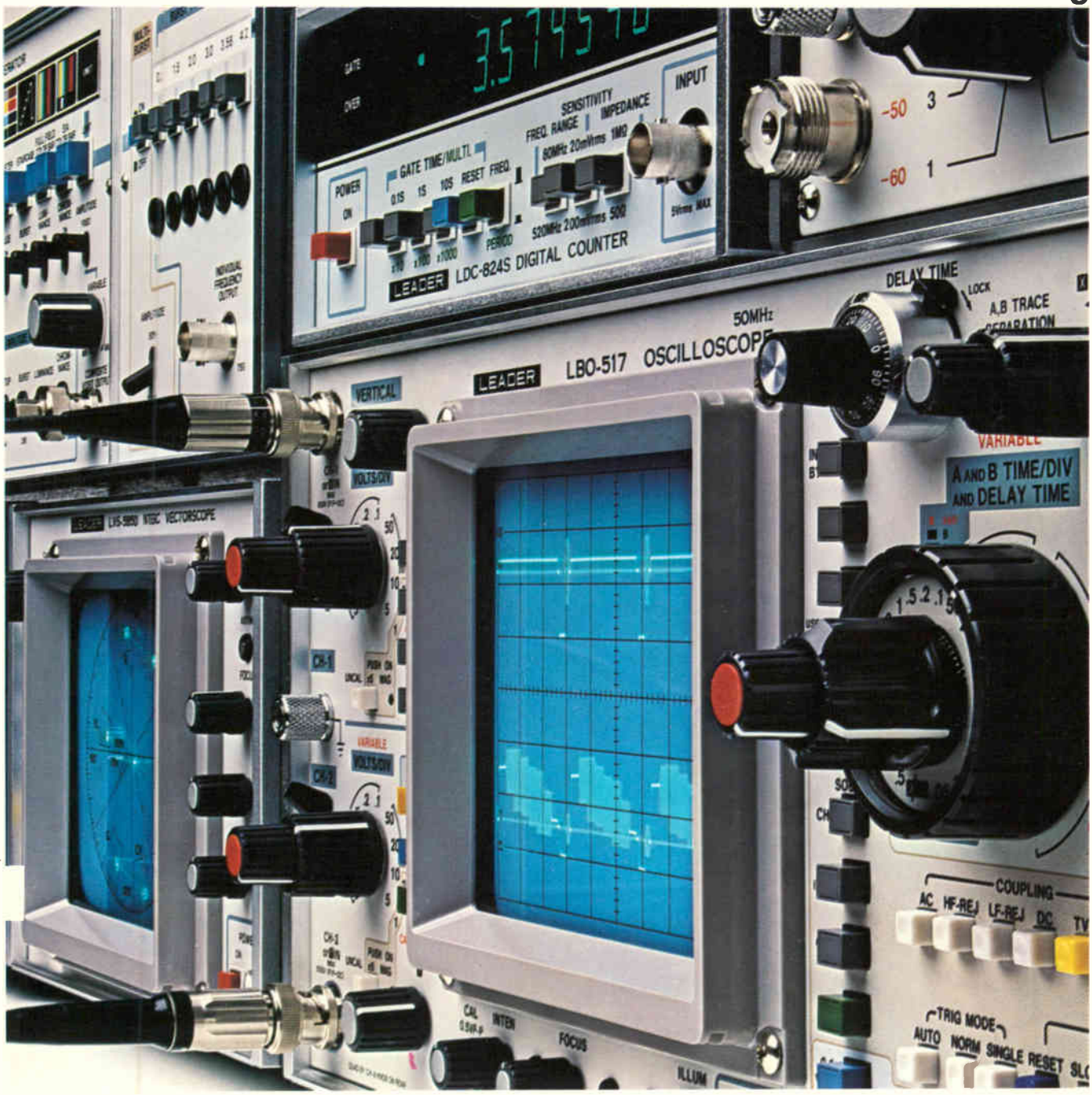
LEADER
Instruments Corporation

1981/82 Catalog



The surprising leader.

LEADER's new headquarters building in Hauppauge, New York contains the U.S. executive offices, East Coast warehouse and service center.

Since its beginning 27 years ago LEADER has earned a worldwide reputation for designing and manufacturing some of the most reliable, practical, and cost effective electronic instruments available. LEADER products were originally developed for production test applications where high reliability, and ease of use are essential qualities. When the company added general purpose instruments to its product line, these qualities were retained along with a cost-performance ratio unequalled in the industry.

This 1981/82 catalog describes over 50 LEADER products which are being specified more and more by engineers for research, development, production, and service applications. There are over 100 additional LEADER instruments which have been custom-designed for production test applications. For information on these, or having a special instrument designed for your unique application, please contact LEADER headquarters in Hauppauge, New York.

