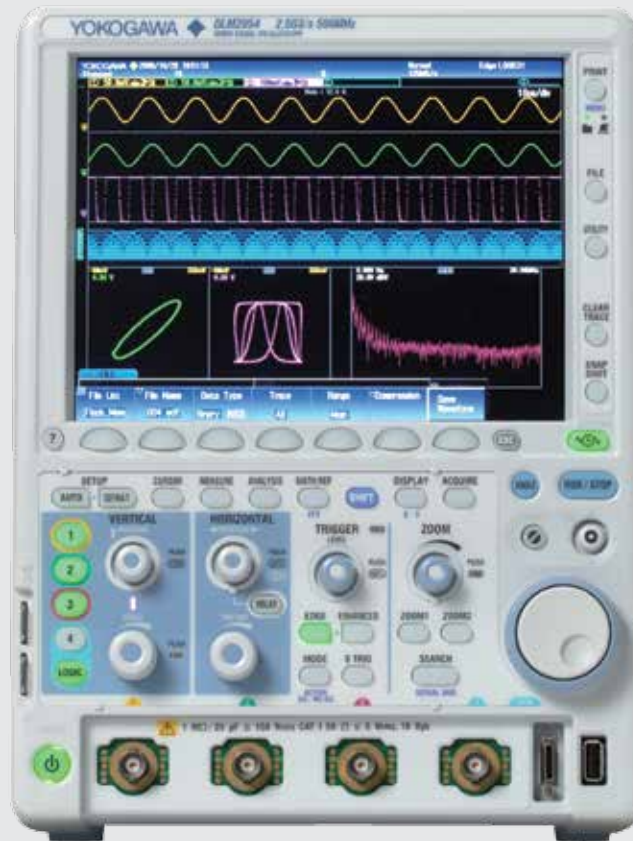




Advanced Test Equipment Corp.

Rentals • Sales • Calibration • Service



Test&Measurement

YOKOGAWA ◆

Precise control and flexibility

DLM2000 Series
Mixed Signal Oscilloscopes

Bulletin DLM2000-E-E

tmi.yokogawa.com

The DLM2000 embodies everything a user would expect in an oscilloscope. It's a family of products that goes beyond the demands and needs of users. Typical of a company focused on quality, the DLM2000 has been built to last decades, crafted by engineers to meet current demands and future proofed to keep track with the ever rapid changes in technology. A product designed for the future but at today's prices.

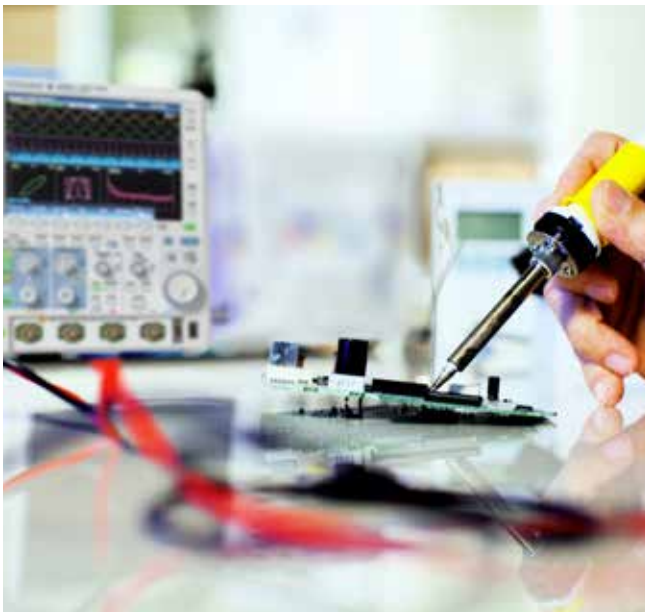
The DLM2000 is a series of bench-top oscilloscopes made for electronic design and debug. It's ergonomic, easy to use, and complete with all the features and more you would expect in today's oscilloscope. With bandwidths from 200 to 500 MHz and memory from 1 to 250 MPoints, there is a DLM2000 to meet your application and budget.

Why choose the DLM2000?

Quality – As a bench-top instrument, an oscilloscope is the most used piece of test and measurement equipment. To meet the rigors of everyday use it needs to be reliable. Yokogawa's reputation for high quality products ensures the user is never let down and can depend on the DLM2000

Innovation – The ever increasing demands of today's test needs means oscilloscopes must be versatile and adapt to all sorts of different applications. Yokogawa's DLM2000 series is equipped with all the features and more that an engineer requires in an oscilloscope.

Foresight – Users experience a short learning curve thanks to an intuitive man-machine interface that is easy to use. Keeping in touch with users has ensured that any Yokogawa product introduced to the market has been developed with their needs in mind.



Why choose Yokogawa

Our passion for measurement

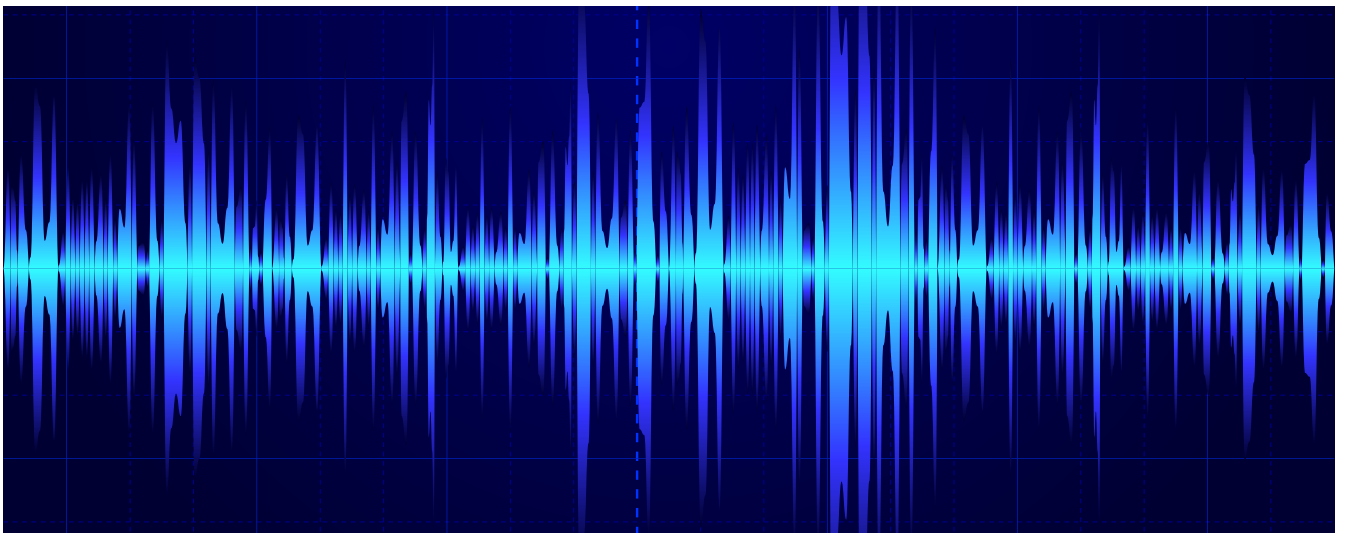
Yokogawa believes that precise and effective measurement lies at the heart of successful innovation – and has focused its own R&D on providing the tools that researchers and engineers need to address their challenges both great and small.

