

Specifications (Main unit)

For the plug-in modules specifications, see the “Bulletin DL950E-02EN”.

Signal Input Section	
Type	Plug-in input unit
Number of slots	8
Maximum number of input channels	
	32 channels (when 4-CH modules are used in all slots) 128 channels (when 16 CH temperature/voltage modules are used in all slots)
Memory size	
	Standard: 1 Gpoint (up to 500 Mpoints per channel) /M1 option: 4 Gpoints (up to 2 Gpoints per channel) /M2 option: 8 Gpoints (up to 4 Gpoints per channel)
Scope Mode Features	
Waveform Acquisition and Display	
Acquisition mode	Normal Normal waveform acquisition
Envelope	Holds peak values at the maximum sample rate, regardless of the time axis setting
Averaging	Average count: 2 to 65536 (2 ⁿ steps), Infinite (attenuation constant: 2 to 256, 2 ⁿ steps)
Record length	Standard model 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M (32 CH), 50 M (16 CH), 100 M (8 CH), 250 M (4 CH), 500 M (2 CH) /M1 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M (32 CH), 250 M (16 CH), 500 M (8 CH), 1 G (4 CH), 2 G (2 CH) /M2 10 k, 25 k, 50 k, 100 k, 250 k, 500 k, 1 M, 2.5 M, 5 M, 10 M, 25 M, 50 M, 100 M, 250 M (32 CH), 500 M (16 CH), 1 G (8 CH), 2 G (4 CH), 4 G (2 CH)
Sample rate	Can be set up to the module's maximum sample rate for each channel (there are limitations based on the record length)
Selectable time scale range	100 ns/div to 1 s/div (1-2-5 steps), 2 s/div, 3 s/div, 4 s/div, 5 s/div, 6 s/div, 10 s/div, 20 s/div, 30 s/div, 1 min/div to 6 min/div (1 min steps), 10 min/div, 12 min/div, 30 min/div, 1 h/div to 6 h/div (1 h steps), 8 h/div, 10 h/div, 12 h/div, 1 day/div to 5 day/div (1 day steps)
Action performed at the end of acquisition	Waveform data saving (simultaneous saving in binary, ASCII, and MATLAB formats) Image saving, measurement result saving, mail transmission, buzzer notification
Event recording	Records up to 100 events using the event input terminal
Zoom	Two windows
Display format	1, 2, 3, 4, 5, 6, 8, 12, 16 split displays (set for each display group)
Maximum number of displayed traces	Up to 64 traces for each display group
Display interpolation	Off, sign interpolation, linear interpolation, pulse interpolation
X-Y display	Select X and Y axes from analog input waveforms and Math waveforms, up to four traces in two windows
Accumulation	Waveform accumulation: Infinite, 2, 4, 8, 16, 32, 64, 128
History function	Maximum number of histories: 5000 Display mode: Single waveform display, all waveform display, average display
Dual capture	Data acquisition of the same waveform is possible at two different sample rates
Low-speed sampling	Maximum sample rate: 100 kS/s Selectable time scale range: 1 s/div to 5 day/div
High-speed sampling	Maximum sample rate: Module's maximum sample rate Selectable time scale range: 100 ns/div to 1 min/div Maximum record length: 50 M (/M2)
SSD recording (/ST1)	
Maximum sample rate	Depends on the number of used channels. 2 MS/s (when 1 CH is used), 200 kS/s (when 16 CH is used) maximum
Maximum record length	50 G (/M2)
Vertical and Horizontal Control	
Channel on/off	CHn, CHn_m, RTMATHn, and MATHn can be turned on and off separately
Vertical axis zooming	x0.1 to x100 (varies depending on the module type) By setting the scale using upper and lower limits
Vertical position setting	Waveforms can be moved in the range of ±5 div (not possible when top and bottom scale values are set).
Linear scaling	Can be set to Ax+B mode or P1-P2 mode (only for voltage, stress, and frequency)
Roll mode display	When the trigger mode is set to auto, single, or on-start, and the time axis setting is greater than or equal to 100 ms/div
Deskewing	±1 μs (modules with sample rates at 10 MS/s or faster)
Triggering Section	
Trigger mode	Auto, Auto Level, Normal, Single, Single (N), On-start