Whatever your industry or specific application, there is likely to be a LEADER instrument that will surprise you with more performance and reliability than you thought possible.

- **Surprising fact**–Less than 1% of all LEADER products are returned for service during the 2-year warranty period.
- **Surprising fact**–No waiting for LEADER instruments. Off-the-shelf deliveries anywhere in the United States from over 100 "Select" stocking distributors... backed by East and West Coast factory warehouses.
- **Surprising fact**–All LEADER instruments are designed and tested to withstand a broad range of extreme environmental conditions.
- **Surprising fact**–Every LEADER instrument is carefully performance tested before shipment.
- **Surprising fact**–LEADER instruments are specified by engineers in over 80 countries.
- **Surprising fact**–A free trial use of any LEADER instrument is available to qualified companies.

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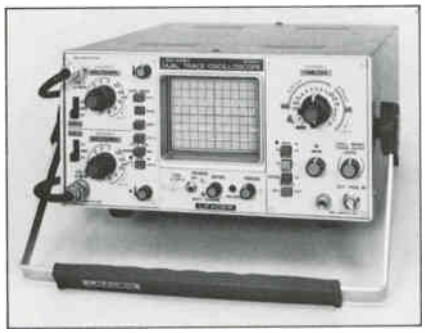
New Products

X-Y Display Module

The new LBO-51M OEM X-Y Display Module CRT display will compliment the performance, reliability and appearance of a broad range of products requiring a bright, sharp and easy to operate X-Y display. Its basic specifications are 100 mV sensitivity, 3 MHz bandwidth and TTL compatible Z-axis input. Its mechanical configuration has been designed to easily accommodate a number of common mounting techniques. Page15

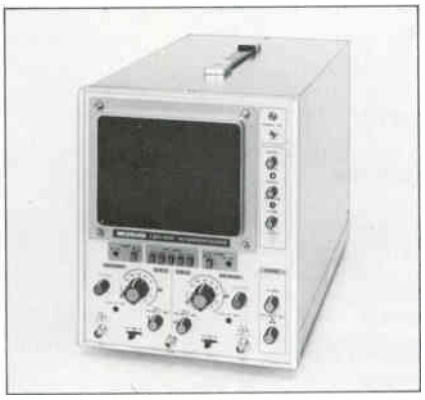
20 MHz Portable Oscilloscope

The LBO-308PL 20 MHz Portable Oscilloscope is a higher performance version of the popular LBO-308S field service oscilloscope. Its features are similar to the LBO-308S but includes signal delay lines and a high intensity PDA CRT. Page 12



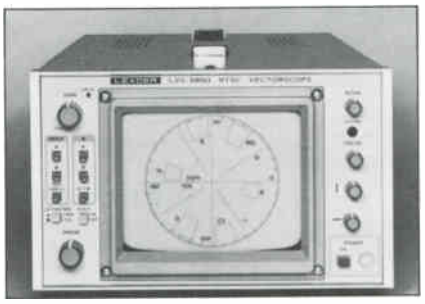
Frequency Response Displays

The LBO-801 and LBO-802 Frequency Response Displays provide a convenient and accurate method for observing the frequency response of rf and microwave devices in swept frequency measurements. The single and dual trace models employ 8" CRT displays and provide up to 200 µV/cm sensitivity to permit direct use with most detectors. Page 14



NTSC Vectorscope

The LVS-5850 NTSC Vectorscope features unique electronically displayed error limits for high accuracy phase and amplitude measurements. It is equipped with two loop through inputs and may also use a subcarrier input as the reference signal. The LVS-5850 is available in either a standard half-rack configuration or as a portable instrument. Page 29



True RMS Multimeter

The LDM-854 3½ Digit True RMS Multimeter covers the full spectrum of multimeter ranges including true RMS ac measurements to 20 kHz. The LCD readout includes automatic polarity indication, automatic zeroing and a low battery indication. Comprehensive overload protection and high reliability components assure a long service life. Page 20

CATV Signal Level Meter

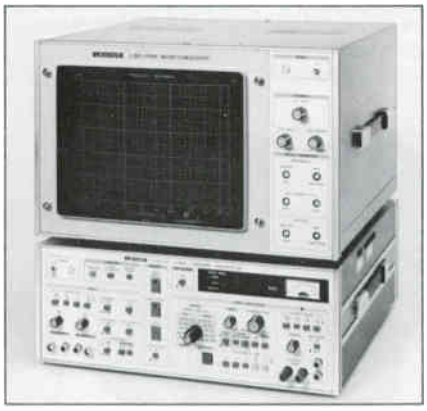
The LFC-945 CATV Signal Level Meter is an all new instrument for measuring the performance of cable and master/community antenna television systems. It covers the frequency ranges of 40 to 300 MHz and 470 to 890 MHz with accuracies of ± 1.5 dB and ± 2.0 dB respectively. Page 32

