

Specifications

1-1 GENERAL

The SS-5710D is an oscilloscope with a frequency bandwidth of DC to 60 MHz that can display 8 traces on 4 channels. The SS-5710D is useful in a wide range of applications for not only production lines and maintenance and service purposes but also for the research and development of a variety of electronic devices. The features of the SS-5710D are as follows;

- In addition to display of 8 traces on 4 channels, the SS-5710D has an ADD function for measuring the sum of two signals and CH 2 POLAR for measurement of the difference between two signals.
- Both CH 1 and CH 2 have a high deflection factor of 1 mV/div (in the x5 MAG function), which permits accurate measurement of lower voltages.
- The horizontal deflection system has sweep rates up to 5 nS/div (in the x10 MAG function) so that even high-speed phenomena can be measured with accuracy.

The SS-5710D has delayed sweep, single sweep, ALT sweep, and X-Y operation functions, and a TV synchronizing signal separator circuit so that television and other composite video signal waveforms can be observed.

- Signals are applied directly to the universal counter for period and frequency measurements.
- Inclusion of a digital multimeter enables direct measuring of DC and AC voltage, current, and resistance.

1-2 ELECTRICAL SPECIFICATIONS

1-2-1 Cathode-Ray Tube (CRT)

Shape	Rectangular, 6 inches
Display Area	8 div x10 div (1 div = 10 mm), with internal illuminated graticule of parallax-free type
Phosphor	B31 (Standard)
Accelerating Voltage	Approximately 15 kV

1-2-2 Vertical Deflection System

Modes	CH 1, CH 2, ALT, CHOP, ADD, QUAD (Quadruple) CHOP switching rate: 300 kHz $\pm 40\%$
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Channels 1 and 2

Deflection Factor	5 mV/div to 10 V/div, in 11 calibrated steps in a 1-2-5 sequence Accuracy: $\pm 2\%$ (at 10° C to 35° C) $\pm 5\%$ (at -10° C to 50° C) 5 mV/div to 25 V/div, continuously variable with the VARIABLE control x5 MAG: 1 mV/div to 2 V/div in 11 calibrated steps Accuracy: $\pm 4\%$ (at 10° C to 35° C) $\pm 8\%$ (at -10° C to +50° C)
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Frequency Response	DC to 60 MHz, -3 dB (5 mV/div to 0.2 V/div) DC to 20 MHz, -3 dB (1 mV/div, 2 mV/div in the x5 MAG mode) Notes • 10°C to 35°C • AC coupling: The lowest useable frequency is 4 Hz.
Rise Time	5.8 nsec (5 mV/div) or less
Pulse Response	Overshoot: 5% or less Sag (at 1 kHz): 1.5% or less Other distortions: 5% or less (5 mV/div, 10°C to 35°C)
Signal Delay	Delay cable supplied
Input Coupling	AC, DC, GND
Input RC	Direct: 1 M Ω \pm 2%/32 pF \pm 3 pF With probe: 10 M Ω \pm 2%/15 pF \pm 2 pF
Maximum Input Voltage	Direct: 400 V (DC + peak AC) With probe: 600 V (DC + peak AC) (Refer to the instruction manual for the probe for the maximum input voltage where probe is used.)
Drift	0.5 div/hour (5 mV/div) or 2 div/hour (1 mV/div) 30 minutes after power is turned on (Standard)
Common Mode Rejection Ratio	5 mV/div 40 : 1 (1 kHz sine wave) 15 : 1 (5 MHz sine wave)
Polarity Inversion	CH 2 only

Channels 3 and 4

Deflection Factor	0.1 V/div, 1 V/div, selectable Accuracy: \pm 4% (at 10°C to 35°C)
Frequency Response	DC to 50 MHz, -3 dB Notes • 10°C to 35°C • AC coupling: The lowest usable frequency is 4 Hz.
Pulse Response	Overshoot: 10% Sag (at 1 kHz): 2% Other Distortions: 10%
Input Coupling	AC, DC
Input RC	Direct: 1 M Ω \pm 3%/32 pF \pm 3 pF With probe: 10 M Ω \pm 2%/15 pF \pm 2 pF
Maximum Input Voltage	Direct: 250 V (DC + peak AC) With probe: 600V (DC + peak AC)

