffix Code		Description
DLM6054 *1			4CH 500MHz+Logic16/32bit, Max. 5GS/s(2.5GS/s/CH), 6.25Mps/CH
DLM6104 *1			4CH 1GHz+Logic 16/32bit, Max. 5GS/s(2.5GS/s/CH), 6.25Mps/CH
Power cable	-D		UL/CSA standard
	-F		VDE standard
	-Q		BS standard
	-R		AS standard
	-H		GB standard
Help Language	-HE		English Help (Menu and Panel)
	-HC		Chinese Help (Menu and Panel)
	-HK		Korean Help (Menu and Panel)
	-HG		German Help (Menu and Panel)
	-HF		French Help (Menu and Panel)
	-HL		Italian Help (Menu and Panel)
	-HS		Spanish Help (Menu and Panel)
Logic input	-L16 *2		Logic 16bit (Logic probe interface x 2)
	-L32 *2		Logic 32bit (Logic probe interface x 4)
Option	/B5		Built-in printer
	/P4 *3		Probe power
		/C9 *4	Internal storage + LXI compliant LAN
		/C12 *4	LXI compliant LAN
		/G2 *5	User defined Math
		/G4 *5	Power supply analysis function (includes /G2)
		/F3	UART+I2C+SPI trigger and analysis
		/F4	UART+CAN+LIN trigger and analysis

*1: Logic probes sold separately. Please order the model 701988/701989 accessory logic probes separately.
*2: Only one of these may be selected at a time.
*3: Specify this option when using current probes or other differential probes such as models 701920 or 701922.
*4: Only one of these may be selected at a time.
*5: Only one of these may be selected at a time.

Vehicle Serial Bus
Analyzer

SB5000

Advanced Functions for FlexRay Waveform & Protocol Analysis
Comprehensive In-Vehicle Serial Bus Analyzer

FlexRay™

SB5710

CE

Basic Specifications

Models

Model name (No.)	Max. sampling rate	Freq. BW	Max. record length	Input channels
SB5310 (701351)	5 GSps	1 GHz	6.25 MW (Mpts)	Analog 4 CH + Logic 8-bit
SB5710 (701361)	5 GSps	1 GHz	6.25 MW (Mpts)	Analog 4 CH + Logic 32-bit

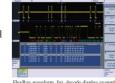|	
FlexRay bus	FlexRay Protocol Version 2.1
Bit rate	10Mbps, 5 Mbps, 2.5 Mbps
FlexRay Trigger Types	
	Frame Start, ID/DATA, ID/DATA OR, Error, Message/Signal
CAN bus	CAN Version 2.0B
CAN Trigger Types	
	SOF, Error Frame, ID Std/Data, ID Ext/Data, ID Data OR, Message/Signal
LIN bus	LIN1.3 or LIN2.0
LIN Trigger Types	Break + Synch, ID/Data, ID/Data OR, Error
UART Trigger Types	Every Data, Data, Error
I²C bus	Bus transfer rate: Up to 3.4 Mbits/s
Address mode	7 bits/10 bits
I²C Trigger Types	
	Every Start, Address&Data, Non-Ack, General Call, Start Byte/HS Mode
SPI Trigger Types	
	Three-wire or Four wire Activate a trigger by comparing data from an arbitrary byte counts after the assertion of the CS. The length of data that is compared can be set to 1 to 4 bytes.
Display of Analysis Results	
	Simple & detailed analysis result displays are available for all buses.
Basic Specifications	
Input channels:	4 (CH1 to CH4)
Voltage axis sensitivity:	For 1 MΩ input : 2 mV/div to 5 V/div (steps of 1-2-5)
	For 50Ω input: 2 mV/div to 500 mV/div (steps of 1-2-5)
Maximum input voltage:	For 1 MΩ input: 150 Vrms CAT I (when frequency is under 1 kHz)
	For 50Ω input: 5 Vrms or less and 10 Vpeak or less
Rated supply voltage	100 to 120 VAC or 220 to 240 VAC (automatic switching)
Rated supply frequency	50/60 Hz
Maximum power consumption	300 VA
External dimensions	350 (W) × 200 (H) × 285 (D) mm (with printer cover put away, excluding handle and other projections)
Weight	Approx. 7.7 kg (without options)
Operating Temperature	5 to 40 °C

Overview

The SB5000 Vehicle Serial Bus Analyzer is an invaluable tool for engineers involved in the development and use of in-vehicle communication buses. It can analyze FlexRay, an emerging bus technology employed by advanced ECU's and electronic vehicle control applications. Because it can measure logic signals of up to 32 bits simultaneously, a single SB5000 offers measurement and analysis of parallel bus signals from microprocessors and other sources.

Features

- **Measure and Analyze 3 Vehicle Serial Buses + 3 General Purpose Serial Buses, and 32-Bit Max Parallel Buses —All on a Single Instrument**
- **Waveform(s), Analysis List and Decode Display**
  Easy and efficient observation of the physical layer and simultaneous protocol analysis enable you to evaluate the performance of your bus communication system.

FlexRay waveform, list, decode display example

- **FlexRay Eye-Diagram Analysis**
- **CAN/FlexRay bus symbolic triggering, analysis, decoding, and trend display (Supports DBC database for CAN, FIBEX database for FlexRay)**

FlexRay Eye-diagram analysis example

FlexRay Fibex symbolic analysis, decode example

- **Auto Setup Dedicated to Serial Busses**

Models and Suffix Codes

Model	Suffix Code	Description
701351		SB5310: 4 ch 1.0GHz + Logic 8-bit Max. 5GS/s(2.5GS/s/ch), 6.25 MW (Mpts)/ch
701361		SB5710: 4 ch 1.0GHz + Logic 32-bit Max. 5GS/s(2.5GS/s/ch), 6.25 MW (Mpts)/ch
Power Cable	-D	UL/CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	AS standard
	-H	GB standard
Help menu language	-HE	English Help
	-HC	Chinese Help
	-HK	Korean Help
Options	/B5	Built-in printer
	/P4*¹	4 Probe power terminals on rear panel
	/C8*²	Built-in HDD + Ethernet interface
	/C9*²	Built-in HDD + LXI compliant Ethernet interface
	/C10*²	Ethernet interface
	/C12*²	LXI compliant Ethernet interface
	/G2*³	User-defined math function
	/G4*³	Power supply analysis function

*1: Please order /P4 option if you use either current probes or differential probes such as 701920, 701922, 701932 or 701933.
*2: Choose either one
*3: Choose either one

Digital Oscilloscopes

DL7440/DL7480

SignalExplorer

The DL7400 Series Allows Multi-channel Capture of Analog and Logic Signals

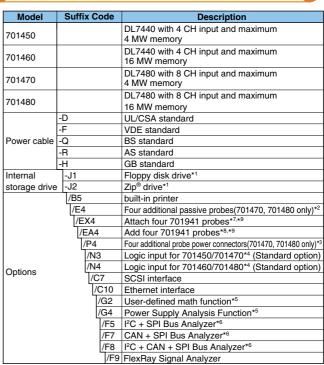**DL7440**

DL7480

CE

Overview

The DL7400 Series includes 4 and 8-channel analog input models. Each model has up to 16-bit logic inputs. All these inputs come in a convenient, benchtop-sized instrument. In additon to capturing up to 16 logic signals, the DL7400 Series lets you simultaneously measure up to 8 analog signals without needing to synchronize two separate oscilloscopes.

Features

- 4 or 8 analog channels and 16-bit logic input
- Maximum 16 MW recording memory
- USB compliant, USB mass storage supported
- Ethernet connectivity (optional)
- User-defined math (optional)
- 2 GS/s maximum speed
- 500 MHz analog bandwidth
- Supports 250 MHz logic probe
- PC card interface (Type II)
- Power supply analysis function (optional)
- Serial bus analysis function (optional)
- FlexRay signal analyzer (optional)

Basic Specifications

Input channels   4/8 analog (depends on model), and 16-bit logic
Voltage axis sensitivity setting range
      For 1 MΩ input: 2 mV/div to 10 V/div (steps of 1, 2, or 5)
      For 50 Ω input: 2 mV/div to 1 V/div (steps of 1, 2, or 5)
Frequency characteristics
      For 1 MΩ input: (using passive probe model 700988; specified at probe tip) 10 V/div to 10 mV/div: DC to 400 MHz (500 MHz[*])
      [*]: When using Miniature passive probe model 701941; specified at probe tip.
A/D conversion resolution
      8 bits (24 LSB/div)
Maximum sampling rate
      2 GS/s
Maximum record length
      701450/701470: 4 MW/channel
      701460/701480: 16 MW/channel
DC accuracy   ±(1.5% of 8 div + offset voltage accuracy)
Time axis setting range
      1 ns/div to 50 s/div (for record length of 10 kW or greater)
Display   8.4-inch color TFT liquid crystal display
Built-in printer (optional)
      Paper width: 112 mm
Interfaces   GP-IB, USB-PC connector, USB peripheral connector, Ethernet (100BASE-TX, 10BASE-T; optional), SCSI (optional)
Other options   I²C bus analysis functions, CAN Bus Signal Analysis Function , SPI Bus Signal Analysis Function, Power Analysis Functions, FlexRay Signal Analyzer
External dimensions
      373 (W) × 210.5 (H) × 355.3 (D) mm (when the printer cover is closed; does not include knobs and protrusions)
Weight   Approx. 10 kg (24.2 lbs, including printer; does not include logic inputs)

Models and Suffix Codes

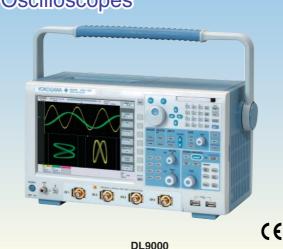| Model	Suffix Code		Description
701450			DL7440 with 4 CH input and maximum 4 MW memory
701460			DL7440 with 4 CH input and maximum 16 MW memory
701470			DL7480 with 8 CH input and maximum 4 MW memory
701480			DL7480 with 8 CH input and maximum 16 MW memory
Power cable	-D		UL/CSA standard
	-F		VDE standard
	-Q		BS standard
	-R		AS standard
	-H		GB standard
Internal storage drive	-J1		Floppy disk drive[*1]
	-J2		Zip® drive[*1]
Options		/B5	built-in printer
		/E4	Four additional passive probes(701470, 701480 only)[*2]
		/EX4	Attach four 701941 probes[*7,*9]
		/EA4	Add four 701941 probes[*8,*9]
		/P4	Four additional probe power connectors(701470, 701480 only)[*3]
		/N3	Logic input for 701450/701470[*4] (Standard option)
		/N4	Logic input for 701460/701480[*4] (Standard option)
		/C7	SCSI interface
		/C10	Ethernet interface
		/G2	User-defined math function[*5]
		/G4	Power Supply Analysis Function[*5]
		/F5	I²C + SPI Bus Analyzer[*6]
		/F7	CAN + SPI Bus Analyzer[*6]
		/F8	I²C + CAN + SPI Bus Analyzer[*6]
		/F9	FlexRay Signal Analyzer

*1: Select one only.
*2: The DL7400 Series is equipped with four passive probes (700988) as standard.
*3: The DL7400 Series is equipped with four probe power connectors as standard.
*4: Select /N3 for models 701450 and 701470, and /N4 for models 701460 and 701480. Logic probes are sold separately. These options can be installed free of charge.
*5: /G2 and /G4 cannot be ordered together. /G4 includes /G2
*6: Option /F5, /F7, and /F8 cannot be specified together. Select one only.
  The SPI Bus Analysis and Search functions are standard feature. The SPI Bus Triggers are only available as an option.
*7: Four 700988 probes are not included when this option is specified.
*8: This option can be specified with model 701470, 701480 only.
*9: When the option /E4 is specified, neither /EX4 nor /EA4 can be specified together.

Digital Oscilloscopes

DL9000

signal X plorer™

High-Performance 500 MHz/1 GHz/1.5 GHz Bandwidth Digital Oscilloscopes

DL9000

CE

Overview

The DL9000 signalXplorer is Yokogawa's 10(X)th generation digital oscilloscope. It allows users to select the most appropriate memory setting for a given measurement and then acquires and displays long and short memory records quickly, saving the waveforms to its segmented memory.
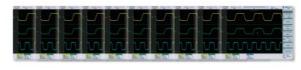**Advanced memory handling ensures that you get all the benefits of a long memory scope regardless of the record size you allocate for each acquisition. This is made possible by the state-of-the-art ADSE (advanced data stream engine) ASIC.**

Features

● **History Memory**
Capture only the desired data for long periods of time.
Make full use of the large-capacity memory to increase development efficiency without acquiring useless data.

Waveform comparison using memory partitioned into up to 2,000 areas

◄─── 2000 frames ───►

● **High Speed Response**
Fast display updates, even when processing mega-words of data.
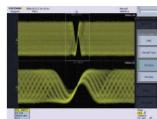
● **Dot Density Display**
Displays waveforms like an analog oscilloscope.

● **UART, I²C, CAN, LIN, SPI Bus Analysis (option)**

● **Auto Setup Function for Serial Bus Analysis**
Fast and Automatic Serial Bus Detection & Analysis with just one button

Overlaid waveforms using dot density display

Basic Specifications

Max. sampling rate
  5 GS/s (2 channels) 2.5 GS/s (4 channels) (DL9040/DL9040L/DL9140/DL9140L)
  10 GS/s (2 channels) 5 GS/s (4 channels) (DL9240/DL9240L)

Bandwidth
  500 MHz (DL9040/DL9040L)
  1 GHz (DL9140/DL9140L)
  1.5 GHz (DL9240/DL9240L)

Number of analog input channels
  4 input channels

Vertical sensitivity
  For 1 MΩ input: 2 mV/div to 5 V/div (steps of 1-2-5)
  For 50 Ω input: 2 mV/div to 500 mV/div (steps of 1-2-5)

DC accuracy
  For 1 MΩ input: ±(1.5% of 8 div + offset voltage accuracy)
  For 50 Ω input: ±(1.5% of 8 div + offset voltage accuracy)

Vertial axis resolution
  8-bit (25 LSB/div)

Sweep sensitivity
  500 ps/div to 50 s/div (steps of 1-2-5)

Max. record length
  2.5 M word/channel (DL9040/DL9140/DL9240)
  6.25 M word/channel (DL9040L/DL9140L/DL9240L)

Internal media drive
  90 MB (Flash Mem: Approx. 30 MB. System memory: Approx. 60 MB.)
  Flash Mem is the part of the memory in which the user can load and save data through file operations.

Interface
  USB Peripheral Support/PC Card Interfaces/
  USB-PC Connections/Ethernet Communication
  (/C8 -/C12 options)

Internal printer   Thermal line-dot, Paper width 112 mm (option)

Other options   I²C Analysis Function, SPI Analysis Function, CAN Analysis Function, LIN Analysis Function, UART Analysis Function Internal Hard Disk Drive, User-defined math function, Power supply analysis function

Display (TFT LCD)
  8.4-inch (21.3 cm) color TFT liquid crystal display

External dimensions
  350 (W) × 200 (H) × 178 (D) mm
  (when printer cover is closed, excluding handle and protrusions)

Weight (kg)   Approx. 6.5 kg

Model Number and Suffix Codes

Model	Suffix Code	Description
701307		DL9040 500 MHz max. 5 GS/s (2.5 GS/s/ch), 2.5 Mword/ch
701308		DL9040L 500 MHz max. 5 GS/s (2.5 GS/s/ch), 6.25 Mword/ch
701310		DL9140 1 GHz max. 5 GS/s (2.5 GS/s/ch), 2.5 Mword/ch
701311		DL9140L 1 GHz max. 5 GS/s (2.5 GS/s/ch), 6.25 Mword/ch
701312		DL9240 1.5 GHz max. 10 GS/s (5 GS/s/ch), 2.5 Mword/ch
701313		DL9240L 1.5 GHz max. 10 GS/s (5 GS/s/ch), 6.25 Mword/ch
Power cable	-D	UL/CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	AS standard
	-H	GB standard
Help menu language	-HE	English Help
	-HC	Chinese Help
	-HK	Korean Help
Options	/B5	Built-in printer
	/P2*¹	2 Probe power connections on rear panel
	/C8*²	Built-in HDD + Ethernet interface
	/C9*²	Built-in HDD + LXI compliant Ethernet interface
	/C10*²	Ethernet interface
	/C12*²	LXI compliant Ethernet interface
	/G2*³	User-defined math function
	/G4*³	Power supply analysis function
	/F5*⁴	UART + I²C + SPI bus analyzer
	/F7*⁴	UART + CAN + LIN + SPI bus analyzer
	/F8*⁴	UART + I²C + CAN + LIN + SPI bus analyzer

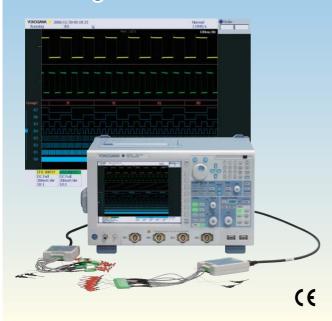*1: Please specify this /P2 option if you use either current probes or differential probes such as 701920, 701922, 701932 or 701933.
*2: Choose either one.
*3: Choose either one.
*4: Choose either one. UART, I²C, CAN, LIN and SPI triggers are standard.