Log Amplifier

The LPA-1305 Log Amplifier is used with the LFG-1300S Sweep/Function Generator to obtain frequency response curves on semi-logarithmic chart paper. Page 34

Frequency Response Test Set

The LSW-115 Frequency Response Test Set is a complete system for accurately measuring the frequency response curves of audio equipment and devices. It includes the LSW-115 Audio Sweep Generator with digital response curve storage and the LBO-115M Display Unit. Page 36



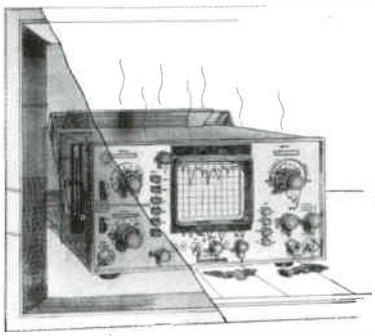
AC Millivoltmeter

The LMV-182A AC Millivoltmeter is a high sensitivity (300 uV f.s.) addition to LEADER's series of broadband voltmeters. Page 40

Quality Assurance

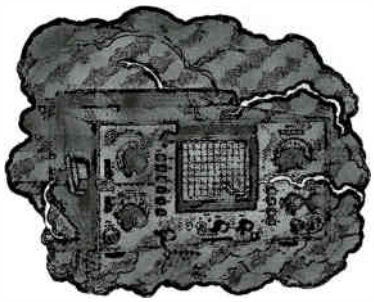
All LEADER products are subjected to a rigorous quality assurance program designed to ensure trouble-free performance for many years.

Actual long term reliability data is used to continually update equipment designs and quality assurance tests and procedures. As a result, LEADER offers instruments with proven reliability that equals or exceeds any other instrument manufacturer. . .regardless of price.



ENVIRONMENTAL TESTING.

All new products are subjected to extreme temperatures, humidity, vibration and shock before the product goes into production. In addition, units from the first production run are subjected to the full environmental tests. Should even one failure occur, the entire production run is tested and any design defects which are revealed are corrected. After the first production run, samples of successive production are tested to assure that no weaknesses have developed in components or manufacturing procedures.

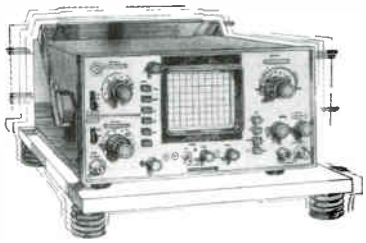


PERFORMANCE TESTING.

In every production run 100% of the units are performance tested to ensure that all specifications are met. Accurate records are maintained to detect any problems which may require retesting an entire production run before any units are released for shipment.

RELIABILITY.

Reliability is a very important feature of all LEADER products. It is one of the primary reasons more companies specify LEADER products each year. Reliability is also the primary reason we are able to offer the liberal two-year warranty policy shown below.



2-YEAR WARRANTY

Leader Instruments Corporation warrants its products to be free from defects in materials and workmanship for a period of two years from the date of purchase. Their Obligation under this warranty is limited to repairing or replacing, at their sole option, any such defective products. Products must be returned to a Leader Service Center with transportation charges prepaid and must be accompanied by a brief description of the problem encountered and date and place of purchase. This warranty does not apply to equipment which has been damaged by accident, negligence, or mis-application, or altered or modified in any way.

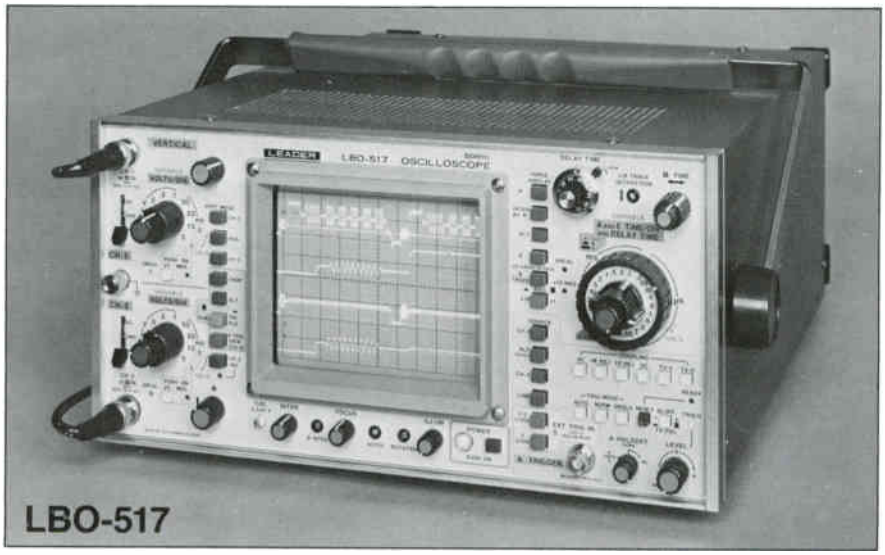
This warranty applies only to the original purchaser who is requested to return the warranty-registration card within 10 days of purchase.