Selectable trigger level range	0 ± 10 div
Manual trigger	Input through dedicated keys or communication commands
Simple trigger	
Trigger source	CHn, CHn_m (specified input channel, specified bit for logic), RTMATHn, external, time, line
Trigger slope	Rising, falling, both edges (rising, falling only for logic)
Clock trigger	Date (year/month/day), time (hour/minute/second), time interval (10 seconds to 24 hours)
Enhanced trigger	
Trigger source	CHn, CHn_m (specified input channel, specified bit for logic), RTMATHn, external
Trigger type	A→B (N), A Delay B, Edge on A, AND, OR, Period, Pulse Width, WaveWindow
Analysis	
Cursors	T-Y waveforms: Horizontal / Vertical / H&V / Marker / Degree X-Y waveforms: Horizontal / Vertical / H&V / Marker FFT waveforms: Marker / Peak
Automated measurement of waveform parameters	
Measured parameters	Analog waveform, Math PP, Amp, Max, Min, High, Low, Avg, Mid, Rms, Sdev, +Over, -Over Rise, Fall, Freq, Period, +Width, -Width, Duty, Pulse, Burst1, Burst2, Avg.Freq, AvgPeriod, Int1TY, Int2TY, Int1XY, Int2XY, Delay
	Logic waveform Freq, Period, Pulse, Duty, Avg.Freq, Delay
Statistical processing	Statistical items Max, Min, Avg, Sdv, Cnt Maximum number of cycles 64000 Maximum measurement range 4 Gpoints (memory recording), 100 Mpoints (internal storage) Continuous statistical processing Statistical processing is performed while waveforms are acquired Cyclic statistical processing Automatically measures the waveform parameters once per cycle and performs statistical processing on the parameters History statistical processing Automatically measures the waveform parameters on the data of each history waveform and performs statistical processing on the parameters
Waveform computation	
Operators	Basic arithmetic with coefficients, binarization, shift
Number of computations	Up to 8
Computation length	Up to 2 Mpoints (when one waveform is used), 250 kpoints (when eight waveforms are used)
User-defined math function (/G02 option)	
Operators	Equations can be created using the following operators. ABS, SQRT, LOG, EXP, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDIF, INTG, IINTG, BIN, P2, P3, F1, F2, FV, PWHH, PWHL, PWLH, PWLL, PWXX, DUTYH, DUTYL, FLT1, FLT2, HLB, MEAN
Set the average	Simple average, exponential average, cycle average, peak computation
FFT	
Waveform to be computed	CHn, CHNm, RTMATHn, MATHn
Number of windows	2
Number of FFT waveforms	Up to eight waveforms (up to four waveforms/window)
Computation range	From the specified computation time start point until the specified number of points have been computed
Math points	1 k / 2 k / 5 k / 10 k / 20 k / 50 k / 100 k
Time window	Hanning, Hamming, FlatTop, Rectangle Exponential (/G02 option)
Average setting (/G02 option)	Domain: Time axis, frequency axis Type: Simple average, exponential average, peak computation
GO/NO-GO determination	A selected operation can be performed according to the determination condition on the acquired waveform.
Zone determination	Number of determination zones: Up to 6 Number of source waveforms: Up to 16 Combinations: AND, OR
Parameter determination	Number of determination parameters: Up to 16 Combinations: AND, OR
Operation after determination	Screen capture data saving, waveform data saving, buzzer notification, mail transmission
Zooming and searching	You can search for and then expand and display a portion of the displayed waveform.
Type	Edge: Searches by counting the number of rising and falling edges Logic pattern: Searches by counting the logic pattern Event: Searches for an event number Time: Searches for a date and time

History search	Searches through history waveforms for specified conditions
Zone search	Number of determination zones: Up to 4 Combinations: AND, OR
Parameter search	Number of determination parameters: Up to 4 Combinations: AND, OR

Recorder Mode Features

Waveform Acquisition and Display

Record conditions	
Preset time recording	Records data for the specified time period from the start point
Continuous recording	Records data for the specified time period before stopping
Trigger recording	Records data based on trigger position setting
Acquisition mode	
Memory recording	Records waveforms to internal memory
Saving during and at the end of memory recording	Records to internal memory and then saves waveform data or screen capture data to files
SSD recording (/ST1)	Records waveforms to internal SSD storage
Acquisition mode	
Normal	Normal waveform acquisition
Envelope	Holds peak values at the maximum sample rate, regardless of the time axis setting
Recording time	1 s to 50 days
Sampling interval	100 ns to 200 ms (1-2-5 series)
Action performed at the end of recording	
	Waveform data saving (binary, ASCII, and MATLAB formats) Screen capture data saving, measurement results saving, buzzer notification, mail transmission