Our heritage

Yokogawa has been developing measurement solutions for almost 100 years, consistently finding new ways to give R&D teams the tools they need to gain the best insights from their measurement strategies. Our oscilloscope design has been led by customers looking for ease-of-use and functionality.

Our commitment

Yokogawa takes pride in its reputation for quality, both in the products we deliver – often adding new features in response to specific client requests – and the level of service and advice we provide to our clients, helping to devise measurement strategies for even the most challenging environments.



Precise control

Easy to use portrait design

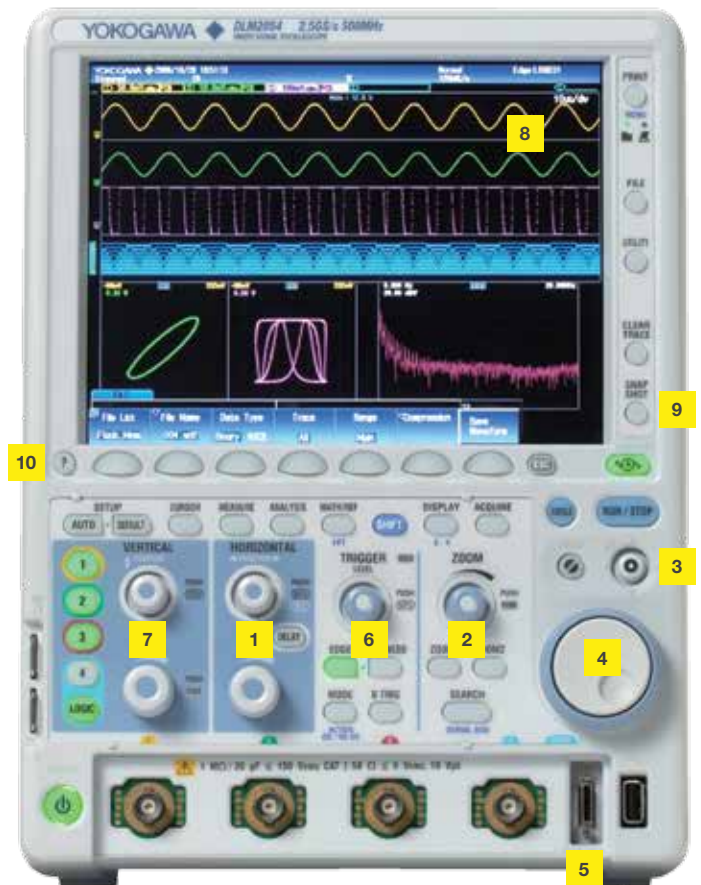
The large display of a DLM2000 is located above the controls; this enables it to be nearer the eyes of the user and keeps the footprint on the bench to a minimum.

The intuitive controls are laid out so that a user can see at a glance what channels and features are switched-on and quickly make the measurements that are needed.

Easy to configure 8.4 inch display

Users can automatically or manually split the display to separate individual channel waveforms while maintaining their full resolution and dynamic range. It is therefore easy to see the details of all signals regardless of the number of channels in use.

- 1** Horizontal Position and Scale Knob
- 2** Dedicated Zoom Keys
- 3** Four-Direction Selector Button
Select key moves the cursor up/down/left/right
- 4** Jog Shuttle and Rotary Knob
- 5** Logic input connector
- 6** Trigger Control Keys and Level Knob
- 7** Vertical Position and Scale
- 8** Large screen in a compact body
- 9** Snapshot key to freeze traces on-screen
- 10** Graphical on-line help key
Built-in manual



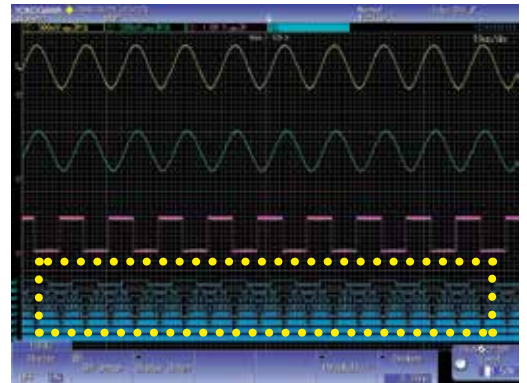
5 Fast and flexible

Flexible MSO input

Choose to capture a mix of analog and more digital signals. With a push of a button, channel 4 converts into 8 digital inputs and the DLM2000 becomes a mixed signal oscilloscope. This makes it possible to view 3 analog and 8 digital signals simultaneously and view more control and logic signals. Digital channels can also be used to analyze I²C, SPI and UART serial buses which keep the analog channels available for other signals.

ScopeCORE fast data processing

The hardware optimized architecture and dedicated ScopeCORE IC in the DLM2000 enable measurements and signal processing to be carried out in real time. This means that turning on more channels does not affect the waveform acquisition rate and measurements are always performed at high speed.



3 channels analog + 8-bit logic



The fast ScopeCORE internal processor

DLM2000 series Lineup

Model	Analog Bandwidth	Maximum sample rate	No of channels	Maximum record length (in single measurement mode and with interleave on)
DLM2022	200 MHz	2.5GS/s with Interleave on	2 analog	62.5 MPoints
DLM2024	200 MHz		4 analog or 3 analog plus 8 digital	250 MPoints with /M3 option
DLM2032	350 MHz		2 analog	62.5 MPoints
DLM2034	350 MHz		4 analog or 3 analog plus 8 digital	250 MPoints with /M3 option
DLM2052	500 MHz		2 analog	62.5 MPoints
DLM2054	500 MHz		4 analog or 3 analog plus 8 digital	250 MPoints with /M3 option

The flexibility of longer memory

Long waveform memory

Up to 250 MPoints

The two advantages of a long waveform memory are the abilities to capture for long periods of time and to maintain high sample rates, and hence higher effective measuring bandwidths for all time base settings.

With the maximum memory installed (/M3 option), in single shot mode, a 10 kHz signal lasting for more than one hour can be captured. The same memory can capture a 200 millisecond signal at a sample rate of 1.25GS/s sample rate.

History memory and high speed acquisition

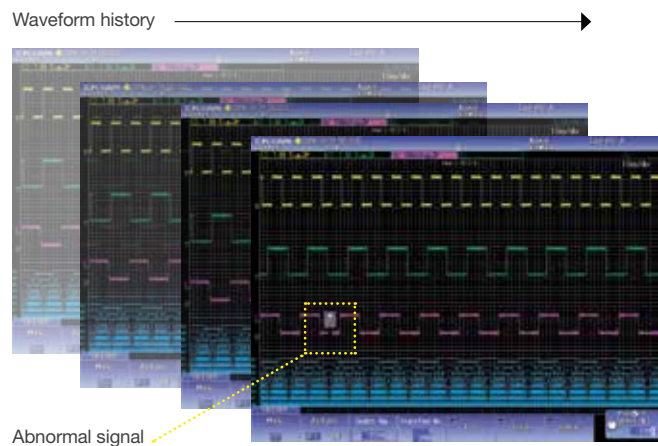
Capture and replay up to 50,000 acquisitions

With the history memory, the DLM2000 can capture and replay up to 50,000 individual acquisitions. These can be displayed one at a time or as an accumulation. Using the search and measurement functions, abnormal signals can therefore be quickly isolated, analyzed and precisely categorized without needing to carefully configure triggers to capture rare events.

Together with a maximum continuous acquisition rate of 20,000 waveforms per second, which increases to approximately 450,000 in N Single mode, the history memory in the DLM2000 enables abnormal signals to be captured without needing to know what makes them different.