Oscilloscope Selection Chart

MODEL	BANDWIDTH (MHz)	TRACES	DISPLAY SIZE (cm)	MAX. SWEEP SPEED (ns/DIV)	MAX. SENSITIVITY (mV/DIV)	ACCELLERATING POTENTIAL (kV)	ADD/SUB.	SIGNAL DELAY (ns)	TRIGGER VIEW	ALT. TRIGGER	SINGLE SHOT TRIGGER	VARIABLE HOLD OFF	DELAYED TIME BASE	ALTERNATE TIME BASE	PAGE
LBO-517	50	Dual	8x10	5	1	20	yes	120	yes	yes	yes	yes	yes	yes	6
LBO-515B	30	Dual	6.4x8	20	5	6/1.2	yes	120			yes	yes	yes		8
LBO-520A	35	Dual	8x10	20	5	5.6/1.8	yes	120			yes				9
LBO-508A	20	Dual	8x10	100	10	2	yes								11
LBO-508P	20	Dual	8x10	100	10	6/2	yes								11
LBO-507A	20	Single	8x10	100	10	2									11
LBO-514	10	Dual	8x10	100	1	2									10
LBO-514P	10	Dual	8x10	100	1	6/2									10
LBO-513	10	Single	8x10	100	1	2									10
LBO-308S	20	Dual	4.8x6	100	2	1.5	yes								12
LBO-308PL	20	Dual	4.8x6	100	2	10	yes	120							12
LBO-310A	4	Single	3.6x4.8	1,000	20	1.2									13
LBO-511	10	Single	8x10	1,000	20	1.5									13
LBO-802	30	Dual	10x14	~	.2	4.5/1.5	Swept Frequency Display CRTs								14
LBO-801	30	Single	10x14	~	.2	4.5/1.5									14
LBO-51M	3	~	7.6x9.5	~	50	6.5	OEM X-Y Display Module								15

50-MHz Dual Trace, Dual Time Base Oscilloscope

- 20 kV Accelerating Potential
- 1 mV Sensitivity < 10 MHz



The LBO-517 is a high performance 50-MHz oscilloscope with 1 mV sensitivity up to 10 MHz and 5 mV sensitivity up to 50 MHz. Dual time bases permit detailed observations and accurate time interval measurements. The two time bases may be alternately displayed for simultaneous viewing of both the main time base (with the delayed portion intensified) and the delayed time base for both input channels. Composite triggering permits stable triggering on two asynchronous signals. A trigger viewing function also displays the trigger waveforms for both time bases. The LBO-517 uses a new dome mesh CRT with 20 kV accelerating potential for bright, clearly defined displays, even with very low repetition rates.

SPECIFICATIONS

VERTICAL DEFLECTION

Bandwidth (−3 dB, 8 div.)
dc: 0 Hz to 50 MHz.
ac: 10 Hz to 50 MHz.

Rise Time
7 ns.

Deflection Coefficients
5 mV/cm to 5 V/cm in 10 steps, 1-2-5 sequence, continuously variable between steps, uncalibrated warning lights, x5 multiplier provides 1 mV/cm sensitivity up to 10 MHz.

Accuracy
± 3% (0-40°C), ± 5% with x5 mag.

Imput Impedance
1 MΩ, ± 2%, 35 pF ± 3 pF.

Maximum Input
600 V (dc plus ac peak).

Signal Delay
Leading edge can be observed.

Display Modes
CH-1, CH-2, alternate, chop, add, subtract (CH-2 invert), triple, quad.

Common Mode Rejection Ratio
26 dB at 1 KHz.

Output
CH-1 output on rear panel of 0.1 mV/cm deflection.

EXTERNAL HORIZONTAL DEFLECTION (X-Y MODE)

Input
Via CH-1 vertical amplifier.

Bandwidth (−3 dB, 10 cm)
dc: 0 Hz to 1 MHz.
ac: 10 Hz to 1 MHz.

Rise Time
350 ns.

Phase Shift
<3° at 100 KHz.
All other external horizontal deflection specifications are identical to vertical deflection.

INTERNAL HORIZONTAL DEFLECTION (SWEEP MODE)

Display Modes
Main time base, main time base intensified by delayed time base, alternate main and delayed time base, delayed time base.

Main Time Base
0.05 µS/cm to 0.5 S/cm in 22 steps, 1-2-5 sequence, continuously variable between steps, uncalibrated warning light.

Delayed Time Base
0.05 µS/cm to 0.1 S/cm in 20 steps, 1-2-5 sequence.

Magnifier
Times 10 magnifier extends maximum sweep rate to 5 nS/cm.