Mixed Signal Oscilloscopes

DL9000 Series MSO Models

signal **X** plorer™

High performance and compact Mixed Signal Oscilloscope with 4 analog channels and 16/32-bit Logic input

CE

Basic Specifications

Analog inputs

Analog Bandwidth	DC-1GHz(DL9710L, DL9510L)
	DC-500MHz(DL9705L, DL9505L)
Analog input	4ch
Vertical sensitivity	for 1MΩ input 2mV/div to 5V/div
	for 50Ω input 2mV/div to 500mV/div
DC accuracy	±(1.5% of 8div + offset voltage accuracy)
Vertical axis resolution	8-bit

Logic inputs

Number of input	32bits(8bits × 4) (DL9710L, DL9705L)
	16bits(8bits × 2) (DL9510L, DL9505L)
Maximum toggle frequency	
	250 MHz (701981)
Input voltage range	±10 V (DC + AC peak, 701981)
Logic Threshold level	±10 V (0.1 V setting resolution, 701981)
Input impedance	approx. 10kΩ/approx. 9 pF (701981)

Common Specifications

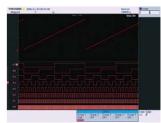|	
Max. sampling rate	5GS/s
Sweep sensitivity	500ps/div to 50s/div
Max. record length	6.25MW
History memory	Max data: 2000 (2.5 kW), when using history
	1600 (2.5 kW), when in N single mode
Trigger modes	Auto, Auto Level, Normal, Single,
	and N Single
Trigger types	Edge/State, Width, Event Interval,
	TV, Serial Bus (UART, I²C, SPI, CAN, LIN),
	Serial Pattern
Internal media drive	Flash ROM, 90MByte (Approx. 30M Byte is
	avilable for data storage)
Interface	USB Peripheral support, PC Card Interfaces,
	USB-PC Connection, Ethernet (optional)
Internal printer (optional)	Thermal line-dot, width 112mm
Other options	Serial Bus analysis (UART, I²C, SPI, CAN,
	LIN), User-defined Math, Power supply
	analysis,
	Internal HDD, Probe Power supply
Display (TFT LCD)	8.4-inch color TFT LCD
External dimensions	350(W) × 200(H) × 285(D)mm
Weight	Approx. 7.7kg (excluding printer)

Features

- Simultaneous measurement and analysis of 4 analog channels + 16/32-bit logic
- High speed acquisition and quick response
- Fast and powerful analysis of logic channels
- Capture and separate anomalies easily with History Memory
- Extensive trigger functions for handling the most complex waveforms
- Versatile zoom and search functions
- "Virtual D/A" Function
- Serial Bus Analysis (optional): UART, I²C, SPI, CAN, LIN
- Power Supply Analysis (optional)

Model	DL9710L	DL9705L	DL9510L	DL9505L
Analog inputs channels	4ch			
Analog Frequency Bandwidth	1GHz	500MHz	1GHz	500MHz
Logic inputs channels	32bits		16bits	
Max. Logic toggle frequency	250MHz			
Max. Sampling Speed	5GS(Simultaneous sampling of analog and logic)			

Model Number and Suffix Codes

Model	Suffix Code	Description
701320		DL9505L: 4ch 500MHz + Logic 16bits Max. 5 GS/s(2.5 GS/s/ch), 6.25 MW/ch
701321		DL9510L: 4ch 1GHz + Logic 16bits Max. 5 GS/s(2.5 GS/s/ch), 6.25 MW/ch
701330		DL9705L: 4ch 500MHz + Logic 32bits Max. 5 GS/s(2.5 GS/s/ch), 6.25 MW/ch
701331		DL9710L: 4ch 1GHz + Logic 32bits Max. 5 GS/s(2.5 GS/s/ch), 6.25 MW/ch
Power Cable	-D	UL/CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	AS standard
	-H	GB standard
Help menu language	-HE	English Help
Logic Probe	-L0	No Logic Probe attached
	-L2	Attach two 250 MHz Logic Probes (701981)
	-L4*1	Attach four 250 MHz Logic Probes (701981)
Options	/B5	Built-in printer
	/P4*2	4 Probe power connections on rear panel
	/C8*3	Built-in HDD + Ethernet interface
	/C9*3	Built-in HDD + LXI compliant Ethernet interface
	/C10*3	Ethernet interface
	/C12*3	LXI compliant Ethernet interface
	/G2*4	User-defined math function
	/G4*4	Power Supply Analysis Function
	/F5*5	UART+I²C+SPI bus analyzer
	/F7*5	UART+CAN+LIN+SPI bus analyzer
	/F8*5	UART+I²C+CAN+LIN+SPI bus analyzer

*1: Not available for DL9500 series
*2: Please order /P4 option if you use either current probes or differential probes such as 701920, 701922.
*3: Choose either one
*4: Choose either one
*5: Choose either one. UART, I²C, CAN, LIN and SPI triggers are standard.

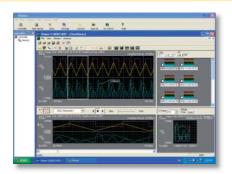**Waveform Measuring** — **Oscilloscopes Accessories**

Classification	Product	Model No.	Power supply Probe interface terminal (front panel)[2]	Power supply Probe power (option)/probe power supply (sold separately)	Description		DLM2000	DLM6000	DL6000	SB5000	DL9700/DL9500	DL9000	DL7400
Passive	200MHz passive probe	701938			200 MHz BW, 10:1, 1.5 meters		●(*5)						
	500MHz passive probe	701939			500 MHz BW, 10:1, 1.3 meters		●(*5)	●	●				
	PB500 (500 MHz passive probe)	701943			500 MHz BW, 10:1, 1.5 meters					●	●	●	
	400 MHz passive probe	700988			400 MHz BW (10:1) Allows the division ratio to be switched between 10:1 and 1:1. 1.5meters								●
	500 MHz Miniature passive probe	701941			DC to 500 MHz, 10:1, 1.2 meters								●
	350 MHz Miniature passive probe	701942			DC to 350 MHz, 10:1, 3.0 meters								●
Passive (High-voltage)	100:1 High voltage probe	701944			400 MHz BW, 100:1, 1.2 meters		●	●	●	●	●	●	●
	100:1 High voltage probe	701945			250 MHz BW, 100:1, 3.0 meters		●	●	●	●	●	●	●
Active, FET	PBA2500 (2.5 GHz active probe)	701913	○		2.5 GHz BW, 10:1, 1.2 meters		●	●	●	●	●	●	
	PBA1500 (1.5 GHz active probe)	701914	○		1.5 GHz BW, 10:1, 1.2 meters		●	●	●	●	●	●	
	PBA1000 (1.0 GHz active probe)	701912	○		1.0 GHz BW, 10:1, 1.2 meters		●	●	●	●	●	●	
	900 MHz FET Probe	700939		○	DC to 900 MHz		●	●	●	●	●	●	●
Resistance	PBL5000 (5 GHz low capacitance probe)	701974			5 GHz BW, 10:1, 20:1, 0.95 meters		●	●	●	●			
Differential	PBD 2000 (2 GHz differential probe)	701923	○		2 GHz BW, 10:1, Max. differential input voltage: ±5 V, 1.2 meters		●	●	●	●	●		
	PBDH 1000 1GHz differential probe	701924	○		DC~1 GHz, 50:1 Max. differential input voltage: ±25V		●	●	●	●	●		
	500 MHz differential probe	701920		○	DC~500 MHz, 10:1, Max. differential input voltage: ±12 V		●	●	●	●	●	●	●
	200 MHz differential probe	701922		○	DC~200 MHz, 10:1, Max. differential input voltage: ±20 V		●	●	●	●	●	●	●
	100 MHz differential probe	701921		○ (*3)	DC~100 MHz, 10:1, 100:1, Max. differential input voltage: ±70 V (10:1), ±700 V (100:1)		●	●	●	●	●	●	●
	100 MHz differential probe	700924		○ (*4)	DC~100 MHz, 100:1, 1000:1, Max. differential input voltage: ±1400 V (1000:1),±350 V (100:1)		●	●	●	●	●	●	●
	50MHz differential probe	701926		○ (*3)	DC~50 MHz, 100:1, 1000:1, Max. differential input voltage: 700Vpeak(100:1), 7000Vpeak(1000:1)		●	●	●	●	●	●	●
	15 MHz differential probe	700925		○ (*4)	DC~15 MHz, 10:1, 100:1, Max. differential input voltage: ±500 V (100:1), ±50 V (10:1)		●	●	●	●	●	●	●
Current	Current probe	701928	○		DC to 100MHz 30 Arms		●	●	●	●	●	●	
	Current probe	701929	○		DC to 50MHz 30 Arms		●	●	●	●	●	●	
	Current probe	701932		○	DC to 100 MHz, 30 Arms		●	●	●	●	●	●	●
	Current probe	701933		○	DC to 50 MHz 30 Arms		●	●	●	●	●	●	●
	Current probe	701931		○	DC to 2 MHz, 500 Arms		●	●	●	●	●	●	●
	Current probe	701930		○	DC to 10 MHz 150 Arms		●	●	●	●	●	●	●
Logic	PBL100 (100MHz Logic probe)	701988			Input impedance MΩ Max. toggle frequency: 100 MHz		●	●		●			●
	PBL250 (100MHz Logic probe)	701989			Input impedance: 100 kΩ Max. toggle frequency: 250 MHz		●	●		●			●
Other	De-skew correction signal source	701936			Voltage/current signal de-skew Supports through-type current transformers and a variety of current probes, including large current probes		●	●	●	●	●	●	●
	Probe power supply	701934			Large current output, external probe power supply (4 outputs)		●	●	●	●	●	●	●
	Probe stand	701919			Diameter of attachable probe ø8 to 13mm Weight : Approx. 1.5 kg		●	●	●	●	●	●	●

*1: These specifications are a summary. For details, please refer to the Web site, catalog, and other documentation.   *2: Available as standard for the DLM2000, DLM6000, DL6000, SB5000, DL9000, DL9700, and DL9500 series.
*3: Can also be battery operated.   *4: A power cable (B9852MJ) sold separately is required. Can also be battery operated.   *5: Use 701938 for the DLM2000 200 MHz model and 701939 for the 350/500 MHz models.
In addition to those listed above, there are other accessories available. For details, please refer to the Web site.
When using multiple current probes using the probe power of the main unit, ensure that the total power supply current of the current probes does not exceed the maximum output current of the probe power.

Oscilloscope Application Software

X viewer/MATLAB tool kit
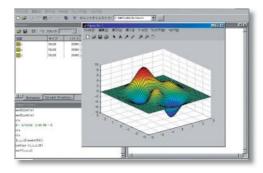
View Waveform Data on Your PC

701992
Xviewer

Xviewer is a PC software application designed to work with Yokogawa's DL (M) Series and the ScopeCorders. Xviewer allows you to display DL-acquired waveform data (using the "Viewer" function), perform file transfers, and control DL (M) Series from a PC.

Plug-in for MATLAB software

701991
MATLAB tool kit

The MATLAB tool kit for the DL Series is a plug-in for MATALAB software. The toolkit can be used to control supported instruments using MATLAB or to acquire data from the instruments to use in MATLAB via a communication interface (GP-IB, USB, Ethernet).

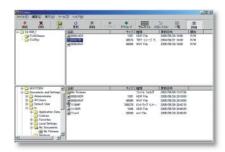## Remote Control Measuring Instrument on Your PC

XWirepuller/Wirepuller
(Free software)

With this software, you can display the front panel of the DLM/DL/SL/WT series on the screen of a PC, and monitor waveform signals. You can perform control from the PC using the mouse and keyboard in the same way as you operate the main unit.

USB-based File Transfer Utility

DL Gates
(Free software)

With this utility software, you can transfer files in the internal storage or internal media drive of the DLM/DL/SL series to a PC using USB or other interfaces.

In addition to the above, various kinds of accessory software, free software, LabVIEW drivers, and LabWindows/CVI drivers, can be downloaded from our web site.

Digital Power Analyzers

Selection Guide

Digital Power Analyzer

Yokogawa's WT Series Power Meters and PZ4000 Power Analyzer:
Advanced Technology and High Reliability for a Wide Range of Power Measurement Solutions

WT Series

Models	WT3000	WT1600	WT500	WT210/WT230	PZ4000
Items	...P26	...P25	...P28	...P29	...P30
Features	Top model of Digital Power Analyzer With basic power accuracy of ±0.02% of reading, DC and 0.1 Hz-1 MHz measurement bandwidth, and up to four input elements, the model provides higher-accuracy measurement of inverter Input/Output efficiency.	Middole Class model Up to six Input elements in one instrument (3 phase power input from two systems in one unit) 6.4-Inch TFT Color LCD Wide voltage and current input range	New Middle Class Power Analyzer Compact half rack size and easy use Max. 1000V and 40A input Simultaneous measurement U, I, P and those harmonics components External USB memory direct data saving	Entry class model Compact design (half-rack size) and superior cost performance 5 mA range for very low current measurements (model WT210 only)	A power analyzer that displays measured waveforms Wide bandwidth, high-precision measurements A power analyzer capable of dynamically capturing load fluctuations Graphical power analysis
Input elements	1 to 4	1 to 6	1 to 3	1 (WT210), 2 or 3 (WT230)	1 to 4 or 1 to 3 + Sensor input
Basic power accuracy (50/60 Hz)	0.02% of rdg + 0.04% of rng	0.1% of rdg + 0.05% of rng	0.1% of rdg + 0.1% of rng	0.1% of rdg + 0.1% of rng	0.1% of rdg + 0.025% of rng
Power measurement frequency range	DC, 0.1 Hz to 1 MHz	DC, 0.5 Hz to 1 MHz	DC, 0.5Hz to 100kHz	DC, 0.5 Hz to 100 kHz	DC, 0.1 Hz to 1 MHz
Input voltage range (for crest factor 3)	15/30/60/100/150/300/600/1000 V	1.5/3/6/10/15/30/60/100/150/300/600/1000 V	15/30/60/100/150/300/600/1000V	15/30/60/150/300/600 V	30/60/120/200/300/600/1200/2000 V peak
Input current range (for crest factor 3)	Direct input: 0.5/1/2/5/10/20/30 A or 5 m/10 m/20 m/50 m/100 m/200 m/500 m/1/2 A External input: 50 m/100 m/200 m/500 m/1/2/5/10 V	Direct input: 10 m/20 m/50 m/100 m/200 m/500 m/1/2/5 A or 1/2/5/10/20/50 A External input: 50 m/100 m/250 m/500 m/1/2.5/5/10 V	Direct input: 500m/1/2/5/10/20/40A External sensor input (option): 50m/100m/250m/500m/1/2/5/10V	Direct input: 5 m /10 m/20 m/50 m/100 m/200 m/500 m/1/2/5/10/20 A (WT210) Direct input: 500 m/1/2/5/10/20 A (WT230) External input (option): 2.5/5/10 V or 50 m/100 m/200 mV	Direct input 5 A: (253751, 253752) 0.1/0.2/0.4/1/2/4/10 Apeak Direct input 20 A: 1/2/4/10/20/40/100 Apeak (253752 only) External input: 100/200/400/1000 mVpeak
Measurement parameters	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle, Peak voltage, Peak current, Voltage Frequency, Current Frequency, Active power integration, Apparent power integration, Reative power integration, Current integration, Corrected power, Crest factor, Efficiency, Harmonic analysis	Voltage, Current, Active power, Apparent power, Reactive power, Power factor, Phase angle, Peak voltage, Peak current, Voltage Frequency, Current Frequency, Active power integration, Current integration, Crest factor, Form factor, Impedance, Resistance, Reactance, Corrected Power, Harmonic analysis	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle, Peak voltage, Peak current, Voltage frequency, Current frequency Active power integration and Current integration for both charge/discharge and sold/bought, crest factor, Efficiency, harmonic analysis	Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase angle, Peak voltage, Peak current, Voltage Frequency, Current Frequency, Active power integration, Current integration, Harmonic analysis	Voltage, Current, Active power, Apparent power, Reactive power, Power factor, Phase angle, Peak voltage, Peak current, Voltage Frequency, Current Frequency, Crest factor, Form factor, Impedance, Resistance, Reactance, Efficiency, Corrected Power, Harmonic analysis
Display	8.4-inch TFT color LCD	6.4-inch TFT color LCD	5.7-inch TFT color LCD	7-segment LED, 3 displays	6.4-inch TFT color LCD
External dimensions (mm) (W × H × D)	426 × 177 × 459	426 × 177 × 400	213 × 177 × 408.5	213 × 88 × 379 (WT210) 213 × 132 × 379 (WT230)	426 × 177 × 450
Weight (kg)	15	15	6.5	3 (WT210), 5 (WT230)	15

*About CW series Clamp-on Power Meters, please refer to the page 66.

Digital Power Meters

WT1600

Digital Power Analyzers

A Precision, Wide Frequency Range, Digital Power Meter with up to Six Input Elements

WT1600

CE

Overview

The WT1600 is a power meter designed to measure extremely small currents in energy-saving equipments, as well as large currents for evaluating large-sized loads. The WT1600 works with voltages ranging from 1.5 V up to 1000 V and supports a wide range of applications. A WT1600 can measure Input/Output signals on inverters, because it can accept signal inputs for up to six phases.

Model Number and Suffix Codes

Model	Suffix codes		Description					
760101			WT1600 digital power meter main unit					
			Element Number					
			1	2	3	4	5	6
Element types and quantities	-01		50					
	-02		50	50				
	-03		50	50	50			
The numbers in the "Description" column have the following meanings.	-04		50	50	50	50		
	-05		50	50	50	50	50	
	-06		50	50	50	50	50	50
50: 50 A input element	-10		5					
5: 5 A input element	-11		5	50				
Blank: No element	-12		5	50	50			
	-13		5	50	50	50		
Elements are inserted in the order shown starting on the left side on the back.	-14		5	50	50	50	50	
	-15		5	50	50	50	50	50
	-20		5	5				
	-21		5	5	50			
	-22		5	5	50	50		
	-23		5	5	50	50	50	
	-24		5	5	50	50	50	50
	-30		5	5	5			
	-31		5	5	5	50		
	-32		5	5	5	50	50	
	-33		5	5	5	50	50	50
	-40		5	5	5	5		
	-41		5	5	5	5	50	
	-42		5	5	5	5	50	50
	-50		5	5	5	5	5	
	-51		5	5	5	5	5	50
	-60		5	5	5	5	5	5
Communication functions	-C1		GP-IB					
	-C2		Serial (RS-232)					
Power cord		-D	UL/CSA Standard					
		-F	VDE Standard					
		-R	SAA Standard					
		-Q	BS Standard					
		-H	GB Standard					
Option specifications		/B5	Internal printer					
		/C7	SCSI interface					
		/C10	Ethernet, HDD, SCSI					
		/DA	30-channel DA output					
		/MTR	Motor evaluation function					

* The WT1600 unit cannot be purchased without any elements. Select an element type (5 A or 50 A) and quantity.

Note: In order to add elements and options after the WT1600 has been delivered, the WT1600 must be modified at the factory. Be aware of this in making your product selections. For further details, see Yokogawa's home page or contact our sales office.

Features

- Up to six input elements in one instrument (3 phase power input from two systems in one unit)
- Wide frequency range
- Wide current input range: 10 mA to 5 A or 1 A to 50 A
- Wide voltage input range: 1.5 V to 1000 V
- 50 ms data storing interval
- Standard integration and harmonic measurement functions
- Variety of display formats:
    Numeric, Waveform, Bar graph, Vector, and Trend
- Standard external current sensor input for use with current clamps
- Motor evaluation function (optional)
- 30ch D/A output (optional)
- Built-in printer (optional)
- Ethernet function (optional)

Basic Specifications

- Measurement voltage range: (for crest factor 3)
    1.5/3/6/10/15/30/60/100/150/300/600/1000 V
    (DC, 0.5 Hz to 1 MHz)
- Measurement current input range: (Direct input, for crest factor 3)
    5 A input element
    10/20/50/100/200/500 mA, 1/2/5 A
    (DC, 0.5 Hz to 1 MHz)
    50 A input element
    1/2/5/10/20/50 A (DC, 0.5 Hz to 100 kHz)
    External sensor input (same for 5 A and 50 A input elements)
    50/100/250/500 mV, 1/2.5/5/10 V (DC, 0.5 Hz to 500 kHz)
- Basic accuracy: (45 Hz $\leq$ f $\leq$ 66 Hz)
    Voltage/Current/Power:
    $\pm$(0.1% of rdg + 0.05% of rng)
- Effective of power factor (at cos ϕ = 0)
    $\pm$0.15% of rng added
- External dimensions:
    Approx. 426 (W) $\times$ 177 (H) $\times$ 400 (D) mm
- Weight: Approx. 15 kg (with 6-input element)

Precision Power Analyzer

WT3000

Best-in-class[*1] Precision and Stability with Basic Power Accuracy: ±0.06% of Total More Precise, More Bandwidth, and Simultaneous Measurement
(*1: As of August 2010, for power accuracy in a three-phase power meter as investigated by Yokogawa)

WT3000

CE

Features

The WT3000 has the highest precision of all the Yokogawa power analyzers in the WT series. The WT3000 can be used as a reference instrument for calibration and to measure the power and conversion efficiency of power transformers such as an inverter. It helps increase efficiency in evaluation and testing.