Maximum memory per channel

Type of measurement	Two analog channel models	Four analog channel models
Continuous	6.25 MPoints	6.25 MPoints (standard memory) 12.5 MPoints (with /M2 option) 25 MPoints (/with M3 option)
Single-shot using all analog channels	25 MPoints	25 MPoints (standard memory) 62.5 MPoints (with /M2 option) 125 MPoints (with /M3 option)
Single-shot using half the analog channels	62.5 MPoints	62.5 MPoints (standard memory) 125 MPoints (with /M2 option) 250 MPoints (with /M3 option)

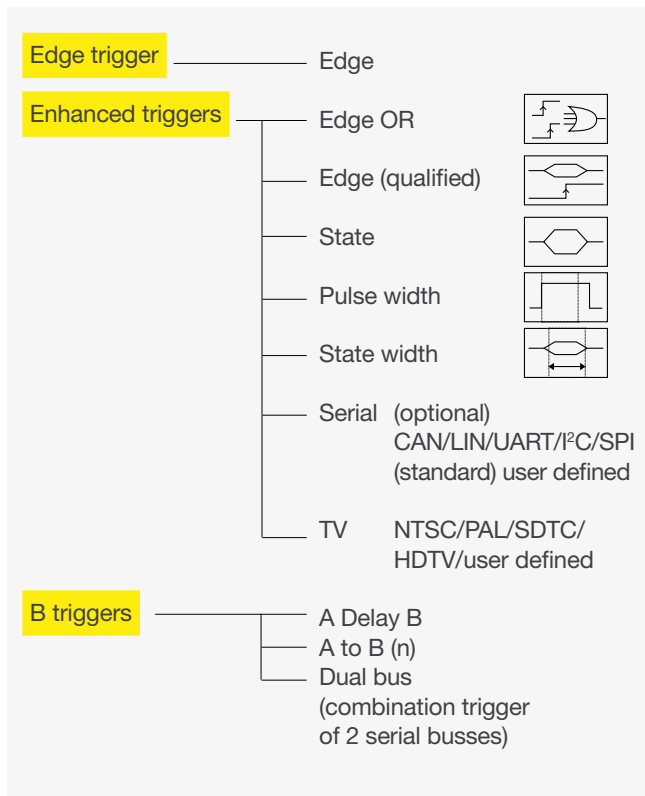


7 Reliable triggering

When just a specific event or abnormal waveform needs to be captured, the flexible and reliable triggering of the DLM2000 is the solution. The user can combine analog and digital inputs and select the trigger conditions appropriate to the complexity and uniqueness of the event.

Enhanced triggers

Via the Enhanced menu, the DLM2000 can be set to trigger, for example, on an edge of any channel, an edge or state when conditions on other channels are met or when the width of a pulse is either more or less than a specified time. Dedicated triggers are also available for serial bus options.



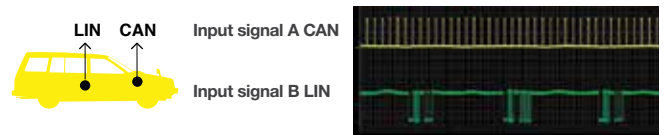
Trigger on arbitrary serial bus patterns

In order to support any type of serial bus and thus the ability to trigger on any combination of ID and data etc., a user define trigger is provided. On one input channel, a pattern of up to 128 bits can be set and other channels can also be used for clock, chip select and latch signals.

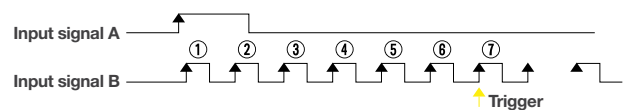


Combination triggers

Via the B trigger menu two serial bus triggers can be combined, which means that the DLM2000, for example, will trigger when signal conditions on either a CAN bus or a LIN bus are met.



The "A to B(n)" trigger provides the ability to trigger when a specific number of edges has occurred on input B. This enables measurements on signals with shifted timing, such as non-standard video signals, and motor reference position pulses and drive pulses to be easily made.



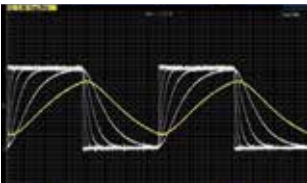
Triggering on the 7th edge of the B input signal

Features and benefits

Capable measurement and analysis

The DLM2000 is packed with advanced capture and analysis features to provide quick and comprehensive answers.

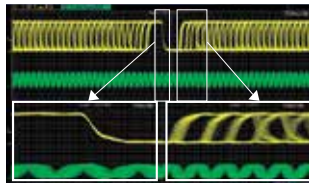
8



Real time filters and post processed digital filters

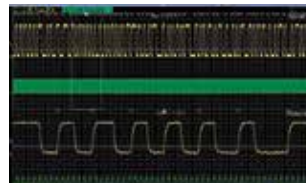
The DLM2000 has two types of filter. Real time input filters, with cut-offs from 8 kHz to 200 MHz, are selectable for each channel and the filtered data is stored in the internal memory. Input waveforms can also be filtered using a digital IIR filter using the mathematics (MATH) function. This method enables the input and filtered waveforms to be simultaneously displayed and compared. High and low pass filters from 0.01 Hz to 500 MHz are selectable with a high level of precision.

The image shows the snapshot function which freezes traces on the screen to compare old and new acquisitions.



Two fully independent zoom windows

Combined with the advanced search and cursor/parameter measurement capabilities, the two zoom windows enable users, for example, to see the waveform detail of two parts of the acquisition which can be separated by a long time period. It is thus possible to quickly find, measure and analyze the details of the cause and effect of an abnormality which could be on the same or different input channels. They also make it possible to view and compare the details and timings of different serial buses which are running at different speeds.



Advanced waveform search functions

Quickly find and mark abnormal signals in long and multiple waveform acquisitions.

Single waveform acquisitions of up to 250 MPoints can be searched using various criteria such as edges, state patterns, pulse widths and serial bus patterns (optional).

The history memory can be searched to find matching criteria in up to 50,000 acquisitions.

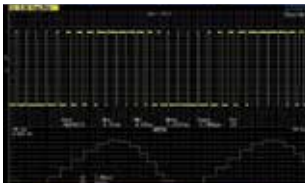


Automatic parameter measurement and statistical analysis

30 waveform parameters from a total of 29 different types can be displayed simultaneously with a high update rate. These include: maximum, minimum, peak-to-peak, pulse width, period, frequency, rise and fall times, and the delay between channels.

The statistics of repetitively measured parameters can also be displayed, such as the mean, maximum, minimum and standard deviation.

Additionally, the Go/NO-GO function can be used to test the results of parameter measurements, trigger conditions and other criteria and automatically save or print data, send an e-mail etc.



Parameter trend and histogram displays

To observe the fluctuations of measured parameters, it is possible to display them as trends. Period-to-period changes can then be easily seen. The variation of parameters can also be displayed as histograms thus providing a visual method of assessing them statistically.



Automatically measure time and voltage differences

Line or waveform marker cursors can be placed on different displayed waveforms and the absolute values of voltage and time, and their differences, can be simply displayed. A degree cursor can also be used by converting the time axis into a position/degree axis.



FFT frequency domain analysis

2 FFT analyses can be performed simultaneously. The source data can be either from input channels or the results of mathematical computations. As well as standard Power Spectrum calculations, a full suite of FFT functions are available using the /G2 user define math option.