Accuracy
± 3% (± 5% with magnifier).

MAIN TIME BASE TRIGGERING (CH-3)

Sources
Internal CH-1, CH-2, Alt., Line.
External (÷1 or ÷10).

Modes
Auto (≥20 Hz).
Normal.
Single.

Coupling
ac, dc, lf reject, hf reject, TV vertical, TV horizontal

Slope
+ or −.

Sensitivity
Internal: 1.5 cm (0.5 cm, 30 Hz-10 MHz)
External: 0.2 V p-p or 2 V p-p switchable.

External Input
Impedance: 1 MΩ, 30 pF.
Maximum Level: 600 V (dc plus ac peak).

Hold-off
Variable sweep hold-off control with B-ends-A switch.

DELAYED TIME BASE TRIGGERING (CH-4)

Modes
Immediate: delayed time base begins immediately after delay time.
Triggered: delayed time base begins on the first trigger after the delay time.

Delay Time Jitter
0.01% (1 part in 10,000) of 10 times the main time base (A TIME/DIV) setting. All other delayed time base specifications are identical to main time base specifications.

Z-AXIS (INTENSITY) MODULATION

Input Level
TTL compatible, DC coupled.

Maximum Input
50 V p-p

INTERNAL CALIBRATOR

Output
0.5 V p-p, ± 2%.

Wave Shape
Square wave, 1 KHz nominal.

CRT DISPLAY

Phosphor
P 31 (P 7 optional).

Graticule
Internal, illuminated 8 x 10 div (1 div = 1 cm).

Accelerating Potential
20 kV.

Trace Alignment
Front panel trace rotation control.

POWER REQUIREMENTS

100, 117, 200, 217, 234 Vac, ± 13%, 50 to 60 Hz.

PHYSICAL

Size (W x H x D)
11¼ x 6¼ x 14¾ in. (290 x 160 x 375 mm).

Weight
25.5 lbs.,
11.5 kg.

ENVIRONMENTAL

Temperature (Operating)
0-40°C.

Vibration
2 mm p-p displacement at 12 to 33 Hz.

Shock
30 g.

SUPPLIED ACCESSORIES

Instruction Manual.
Two (2) Type LP-011 X10 Probes.

AVAILABLE ACCESSORIES

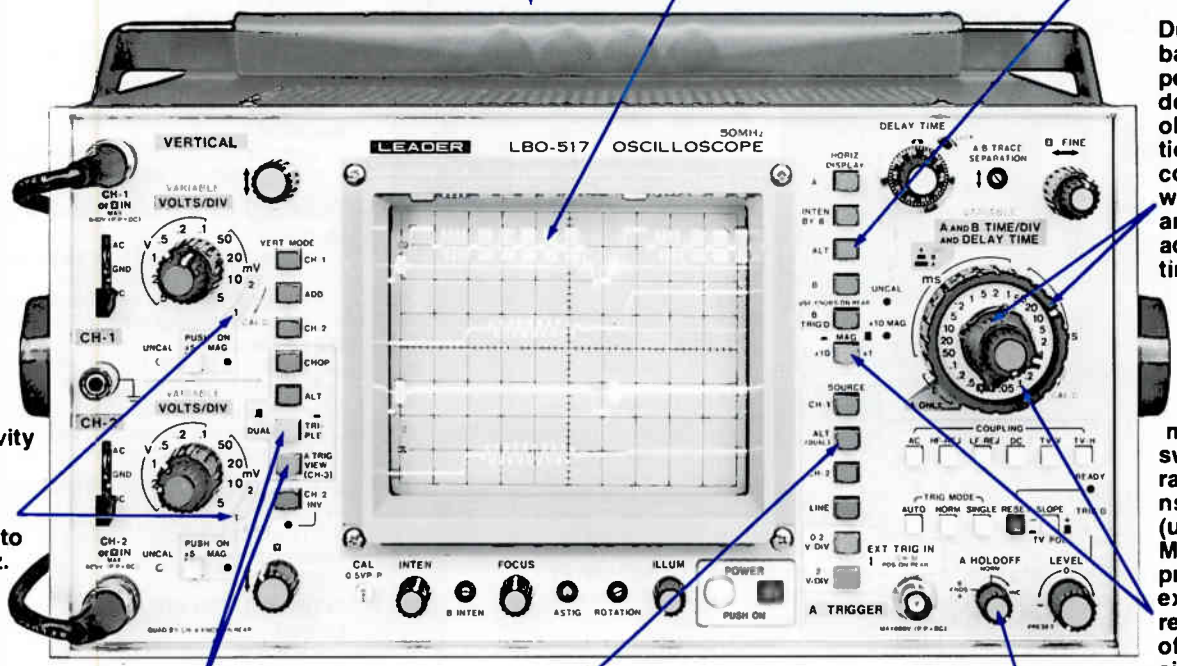
(See pages 16 & 17)
LP-2010 Probe Pouch.
LC-2009 Protective Front Cover.
LRA-517 Rack Mounting Adapter.