SSD recording (/ST1)	
Minimum sampling interval	Depends on the number of used channels. 500 ns (when 1 CH is used), 5 μ s (when 16 CH is used) minimum
Maximum number of recorded points	20 Gpoints, 50 Gpoints (/M1, /M2) (there are limitations based on the number of used channels)
Event recording	Records up to 100 events using the event input terminal
Display time range	10 μ s to 10 s (1-2-5 steps), 20 s, 30 s, 40 s, 50 s, 60 s, 100 s, 200 s, 300 s, 10 min to 60 min (10 min steps), 100 min, 2 hour, 5 hour, 10 hour to 60 hour (10 hour steps), 80 hour, 100 hour, 5 day, 10 day, 20 day, 30 day, 40 day, 50 day
Zoom	One window
Display format	1, 2, 3, 4, 5, 6, 8, 12, 16 split displays (set for each display group) of TY display
Maximum number of displayed traces	Up to 64 traces for each display group
X-Y display	Number of windows: 2 Number of X-Y traces: Up to eight traces (up to four traces/window) Select the X and Y axes from CHn, CHn_m, RTMATHn, MATHn.

Vertical and Horizontal Control

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

Triggering Section

Selectable trigger level range	0 \pm measurement range
Manual trigger	Using a dedicated key
Trigger source	CHn, CHn_m (specified input channel, specified bit for logic), RTMATHn, external trigger, time
Trigger type	Edge, Time, OR, AND

Analysis

Cursors	T-Y waveforms: Horizontal / Vertical / H&V / Marker / Degree X-Y waveforms: Horizontal / Vertical / H&V / Marker FFT waveforms: Marker / Peak
Automated measurement of waveform parameters	
Measured parameters	<p>Analogue waveform, Math</p> <p>PP, Amp, Max, Min, High, Low, Avg, Mid, Rms, Sdev, +Over, -Over Rise, Fall, Freq, Period, +Width, -Width, Duty, Pulse, Burst1, Burst2, Avg.Freq, AvgPeriod, Int1TY, Int2TY, Int1XY, Int2XY, Delay</p> <p>Logic waveform</p> <p>Freq, Period, Pulse, Duty, Avg.Freq, Delay</p>
Statistical processing	<p>Statistical items</p> <p>Max, Min, Avg, Sdv, Cnt</p> <p>Maximum number of cycles</p> <p>64000</p> <p>Maximum measurement range</p> <p>4 Gpoints (memory recording), 100 Mpoints (SSD recording)</p> <p>Cyclic statistical processing</p> <p>Automatically measures the waveform parameters once per cycle and performs statistical processing on the parameters</p>

Waveform computation	
Operators	Basic arithmetic with coefficients, binarization, shift
Number of computations	Up to 8
Computation length	Up to 2 Mpoints (when one waveform is used), 250 kpoints (when eight waveforms are used)

User-defined math function (/G02 option)	
Operators	Equations can be created using the following operators ABS, SQRT, LOG, EXP, NEG, SIN, COS, TAN, ATAN, PH, DIF, DDIF, INTG, IINTG, BIN, P2, P3, F1, F2, FV, PWHH, PWHL, PWLL, PWXX, DUTYH, DUTYL, FILT1, FILT2, HLBT, MEAN
Set the average	None

FFT	
Waveform to be computed	CHn, MATHn
Number of windows	2
Number of FFT waveforms	Up to eight waveforms (up to four waveforms/window)
Computation range	From the specified computation time start point until the specified number of points have been computed
Math points	1 k / 2 k / 5 k / 10 k / 20 k / 50 k / 100 k
Time window	Hanning, Hamming, FlatTop, Rectangle Exponential (/G02 option)
Set the average	None

Zooming and searching	You can search for and then expand and display a portion of the displayed waveform
Type	Edge: Searches by counting the number of rising and falling edges Logic pattern: Searches by counting the logic pattern Event: The instrument searches for an event number Time: The instrument searches for a date and time

Real Time Math (/G03, /G05)

Math expression	Real time math using hardware
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Max. number of math channels	16 (separate from the input channels)
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Computation result storage format	Single-precision floating-point (32 bit)
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Real time math function	
Math rate	Max. math rate: 10 MS/s or 1 MS/s for polynomials

