Digital Storage Oscilloscopes

DCS-7000 SERIES

40MS/s 2 Acquisition (Readout Cursors)

DCS-7040

20MS/s 2 Acquisition (Readout Cursors)

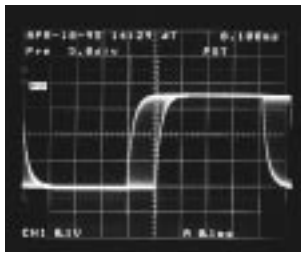
DCS-7020

OUTLINE

With the storage menu and triggering function concentrated to assure safe use by anyone engaged in the production and a clear panel layout showing operations at a glance, the DCS-7000 Series of oscilloscopes are easy-to-use models even for beginners in spite of the many, versatile functions packed in each unit. The maximum sampling rate of 40 MS/s (DCS-7040) enables advanced waveform observations, and an analog function (50 MHz) is also incorporated so that each model can play two roles of digital and analog. Each channel has a 4K-word acquisition memory. The peak detector and overwriting functions are provided in pursuit of a compatibility between the ease of use and the high functionality. Optional interfaces can also be installed so the waveforms displayed on the CRT can be hard-copied on a plotter or a special printer.

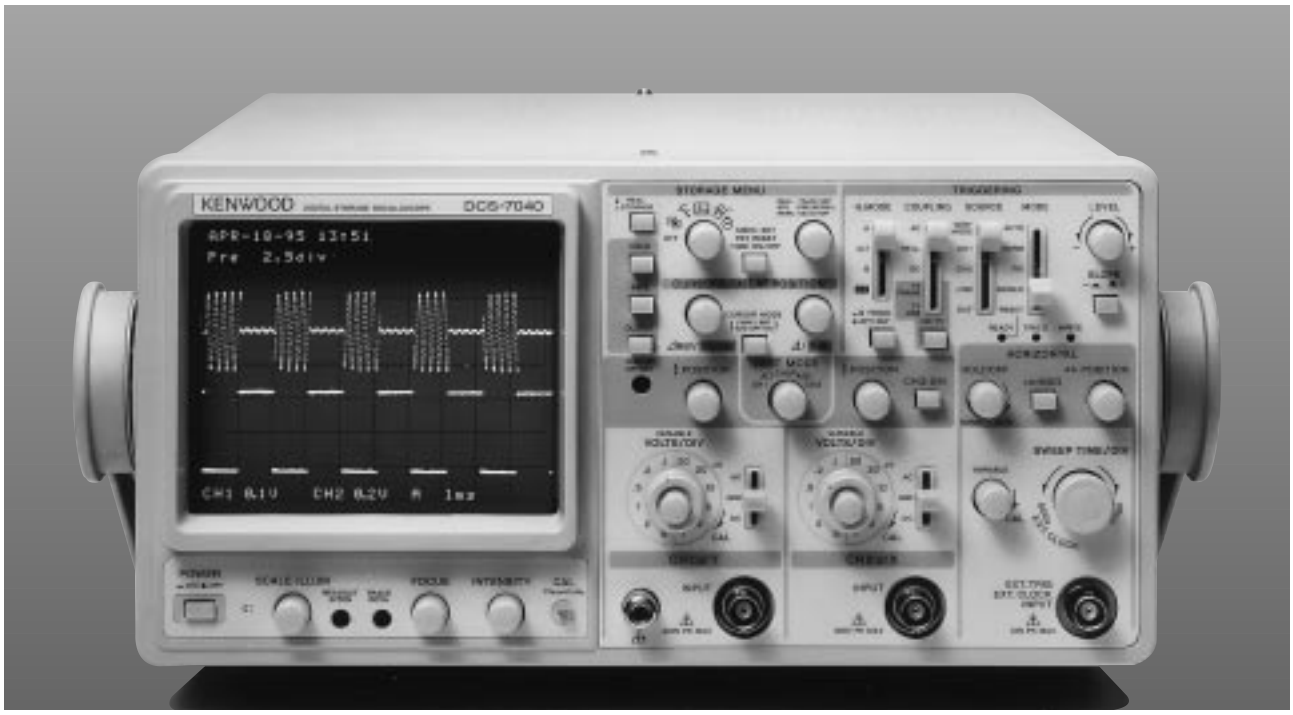
FEATURES

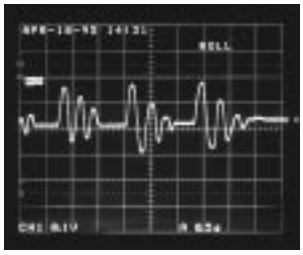
(1) Maximum sampling rate of 40 MS/s (DCS-7040; 20 MS/s with the DCS-7020) allows advanced waveform observations.
(2) 4K-word acquisition memories and 2K-word reference memories (backed up by a built-in battery) are provided.
(3) The peak detector function can detect glitch with pulse duration of 25 ns or more.
(4) The overwriting function makes for easy measurements of jitter, voltage variation, etc.
(5) The external clock input can be used to sample asynchronous low-speed signals as required.



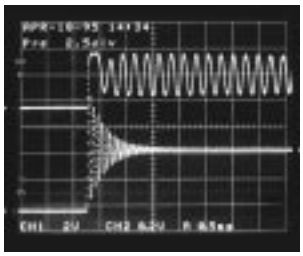
[Overwrite] This mode allows you to write an input waveform without erasing the previously written waveforms. It makes the observation of the jitter components in, and amplitude variations of waveforms easy.

