

## DIGITAL OSCILLOSCOPES &amp; DIGITAL SCOPES

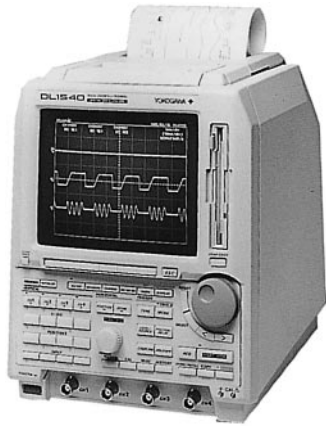


## DL1540/DL1540L/DL1520/DL1520L

701510/701520/701505/701515

Digital Oscilloscopes

DL1540/DL1540L/DL1520/DL1520L



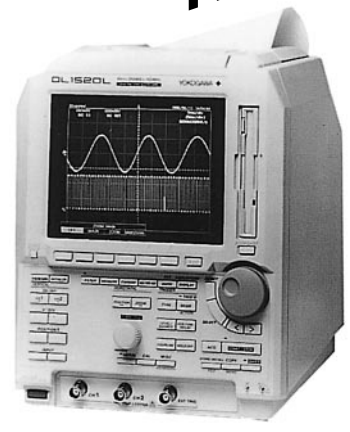
**DL1540(701510)**  
215 × 268 × 295mm 5kg  
(8-1/2 × 10-9/16 × 11-5/8" 11.0 lbs)



**DL1540L(701520)**  
215 × 268 × 295mm 6kg  
(8-1/2 × 10-9/16 × 11-5/8" 13.2 lbs)



**DL1520(701505)**  
215 × 268 × 295mm 6kg  
(8-1/2 × 10-9/16 × 11-5/8" 13.2 lbs)



**DL1520L(701515)**  
215 × 268 × 295mm 6kg  
(8-1/2 × 10-9/16 × 11-5/8" 13.2 lbs)



Safety Standards; EN61010  
EMI Standard; EN55011 Group 1 Class A  
Immunity Standard; EN50082-2: 1995



The DL1500 Series Digital Oscilloscopes are high performance personal digital oscilloscope in a compact and light body.

## FEATURES

- Full range 4 channels (DL1540/DL1540L)
- Max. 200 MS/s(8 bits)
- 150 MHz analog bandwidth

- Max. 2M words (DL1540L)  
1M words (DL1520L)  
120k words (DL1540)  
20k words (DL1520)
- Approx. 6 kg (DL1540L/DL1520L/ DL1520)  
Approx. 5 kg (DL1540)
- Footprint smaller than A4
- Built-in 3.5-inch FDD
- Built-in printer (option)

## DL1500 SERIES

		DL1540L	DL1540	DL1520L	DL1520
Basic Specifications	Number of input channels	4	4	2	2
	Max. Sampling rate	200 MS/s	200 MS/s	200 MS/s	200 MS/s
	Max. record length	2M word	120k word	1M word	20k word* <sup>1</sup>
	Frequency bandwidth	150MHz	150MHz	150MHz	150MHz
	Advanced trigger	Option	Option	NA	NA
Interface	3.5 inch FDD	Std.	Std.	Std.	Std.
	Option box control connector	Std.	Std.	NA	NA
	Centronics	NA	NA	Std.* <sup>2</sup>	Std.* <sup>2</sup>
	RS-232-C	Option	Option	Std.* <sup>2</sup>	Std.* <sup>2</sup>
	GP-IB	Std.	Std.	Std.* <sup>2</sup>	Std.* <sup>2</sup>
	Built-in printer	Option	Option	Option	Option
Functions	Snap shot	Available	Available	Available	Available
	History memory	Available	Available	Available	NA
	Sequential store	Available	Available	Available	NA

\*<sup>1</sup>: In Roll mode. \*<sup>2</sup>: Varies depending on the model.

