## **FEATURES**

- Small and compact with high 1 mV/div sensitivity and 70 MHz bandwidth (1 mV/div when X5 GAIN function is used and 500 μV/div for cascaded operation, channel 1 to channel 2).
- Bright 150 mm rectangular CRT with an internal graticule and a 12 kV accelerating potential.
- Vertical axis is capable of single, dual as well as quadtrace display.
- The 20 MHz bandwidth limiter incorporated eliminates high-frequency noises and stabilizes signal waveforms displayed.
- Single sweep, X10 magnification, delayed sweep and alternating sweep capability are provided.
- Fast 50ns/div sweep speed (5ns/div with X10 magnification).

- Accuracies of vertical axis and horizontal sweeping are as high as ± 2% at 10 ~ 35°C.
- The VIDEO synchronization circuit permits to observe video signal easily.
- The dual intensity control circuit permits to vary intensities separately for A and B sweeps.
- A switching type power supply provides stable operation with varying power sources (90V ~ 264V).
- A convenient channel 1 sampling output is provided.
- CPU controlled switching with LED lighted pushbutton switches provides easy. The LED of the switches indicate as follows when supplying power starts.

Vertical MODE	: CH1
HORIZ DISPLAY	: A
TRIG MODE	: AUTO

## **SPECIFICATIONS**

CRT		AC:	5 Hz to 70 MHz (–3 dB)
Model:	150LTM31		5 Hz to 90 MHz (–6 dB)
Туре:	Rectangular, with internal		7 Hz to 40 MHz (–3 dB),
	graticule		(Cascaded operation,
Accelerating potential:	12kV		CH1 to CH2)
Display area:	8 div × 10 div (1 div = 1 cm)		5 Hz to 50 MHz (–3 dB) (X5 mode)
VERTICAL AXIS (Chann	el 1 and Channel 2 identical	Risetime:	5ns (X1 mode)
specifications)			7ns (X5 mode)
Sensitivity	5mV/div to 5V/div (X1 mode)	Signal delay time:	Approx 10ns as displayed
	1 mV/div to 1V/div (X5 mode)		on CRT screen
	500µV/div (Cascaded opera-	Crosstalk:	–40 dB minimum
	tion, CH1 to CH2)	Operating modes:	
Accuracy:	± 2% (10 ~ 35°C)	CH1	CH1, single trace
	$\pm$ 5% (0 $\sim$ 50°C)	CH2	CH2, single trace
	$\pm$ 8% (Cascaded operation,	DUAL	CH1 and CH2, dual trace
	CH1 to CH2)	ADD	CH1 + CH2 (added) display
Attenuator:	5mV/div to 5V/div in 1-2-5	QUAD	CH1 $\sim$ CH4, quad trace
	sequence, all 10 ranges with	ALT	Dual or quad trace alternating
	fine adjustment between steps.	CHOP	Dual or quad trace chopped
Input resistance:	$1 \ M\Omega \pm 1\%$	CHOP frequency:	Approx 250 kHz
Input capacitance:	Approx 22pF	Channel polarity	Normal or inverted, CH 2 only
Frequency response			inverted
DC:	DC to 70 MHz (–3 dB)	\Lambda Maximum input vol	tage:
	DC to 90 MHz (6 dB)		800 Vp-p or 400V (dc + ac
	DC to 40 MHz (3 dB)		peak)
	(Cascaded operation, CH1 to		
	CH2)		
	DC to 50 MHz (-3 dB) (X5		
	mode)		

## **SPECIFICATIONS**

B sweep time:

Sweep magnification:

Accuracy

Linearity:

HOLDOFF:

Trace separation:

Delay method:

Delay time:

fully adjustable sweep time

50ns/div to 50ms/div in 19

ranges, in 1-2-5 sequence.

between steps.

 $\pm\,2\%$  (10  $\,\sim\,$  35°C)

X10  $\pm$  5% (10  $\sim$  35°C)

B positionable up to 4 divisions separated from A sweep, continuously adjusta-

 $\pm$  7% (0 ~ 50°C)

50ns/div to 0.5s/div  $\pm 3\%$ 

 $(\pm 5\%$  with X10 magnifica-

Continuously adjustable for A sweep from NORM to X5

Continuous delay, Trigger de-

0.2 to 10 times the sweep time from 200ns to 0.5s, con-

tinuously adjustable.

 $\pm 2\% (10 \sim 35^{\circ}C)$ 

 $\pm\,6\%~(0~\sim~50^\circ C)$ 

tion)

ble.

lay

Time difference measurement accuracy:

Maximum undistorted	
amplitude:	8 divisions, minimum (DC to
	70 MHz)
Bandwidth limiting:	Vertical system bandwidth
	with the 20 MHz BW pushbut-
	ton switch pushed is approxi-
	mately 20 MHz

# VERTICAL AXIS (Channel 3 and Channel 4 common specifications)

-	peeniou denono,	
	Sensitivity	$0.1V/div, \pm 2\%$
	Input resistance:	$1~{ m M}\Omega\pm1\%$
	Input capacitance:	Approx. 22 pF
	Input coupling mode:	DC only
	Frequency response:	DC to 70 MHz (-3 dB)
		DC to 90 MHz (-6 dB)
	Risetime:	5ns
	Signal delay time:	Same as CH1 and CH2
	Maximum allowable voltage	ge
	DC component:	$\pm0.5V$ or less (ac + dc)
	AC component:	1 Vp-p or less
2	Maximum input voltage:	400V (dc + ac peak)