GP-IB OPTION

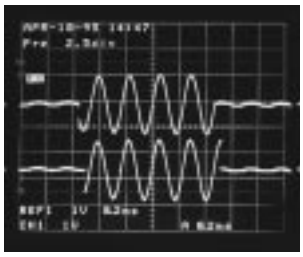




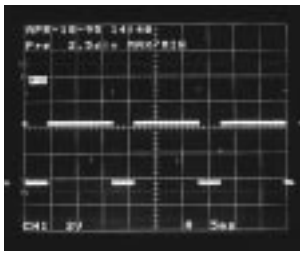
[Single roll] Setting "Single" in the roll mode enters the single roll mode. When the trigger signal is input in this mode, the CRT display waveform stops after the data corresponding to the value set for pre-triggering has been updated.



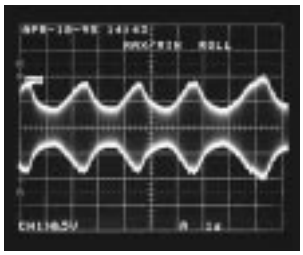
[Pre-triggering] The triggering for storage includes pre-triggering of up to 20 div in addition to normal triggering and delayed-sweep triggering. This makes it possible to observe phenomena which have previously been unable to be captured.



[2-channel simultaneous sampling] The 2-channel simultaneous sampling at the maximum sampling rate of 40 MS/s (DCS-7040; 20 MS/s with the DCS-7020) makes for easy waveform observations of single-shot phenomena, transient phenomena, sudden phenomena, etc.



[Peak detector]
(1) The peak detector function detects the maximum and minimum values of signal waveforms. This mode is capable of detecting glitches of 25 ns or more regardless of the sweep rate.



(2) The peak detector function allows you to observe the envelopes of amplitude-modulated signal waveforms.

Memory

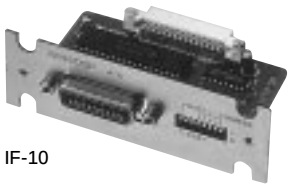
Each CH1 and CH2 is equipped with a 4K-word acquisition memory and a 2K-word reference memory. Each acquisition memory can scroll the desired position and display it on the CRT.

External clock input

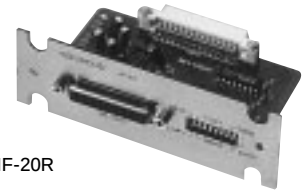
Sampling can be performed in synchronism with the externally input clock signal. This allows waveform observations synchronized with signals with inconstant period, such as encoder pulse and rotary object signals.