## DIGITAL OSCILLOSCOPES &amp; DIGITAL SCOPES

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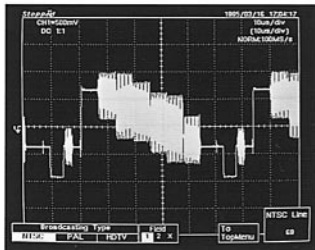
## DL1540/DL1540L/DL1520/DL1520L

## FUNCTIONS

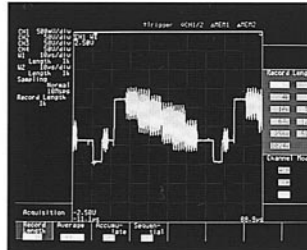
## ■ SIGNAL OBSERVATION USING LONG MEMORY

## ● Capturing Signals Using Long Memory for Accurate Waveforms

The DL1520/DL1540 can continuously capture signals using a record length of up to 10k words, and the DL1540L/DL1520L using a record length of up to 100k words. Within the desired observation period, the DL1520/DL1540 can thus capture signals at a time resolution (sampling rate) of 10 times that for signals captured using a record length of 1k word, and the DL1540L/DL1520L at a time resolution of 100 times. (You can use a longer record length when capturing a single-shot signal, or when using the roll mode.)



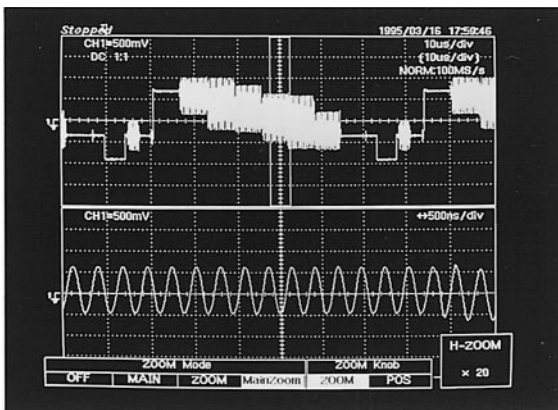
Observation using a 10-kword record length (signal capture using DL1540)



Observation using a 1-kword record length (signal capture using DL2200)

## ● Zoom Function Displays Eight Traces Simultaneously, Zooming in Quickly and Easily on Waveform Details

Zooming is an important function in a digital oscilloscope with a long record length. The DL1500 series inherits the popular intuitive, high-speed zooming function of the DL4000 series. The DL1500 series eliminates problem of which trace to assign the zoom trace to. This scope allows you to display the captured trace and the zoomed trace at the same time.



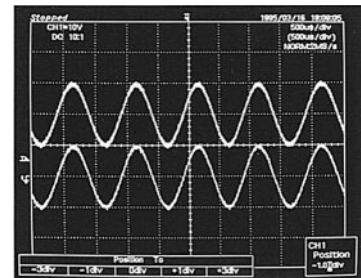
## ● Recall Any Waveform with The History Memory Function (DL1540/DL1540L/DL1520L only)

With a conventional digital oscilloscope, the contents of the memory are updated at every trigger. So once a waveform is updated, there is no way to bring the previous waveform back. However, the history memory function of the DL1540/DL1540L/DL1520L stores the last 100 displays.



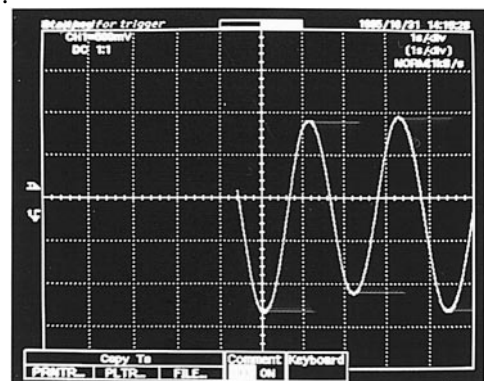
## ● Snapshot Function for Simple Comparison of Waveforms

With most digital oscilloscopes, in order to compare waveforms you must save the waveform to be used as the reference signal into internal memory, and then load it again. But with the snapshot function of the DL1500 Series, you can simply compare waveforms using just a single key operation.