User define math

Up to 2 math channels are available. The standard DLM2000 provides arithmetic and filtering functions on computations of up to 125 MPoints. By installing the /G2 option, the oscilloscope offers comprehensive user defined mathematics. Equations can be arbitrarily created using a suite of operators such as trigonometric and logarithmic operators, integration and differentiation, pulse width operators, phase measurement and digital to analogue conversion (in the image).

When used in combination with cursor and automatic waveform measurements on the computed waveforms, the DLM2000 is able to provide meaningful results according to the user's specific requirements.

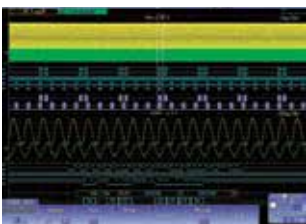
Serial bus triggering and analysis

Up to 4 buses simultaneously

Dedicated trigger and analysis options are available for FlexRay, CAN, CAN FD, LIN, SENT, UART, I2C and SPI serial buses.

From most buses a wide variety of trigger combinations can be set, including ID and Data combinations, which can also be combined with conventional edge triggers. A serial bus auto-setup enables the MSO to be quickly configured. The user therefore does not need detailed knowledge of the bus frame format.

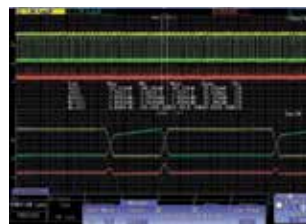
Analysis can be performed at high speed simultaneously on up to four different buses operating at different speeds. This is enhanced by the extensive search facilities, allowing the user to look for specific data in the very long memory. The dual-zoom facility means that different buses can be viewed and debugged alongside each other.



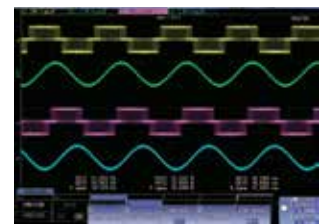
Simultaneous analyses of I²C and SPI



Four bus decode and list display



Switching loss analysis



Power parameter measurement

Power supply analysis options

The /G3 and /G4 options enable switching loss, joule integral (i^2t), SOA (safe operating area), harmonics based on EN61000-3-2, and other power parameters to be measured and analyzed.

Switching loss analysis

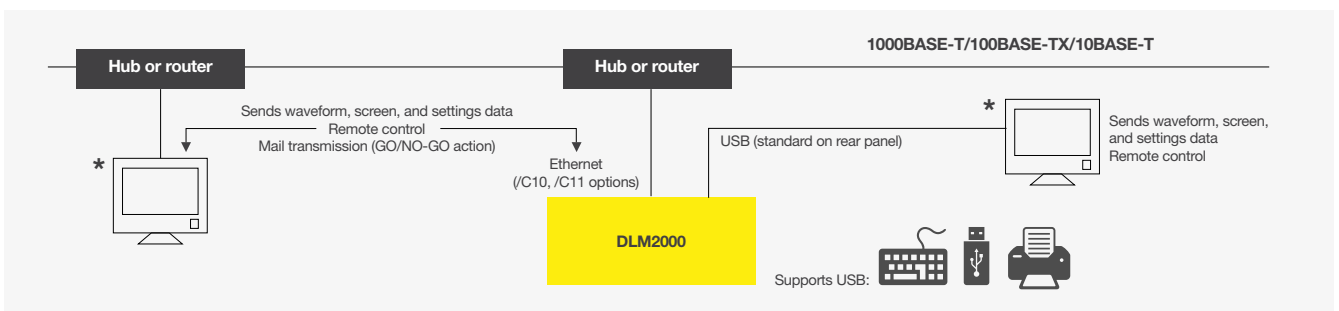
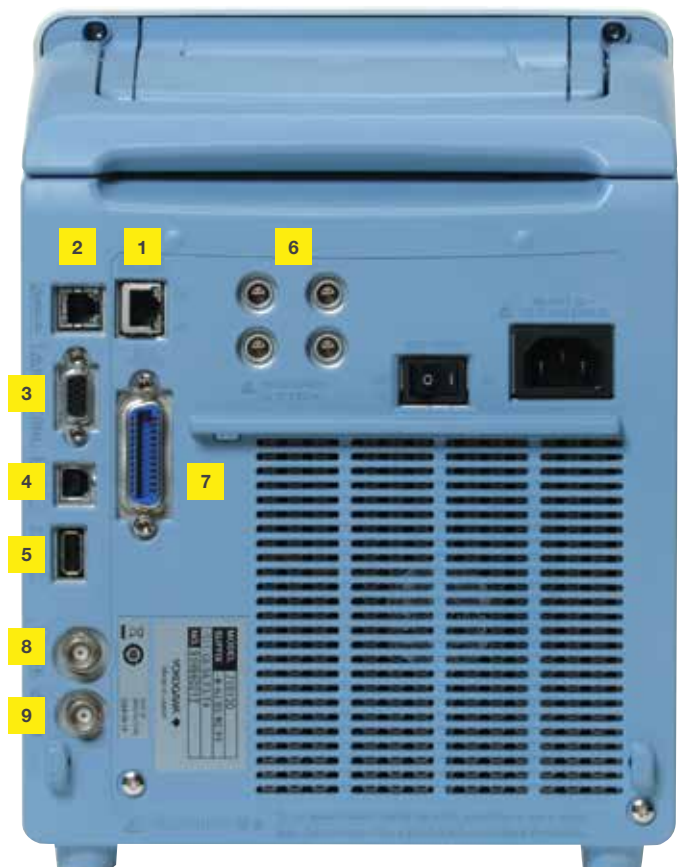
Using the long memory, the switching loss of the voltage and current input waveforms can be computed ($V(t) \times i(t)$) over long time periods. The turn-on/off loss, the loss including the continuity loss, and the loss over many cycles of the 50 Hz/60 Hz power line can be calculated and analyzed.

Power measurement

The MSO can also be used as a power meter by providing automated measurement of power parameters for up to two pairs of voltage and current waveforms, such as the active power, apparent power and power factor. These values can then be statistically processed and calculated.

11 Connectivity

- 1 Ethernet (optional)**
Supports 1000BASE-T, 100BASE-TX, 10BASE-T.
- 2 Go/No-Go output terminal**
TTL level output of the result of the GO/No-GO function.
- 3 RGB video signal output terminal**
Check the image of the waveform on a external monitor.
- 4 USB-PC connection terminal**
Enables control from a PC.
- 5 USB peripheral connection terminal**
Supports USB storage, USB keyboards, USB printers.
- 6 Probe power terminal (optional)**
Power supply for current and differential probes.
- 7 GP-IB connection terminal (optional)**
Enables control from a PC.
- 8 External trigger input**
An input for a trigger signal separate from the channel signals.
- 9 Trigger output**
Output a CMOS 3.3V level trigger signal



*DLM2000's internal storage can be recognized by a PC as an external USB storage device. Transferring files is easy even when a USB thumb drive can't be used.

Comprehensive software tools

A comprehensive suite of software tools to support and complement complex measurement tasks.

