# SPECIFICATIONS

A Sweep time: 20ns/div to 0.5s/div in 23 ranges, in 1-2-5 sequence, verninier control provides fully adjustable sweep time between steps.

B Sweep time: 20ns/div to 50ms/div in 20 ranges, in 1-2-5 sequence.

Accuracy: ±3% (10 ~ 35°C)
±6% (0 ~ 50°C)

Sweep magnification: X10 ±5% (10 ~ 35°C)
±7% (0 ~ 50°C)

Linearity: 20ns/div to 0.5s/div ±3% (±5% with X10 magnification)

HOLDOFF: Continuously adjustable for A Sweep hold off time from NORM to X5.

Trace separation: B positionable up to 4 divisions separated from A Sweep, continuously adjustable.

Delay method: Continuous delay, SYNC delay

Delay time: 0.2 to 10 times the sweep time from 200ns to 0.5s, continuously adjustable.

Time difference measurement accuracy:
±2% (10 ~ 35 °C)
±4% (0 ~ 50°C)

Delay jitter: 1/20000 of the full scale sweep time.

## TRIGGERING

### A TRIG

A trigger modes: AUTO, NORM, SINGLE, FIX: at the center of the waveform

Trigger source: V MODE, CH1, CH2, (EXT) CH3 1/1 and 1/10

Coupling modes: AC, LF$_{REJ}$, HF$_{REJ}$, DC, VIDEO
VIDEO-LINE sync automatically selected at sweep times of 50 μs/div to 20ns/div.
VIDEO-FRAME sync automatically selected at sweep times of 0.5s/div to 0.1ms/div.

Trigger level: ±90° adjustable

Polarity: +/−

### B TRIG

B trigger modes: STARTS AFTER DELAY, TRIGGERABLE AFTER DELAY

Trigger source: CH1, CH2, (EXT) CH4 1/1 and 1/10

Coupling modes: AC, LF$_{REJ}$, HF$_{REJ}$, DC

Trigger level: ±90° adjustable

Polarity: +/−

Trigger sensitivity (A and B)

| COUPLING | FREQ RANGE | MINIMUM SYNC AMPLITUDE | | |
|---|---|---|---|---|
| | | INT | EXT | EXT/10 |
| DC | DC ~ 20 MHz<br>DC ~ 50 MHz<br>DC ~ 100 MHz | 0.5div<br>1.0div<br>1.5div | 50 mV<br>100 mV<br>150 mV | 0.5V<br>1.0V<br>1.5V |
| AC | Same as for DC but with increased minimum level for below 20 Hz | | | |
| AC HF$_{REJ}$ | Increased minimum level below 20 Hz and above 30 kHz | | | |
| AC LF$_{REJ}$ | Increased minimum level below 30 kHz | | | |
| VIDEO | FRAME LINE | 0.5div | 50 mV | 0.5V |

AUTO: Same as above specifications for above 30 Hz

FIX: 40 Hz~20 MHz 1.0 div (100 mV)
40 Hz~80 MHz 1.5 div (150 mV)

Jitter: 0.5ns maximum at 100 MHz at 2ns/div sweep rate (X10 MAG on)

## CALIBRATING VOLTAGE AND CURRENT

1 kHz ±3% Positive square wave
0.3V ±1% (10 ~ 35 C)
±2% (0 ~ 50 C)
10 mA ±2% (10 ~ 35 C)
±4% (0 ~ 50 C)

## INTENSITY MODULATION

Input signal: TTL level, intensity increasing with more positive levels

Input impedance: Approx. 10 kΩ

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 50Ω load)

Output impedance: Approx. 50Ω

Frequency response: DC to 100 MHz (−3 dB) (into 50Ω load)

## GATE OUTPUT (A and B)

Output voltage: Approx. 1.5V positive gate (into 500Ω load)

## TRACE ROTATION

Electrical, adjustable

## POWER SUPPLY

Line voltage: LOW: 90 ~ 132V
HIGH: 180 ~ 264V

Line frequency: 50/60 Hz

Power consumption: Approx. 56W

## DIMENSIONS

Width: 284 mm (328 mm)

Height: 138 mm (150 mm)

Depth: 400 mm (471 mm)

( ) dimensions include protrusions from basic case outline dimensions.