## ● Roll Mode for Maximum Sampling Speed of 200 kS/s

Roll mode is ideal for observing low frequency signals of around 10 Hz, which is difficult to do with a conventional analog oscilloscope. The roll mode allows a maximum sampling speed of 20 kS/s for the DL1520/DL1540, or 200 kS/s for the DL1540L/DL1520L. When the oscilloscope is in roll mode, the waveform moves from the right to the left of the screen. The DL1500 Series always records two screens' worth of waveforms, enabling you to recall a waveform if it disappears off the left edge of the screen.



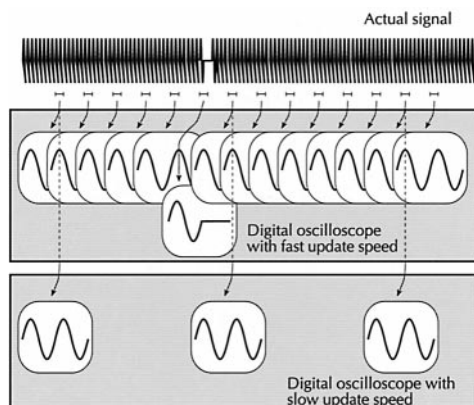
# DIGITAL OSCILLOSCOPES & DIGITAL SCOPES

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## DL1540/DL1540L/DL1520/DL1520L

### ● Screen Update Speed Independent of Number of Traces Displayed or Waveform Processing Type

As shown in the figure below, it is easy to overlook an irregular event if the digital oscilloscope has a slow screen update speed. With most digital oscilloscopes, the screen update speed falls as the number of waveforms displayed is increased, or when signal processing such as automatic measurement of the waveform parameters is taking place. The DL1500 Series has been designed primarily for measuring waveforms; hence signals are measured without reducing the screen update speed even when the number of waveforms displayed is increased or signal processing is added.



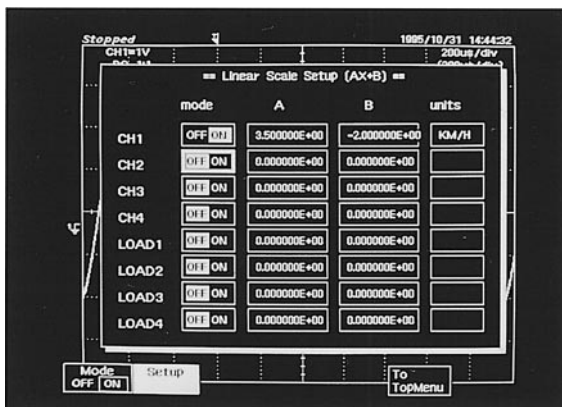
### ■ A SINGLE OSCILLOSCOPE TO PERFORM EVERYTHING, FROM PROCESSING TO RECORDING OF THE CAPTURED SIGNAL

(Optional built-in printer is needed to print captured waveforms)

### ● Linear Scale Function Converts Measured Voltage into a Physical Value

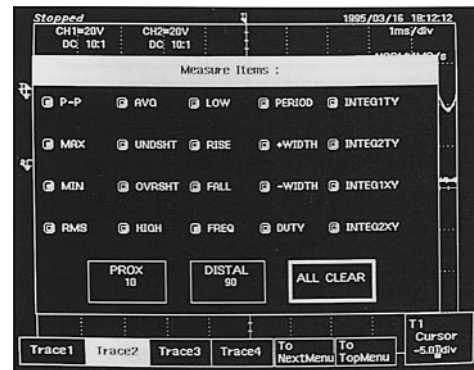
When recording an output from a sensor, for example, it is useful to be able to directly convert the voltage value from the sensor into a physical quantity such as rpm or m/s.

The linear scaling function of the DL1500 Series provides coefficients and offset values, enabling the input voltage to be converted into a physical quantity. And you can even append a unit to the converted result.