- Basic power accuracy ±0.06% of total, the highest precision of all power analyzers in the WT series
- Up to four input elements to achieve accurate measurement of input and output conversion efficiency
- Great improvement in measurement accuracy at low power factors when evaluating the loss of transformers or the like
- Motor efficiency and total efficiency measurement of the motor version
- Continuous maximum common mode voltage 1,000 Vrms to deal with high-voltage devices
- Simultaneous harmonic measurement without changing measuring modes (option)
- Wide bandwidth harmonic measurement between 0.1 Hz and 2.6 kHz of the fundamental waveform (option)
- Built-in printer (option)
- USB (media, keyboard, PC connection) (option)
- Ethernet interface (option)
- Harmonic measurement compliant with IEC61000-3-2/12 and (option)
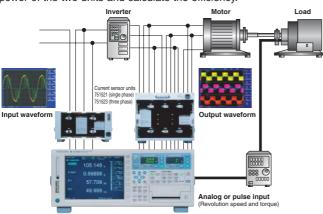- Voltage fluctuation/flicker measurement compliant with IEC61000-3-3/11 (option)

Applications to Utilize WT3000 Precision Power Analyzer's Capabilities
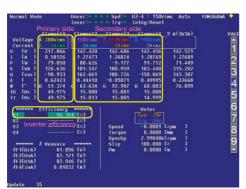
● **High-precision measurement of motor/inverter efficiency**

Growing interest in energy conservation of late increases the need to evaluate motor/inverter efficiency with high precision. The WT3000 offers up to four voltage and four current inputs and is capable of high-precision measurement of single-phase input and three-phase output to evaluate the inverter efficiency.

A motor evaluation function (option) allows you to observe changes in voltage, current, and power while at the same time observing changes in revolution speed and torque, and calculate and display mechanical power and total efficiency.

Also, you can synchronize two units and take measurements, and WTViewer software for data acquisition allows you to compare the power of the two units and calculate the efficiency.
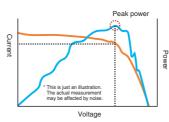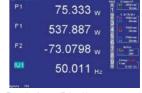
Inverter   Motor   Load

Current sensor units
751521 (single phase)
751523 (three phase)

Input waveform   **Output waveform**

Analog or pulse input
(Revolution speed and torque)

Example of measurement data display on the primary and secondary sides

● **Measuring instantaneous peak power in photovoltaic power generation**

In photovoltaic power generation, MPPT control varies the voltage to maximize energy harvested from the solar panel. The WT3000 allows you to measure voltage, current, and power, as well as peak voltage and peak current (on the plus and minus sides, respectively). Also, the user-defined math allows you to measure the instantaneous peak power (on the plus and minus sides).
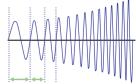
Peak power

Current   Power

* This is just an illustration.
The actual measurement
may be affected by noise.

Voltage

MPPT: Maximum Power Point Tracker
Example of measurement results of voltage, current, and power under control

Example of power (P1) and instantaneous peak power on the plus (F1) and minus (F2) sides

● **Cycle-by-cycle function allows measuring voltage, current, and power for each cycle**

To observe the rising characteristic of a starting motor or the like, you may want to acquire data for each cycle instead of at specified time intervals. The cycle-by-cycle measurement (/CC option) of the WT3000 allows you to measure the following parameters: voltage, current, active power, apparent power, reactive power, power factor, speed, torque, and mechanical power. Up to 3,000 periods of measurements can be taken.

Cycle-by-cycle data computation

Example of cycle-by-cycle measurement of three-phase voltage, current, active power, and apparent power

● Example of LED driving circuit and measurement

Lighting equipment is shifting from incandescent to fluorescent lamps. Furthermore, in recent years, long-life, low power consumption LEDs are attracting attention. To increase the power conversion efficiency of an LED driving circuit (drive module), it is necessary to measure the voltage, current, and power of input and output with high precision. The WT3000 provides the best-in class accuracy to measure the power conversion efficiency of input and output.

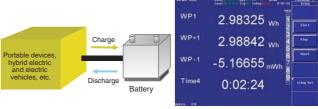Example of DC voltage, current, and power at three points and conversion efficiency measurement.

LED — Switching regulator — AC power supply

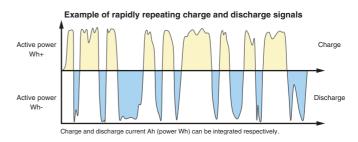Rear panel (4 input elements and options)

● Measuring battery charge and discharge (Ah/Wh)

For battery-powered equipment such as portable devices and electric-powered bicycles, engineers must often perform short-duration charge/discharge tests under actual operating conditions. Since the WT3000 employs a digital sampling system, each rapidly changing charge/discharge current and power can be integrated without gaps. This is effective in the evaluation of ampere-hours and watt-hours for calculating battery life.

Portable devices, hybrid electric and electric vehicles, etc. — Charge / Discharge — Battery

Example of display of total watt hours (on the plus and minus sides)

Example of rapidly repeating charge and discharge signals

Active power Wh+ — Charge
Active power Wh- — Discharge

Charge and discharge current Ah (power Wh) can be integrated respectively.

Specifications	
Voltage direct input range	: 15/30/60/100/150/300/600/1000 V
Current direct input range	: 0.5/1/2/5/10/20/30 A or 5 m/10 m/20 m/ 50 m/100 m/200 m/500 m/1/2 A
Current sensor input range	: 50 m/100 m/200 m/500 m/1/2/5/10 V
Frequency bandwidth	: DC, 0.1 Hz to 1 MHz
Basic accuracy (45 Hz to 66 Hz)	(30 A input element)
Voltage/current	0.01% of rdg[*1] + 0.03% of rng[*2]
Power	0.02% of rdg[*1] + 0.04% of rng[*2]
Data update period	: Select from 50 ms, 100 ms, 250 ms, 500 ms, 1 s, 2 s, 10 s, and 20 s
Power factor influence:	0.03% of S (apparent power) when $\cos \phi = 0$
A/D converter	Simultaneous voltage and current conversion, 16-bit resolution Conversion speed approx. 5 μs
Display	8.4-inch color TFT LCD monitor
Built-in printer (option)	Thermal line-dot, paper width 112 mm
PC card port, USB port (option)	
External dimensions	: Approx. 426 (W) × 177 (H) × 459 (D) mm (excluding protrusions)
Weight	: Approx. 15 kg (main unit, four input elements, options)

*1: 1 rdg: reading   *2: 1 rng: range

For common optional accessories, please see page 33.

Digital Power Analyzer

WT500 Series

Compact and easy use. The Power Analyzer for the renewable energy generation

WT500

$C\epsilon$

Overview of a Photovoltaic Power Conditioner

DC100V to 250V   DC300V   AC100V

Solar cell module

Booster converter ①

DC/AC converter ②

③

Load

Power link

* DC voltage values vary depending on the manufacturer and the system.

WT500 Power Analyzer

Overview

The WT500 is a new middle class power analyzer and it features a 5.7-inch color TFT and half width racking compact body that enable s single-phase and three-phase power measurement, achieving ±0.1% of reading basic and DC accuracy, maximum input of 1000Vrms, 40Arms and a measurement bandwidth up to 100kHz.

Features

- Accurate efficiency measurement of DC and AC signals
- RMS, MEAN, DC, AC and RMEAN of voltages and currents simultaneously.
- Simultaneous measurement of normal U/I/P data and those harmonic data
- As fast as 100ms data capturing and store data with all channels
- Separate integration functions for charge/discharge and bought/sold power
- Integration of power, reactive power, apparent power, and current enables you to determine a device's average power consumption
- Harmonics (DC-50th order) and Total harmonic distortion (THD) can be measured
- Saving measured data directly to external USB memory
- Measurement values can be saved as images or numerical data, and can be pasted into reports, analyzed in spreadsheet software, or used in a variety of other ways
- Easy setup with cursor keys
- GP-IB, USB and Ethernet communication are available

Basic Specifications

- Measurement voltage range: (for crest factor 3)

    15/30/60/100/150/300/600/1000V (for crest factor 3)

- Measurement current range: (for crest factor 3)

    Direct input 500m/1/2/5/10/20/40A

    External sensor input (option)

        50m/100m/200m/500m/1/2/5/10V

- Frequency range:

    DC, 0.5Hz to 100kHz

- Measurement Accuracy:

    Basic Accuracy (45Hz ≤ f ≤ 66Hz) and DC

    Voltage/Current/Power

        ± (0.1% of rdg + 0.1% of rng)

- USB interface to PC is standard feature
- Ethernet communication function is available (optional)
- GP-IB communication function is available (optional)
- Effective of power factor (at cos ϕ =0)

        ± 0.2% of S (apparent power)

- External dimensions:

    Approx. 213(W) × 177(H) × 408.5(D) mm

- Weight: Approx. 6.5kg (with 3-input element)

Model Number and Suffix Codes

Model	Suffix Codes	Description
760201		WT500 1 input element model
760202		WT500 2 input elements model
760203		WT500 3 input elements model
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	SAA standard
	-Q	BS standard
	-H	GB standard
Options	/C1	GP-IB interface
	/C7	Ethernet interface
	/EX1	External sensor input for 760201
	/EX2	External sensor input for 760202
	/EX3	External sensor input for 760203
	/G5	Harmonic Measurement
	/DT	Delta computation (760202/03 only)
	/FQ	Add-on Frequency Measurement (760202/03 only)
	/V1	VGA Output

Note: Adding input modules after initial product delivery will require rework at the factory. Please choose your models and configurations carefully, and inquire with your sales representative if you have any questions.

Digital Power Meters

WT210/WT230

Digital Sampling Power Meters with Superior Cost Performance

WT210
For standby low-power measurements and
rated-power measurements.
A single-phase model

WT230
For measurement applications from low-frequency
equipment to high frequency inverters.
A three-phase model

Overview

The WT210 and WT230 are compact, half-rack sized power meters. They are suited for a wide range of applications from low-frequency instruments to inverters, and offer improved basic accuracy and bandwidth. WT210 also has the same 5 mA range as WT200 allowing measurement of the extremely small currents found in energy-saving designs and intermittent control devices.

Features

- Maximum input with assured accuracy: 26 A
- Compact design (half-rack size)
- 5 mA range for very low current measurements (model WT210 only)
- Line filter function
- High-speed data update (as fast as 10 readings per second)
- Harmonic measurement function available (optional)
- User calibration capability
- Large-current measurement capability using external sensor input (optional)

Basic Specifications

- Measurement voltage range: (for crest factor 3)
  Voltage: 15/30/60/150/300/600 V
- Measurement current range: (for crest factor 3)
  Direct input:
  5 m/10 m/20 m/50 m/100 m/200 mA/
  0.5/1/2/5/10/20 A (WT210),
  0.5/1/2/5/10/20 A (WT230)
  External Sensor input (optional):
  2.5/5/10 V or 50/100/200 mV
- Frequency range:
  DC and 0.5 Hz to 100 kHz
- Basic accuracy (45 Hz ≤ f ≤ 66 Hz)
  Voltage/current/power
  ±(0.1% of rdg + 0.1% of rng)
- Effect of power factor (at cos ϕ = 0)
  ±0.2% of S added (S: apparent power)
- External dimensions:
  approx. 213 (W) × 88 (H) × 379 (D) mm (WT210)
  approx. 213 (W) × 132 (H) × 379 (D) mm (WT230)
- Weight: approx. 3.0 kg (WT210)
  approx. 5.0 kg (WT230)

- Wiring Types and Model Numbers

Wiring Model	760401	760502	760503
Single-phase 2-wire	✓	✓	✓
Single-phase 3-wire	–	✓	✓
Three-phase 3-wire (2 voltages, 2 currents)	–	✓	✓
Three-phase 3-wire (3 voltages, 3 currents)	–	–	✓
Three-phase 4-wire	–	–	✓

Model Number and Suffix Codes

Model number	Suffix code		Description	
760401			WT210 single-input element model	
Power cord	-D		UL/CSA standard	
	-F		VDE standard	
	-R		AS standard	
	-Q		BS standard	
	-H		GB standard	
Options	/C1		GP-IB communication interface	Select
	/C2		Serial (RS-232-C) communication interface	one
	/EX1		External input 2.5/5/10 V	Select
	/EX2		External input 50/100/200 mV	one
		/HRM	Harmonic measurement function	
		/DA4	4-channel DA output	Select
		/CMP	Comparator and D/A, 4 channels each	one

Note: The WT210 communication interface cannot be changed or modified after delivery.

Model number	Suffix code		Description	
760502			WT230 2-input element model	
760503			WT230 3-input element model	
Interface	-C1		GP-IB communication interface	Select
	-C2		Serial (RS-232-C) communication interface	one
Power cord		-D	UL/CSA standard	
		-F	VDE standard	
		-R	AS standard	
		-Q	BS standard	
		-H	GB standard	
Options	/EX1		External input 2.5/5/10 V	Select
	/EX2		External input 50/100/200 mV	one
		/HRM	Harmonic measurement function	
		/DA12	12-channel DA output	Select
		/CMP	Comparator and D/A, 4 channels each	one

29

Digital Power Analyzers

Power Analyzer

PZ4000

An Innovative Power Analyzer that Uses High-speed Sampling, Wide Frequency Range, and Waveform Analysis to Capture Transient Power Values

PZ4000

CE

Basic Specifications

- Measurement voltage range
  - 30/60/120/200/300/600/1200/2000 Vpk (Max. 1000 Vrms)
- Measurement current range
  - Direct input:
    - 0.1/0.2/0.4/1/2/4/10 Apk
    - (Max. 5 Arms) for 253751 and 253752
    - 1/2/4/10/20/40/100 Apk
    - (Max. 20 Arms) for 253752
  - External input:
    - 100/200/400/1000 mVpk
    - (Max. 500mVrms)
- Frequency range: DC to 2 MHz
- Basic accuracy (45 Hz ≤ f ≤ 66 Hz)
  - Voltage/current: ±(0.1% of rdg 0.05% of rng)
  - Power: ±(0.1% of rdg +0.025% of rng)
  - Effect of power factor: ±0.15% of S reading added
    - (S: apparent power)
- External dimensions: Approx. 426 (W) × 177 (H) × 450 (D) mm
- Weight: Approx. 15 kg (with 4-input module)

253751   253752   253771

- 253751 Power measurement module:
  - Voltage direct input ranges:
    - 30/60/120/200/300/600/1200/2000 Vpk (1000 Vrms)
  - Current direct input ranges: 0.1/0.2/0.4/1/2/4/10 Apk (5 Arms)
  - Current sensor input ranges: 0.1/0.2/0.4/1 Vpk (500 mVrms)

- 253752 Power measurement module:
  - Voltage direct input ranges:
    - 30/60/120/200/300/600/1200/2000 Vpk (1000 Vrms)
  - Current direct input ranges:
    - 0.1/0.2/0.4/1/2/4/10 Apk (5 Arms, upper terminal)
    - 1/2/4/10/20/40/100 Apk (20 Arms, lower terminal)
  - Current sensor input ranges: 0.1/0.2/0.4/1 Vpk (500 mVrms)

- 253771 Sensor input module:
  - Torque computing analog input: 1 /2 /5 /10 /20 /50 Vpk
  - Revolution speed computing analog input: 1 /2 /5 /10 /20 /50 Vpk
  - Revolution speed computing pulse input:
    - Maximum input range ±5 Vpk
    - Effective input range Min. 1 Vp-p

Overview

In the power electronics field, power measurement requires wide bandwidth performances to evaluate low to high frequencies and distorted waveform signals. The PZ4000 offers wide measurement bandwidths of up to 2 MHz and 5MS/s high-speed sampling to make accurate power measurement. With its LCD color display, the PZ4000 can display a wide variety of measurement parameters and analyze input waveforms as well. Various analysis functions are available to measure fluctuated or transient power during power activation or changes of motors, lighting, etc, which are difficult to measure with conventional power meters.

Features

- Wide measurement bandwidth (DC, up to 2 MHz).
- Accurate capturing of input waveforms using high-speed (maximum 5 MS/s) sampling.
- Voltage and current waveform display and analysis functions to enable power calculations on fluctuating inputs.
- Harmonic analysis (up to 500th order) and Fast Fourier Transform (FFT) functions to enable high-frequency power spectrum analysis.
- Multiple channel, synchronized measurements using multiple units and Master-Slave trigger function simplifies complex investigations.
  Variety of display formats: Numeric, Waveform, Bar graph, Vector, X-Y
- Sensor input module option enables evaluation of motor efficiency and total efficiency including the motor drive.

Model Number and Suffix Codes

Main unit

Model	Suffix Code		Description
253710			PZ4000 Power Analyzer
Power cord	-D		UL/CSA Standard
	-F		VDE Standard
	-R		SAA Standard
	-Q		BS Standard
	-H		GB Standard
Options		/M1	Memory extension to 1 M word/CH
		/M3	Memory extension to 4 M word/CH
		/B5	Built-in printer
		/C7	SCSI interface

Plug-in modules

Model	Suffix Code	Description
253751		Power measurement module Voltage: 1000 V Current: 5 A Current sensor: 500 mV
253752		Power measurement module Voltage: 1000 V Current: 5 A and 20 A Current sensor: 500 mV
253771 *		Sensor input module Torque / Revolution speed input
Module specifications	-E1	Plug-in unit

* Sensor input module can be used element 4 slot only.

Current Sensor Units

751521/751523

Accessory for Digital Power Meters and Power Analyzer

751521
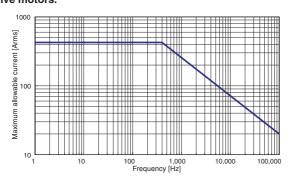(for single-phase
measurements)

751523
(for three-phase
measurements)

*751521/751523 do not conform to CE Marking.

Current sensor units can be used for large-current power measurements, which exceed the direct input range of a power meter. With the ability to measure a wide range of frequencies from DC to 100 kHz with high precision, these can be used in a variety of power measurement applications, such as EV/ inverter drive motors.

