MODEL COS6100
OSCILLOSCOPE

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1. GENERAL

1.1 Description

Kikusui Model COS6100 Oscilloscope is a universal-type portable oscilloscope which is capable of 5-channel 12-trace display. It employs a 6-inch rectangular type cathode-ray tube with red internal graticule.

The COS6100 oscilloscope is sturdy, easy to operate, and extremely reliable. This scope has many convenient features and special functions which make it an ideal instrument for diversified types of research and development of electronic equipment. It can also be efficiently used in production line maintenance and service applications.

1.2 Features

The features of the COS6100 Oscilloscope can be summarized as follows:

(1) Ease of use:

Light torque lever switches and pushbutton switches are used. These and other controls are laid out in the most convenient locations making the oscilloscope extremely easy to operate.

(2) Clear waveform observation:

The cathode-ray tube is a 6-inch large-screen rectangular type CRT with a red internal graticule of 80 mm × 100 mm (3.15 in. × 3.94 in.) The red graticule produces a high resolution background for easy waveform viewing.

(3) High acceleration voltage (20 kV):

The high acceleration voltage of the CRT ensures a bright trace for observation and photography.

(4) High sensitivity and wide frequency bandwidth:

The maximum vertical sensitivity is 1 mV/DIV (with ×5 MAG) and the frequency response is 100 MHz or greater (-3 dB).

(5) High input impedance:

The input impedance of CH1, CH2, CH3, CH4 and CH5 (EXT TRIG) is 1 MΩ ±1%, 20 pF ±2 pF, allowing the use of 10× Probes.

(6) 5-channel simultaneous display:

The COS6100 employs a new type of vertical mode switching circuit which enables display of any combination of CH1, ADD (CH1 ± CH2), CH2, CH3, and TRIG VIEW (CH4 and CH5). Up to five channels can be displayed simultaneously; up to twelve traces can be displayed when in the alternate sweep mode.

(7) Trigger level lock:

A new trigger level lock circuit eliminates the requirement of triggering adjustments on most signals. (Manual control is still available for triggering on complex waveforms.)

(8) Stable alternate triggering function:

When in the alternate triggering mode, stable triggering can be attained even when the signals of CH1, CH2 and CH3 are not time releated. (patent pending)

(9) TV sync triggering:

The COS6100 has a sync separator circuit, which allows triggering for TV V signal and TV H signal. It is automatically switched with the TIME/DIV control.

(10) B END'S A switch separated from holdoff control knob:

The B END'S A switch is installed separately from the holdoff control switch. Holdoff control can be used while in the B END'S A mode.

(11) Maximum sweep time 2 nsec/DIV with ×10 MAG function:

With the ×10 MAG function, the highest sweep speed of 20 nsec/DIV can be multiplied by a factor of 10 to attain a maximum sweep speed of 2 nsec/DIV.

(12) Alternate sweep:

The A sweep and the delayed sweep can be viewed simultaneously in the alternate mode.

(13) Linear focus:

Once the beam focus is adjusted, it is automatically maintained in this state regardless of changes in intensity.

(14) Multiple-channel X-Y operation:

By using the CH3 HOR channel as the X-axis input and all other channels as the Y-axis inputs, up to four channels of X-Y operation can be viewed.

2. SPECIFICATIONS

Vertical axes

Item	Specification	Remarks
CH1 and CH2		
Sensitivity	5 mV/DIV - 5 V/DIV 1 mV/DIV - 1 V/DIV (when ×5 MAG)	1-2-5 sequence, 10 ranges
Sensitivity accuracy	±2% ±4% (when ×5 MAG)	10 to 35°C (50 to 95°F), at 8 DIV
Variable vertical sensitivity	To 1/2.5 or less of panel-indicated value	
Frequency bandwidth	DC - 100 MHz (-3 dB) DC - 10 MHz (-3 dB), when ×5 MAG AC coupling: Low limit frequency 10 Hz	With reference to 50 kHz, 8 DIV. Except when in bandwidth limit mode
Input coupling	AC, DC, GND	
Input impedance	1 MΩ ±1%, 20 pF ±2 pF	
Allowable input voltage	400 V (DC + AC peak)	Frequency 1 kHz or lower
Square wave characteristics	Overshoot: Not greater than 3% (at 10 mV/DIV range) Other distortions: Not greater than 2%	Other ranges: Add 5% VARIABLE knob is CAL'D position.
CH3 (HOR)		
Sensitivity	0.1 V, 1 V/DIV	
Sensitivity accuracy	±3%	10 to 35°C (50 to 95°F)