Math type	Basic arithmetic with coefficients, Quartic polynomial, Coefficient multiplied by addition or subtraction of sources, Logic signal/analogue waveform conversion, Differentiation, Integration, Common logarithm, Square root, Frequency, Period, Edge count, Demodulation of PWM signal, Torque, Rms value, Effective power, Effective power integration, Cosine, Sine, Arc tangent, Angle of rotation, Electrical angle, Knocking filter (only when the /VCE option is installed), Resolver, 3 phase resolver
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Math source waveforms	All input channels including sub channels. (there are limitations based on the operator) Math results can be specified as sources of another channel. However, you can only specify math results of channels whose numbers are smaller than the channel that you are specifying sources for.
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Math delay	A uniform delay for each math operation, regardless of the number of math channels
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Filter on math results	IIR low-pass filter all math results Full, cutoff frequencies 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, 62.5 Hz
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Vertical scale	Set based on the specified top and bottom scale values, simultaneous use of zooming using the scale knob and moving using the position knob
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Digital filter	Digital filter for input channels. Math can be performed on up to 16 channels at the same time
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Target input modules	720212, 720211, 701250, 701255, 720250, 701251, 720268, 701261, 701262, 701265, 720266, 701275, 701270, 701271
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Filter types	Mean (moving average), Gauss, Sharp, IIR, IIR-Lowpass
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Power Math (/G05)

Math expression	Real time math using hardware
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Math source channels	Voltage input channels excluding the 720221
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Max. math rate	10 MS/s (100 kS/s for power math)
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Math result output channels	Power analysis math: Real time math RTMATH13, RTMATH14; harmonic analysis math RTMATH15, RTMATH16; fixed
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Computed result	Single-precision floating-point (32 bit)
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Power analysis	
Max. number of analyzable systems	Up to two three-phase systems can be computed simultaneously

Max. number of simultaneous math parameters	126 when one system is measured 54 \times 2 systems when two systems are measured
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Supported wiring systems	Single-phase two-wire (1P2W); single-phase three-wire (1P3W); or three-phase three-wire (3P3W), Three-phase three-wire system that uses a three-voltage three-current method (3P3W; 3V3A); three-phase four-wire system (3P4W)
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Delta math function	Three-phase three-wire (3P3W) → three-phase three-wire system that uses a three-voltage three-current method (3P3W; 3V3A) Three-phase three-wire (3V3A) → three-phase four-wire system (3P4W) (delta → star) Three-phase four-wire system (3P4W) → three-phase three-wire (3V3A) (star → delta)	
Math items	Rms voltage and current of each phase, Voltage and current simple average of each phase (DC), AC voltage and current components of each phase (AC), Active power, Apparent power, Reactive power, Power factor, Current phase difference, Voltage and current frequencies, Maximum voltage and current, minimum voltage and current, Maximum power, minimum power, Integrated watt-hour, integrated watt-hour of each polarity (positive and negative), Integrated ampere-hour, integrated ampere-hour of each polarity (positive and negative), Apparent energy, Reactive energy, Impedance of the load circuit, Series resistance of the load circuit, Series reactance of the load circuit, Parallel resistance of the load circuit, Parallel reactance of the load circuit, Three-phase voltage unbalanced factor, Three-phase current unbalanced factor, Motor output math, Power efficiency	
Rms math system	Select true rms value or rectified mean value calibrated to the rms value	
Math sync mode	Edge: Select a signal. Computed using zero-crossings. Auto Timer: Specify the time. Computed at specified time intervals. AC: Select a signal. Computed using zero-crossings. Signal stop determined by a stop prediction function. AC+DC: Select a signal. Computed using zero-crossings. Signal stop determined by a stop prediction function. Switches to Auto Timer after stopping.	
Channel selection for edge	Select a single channel from own phase voltage, own phase current, or other voltage/current	
Sync channel filter	If sync mode is set to Edge, low-pass filter can be selected. Cutoff frequency: Select from 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, and 62.5 Hz.	
Harmonic analysis	Max. number of analyzable systems 1	
	Max. number of analyzable frequencies Fundamental wave 1 kHz	
	FFT points 512	
Supported wiring systems	Single-phase two-wire (1P2W); single-phase three-wire (1P3W); or three-phase three-wire (3P3W), Three-phase three-wire system that uses a three-voltage three-current method (3P3W; 3V3A); three-phase four-wire system (3P4W)	
Delta math function	Three-phase three-wire (3P3W) → three-phase three-wire system that uses a three-voltage three-current method (3P3W; 3V3A) Three-phase three-wire (3V3A) → three-phase four-wire system (3P4W) (delta → star) Three-phase four-wire system (3P4W) → three-phase three-wire (3V3A) (star → delta)	
Math mode	Rms analysis mode, power analysis mode	
Math items	Rms analysis mode	Rms percentage content of the 1st to 40th harmonic, Phase angles of the 1st to 40th harmonic, Total rms value, Distortion factor (IEC), Distortion factor (CSA)
	Power analysis mode	Active powers from the 1st to the 35th harmonic, Active power percentage content from the 1st to the 35th harmonic, Phase angles of the 1st to 35th harmonic, Total active powers, Total reactive powers, Total apparent powers, Power factor, 1st harmonic rms voltage, 1st harmonic rms current, 1st harmonic voltage phase angle, 1st harmonic current phase angle
Sync channel	Rms analysis mode: Analysis source channel Power analysis mode: Select one channel from voltage and current.	
Sync channel filter	Low-pass filter can be selected Cutoff frequency: Select from 128 kHz, 64 kHz, 32 kHz, 16 kHz, 8 kHz, 4 kHz, 2 kHz, 1 kHz, 500 Hz, 250 Hz, 125 Hz, and 62.5 Hz.	
Time Axis		
Time axis accuracy	±4.6 ppm	
External clock input	Clock input through the external clock input terminal	
Display		
Display	12.1-inch color TFT LCD (capacitive touch panel)	
Display format	T-Y, X-Y, FFT, harmonics (/G05)	
Display resolution	1024×768 (XGA)	
Resolution of the waveform display	801×656 (normal), 1001×656 (wide)	
Defective pixels	3 ppm or less of the total number of pixels including RGB	