751521/751523
Current Sensor Units

Use model 751521 for single-phase measurements and model 751523 for three-phase measurements.
• Achieves superior noise resistance and CMR characteristics from its optimized rectangular design
• Accuracy assurance and calibration when combined with the WT digital power meters or the PZ power analyzer

751521/751523 Specifications

Input format: Floating input method using a CT (s)
Rated Current:
 DC   –600 A-0-600 A
 AC   600 A peak
Output current: 400 mA (when the rated 600 A input current is flowing)
Input/Output Ratio: 1500 : 1
Accuracy:
 DC $\pm$(0.05% of rdg + 40 μA)
 45 Hz $\leq$ f $\leq$ 66 Hz $\pm$(0.05% of rdg + 40 μA)
 Frequency Band: DC-100 kHz (-3dB)
• External dimensions
 751521: Approx. 426 (W) $\times$ 221 (H) $\times$ 430 (D) mm
 751523: Approx. 426 (W) $\times$ 355 (H) $\times$ 430 (D) mm
  (excluding the input terminal, feet, and other protrusions)
• Weight
 751521: Approx. 14 kg
 751523: Approx. 24 kg

751521/751523 Models and Suffix Codes

Models	Suffix codes		Description
751521			Single phase
751523	-10		Three phase U, V
	-20		Three phase U, W
	-30		Three phase U, V, W
Power supply voltage		-1	100 V AC (50/60 Hz)
Power cable		-M	UL/CAS standards with 3 to 2 pin adapter (Can be used only in Japan)

* Model 751523-10 is for the PZ4000/WT1600 series and Model 751523-20 is for the WT2000/WT200 series.

Current Transducer

751574/751552

Accessory for Digital Power Meters and Power Analyzer

$C\epsilon$

758917   **758921**

751574
Current Transducer

Yokogawa's current transducer model 751574 is a large-current measurement DC-CT used inside current sensor units 751521 and 751523. It is especially valuable for applications with limited installation space such as measurements in embedded systems and measurements in actual vehicles (e.g., EV/HEV).
(Note: A separate drive DC power supply is required. In addition, precision guarantee conditions may differ from those of the current sensors, depending on conditions such as the conductor position of the input primary wiring.)

751574 Specifications

Rated Current:
 DC   –600 A-0-600 A
 AC   600 A peak
Output current: 400 mA (when the primary rated current of 600 A is flowing)
Current transformation Ratio: 1500:1
Accuracy:
 DC $\pm$(0.05% of rdg + 40 μA)
 50/60 Hz $\pm$(0.05% of rdg + 40 μA)
Frequency band: DC-100 kHz (-3dB)
External dimensions:
 Approx. 122 (W) $\times$ 98 (H) $\times$ 57 (D) mm
  (excluding the connector, primary cable guide, and other protrusions)
Weight: Approx. 1 kg.

751552
Current Clamp-on Probe AC 1000 Arms (1400 A Peak)

● Measurement bandwidth: 30 Hz to 5 kHz
● Basic accuracy: $\pm$ 0.3% of reading
● Maximum allowable input: AC 1000 Arms
                           1400 Apk (AC)
● Current output type: 1 mA/A

To connect this probe to the WT series, you need the Model 758921 (Fork terminal adapter) and Model 758917 (Measurement lead set) accessories sold separately. For details, please see the Power Meter Accessories Catalog (Bulletin 7515-52E).

WT Series
Accessory Software

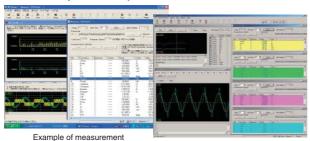# 760122, 761922 and Power Consumption Measurement Software

PC-based Control and Data Acquisition

WTViewer

760122

Main Features of WTViewer (common for all models)
- Numeric, waveform, harmonic, and trend displays
- Manual save function: With one click you can save only desired data at the right timing.
- Data conversion to CSV: You can save waveforms, numeric data, and screen images to a PC.
- You can control multiple WT series units of the same specifications from a PC.
  Note: The functionality differs slightly depending on the model. For details, please refer to the specifications of your desired model.

WTViewer is a software application that allows you to load numeric and waveform data measured with the WT3000 Precision Power Analyzer, WT1600 Digital Power Meter, or WT500 Power Analyzer to a PC via GP-IB, serial (RS-232 for WT3000/WT1600), or USB (for WT3000/WT500) communications. It also lets you view the waveform data, and analyze and save the numeric data.

Communication functions supported by WTViewer 760122

Model number	GP-IB	Serial (RS-232)	Ethernet	USB
WT3000	○	● *1	●	● *1
WT1600	○ *2	○ *2	●	×
WT500	●	×	●	○
WT210	● *2	● *2	×	×
WT230	○ *2	○ *2	×	×

○ : Supported (by WT as standard)　● : Supported (by WT as an option)　× : Not supported (by WT)
*1: With the WT, RS232 and USB port (PC) cannot be used at the same time.
*2: With the WT, RS232 and GP-IB cannot be used at the same time.

WT3000

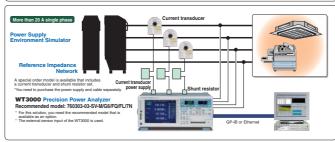|	Maximum connections	FTP server/client function
GP-IB connection	1 to 4 units	Not available
Serial (RS-323) communication	1 unit	Not available
Ethernet communication	1 to 4 units	Available*
USB communication	1 to 4 units	Not available

WT1600

	Maximum connections	FTP server/client function
GP-IB connection	1 to 4 units	Not available
Serial (RS-323) communication	1 unit	Not available
Ethernet communication	1 to 4 units	Available

WT500

	Maximum connections	FTP client function
GP-IB connection	1 to 4 units	Not available
Ethernet communication	1 to 4 units	Available
USB communication	1 to 4 units	Not available

* A PC card or USB memory is required.

Example of measurement display of WTViewer

Example of measurement display using multiple WT units

Support for IEC Standards Testing

Harmonic/Flicker Measurement Software

761922

- Allows you to judge high current equipment with input current of 16 A or more per phase (IEC61000-3-11/-3-12)
- Support for the method that does not consider interharmonics in the window of 16 cycles specified in IEC61000-4-7 1991
- Best-in-class high-precision current and voltage measurements (also allows you to calculate the limits of the standard)
- All Judgment graph display shows a list of all the measurement results in a time series by order.
- Allows you to measure harmonics for up to 24 hours, so capable of measuring equipment that needs more than one hour for one cycle.
- Continuous data acquisition at a measurement interval of 200 ms ensures continuous measurement over a long period of time with no missing data
- Support for the standard tests of single- and three-phase equipment

Less than 20 A single phase

Power Supply Environment Simulator

Reference Impedance Network

WT3000 Precision Power Analyzer
Recommended model: 760301-01-SV-M/G6/FL
* For this solution, you need the recommended model that is available as an option.

GP-IB or Ethernet

More than 20 A single phase

Power Supply Environment Simulator

Reference Impedance Network

A special order model is available that includes a current transducer and shunt resistor set.
*You need to purchase the power supply and cable separately.

Current transducer

Current transducer power supply

Shunt resistor

WT3000 Precision Power Analyzer
Recommended model: 760303-03-SV-M/G6/FQ/FL/7N
* For this solution, you need the recommended model that is available as an option.
* The external sensor input of the WT3000 is used.

GP-IB or Ethernet

Example of a measurement screen

Launcher screen

Example of an initial setup screen

Example of a printed report

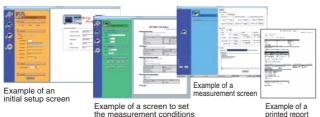|	Applicable standards
Harmonic current standard	IEC61000-3-2 Ed3.0 2008 (less than 16 A per phase) / 3-12 Ed 1.0 2004 (more than 16 A per phase)
Harmonic analyzer	IEC61000-4-7 Ed 1.0 1991/ Ed 2.0 2002 / Ed 2.0-Am1 2008
Voltage fluctuations and flicker standard	IEC61000-3-3 Ed 2.0 2008 (less than 16 A per phase /-3-11 Ed 1.0 2000 (more than 16 A per phase)
Flicker analyzer	IEC61000-4-15 Ed 1.1 2003

Power Consumption Measurement Software

Power Consumption Measurement Software

Free Software

- Support for the measurement of standby power compliant with the ErP Directive Lot 6, IEC62301 standard
- Allows you to acquire the necessary data such as a power value with simple operations such as just pressing the Start button.
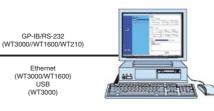- Allows you to print out a report on the measurement results.

(The free software can be downloaded from Yokogawa's website)

Example of an initial setup screen

Example of a screen to set the measurement conditions

Example of a measurement screen

Example of a printed report

WT3000

WT210

WT1600

GP-IB Ethernet USB

GP-IB/RS-232 (WT3000//WT1600/WT210)

Ethernet (WT3000/WT1600)

USB (WT3000)

- Allows you to check the power data together with current and power waveforms.
- Allows you to check harmonic components (up to 100th order).
- Allows you to display fluctuations in voltage, current, and power consumption in a time series (trend display).

For customers who are interested in the measurement of small currents using the WT500, a special model is also available. Please contact us.

Low-current measurement Box

Digital Analyzers Accessories List | **Accessories List**

Digital Power Analyzers

Product	Part No.	Description		WT3000	WT1600	WT500	WT210/WT230	PZ4000
1:1 BNC safety adapter lead	701901	1000 Vrms-CAT II, 1.8 m long Safety BNC (male) to safety banana (female) use in combination with 701959, 701954, 758921, 758922 or 758929		●	●	●	●	●
Measurement leads	758917	Two leads in a set. Use 758917 in combination with 758922 or 758929. Total length: 75 cm Rating: 1000 V, 32 A		●	●	●	●	●
Small alligator adapters	758922	For connection to measurement leads (758917). Two in a set. Rating: 300 V		●	●	●	●	●
Large alligator adapters	758929	For connection to measurement leads (758917). Two in a set. Rating: 1000 V		●	●	●	●	●
Safety terminal adapter set	758923	(spring-hold type) Two adapters in a set.		●	●	●	●	●
Safety terminal adapter set	758931	Screw-fastened adapters. Two adapters in a set. 1.5 mm Allen wrench included for tightening.		●	●	●	●	●
Fork terminal adapter	758921	Two adapters (red and black) to a set. Used when attaching banana plug to binding post.		●	●	●	●	●
Conversion adapter	758924	For conversion between BNC and female banana plug		●	●	●	●	●
Conversion adapter	366971	9-pin/25-pin conversion adapter		●	●			●
External sensor cable	B9284LK	For the external input of the WT210 and WT230. Length: 50 cm		●	●	●	●	●
BNC cable	366924	BNC cable BNC–BNC, 1 m		●	●	●		●
BNC cable	366925	BNC cable BNC–BNC, 2 m		●	●	●		●
Compact instrument cart	701960	500 (W) × 560 (D) × 705 (H) mm /A: keyboard, mouse table /B: 3-prong power strip		●	●	●	●	●
Deluxe instrument cart	701961	570 (W) × 580 (D) × 893 (H) mm /A: keyboard, mouse table /B: 3-prong power strip		●	●	●	●	●
All-Purpose instrument cart	701962	467 (W) × 693 (D) × 713 (H) mm		●	●	●	●	●
Rack mounting kit	751535-E4	For EIA		●	●	●		●
Rack mounting kit	751535-J4	For JIS		●	●	●		●
Rack mounting kit	751533-E2	For WT210 EIA standalone installation					●	
Rack mounting kit	751533-J2	For WT210 JIS standalone installation					●	
Rack mounting kit	751534-E2	For WT210 EIA connected installation					●	
Rack mounting kit	751534-J2	For WT210 JIS connected installation					●	
Rack mounting kit	751533-E3	For WT230 EIA standalone installation					●	
Rack mounting kit	751533-J3	For WT230 JIS standalone installation					●	
Rack mounting kit	751534-E3	For WT230 EIA connected installation					●	
Rack mounting kit	751534-J3	For WT230 JIS connected installation					●	

**DC Voltage/
Current Source**

GS200

Higher Accuracy The New Advanced DC Voltage/Current Source

Drag & Drop

USB

Drag & Drop
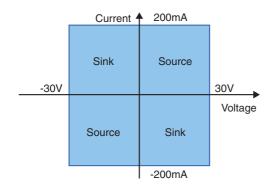
USB STORAGE

CE

Functions

The GS200 is a DC voltage/current source that boasts high accuracy, high stability, and high resolution. With its excellent traceability, stability, and 5 1/2-digit resolution, the GS200 generates extremely low-noise DC voltage and current signals.

- Voltage source up to ±32 V and current source up to ±200 mA
- 5 1/2-digit, ±120,000-count output resolution
- Voltage and current simple monitoring feature (optional)
- Programmable output up to 10,000 points
- Built-in USB mass storage device
- Channel expansion through synchronous operation

Load current measurement

The monitoring feature can be used to:
- Check that current is flowing.
- Check and inspect current consumption
- Log fluctuations in the load current
- Record V-I characteristics

Vcc application

GS200

Voltage and Current Source Range

The GS200 can perform four-quadrant operation by operating as a current source or a current sink in the range of ±30 V and ±200 mA. When the GS200 is sinking current, it can operate over the exact same range as when it is operating as a current source. You can use the GS200 not just as a highly accurate voltage source but also as a highly accurate constant-current electronic load.

Functions and Specifications

■ Source
- **Voltage source**

  Range : 10 mV, 100 mV, 1 V, 10 V, 30 V (Use a highly accurate voltage divider at 10 mV and 100 mV ranges)

  Maximum output : ±200 mA (at 1 V, 10 V, and 30 V ranges)
- **Current source**

  Range : 1 mA, 10 mA, 100 mA, and 200 mA

  Maximum output : ±30 V
- **Programming feature**

  Maximum number of steps : 10,000

  Trigger source : Internal timer (0.1 s resolution), External, STEP key, measurement end

■ Monitoring (option)
  Function : Voltage (during current generation), current (during voltage generation)

  Integration time : 1 to 25 PLC (Power Line Cycle)

  Trigger source : Measurement timer (0.1 s), source change, measurement end

  Delay : 0 to 999,999 ms (1 ms resolution)

  Maximum storage : 10,000 points

■ External Input and Output
  Input signal : TRIG IN, OUTPUT IN

  Output signal : TRIG OUT, OUTPUT OUT, READY OUT

  Connector : BNC connector (Select any one of the signals for both the input and output)

  Input and output level : TTL

  Minimum pulse width : 10 μs

■ Interface
- GP-IB interface
- USB interface
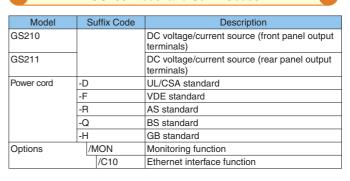- Ethernet interface (option) 100BASE-TX/10BASE-T

■ General Specifications
- Display : 256 × 64 dot vacuum fluorescent display
- External dimensions : Approx. 213 (W) × 88 (H) × 350 (D) mm (excluding protrusions)
- Weight : Approx. 5 kg

GS200 Model and Suffix Codes

Model	Suffix Code		Description
GS210			DC voltage/current source (front panel output terminals)
GS211			DC voltage/current source (rear panel output terminals)
Power cord	-D		UL/CSA standard
	-F		VDE standard
	-R		AS standard
	-Q		BS standard
	-H		GB standard
Options	/MON		Monitoring function
		/C10	Ethernet interface function

Multi Channel Source Measure Unit

GS820

Highly Accurate 2-Channel Voltage/Current Source Measure Unit

CE

Drag & Drop

USB

Drag & Drop

USB STORAGE

Features

The GS820 is a highly accurate and highly functional 2-channel programmable DC voltage/current source that incorporates voltage/current generation and measurement functions.

- Isolated 2-channel source and measurement function
- Source and measurement ranges: 7 V and 3.2 A or 18 V and 1.2 A
- Minute current ranges with 200-nA or 1-pA resolution
- Generate arbitrary waveforms consisting of up to 100,000 points at 100-μs intervals
- Channel expansion through master-slave synchronization link
- Fast test speeds
- 16-bit digital I/O (model 765602)

2-channel display example (256 x 64 dot matrix display)

Source and Measurement Range

Four-quadrant operation consisting of source operation (current source) and sink operation (current sink) is available with ranges up to 7 V and 3.2 A or 18 V and 1.2 A.

The output and measurement resolutions are 5.5 digits.

Functions

Source

Function:	Voltage or current
Mode:	DC or pulse (pulse width: 50 μs to 3,600 s)
Sweep mode:	Linear, logarithmic, or program (up to 100,000 steps)
Trigger source:	External or internal timers 1 and 2 (period: 100 μs to 3600 s)
Sweep start source:	External or internal timers 1 and 2 (period: 100 μs to 3600 s)
Source delay:	15 μ to 3600 s
Response characteristics:	Normal or stable

Measurement

Function:	Voltage, current, auto, voltmeter mode, ammeter mode, or resistance meter mode
Integration time:	0.001 to 25 PLC (Power Line Cycle)
Trigger source:	External or internal timers 1 and 2 (period: 100 μs to 3600 s)
Measure delay:	0 μs to 3600 s
Measurement data storage:	Up to 100000 data points
Average:	Moving average (average count: 2 to 256)
Voltage sense:	Two-wire system or four-wire system
Auto zero:	Measure the internal zero reference every measurement and correct the measured value
NULL computation:	Computes the difference with respect to the current measuredvalue or user-defined value
User-defined computation:	Computes user-defined equations in real-time
Operators:	+[addition], -[subtraction], *[multiplication], /[division], ^ [exponentiation], % [mod],	[logic OR], & [logic AND], ! [negation], < <= > >= == != [comparison], = [substitution],
Functions:	ABS() [absolute value], SQRT() [square root], LN(), LOG() [logarithm], SIN(), COS(), TAN() [trigonometric functions], ASIN(), ACOS(), ATAN() [inverse trigonometric functions], SINH(), COSH(), TANH() [hyperbolic functions], RAND() (random number generation), EDGE() [logic change extraction], TRUNC(), FLOOR() [rounding to an integer], ISINF() [infinity judgment], ISNAN [not-a-number judgment]
Conditional statement:	IF-THEN-ELSE

Communication Interface

GPIB

Electrical and mechanical specifications:	Conforms to IEEE St'd 488-1987
Functional specifications:	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0
Protocol:	Conforms to IEEE St'd 488.2-1987
Address:	0 to 30

RS232

Electrical specifications:	Conforms to EIA RS232
Connection format:	Point-to-point
Transmission mode:	Full-duplex
Synchronization mode:	Start-stop synchronization
Baud rate:	9600, 14400, 19200, 38400, 57600, 115200 bps

USB

Number of ports:	1
Connector type:	Type B connector (receptacle)
Electrical and mechanical specifications:	Conforms to USB Rev. 2.0
Protocol:	Mass storage class, USB-TMC

Ethernet

Number of Ethernet ports:	1
Connector type:	RJ-45 connector
Electrical and mechanical specifications:	Conforms to IEEE 802.3
Transmission system:	100BASE-TX/10BASE-T
Data rate:	100 Mbps or 10 Mbps
Protocol:	VXI-11 server, HTTP server, FTP server, DHCP client, and command socket

Model and Suffix code

Model	Suffix Code	Notes
765601		GS820 Multi Channel Source Measure Unit Standard Model
765602		GS820 Multi Channel Source Measure Unit Digital I/O Installed Model
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard

Generators, Sources, Manometers etc.