- **Alternate Time Base**
- **5 ns Sweep Speed**

An amplified output of the signal applied to CH-1 is available at a rear panel BNC connector. This permits utilizing the oscilloscope's 1 mV sensitivity for driving frequency counters or other less sensitive instruments. Output level is 0.1 V per cm deflection.

A dome-mesh CRT employing 20 kV accelerating potential provides bright, well defined traces even at highest sweep rates.

The alternate time-base mode permits viewing both the main and delayed time-bases simultaneously.



Dual time-base mode permits detailed observations of complex waveforms and accurate time interval measurements.

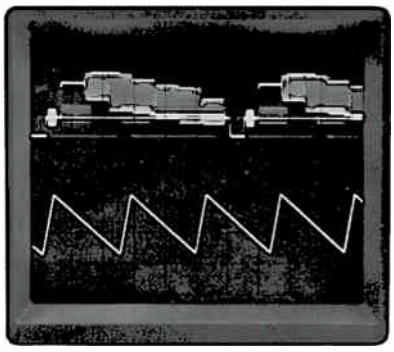
1 mV sensitivity up to 10 MHz and 5 mV up to 50 MHz.

The maximum sweep rate of 5 ns/cm (using x10 Mag) provides excellent resolution of H.F. signals.

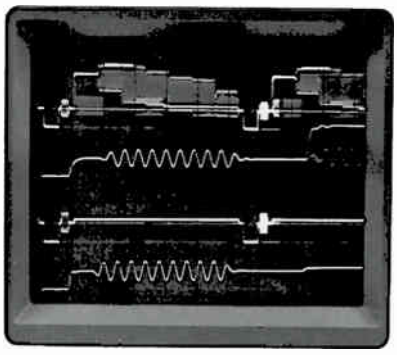
Third and fourth channel trigger view permits observing both the main and delayed time-base trigger wave forms. Channel 4 (input and position control on rear panel) may be used as an additional independent display channel when the delayed time-base is not triggered.

Alternate triggering provides a stable display of two asynchronous signals

Variable hold-off provides stable triggering on complex signals by ignoring intermediate trigger points within the repetition cycle of the desired display. The B-ends-A position is used on signals with low repetition rates to provide a brighter display by increasing the sweep repetition rate.



Alternate triggering permits a stable display of two asynchronous signals.



The alternate time-base mode permits viewing the main and delayed time bases for both channels simultaneously. The main time-base is shown with the delayed time-base portion intensified.

30-MHz Dual Trace, Dual Time Base Oscilloscope

- 5 mV Sensitivity
- Calibrated Delayed Time Base
- 0.2 μs Sweep Speed
- Compact Size

LBO-515B

The LBO-515B is a compact, extremely versatile oscilloscope for both lab and field use. Its 30-MHz bandwidth and 5-mV sensitivity make it suitable for a broad range of applications in design, testing and servicing of both digital and analog circuits and equipment. A 4-inch internal graticule PDA CRT provides sharp, bright displays even at highest sweep rates. The dual time base with calibrated delay time permits accurate observation and time interval measurements of complex waveforms.

SPECIFICATIONS

VERTICAL DEFLECTION

Bandwidth (-3 dB, 8 div.)
dc: 0 Hz to 30 MHz.
ac: 2 Hz to 30 MHz.

Rise Time
11.7 ns.

Deflection Coefficients
5 mV/div to 5 V/div in 10 steps, 1-2-5 sequence, continuously variable between steps, uncalibrated warning lights.

Accuracy
± 3% (0-40°C).

Input Impedance
1 MΩ, 35 pF.

Maximum Input
600 V (dc plus ac peak).

Signal Delay
120 ns.

Display Modes
CH-1, CH-2, alternate, chop (250 kHz), add, subtract (CH-2 invert).

Common Mode Rejection Ratio
26 dB at 1 kHz.

EXTERNAL HORIZONTAL DEFLECTION (X-Y MODE)

Input
Via CH-1 vertical amplifier.

Bandwidth (-3 dB, 10 div.)
dc: 0 Hz to 1 MHz.
ac: 2 Hz to 1 MHz.

Rise Time
350 ns.

Phase Shift
<3° at 100 kHz.
All other external horizontal deflection specifications are identical to vertical deflection.

INTERNAL HORIZONTAL DEFLECTION

Display Modes
Main time base, main time base intensified by delayed time base, delayed time base.

Main Time Base
0.2 μs/div to 0.5 s/div in 20 steps, 1-2-5 sequence, continuously variable between steps, uncalibrated warning light.

Delayed Time Base
0.2 μs/div to 0.1 s/div in 18 steps, 1-2-5 sequence.