	Free	Trial version available
Off-line waveform display and analysis	<p>XviewerLITE <i>Basic display and measurement</i> Provides zooming, vertical cursors and data conversion to CSV format.</p>	<p>Xviewer <i>Advanced analysis</i> Xviewer can display acquired waveforms, transfer files and control instruments remotely. In addition to simply displaying the waveform data, Xviewer features many of the same functions that the DLM2000 offers; zoom display, cursor measurements, calculation of waveform parameters, complex waveform math and FFT. Binary waveform data can easily be converted to CSV, Excel or Floating Point Decimal format.</p>
Waveform monitoring on a PC Data transfer to a PC	<p>Xwirepuller The DLM2000 can be simply controlled using a PC and mouse via an Ethernet, USB, or GP-IB interface. When the software program starts, a simulation of the oscilloscope appears on the PC display.</p>	
Command control Custom software development	<p>LabVIEW drivers By using the LabVIEW driver written for the DLM2000, a developer can dramatically reduce the amount of work required to enable a PC to control the instrument from within the LabVIEW environment.</p> <p>TMCTL library This DLL (Dynamic Link Library) enables Microsoft Visual studio programs, such as Visual C++ and Visual Basic, to be quickly developed to communicate between the PC and the DLM2000. It supports GPIB, USB and Ethernet interfaces.</p> <p>DLTerm The command line tool can be used with the TMCTL library to develop communication programs. Prototype code can be rapidly created to automate sequences of capture, measurement and analysis tasks before writing a fully custom software routine.</p>	<p>MATLAB toolkit The MATLAB® tool kit can be used to control the DLM2000 and to transfer data via GP-IB, USB or Ethernet from within MATLAB.</p>
	<p>Symbol editor Physical value symbol definition files for CAN serial bus analysis can be created and edited. CANdb files can also be imported.</p>	

13

Recommended Probes and accessories

The extensive range of Yokogawa probes includes models which are designed and optimized for specific applications.

For power electronics testing

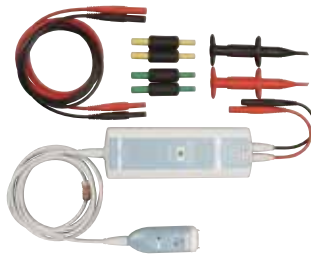
PBC050 / PBC100 - Current probes*

DC to 50 MHz / 100 MHz
30 Arms



PBDH0150 - differential probe

DC to 150 MHz
1400 V (DC + ACpeak) differential and common mode voltage



701926 – differential probe*

DC to 50 MHz
5000 Vrms / 7000 Vpeak



701936 deskew correction signal source

For serial bus testing

PBDH1000 – 1GHz differential probe

1 M ohm / 1.1 pF input
±25 V differential voltage input
Compatible with the FlexRay standard



701920 / 701922

differential probes
500 MHz / 200 MHz
±12 V / ±20V
differential voltage input



Logic probes

PBL100 / PBL250 8 bit logic probes

100 MHz / 250 MHz toggle frequency
1 M ohm / 100 K ohm input



PBA1000 1 GHz Active probe

100 k ohm / 0.9 pF input



*Higher current and other differential probes are available. See page 16

Specifications

DLM2000 Series

Models			
Model name	Frequency bandwidth	Input terminal	Max. sample rate
DLM2022 (710105)	200MHz	2 analog channels	1.25GS/s (interleave mode off)
DLM2032 (710115)	350MHz		
DLM2052 (710125)	500MHz		
DLM2024 (710110)	200MHz	4 analog channels / 3 analog channels + 8bit logic	2.5GS/s (interleave mode on)
DLM2034 (710120)	350MHz		
DLM2054 (710130)	500MHz		

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 setting range	1 MΩ	2 mV/div to 10 V/div (steps of 1-2-5)
	50 Ω	2 mV/div to 500 mV/div (steps of 1-2-5)
Max. input voltage	1 MΩ	150 Vrms
	50 Ω	Must not exceed 5 Vrms or 10 Vpeak
Max. DC offset setting range	1 MΩ	±1V (2 mV/div to 50 mV/div) ±10V (100 mV/div to 500 mV/div) ±100V (1 V/div to 10 V/div)
	50 Ω	±1V (2 mV/div to 50 mV/div) ±5V (100 mV/div to 500 mV/div)
DC accuracy ¹		±(1.5% of 8 div + offset voltage accuracy)
Offset voltage accuracy ¹	2 mV to 50mV/div	±(1% of setting +0.2 mV)
	100 mV to 500 mV/div	±(1% of setting + 2 mV)
	1 V to 10 V/div	±(1% of setting + 20 mV)

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 500mV/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

Isolation between channels	-34 dB@ analog bandwidth (typical value)
Residual noise level ³	The larger of 0.4 mV rms or 0.05 div rms (typical value)
A/D resolution	8bit (25LSB/div) Max. 12 bit (in High Resolution mode)
Bandwidth limit	FULL, 200 MHz, 100MHz, 20 MHz, 10 MHz, 5 MHz, 2 MHz, 1 MHz, 500 kHz, 250 kHz, 125 kHz, 62.5 kHz, 32 kHz, 16 kHz, 8 kHz (can be set for each channel)

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 (M1S)	Repeat/Single/Single Interleave: 6.25 M/25 M/62.5 MPoints
	4 ch model (M1S)	Repeat/Single/Single Interleave: 6.25 M/25 M/62.5 MPoints
	4 ch model (M2)	Repeat/Single/Single Interleave: 12.5 M/62.5 M/125 MPoints
	4 ch model (M3)	Repeat/Single/Single Interleave: 25 M/125 M/250 MPoints

Ch-to-Ch deskew	±100 ns
Time axis setting range	1 ns/div to 500 s/div (steps of 1-2-5)
Time base accuracy ¹	± 0.002%
Max. acquisition rate ⁴	Approx. 20,000 waveform/sec/ch (Accumulation mode)
Dead time in N Single mode	Approx. 2.2µs (approx. 450,000 waveforms/sec/ch)

Logic Signal Input (4 ch model only)

Number of inputs	8 bit (excl. 4 ch input and logic input)	
Maximum toggle frequency ¹	Logic probe 701988: 100 MHz Logic probe 701989: 250 MHz	
Compatible probes	701988, 701989 (8 bit input) (701980, 701981 are available)	
Min. input voltage	701988: 500 mVp-p 701989: 300 mVp-p	
Input range	Model 701988: ±40 V Model 701989: threshold ±6V	
Max. nondestructive input voltage	±40 V (DC + ACpeak) or 28 Vrms (when using 701989)	
Threshold level setting range	Model 701988: ±40 V (setting resolution of 0.05 V) Model 701989: ±6 V (setting resolution of 0.05 V)	
Input impedance	701988: Approx. 1 MΩ/approx. 10 pF 701989: Approx. 100 kΩ/approx. 3 pF	
Maximum sampling rate	1.25 GS/s	
Maximum record length	/M1, /M1S option	Repeat: 6.25 MPoints, Single: 25 MPoints
	/M2 option	Repeat: 12.5 MPoints, Single: 62.5 MPoints
	/M3 option	Repeat: 25 MPoints, Single: 125 MPoints

Triggers

Trigger modes	Auto, Auto Level, Normal, Single, N-Single
Trigger type, trigger source	A triggers Edge Edge OR Edge Qualified State Pulse width State width TV CH1 to CH4, Logic, EXT, LINE CH1 to CH4, Logic, EXT CH1 to CH4, Logic, EXT CH1 to CH4, Logic, EXT CH1 to CH4, Logic CH1 to CH4