35

Source Measure Unit

GS610

Combines High Accuracy and High Speed in a Single Unit

USB STORAGE

Functions

■ Function

- Generation

  Generation function : Voltage or current

  Generation mode : DC or pulse

  Sweep mode : Linear, logarithmic, or program (up to 65,535 steps)

- Measurement

  Measurement function : DC voltage, DC current, and resistance

  Measurement data storage : Up to 65,535 data points

  Average : Block average or moving average (Specified count: 2 to 256)

- Trigger

  Trigger mode : Internal, external, and immediate

- Time setting

  Pulse width : 100 µs to 3,600 s, 1 µs resolution

  Period time : 1 ms to 3,600 s, 1 µs resolution (during source and measure operation) 100 µs to 3,600 s, 1 µs resolution (during source-only operation)

  Source delay : 1 µs to 3,600 s, 1 µs resolution

  Measurement delay : 1 µs to 3,600 s, 1µs resolution

  Integration time : 250 µs, 1 ms, 4 ms, 16.6 ms/20 ms,100 ms, 200 ms (auto detect from the power supply frequency when the power is turned ON for 16.6 ms/20 ms)

- Computation function

  Operator : +[addition], -[subtraction], *[multiplication], /[division], and ^ [exponentiation]

  Function : ABS(), EXP(), LN(), LOG(), SQRT(), SIN(), COS(), TAN(), ASIN(), ACOS(), ATAN(), SINH(), COSH(), TANH(), RAND()

■ External Input/Output

- Synchronization signal input/output (TRIG, SWEEP, CTRL IN and OUT) (BNC)
- External input/output (D-Sub 15-pin)
- GP-IB interface
- RS-232 interface
- USB interface
- Ethernet interface (option) 100BASE-TX/10BASE-T

■ Internal memory

ROM : 4 MB Area for storing setup and output pattern files

RAM : 4 MB Area for storing the measured results (cleared when the power is turned OFF)

■ Display : 256 × 64 dot vacuum fluorescent display

■ External dimensions : Approx. 213 (W) × 132 (H) × 400 (D) mm (excluding protrusions)

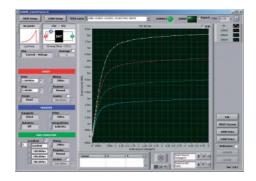### ■ Weight : Approx. 7 kg

Features

The GS610 is a highly accurate and highly functional programmable voltage/current source that incorporates voltage/current generation and measurement functions. The maximum output voltage and current are 110 V and 3.2 A, respectively. Evaluation of over a wide range of basic electrical characteristics is possible, because the GS610 can operate as a current source or a current sink.

- Source and sink operation up to 110 V/3.2 A (four-quadrant operation)
- Basic accuracy: ±0.02% *1
- Sweep output at up to 100 µs intervals
- Comes with abundant sweep patterns (linear, logarithmic, and arbitrary)
- Stores up to 65535 points of source measure data in the internal memory
- Easy file operation with the USB storage function
- Remote control and FTP using Web server function (Optional)

*1: DC voltage generation

Voltage/Current Generation and Measurement Range

Four-dimensional operation with source operation (current source) and sink operation (current sink) is possible at up to 110 V, 3.2 A, and 60 W. The output and measurement resolutions are 5.5 digits.

Voltage generation/measurement range: 200mV to 110 V

Current generation/measurement range: 20 µA to 3.2 A

Maximum output current:

  ±3.2 A (at an output voltage of ±12 V or less)

  ±2 A (at an output voltage of ±30 V or less)

  ±1 A (at an output voltage of ±60 V or less)

  ±0.5 A (at an output voltage of ±110 V or less)

Model and Suffix code

Model	Suffix Codes	Description
765501		GS610 Source Measure Unit
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS standard
	-H	GB standard
Option	/C10	Ethernet interface

GS Series Accessory Software

765670 Curve Tracer Software for the GS series

Product Overview

This product is a high-speed, high-accuracy real-time V-I curve tracer that consists of the GS series Source Measure Unit and the 765670 Curve Tracer Software. It is particularly well-suited to DC parametric tests of minute signals.

Features

■ **Simple system configuration, easy connection, compact, and light**

This system is configured by connecting the GS series Source Measure Unit to a PC that contains the 765670 Curve Tracer Software via USB.
You can perform high speed, high-accuracy curve tracing despite its compact size, light weight, And simple system configuration.

■ **Real-time, High-Speed Drawing**

The GS series is high-speed communication and sweep features allow high-speed graph update rate up to 25 pages/s(GS820).
You can use the real-time curve tracer with comfort.

■ **Field of Applications**

• Discrete semiconductors such as transistors and diodes
• Analog ICs such as voltage regulators and op- amps
• MOS logic and other digital ICs
• LEDs and other optical devices
• Solar battery cells

Drawing Speed (times/s; reference values)

Plot Points	Model Number	
	GS610	GS820
20	20	25
50	10	16
100	5	11
200	3	6

Measurement conditions: Using Core2Duo CPU, 1.5 GHz, USB 2.0, and LabVIEW
Measurement integration time: 0.001 PLC for GS820 / 250 µs for GS610

http://tmi.yokogawa.com/products/generators-sources/
    source-measure-units/765670-curve-tracer-software/

GS820   PC

System configuration illustration

GS610   PC

Specifications

• Graph drawing:
 Voltage vs. current, voltage vs. voltage, gain vs. voltage, voltage vs. timestamp, current vs. voltage, current vs. current, gain vs. current, current vs. timestamp

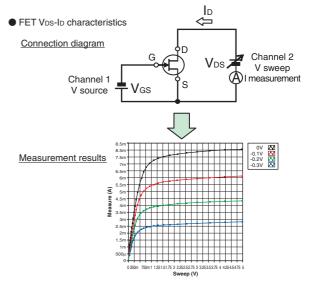|	
Sweep axis:	Voltage source or current source
Measurement axis:	Voltage measurement or current measurement
Parameter:	Voltage source or current source
Sweep shape:	Ramp (linear or log), triangle (linear or log), rectangle
Sweep points:	5, 10, 20, 50, 100, 200, 1000
Scaling:	Auto scale or fixed scale
Averaging count:	2 to 100

• Analysis feature:
 Cursor, zoom & scroll, reference curve designation
• File operations:
 CSV data storage and loading, graphic image storage, panel image storage, setup storage and recall

Examples of Measurements of Characteristics

● FET V_{DS}-I_D characteristics

Connection diagram

Measurement results

Generators, Sources, Manometers etc.

37

Digital Multimeters — 7555/7561/7562

5.5 Digits Digital Multimeter

7555
Digital Multimeter

• Fast sampling at 125 times/s
• Scanner Function for multi-points measurement. (Up to 8 ch, optional)
• D/A output and BCD output functions

7555 Specifications

• DC voltage (DCV)
  Range: 200 mV to 1000 V
• DC current (DCA)
  Range: 2 mA to 2000 mA
• AC voltage (ACV)
  Range: 200 mV to 700 V
  (true rms value measuring method)
• AC current (ACA)
  Range: 2 mA to 2000 mA
• Resistance measurement (OHM, 2 W/4 W)
  Range: 200 Ω to 200 MΩ
• Maximum indication: 199999
• RS-232C interface (standard)
• GP-IB interface (optional)
• External dimensions:
  approx. 213 (W) × 88 (H) × 379 (D) mm
• Weight: approx. 3.5 kg

6.5 Digits Digital Multimeter

7561/7562
Digital Multimeters

• High accuracy (DC voltage-based accuracy)
  ±0.0045% of reading ± 15 digits
• Fast sampling at 333 times/s
• Large capacity buffer memory: up to 8000 data items
  IC memory card usable
• GP-IB interface (standard)

7561/7562 Specifications

• DC voltage (DCV)
  Range: 200 mV to 1000 V
• DC current (DCA)
  Range: 2 mA to 2000 mA
• AC voltage (ACV)(7562 only)
  Range: 200 mV to 700 V
• AC current (ACA)(7562 only)
  Range: 2 mA to 2000 mA
• Resistance measurement (OHM, 2 W/4 W)
  Range: 200 Ω to 200 MΩ
• Maximum indication: 1999999
• External dimensions:
  approx. 213 (W) × 88 (H) × 330 (D) mm
• Weight: approx. 3 kg

Digital Resistance Meter — 7556

High-Speed Digital Resistance Meter for Production Line of Fixed Chip Resistors

The 7556 is designed to be mounted on a taping machine.
* When you use the 7556 for any purpose other than a production line, you need to be careful.
  Please read the specifications carefully.

7556

• High-speed measurement (2.8 ms)
• High accuracy: ±(0.006% of reading + 3 digits)
• High resolution: 5.5 digits
• Wide range: 1 Ω range to 100 MΩ range
• Full remote control through serial (RS-232) or GP-IB interface
• Software-based calibration function
• Advanced contact check function

7566 Specifications

Range: 1 Ω, 10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ,
  1 MΩ, 10 MΩ, 100 MΩ
Resolution: Deviation display
  755601: -99.99% to 19.99% or -99.9% to 199.9% (selectable)
  755611: -99.999% to 19.999% or -99.99 to 199.99% (selectable)
  Absolute value display
  755601: 100 μΩ (at 1 Ω range)
  755611: 10 μΩ (at 1 Ω range)
Measurement time:
  Normal mode: 60 Hz power supply: 19.9 ms
               50 Hz power supply: 23.2 ms
  Fast mode: 5.7 ms
  High-speed mode: 2.8 ms
Accuracy (at 1 kΩ range, 23±5°C in normal mode)
  755601: ±(0.015% of reading + 1 digit)
  755611: ±(0.006% of reading + 3 digits)
Contact check function
  Check level: 1 Ω to 30 Ω (Selectable)
  Execute checks before or after measurement (selectable)
  Check current: 50 mA
  Contact check error message with display panel and handler interface
  Measured current abnormality detection function
  (Detect measured current abnormality caused by a contact error)
Comparator function (both Hi and Lo)
  Deviation setting range
  755601: -9.99% to 9.99% or -99.9% to 99.9% (selectable)
  755611: -9.999% to 9.999% or -99.99% to 99.99% (selectable)
  Absolute value setting range
      755601: 0.0000 Ω to 1.2000 Ω
      755611: 0.00000 Ω to 1.20000 Ω

Temperature Measuring Instrument — 7563

Precision Digital Thermometer

7563
Digital Thermometer, 6.5 Digits

• Thermometer has a 6.5-digits display Twelve types of TC's and four types of RTD's
• Basic accuracy in temperature measurement: 0.006% (TC)
• Basic accuracy in DCV measurement: 0.0045% (2000 mV range)
• Basic accuracy in resistance measurement: 0.006% (2000 Ω range)
• Number of sampling times: up to 100 times/s (4.5 digits)

7563 Specifications

Maximum display: ±1999999
Resolution: Voltage   100 nV
            Resistance   100 μΩ
            Thermocouple 0.1°C
            RTD   0.01°C
Reference junction compensation accuracy:
  ±0.2°C
Various computation functions
Software calibration function
Memory function
• Internal memory up to 1000 data items
• IC memory up to 8000 data items
Communication function: GP-IB
Analog output (optional):
  code /DA specified
Power consumption: 20 VA
External dimensions:
  213 (W) × 88 (H) × 350 (D) mm
Weight: approx. 3 kg

Programmable Scanner — 7501

Multi-Point Measurements in Combination with a Measuring Instrument

7501

• Switching for up to 50 channels
• Four types of relay cards and a digital I/O card
• Switching programs of up to 100 steps can be stored
• GP-IB interface (standard)

7501 Specifications

Step/scan interval:	Arbitrary setting is possible
	20 to 9,999 ms (resolution: 1 ms)
	1 to 3,600 s (resolution: 1 s)
	1 to 1,440 min (resolution: 1 min)
	1 to 24 h (resolution: 1 h)
Scan start timer:	Scan starting time settable in 1-s steps; internal clock with calendar function
External trigger input:	TTL level, negative pulse (pulse width: 2 μs or more)
Closed output:	TTL level, negative pulse (pulse width: 10 μs)

Relay card specifications
• General-purpose multiplexer card: 750611; 10-channel, maximum 40 V/1 A input available
• Thermocouple multiplexer card: 750612; 10-channel, maximum 40 V/100 mA input available
• General-purpose actuator card: 750631; 10-channel, 2-wire system, maximum 40 V/1 A input available
• General-purpose matrix card: 750641; 4 by 4-channel, maximum 40 V/1A input available

Working temperature range:	5 to 40°C, 20 to 80% RH (no condensation)
Power supply:	90 to 250 VAC
Power consumption:	20 VA max (for 5 cards mounted)
External dimensions:	Approx. 426 (W) × 88 (H) × 430 (D) mm
Weight:	Approx. 5 kg (with relay cards not mounted)

Pressure Standard

MC100

Pneumatic Pressure Standard

MC100
Pneumatic Pressure Standard

- High accuracy: ±0.05% of full scale
- Output ranges and resolution
  0 to 200 kPa (resolution 0.01 kPa)
  0 to 25 kPa (resolution 0.001 kPa)
- Functions useful for instrument calibration
  Divider output, auto-step output, and sweep output
- Excellent temperature coefficient
  Zero point: ±0.003% of full scale/°C
  Span: ±0.002% of full scale/°C

MC100 Series Specifications

- Supply pressure
  0 to 200 kPa range model:
  280 kPa ±20 kPa
  0 to 25 kPa range model: 50 kPa ±10 kPa
- Accuracy
  ±0.05% of full scale (at 23°C ±3°C)
- Output noise: ±0.02% of full scale
- Effect of mounting orientation
  Forward/backward incline of 90°
  0 to 200 kPa range model: ±0.01% of full scale
  0 to 25 kPa range model:

±0.1% of full scale
Sideways incline of 30°
  0 to 200 kPa range model: ±0.2% of full scale
  0 to 25 kPa range model: ±2.5% of full scale
- Pressure display units (selectable):
  kPa, kgf/cm², mmH₂O, mmHg
  kPa, psi, inH₂O, inHg
- External dimensions:
  213 (W) × 132 (H) × 400 (D) mm
- Weight: approx. 9.5 kg

Manometers

MT210/MT210F/MT220/MT10

Precision Digital Manometer

MT210
Digital Manometer

- High accuracy: ±(0.01% of reading + 3 digits) (130 kPa range gauge model)
- A wide range pressures, from a low differential pressure of 1 kPa to a high gauge pressure of 3000 kPa, and absolute pressure of 130 kPa
- D/A conversion output, comparator output, and external trigger input (optional)
- Both gases and liquids measurable
- External attachable battery pack (optional)

MT210 Series Specifications

- Measuring range (gauge pressure: positive)
  0 to 10 kPa, 130 kPa, 700 kPa and 3000 kPa
  Measuring range (gauge pressure: negative)
  -80 to 0 kPa, -10 to 0 kPa
- Measuring range (absolute pressure)
  0 to 130 kPa abs
- Measuring range (differential pressure)
  0 to 1 kPa, 10 kPa, 130 kPa and 700 kPa
- Accuracy (for 0 to 10 kPa range model)
  ±(0.01% of reading + 0.015% of full scale) (at positive pressure)
- Resolution
  0 to 1 kPa range model: 0.00001 kPa
  0 to 10 kPa range model: 0.0001 kPa
  0 to 130 kPa range model: 0.001 kPa
  0 to 700 kPa range model: 0.01 kPa
  0 to 3000 kPa range model: 0.01 kPa
- Maximum allowable input (for gauge pressure positive)
  0 to 10 kPa range model: 500 kPa gauge
  0 to 130 kPa range model: 500 kPa gauge
  0 to 700 kPa range model: 3000 kPa gauge
  0 to 3000 kPa range model: 4500 kPa gauge
- Pressure display units (selectable):
  psi, inH₂O, inHg, kPa, kgf/cm², mmH₂O, mmHg
- External dimensions:
  213 (W) × 132 (H) × 350 (D) mm
- Weight
  Approx. 6.5 kg (0 to 130 kPa range model)

Fast Response Digital Manometer

MT210F
Digital Manometer

- High accuracy: ±(0.01% of reading + 3 digits) (130 kPa range gauge model)
- Select from three measurement modes: normal speed, medium speed, and high speed
- D/A conversion output, comparator output, and external trigger input (optional)
- Both gases and liquids measurable
- External attachable battery pack (optional)

MT210F Series Specifications

- Measuring range (gauge pressure: positive)
  0 to 10 kPa, 130 kPa, 700 kPa and 3000 kPa
  Measuring range (gauge pressure: negative)
  -80 to 0 kPa, -10 to 0 kPa
- Measuring range (absolute pressure)
  0 to 130 kPa abs
- Accuracy (for 0 to 10 kPa range model)
  ±(0.01% of reading + 0.015% of full scale) (at positive pressure)
- Response time (0 to 130 kPa range model, at high speed mode)
  50 msec max.
- Readout update interval (at medium and high speed mode)
  100 msec
- Resolution
  0 to 10 kPa range model: 0.0001 kPa
  0 to 130 kPa range model: 0.001 kPa
  0 to 700 kPa range model: 0.01 kPa
  0 to 3000 kPa range model: 0.01 kPa
- Maximum allowable input (for gauge pressure positive)
  0 to 10 kPa range model: 500 kPa gauge
  0 to 130 kPa range model: 500 kPa gauge
  0 to 700 kPa range model: 3000 kPa gauge
  0 to 3000 kPa range model: 4500 kPa gauge
- Pressure display units (selectable):
  psi, inH₂O, inHg, kPa, kgf/cm², mmH₂O, mmHg
- External dimensions:
  213 (W) × 132 (H) × 350 (D) mm
- Weight
  Approx. 6.5 kg (0 to 130 kPa range model)

Digital Manometer For Efficient Field Calibration

MT220
Digital Manometer

- The de facto standard of field celibrators for pressure and ditferential pressure transmitters
- High accuracy: ±(0.01% of reading + 3 digits) (130 kPa range gauge model)
- DCV/DCA measurement function (DMM function)
- 24 VDC power supply for driving the transmitter
- % display, error display, and measured data memory
- D/A conversion output, comparator output, and external trigger input (optional)
- Both gases and liquids measurable
- External attachable battery pack (optional)

