

## Technical Specifications

### Acquisition System

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BANDWIDTH (-3 DB):

LC564/LC584 @ 50 Ohms: DC to 1 GHz

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LC684D @ 50 Ohms: DC to 1.5 GHz

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@ 1 MOhms: Bandwidth dependent on probe used.

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SENSITIVITY:

LC564/LC584/LC684D: 2 mV/div to 1 V/div, 50 Ohms, fully variable.

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LC564/LC584: 2 mV/div to 10 V/div, 1 MOhms, fully variable.

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LC684D: 2 mV/div to 2 V/div, 1 MOhms, fully variable.

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SCALE FACTORS: Choice of over 12 probe attenuation factors selectable via front panel menus.

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OFFSET RANGE:

±20 V across the whole sensitivity range when using the AP020/AP022 active probe.

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LC684D:

2.00 4.99 mV/div: ±400 mV

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5.00 99 mV/div (50 Ohms only):  $\pm 1$  V

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0.1 1.0 V/div (50 Ohms only):  $\pm 10$  V

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5.0 100 mV/div (1 MOhms only):  $\pm 1$  V

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102 mV 2.0 V/div (1 MOhms only):  $\pm 20$  V

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LC564/LC584:

1.0 10.0 V/div (1 MOhms only):  $\pm 100$  V

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2.00 4.99 mV/div:  $\pm 400$  mV

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0.1 0.99 V/div:  $\pm 10$  V

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DC ACCURACY:

LC684D: Typically  $\pm(2\%$  full scale + 1% offset setting).

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LC584A: Typically  $\pm(1\%$  full scale + 1% offset setting).

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VERTICAL RESOLUTION: 8 bits

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BANDWIDTH LIMITER: 25 MHz and 200 MHz typical

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INPUT COUPLING: AC (>10 Hz typ.), DC, GND

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INPUT IMPEDANCE: 10 MOhms//11 pF typical (using PP005 probe), or 50 Ohms  $\pm 1.25\%$ .

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MAX INPUT VOLTAGE:

50 Ohms:  $\pm 5$  V DC (500 mW) or 5 V RMS

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LC564/LC584 SERIES: 1 MOhms: 400 V (DC + peak AC  $\frac{3}{4}$ 10 kHz)

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LC684D SERIES: 1 MOhms: 100 V (DC + peak AC @ 10 kHz)

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## Acquisition Modes

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RANDOM INTERLEAVED SAMPLING (RIS): 25 GS/s. For repetitive signals from 200 ps/div to 1  $\mu$ s/div.

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SINGLE SHOT: For transient and repetitive signals from 0.5 ns/div (1 Ch), 1 ns/div (2 Ch), 2 ns/div (4 Ch).

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SEQUENCE: Stores multiple events -- each of them time stamped (1 ns resolution) -- in segmented acquisition memories.

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SEQUENCE MODE DEAD TIME: Typically 30  $\mu$ s

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NUMBER OF SEGMENTS AVAILABLE:

LC564/LC584A,LC684D 2 1000

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LC584AM/AL/AXL 2 2000

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LC684DM/DL/DXL 2 2000

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## Timebase System

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TIMEBASES: Main and up to 4 Zoom Traces.

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TIME/DIV RANGE:

500 ps/div (at 8 GS/s), 1 ns/div (at 4 GS/s),  
2 ns/div (at 2 GS/s) to 1,000 s/div

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CLOCK ACCURACY: 10 ppm

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INTERPOLATOR RESOLUTION:

5 ps on LC684 Series

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10 ps on LC584/564 Series

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ROLL MODE IN NORMAL TRIGGER MODE: 500 ms/div to 1,000 s/div

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EXTERNAL CLOCK: Optional (CKTRIG) up to 500 MHz rear-panel fixed-frequency clock input (<20 ns rise/falltime).

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EXTERNAL REFERENCE: Optional (CKTRIG) 10 MHz rear-panel input.

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## Triggering System

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MODES: Normal, Auto, Single, and Stop

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SOURCES: CH1, CH2, CH3, CH4, Line, Ext, Ext/5, Slope. Level and Coupling are unique for each source.

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SLOPE: Positive, Negative, Bi-Slope (Window in & out).

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COUPLING: DC, AC (>10 Hz), HF (175 MHz to >1 GHz), LFREJ (>50 kHz), HFREJ (<100 MHz)

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PRE-TRIGGER RECORDING: 0 to 100% of full scale (adjustable in 1% increments).

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POST-TRIGGER DELAY: 0 to 10,000 divisions (adjustable in 0.1 div. increments).