1-2-3 Triggering

A-Triggering

Triggering Mode	AUTO, NORM, SINGLE/RESET
Signal Source	CH 1, CH 2, CH 3, LINE, NORM (External trigger can be used by selecting CH 3 with SOURCE switch.)
Coupling	AC, DC, HF REJ, LF REJ, FIX, TV-H, TV-V
Slope	Positive-going (+), Negative-going (—)
Minimum Trigger Sensitivity	As shown in Table 1-1

Table 1-1 (at 10°C to 35°C)

Frequency Range	Sensitivity	
	CH 1, CH 2	CH 3, CH 4
DC to 1 kHz	1 div	1.5 div
1 kHz to 2 MHz	0.5 div.	1 div
2 MHz to 20 MHz	1 div	1.5 div
20 MHz to 60 MHz	1.5 div	2 div

Note

- Fix: 1 div at 10 Hz to 2 MHz
2 div at 2 MHz to 30 MHz
Sine wave only
- TV-V, TV-H synchronizing
signal level: 2.3 div or more
on screen amplitude for a
composite video signal
composed of 7 parts video
signal and 3 parts synchro-
nizing signal
- Trigger signals are attenuated
in the following frequency
ranges depending on coupling
AC: 10 Hz or less
HF REJ: 10 kHz or higher
LF REJ: 10 kHz or lower
- AUTO sweep mode: The
lowest useable frequency is
50 Hz.

B-Triggering

Signal Sources	RUNS AFTER DELAY, CH 1, CH 2, CH 4 (External trigger can be used by select- ing CH 4 with SOURCE switch.)
Coupling	AC, DC, HF REJ, TV-H
Slope	Positive-going (+), negative-going (—)
Minimum Trigger Sensitivity	As shown in Table 1-1 However, Sensitivity of 20 MHz to 60 MHz is 2 div at CH 1, CH 2.

1-2-4 Horizontal Deflection System

Modes	A, A INTEN, ALT, B (DLT'D), X-Y
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A-Sweep

Sweep Rates	50 nsec/div to 0.5 sec/div, in 22 calibrated steps in a 1-2-5 sequence 50 nsec/div to 1.25 sec/div, continuously variable with the VARIABLE control Accuracy I (Over center 8 divisions): ± 3% at 50 nsec/div to 5 msec/div ± 4% at 10 msec/div to 0.5 sec/div (at 10°C to 35°C) ± 5% (at -10°C to +50°C) Accuracy II (Over any 2 of the center 8 divisions): ± 5% (at -10°C to +50°C)
Hold-Off Time	Variable with the HOLDOFF control

B-Sweep

Delay	Continuous delay (RUNS AFTER DELAY), triggered delay
Sweep Rates	50 nsec/div to 50 msec/div, in 19 calibrated steps in a 1-2-5 sequence Accuracy I (Over center 8 divisions): $\pm 3\%$ (at 10°C to 35°C) $\pm 5\%$ (at -10°C to $+50^\circ\text{C}$) Accuracy II (Over 2 of the center 8 divisions): $\pm 5\%$ (at -10°C to $+50^\circ\text{C}$)
Time Difference Measurement	0.5 $\mu\text{sec}/\text{div}$ to 5 sec/div Accuracy: $\pm 2\%$ of reading ± 0.01 graduation (Minimum graduation of DELAY TIME MULT dial)
Delay Jitter	1/20,000 or less
Sweep Magnification	10 times (Maximum sweep rate: 5 nsec/div) Accuracy I of magnified sweep rate (Over center 8 divisions) $\pm 5\%$ at 50 nsec/div to 0.1 $\mu\text{sec}/\text{div}$ $\pm 4\%$ of 0.2 $\mu\text{sec}/\text{div}$ to 0.5 sec/div (at 10°C to 35°C) Accuracy II of magnified sweep rate (Over any 2 of the center 8 divisions): $\pm 10\%$ at 50 nsec/div to 0.1 $\mu\text{sec}/\text{div}$ $\pm 6\%$ at 0.2 $\mu\text{sec}/\text{div}$ to 0.5 sec/div (at 10°C to 35°C) (Except 25 nsec before and after sweep)

1-2-5 X-Y Operation

X Axis	(Same as CH 1 except for the following)
Deflection Factor	Same as that of CH 1 Accuracy: $\pm 5\%$ (at 10°C to 35°C) $\pm 6\%$ (at -10°C to $+50^\circ\text{C}$)
Frequency Response	DC to 2 MHz, -3 dB
Y Axis	same as CH 2
X-Y Phase Difference	3° or less (at DC to 50 kHz)