MT220 Series Specifications

- Measuring range (gauge pressure: positive)
  0 to 10 kPa, 130 kPa, 700 kPa and 3000 kPa
  Measuring range (gauge pressure: negative)
  -80 to 0 kPa, -10 to 0 kPa
- Measuring range (absolute pressure)
  0 to 130 kPa abs
- Accuracy (for 0 to 10 kPa range model)
  ±(0.01% of reading + 0.015% of full scale) (at positive pressure)
- Resolution
  0 to 10 kPa range model: 0.0001 kPa
  0 to 130 kPa range model: 0.001 kPa
  0 to 700 kPa range model: 0.01 kPa
  0 to 3000 kPa range model: 0.01 kPa
- Maximum allowable input (for gauge pressure positive)
  0 to 10 kPa range model: 500 kPa gauge
  0 to 130 kPa range model: 500 kPa gauge
  0 to 700 kPa range model: 3000 kPa gauge
  0 to 3000 kPa range model: 4500 kPa gauge
- Pressure display units (selectable):
  psi, inH₂O, inHg, kPa, kgf/cm², mmH₂O, mmHg
- Measurement range of DCV/DCA measurement function
  0 to ±5.25 V
  0 to ±21 mA
- Accuracy of DCV/DCA measurement function (6 months after calibration)
  ±(0.05% of reading + 3 digits)
- 24 VDC output
  24 ± 1 VDC, 30 mA max.
- External dimensions:
  213 (W) × 132 (H) × 350 (D) mm
- Weight
  Approx. 7.0 kg (0 to 130 kPa range model)

Handheld Digital Manometer

MT10
Mini-Manometer

- Compact and lightweight (approx. 700 g), battery-operated
- High reliability (silicon resonant sensor adopted)
- Accuracy: ±(0.04% of rdg + 0.03% of FS) for 130 kPa model
- Three models for 130 kPa, 700 kPa, and 3000 kPa (gauge pressure)
- Data hold function
- RS-232-C interface
- Comes with carrying case

MT10 Series Specifications

- Type of pressure: gauge
- Three measuring ranges
  0 to 130 kPa, 0 to 700 kPa, and 0 to 3000 kPa
- Measurement display range:
  -2.5 to 110% of FS
- Accuracy:
  0 to 130 kPa range model
  ±(0.04% of rdg + 0.03% of FS)
  0 to 700 kPa and 0 to 3000 kPa range models
  ±0.1% of FS
- Resolution
  0 to 130 kPa range model: 0.01 kPa
  0 to 700 kPa range model: 0.1 kPa
  0 to 3000 kPa range model: 1 kPa
- Maximum allowable input
  0 to 130 kPa range model: 500 kPa
  0 to 700 kPa range model: 1000 kPa
  0 to 3000 kPa range model: 4500 kPa
- Effect of temperature
  Zero: ±0.02% of FS/10°C or less
  Span: ±0.02% of FS/10°C or less
- Pressure display units (specified at shipment)
  kPa, kgf/cm², mmH₂O, mmHg, Psi, inH₂O, inHg
- External dimensions:
  Approx. 72 (W) × 174 (H) × 60 (D) mm (excluding input connections)
- Weight: Approx. 700 g (including battery)

Synthesized Function Generators

FG210/FG220/FG310/FG320/FG120/FG110

Frequency Range 1 µHz to 15 MHz

FG210, FG220, FG310, FG320
Synthesized Function Generators

- Generating frequencies:
  1 µHz to 15 MHz (sine waves and square waves)
  1 µHz to 200 kHz (triangular, pulsed, and arbitrary)
- Independent 2 channels (FG220/FG320)
- Multiple sweep functions and modulation functions
- Intuitive operation with large LCD panel and touch screen

FG200/FG300 Specifications

- Number of signal outputs:
  1 (for FG210 or FG310)
  2 (for FG220 or FG320)
- Output waveforms: sine waves
  Square waves (duty ratio 50% fixed)
  Triangular waves (symmetry variable)
  Pulse waves (duty ratio variable)
  Arbitrary waves (FG310/FG320)
- Operation mode:
  continuous, trigger or gate oscillation, DC output
- Frequency range
  Sine and square waves:
    1 µHz to 15 MHz
  Triangular and pulse waves:
    1 µHz to 200 kHz
  Arbitrary waves: 1 µHz to 200 kHz
- Frequency resolution:
  1 µHz or 9 digits max.
- Max. output voltage: ±10 V (high-impedance load)
- Output impedance: 50 Ω ± 1%
- Sweep types:
  linear, log, linear step, log step, and arbitrary patterns (FG310/FG320)
- Sweepable parameters:
  frequency, amplitude, offset phase, duty ratio, frequency and amplitude
- Modulation types:
  AM, DSB-AM, FM, phase modulation, offset modulation, or PWM
- External dimensions:
  approx. 213 (W) × 132 (H) × 350 (D) mm
- Weight: Approx. 5 kg

Frequency Range 1 µHz to 2 MHz

FG120/FG110
Synthesized Function Generator

- Completely independent 2-channel output (FG120)
- Output waveform: sine, square, triangular, ramp and pulse
- Output frequency: DC and 1 µHz to 2 MHz (sine and square waves)
- Max. output voltage: ±10 V
- Compact (A4 size), lightweight (approx. 3.6 kg) and low cost

FG120/FG110 Specifications

- Number of signal outputs:
  1 (use 706011 (FG110))
  2 (use 706012 (FG120))
- Output waveforms:
  sine, triangular, square wave (duty ratio 50% fixed), ramp, pulse (duty ratio 5 to 95% variable)
- Operation mode:
  continuous, trigger or gate oscillation, DC output
- Output frequency range
  Sine and square waves:
    1 µHz to 2 MHz
  Triangular, ramp, and pulse waves:
    1 µHz to 100 kHz
- Frequency resolution: 1 µHz or 10 digits
- Max. output voltage: ±10 V*
- Output impedance: 50 Ω ± 1%
- GP-IB interface equipped as standard
- External dimensions:
  approx. 213 (W) × 100 (H) × 330 (D) mm
- Weight: Approx. 3.6 kg

*(Maximum amplitude plus offset with high-impedance load)

CE∗: except 706011-1/-4, 706012-1/-4 models

Universal Counters

TC110/TC120

Wide Measuring Range from 1 mHz to 2 GHz (TC120)

TC110/TC120
Universal Counter

- Measuring frequency range:
  1 mHz to 2 GHz (TC120)
  1 mHz to 120 MHz (TC110)
- Resolution of 8 digits in 1 s
- Easy 1-action operation with 1 key
- Convenient auto-trigger function
- Measurement of revolution (TC110 only)

TC110/TC120 Specifications

- Frequencies A, B, and C
  Measurable range
  A: 1 Hz to 120 MHz (1/2-prescaler)
  B: 1 mHz to 60 MHz
  C: 100 MHz to 2 GHz (1/128-prescaler)
- Period B
  Measuring range: 20 ns to 999.999999 s
- Time interval A→B
  Measuring range: 60 ns to 999.999999 s
- Pulse width B
  Measuring range: 20 ns to 999.999999 s
- Duty ratio B
  Measuring range: 0.00000001 to 0.99999999
  Input range: 20 ns to 999.999999 ns
- Frequency ratio A/B

- Measuring range: A and B:
  1 mHz to 60 MHz
- Totalization A
  Input frequency range: 1 mHz to 50 MHz
  Counting capacity: 0 to 999999999
- Revolution B (TC110 only)
  Measuring range: 60 mrpm to 120 Mrpm
- Peak voltage A and B
  Measuring voltage range:
    ±5 V (ATT = x1)
  Frequency range: 50 Hz to 20 MHz
- External dimensions:
  approx. 213 (W) × 100 (H) × 330 (D) mm
- Weight: Approx. 3.6 kg

Time Interval Analyzers

TA720

Continuous Measurement Up to 80 MS/s

TA720
Time Interval Analyzer

- Maximum Continuous Sampling Rate 80 MS/s
- Sampling rate:
  80MS/s continuous (at Single measurement function)
  50MS/s continuous (at Dual measurement function)
- Sampling Modes:
  Time stamp mode (T.S. Mode), Hardware histogram mode (H.H. Mode), Inter-symbol interference analysis mode (ISI mode)
- Dual Measurement Function

This function enables two measurements to be done simultaneously.
- Inter-Symbol Interference Analysis Function
- Ethernet/PC Card Interface (optional)
- Built-in Printer (standard)
- GP-IB Interface (standard)
- 3.5-inch floppy drive (standard)
- TFT color LCD screen

Optical Spectrum Analyzer

AQ6370 Series

High Performance Optical Spectrum Analyzers Meeting Measurement Needs in a Broad Range of Applications

Features

- Best-in-class optical performance
  - · High wavelength resolution and high dynamic range
  - · High sensitivity
  - · Free-space optical input
- Excellent measurement throughput
  - · High-speed spectrum measurement
  - · High-speed remote interface
  - · High resolution and wide bandwidth batch measurement
- More user-friendly
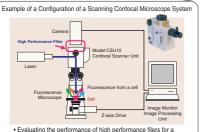 - · USB interface available
    For mouse, keyboard, and external storage devices such as a memory device and hard disc drive (HDD).
  - · Trace zooming function
  - · More than 10 waveform analysis functions available
- Support for creating an automatic measurement system
  - · GP-IB, RS-232C, and Ethernet interfaces available
    Support for the remote commands and formats of the AQ6317 series
  - · Macro programming function available
- Wavelength calibration reference light source or alignment light source available
- PC emulation and remote control software (option)

Three Models Converting a Wide Wavelength from 350 nm to 2400 nm

■ **AQ6370C (600 to 1700 nm)**
Standard model optimized to the wavelengths often used in telecommunication applications

■ **AQ6373 (350 to 1200 nm)**
Model for short-wavelength including visible light (VIS)

■ **AQ6375 (1200 to 2400 nm)**
Model for long wavelength over 2 μm commonly used in the near-infrared range

Optical Applications

Today, optical technology is used in a wide variety of applications, which include biomedical application and environmental measurement, as well as information and communication, where demand for broadband connectivity is growing rapidly, driven by the popularity of the Internet, IP telephony, and video streaming. Yokogawa's optical spectrum measurement technology contributes to the development of such optical applications.
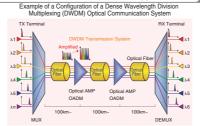
Main Optical Applications and Wavelength Bands Used

Medical Treatment – Biology – Information & Communication – Environmental Analysis – Sensing – Material Processing, etc.

Short Wavelength

AQ6375

AQ6370C

Long Wavelength

AQ6373

Visible Light Range

400   600   1000   1200   1500   1700   2000   2400 wavelength (nm)

Biomedical Application

Example of a Configuration of a Scanning Confocal Microscope System

Camera
High Performance Filter
Laser
Model CSU10 Confocal Scanner Unit
Fluorescence Microscope
Fluorescence from a cell
Cell
Z-axis Drive
Image Monitor Image Processing Unit

• Evaluating the performance of high performance filers for a visible light laser and fluorescence extraction

Information & Communication Application

Example of a Configuration of a Dense Wavelength Division Multiplexing (DWDM) Optical Communication System

TX Terminal   RX Terminal
λ1   λ1
λ2   DWDM Transmission System   λ2
λ3   Amplified   Optical Fiber   λ3
λ4   λ4
λ5   Optical   Optical   Optical   λ5
λn   Fiber   Fiber   Fiber   λ6
        Optical AMP Optical AMP
        OADM   OADM
MUX   100km~   100km~   100km~   DEMUX

• Evaluating the performance of optical components, such as a laser, optical multiplexer, optical demultiplexer and optical amplifier, as well as the system as a whole

Environmental Measurement Application

Example of a Configuration of Simultaneous Multi-Wavelength Measurement of Gases Using the CDRS Technique

Fiber Loop
Laser λ1   Fiber Grating
        WDM   CRDS Optical   λ1
        Coupler Coupler   Circulator
Laser λ2   λ2
        Detecting Gases Using Gas-Specific
        Light Absorption Characteristics

• Evaluating the performance of optical components such as a laser and grating
• Evaluating the light absorption characteristics of gases

AQ6370 Series of Optical Spectrum Analyzers Common Specifications

Item	Specifications
Electrical interface	GP-IB × 2 (standard/for external controller), RS-232, Ethernet, USB, PS/2 (keyboard), SVGA output, analog output port, trigger input port, trigger output port
Remote control *	GP-IB, RS-232, Ethernet (TCP/IP) AQ6317 series compatible commands (IEEE488.1) and IEEE488.2
Data storage	Internal storage: 128 MB or more, Internal memory: 64 traces, 64 programs, 3 template lines, External storage: USB storage (memory/HDD), FAT32 format File types: CSV (text), Binary, BMP, TIFF
Display **	10.4-inch color LCD (Resolution: 800 × 600)
Printer	Built-in thermal printer (Factory installed option)
External dimensions	Approx. 426 (W) × 221 (H) × 459 (D) mm (excluding protector and handle)
Weight	AQ6370C: Approx. 19 kg, AQ6373: Approx. 20 kg, AQ6375: Approx. 27 kg (without printer option)
Power supply	100 to 240 VAC, 50/60 Hz, approx. 150 VA
Environmental conditions	Performance guarantee temperature range: + 18 to + 28°C, Operating temperature range: +5 to +35°C, Storage temperature range: -10 to +50°C, Humidity: ≤80 %RH (no condensation)

*: Some AQ6317 series commands may not be compatible due to changes in the specifications or functions of models.

**: Liquid crystal display may include a few defective pixels (within 0.002% with respect to the total number of pixels including RGB). There may be a few pixels on the liquid crystal display that do not emit all the time or remain ON all the time. These are not malfunctions.

Optical Measuring Instruments

Optical Spectrum Analyzer

AQ6370C

Redefining Optical Spectrum Measurement Excellence

CE

Optical Measuring Instruments

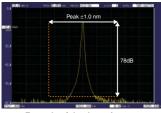## Features

- World Class Optical Performance & Flexibility
  High wavelength resolution: 0.02 nm
  Wide close-in dynamic range: 78dB typ.
  Single and multimode fiber test capability (up to GI 62.5/125μm)
- Improved Measurement Throughput
  Fast measurement and fast data transfer
- Enhanced User Friendliness
  USB for Mouse, keyboard, and external storage devices
  Bright 10.4" LCD
  Trace zoom capability
  Various built-in analysis functions
- Expedites Development of Automated Test Systems
  Supports GP-IB, RS-232C, and Ethernet interfaces
  Compatible with SCPI and supports AQ6317 series remote commands
  Built-in simple macro programming function
- Includes Wavelength Calibration Source
- AQ6370 Viewer: Emulation/Remote control software (Optional)

Basic Specifications

- Measurement wavelength range: 600 to 1700 nm
- Wavelength accuracy: ±0.01 nm (High performance model), ±0.02 nm (standard model)
- Measurement data point: 101 to 50001
- Wavelength resolution setting: 0.02 to 2.0 nm
- Level sensitivity:
  -90 dBm (1300 to 1620 nm, resolution: 0.05nm or wider, sensitivity: HIGH3)
- Maximum input power: +20 dBm (Per channel, full span)
- Close-in dynamic range (at 1523nm):
  45 dB (±0.1 nm from peak, resolution: 0.02 nm)
  58 dB (±0.2 nm from peak, resolution: 0.02 nm)
  50 dB (±0.2 nm from peak, resolution: 0.05 nm)
  64 dB (±0.4 nm from peak, resolution: 0.05 nm)
  73 dB (±1.0 nm from peak, resolution: 0.05 nm)
  45 dB (±0.2 nm from peak, resolution: 0.1 nm)
  60 dB (±0.4 nm from peak, resolution: 0.1 nm)
- Applicable fiber: SM (9.5/125 μm), GI (50/125 μm, 62.5/125 μm)

Model Number and Suffix Codes

Model	Suffix Codes			Descriptions
AQ6370C				Optical Spectrum Analyzer AQ6370C
Spec-code	-10			Standard model
	-20			High performance model
Power cord	-D			UL/CSA Standard
	-F			VDE Standard
	-R			AS Standard
	-Q			BS Standard
	-H			GB Standard
Factory Installed Options		/FC		AQ9447(FC) Connector adapter for optical input
		/SC		AQ9447(SC) Connector adapter for optical input
		/ST		AQ9447(ST) Connector adapter for optical input
			/RFC	AQ9441(FC) Universal adapter for calibration output
			/RSC	AQ9441(SC) Universal adapter for calibration output
			/RST	AQ9441(ST) Universal adapter for calibration output
			/B5	Built-in thermal printer

World-class optical performance

Peak ±1.0 nm

78dB

Example of the dynamic range
Peak±1.0nm, Resolution setting 0.05 nm, High dynamic mode: ON, High performance model

DWDM signal measurement
DWDM channels allocated at 50GHz spacing can be measured and analyzed.

Improved Measurement Throughput

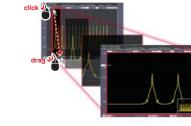| 10x | Measurement speed |
| 100x | Key & Command response |
| 100x | Data transfer Speed |

(in comparison with AQ6317C Optical spectrum Analyzer)

Enhanced User Friendliness

Mouse
Keyboard
Memory
HDD

click
drag

USB interface
Supports mouse, keyboard, and external storage devices.

Trace zoom function
Enlarges a designated area

AQ6370 Viewer Emulation/Remote Control Software (Optional)

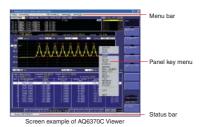Note. AQ6370 Viewer contains the AQ6370C Viewer.

The AQ6370C Viewer is a PC application software that has the same user interface and functions as the AQ6370C so that you can easily display and analyze waveform data acquired by the AQ6370C.
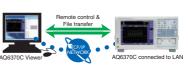
- **Viewer function**
  Trace data files saved on the AQ6370C can be retrieved and analyzed on a PC.
- **Remote Control function**
  The remote control allows you to set measurement conditions and to execute a measurement on AQ6370C Optical Spectrum Analyzer from anywhere on the Ethernet network.
- **File Transfer function**
  Files can be exchanged between AQ6370C and PC.