Trigger type, trigger source	A triggers	Serial Bus I ² C (optional) SPI (optional) UART (optional) FlexRay (optional) CAN (optional) CAN FD (optional) LIN (optional) SENT (optional) User defined CH1 to CH4, Logic CH1 to CH4, Logic CH1 to CH4, Logic CH1 to CH4 CH1 to CH4 CH1 to CH4, Logic CH1 to CH4
	AB triggers	A Delay B A to B(N) Bus 10 ns to 10 s (Edge, Edge Qualified, State, Serial Bus) 1 to 10 ⁶ (Edge, Edge Qualified, State, Serial Bus) Dual Serial bus only
Trigger level setting range	CH1 to CH4	±4 div from center of screen
Trigger level setting resolution	CH1 to CH4	0.01 div (TV trigger: 0.1 div)
Trigger level accuracy ¹	CH1 to CH4	±(0.2 div + 10% of trigger level)
Window Comparator		Center/Width can be set on individual Channels from CH1 to CH4

Display	
Display	8.4-inch TFT color liquid crystal display 1024 x 768 (XGA)

Functions

Waveform acquisition modes	Normal, Envelope, Average	
High Resolution mode	Max. 12 bit (the resolution of the A/D converter can be improved equivalently by placing a bandwidth limit on the input signal.)	
Sampling modes	Real time, interpolation, repetitive sampling	
Accumulation	Select OFF; Intensity (waveform frequency by brightness), or Color (waveform frequency by color)	
	Accumulation time	100 ms to 100 s, Infinite
Roll mode	Enabled at 100 ms/div to 500 s/div (depending on the record length setting)	
Zoom function	Two zooming windows can be set independently (Zoom1, Zoom2)	
	Zoom factor	x2 to 2.5 points/10div (in zoom area)
	Scroll	Auto Scroll
	Search functions	Edge, Edge Qualified, State, Pulse Width, State Width (FC option), SPI (option), UART (option), CAN (option), LIN (option), Flexray (option)
History memory	Max. data	10,000 (record length 1.25 kPoints, with /M1 or /M1S option) 20,000 (record length 1.25 kPoints, with /M2 option) 50,000 (record length 1.25 kPoints, with /M3 option)
	History search	Select Rect, WAVE, Polygon, or Parameter mode
	Replay function	Automatically displays the history waveforms sequentially
	Display	Specified or average waveforms
Cursor	Types	AT, ΔV, AT & ΔV, Marker, Degree
Snapshot		Currently displayed waveform can be retained on screen

Computation & Analysis Functions

Parameter measurement	Max, Min, P-P, High, Low, Rms, Mean, Sdev, IntegTY+, IntegTY, +OVER, -OVER, Pulse Count, Edge Count, V1, V2, AT, Freq, Period, Avg Freq, Avg Period, Burst, Rise, Fall, +Width, -Width, Duty, Delay
Statistical computation of parameters	Min, Max, Mean, standard deviation, Count
Statistics modes	Continuous, Cycle, History
Trend/Histogram display of wave parameters	Up to 2 trend or histogram display of specified wave parameters
Computations (MATH)	+, -, x, /, Filter (Delay, Moving Avg, IIR Lowpass, IIR Highpass), Integ, Count (Edge, Rotary), user defined math (optional)
Computable no. of traces	2 (Math1, Math2) (1 trace for 2ch model)
Max. computable memory length	/M1, /M1S option: 25 MPoints /M2 option: 62.5 MPoints /M3 option: 125 MPoints
Reference function	Up to 2 traces (REF1/REF2) of saved waveform data can be displayed and analyzed
Action ON trigger GO/NO-GO	Modes: Rect, Wave, Polygon, Parameter Actions: Buzzer, Print, Save, Mail
XY	Displays XY1, to XY2 and T-Y simultaneously
FFT	Number of points: 1.25k, 12.5k, 25k, 125k, 250k Window functions: Rectangular, Hanning, Flat-Top FFT Types: PS (LS, RS, PSD), CS, TF, CH are available with /G2 or /G4 option)
Histogram	Displays a histogram of acquired waveforms
User-defined math (/G2 option)	The following operators can be arbitrarily combined in equations: +, -, x, /, SIN, COS, TAN, ASIN, ACOS, ATAN, INTEG, DIFF, ABS, SQRT, LOG, EXP, LN, BIN, DELAY, P2 (power of 2), PH, DA, MEAN, HLBT, PWHH, PWLL, PWHL, PWLH, PWWX, FV, DUTYH, DUTYL The maximum record length that can be computed is the same as the standard math functions

Power supply analysis (/G3, /G4 option)

Power analysis	For Pwr1 and Pwr2, selectable from 4 analysis types De-skewing between the voltage and current waveforms can be executed automatically.	
	Switching loss	Total loss / switching loss, power waveform display, Automatic measurement and statistical analysis of power analysis items (Wp, Wp+, Wp-, Abs.Wp, P, P+, P-, Abs.P, Z)
	Safety operation area	SOA analysis by X-Y display, using voltage as X axis, and current as Y axis is possible
	Harmonic analysis	Basic comparison is possible with following standard Harmonic emission standard IEC61000-3-2 edition 2.2, EN61000-3-2(2000), IEC61000-4-7 edition 2
	Joule integral	Joule integral (I2t) waveform display, automatic measurement and statistical analysis is possible
Power Measurement		Automated measurement of power parameters for up to two pairs of voltage and current waveforms Values can be statistically processed and calculated
	Measurement parameters	Urms, Urm, Udc, Urmn, Uac, U+pk, U-pk, Up-p Irms, Imn, Idc, Imn, Iac, I+pk, I-pk, Ip-p S, Q, Z, λ, Wp, Wp+, Wp-, Abs.Wp, q, qr, q-, Abs.q Avg Freq(voltage, current)

I2C Bus Signal Analysis Functions (/F2 & /F3 Options)		
Applicable bus	I ² C bus	Bus transfer rate: 3.4 Mbit/s max. Address mode: 7 bit/10 bit
	SM bus	Complies with System Management Bus
Analyzable signals		CH1 to CH4, Logic input, or M1 to M2
I ² C Trigger modes		Every Start, Address & Data, Non-Ack, General Call, Start Byte, HS Mode
Analysis results displays		Analysis no., time from trigger position (Time (ms)), 1st byte address, 2nd byte address, R/W, Data, Presence/absence of ACK, information
Auto setup function		Auto setting of threshold value, time axis scale, voltage axis scale, and display of analysis results
Analyzable no. of data		300,000 bytes max.
Search function		Searches data that matches specified address pattern, data pattern, and acknowledge bit condition
Analysis results save function		Analysis list data can be saved to CSV-format files

SPI Bus Signal Analysis Functions (/F2 & /F3 Options)		
Trigger types		3 wire/4 wire After assertion of CS, compares data after arbitrary byte count and triggers.
Analyzable signals		CH1 to CH4, Logic input, M1 to M2
Byte order		MSB/LSB
Auto setup function		Auto setting of threshold value, time axis scale, voltage axis scale, and display of analysis results
Analyzable no. of data		300,000 bytes max.
Decode bit length		Specify data interval (1 to 32 bits), decode start point, and data length
Analysis results displays		Analysis no., time from trigger position (Time (ms)), Data 1, Data 2
Auxiliary analysis functions		Data search function
Analysis result save function		Analysis list data can be saved to CSV-format files