Saving Data		
Saving Data	Types of saved data	Measured data, analysis results, settings, screen capture
	Measured data format	Binary (.WDF), MATLAB (.MAT), text (.CSV) Maximum file size (MAT, CSV format): 2 GByte
	Data storage device	Internal storage, SD memory card, USB storage, network drive
Saving Screen Captures		
	Screen capture data format	PNG, JPEG, BMP
	Screen capture data color	Monochrome, color, color (reverse), grayscale
	Data storage device	Internal storage, SD memory card, USB storage, network drive

PC Data Streaming	
Connection type	USB, Ethernet, 10G Ethernet (/C60)
Maximum sample rate	Depends on the number of used channels. 2 MS/s (when 1 CH is used), 200 kS/s (when 16 channels are used) maximum (USB, Ethernet) 10 MS/s (when 8 channels are used) (10G Ethernet)

Multi-Unit Synchronization (/C50)	
Connector type	SFP
Ports	4 (up to four sub units can be connected to a main unit)
Synchronization accuracy	± (30 ns + 1 sample) (typical value)
Function	Start and stop from the main unit, combination trigger across units
Maximum cable length	20 m

Storage	
Internal storage (/ST1 option)	
Number of drives	1
Media type	SSD
Available space	512 GB
SD memory card	
Number of slots	1
Maximum capacity	128 GB
Compatible cards	SD, SDHC, and SDXC memory cards
USB storage	
Compatible USB storage devices Mass storage devices that comply with USB Mass Storage Class Ver. 1.1	
Available space	8 TB max. Partition format: MBR, GPT; format type: FAT16/FAT32/exFAT

USB Ports for Peripherals		
Connector type	USB type A (receptacle)	
Electrical and mechanical	USB Rev. 2.0 compliant	
Supported transfer modes	HS (High Speed; 480 Mbps), FS (Full Speed; 12 Mbps), LS (Low Speed; 1.5 Mbps)	
Compatible devices	Mass storage devices that comply with USB Mass Storage Class Ver. 1.1 104 or 109 keyboards that comply with USB HID Class Ver. 1.1 Mouse devices that comply with USB HID Class Ver. 1.1 HP Inkjet printers compatible with USB Printer Class Ver. 1.0, Brother/PocketJET printers	
Number of ports	2	
Power supply	5 V, 500 mA (for each port)	
External Printer Output		
Supported models	Brother Pocket JET printers, 300 dpi models HP inkjet printers, single function models For details on models, see the catalog or website	
Output format	Screen hard copy, monochrome or color (color available only with HP printers)	

Auxiliary I/O Section		
External Trigger Input Terminal		
Connector type	BNC	
Input level	TTL (0 to 5 V)	
Minimum pulse width	100 ns	
Detected edge	Rising or falling	
Trigger Output Terminal		
Connector type	BNC	
Output level	5 V CMOS	
Output delay time	(1.8 μs to 4.5 μs) + 1 sample (typical value) Applies to 1 MS/s or faster modules. Depends on the installed module	
Output format		
Normal format	Logic: Falls when a trigger occurs and rises when a signal acquisition is completed Output hold time: 100 ns or more	
Pulse format	Logic: Transmits a pulse when a trigger occurs Pulse width: 1 ms, 50 ms, 100 ms, 500 ms	