Optional interfaces

Both the DCS-7040 and DCS-7020 can be equipped optionally with GP-IB or RS-232C interface. This allows you to hard-copy the CRT display waveforms on a plotter or a special printer as they are.



IF-10



IF-20R

SPECIFICATIONS

※Figures inside [ ] are the values for the DCS-7020; all other values are common.

[Real-time section]

CRT

Type	150mm rectangular, with internal graticule
Accelerating voltage	Approx. 12kV
Effective area	8div.×10div. (1div=10mm)

Vertical axis (Common for CH1, CH2)

Operating modes	CH1, CH2, ADD, ALT, CHOP
Sensitivity	1mV/div., 2mV/div. : ±5% 5mV/div. to 5V/div. : ±3%
Attenuator	1mV/div. to 5V/div., 1-2-5 step, (fine adjustment)
Input impedance	1MΩ±2%, approx. 25pF
Frequency response	
DC	DC to 50MHz, (−3dB) (5mV/div to 5V/div.) DC to 20MHz, (−3dB) (1mV/div, 2mV/div.)
AC	5Hz to 50MHz, (−3dB) (5mV/div to 5V/div.) 5Hz to 20MHz, (−3dB) (1mV/div to 2mV/div.)
Rise time	Approx. 7ns (5mV/div. to 5v/div.) Approx. 17.5ns (1mV/div., 2mV/div.)
Crosstalk	Below −40dB (at 1kHz)
Polarity inversion	CH2 only
CHOP Frequency	Approx. 250kHz
Maximum input voltage	800Vp-p or 400V (DC+AC peak)

Horizontal axis

Operating modes	Set to X-Y mode by H MODE CH1 : Y-axis、CH2 : X-axis
Sensitivity	Same as Vertical axis (CH2)
Input impedance	Same as Vertical axis (CH2)

Frequency response
- DC ····· DC to 1MHz, within −3dB
- AC ····· 5Hz to 1MHz, within −3dB

X-Y phase difference ····· Below 3 degrees at 50kHz
Maximum input voltage ····· Same as vertical axis (CH2)

Sweep

Sweep modes ····· A sweep. B sweep, ALT
Sweep time
- A ····· 0.5s/div to 0.1μs/div±3% in 1-2-5 steps, 21 ranges, and fine adjustment
- B ····· 50ms/div to 0.1μs/div±3% in 1-2-5 steps, 18 ranges

Magnified sweep ····· ×10±5% (±8% at 0.5μs/div)
Linearity ····· ±3% (10MAG ±5%)
Delay method ····· Continuous delay, synced delay
Delay time ····· 0.5s/div to 0.1μs/div ; continuously variable from 0.2div.〜10div.
Delay time error ····· ±(3% of set value + 1% of f.s.) + (0 to 300ns)
Delay jitter ····· 10,000 : 1 of 10 times of the A sweep time
Hold off ····· A Sweep : Continuously variable from NORM
Trace separation ····· B separation from A is continuously adjustable to approx. ±4 div.

Triggering

Trigger sources ····· VERT, CH1, CH2, LINE, EXT
Mode ····· AUTO, NORM, FIX, SINGLE
Trigger coupling ····· AC, HFrej, DC, TV-FRAME, TV-LINE
Trigger sensitivity

Trigger coupling	Synced range frequency range	Internal sensitivity (amplitude)		External sensitivity (amplitude)	
		NORM	FIX	NORM	FIX
DC	DC to 20MHz	1div.	1.5div.	100mV	150mV
	20MHz to 50MHz	1.5div.	2div.	150mV	200mV
AC	10Hz to 20MHz	1div.	1.5div.	100mV	150mV
	20MHz to 50MHz	1.5div.	2div.	150mV	200mV
HFrej	Minimum triggering amplitude increases above 10kHz				
TV	TV-F, TV-L Comp.video	1.5div.	1.5div.	150mV	150mV

Calibration voltage ····· 1Vp-p±3% (positive polarity, approx. 1kHz, square wave)