UART Bus Signal Analysis Functions (/F1 & /F3 Options)		
Bit rate		1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, user defined (an arbitrary bit rate from 1 k to 1 Mbps with resolution of 100 bps)
Analyzable signals		CH1 to CH4, logic input, or M1 to M2
Data format		Select a data format from the following 8 bit (Non Parity) / 7 bit Data + Parity / 8 bit + Parity
UART Trigger modes		Every Data, Data, Error (Framing, Parity)
Auto setup function		Auto setting of bit rate, threshold value, time axis scale, voltage axis scale, and display of analysis results
Analyzable no. of frames		300,000 frames max.
Analysis results displays		Analysis no., time from trigger position (Time(ms)), Data (Bin, Hex) display, ASCII display, and Information.
Auxiliary analysis functions		Data search
Analysis result save function		Analysis list data can be saved to CSV-format files

CAN Bus Signal Analysis Functions (/F4, /F6, /F7 and /F8 Options)		
Applicable bus		CAN version 2.0A/B, Hi-Speed CAN (ISO11898), Low-Speed CAN (ISO11519-2)
Analyzable signals		CH1 to CH4, M1 to M2
Bit rate		1 Mbps/500 kbps/250 kbps/125 kbps/83.3 kbps/ 33.3 kbps User defined (an arbitrary bit rate from 10.0 kbps to 1,000 Mbps with resolution of 100 bps)
CAN bus Trigger modes		SOF, ID/DATA, ID OR, Error(enabled when loading physical values/symbol definitions)
Auto setup function		Auto setting of bit rate, threshold value, time axis scale, voltage axis scale, and display of analysis results
Analyzable no. of frames		100,000 frames max.
Analysis results displays		Analysis no., time from trigger position (Time (ms)), Frame type, ID, DLC, Data, CRC, presence/absence of Ack, information
Auxiliary analysis functions		Data search and field jump functions
Analysis result save function		Analysis list data can be saved to CSV-format files

CAN FD Bus Signal Analysis Functions (/F7 and /F8 Options)		
Applicable bus		CAN FD Version 1.0
Analyzable signals		CH1 to CH4, M1 to M2
Bit rate	Arbitration	1 Mbps, 500 kbps, 250 kbps, User Define (an arbitrary bit rate from 20 kbps to 1 Mbps with resolution of 100 bps)
	Data	8 Mbps, 5 Mbps, 4 Mbps, 2 Mbps, 1 Mbps, 500 kbps, User Define (an arbitrary bit rate from 250kbps to 10Mbps with resolution of 100 bps)
CAN FD bus trigger modes		SOF, ID, ID OR, Error Frame, Message (enabled when loading physical values/symbol definitions)
Auto setup function		Auto setting of bit rate, recessive Level, threshold value, time axis scale, voltage axis scale, and display of analysis results
Analyzable no. of frames		50,000 frames max.
Analysis results displays		Analysis no., time from trigger position (Time (ms)), Frame type, ID, DLC, Data, CRC, presence/absence of Ack, information
Auxiliary analysis functions		Data search and field jump functions
Analysis result save function		Analysis list data can be saved to CSV-format files

LIN Bus Signal Analysis Functions (/F4, /F6, /F7 and /F8 Options)		
Applicable bus		LIN Rev. 1.3, 2.0, 2.1
Analyzable signals		CH1 to CH4, M1 to M2
Bit rate		19.2 kbps, 9.6 kbps, 4.8 kbps, 2.4 kbps, 1.2 kbps User defined (an arbitrary bit rate from 1000 bps to 200 kbps with resolution of 10 bps)
LIN bus Trigger modes		Break Synch, ID/DATA, ID OR, and ERROR trigger
Auto setup function		Auto setting of bit rate, threshold value, time axis scale, voltage axis scale, and display of analysis results
Analyzable no. of frames		100,000 frames max.
Analysis results displays		Analysis no., time from trigger position (Time (ms)), ID, ID-Field, Data, CheckSum, information
Auxiliary analysis functions		Data search and field jump functions
Analysis result save function		Analysis list data can be saved to CSV-format files

FlexRay Bus Signal Analysis Functions (/F5, /F6 and /F8 Options)	
Applicable bus	FlexRay Protocol Version2.1
Analyzable signals	CH1 to CH4, M1 to M2
Bit rate	10 Mbps, 5 Mbps, 2.5Mbps
FlexRay bus Trigger modes	Frame Start, Error, ID/Data, ID OR
Auto setup function	Auto setting of bit rate, threshold value, time axis scale, voltage axis scale, and display of analysis results
Analyzable no. of frames	5,000
Analysis results displays	Analysis no., time from trigger positions (Time(ms)), Segment (Static or Dynamic), Indicator, FramID, Payload length, Cycle count, Data, Information
Auxiliary analysis functions	Data search
Analysis result save function	Analysis list data can be saved to CSV-format files

SENT Signal Analysis Functions (/F9 Option)	
Applicable standard	J2716 JAN2010 and older
Analyzable signals	CH1 to CH4, logic input, or M1 to M2
Clock period	1 us to 100 us with resolution of 0.01 us
Data type	Fast channel Nibbles/User Defined Slow channel Short/Enhanced
SENT trigger modes	Start of fast channel
Auto setup function	Auto setting of clock period, nibble number, pause pulse, threshold value, time axis scale, voltage axis scale, and display of analysis results
Analyzable no. of frames	100,000 frames max.
Analysis results displays	Fast channel Analysis no., time from trigger position (Time (ms)), Sync/Cal period, Tick, Status & Comm, Data, CRC, frame length, information Slow channel Analysis no., time from trigger position (Time (ms)), ID, Data, CRC, information
Auxiliary analysis functions	Data search and trend functions
Analysis result save function	Analysis list data and trend data can be saved to CSV-format files

GP-IB (/C1 & /C11 Options)	
Electromechanical specifications	Conforms to IEEE std. 488-1978 (JIS C 1901-1987)
Protocol	Conforms to IEEE std. 488.2-1987

Auxiliary Input	
Rear panel I/O signal	External trigger input(DLM20x2: front panel), external trigger output, GO-NOGO output, video output
Probe interface terminal (front panel)	4 terminals (DLM20x4) 2 terminals (DLM20x2)
Probe power terminal (rear panel)	2 terminals (/P2 option) 4 terminals (/P4 option)

Internal Storage (Standard model /C9 Option)	
Capacity	Standard model: 300 MB /C9 option: 7.2 GB

Built-in Printer (/B5 Option)	
Built-in printer	112 mm wide, monochrome, thermal

USB Peripheral Connection Terminal	
Connector	USB type A connector x 2 (front panel x 1, rear panel x 1)
Electromechanical specifications	USB 2.0 compliant
Supported transfer standards	Low Speed, Full Speed, High Speed
Supported devices	USB Printer Class Ver. 1.0 compliant EPSON/NHP (PCL) ink jet printers USB Mass Storage Class Ver. 1.1 compliant mass storage devices* Please contact your local Yokogawa sales office for model names of verified devices

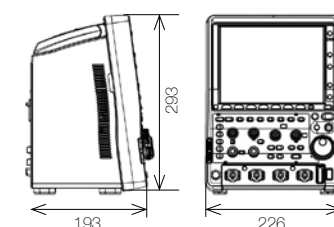
USB-PC Connection Terminal	
Connector	USB type B connector x 1
Electromechanical specifications	USB 2.0 compliant
Supported transfer standards	High Speed, Full Speed
Supported class	USBTMC-USB488 (USB Test and Measurement Class Ver. 1.0)

Ethernet (/C10 & /C11 Options)	
Connector	RJ-45 connector x 1
Transmission methods	Ethernet (1000BASE-T/100BASE-TX/10BASE-T)
Supported services	Server: FTP, HTTP, VXI-11 Client: FTP, SMTP, SNMP, LPR, DHCP, DNS

General Specifications	
Rated supply voltage	100 to 240 VAC
Rated supply frequency	50 Hz/60 Hz
Maximum power consumption	170 VA
External dimensions	226 (W) x 293 (H) x 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. Standard operating conditions: Ambient temperature: 23°C ±5°C. Ambient humidity: 65 ±10% RH. Error in supply voltage and frequency: Within 1% of rating.
*2 Value in the case of repetitive phenomenon. The frequency bandwidth of a single-shot phenomenon is the smaller of the two values, DC to sampling frequency/2.5 or the frequency bandwidth of the repetitive phenomenon.
*3 When the input section is shorted, the acquisition mode is set to Normal, accumulation is OFF, and the probe attenuation is set to 1:1.
*4 Acquisition rate does not vary with an increase or decrease in channels.