Item	Specification	Remarks
Frequency bandwidth	DC - 100 MHz (-3 dB) AC coupling: Low limit frequency 10 Hz	
Input coupling	AC, DC, GND	
Input impedance	1 MΩ ±1%, 20pF ±2 pF	
Allowable input voltage	400 V (DC + AC peak)	Frequency 1 kHz or lower
Square wave characteristics	Overshoot: Not greater than 5% Other distortions: Not greater than 3%	
CH4 and CH5	CH4: A TRIG EXT input CH5: B TRIG EXT input	
Sensitivity	0.1 V, 1 V/DIV	
Sensitivity accuracy	±3%	10 - 35°C (50 - 95°F)
Frequency bandwidth	DC - 100 MHz (-3 dB) AC coupling: Low limit frequency 10 Hz	With reference to 50 kHz, 4 DIV
Input coupling	CH4: AC, HF REJ, TV, DC CH5: AC, HF REJ, LF REJ, DC	Selectable with the coupling switch
Input impedance	1 MΩ ±1%, 20 pF ±2 pF	
Allowable input voltage	100 V (DC + AC peak)	Frequency 1 kHz or lower
Square wave characteristics	Overshoot: Not greater than 10% Other distortions: Not greater than 5%	
Rise time	Approx. 3.5 nsec (Approx. 35 nsec when ×5 MAG)	

Item	Specification	Remarks
Signal delay time	Approx. 40 nsec (with delay cable of approx. 100 nsec)	The displayed portion preceding the triggering point
Delay time differences among channels	Not greater than ±0.5 nsec among CH1, CH2, and CH3	
Polarity change	CH2 only	
DC balance shift	±0.5 DIV (±2.0 DIV when in ×5 MAG)	CH1 and CH2, at 10 mV/DIV
Display modes	Simultaneous displays of CH1, ADD (CH1 + CH2), CH2, CH3, and TRIG VIEW (CH4 and CH5) are possible in any combination. Single X-Y (CH1 for X-axis and CH2 for Y-axis) also is possible.	
Chopping repetition frequency	1 MHz/ (number of displayed channels) ±40%	
Common mode rejection ratio	50:1 or better at 50 kHz, sinusoidal wave	When sensitivities of CH1 and CH2 are set equal
Isolation between channels	At least 1000:1 at 50 kHz At least 30:1 at 100 MHz	At 5 mV/DIV range
Bandwidth limit	With filter for approx. 3 dB attenuation at 20 MHz	
CH1 signal output Output voltage	Approx. 10 mV per 1 DIV deflection amplitude on screen	50-ohm termination
Frequency bandwidth	DC - 100 MHz (-6 dB)	
Output resistance	Approx. 50 ohms	

Triggering

Item	Specification	Remarks
Internal trigger selection (INT TRIG switch)	CH1, CH2, CH3, ALT (When in ALT mode, a trigger source is selected depending on the vertical operation mode.)	When in ADD, the CH1 input signal is used as the trigger source signal.
A trigger		
Signal source	INT, LINE, EXT, EXT/10	
Coupling	AC, HF REJ, TV, DC	
Polarity	+ or -	
Sensitivity	DC - 20 MHz: 0.4 DIV (0.04 V) 20 - 100 MHz: 1.5 DIV (0.15 V) 100 - 130 MHz: 3.0 DIV (0.3 V) Video signal: 1.0 DIV (0.1 V) AC coupling: Attenuates signal components of lower than 10 Hz. HF REJ: Attenuates signal components of higher than 50 kHz.	The values enclosed in the parentheses are the input sensitivities when in the EXT trigger mode.
B trigger		
Signal source	INT, EXT, EXT/10	
Coupling	AC, HF REJ, LF REJ, DC	
Polarity	+ or -	
Sensitivity	DC - 20 MHz: 0.4 DIV (0.04 V) 20 - 100 MHz: 1.5 DIV (0.15 V) 100 - 130 MHz: 3.0 DIV (0.3 V)	The values enclosed in the parentheses are the input sensitivities when in the EXT trigger mode.