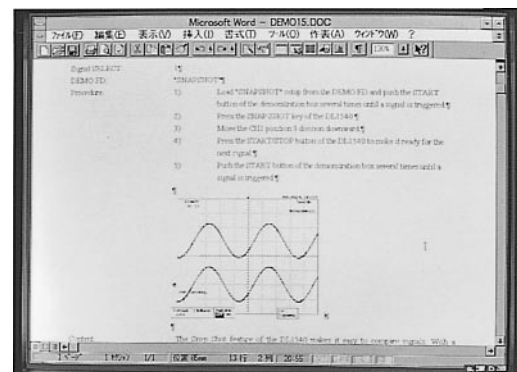
### ● Automatic Waveform Parameter Measurement Function

With this function you can automatically measure the maximum voltage, frequency and other parameters of a waveform. The digital oscilloscope performs parameter measurements, thus eliminating human errors, such as reading errors, and ensuring reliable results. The All Scan EXE function calculates the parameters of the acquired data for all points captured in the long memory, and thus ensures that waveform parameters are calculated very accurately.



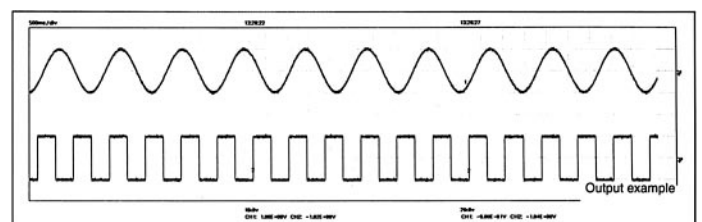
### ● Compiling a Report Using a Hard Copy/Image File

By using the built-in 3.5-inch FDD that supports three MS-DOS modes, you can save waveform data, panel setting information and hard copy images from the screen. You then simply import the hard copy of the screen directly into a word processor document when writing a report or paper using a PC with Windows.



### ● Real-time Printing Function Captures 20 ns Pulse Signals

The real-time printing function continuously records low-speed signals to the built-in thermal printer. The chart speed runs at up to 16.7 mm/s, and the speed can be changed by setting the time axis. By using this function in combination with the envelope mode, you can also record high-speed pulse signals and surge signals of millisecond and nanosecond order, which is impossible using a conventional pen recorder or thermal array recorder.

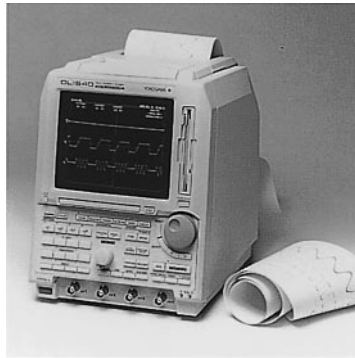




## DIGITAL OSCILLOSCOPES &amp; DIGITAL SCOPES

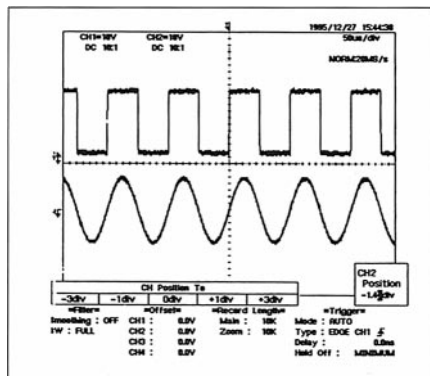


## DL1540/DL1540L/DL1520/DL1520L



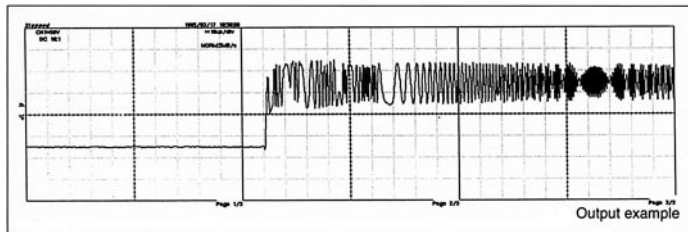
### ● Short Copy Function Outputs a Screen Hard Copy in Just 10 Seconds

This function outputs a hard copy of a waveform displayed on the screen to the built-in printer. The built-in printer uses thermal paper, and produces the hard copy in about 10 seconds. You can even attach to the screen hard copy the panel setting information that was used to capture the waveform.