Magnifier
Times 10 magnifier extends maximum sweep rate to 20 ns/div.

Accuracy
±3% (±5% with magnifier).

MAIN TIME BASE TRIGGERING

Sources
Internal CH-1 and CH-2.
External.

Modes
Auto (≥20 Hz).
Normal.
Single.

Coupling
ac, dc (external triggering only), HF REJ (10-kHz cutoff), TV (automatic selection of line or frame filtering by position of TIME/DIV control).

Slope
+ or −

Sensitivity
Internal: 0.5 div.
External: 0.1 V p-p.

External Input
Impedance: 1 MΩ, 30 pF.
Maximum Level: 600 V (dc plus ac peak).

Hold-Off
Variable sweep hold-off control permits stable triggering on complex waveforms.

DELAYED TIME BASE TRIGGERING

Modes
Immediate: delayed time base begins immediately after delay time.
Triggered: delayed time base begins on the first trigger after the delay time.

Delay Time Jitter
<0.01% (1 part in 10,000) of 10 times the main time base (A TIME/DIV) setting.
All other delayed time base specifications are identical to main time base specifications.

Z-AXIS (INTENSITY) MODULATION

Input Level
TTL compatible.

Maximum Input
50 V p-p.

INTERNAL CALIBRATOR

Output
0.5 V p-p, ±3%.

Wave Shape
Square wave, 1 kHz nominal.

CRT DISPLAY

Phosphor
P 31 (P 7 optional).

Graticule
Internal, illuminated 8 x 10 div (1 div = 0.8 cm).

Accelerating Potentials
6 kV and 1.2 kV (post deflection).

Trace Alignment
Front panel trace rotation control.

POWER REQUIREMENTS

115/230 Vac, ±13%, 50 to 60 Hz, 40 VA.

PHYSICAL

Size (W x H x D)
11⅜ x 5¼ x 14⅛ in.
290 x 135 x 360 mm.

Weight
18 lbs., 5 oz.
8.3 kg.

ENVIRONMENTAL

Temperature (Operating)
0-40° C.

Vibration
2 mm p-p displacement at 12 to 33 Hz.

Shock
30 g.

SUPPLIED ACCESSORIES

Instruction Manual.
Two (2) Type LP-16AX switchable X1/X10 Probes.

AVAILABLE ACCESSORIES

(See pages 16 & 17)
LP-2005 Probe Pouch.
LC-2002 Protective Front Cover.
LRA-515 Rack Mounting Adapter.

35-MHz Dual Trace Oscilloscope with Delay Lines

- 5.6 kV PDA CRT
- Signal Delay Lines
- Internal Graticule

The LBO-520A is designed to meet a broad range of requirements for a versatile, medium bandwidth oscilloscope with high reliability at moderate cost. Its bright PDA CRT, signal delay lines and comprehensive display and triggering controls make it suitable for use in the design lab, production test, or service departments. Convenience features such as uncalibrated warning lamps, trace rotation control, and color-coded front-panel ensure easy, error-free operation.

SPECIFICATIONS

VERTICAL DEFLECTION

Bandwidth (-3 dB, 8 cm)
dc: 0 Hz-35 MHz.
ac: 2 Hz-35 MHz.

Rise Time
10 ns.

Deflection Coefficients
5 mV/cm to 5 V/cm, in 10 calibrated steps, 1-2-5 sequence, continuously variable between steps, uncalibrated warning lights.

Accuracy
± 3% (0-40° C).

Input Impedance
1 MΩ, 35 pF.

Maximum Input
600 V (dc plus ac peak).

Signal Delay
120 ns.

Display Modes
CH-1, CH-2, alternate, chop (230 kHz) add, subtract (CH-2 invert).

Common Mode Rejection Ratio
26 dB at 1 kHz.

EXTERNAL HORIZONTAL DEFLECTION (X-Y MODE)

Input
Via CH-1 vertical amplifier.

Bandwidth (-3 dB, 8cm)
dc: 0 Hz to 1 MHz.
ac: 2 Hz to 1 MHz.

Rise Time
350 ns.

Phase Shift
<3° at 100 kHz.
All other external horizontal deflection specifications are identical to vertical deflection.

INTERNAL HORIZONTAL DEFLECTION (SWEEP MODE)

Deflection Coefficients (Sweep Rate)
0.2 µs/cm to 0.5 s/cm in 20 calibrated steps, 1-2-5 sequence, continuously variable between steps, uncalibrated warning light.

Magnifier
Times 10 magnifier extends maximum sweep rate to 20 ns/cm.

Accuracy
± 3% (± 5% with magnifier).

TRIGGERING

Sources
Internal CH-1 and CH-2.
External.

Modes
Auto (≥20 Hz).
Normal.
Single.

Coupling
ac, dc (external triggering only), HF REJ (10 kHz cutoff), TV (Automatic selection of line or frame filtering by position of TIME/CM control).