Item	Specification	Remarks
EXT trigger input Input impedance Maximum allowable input voltage	CH4 and CH5 input terminals used in common 1 MΩ ±2%, 20 pF ±2 pF 100 V (DC + AC peak)	Frequency 1 kHz or lower
AUTO mode	Satisfies the A trigger sensitivity specification for signal repetition frequency of 50 Hz of over.	
LEVEL LOCK	Satisfies the value of the above trigger sensitivity plus 0.5 DIV (0.05 V) for signal of duty cycle 20:80 and repetition frequency 50 Hz - 100 MHz.	

Horizontal axis

Item	Specification	Remarks
Horizontal axis display	A, A INT, ALT, B (DLY'D)	
A sweep Sweep mode	AUTO, NORM, SINGLE	
Sweep time	20 nsec/DIV - 0.5 sec/DIV 2 nsec/DIV - 50 msec/DIV (when in "× 10 MAG")	1-2-5 sequence, 23 ranges
Sweep time accuracy	±2%	10 to 30°C (50 to 95°F)
Variable sweep time	To 1/2.5 or slower of panel-indicated value	
Holdoff time	Continuously variable to 2 times or over of sweep length (time) at 20 nsec/DIV - 0.1 sec/DIV ranges	

Item	Specification	Remarks
B sweep Delay system	Continuous delay or triggered delay	
Sweep time	20 nsec/DIV - 0.5 sec/DIV 2 nsec/DIV - 50 msec/DIV (when in "×10 MAG")	1-2-5 sequence, 23 ranges
Sweep time accuracy	±2%	10 to 35°C (50 to 95°F)
Delay time	0.2 µsec - 5 sec	
Delay time accuracy	±2% of multidial-indicated value (except 0 - 0.50) ±3% of value read on screen	
Delay jitter	1/20,000 or less $\frac{\text{B sweep time}}{\text{A sweep time}} \times \frac{\text{jitter width}}{\text{10 DIV}}$	Jitter width 0.5 DIV or less at A: 1 msec/DIV B: 1 µsec/DIV
Sweep magnification	10 times (maximum sweep time 2 nsec/DIV)	Both A and B
Magnified sweep time accuracy	0.1 µsec/DIV - 0.5 sec/DIV ranges: ±4% 20 nsec/DIV - 50 nsec/DIV ranges: ±5%	10 to 35°C (50 to 95°F)
Linearity	±3% ±5% (when in "×10 MAG")	
CH3 sweep (CH3 HOR)	CH3 input signal is used as sweep trigger signal. For vertical axes, any combination of CH1, ADD (CH1 + CH2), CH2, and TRIG VIEW can be simultaneously displayed in CHOP mode.	
Sensitivity	0.1 V, 1 V/DIV	Same as CH3
Sensitivity accuracy	±3%	Same as CH3

Item	Specification	Remarks
Frequency bandwidth	DC - 5 MHz (-3 dB) AC coupling: Low limit frequency 10 Hz	With reference to 50 kHz, 10 DIV
Phase difference between vertical axes	Not greater than 3° at DC - 100 kHz	
X-Y mode	X-axis: CH1 input signal Y-axis: CH2 input signal	
Sensitivity	5 mV - 5 V/DIV	Same as CH1
Sensitivity accuracy	±3% ±5% (when in "× 5 MAG")	10 to 35°C (50 to 95°F)
Frequency bandwidth	DC - 5 MHz (-3 dB) AC coupling: Low limit frequency 10 Hz	With reference to 50 kHz, 10 DIV
X-Y phase difference	Not greater than 3° at DC - 100 kHz	
Sweep signal output	A sweep signal	
Output voltage	Approx. 5 Vp-p	Zo ≒ 10 kΩ
Sweep gate output	A sweep gate signal	
Output voltage	Approx. 1 Vp-p	Zo ≒ 100 Ω

Z axis

Item	Specification	Remarks
Sensitivity	3 Vp-p (Trace becomes brighter with negative input.)	
Frequency bandwidth	DC - 10 MHz	
Input resistance	5 kΩ ±10%	
Allowable input voltage	50 Vp-p (DC + AC peak)	AC: 1 kHz or lower

