

# Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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# LT224/LT322/LT342/LT344/LT364 Technical Specifications

## Acquisition System

### Bandwidth (-3dB):

**LT322/LT342/LT344/LT364:** 500 MHz @ 50 Ohm and at probe tip with PP006; select bandwidth limit (25 or 200 MHz) independently by channel.

**LT224:** 200 MHz @ 50 Ohm and at probe tip with PP006; select bandwidth limit (25 MHz) independently by channel.

**INPUT IMPEDANCE:** 50 Ohm  $\pm$ 1.0%; 1 MOhm // 12 pF typical (using PP006 probe)

### Input Coupling:

1 MOhm: AC, DC, GND;

50 Ohm: DC, GND

### Max Input:

50 Ohm: 5 Vrms;

1 MOhm: 400 Vmax (peak AC <-5kHz + DC)

### Single Shot Sampling Rate per Channel:

**LT342/LT344/LT364:** 500 MS/s max ( 1 GS/s for LT364 when using two channels)

**LT224/LT322:** 200 MS/s max

### Repetitive (RIS) Sampling Rate:

**LT342/LT344/LT364:** 25 GS/s max

**LT224/LT322:** 10 GS/s max

### Acquisition Memory:

**LT342/LT344/LT364:** 250 kpts/Ch, 1 Mpt/Ch on L models (500 kpts for LT364 and 2 Mpts for LT364L when using two channels)

**LT224/LT322:** 100 kpts/Ch

### Sequence Acquisition Mode

**LT224/LT322:** 2 - 400 Segments

**LT342/LT344/LT364:** 2 - 1000 Segments

**LT342L/LT344L/LT364L:** 2 - 4000 Segments

**Vertical Resolution:** 8 bits

**Sensitivity:** 2 mV – 10 V/div fully variable

**DC Gain Accuracy:**  $\pm$ (1.5% +0.5% of full scale)

**Offset Range:** 2 mV–50 mV/div:  $\pm$ 1 V 100 mV–500 mV/div:  $\pm$ 10 V 1 V–10 V/div:  $\pm$ 100 V

**Offset Accuracy:**  $\pm$ (1.5% + 0.5% of full scale + 1.0 mV)

## Timebase System

**Timebases:** Main and up to four zoom traces simultaneously

**Clock Accuracy:**  $\leq$ 10 ppm

**Interpolator Resolution:** 5 ps

### External Clock:

**LT342/LT344:**  $\leq$ 500 MHz, 50 Ohm, or 1 MOhm impedance

**LT322/LT224:**  $\leq$ 200 MHz, 50 Ohm, or 1 MOhm impedance

**RollMode:** <=500 kpts: 500 ms - 1000 s/div, 100 ks/s max; >=500 kpts: 1 s - 1000 s/div, 100 ks/s max

## Triggering System

**Modes:** Normal, Auto, Single, and Stop

**Sources:** Any input channel, external, Ext/10 or line; slope, level, and coupling are unique to each source (except line trigger). Coupling Modes: DC, AC, HF, HFREJ, LFREJ (reject frequency 50 kHz typ)

**Pre-Trigger Recording:** 0–100% of horizontal time scale

**Post Trigger Delay:** 0–10,000 divisions

**Holdoff by Time or Events:** Up to 20 s or from 1 to 99,999,999 events

**Internal Trigger Range:**  $\pm 5$  div

**Maximum Trigger Frequency:** Up to 500 MHz with HF coupling

**External Trigger Input:**  $\pm 5$  V,  $\pm 5$  V with Ext/10; max input same as input channels

## Autosetup

Automatically sets timebase, trigger, and sensitivity to display a wide range of repetitive signals; vertical find automatically sets sensitivity for the selected input signal.

## Acquisition Systems

Model	Bandwidth	Channels	Sample Rate	Acquisition Memory
LT342	500 MHz	Two	500 MS/s	250 kpts/Ch
LT342L	500 MHz	Two	500 MS/s	1 Mpts/Ch
LT322	500 MHz	Two	200 MS/s	100 kpts/Ch
LT344	500 MHz	Four	500 MS/s	250 kpts/Ch
LT344L	500 MHz	Four	500 MS/s	1 Mpts/Ch
LT364	500 MHz	Four	1 GS/s/2 Ch	500 kpts/Ch
LT364L	500 MHz	Four	1 GS/s/2 Ch	2 Mpts/Ch
LT224	200 MHz	Four	200 MS/s	100 kpts/Ch

## Waverunner Triggers

Name	Description	Edge or SMART Trigger®
Edge/Slope/Window/Line	Triggers when signal meets slope and level condition.	Edge

Signal pulse width	Triggers on glitches down to 2 ns. Width selectable from <2.5 ns to 20 s or on intermittent faults.	SMART
Signal interval	Triggers on intervals selectable between 10 ns and 20 s.	SMART
State or edge qualified	Triggers on input only after a defined state or edge occurred on another channel. Delay between sources is selectable by time or events.	SMART
Dropout	Triggers if the input signal drops out for longer than selected time between 25 ns and 20 s.	SMART
Pattern*	Triggers on logic combination of five inputs - CH1, CH2, CH3, CH4, and EXT trigger, where each source can be defined as High, Low, or Don't Care.	SMART
TV	Triggers on line (up to 1500), NTSC, or nonstandard video, choice of fields**.	SMART

\* LT364/L only

\*\* 1, 2, 4, 8 fields for LT364/L; odd or even fields for all other models

## Probes

**Model PP006:** 10:1, 10 MOhm with autodetect (one per channel)

**Probe System:** ProBus Intelligent Probe System supports differential amplifiers and active, high-voltage, current, and differential probes.