Menu bar
Panel key menu
Status bar

Screen example of AQ6370C Viewer

Remote control & File transfer

TCP/IP NETWORK

AQ6370C Viewer

AQ6370C connected to LAN

Optical Spectrum Analyzer

AQ6375

Long Wavelength OSA 1200 - 2400nm

CE

Features

- Unparalleled Performance
  Long wavelength: 1200 - 2400nm
  High sensitivity: +20 to -70dBm
  High resolution & wide dynamic range
- Greater Efficiency
  High speed measurement
  Fast command processing and data transfer
- Support Multimode Fiber
  Free-space optical input
- Intuitive Easy Operation
  Mouse & keyboard operation
  Trace zoom function
- Easy Calibration
  Built-in calibrator
- AQ6375 Viewer: Emulation/Remote control software (Optional)

Basic Specifications

- Measurement wavelength range: 1200 to 2400 nm
- Wavelength accuracy: ±0.05 nm (1520 to 1580 nm),
  ±0.1 nm (1580 to 1620 nm), ±0.5 nm (Full range)
- Measurement data point: 101 to 50001
- Wavelength resolution setting: 0.05 to 2.0 nm
- Level sensitivity:
  -70 dBm (1800 to 2200 nm, resolution: 0.1nm or wider, sensitivity: HIGH3)
- Maximum input power: +20 dBm (Per channel, full span)
- Close-in dynamic range (at 1523nm):
  45 dB (±0.4 nm from peak, resolution: 0.05 nm)
  55 dB (±0.8 nm from peak, resolution: 0.05 nm)
- Applicable fiber: SM (9.5/125 μm), GI (50/125 μm, 62.5/125 μm)

Model Number and Suffix Codes

Model	Suffix Codes		Descriptions
735305			Optical Spectrum Analyzer AQ6375
Power cable	-D		Power cord (UL3P)
	-F		Power cord (CEE-C7)
	-R		Power cord (SAA-3P)
	-Q		Power cord (BS3P Rectangular)
	-H		Power cord (BS3P Round)
Factory Installed Options	/FC		AQ9447(FC) Connector adapter for optical input
	/SC		AQ9447(SC) Connector adapter for optical input
	/ST		AQ9447(ST) Connector adapter for optical input
		/RFC	AQ9441(FC) Universal adapter for calibration output
		/RSC	AQ9441(SC) Universal adapter for calibration output
		/RST	AQ9441(ST) Universal adapter for calibration output
		/B5	Built-in thermal printer

Unparalleled Optical Performance

■ High sensitivity in long wavelength

The spectrum of a white light source (yellow) and the background noise of AQ6375 (red)

■ Measurement Example

2010nm DFB-LD
Resolution: 50 pm, Span: 20 nm Sensitivity: HiGH1/CHOP

Easy Operation

USB interface
Supports mouse, keyboard, and external storage devices.

Trace zoom function
Enlarges a designated area

AQ6370 Viewer Emulation/Remote Control Software (Optional)
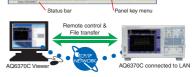
Note. AQ6370 Viewer contains AQ6375 Viewer.

The AQ6375 Viewer is a PC application software that has the same user interface and functions as the AQ6375 so that you can easily display and analyze waveform data acquired by the AQ6375.

- **Viewer function**
  Trace data files saved on the AQ6375 can be retrieved and analyzed on a PC.
- **Remote Control function**
  The remote control allows you to set measurement conditions and to execute a measurement on AQ6375 Optical Spectrum Analyzer from anywhere on the Ethernet network.
- **File Transfer function**
  Files can be exchanged between AQ6375 and PC.

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Short-Wavelength Model — AQ6373 350 to 1200 nm

- Wavelength accuracy: ±0.05 nm
- Wavelength resolution setting: 0.02 to 10 nm
  (Settable to 0.01 nm at 400 to 470 nm)
- Max. safe input power: +20 dBm
- Level sensitivity: -80 dBm
- Dynamic range: ≥60 dB
- Single-mode, multimode, and large-core fibers
- Built-in optical alignment source
- Automatic wavelength calibration with an external source
- Built-in color analysis function for VIS
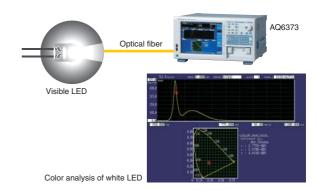
Example of 405 nm FP-LD measurement (Resolution setting: 0.01 nm)

FWHM = 0.011nm

Higher resolution measurement is possible in 400 to 470 nm range.

Applications

■ **Active optical device (semiconductor laser, fiber laser, LED)**
■ **Passive active device (filter, FBG, special optical fiber)**
■ **Support for the development of optical devices**
- Medical and biological applications (medical laser treatment, DNA analysis, laser microscope)
- Industrial equipment (laser processing, laser marking)
- Home electronics (laser projector, next-generation optical disc, LED products)
- Measurement (LIDAR, interferometer)
- Communication (plastic optical fiber (POF) communication)

Visible LED Test

The optical spectrum of visible LEDs used in a wide variety of applications such as lighting, indication, and measurement can be measured and analyzed. By supporting the large core fiber input, the AQ6373 can efficiently acquire the LED light and measure its spectrum. The standard built-in color analysis function automatically evaluates a dominant wavelength and XYZ color coordinates.

Optical fiber · AQ6373

Visible LED

Color analysis of white LED

Main Specifications

Item	Specifications
Wavelength range [*1]	350 to 1200 nm
Span [*1]	0.5 nm to 850 nm (full span), and 0nm
Wavelength accuracy [*1]	± 0.05 nm (633nm), ± 0.20 nm (400 to 1100nm) (after wavelength calibration with 633 nm He-Ne laser)
Wavelength resolution setting [*1, *2]	0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10 nm (full range), and 0.01nm (400 to 470 nm)
Minimum sampling resolution [*1]	0.001 nm
Number of sampling points	101 to 50001, AUTO
Measurement sensitivity setting	NORM_HOLD, NORM_AUTO, NORMAL, MID, HIGH1, HIGH2 and HIGH3
High dynamic mode	SWITCH (sensitivity setting: MID, HIGH1 to 3)
Level sensitivity [*3]	-80 dBm (500 to 1000 nm), -60 dBm (400 to 500 nm, 1000 to 1100 nm) (Typical, Resolution setting: ≥ 0.2nm, Averaging: 10 times, Sensitivity: HIGH3)
Maximum safe input power [*3]	+ 20 dBm (550 to 1100nm), + 10 dBm (400 to 550nm) (total input power)
Level accuracy [*2]	± 1.0 dB (850 nm, Input level: -20 dBm, Resolution: ≥ 0.2 nm, Sensitivity: MID, HIGH1 to 3, SMF [MFD5 µm@850nm, NA0.14]
Level linearity [*3]	± 0.2 dB (Input level: -40 to 0 dBm, Sensitivity: HIGH1-3)
Dynamic range [*1]	60 dB (Peak ± 0.5 nm, Resolution: 0.02 nm, 633nm, Sensitivity: HIGH1 to 3)
Applicable fiber	SM, GI (50/125 µm, 62.5/125 µm), Large core fiber (up to 800 µm)
Optical connector	FC type (optical input and calibration light source output)
Built-in calibration light source	Optical alignment light source (not equipped with wavelength reference light source.)
Sweep time [*1, *4]	NORM_ AUTO: 0.5 sec, NORMAL: 1 sec, MID: 2 sec, HIGH1: 5 sec, HIGH2: 20 sec, HIGH3: 75 sec
Warm-up time	Minimum 1 hour (after warming up, optical alignment adjustment with built-in light source is required.)

Performance and functions can be limited by type of used fiber. The specifications are only guaranteed when a single mode fiber in which light travels in single mode at the measured wavelength is used. In the case in which the measured wavelength is less than the cut-off wavelength of the used fiber, or a multimode fiber is used, a measured spectrum may be inaccurate due to speckle noise. Please be careful especially when measuring high coherency sources like gas laser and laser diode.
*1: Horizontal scale: Wavelength display mode.
*2: Actual wavelength resolution varies according to the measured wavelength. Actual resolution at the 10 nm resolution setting is about 8 nm at most.
*3: Vertical scale: Absolute power display mode.
*4: High dynamic mode: OFF, Pulse light measurement mode: OFF, Number of sampling points: 1001, Average number: 1, Span: ≤ 100 nm excluding 450 to 470 nm and 690 to 700 nm.

White Light Source — AQ4305

The AQ4305 is a high power broadband light source that uses a halogen lamp. The AQ4305 is used in conjunction with an optical spectrum analyzer and can measure wavelength dependent loss characteristics of optical devices and optical fibers used for optical communication and visible light range.

Broadband Light Source for Measuring Wavelength Dependent Loss Characteristics Used in Conjunction with Optical Spectrum Analyzer

CE

Multi Application Test System

AQ2200

Build Your Own Test Configurations in Small Footprint

CE

Features

The AQ2200 Multi Application Test System is the ideal system for measuring and evaluating a wide range of optical devices and optical transmitters.

- Flexible and space effective
- Easy-to-View TFT color display
- Remote operation through Ethernet network
- Built-in applications
  - Optical power stability measurement
  - Short-term optical power fluctuation measurement
  - Wavelength dependent loss measurement
  - Bit error rate test (BERT)
  - Optical return loss and insertion loss measurement
- Wide variety of plug-in modules
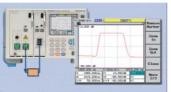- Hot-swappable modules

Applications

- 10Gbit/s transceiver measurement system
- GE-PON ONU/OLT measurement system
- GE-PON optical three wavelength filter measurement
- Optical amplifier measurement system
- MUX/DEMUX measurement system

Frame and Module Lineup

- Frame controllers
  AQ2211 Frame controller (3 slots for modules)
  AQ2212 Frame controller (9 slots for modules)
- Light source modules
  AQ2200-111 DFB-LD module (C & L Band, 1310nm, 1490nm, 1-slot)
  AQ2200-136 TLS module (1440-1640nm, SMF, 2-slot)
  AQ2200-141 FP-LD module (1310nm, 1550nm, 1-slot)
  AQ2200-142 DUAL FP-LD module (1310/1550nm, 1-slot)
- Sensor modules and Sensor Heads
  AQ2200-211 Sensor module (-110dBm, 700-1700nm, 1-slot)
  AQ2200-215 Sensor module (+30dBm, 970-1660nm, 1-slot)
  AQ2200-221 Sensor module (Dual sensor, 800-1700nm, 1-slot)
  AQ2200-201 Interface module (for AQ2200-231 and -241, 1-slot)
  AQ2200-231 Optical sensor head (Large diameter, 800-1700nm)
  AQ2200-241 Optical sensor head (Large diameter, 400-1100nm)
- Optical Return Loss module
  AQ2200-271 ORL module (SMF)
- Optical attenuator modules
  AQ2200-311A ATTN module [w/ Monitor output (optional)] (SMF or MMF, 1-slot)
  AQ2200-331 ATTN module [w/built-in optical power meter] (SMF or MMF, 1-slot)
- Optical switch modules
  AQ2200-411 OSW module (1×4 or 1×8, SMF or MMF, 1-slot)
  AQ2200-412 OSW module (1×16, SMF, 1-slot)
  AQ2200-421 OSW module (1×2 or 2×2, SMF or MMF, 1-slot)
- 10Gbit/s BERT modules
  AQ2200-601 10 Gbit/s BERT module (3-slot)
  AQ2200-621 10 Gbit/s optical modulator (1.55 µm, SMF, 1-slot)
  AQ2200-622 10 Gbit/s optical modulator (1.31 µm, SMF, 1-slot)
  AQ2200-631 10 Gbit/s optical receiver (1.31/1.55 µm, SMF, 1-slot)
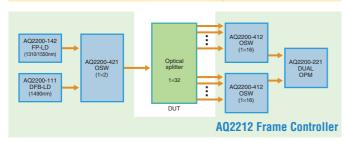 AQ2200-641 XFP interface module (2-slot)
  AQ2200-642 Transceiver interface module (2-slot)
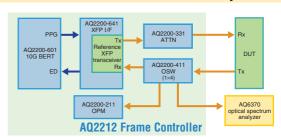 AQ2200-651 SG module (2-slot)

AQ2200 series modules

Passive component test applications

TLS-OSA Sync Sweep

TLS-OPM Sync Sweep

Optical splitter measurement system for PON

AQ2212 Frame Controller

10 Gbit/s transceiver measurement system

AQ2212 Frame Controller

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| Optical Time Domain Reflectmeter | **AQ7275** |

Superior cost performance, easy to operate
Makes your work more efficient

Model and Suffix Code

Model	Option availability							Remarks
	Optical power monitor	Stabilized light source	Visible light source	PON measure-ment	High Dynamic range	Printer/ LAN	Dummy fiber	
735031	—	√	√	√	—	√	√	1-port, SM1650nm, filter
735032	√	√	√	—	√	√	√	1-port, SM1310/1550 nm
735033	√	√	√	√	—	√	√	1-port, SM1310/1550 nm, High DR
735034	√	√	√	—	√	√	√	1-port, SM1310/1550 nm, Higher DR
735035	√	√	√	—	√	√	√	1-port, SM1310/1490/1550 nm
735036	√	√	—	√	—	√	√	2-port, SM1310/1550/1625 nm, filter
735037	√	√	—	—	—	√	√	2-port, SM1310/1550/1650 nm, filter
735038	√	√	√	√	—	√	√	1-port, SM1310/1550/1625 nm
735041	√*1	√*1	—	—	—	√	—	2-ports, MM850/1300 nm, SM1310/1550 nm

*1 : MMF is not supported.
√ : Available.

	Suffix Codes	Description
Optical Connector	-SCC	SC type connector
	-FCC	FC type connector
	-NON	No universal adapter
	-USC	Universal adapter (SC)
	-UFC	Universal adapter (FC)
	-ASC	Angled-PC connector (SC) *2
Language	-HE	English
	-HC	Chinese/English
	-HK	Korean/English
	-HR	Russian/English
Power Cord	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS/Singapore standard
	-H	GB standard, Complied with CCC
	-P	Korean standard
Options	/PM	Optical power monitor
	/SLS	Stabilized light source
	/VLS	Visible light source
	/PN	PON measurement
	/DR	High Dynamic range
	/PL	Built-in printer, LAN
	/DF	Dummy fiber (SMF)
	/SB	Shoulder belt

*2: An angled-PC connector cannot be used in the MM port of the 735040. -USC needs to be attached.
Example: 735033-USC-HE-D/PM/SLS
AQ7275 OTDR 1310/1550nm, high dynamic range, with SC universal adapter, English version, with a UL/CSA standard power cord, with optical power monitor function and with stabilized light source function.
Standard Accessories
Power cord, AC adapter, battery pack, hand belt, user's manual (CD-ROM), operation guide

General Specifications

- Display: 8.4-inch color TFT (640 × 480 pixels, semi-transparent)
- External interface: USB 1.1 Type A and Type B, one each
- Power supply: AC adapter 100 to 240 VAC, 50 to 60 Hz
  Battery operation time 6 hours and recharge time 5 hours
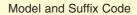- Dimensions and weight: 287 mm (W) × 197 mm (H) × 85 mm (D), approx. 2.8 kg (excluding options)

Features

A wealth of features, including a short event dead zone, quick startup, high-speed measurement, easy operation, as well as optional functions such as stabilized light source, APC connector and PON measurement, extend the range of applications. In particular, the PON measurement option allows the user to test fiber optic cable with a splitter and view waveforms in a more understandable way.

Specifications by Model

Fiber	Number of wavelengths	Wavelength	Dynamic range	Model	Features
SMF	1	1650nm	30dB	735031	Single-wavelength model, supporting a maintenance wavelength of 1650 nm, including a built-in light cut filter.
	2	1310/1550nm	34/32dB	735032	Standard model for installation and maintenance of FTTH.
	2	1310/1550nm	40/38dB	735033	Standard model for installation and maintenance of Metro and Access networks.
	2	1310/1550nm	43/41dB 45/43dB(typ)	735034	High dynamic range model for installation and maintenance of Core and Metro networks.
	3	1310/1490/1550nm	34/30/32dB	735035	Three-wavelength model for PON system supporting 1490 nm.
	3	1310/1550/1625nm	40/38/33dB	735036	Three-wavelength model, supporting a maintenance wavelength of 1625 nm, including a built-in light cut filter.
	3	1310/1550/1650nm	40/38/30dB	735037	Three-wavelength model, supporting a maintenance wavelength of 1650 nm, including a built-in light cut filter. 1310/1550 nm is for Metro and Access networks.
	3	1310/1550/1625nm	40/38/36dB	735038	Model for installation and maintenance of WDM network.
MMF SMF	4	850/1300nm 1310/1550nm	22.5/24dB (62.5GI) 21.5/23dB (50GI) 40/38dB	735041	Four-wavelength model for installation and maintenance of LAN and FTTH with support for both multimode and single mode fiber. Dynamic range is available for measuring 50GI fiber.

Accessories (Sold Separately)

Name	Model	Specifications
Soft carrying case	739860	
Battery pack	739880	
External large capacity battery	739881	With battery case and connection cable
Universal adapter (SC)	SU2005A-SCC	SC type
Universal adapter (FC)	SU2005A-FCC	FC type
Printer roll paper	A9010ZP	80 mm × 25 m
Shoulder belt	B8070CY	
AC adapter	739870-D	UL/CSA standard
	739870-F	VDE standard
	739870-R	AS standard
	739870-Q	BS/Singapore standard
	739870-H	GB standard, Complied with CCC
	739870-P	Korean standard

Application Software

Model	Suffix Codes	Specifications
735070		AQ7932 Emulation Software (Ver3.0 or later)
	-EN	English

MFT-OLTS

AQ1100

CE

General Specifications

Display: 5.7-inch color LCD (640 × 480)

Loss test mode (only with /SPM or /HPM): Auto loss test, Loopback test, Multi-core loss test

External interface: USB1.1 Type A and Type B (mini) × 1

Power supply: AC adapter voltage 100 to 120 VAC or 200 to 240 VAC (auto-switching)

Battery (Li-ion) operation time 6 hours and charging time 5 hours

External dimensions: Approx. 217.5 mm (W) × 157 mm (H) × 74 mm (D)

Weight: Approx. 1 kg or less (including internal battery)

Features

The AQ1100 is an optical loss test set combining an optical power meter and light sources in one unit. An optical power meter is a measuring instrument usually used for optical loss tests. The AQ1100 supports up to MM850/1300 nm and SM1310/1550/1625 nm. Also, you can select a +27 dBm high power optical meter. For the light source, three models are available depending on the wavelength and fiber type used. For the optical power meter, you can select from three models depending on the measurement power and the purpose of the optical power meter.