Calibration voltage

Item	Specification	Remarks
Waveform	Positive-going square wave	
Frequency	1 kHz ±5%	
Duty ratio	Within 45:55	
Output voltage	2 V, 200 mV ±2%	
Rise time	Approx. 3 µsec	
Output resistance	2 V: Approx. 2 kΩ 200 mV: Approx. 200 Ω	

CRT

Item	Specification	Remarks
Type	6-inch rectangular type, internal graticule	
Fluorescent screen	P31 phosphor	
Acceleration voltage	Approx. 20 kV	
Effective screen size	8 × 10 DIV	1 DIV = 10 mm (0.39 in.)
Graticule	Internal graticule, continuously adjustable illumination	Red

Mechanical specifications

Item	Specification	Remarks
Dimensions of mainframe	310 W × 150 H × 400 D mm (12.20 W × 5.91 H × 15.75 D in.)	
Maximum dimensions	370 W × 190 H × 480 D mm (14.57 W × 7.48 H × 18.90 D in.)	
Weight	Approx. 9.5 kg (21 lbs)	

o Line power requirements

Voltage: 100 V, 115 V, 215 V, 230 V; with 10% allowance.
Selectable by connector change

Frequency: 50 Hz or 60 Hz

Wattage: Approx. 56 W (Approx. 66 VA)

o Operating environment

To satisfy specifications: 5 to 35°C (41 to 95°F), 85% RH

Maximum operating ranges: 0 to 40°C (32 to 104°F), 90% RH

o Accessories

961 BNC probes (10:1, 1.5 m)	(89-03-0230)	2
942A terminal adaptors	(W4-986-011)	3
Slow blow fuse (0.5A)	(99-02-0115)	1
Slow blow fuse (1 A)	(99-02-0120)	1
Power cord	(85-10-0120)	1
Instruction manual	( )	1

Power cord (USA and Canada) ..... (85-10-0170)
(European countries) ..(85-10-0140)

COS6100M

ERRATA SHEET

Throughout manual, reference of Model COS 6100 change to P/N COS 6100M.

The reference of TV sync is changed to AC LF REJ.

Ratios to 1/2.5, ect. throughout manual are changed to 1:2.5, etc.

Page 8 - A Trigger Sensitivity and B Trigger Sensitivity are changed as follows:

DC-0.3 div internal or 50 mV P-P external from DC to 25 MHz.
1.0 div internal or 150 mV P-P external from 25 MHz to 100 MHz.

AC-0.3 div internal or 50 mV P-P external from 30 Hz to 25 MHz.
1.0 div internal or 150 mV P-P external from 25 MHz to 100 MHz.

LF REJ-0.3 div internal or 50 mV external from 15 kHz to 25 MHz.
1.0 div internal or 150 mV external from 25 MHz to 100 MHz.

HF REJ-0.3 div internal or 50 mV external from 30 Hz to 50 kHz.

Page 9 - Sweep time accuracy is changed to ± 3%, 0°C to 55°C.

Page 10 - Sweep time accuracy is changed to ± 3%, 0°C to 55°C.

Page 10 - Magnified sweep time accuracy for 0.1 μsec/div to 0.5 sec/div range is changed to ± 5%.

Page 10 - Linearity is changed from ± 3% to read: 0.25 minor divisions or less.

Page 12 - Calibrator output voltage is changed to read: 1 V, 200 mV.
Accuracies are changed to read: ± 2% @ 200 mV, ± 1% @ 1 V.

Page 13 - Accessories, a 1:1 and two 10:1 probes are included instead of two 10:1 probes.

Pages 22-23 - All references to TV coupling are deleted.

Pages 27-28 - All references to 2 V calibrator signal are changed to 1 V.

Page 30, Figure 4-1, Item 34 - Change TV setting to read LF REJ.

Page 43 - Reference to TV and Figure 4-7 is deleted.

Pages 80-82 - The references to TV synchronization are deleted.

Page 93, Paragraph 6.14 - The reference to the 2 V P-P is changed to 1 V P-P.

Diagram ⟨5⟩ - A TRIG CIRCUIT schematic diagram, the TV SYNC SEP circuit does not apply.