1-2-6 Z-Axis System

Sensitivity	0.5 Vp-p
Polarity	Positive decreases intensity, negative increases intensity
Frequency Range	DC to 3 MHz
Input Resistance	5 k $\Omega \pm 10\%$
Maximum Input Voltage	50 V (DC +peak AC)

1-2-7 Calibrator

Waveform	Square wave
Repetition Frequency	1 kHz Accuracy: $\pm 30\%$ (at 10°C to 35°C)
Duty Ratio	40% to 60%
Output Voltage	0.3 V Accuracy: $\pm 1\%$ (at 10°C to 35°C) $\pm 2\%$ (at -10°C to $+50^\circ\text{C}$)
Output Current	10 mA Accuracy: $\pm 2\%$ (at 10°C to 35°C) $\pm 3\%$ (at -10°C to 50°C)

1-2-8 Counter

Frequency measurement	Measures A trigger signal
Range	LF mode: 0.1 Hz to 10 MHz HF mode: 1 MHz to 100 MHz (with 1/1000 prescaler)
Count time	0.01 sec, 0.1 sec, 1 sec, 10 sec
Measurement error	Base oscillator accuracy ± 1 count

Period measurement	Measures A trigger signal
Range	LF mode: 0.5 μ sec to 10 sec HF mode: 10 nsec to 1 μ sec (1000 periods or more)
Number of periods	LF mode: 10^0 , 10^1 , 10^2 , 10^3 HF mode: 10^3 , 10^4 , 10^5 , 10^6
Base time	0.1 μ sec
Measurement error	Base oscillator accuracy $\pm \left(\frac{\pm \text{trigger error} \pm 0.1 \mu\text{sec}}{\text{Number of period}} \right)$
Minimum input	LF mode: 0.25 μ sec
Push width	HF mode: 5 nsec

Time interval measurement	Time interval of portion set on CRT with START, STOP cursor is measure.
Range	0.5 μ sec to 10 sec
Base time	0.1 μ sec
Measurement error	$\pm (\text{A sweep rate} \times 10 \text{ div} \times 3/1000) \pm 0.2 \mu\text{sec}$ or less

Delay time measurement	Delay time (A sweep start to B sweep start)
Range	0.5 μ sec to 10 sec
Base time	0.1 μ sec
Measurement error	$\pm (\text{A sweep rate} \times 10 \text{ div} \times 2/1000) \pm 0.2 \mu\text{sec}$ or less

A EVENT IN DELAY TIME

	Number of A sweep trigger (A sweep start to B sweep start)
Count resolution	0.1 μ sec
Minimum input pulse width	0.05 μ sec
Maximum count	99,999,999
Count error	$\pm \left(\frac{\text{A sweep rate} \times 10 \text{ div} \times 2/1000}{\text{period of A sweep trigger signal}} \right) \pm 1 \text{ count}$

EXT INPUT

	Frequency and period of signals input from an external source may be measured in the HF mode.
Frequency range	1 MHz to 150 MHz (with 1/1000 prescaler)
Period range	6.7 nsec to 1 μ sec (1000 periods or more)
Measurement error	Frequency: Base oscillator accuracy ± 1 count Period: Base oscillator accuracy
	$\pm \left(\frac{\text{trigger error} \pm 0.1 \mu\text{sec}}{\text{measured frequency}} \right)$
Input voltage	0.1 Vrms to 2 Vrms
Input coupling	AC only
Input RC	Approximately 1M Ω //40pF or less
Maximum input voltage	250 V (DC + peak AC)

General

Display	Zero-blanking, storage display with red LEDs, Non-storage display only with events in delay time.
Displayed digits	decimal 8 digits
Display time	Counted time + approximately 0.2 sec
Self-check	10 MHz (only with frequency measurement)
Read units	kHz, MHz, μ sec, nsec displayed with 2 LEDs.
Alarm operation	Period measurement (LF mode only): 0.2 μ sec to 0.4 μ sec or less. Interval measurement, delay time measurement: 0.2 μ sec to 0.4 μ sec or less. The unit display LEDs blink for the input signals listed above.
Reset	Both automatic and manual (AC reset). When single operation time is measured with time interval measurement, the system is set in the wait status by pressing the reset button (since the interval is measure every second period).
Base oscillator	Oscillator frequency: 10,000 MHz Stability: $\pm 5 \times 10^{-7}$ /Week Temperature stability: $\pm 10 \times 10^{-6}$ /(0° to 40 °C)