### ● Long Copy Function Records Signals in Expanded Form after Storing Them in Long Memory

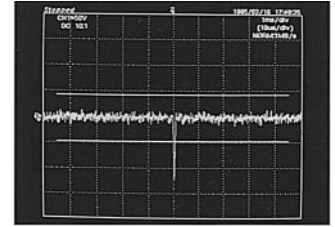
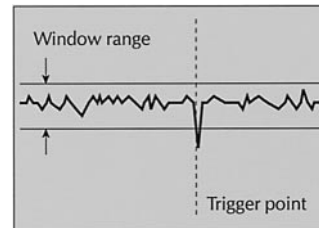
With the long copy function of the DL1500 Series, you can print out signals in expanded form after first storing them in the memory. When using the zoom function, an expanded screen can only be displayed one page at a time on the CRT. By using the Long Copy function, you can print an expanded diagram containing many pages of the expanded waveforms.



### ■ A WEALTH OF TRIGGER FUNCTIONS

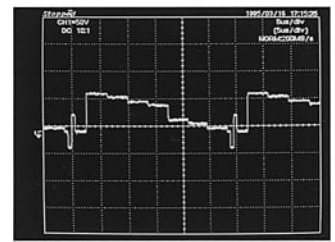
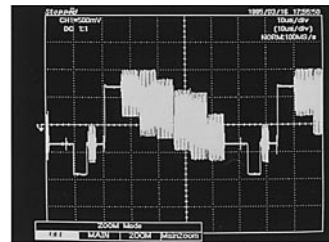
#### ● Window Trigger

A trigger occurs when the incoming signal crosses one of the upper or lower level thresholds which you set in advance. So you can capture signals even if you don't know the polarity of the noise component on the DC line.



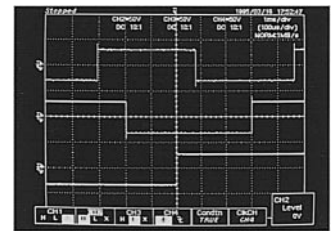
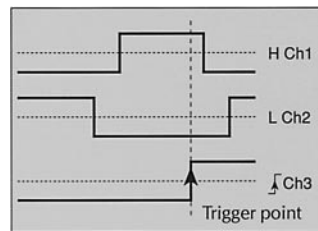
#### ● TV Trigger

You can apply a trigger to NTSC, PAL and HDTV signals and specify the number of lines of the signal to be captured. (The HDTV trigger is supported only by the DL1540/DL1540L.)



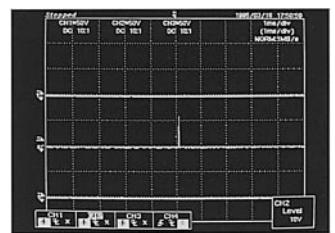
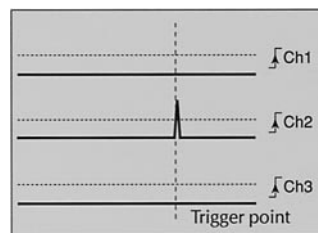
#### ● Pattern Trigger (Option for DL1540/DL1540L Only)

By assigning High, Low, or Don't Care to each channel, you can trigger on a combination of signals. You can also assign the signal in one channel as the trigger source.



#### ● OR Trigger (Option for DL1540/DL1540L Only)

A trigger occurs when any one of the trigger conditions which are set for each channel is satisfied.



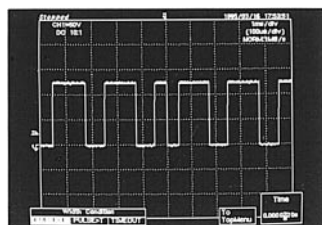
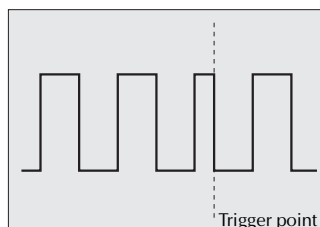
## DIGITAL OSCILLOSCOPES &amp; DIGITAL SCOPES



## DL1540/DL1540L/DL1520/DL1520L

● **Pulse Width Trigger, Timeout (Option for DL1540/DL1540L Only)**

A trigger occurs when the pulse width becomes narrower or wider than the defined width. In the case of the timeout trigger, a trigger occurs when the next signal is not detected within a certain time.