#### HORIZONTAL AXIS (Channel 2 input)

Modes:	X-Y mode is switch selectable		$\pm$ 4% (O $\sim$ 50°C)
	(HORIZ DISPLAY)	Delay jitter:	1/20000 of the full scale
X-Y mode:	CH1: Y-axis		sweep time.
	CH2: X-axis		
Sensitivity:	Same as CH2	TRIGGERING	
Accuracy:	Same as CH2	A TRIG	
Input resistance:	Same as CH2	A trigger modes:	AUTO, NORM, SINGLE,
Input capacitance:	Same as CH2	Trigger source:	V MODE, CH1, CH2, EXT CH3
Frequency response:		Coupling modes:	AC, LFREJ, HFREJ, DC, VIDEO
DC:	DC to 5 MHz (-3 dB)		VIDEO-LINE sync automatical-
	DC to 7 MHz (-6 dB)		ly selected at sweep times of
AC:	5 Hz to 5 MHz (–3 dB)		50 $\mu$ s/div to 50ns/div.
	5 Hz to 7 MHz (–6 dB)		VIDEO-FRAME sync automati-
X-Y phase difference:	Less than 3° at 100 kHz		cally selected at sweep times
			of 0.5s/div to 0.1ms/div.
SWEEP		Trigger level:	$\pm$ 90° adjustable
Modes	(switchable with the HORIZ	Polarity:	+/
	DISPLAY switch):		
А	A sweep		
ALT	B sweep waveform is dis-		

played as an intensified portion of the A sweep and B sweep alternating

B sweep waveform is displayed as an intensified por-

50 ns/div to 0.5s/div in 22

ranges, in 1-2-5 sequence, vernier control provides

tion of the A sweep.

Delayed B sweep

X-Y display mode

A-INT-B

B DLY'D

A sweep time:

X-Y

# SPECIFICATIONS

#### **B** TRIG

Trigger source:CH1, CH2, EXT CH4STARTS AFTER DELAYCoupling modes:AC onlyTrigger level:± 90° adjustablePolarity:+/-

### TRIGGER SENSITIVITY (A AND B)

		MINIMUM SYN	IC AMPLITUDE
COUPLING PRECINANCE	INT	EXT	
DC	DC ~ 20 MHz DC ~ 70 MHz	0.5 div 1.5 div	50 mV 210 mV
AC	Same as for DC b for below 20 Hz.	out with increased	l minimum level
AC HFrej	Increased minimum level below 20 Hz and above 30 kHz.		
AC LFREJ	Increased minimum level below 30 kHz.		
VIDEO	FRAME/LINE	0.5 div	50 mV

1ns maximum

AUTO: Same as above specifications for above 50 Hz.

Jitter:

(At 70 MHz) 5ns/div (X10 MAG on)

#### CALIBRATING VOLTAGE

 $\begin{array}{rl} 1 \text{ kHz} & \pm 3\% \text{ Positive square wave} \\ 1 \text{Vp-p} & \pm 1\% \text{ (10} \sim 35^\circ \text{C)} \\ & \pm 2\% \text{ (0} \sim 50^\circ \text{C)} \end{array}$ 

adjustable

#### INTENSITY MODULATION

Input signal:	TTL level, intensity decreasing
	with more positive levels
Input impedance:	Approx. 10 k $\Omega$
Usable frequency range:	DC to 10 MHz

▲ Maximum input voltage: 50V (dc + ac peak)

VERTICAL AXIS OUTPUT	(Sampled CH1 output)
Output voltage:	50 mVp-p/div (into 50 $\Omega$ load)
Output impedance:	Approx. $50\Omega$
Frequency response:	DC to 70 MHz (-3 dB)
	(into 50 $\Omega$ load)

#### POWER SUPPLY

Line voltage:	$90 \sim 264V$
Line frequency:	$45~\sim~400~Hz$
Power consumption:	Approx. 55W (at 100V, 50 Hz)

#### DIMENSIONS Width:

Width:	284 mm (328 mm)
Height:	138 mm (150 mm)
Depth:	400 mm(471mm)
	( ) dimensions include pro-
	trusions from basic case out-
	line dimensions.

7.4 kg

### WEIGHT

ACCESSORIES	
PC-29 Probes	2
Instruction manual	1
AC power cord	1
Probe holder	1

#### OPTION

Accessory bag (MC-78) Panel cover (MD-85)

#### ENVIRONMENT

Operating temperature an	d
humidity for guaranteed	
specifications:	$10\sim35^\circ\text{C},85\%$ maximum RH
Full operating range:	$0\sim50^\circ$ C, 90% maximum RH
Storage temperature and	
humidity range:	$-20 \sim +70^{\circ}C$
	80% maximum
Altitude:	
Operating:	5000 m
Non-operating:	12000 m

Circuit and ratings are subject to change without notice due to developments in technology.