1-2-9 Digital Multimeter**DC Voltage Measurement**

Table 1-3

Range	Accuracy (23 °C \pm 5 °C, 80% or less)	Resolu- tion	Input resistance
200mV	$\pm 0.25\%$ of rdg $\pm 0.05\%$ of range	100 μ V	10M Ω $\pm 2\%$
2 V		1mV	
20 V		10mV	
200 V		100mV	
1000 V	$\pm 0.25\%$ of rdg $\pm 0.1\%$ of range	1V	

rdg: Displayed value, range: Range value

Temperature coefficient

0° C to 18° C, 28° C to 50° C

200mV to 200V range:

($\pm 0.03\%$ of rdg $\pm 0.0075\%$ of range)/° C

1000 V range

($\pm 0.03\%$ of rdg $\pm 0.015\%$ of range) /° C**Range select**

Manual

C M R

100 dB or more 50/60Hz

N M R

40 dB or more 50/60 Hz

Maximum input

 $\pm 1,100$ VDC

voltage

AC Voltage Measurement

Table 1-4

Range	Accuracy (23 °C \pm 5 °C, 80RH or less)	Resolu- tion	Input resistance
200mV	$\pm 0.75\%$ of rdg $\pm 0.25\%$ of range	100 μ V	10M Ω
2V		1mV	$\pm 2\%$ //
20V		10mV	300 pF
200V		100mV	or less
750V	$\pm 10\%$ of rdg $\pm 0.4\%$ or range	1 V	

Display used the average value rectification method (actual value corrected)

Frequency range	40 Hz to 500 Hz
Temperature coefficient	0 °C to 18 °C, 28 °C to 50 °C
	200 mV to 200 V range: ($\pm 0.01\%$ of rdg $\pm 0.02\%$ of range)/°C
	750V range: ($\pm 0.15\%$ or rdg $\pm 0.06\%$ of range)/°C
Range select	Manual
Maximum input voltage	1,100 VDC or 750 Vrms

Resistance Measurement

Table 1-5

Range	Accuracy (23 °C \pm 5 °C, 80% RH or less)	Resolution	Input current
200 Ω	$\pm 0.25\%$ of rdg $\pm 0.05\%$ of range	100m Ω	1.9mA
2k Ω		1 Ω	1.2mA
20k Ω		10 Ω	0.25mA
200k Ω		100 Ω	28 μ A
2000k Ω	$\pm 0.5\%$ or rdg $\pm 0.1\%$ of range	1000 Ω	2.8 μ A
20M Ω	$\pm 2\%$ of rdg $\pm 0.1\%$ of range	10k Ω	0.28 μ A

Temperature coefficient

0 °C to 18 °C, 28 °C to 50 °C
 200 Ω to 200k Ω range:
 ($\pm 0.03\%$ of rdg $\pm 0.0075\%$ of range)/°C
 2000 k Ω range:
 ($\pm 0.075\%$ of rdg $\pm 0.015\%$ of range)/°C
 20 M Ω range:
 ($\pm 0.3\%$ of rdg $\pm 0.015\%$ of range)/°C

Range select	Manual
Maximum voltage across terminals	3.5 V or less
Maximum input voltage	± 400 VDC/rms

DC Current Measurement

Table 1-6

Range	Accuracy (23 °C \pm 5 °C, 80% RH or less)	Resolution	Burden voltage
2mA	$\pm 0.8\%$ of rdg $\pm 0.05\%$ of range	1 μ A	0.3 V or less
20mA		10 μ A	
200mA		100 μ A	
2000mA	$\pm 2\%$ of rdg $\pm 0.05\%$ of range	1mA	0.7V or less

In case of 2A or more, protected by fuse.

Temperature coefficient

0 °C to 18 °C, 28 °C to 50 °C
 ($\pm 0.1\%$ of rdg $\pm 0.0075\%$ of range)/°C

AC Current Measurement

Table 1-7

Range	Accuracy (23 °C \pm 5 °C, 80% RH or less)	Resolution	Burden voltage
2mA	$\pm 2\%$ of rdg $\pm 0.25\%$ of range	1 μ A	0.3 V or less
20mA		10 μ A	
200mA		100 μ A	
2000mA		1mA	0.7V or less

Display uses the average value rectification method (actual value corrected)

In case of 2A or more, protected by fuse.