## Color Waveform Display

**Type:** Color 8.4" flat panel TFT-LCD with VGA, 640 x 480 resolution

**Screen Saver:** Display blanks after 10 minutes. Real Time Clock: Date, hours, minutes, and seconds displayed with waveform

**Number of Traces:** Maximum eight on four channel models, six on two channel models; simultaneously display channel, zoom, memory, and math traces

**Grid Styles:** Single, Dual, Quad, Octal, XY, Single+XY, Dual+XY; Full Screen gives enlarged view of each style.

**Waveform Styles:** Sample dots joined or dots only -- regular or bold

## Analog Persistence Display

**Analog and Color-Graded Persistence:** Variable saturation levels; stores each trace's persistence data in memory

**Trace Display:** Opaque or transparent overlap Zoom Expansion Traces

## Zoom Expansion Traces

**Style:** Display up to four zoom traces Vertical Zoom: Up to 5x expansion, 50x with averaging

**Vertical Zoom:** Up to 5x expansion, 50x with averaging

**Horizontal Zoom:** Expand to 2 pts/div, magnify to 50,000x

**Auto scroll:** Automatically scan and display a captured signal

## Rapid Signal Processing

**Processor:** 160 MHz PowerPC

**Memory:**

16 Mbytes: LT364, LT344, LT342, LT322, LT224

32 Mbytes: LT364L, LT344L, LT342L

## Internal Waveform Memory

**Waveform:** M1, M2, M3, M4\*\*

**Zoom and Math:** A, B, C, D

\*\*Store full-length waveforms with 16 bits/data point.

## Setup Storage

**For front panel and instrument status:** Four non-volatile memories and floppy drive are standard. PC card hard drive and memory card are optional.



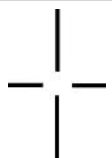
## Math Tools


Simultaneously perform up to four math processing functions; traces can be chained together to perform math on math. standard math tools:

**Standard Math Tools:**

- |   |                      |
|---|----------------------|
| average (summed to 4000 sweeps)           | product              |
| difference                                | ratio                |
| enhanced resolution (to 11 bits vertical) | reciprocal (invert)  |
| envelope                                  | resample (deskew)    |
| FFT of 50 kpoint waveforms                | rescale (with units) |
| floor                                     | roof                 |
| identity                                  | sin x/x              |
| negate                                    | sum                  |

## Cursor Measurements

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
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## Measure Tools

**Automated Measurements: Display any five parameters together with their average, high, low, and standard deviations.**

### Standard Measure Tools:

amplitude	duty cycle	-overshoot
area	fall 90-10%	peak-to-peak
base	fall 80-20%	period
cycle mean	frequency	phase
cycle rms	maximum	rise 10-90%
cycles	mean	rise 20-80%
data	median	rms
delay	minimum	top
delta delay	+overshoot	width

## Pass/Fail

**Test any five parameters against selectable thresholds. Limit testing is performed using masks created on the scope or PC. Setup a pass or fail condition to initiate actions such as hardcopy output, save waveform to memory, GPIB SRQ, or pulse out.**

## Extended Math and Measurements Option

**Adds math and advanced measurements for general-purpose applications. Includes all standard math and measurement tools, plus:**

### Extended Math Tools:

absolute value	log (base 10)
differentiate	integrate
exp (base e)	square
exp (base 10)	square root
log (base e)	trend (datalog)

### Extended Measure Tools:

cycle medium	fall @ level; % and volts
cycle std. deviation	first point
delta time @ level; % and units	last point
delta time @ level from trigger	number of points
delta time from clock to data + (setup time)	rise @ level; % and volts
delta time from clock to data - (hold time)	std. deviation
duration	

## Waveanalyzer Option (WAVA)

Includes the Extended Math and Measure Tools as well as expanded capabilities for performing FFTs, averaging, histograms, and histogram parameters.

### WaveAnalyzer Tools:

- Histograms with 18 histogram parameters
- Summed averaging to one million sweeps
- Continuous weighted averaging
- FFT (up to 1 Mpoint waveforms)
- FFT power averaging
- FFT power density, real, and imaginary

## Other Application Solutions

Jitter and Timing Analysis (JTA), PowerMeasure System, Telecom Mask Testing

## Interface

**Remote Control:** Full control via GPIB and RS-232-C (standard) or via Ethernet for all instrument controls and internal functions (optional).

**Ethernet Port (Optional):** 10 Base-T, TCP/IP Protocol

**Floppy Drive:** Internal, DOS-format, 3.5" high-density

**PC Card Slot (Optional):** Supports memory and hard drive cards.

**External Monitor Port:** 15-pin D-Type VGA-compatible, 640 x 480 RGB

**Centronics Port:** Parallel printer interface

**Internal Graphics Printer (Optional):** Provides hardcopy output in <10 seconds.

## Outputs

**Calibrator Signal:** 500 Hz–1 MHz square wave, -1.0 to +1.0, test point, and ground lug on front panel

**Control Signals:** Choice of trigger ready, trigger out, or pass/fail status; TTL levels into 1 MOhm at rear panel BNC (output resistance 300 Ohms  $\pm$ 10%)

## General

**Operating Conditions:** Temperature 5–40°C; humidity 80% non-condensing at 40°C; altitude  $\leq$ 2,000 meters

**Shock and Vibration:** Conforms to MIL-PRF-28800F, Class 4

**Power Requirements:** 90-132 V AC and 180-250 V AC; 45-66 Hz; maximum power dissipation: 150 VA - 230 VA, depending on model

**Certifications:** CE, UL and cUL

**Dimensions (HWD):** 210mm x 350mm x 300mm; 8.3" x 13.8" x 11.8" (height excludes feet)

**Weight:** 8 kg; 18 lbs

**Warranty and Calibration:** Three years; calibration recommended yearly