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HOLDOFF BY TIME: 2 ns to 20 s

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HOLDOFF BY EVENTS: 1 to 99,999,999

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INTERNAL TRIGGER RANGE:  $\pm 5$  div

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MAXIMUM TRIGGER FREQUENCY: 1 GHz (DC, AC), >1 GHz (HF) on LC584/564, >1.5 GHz (HF) on LC684

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EXT TRIGGER MAX. INPUT: 50 Ohms  $\pm 1\%$ :  $\pm 5$  V DC (500 mW) or 5 V RMS.

LC564/LC584 SERIES: 400 V (DC+ peak AC  $\frac{3}{4}$ 10 kHz). 10 M Ohms // 11 pF at probe tip (PP005).

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L684 SERIES: 100 V (DC+ peak AC  $\frac{3}{4}$ 10 kHz). 10 M Ohms // 11 pF at probe tip (PP005).

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EXT TRIGGER RANGE:  $\pm 0.5$  V ( $\pm 2.5$  V with Ext/5)

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MAXIMUM EXTERNAL TRIGGER FREQUENCY: 750 MHz when using 50 Ohms coupling.

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TRIGGER OUTPUT:

Optional ECL rear panel output (option CKTRIG). The calibrator output can provide a trigger status signal or a Pass/Fail test output.

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## Autosetup

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Automatically sets sensitivity, vertical offset and timebase on all display channels.

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AUTOSETUP TIME: Approximately three seconds

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VERTICAL FIND: Automatically sets sensitivity and offset for selected channel.

## Probes

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MODEL: One PP005 probe supplied per channel.

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OPTIONAL PROBES: 1 GHz active probe (AP020); 2.5 GHz active probe (AP022);  
1 GHz active differential probe (AP034).

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PROBE CALIBRATION: Max 1 V into 1 MOhms, 500 mV into 50 Ohms, frequency and amplitude programmable, pulse, or square wave selectable; rise and fall time 1 ns typical. Alternatively, the calibrator output can provide a trigger output or a Pass/Fail test output.

## Acquisition System Configuration

Bandwidth Maximum Record Length

Active	Maximum	1.5 GHz		LC684D	LC684DM	LC684DL	LC684DXL
Channels	Sample Rate	1 GHz	LC564A	LC584A	LC584AM	LC584AL	LC584AXL
4	2 GS/s		100 k	100 k	500 k	2 M	4 M
2	4 GS/s		250k	250 k	1 M	4 M	8 M
1	8 GS/s			500 k	2 M	8 M	16 M

## Technical Specifications

### SMART Trigger Types

Name Description

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### Basic Triggers

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Edge/Slope/Window/Line Triggers when signal meets slope and level condition.

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## SMART Triggers

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State or Edge Qualified	Triggers on any input source only if a defined state or edge occurred on another input source. Delay between sources is selectable by time or events.
Dropout	Trigger if signal drops out for longer than selected time between 2 ns and 20 s.
Pattern	Logic combination of 5 inputs (4 channels and external trigger input); Each source can be high, low, or don't care. Trigger at start or end of the pattern.

TV-Video Triggers odd or even fields for NTSC, PAL SECAM, or nonstandard video (up to 1500 lines).

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### SMART Triggers with Exclusion Technology

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Signal or Pattern Width Triggers on glitches or on pulse widths selectable from 600 ps to 20 s or on intermittent faults.

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Signal or Pattern Interval Triggers on intervals selectable between 2 ns and 20 s.

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Slew Rate	Trigger on edge rates; select limits for dV, dt, and slope. Select dt from 600 ps to 20 s.
Runt	Positive or negative runts defined by two voltage limits and two time limits selectable between 600 ps and 20 ns.

## Technical Specifications

TYPE:

LC584A Series: Color 10" Raster Scan CRT,  
0.26 mm dot pitch.

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LC684D Series: Color 10.4" TFT LCD

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RESOLUTION: VGA (640 x 480 pixels)

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DISPLAY AREA:

LC584A Series: 170 mm x 125 mm

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LC684D Series: 212 mm x 160 mm

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CONTROLS: Rear-panel presets for position, brightness and contrast. Menu controls for brightness and color selection.

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GRID STYLES: Single, Dual, Quad, Octal, XY, Single+XY, Dual+XY, and Full Screen -- an enlarged view of each grid style.

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GRATICULES: Internally generated; separate intensity control for grids and waveforms. Selectable blending of grid with displayed traces.

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WAVEFORM STYLE: Dot-join with optional bold sample point highlight or dots-only.

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PERSISTENCE MODES: Color-graded persistence and Analog Persistence, infinite or variable with decay over time. In color-graded persistence, a color spectrum from red through violet is used to map signal intensity. With Analog Persistence, the brightness level of a single color denotes signal intensity. Each trace's persistence data is stored in 64k levels.

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TRACE DISPLAY: Opaque or transparent mode, with overlap management.

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NUMBER OF TRACES: 8 (supports a mix of channels, memories or math functions).