## SPECIFICATIONS

## Vertical section

Number of input channels:	4 (DL1540/DL1540L); 2 (DL1520/DL1520L)
Vertical resolution:	8 bits (normal) (25LSB/div) 9 bits (smoothing) 12 bits (after averaging with 256 weight)
Max sampling rate:	200 MS/s (when half of the number of available channels are in use)
Normal	100 MS/s (when all channels are in use) Equivalent time 20 GS/s
Effective storage frequency	(-3 dB): Repetitive waveform DC to 150 MHz *1 Single shot waveform DC to 80 MHz *2 (When half of the number of available channels are in use) DC to 40 MHz *2 (When all channels are in use)
Sensitivity:	1 mV/div *3 to 5 V/div (DL1540/DL1540L) 2 mV/div to 5 V/div (DL1520/DL1520L)
DC accuracy *4:	100 mV/div $\pm(1.5\%$ of 8 div + 1 LSB) 1 mV/div $\pm(5\%$ of 8 div + 1 LSB) Other ranges $\pm(2.5\%$ of 8 div + 1 LSB)
Offset voltage accuracy:	1 m to 50 mV/div $\pm(2.5\%$ of set value + 0.2 mV) 100 m to 500 mV/div $\pm(1\%$ of set value + 2 mV) 1 to 5 V/div $\pm(2.5\%$ of set value + 20 mV)
Interchannel isolation:	-40 dB (typical value *5 in the same range)
Max input voltage:	250 V (DC + AC peak) (1 kHz max) (CAT I & II, 177 Vrms)
Input impedance:	1 M $\Omega$ $\pm 1.5\%$ (approx. 25 pF)
Input coupling:	AC/DC/GND

## Horizontal section

Sweep time:	5 ns/div to 50 s/div
Time axis accuracy:	$\pm(0.01\%$ + 500 ps)*6
Max record length (DL1540L):	2M words (2 channels use) 1M word (3 or 4 channels use)
Max record length (DL1520L):	1M words (1 channel use) 400k word (2 channels use)
Max record length (DL1540):	120k words (2 channels use) 56k words (3 or 4 channels use)
Max record length (DL1520):	20k words (roll mode) 10k words (other mode)
External clock input:	
(DL1540/DL1540L):	EXT CLOCK IN input 40 Hz to 15 MHz *7 CH4 input *11 40 Hz to 80 MHz *7
(DL1520/DL1520L):	40 Hz to 80 MHz

## Trigger

Mode:	AUTO/AT-LVL/NORMAL SGL(S) *9/SGL(L) *9 SINGLE *10/N-SGL: Sequential store *12
Source:	CH1 /CH2 /CH3 *11 /CH4 *11 /EXT /LINE
Slope:	Rise/Fall/Both
Coupling:	AC/DC/HFRej
Sensitivity:	1 div p-p (DC to 150 MHz)
Type:	Edge TV *8 NTSC/PAL/HDTV *11 Window *8 OR (option *13) Pattern (option *11) Pulse width (option *11)

## External trigger input

(DL1540/DL1540L):	
Range	$\pm 6$ V
Level	1.5 V/0.15 V
Frequency range	DC to 15 MHz
(DL1520/DL1520L):	
Range	$\pm 10$ V/ $\pm 1$ V
Level	
Range	$\pm 10$ V range: $\pm 10$ V $\pm 1$ V range: $\pm 1$ V
Resolution	$\pm 10$ V range: 40 mV $\pm 1$ V range: 4 mV
Input sensitivity (DC to 100 MHz)	
$\pm 10$ V range:	2 Vp-p
$\pm 1$ V range:	200 mVp-p