External Dimensions



Unit: mm

Model and Suffix Codes		
Model code	Suffix code	Description
710105		DLM2022 Digital Oscilloscope, 2ch, 200MHz
710110 ¹		DLM2024 Mixed Signal Oscilloscope, 4ch, 200MHz
710115		DLM2032 Digital Oscilloscope, 2ch, 350MHz
710120 ¹		DLM2034 Mixed Signal Oscilloscope, 4ch, 350MHz
710125		DLM2052 Digital Oscilloscope, 2ch, 500MHz
710130 ¹		DLM2054 Mixed Signal Oscilloscope, 4ch, 500MHz
Power cord	-D	UL/CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	AS standard
	-H	GB standard
	-N	NBR 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 (Standard)	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)
	/M3 ²	Memory expansion option (4 ch model only) During continuous measurement: 25 Mpoints; Single mode: 125 Mpoints (when interleave mode ON: 250 Mpoints)
	/M1S (Standard)	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
	/C9	Internal storage (7.2 GB)
	/G2 ⁵	User defined math (4 ch model only)
	/G3 ⁵	Power supply analysis function (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	IC + SPI trigger and analysis (4 ch model only)
	/F3 ⁶	UART + IC + 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)	
/F7 ⁷	CAN+CAN FD+LIN trigger and analysis (4 ch model only)	
/F8 ⁷	FlexRay+CAN+CAN FD+LIN trigger and analysis (4 ch model only)	
/F9	SENT analysis (4 ch model only)	
/EX22 ⁸	Attach two 701946 probes (For 2ch, 200 MHz models)	
/EX24 ⁸	Attach four 701946 probes (For 4ch, 200 MHz models)	
/EX52 ⁹	Attach two 701946 probes (For 2ch, 350/500 MHz models)	
/EX54 ⁹	Attach four 701946 probes (For 4ch, 350/500 MHz models)	

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 that don't support probe interface.
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.
⁸ The 701938 probes are not included when this option is selected.
⁹ The 701939 probes are not included when this option is selected.

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



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Bulletin DLM2000-E-E
 Edition 2

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Standard Main Unit Accessories	
Part Name	Quantity
Power cord	1
Passive probe, model 701938 (200 MHz, 1.5 m) For models 710105, 710110 ¹	Per number of channels
Passive probe, model 701939 (500 MHz, 1.3 m) For models 710115, 710120, 710125, 710130 ²	Per number of channels
Protective front cover	1
Soft carrying case for probes	1
Printer roll paper (for /B5 option)	1 roll
User's manuals ³	1 set

¹ The 701938 probes are not included when /EX22 or /EX24 is selected.
² The 701939 probes are not included when /EX52 or /EX54 is selected.
³ Operation guide as the printed material, and User's manual as CD-ROM are included.

Additional Option License for DLM2000 ¹		
Model	Suffix code	Description
709810	-G2	User defined math (4 ch model only)
	-G3	Power supply analysis function (4 ch model only)
	-G4	Power supply analysis function (includes /G2) (4 ch model only)
	-F1	UART trigger and analysis (4 ch model only)
	-F2	IC + SPI trigger and analysis (4 ch model only)
	-F3	UART + IC + SPI trigger and analysis (4 ch model only)
	-F4	CAN + LIN trigger and analysis (4 ch model only)
	-F5	FlexRay trigger and analysis (4 ch model only)
	-F6	CAN + LIN + FlexRay trigger and analysis (4 ch model only)
	-F7	CAN+CAN FD+LIN trigger and analysis (4 ch model only)
	-F8	FlexRay+CAN+CAN FD+LIN trigger and analysis (4 ch model only)
-F9	SENT analysis (4 ch model only)	
-X1	F4 -> F7 or F6 -> F8 (add CAN FD)	

¹ Separately sold license product (customer-installable).

Accessory Models		
Name	Model	Specification
Logic probe (PBL100)	701988	1 MΩ input resistance, toggle frequency of 100 MHz
Logic probe (PBL250)	701989	100 kΩ input resistance, toggle frequency of 250 MHz
Passive probe ¹	701938	10 MΩ (10:1), 200 MHz, 1.5 m
Passive probe ¹	701939	10 MΩ (10:1), 500 MHz, 1.3 m
Miniature passive probe	701946	10 MΩ (10:1), 500 MHz, 1.3 m
FET probe	700939	DC to 900 MHz bandwidth/2.5MΩ/1.8pF
Active probe (PBA1000)	701912	DC to 1 GHz bandwidth/100kΩ/0.9pF
100:1 voltage probe	701944	DC to 400 MHz, 1.2 m, 1000 Vrms
100:1 voltage probe	701945	DC to 250 MHz, 3 m, 1000 Vrms
Differential probe	701921	DC to 100 MHz bandwidth/max. ±700 V
Differential probe	701922	DC to 200 MHz bandwidth/max. ±20 V
Differential probe (PBDH1000)	701924	DC to 1 GHz bandwidth/1MΩ/max. ±25 V
Differential probe	701926	DC to 50 MHz bandwidth, 5000 Vrms/7000 Vpeak
Differential probe (PBDH0150)	701927	DC to 150 MHz bandwidth, max. ±1400V
Differential probe	700924	DC to 100 MHz bandwidth/max. ±1400 V
Differential probe	700925	DC to 15 MHz bandwidth/max. ±500 V
Differential probe	701920	DC to 500 MHz bandwidth/max. ±12 V
Current probe (PBC050) ²	701929	DC to 50 MHz bandwidth, 30 Arms
Current probe (PBC100) ²	701928	DC to 100 MHz bandwidth, 30 Arms
Current probe ²	701930	DC to 10 MHz bandwidth, 150 Arms
Current probe ²	701931	DC to 2 MHz bandwidth, 500 Arms
Deskew correction signal source	701936	For deskew correction
Printer roll paper	B9988AE	Lot size is 10 rolls, 10 meters each
Probe stand	701919	Round base, 1 arm
Carrying case	701964	Also for DL1600/DL1700E Series

¹ For the accessories for 701938, 701939 probe, various adapters are available. Please refer to DL series Accessories brochure.
² Current probes' maximum input current may be limited by the number of probes used at a time.

Accessory Software		
Name	Model	Specification
MATLAB tool kit	701991	MATLAB plug-in
Xviewer	701992-SP01	For DL/DLM Series, standard version
	701992-GP01	For DL/DLM Series, with MATH functions