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REAL-TIME CLOCK: Date, hours, minutes, seconds.

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EXTERNAL MONITOR: Rear panel 15-pin socket for external VGA compatible monitor.

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VERTICAL ZOOM: Up to 5x vertical expansion (50x with averaging, up to 40  $\mu\text{V}/\text{div}$  sensitivity).

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HORIZONTAL ZOOM: Waveforms can be expanded to 0.4 points/division.

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AUTO SCROLL: Use Auto Scroll to automatically "PLAY" the captured signal to identify anomalies quickly and easily. With a selectable zoom expansion and scrolling speed, you can set up Auto Scroll to match your signal viewing needs. The scrolling speed can be adjusted during the scan to focus on the more interesting characteristics of the signal.

"REVERSE" enables you to quickly review any part of the signal.

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## Technical Specifications

### Rapid Signal Processing

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MICROPROCESSOR:

LC584A/LC684D, LC584AM/LC684DM, LC584AL/LC684DL: 96 MHz PowerPC 603e

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LC584AXL/LC684DXL: 192 MHz PowerPC 603e

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<b>System Memory Configurations</b>
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MODEL	SYSTEM RAM
LC564A/LC584A/LC684D	16 Mbytes
LC584AM/LC684DM	16 Mbytes
LC584AL/LC684DL	64 Mbytes
LC584AXL/LC684DXL	64 Mbytes

VIDEO MEMORY: 1 Mbyte

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PERSISTENCE DATA MAP MEMORY: 16 bits per displayed pixel (64k levels).

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## Waveform Processing

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Up to four processing functions may be performed simultaneously. Functions available are: Add, Subtract, Multiply, Divide, Negate, Identity, Summation Averaging, Sine x/x, Integral, Derivative, Square Root, Ratio, Absolute Value, and the advanced functions listed below.

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AVERAGE: Up to  $10^6$  averages possible.

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EXTREMA: Roof, Floor, or Envelope values from 1 to  $10^6$  sweeps.

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ERES: Low-Pass digital filters provide up to 11-bit vertical resolution. Sampled data is always available, even when a trace is turned off.

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FFT: Spectral analysis with five windowing functions (Rectangular, Von Hann, Hamming, Flat Top, and Blackman-Harris) and FFT averaging.

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STATISTICAL DIAGNOSTICS: The Parameter Analysis package permits in-depth diagnostics on waveform parameters. Live histogramming and trending of any waveform parameter measurement is possible. The histogram can be autoscaled to display the center and width of the distribution. This package is standard on the LC684 and LC584 series and optional on the LC564A.

Note: Any of the above processes can be invoked without losing the data.





## Internal Memory

WAVEFORM MEMORY: Up to four 16-bit memories (M1, M2, M3, M4).

ZOOM & MATH MEMORY: Up to four 16-bit Waveform Processing memories (A,B,C,D) whose length corresponds to the length of the channel acquisition memory.

SETUP MEMORY: Four non-volatile memories. The floppy drive and optional cards or disks may also be used for high-capacity waveform and setup storage.

## Cursor Measurements

<b>CURSOR MEASUREMENTS</b>			
TYPE	SYMBOL	FROM	TO
Relative time		first point on waveform	any other point on waveform
Relative voltage		select voltage level	any other voltage level
Absolute time		time and voltage relative to	ground and trigger
Absolute voltage		voltage	ground

## Automated Measurements

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The following parametric measurements are available, together with their Average, Highest, Lowest values and Standard Deviation:

<i>amplitude</i>	
<i>area</i>	<i>last</i>
<i>base</i>	<i>maximum</i>
<i>cmean</i>	<i>mean</i>
<i>cmedian</i>	<i>median</i>
<i>crms</i>	<i>minimum</i>
<i>csdev</i>	<i>overshoot+</i>
<i>cycles</i>	<i>overshoot-</i>
<i>delay</i>	<i>period</i>
<i>delta c2d- delta c2d+</i>	<i>phase</i>
<i>delta delay</i>	<i>peak-to-peak</i>
<i>delta @level</i>	<i>rise</i>
<i>duration</i>	<i>r 20-80%</i>
<i>duty</i>	<i>r@level</i>
<i>fall</i>	<i>rms</i>
<i>f 80-20%</i>	<i>std dev</i>
<a href="#"><i>f@level</i></a>	<i>t@level</i>
<i>first</i>	<i>top</i>
<i>frequency</i>	<i>width</i>

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PASS/FAIL: Pass/Fail testing allows any five items (parameters and/or masks) to be tested against selectable thresholds. Waveform Limit Testing is performed using Masks that may be defined either inside the instrument or by downloading templates created on a PC. Any failure will cause pre-programmed actions, such as Hardcopy, Save to Internal Memory, Save to mass storage device (card or disk), GPIB SRQ, or Pulse Out.