External Clock Input Terminal	
Connector type	BNC
Input level	TTL (0 to 5 V)
Maximum input frequency	9.5 MHz, 100 kHz (for envelope)
Minimum pulse width	50 ns
Detected edge	Rising
Video signal output	
Connector type	D-sub 15 pin, receptacle
Output format	Analog RGB
Output resolution	XGA-compliant output, 1024 × 768 dots Approx. 60-Hz Vsync (66 MHz dot clock frequency)
GO/NOGO Output	
Connector type	Screwless terminal block
Output level	5 V CMOS
External Start/Stop Input	
Connector type	Screwless terminal block
Input level	TTL (0 to 5 V) or contact input
Event Input	
Connector type	Screwless terminal block
Input level	TTL (0 to 5 V) or contact input
Sample clock output	
Connector type	Screwless terminal block
Output level	5 V CMOS
Output operation	Outputs a clock signal at the specify frequency
Frequency range	5 Hz to 200 kHz (1-2-5 steps)
COMP Output (Probe Compensation Signal Output Terminal)	
Output signal frequency	1 kHz±1%
Output amplitude	1 V _p -p±10%
Probe power (/P4 or /P8 option)	
Output terminals	4 (/P4), 8 (/P8)
Output power	±12 V
Output current	Up to a total of 2.4 A (/P4), up to a total of 4.8 A (/P8)
GPS Interface (/C35 option)	
Input connector	9-pin Mini DIN
Compatible GPS unit	720940 (optional accessory)
Function	Instrument clock synchronization Sample clock synchronization
Synchronization accuracy*	± 200 ns (typical value when locked to GPS signal)*
*The figure is based on results obtained when the GPS unit is installed in a location with good line of sight to GPS satellites. The accuracy may not be attained depending on the measurement location, the location of satellites when the measurement is taken, the weather, and influence caused by obstruction.	
IRIG Interface (/C35 option)	
Input connector	BNC
Number of input connectors	1
Compatible IRIG signals	A006, B006, A136, B126
Input impedance	50 Ω/5 kΩ switchable
Maximum input voltage	±8 V
Used for	Instrument clock synchronization Sample clock synchronization
Clock sync range	±60 ppm
Synchronization accuracy	No drift from the input signal
Computer Interface	
USB-PC Connection	
Connector type	USB type B (receptacle)
Electrical and mechanical specifications	USB Rev. 3.0 compliant
Supported transfer modes	FS (Full Speed) mode (12 Mbps), HS (High Speed) mode (480 Mbps), SS (Super Speed) mode (5 Gbps)
Number of ports	1
Supported protocols	Functions as a device that conforms to one of the following two protocols. USBTMC-USB488 (USB Test and Measurement Class Ver. 1.0)* Communication commands can be used through USB. *A separate driver is required Mass Storage Class Ver. 1.1 Only reading is possible from the instrument's internal storage through PC access. (Operations, such as formatting, are not possible.)
PC system requirements	Windows8.1, Windows10

Ethernet	
Connector type	RJ-45 modular jack
Ports	1
Electrical and mechanical specifications	IEEE802.3 compliant
Transmission system	Ethernet (1000BASE-T/100BASE-TX/10BASE-T)
Communication protocol	TCP/IP
Supported services	DHCP, DNS, SNMP client, SMTP client, FTP client, FTP server, Web server, LPR, VXI-11, HiSLIP, Socket PTP slave, PTP master (/C40 option)
Time synchronization feature	
Sync source	Supports IEEE1588-2008 (PTP v2) Supports PTP packets of Layer3 (UDP/IPv4) and Layer2 (Ethernet) Slave feature only (without the /C40 option) Slave and master features (with the /C40 option) Supports Ordinary Clock Supports E2E delay correction Supports 2-step Sync messages
Sync targets	Instrument clock, sample clock
Synchronization accuracy	±150 ns (typical value) when 1000BASE-T is used and an Ethernet switch is not used
Master sync clock (/C40 option)	Internal clock, GPS (/C35 option)
10 G Ethernet (/C60)	
Connector type	SFP+
Ports	1
Electrical and mechanical specifications	IEEE802.3 compliant
Transmission system	Ethernet (10GBASE-R)
Communication protocol	TCP/IP
Supported services	DHCP, DNS, SNMP client, SMTP client, FTP client, FTP server, Web server, Socket, VXI-11, HiSLIP

General Specifications**Standard operating conditions**

Ambient temperature: 23±5°C
Ambient humidity: 20 to 80%RH
Supply voltage and frequency errors Within ±1% of rating
After a 30 minute warm-up and after calibration

Recommended calibration period

1 year

Warm-up time

At least 30 minutes

Operating environment

Temperature: 5°C to 40°C
Humidity: 20 to 85%RH (no condensation)
Altitude: 2000 m or less