Frequency range	40 Hz to 500 Hz
Temperature coefficient	0 °C to 18 °C, 28 °C to 50 °C ($\pm 0.3\%$ of rdg $\pm 0.02\%$ of range)/°C

General

Display	Static display with 4 x 8 red LEDs
Maximum displayed	1999 or -1999
Operation	Drift compensation integration
Polatiry	Automatic switching
Units	mV, V,Ω, kΩ, MΩ, mA displayed with 3 LEDs.
Range exceeded indication	Highest digit 1 or -1
Range select	Manual
Sample time	Approximately 400 msec/cycle

1-2 8 Power Supply

Voltage Range	100V (90 to 110 V)/ 115V (103 to 128 V)/ 220V (195 to 242 V)/ 230, 240V(207 to 264 V)/ AC One of these voltage ranges can be selected with voltage selector plug
Frequency Range	50 to 440 Hz
Power Consumption	Approximately 50 W (at 100 VAC)

1-4 ENVIRONMENTAL CHARACTERISTICS

Operating Temperature	-10 °C to -50 °C
Operating Humidity	40 °C, 90% Relative Humidity
Storage Temperature	-20 °C to 70 °C
Storage Humidity	70 °C, 80% Relative Humidity
Altitude	Operating: 5,000 m maximum (atmospheric pressure 405 mm Hg) Non-operating: 15,000 m maximum (atmospheric pressure 90.4mmHg)
Vibration	From 10 Hz to 55 Hz and back in 1 minute; double amplitude 0.63 mm; for 15 minutes each in vertical, horizontal, and longitudinal directions for a total of 45 minute
Impact	One side is raised to an elevation angle of 45° (10 cm maximum), and let fall on a piace of hard wood. Each side is put to this test 3 times.
Drop	A package ready for trans- potation is dropped from a height of 90 cm.

1-3 PHYSICAL CHARACTERISTICS

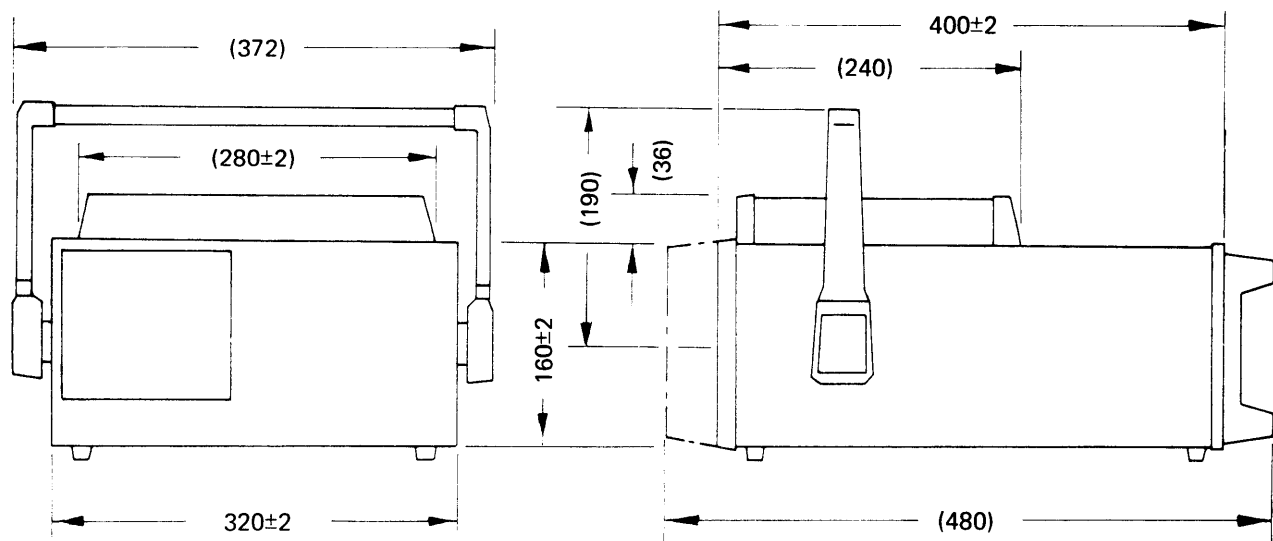
Weight	Approximately 8.5 kg (without panel cover and accessories bag)
Dimensions	320 ± 2 (W) x 160 ± 2 (H) x 400 ± 2 (L) (mm) See Figure 1-1.

1-5 ACCESSORIES

Power cord	1
Probe (SS-0011)	2
Fuse (FSA-1)	2
Panel cover	1
Dust cover	1
Instruction Manual	1
Accessories bag	1

For the method of removing the accessories bag,
refer to Figure 1-2.

Figure 1-1. Dimensional Diagram



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