## Screen update speed

1 channel in use:	Max 60 screens/s
All channels in use:	Max 60 screens/s

## DIGITAL OSCILLOSCOPES &amp; DIGITAL SCOPES



## DL1540/DL1540L/DL1520/DL1520L

## Display

CRT: 7-inch, raster scan, amber (540 × 432 dots)  
 Number of displayed traces: Max 8 traces (zoom mode) (DL1540/DL1540L)  
 (4 captured + 4 magnified) traces  
 Max 6 traces (zoom mode) (DL1520/DL1520L)  
 (2 captured + 2 magnified + 2Math) traces

## Extension functions

Computation: +, -, ×, FFT (1000-point power spectrum)  
 GO/NO-GO function: Zone: Up to 4 traces  
 Parameter: Up to 4 parameters  
 Automatic waveform parameter measurement:  
 Up to 21 items for each trace. Parameters for all traces  
 can be measured simultaneously, and the result of auto-  
 matic measurement displayed. Up to 24 items can be  
 displayed.  
 Image format saving: HP-GL, PostScript, TIFF, and BMP formats  
 Snapshot: By pressing the snapshot key, an infinite number of  
 waveforms can be kept on the CRT screen.  
 Accumulation: 0.1 to 60 s, INFINITE (infinite period)

## Communication

## GP-IB interface

Electrical and mechanical specifications: Conform to IEEE st'd. 488-1978  
 Protocol: Conforms to IEEE st'd 488.2-1987

## RS-232-C interface

[RS-232-C interface unit (optional accessory) required for use with the DL1540 and the DL1540L]  
 Baud rate: 75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 bps

## Centronics interface

[Available for the -C3 model of the DL1520 and the DL1520L]  
 Supported printer commands: ESC/P, LIPS3, PC-PR201, PCL5

## SCSI interface

[SCSI interface unit (optional accessory) required for the DL1540 and the DL1540L.  
 Available for -C4 model of the DL1520L.]  
 Supported SCSI devices and conditions  
 HD drive: Drive formattable by the EZ-SCSI  
 MO drive: Up to 640MB type which is formattable by the EZ-SCSI  
 Zip drive: Iomega Zip drive compatible

## Signal input/output

TRIG OUT \*11: TTL level  
 GO/NO-GO evaluation output \*11: TTL level (from option box control connector)  
 GO/NO-GO operation condition output \*11: TTL level (from option box control connector)  
 Calibration output: 1 kHz, 1 Vp-p, square wave

## 3.5-inch FDD

Types of supported disks: 640 KB, 720 KB, 1.2 MB, 1.44 MB  
 Format: MS-DOS

## Built-in printer (option)

Printing method: Thermal line dot method  
 Dot density: 6 dots/mm  
 Paper width: 112 mm  
 Realtime printing: Max 16.7 mm/s chart speed (Available from a time axis  
 range of 500 ms/div and slower)

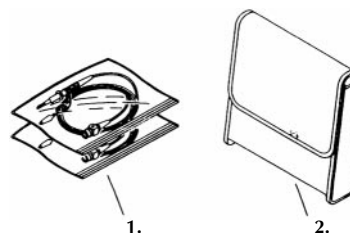
## General specifications

Operation temperature range: 5 to 40°C  
 Operation humidity range: 20 to 85% RH (when not using the printer)  
 35 to 85% RH (when using the printer)  
 Supply voltage: 100 to 120 V AC/ 220 to 240 V AC  
 DL1540/DL1540L Automatically switched  
 DL1520/DL1520L Select from the above  
 Supply frequency: 50/60 Hz  
 Power consumption: 280 VA max  
 External dimensions: 215(W) × 268(H) × 295(D) mm  
 (Excluding projections)  
 Weight: Approx. 5 kg (DL1540 only)  
 Approx. 6 kg  
 (DL1540L/DL1520/DL1520L main unit only)