Storage environment

Temperature: -20°C to 60°C
Humidity: 20 to 85%RH (no condensation)

Power supply

Rated supply voltage: 100 to 120 VAC, 220 to 240 VAC (auto switching)
Permitted supply voltage range: 90 to 132 VAC, 198 to 264 VAC
Rated supply frequency range: 48 Hz to 63 Hz
Maximum power consumption: 280 VA
Withstand voltage:
1500 VAC for 1 minute between the power supply and case
Insulation resistance:
10 MΩ or higher at 500 VDC between the power supply and case

Installation orientation

Vertical, horizontal, tilted

External dimensions

Approx. 375 mm (W) × 259 mm (H) × 202 mm (D), excluding the handle and protrusions

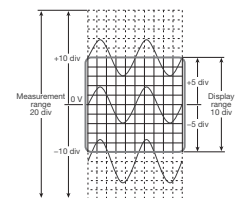
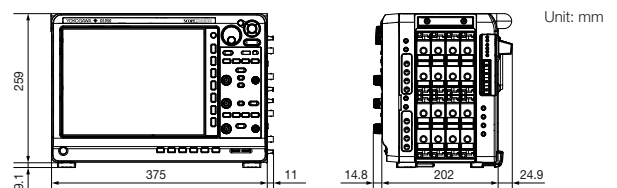
Weight

Approx. 7.5 kg (main unit only, no options)

Measurement Range and Display Range

The measurement range of the ScopeCorder is ±10 divisions (20 divisions of absolute width (span)) around 0 V. The display range of the screen is ±5 divisions (10 divisions of span). The following functions can be used to move the displayed waveform and display the waveform outside the display range by expanding/reducing the displayed waveform.

- Move the vertical position.
- Set an offset voltage.
- Zoom in or out of the vertical axis (expand/reduce).

**Outline Drawing**

Model and suffix code

Model	Suffix codes	Description
DL950		ScopeCorder, 1 G Points memory ¹
Power cord	-D	UL/CSA standard and PSE compliant
	-F	VDE/Korean standard
	-R	Australian standard
	-Q	British standard
	-H	Chinese standard
	-N	Brazilian standard
	-T	Taiwanese standard
	-B	Indian standard
	-U	IEC Plug Type B
	Language	-HJ
-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
-HR		Russian menu and panel
Option		/M1 ²
	/M2 ²	Memory expansion to 8 G Points ⁷
	/ST1	Internal storage (512 GB)
	/C35	IRIG and GPS interface
	/C40	IEEE1588 Master function
	/C50	Multi-unit synchronization interface
	/C60	10 Gbps Ethernet interface
	/G02	User-defined math function
	/G03 ³	Real time math function
	/G05 ³	Power math function (including Real time math function)
/P4 ⁴	Four probe power outputs	
/P8 ⁴	Eight probe power outputs	
/VCE	Vehicle edition	

Standard Main Unit Accessories

Power cord, front cover, panel sheet, 8 slot cover panels, user's manuals⁵

*1: The main unit requires plug-in module (s). Max. 500 M Points/CH. *2,*3,*4: Only one of these can be selected. *5: The Start Guide is provided as a printed document and other manuals on a CD-ROM. *6: Max. 2 G Points/CH *7: Max. 4 G Points/CH

Binary files saved by DL950 cannot be opened by Xviewer. Please use IS8000.

Additional option license for DL950*

Model	Suffix code	Description
709831	-C40	IEEE1588 Master function
	-G02	User-defined math function
	-G05	Power math function (including Real time math function) /G03 is necessary to add /G05
	-VCE	Vehicle edition

*Separately sold license product (customer-installable).

ScopeCorder, is registered trademarks of Yokogawa Electric Corporation.

*Any company's names and product names mentioned in this document are trade names, trademarks or registered trademarks of their respective companies. The User's Manuals of this product are provided by CD-ROM.

Plug-in module model numbers

See page 18 for details.

NOTICE

- Before operating the product, read the user's manual thoroughly for proper and safe operation.

Yokogawa's Approach to Preserving the Global Environment

- Yokogawa's electrical products are developed and produced in facilities that have received ISO14001 approval.
- In order to protect the global environment, Yokogawa's electrical products are designed in accordance with Yokogawa's Environmentally Friendly Product Design Guidelines and Product Design Assessment Criteria.