Model and Suffix Codes

Model	Suffix codes		Description
AQ1100A			LS:1310/1550nm
AQ1100B			LS:1310/1550/1625nm
AQ1100D			LS:MM850/1300, SM1310/1550nm
Language	-HJ		Japanese/English
	-HE		English
	-HC		Chinese/English
	-HK		Korean/English
	-HR		Russian/English
Power cord	-M		Complied with PSE
	-D		UL/ CSA standard
	-F		VDE standard
	-R		AS standard
	-Q		BS, Singapore standard
	-H		GB standard, Complied with CCC
	-P		EK standard (S. Korea)
Optical power meter	-SPM		Optical power meter
	-HPM		High power optical power meter
	-PPM (AQ1100A only)		PON Optical power meter
Optical connector	-USC		SC type (LS port, and OPM port)
	-UFC		FC type (LS port, and OPM port)
	-ULC		LC type (LS port, and OPM port for -PPM), φ1.25 adapter(OPM port for -SPM and -HPM)
	-ASC (except AQ1100D)		SC/Angled-PC type (LS port, and OPM port for -PPM), SC type (OPM port for -SPM and -HPM)
Factory installed options	/VLS		Visible light source, optical connector: 2.5φ ferrule
	/LAN		Ethernet (10/100BASE-TX)
	/SB		Shoulder belt

■Standard Accessories
Power cord, AC adapter, battery pack, hand belt, user's manual (CD-ROM), operation guide

Optional Accessories

Model	Suffix codes	Description
SU2006A		Soft carrying case
735480 (For opticalpower meters)	-SCC	Connector adapter (SC)
	-FCC	Connector adapter (FC)
735481	-LMC	Ferrule adapter (φ1.25)
SU2005A (For LS and PON optical power meter)	-SCC	Universal adapter (SC)
	-FCC	Universal adapter (FC)
	-LCC	Universal adapter (LC)
739871	-M	Complied with PSE
	-D	UL/ CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS, Singapore standard
	-H	GB standard, Complied with CCC
	-P	EK standard (S. Korea)
739882		Battery pack (Spare)
B8070CY		Shoulder belt

Specifications by Model

Models		AQ1100A	AQ1100B	AQ1100D
Light source performance	Wavelength (nm) *[1]	1310/1550 ± 25	1310/1550/1625 ± 25	1310/1550 ± 25 (SM) 850/1300 ± 30 (GI)
	Light emitting device	LD	LD	LD(SM), LED(GI)
	SM (LD) spectral width (nm) *[1] *[2]	<5 / <10	<5 / <10 / <10	<5 / <10
	GI (LED) spectral width (nm) *[1] *[3] (FWHM)	–	–	40(typ)/140(typ)
	Optical output level (dBm)	-3 ± 1	-3 ± 1	SM: -3 ± 1 GI: -20 ± 1
	Level stability (dB) *[4]	±0.05	±0.05	SM: ±0.05 GI: ±0.1
	Modulation mode	CW, CHOP(270Hz, 1kHz, 2kHz) *[5]		
	Applicable fiber	SM (ITU-T G.652)		SM (ITU-T G.652)GI (50/125um)
	Optical connector	SC, FC, 1.25 mm ferrule, SC/Angled-PC		SC, FC, 1.25 mm ferrule
	Laser class	1		

Factory Installed Options			
Visible light source (/VLS)	Optical connector	2.5 mm ferrule type
	Wavelength and optical output level	650 nm ±20 nm, peak value -3 dBm or more
	Modulation frequency	Approx. 2 Hz
	Laser class	3R
LAN interface (/LAN)	10BASE-T/100BASE-TX RJ-45 connector	Ping test, PC remote control

Optical Power Meter Performance and Functions			
Model	Standard (/SPM)	High power (/HMP)	PON (/PPM)
Wavelength setting	Simple mode: 850/1300/1310/1490/1550/1625/1650 nm Detail mode setting range: 850 nm to 1650 nm, 1 nm step CWDM mode setting range: 1270 nm to 1610 nm 20 nm step		1310/1490/1550 nm (1490 nm and 1550 nm can be measured separately)
Power range	-70 to +10 (CW) -70 to +7 (CHOP)	-50 to +27 (CW) -50 to +24 (CHOP) *[6]	-70 to +10: 1310/1490nm -50 to +27: 1550nm
Noise level	0.5nW (-63dBm, 1310nm)	50nW (-43dBm, 1310nm)	0.5nW(-63dBm, 1310nm) 50nW(-43dBm, 1550nm)
Uncertainty under standard conditions *[7]	±5%	±5%	±0.5dB (10%)
Readout resolution	0.01		
Level unit	Absolute: dBm, mW, μW, nW, Relative: dB		
Modulation mode	CW CHOP(270/1k/2kHz)	CW CHOP(270/1k/2kHz)	CW
Average function	1, 10, 50 and 100 times		
Logging function	Measurement intervals: 500 ms, 1 s, 2 s, 5 s, 10 s, Measurement count: 10 to 1000		

MFT-OTDR

AQ1200

CE

Features

The AQ1200 is a multifunctional handheld OTDR that combines all the necessary field test functions in one unit. It offers various functions, including an OTDR function that features short 80 cm event dead zone, a fault locator function that is effective in locating a fault, a loss test function (option) that combines light sources and an optical power meter in one unit, and a visible light source (option). You can also connect a fiber end-face inspection probe. The AQ1200 retains the interface of the very popular AQ7252 series. So you can use the variety of functions and the user-friendly interface.

Specifications

Model	AQ1200A
Wavelength (nm) *1	1310/1550 ± 25
Distance range	500m,1km,2km,5km,10km,20km,50km,100km,200km
Pulse width	3ns,10ns,20ns,50ns,100ns,200ns,500ns,1us,2us,5us,10us
Dynamic range *2	32/30 dB
Event dead zone *3	0.8m
Attenuation dead zone *4	5/5m (typ)
Applicable fiber	SM (ITU-T G.652)
Optical connector	SC, FC, ASC
Laser class	1M
Display	5.7-inch color LCD (640 x 480)
Battery operation time*5	6 hours
Interface — USB port	USB1.1 TYPE A × 1, TYPE B (mini) × 1
Interface — DC power supply	For AC adapter connection
External dimensions	217.5 (W) × 157 (H) × 74 (D) mm
Weight	Approx. 1 kg (including protector and internal battery)

Optional Accessories

Model	Suffix codes	Description
SU2006A		Soft carrying case
735480 (For optical power meters)	-SCC	Connector adapter (SC)
	-FCC	Connector adapter (FC)
735481	-LMC	Ferrule adapter (1.25 ϕ)
SU2005A (For OTDR and LS)	-SCC	Universal adapter (SC)
	-FCC	Universal adapter (FC)
739871	-M	Complied with PSE
	-D	UL/ CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS, Singapore standard
	-H	GB standard, Complied with CCC
	-P	EK standard (S. Korea)
	-T	BSMI standard
739882		Battery pack (Spare)
B8070CY		Shoulder belt

Recommended fiber inspection probe
• Lightel (Sunrise) : CI-1000 (USB1.1)
• Westover (JDSU): FBP505 (USB1.1)

Model and Suffix Codes

Model	Suffix codes			Description
AQ1200A				
Language	-HJ			Japanese/English
	-HE			English
	-HC			Chinese/English
	-HK			Korean/English
	-HR			Russian/English
Power cord	-M			Complied with PSE
	-D			UL/ CSA standard
	-F			VDE standard
	-R			AS standard
	-Q			BS, Singapore standard
	-H			GB standard, Complied with CCC
	-P			EK standard (S. Korea)
	-T			BSMI standard
Optical connector	-USC			SC type
	-UFC			FC type
	-ASC			SC/Angled-PC type
Factory installed options		/SLT		Optical Loss Test : Stabilized Light Source & Standard optical power meter (+10 to -70dBm)
		/HLT		Optical Loss Test : Stabilized Light Source & High power optical power meter (+27 to -50dBm)
			/VLS	Visible light source, optical connector: 2.5ϕ ferrule
			/LAN	Ethernet I/F (10/100BASE-TX),Ping test
			/SB	Shoulder belt

■Standard accessories
AC adapter, power cable, battery pack, hand belt, user's manual (CD-ROM), and operation guide.

Factory Installed Options

●Optical Loss Test

	Optical power meter model	Standard (/SLT)	High power (/HLT)
Optical power meter	Wavelength setting	850/1300/1310/1490/1550/1625/1650 nm, 800 to 1700 nm (1 nm steps), or CWDM (1270 to 1610 nm, 20 nm steps)	
	Power range	+10 to -70dBm (CW) +7 to -70dBm (CHOP)	+27 to -50dBm (CW) +24 to -50dBm (CHOP)*6
	Noise level	0.5nW (-63dBm,1310nm)	50nW (-43dBm,1310nm)
	Uncertainty under standard conditions*7	± 5%	
	Readout resolution	0.01	
	Level unit	Absolute: dBm, mW, µW, nW, Relative: dB	
	Modulation mode	CW, CHOP(270Hz/1kHz/2kHz)	
	Average function	1, 10, 50, and 100 times	
Stabilized light source	Wavelength (nm) *8	1310/1550 ± 25	
	Light emitting device	LD	
	Spectral width (nm) *8,*9	<5 / <10	
	Output level (dBm)	-3 ± 1	
	Level stability (dB) *10	± 0.05	
	Modulation mode	CW, 270Hz, 1kHz, 2kHz	
	Applicable fiber	SM (ITU-T G.652)	
	Laser class	1	
Memory and logging function		Measurement data storage: 10 to 1000 data points Logging interval: 0.5 s, 1 s, 2 s, 5 s, or 10 s (selectable)	

●Visible Light Source (/VLS) option

Optical connector	2.5 mm type ferrule
Wavelength and optical output level	650 nm± 20 nm, -3 dBm or more (peak)
Modulation mode	CHOP approx. 2 Hz
Laser class	3R

●Ethernet Interface (/LAN) option

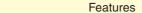| Interface	10BASE-T/100BASE-TX
Function	Ping test and remote control

MFT-10GbE

AQ1300

CE

General Specifications

Display: 5.7-inch color LCD (640 × 480)
External interface: USB1.1 Type A and Type B (mini), LAN (RJ-45) × 1
Power supply: AC adapter 100 to 240 V, 50 to 60 Hz
　　　　　　　Battery (Li-ion) operation time 1 hour
External dimensions: 217.5 (W) × 157 (H) × 74 (D) mm
Weight: Approx. 1.5 kg (including internal battery)

Features

The AQ1300 is a compact and lightweight handheld tester optimized to the network path testing and maintenance of 10 Gigabit Ethernet networks. It combines functions and operations optimized to use in the field in one compact unit that is the smallest in its class. The AQ1300 is a test solution to improve work efficiency and quality at the same time. The AQ1300 is equipped with test ports for 10 Megabit to 10 Gigabit Ethernet and optical power meter (factory installed option). It also supports throughput, latency time, BERT, loop back, and high-speed ping tests. It covers all the functions necessary for network path testing and maintenance in one unit. You just need to select a setup file and execute tests, and the auto-test mode automatically performs tests and saves the measurement results. The in-band remote function allows you to search for opposite testers in a network domain, select one from a list display, and remote control it using a test line. The AQ1300 offers more powerful functions to help improve the skills of field operators.

Model and Suffix Codes

Model	Suffix codes		Description
AQ1300			AQ1300 MFT-10GbE
Language	-HJ		English
Power cord	-D		UL/CSA standard
	-F		VDE standard
	-R		AS standard
	-Q		BS, Singapore Standard
	-H		GB standard, CCC correspondence
	-P		EK standard (South Korea)
Optical power meter	/SPML		Standard Optical power meter
XFP module (*)	/SR		10 GBASE-SR XFP module
	/LR		10 GBASE-LR XFP module
	/ER		10 GBASE-ER XFP module
SFP module (*)		/SX	1000BASE-SX SFP module
		/LX	1000BASE-LX SFP module
Shoulder belt		/SB	Shoulder belt

* Please do not use an SFP or XFP module other than our standard model mentioned above.
If another module is used, the performance of this product cannot be guaranteed and the product warranty expires.

Optional Accessories

Model	Suffix codes	Description
735454 (*)		Optical transceiver module
	-SR	10 GBASE-SR XFP module
	-LR	10 GBASE-LR XFP module
	-ER	10 GBASE-ER XFP module
	-SX	1000BASE-SX SFP module
	-LX	1000BASE-LX SFP module
739882		Battery pack (reserve)
SU2006A		Soft carrying case
739871		AC/DC adaptor
	-D	UL/CSA standard
	-F	VDE standard
	-R	AS standard
	-Q	BS, Singapore Standard
	-H	GB standard, CCC correspondence
	-P	EK standard (South Korea)
B8070CY		Shoulder belt
735480		Connector adapter
	-SCC	SC connector adapter for optical power meters
	-FCC	FC connector adapter for optical power meters

Specifications

Item		Specifications
Interface	RJ-45	10BASE-T, 100BASE-TX, 1000BASE-T
	SFP	1000BASE-SX, 1000BASE-LX
	XFP	10GBASE-SR, 10GBASE-LR, 10GBASE-ER
Measurement function	Measurement menu	Auto, Auto (Remote), Manual, OPM (Optical power meter)
	Measurement mode	TRAFFIC, QoS, PING, Loop Back, BERT
Transmission function	Frame length	48 to 9999 bytes
	QoS transmission	Up to 8 channels (up to 4 ch in Auto and Auto (remote) mode)
Receive function	Receivable frame length	48 to 9999 bytes (Minimum IFG: 5 bytes)
	Latency time measurement resolution	100ns
Loop back function	Field swap	DA/SA of MAC address, DA/SA of IP address, Dst/Src port of TCP/UDP
Remote control function	In-band remote	Remote test synchronization, Remote test start synchronization, Opposite tester automatic search(*), Opposite tester automatic addressing (*) (*: Applicable only within a segment)
Layer-1 measurement function	Receiving clock measurement	Measurement range: -100 to +100 ppm Measurement resolution: 0.1 ppm
	LFS generation	Manual: Continuous transmission (Start/Stop), Auto: When a link down or LF is received, RF is transmitted automatically.

Handy Optical
Powermeter & Light Source

AQ2160-01/AQ2160-02/AQ4270-01

Simplified Functions Bring Superior Cost Performance

Powerful Tools for Installation of Optical Fiber Networks with High-performance, Durability and Robustness

AQ2160-01
Optical Powermeter

The AQ2160-01 is a compact, lightweight, cost-effective optical powermeter designed for optical fiber line installation and maintenance. The AQ2160-01 is a new de facto standard of handheld optical powermeters focusing on the ease of use, including simple operation, convenient backlighting, and safe transport using the neck strap.

AQ2160-02
Optical Powermeter

The AQ2160-02 is a full-featured handheld optical power meter that can measure the relative and absolute optical power for CW and chopped light, and is equipped with the data storage capability.
With the USB interface the AQ2160 can transfer the measured data from an internal memory to a PC.

AQ4270-01
LD Light Source (1310/1550 nm)

The AQ4270-01 is a rugged durable handheld LD light source that is operable in the temperature from 0°C to 50°C and conforms the waterproofing standard IEC60529 IP×1. The AQ4270-01 can output two wavelengths (1310/1550 nm), and is easy to maintain due to a user cleanable input connector.

Traffic TesterMini

AE5501

A single unit can test Ethernet network at 10 Mbit/s, 100 Mbit/s, and 1 Gbit/s

AE5501
TrafficTesterMini

AE5501 is designed for installation and maintenance of networks such as wideband Ethernet and CATV access networks, working in Layer 2 to Layer 3. It has various hardware interfaces (10BASE-T upto 1000BASE-T, SX, LX) to flexibly adapt to multiple Ethernet networks, in a simple operation.

Optical Measuring Instruments

TrafficTesterPro

AE5511

Cost Effective Multi-port IP Performance Test Tool

AE5511 TrafficTesterPro is an IP traffic generation tester that provides test solutions to evaluate and inspect network equipment such as LAN switches, routers, and GE-PON. TrafficTesterPro offers flexible modular designs. Customers can choose and exchange units to support their specific needs or to adapt to new interfaces and standards. Yokogawa is offering a wide variety of units, from highly functional type units, which have all the necessary functions to develop and inspect IP network equipment to affordable units, which provide cost-cutting at production and during shipping inspections.

Features

- Supports 10 Mbit/s to 10 Gbit/s Ethernet
- A PC can control up to 16 frames (max. 512 ports)
- Full-wire rate traffic generation and statistics monitor function
- Frame BERT (Bit Error Rate Test) capability
- Frame latency and IFG measurement function
- Frame capture function
- Multi-user function allows up to eight users to share a unit
- Ethernet-OAM supported (AE5523 and AE5524)

Optical Measuring Instruments

The Statistical monitor display on the TTproControlWindow

LAN

Unit		Interface	Number of Ports
AE5520 10/100BASE-T unit		10BASE-T, 100BASE-TX	16 ports
AE5521 1000BASE-X unit		1000BASE-SX, 1000BASE-LX	4 ports (GBIC)
AE5522 10GBASE-X unit		10GBASE-LR, 10GBASE-ER, 10GBASE-SR	2 ports (XENPAK)
AE5523 1000BASE-T unit		10BASE-T, 100BASE-TX, 1000BASE-T	12 ports
		1000BASE-SX/LX	1 port (SFP)
AE5524 1000BASE-X unit		1000BASE-SX, 1000BASE-LX	12 ports (SFP)

Applicable Functions by Unit

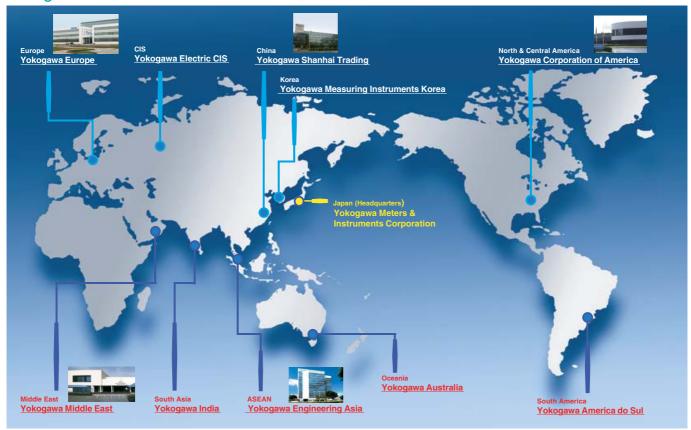| FUNCTIONS	AE5520	AE5521	AE5522	AE5523	AE5524
Full-wire rate traffic generation	✔	✔	✔	✔	✔
Latency measurement	✔	✔	✔	✔	✔
Frame BERT	✔	✔	✔	✔	✔
Data Capture	-	-	✔	✔	✔
Multi user Sharing	✔ *1	✔ *1	✔ *1	✔	✔
Link down generation	✔ *2	✔ *2	✔ *2	✔	✔
IPv4 emulation	✔	✔	✔	✔	✔
IPv6 emulation	-	-	-	✔	✔
Sequence check	-	-	-	✔	✔
Alarm logging	-	-	-	✔	✔
QoS Statistics monitoring	-	-	-	✔	✔
PoE measurement	-	-	-	✔	-
TX clock adjustment	-	-	-	✔	✔
Clock Master/Slave	-	-	-	✔	-
LFS	-	-	✔	-	-
Ethernet-OAM	-	-	✔ *3	✔	✔

*1:Can share per unit *2:Only for single link down generation *3:Suppors the frame generation and the capture

Model Number and Suffix Code

Product Name	Model Name	Suffix Code		Specification
AE5511 TrafficTesterPro	417322900			
		-L		JAPAN standard
		-C		UL/CSA standard
		-E		VDE standard
		-G		SAA standard
		-S		BS standard
		-V		GB standard
			-LNJ	Japanese
			-LNE	English
AE5520 10/100BASE-T Unit	417322901			
AE5521 1000BASE-X Unit	417322902			
AE5522 10GBASE-X Unit	417322904			
AE5523 1000BASE-T Unit	731010			
AE5524 1000BASE-X Unit	731011			
RFC2544 Test application for AE5511	731070			

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[Ed : 01/b]   Printed in Japan, 009(KP)