- \*1: Between 5 V/div and 10 mV/div ranges.  
 For 5 mV/div: DC to 80 MHz. For 2 mV/div and 1 mV/div: DC to 20 MHz.  
 \*2: Between 5 V/div and 5 mV/div ranges.  
 For 2 mV/div and 1 mV/div: DC to 20 MHz.  
 \*3: 1 mV/div is realized by zooming of 2 mV/div.  
 \*4: Standard operating conditions (23±2°C, 55±10% RH).  
 After 30 minutes warmup, and after calibration.  
 \*5: A "typical" value is a representative or average value. It is not a strictly guaran-  
 teed value.  
 \*6: Standard operating conditions (23±2°C, 55±10% RH).  
 After 30 minutes warmup.  
 \*7: Continuous clock signal only.  
 \*8: Supported by CH1 only.  
 \*9: DL1540 only.  
 \*10: DL1540L/DL1520/DL1520L only.  
 \*11: DL1540/DL1540L only.  
 \*12: DL1540/DL1540L/DL1520L only.

## Standard Accessories

No.	Item	Quantity
—	Power cable	1
1.	Probe	2
—	Set of manuals	1
2.	Soft case (for storing probes, etc.)	1
—	Front cover (700916)	1



## DIGITAL OSCILLOSCOPES &amp; DIGITAL SCOPES



## DL1540/DL1540L/DL1520/DL1520L

## AVAILABLE MODELS

## ● DL1540/DL1540L

Model	Suffix code	Description
701510		DL1540 digital oscilloscope
701520		DL1540L digital oscilloscope
Power voltage	-1	100 to 120 V AC
	-5	220 to 240 V AC
Power cable	-D	UL, CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	SAA standard
Options	/B5	Built-in printer
	/F1	Enhanced trigger
	/E1	Two additional 700998 probes

## ● DL1520 / DL1520L

Model	Suffix code	Description
701505		DL1520 digital oscilloscope
701515		DL1520L digital oscilloscope
Power voltage	-1	100 to 120 V AC
	-5	220 to 240 V AC
Power cable	-D	UL, CSA standard
	-F	VDE standard
	-Q	BS standard
	-R	SAA standard
Communication	-C1	GP-IB interface
	-C2	RS-232-C interface
	-C3	GP-IB & Centronics interface
	-C4	GP-IB & SCSI interface* <sup>1</sup>
Options	/B5	Built-in printer

\*<sup>1</sup>: Available for the DL1520L only.

## ● Accessories (optional)

Item	Code	Description	Order Q'ty
50Ω terminator	700976	Through type	1
Carrying case	700915	340(W)×290(H)×225(D) mm	1
RS-232-C unit	700927	Exclusively for DL1540/DL1540L	1
TV signal output unit	700928	Exclusively for DL1540/DL1540L* <sup>1</sup>	1
SCSI interface unit	700930	Exclusively for DL1540/DL1540L* <sup>2</sup>	1

\*<sup>1</sup>: For the DL1540, the firmware version 1.10 or later is required.

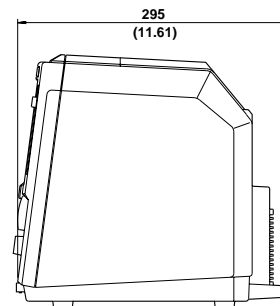
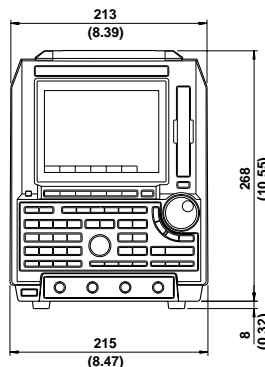
\*<sup>2</sup>: For the DL1540 and the DL1540L, the firmware version 1.20 or later is required.

## ● Spare Parts

Item	Code	Description	Order Q'ty
Roll paper for printer	B9850NX	30 m (one roll/unit)	5
150 MHz passive probe	700998	10 MΩ (10:1), 1.5 m (1/unit)	1
Soft case	B9918EZ	For storing probes, etc.	1
Front cover	700916	For protecting the CRT and the front panel	1
Printer connecting cable	B9916TB	1 m (exclusively for DL1520)	1

## DIMENSIONS

Unit: mm (inch)



Carrying case



RS-232-C unit



TV signal output unit



SCSI interface unit