Probes, cables, and converters*⁸

Model	Product	Description ¹
701947	100:1 Probe	1000 V (DC+ACpeak) CAT II, 1.5 m
702902	10:1 Probe	Operating temp. range: -40 to 85°C, 2.5 m
700929	10:1 Probe	1000 V (DC+ACpeak) CAT II, 1.5 m
701901	1:1 Safety BNC adapter lead	1000 Vrms CAT II
701904	1:1 Safety Adapter Lead	1000 Vrms CAT II, 600 Vrms CAT III
(in combination with the following)		
758928	Pinchers tip (Hook type)	1000 Vrms CAT III, 1 set each of red and black
701954	Large alligator-clip (Dolphin type)	1000 Vrms CAT III, 1 set each of red and black
758929	Alligator clip adaptor set	1000 Vrms CAT II, 1 set each of red and black
758922	Alligator clip adaptor set	300 Vrms CAT II, 1 set each of red and black
758921	Fork terminal adapter set	1000 Vrms CAT II, 1 set each of red and black
701940	Passive probe ²	Non-isolated 600 Vpk (701255) (10:1)
366926	1:1 BNC-alligator cable	Non-isolated 42 V or less, 1 m
366961	1:1 Banana-alligator cable	Non-isolated 42 V or less, 1.2 m
702915	Current probe ^{3,4}	0.5, 5, 30 Arms, DC to 50 MHz
702916	Current probe ^{3,4}	0.5, 5, 30 Arms, DC to 120 MHz
701917	Current probe ^{3,4}	5 Arms, DC to 50 MHz
701918	Current probe ^{3,4}	5 Arms, DC to 120 MHz
701932	Current probe ^{3,4}	30 Arms, DC to 100 MHz
701933	Current probe ^{3,4}	30 Arms, DC to 50 MHz
701930	Current probe ^{3,4}	150 Arms, DC to 10 MHz
701931	Current probe ^{3,4}	500 Arms, DC to 2 MHz
720930	Clamp-on probe	AC 50 Arms, 40 Hz to 3.5 kHz
720931	Clamp-on probe	AC 200 Arms, 40 Hz to 3.5 kHz
701934	Probe power supply	External probe power supply (4 outputs)
701977	Differential probe ^{3,4}	7000 Vpeak, 5000 Vrms (For 701255)
701978	Differential probe ^{3,4}	1500 Vpeak, 1000 Vrms (For 701255)
701955	Bridge head (NDIS, 120 Ω)	With 5 m cable
701956	Bridge head (NDIS, 350 Ω)	With 5 m cable
701957	Bridge head (DSUB, 120 Ω)	Shunt-CAL with 5 m cable
701958	Bridge head (DSUB, 350 Ω)	Shunt-CAL with 5 m cable
758924	Safety BNC-banana adapter	500 Vrms CAT II
702911	Logic probe ⁵	8 bit, 1 m, non-isolated, TTL level/Contact Input
702912	Logic probe ⁵	8 bit, 3 m, non-isolated, TTL level/Contact Input
700986	High-speed logic probe ⁵	8 bit, non-isolated, response speed: 1 μs (typ.)
700987	Isolation logic probe ⁵	8 bit, each channel isolated
758917	Measurement lead set ⁷	0.75 m, Stackable type (2 per set) Separate alligator clips are required.
758933	Measurement lead set ⁷	1000 V/19 A/1 m length Separate alligator clips are required.
701902	Safety BNC-BNC cable (1 m)	1000 Vrms CAT II (BNC-BNC)
701903	Safety BNC-BNC cable (2 m)	1000 Vrms CAT II (BNC-BNC)
701948	Plug-on clip	For 700929 and 701947
701906	Long test clip	For 701977, 701978 and 701901
720941	Optical Transceiver Module	For multi-unit connection
720942	Optical Fiber Cord	For multi-unit connection, 3 m
701972	Soft carrying case	For DL950
720940	GPS unit	For DL950 and DL350

*1: Actual allowable voltage is the lower of the voltages specified for the main unit and cable. *2: 30 Vrms is safe when using the 701940 with an isolated type BNC input. *3: The number of current probes that can be powered from the main unit's power supply is limited. *4: Either the probe power option of the main unit or the probe power supply (701934) is required. *5: Includes one of each of the B9879PX and B9879KX connection leads. *6: Additionally, 758917 and either the 758922 or 758929 are required for measurement. *7: Alligator clips are required. *8: Refer to the bulletin and user's manual of each product to confirm the compatibility with the main unit.

This is a Class A instrument based on Emission standards EN61326-1 and EN55011, and is designed for an industrial environment.

Operation of this equipment in a residential area may cause radio interference, in which case users will be responsible for any interference which they cause.

The DL950, 720212, and 720211 use an Internal laser light source.



Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated June 24, 2007
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