Intensity modulation

Input voltage ····· TTL level (+5V) diminishes as positive polarity
Input impedance ····· Approx. 10kΩ
Frequency range ····· DC to 3.5MHz
Input range ····· 100Vp-p or 50V (DC+AC Peak, 1kHz or under)

CH1 Signal output

Output voltage ····· Approx. 50mVp-p/div
Output impedance ····· Approx. 50Ω
Frequency response ····· 5mV to 5V/div. : 100Hz to 50MHz (−3dB)
1mV to 2mV/div. : 100Hz to 20MHz (−3dB)

Trace rotation ····· Enables trace rotation adjustment by semi-fixed controller on the panel

[Storage section]

Vertical axis

Vertical resolution ····· 8bit (25dot/div.)
Dynamic range ····· ±5div
Effective storage frequency
- DC ····· DC to 16MHz [8MHz] (sine interpolation)
- AC ····· 5Hz to 16 MHz [8MHz] (sine interpolation)

Rise time ····· Below 40ns [80ns] (With linear interpolation)

Memory capacity

NORM sampling
- Display memory (data) ····· 2KW/CH (200dot/div)
- Display memory (REF) ····· 2KW/CH
- Acquisition memory ····· 4KW/CH
- REF memory ····· 2KW/CH

Roll mode
- Display memory (data) ····· 2KW/CH (200dot/div.)
- Display memory (REF) ····· 2KW/CH
- Acquisition memory ····· 4KW/CH
- REF memory ····· 2KW/CH

Memory backup ····· Battery backed up for approx. 30,000 hrs. (at normal temperature)
- Acquisition memory ····· 4KW/CH
- REF memory ····· 2KW/CH

Sweep time•Display mode

NORM sampling ····· 0.1μs/div. to 500s/div. (0.1μs/div. to 2μs [5μs]/div. in the MAG range) (Maximum sampling rate : 40MS/s [20MS/s])
Peak detector ····· 10μs [20μs]/div. to 500s/div.
Roll mode ····· 0.2s/div. to 500s/div.

Storage mode

AUTO ····· Same operation as NORM for the same period, free-running data updating in other cases.
NORM ····· Data updated each time an acceptable trigger is received.
SINGLE ····· Data is storaged with the first acceptable triggering after resetting and held
AVG (Averaging) ····· Average of 4 or 16 or 64 times
SMT (Smoothing) ····· Data writing point will be averaged following 32 words.
PST (Persistence) ····· Mutual display of maximum and minimum values in storage, and initialization by PST RESET.
PEAK ····· 25ns glitch detection
ROLL ····· NORM : Continuous recording and updating of data on the CRT.
SINGLE : After receiving the acceptable trigger, the pre-triggering data is updated and the data is stored.

Magnification,Compression

Magnification ····· By pressing X10 MAG under Hold conditions, 10-times magnification is obtained by linear interpolation around the CRT center.
Interpolation ····· Linear interpolation, sign interpolation

Trigger • Delay

Pre-trigger ····· NORM : 0 to 20div. (in 2.5div steps)
ROLL-SINGLE : 10div. to 20div.(in 2.5div steps)

Usage of B triggering ····· AFT.DLY :
B STARTS AFTER DELAY TIME
B TRIG'D :
B TRIG'D AFTER DELAY TIME

X−Y

Effective storage frequency range ····· **DC to 16MHz [8MHz] (−3dB**
Adjustable sampling rate for the SWEEP TIME /DIV.)

External clock ····· Carries out sampling by first transition of signals input from the external clock terminal when setting SWEEP TIME/DIV to EXT.
Input impedance ····· 1MΩ ±2%, Approx. 25pF
Maximum input voltage ····· 100Vp-p or 50V (DC+AC peak, 1kHz or below)
Input signal level ····· TTL "L" level+0.4V or less
"H" level+3.2V or more
Input signal frequency range ····· DC to 1MHz (1 kHz in roll mode)
Input signal duty ratio ····· 20% to 80% (at "L" level+0.4V, "H" level +3.2V)
Waveform calculation ····· +, −
PLOT OUT (Display hardcopy)
Usage of RS-232C
Output ····· HP-GL command, CRT display hardcopy (only data transfer)
Baud rate ····· 9600/1200 bps
Transfer type ····· data length=8bit, no parity
stop bit=1bit or more
Signal