# SPECIFICATIONS

**CRT**

| | |
|---|---|
| Model: | 150ATM31A |
| Display area: | 8 × 10 div (1 div = 1 cm) |
| Type: | Rectangular, with internal graticule |
| Accelerating potential: | 16kV |

**VERTICAL AXIS (Channel 1 and Channel 2 identical specifications)**

| | |
|---|---|
| Sensitivity: | 5 mV/div to 5V/div (X1 mode)<br>1 mV/div to 1V/div (X5 mode)<br>500 μV/div (Cascaded operation, CH1 to CH2) |
| Accuracy: | ±3% (10 ~ 35°C)<br>±5% (0 ~ 50°C)<br>±8% (Cascaded operation, CH1 to CH2) |
| Attenuator: | 5 mV/div to 5V/div in 1-2-5 sequence, all 10 ranges with fine adjustment. |
| Input resistance: | 1 MΩ ±2% (1 MΩ mode)<br>50Ω ±2% (50Ω mode) |
| Input capacitance: | Approx. 28pF |
| Frequency response: | (Include × 5 GAIN mode) |
| DC: | DC to 100 MHz (−3 dB)<br>DC to 120 MHz (−6 dB)<br>DC to 70 MHz (−3 dB), (Cascaded operation, CH1 to CH2) |
| AC: | 5 Hz to 100 MHz (−3 dB)<br>5 Hz to 120 MHz (−6 dB)<br>7 Hz to 70 MHz (−3 dB), (Cascaded operation, CH1, to CH2) |
| Risetime: | 3.5ns |
| Signal delay time: | Approx 30ns as displayed on CRT screen |
| Crosstalk: | −40 dB minimum |
| Operating modes: | |
| CH1 | CH1, single trace |
| CH2 | CH2, single trace |
| DUAL | CH1 and CH2, dual trace |
| ADD | CH1 + CH2 (added) display |
| QUAD | CH1 ~ CH4, four trace |
| ALT | Two or four waveforms, alternating |
| CHOP | Two or four waveforms, chopped |
| CHOP frequency: | Approx 250 kHz, switchable |
| Polarity reversal: | CH2 only |
| Maximum input voltage: | 500 Vp-p or 250V (DC + AC peak) in 1 MΩ mode.<br>5 Vrms or DC ±5V in 50Ω mode. |
| Maximum undistorted amplitude: | 8 division, minimum (DC to 100 MHz) |
| Bandwidth limiting: | Vertical system bandwidth with the 20 MHz BW pushbutton switch pushed is approximately 20 MHz |

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

| | |
|---|---|
| Sensitivity: | 0.1V/div, 1V/div ±3% |
| Attenuator: | 1/1, 1/10 |
| Input resistance: | 1 MΩ ±2% |
| Input capacitance: | Approx. 28 pF |
| Input coupling mode: | DC only |
| Frequency response: | DC to 100 MHz (−3 dB)<br>DC to 120 MHz (−6 dB) |
| Risetime: | 3.5ns |
| Signal delay time: | Same as CH1 and CH2 |
| Maximum allowable voltage | |
| DC component: | ±0.5V or less (AC + DC)<br>(+5V, 1/10 attenuated) |
| AC component: | 1 Vp-p (10 Vp-p, 1/10 attenuated) or less |
| Maximum input voltage: | 50V (DC + AC peak) |

**HORIZONTAL AXIS (CH2 input)**

| | |
|---|---|
| Modes: | X-Y mode is switch selectable (HORIZONTAL DISPLAY) |
| X-Y mode: | CH1: Y-axis<br>CH2: X-axis |
| Sensitivity: | Same as CH2 |
| Accuracy: | Same as CH2 |
| Input resistance: | Same as CH2 |
| Input capacitance: | Same as CH2 |
| Frequency response: | |
| DC: | DC to 5 MHz (−3 dB)<br>DC to 6 MHz (−6 dB) |
| AC: | 5 Hz to 5 MHz (−3 dB)<br>5 Hz to 6 MHz (−6 dB) |
| X-Y phase difference: | Less than 3° at 100 kHz |

**SWEEP**

Modes (switchable with the HORIZONTAL DISPLAY switch):

| | |
|---|---|
| A | A Sweep |
| ALT | B Sweep waveform is displayed as an intensified portion of the A Sweep and B Sweep alternating |
| A-INT-B | Duration of the B Sweep is displayed as an intensified portion of the A Sweep. |
| B DLY'D | Delayed B sweep |
| DUAL | Dual sweep − A and B sweeps, in dependently |
| X-Y | X-Y display mode |