FG (Frame Ground)	Frame ground	
SD (Send Data)	Send data	→Plotter
RD (Receive Data)	Receive data	←Plotter
RS (Request to Send)	Request to send	→Plotter
CS (Clear to Send)	Clear to send	←Plotter
DR (Data Set Ready)	Data set ready	←Plotter
ER (Data Terminal Ready)	Data terminal ready	→Plotter
SG (Signal Ground)	Signal ground	

Connections ····· DCS-7000 side — Plotter side

DCS-7000 side		Plotter side	
1 Shield	———	1 Shield	
2 Blue	⟍	2 Red	SD
3 Red	⟋	3 Blue	RD
4 Gray	⟍	4 Yellow	RS
5 Brown	⟋	5 Green	CS
6 Yellow	⟍	6 Gray	DR
7 Black	———	7 Black	SG
8 —		8 —	
20 Green	⟋	20 Brown	ER

[Readout section]
Display ····· Capable of NO/OFF by pressing and holding the CURSOR MODE switch for about 1 second.
Calendar
Display ····· Year / month / day / hour / minute
Clock accuracy ····· ±2minutes/month
Battery life ····· Approx. 30,000 hours (at room temperature)
Setting values
Vertical axis related items ····· CH1, CH2 scale factors (with probe detector)
V-UNCAL, ADD, INV
Horizontal axis related items ····· (A, B) sweep scale factor (MAG conversion), **×10MAG, X-Y, external clock SWEEP VARIABLE UNCAL**
Trigger-related items ····· DELAY TIME, B TRIG' D
Storage related items ····· **X-Y sampling rate, display scroll, setting storage function (kind of PEAK, AVE and count, SMT, PST, ROLL, kind of interpolation pre-trigger, point, REF** memory setting condition, menu, OUTPUT)

Cursor measurement
Cursor modes ····· ΔV1, ΔV2, ΔT, 1/ΔT, RATIO (V or H)
PHASE (at VARI UNCAL)
Measuring resolution ····· 10bit
Measuring accuracy ····· ±4%
Measurement range
Vertical direction ····· ±3.6 div. or more at center of CRT
horizontal direction ····· ±4.6 div. or more at center of CRT
Power source section
Line voltage /Frequency ····· AC100/120/220/230V±10% / 50/60Hz
Power consumption ····· Approx. 57W, approx. 69VA (with optional IF-10 <GP-IG interface> installed)

[Other]
Case dimensions ····· 305 (W)×150 (H)×400 (D) mm
Maximum dimensions ····· 347(W)×165 (H)×459 (D) mm
Weight ····· Approx. 9.6kg
Temperature/humidity for characteristics in spec. ····· 10℃ to 35℃, 85% or less (without condensation)
Temperature/humidity for operation ····· 0℃ to 40℃, 85% or less (without condensation)
Accessories
Probe ····· PC-53 (2)
Power cable ····· (1)
Instruction manual ····· (1)
Alignment tool ····· (1)

[Options]
OUT PUT ····· Makes possible mounting of optional IF-10 or IF-20 (but simultaneous mounting is not possible).
IF-10 ····· GP-IB (complies with IEEE-488 1978)
Operation ····· Outputs screen numerical data and screen readout data through GP-IB interface computer. (TALK ONLY, HP-GL command). Plot out the screen waveform and screen readout data to the GP-IB interface plotter.
IF-20R ····· EIA RS-232C interface
Operation ····· Prints out screen waveform and screen readout data with an RS-232C printer (only model DPU-412 made by Seiko Electronics, Ltd.). Outputs screen waveform data and screen readout data to the RS-232C interface computer.
Baud rate ····· 9600/1200bps
Transfer type ····· Data length=8 bits without parity
Stop bit length=1 bit or more
Delimiter=CR+LF
Handshake=CTS-RTS system