Slope
+ or −

Sensitivity
Internal: 0.5 cm.
External: 0.1 V p-p.

External Input
Impedance: 1 MΩ, 30 pF.
Maximum Level: 600 V (dc plus ac peak).

Z-AXIS (INTENSITY) MODULATION

Input Level
TTL compatible.

Maximum Input
50 V p-p.

INTERNAL CALIBRATOR

Output
0.5 V p-p, ± 3%.

Wave shape
Square wave, 1 kHz nominal.

CRT DISPLAY

Phosphor
P 31 (P 7 optional)

Graticule
Internal 8 x 10 cm with rise time calibration.

Accelerating Potential
5.6 kV and 1.8 kV (post deflection).

Trace Alignment
Front panel trace rotation control.

POWER REQUIREMENTS

115/230 Vac ± 13%, 50 to 60 Hz, 40 VA.

PHYSICAL

Size (W x H x D)
11⅜ x 6¼ x 14¾ in.
290 x 160 x 375 mm.

Weight
19 lbs, 8.5 kg.

ENVIRONMENTAL

Temperature (Operating)
0-40° C.

Vibration
2 mm p-p displacement at 12 to 33 Hz.

Shock
30 g.

SUPPLIED ACCESSORIES

Instruction Manual.
Two (2) type LP-16AX Switchable x1/x10 Probes.

AVAILABLE ACCESSORIES

(See pages 16 & 17)
LP-2004 Probe Pouch.
LC-2001 Protective Front Cover.
LRA-508 Rack Mount Adapter.

10-MHz Single and Dual Trace High-Sensitivity Oscilloscopes

- 1 mV Sensitivity
- 5" CRT
- 0.1 μs Sweep Speed
- X-Y Mode

LBO-513

LBO-514/514P

The single trace LBO-513 and the dual trace LBO-514 are compact 5-inch oscilloscopes that offer maximum performance at low cost. Equipped with both vertical and horizontal magnifiers, they have 1-mV sensitivity with X5 magnification and a maximum sweep speed of 0.1 μs/cm (0.2 s/cm to 0.5 μsec in 18 calibrated steps plus X5 magnification). Rise time of both oscilloscopes is 35 ns with normal and automatic, + or − triggering. The LBO-514 provides both chop and alternate dual trace displays.

The model LBO-514P is available with a higher intensity CRT and internal graticule.

SPECIFICATIONS

VERTICAL DEFLECTION

Bandwidth (-3 dB, 4 cm)
dc: 0 Hz to 10 MHz.
ac: 2 Hz to 10 MHz.

Rise Time
35 ns.

Deflection Coefficients
5 mV/cm to 10 V/cm in 11 calibrated steps, 1-2-5 sequence, continuously variable up to 2.5 times setting between steps; sensitivity increased to 1 mV/cm by X5 vertical magnifier.

Accuracy
± 3% (0-40° C).

Input Impedance
1 MΩ, 35 pF.

INTERNAL HORIZONTAL DEFLECTION (SWEEP MODE)

Deflection Coefficients (Sweep Rates)
0.5 μs/cm to 200 ms/cm in 18 calibrated steps, 1-2-5 sequence, continuously variable between steps.

Magnifier
Times 5 magnifier extends maximum sweep rate to 100 ns/cm.

Accuracy
± 3% (± 5% with magnifier).

TRIGGERING

Internal CH-1.
Internal CH-2 (LBO-514 only).
External.

Maximum Input
600 V (dc plus ac peak).

Display Modes (LBO-514 only)
CH-1, CH-2, alternate, chop, (chop frequency is 250 kHz nominal).

EXTERNAL HORIZONTAL DEFLECTION (X-Y MODE) LBO-513

Input
Via external trigger connector.

Deflection Coefficients
200 mV/cm to 5 V/cm.

Bandwidth (-3dB, 10 cm)
dc–250 kHz.

Rise Time
1.4 μs.

EXTERNAL HORIZONTAL DEFLECTION (X-Y MODE) LBO-514

Input
Via CH-1 vertical input connector.

Deflection Coefficients
See vertical specifications.

Bandwidth (-3 dB, 10 cm)
dc–800 kHz.

Rise Time
440 ns.

Phase Shift
< 3° at 100 kHz.

TRIGGERING

Sources
Internal CH-1.
Internal CH-2 (LBO-514 only).
External.

Modes
Auto (≥50 Hz).
Normal.

Coupling
Normal or TV (automatic selection of line or frame filtering by position of TIME/CM control).

Slope
+ or −.

Sensitivity
Internal: 1 cm.
External: 200 mV p-p.

External Input
Impedance: 100 kΩ, 50 pF.
Maximum Level: 100 V (dc plus ac peak).

Z-AXIS (INTENSITY) MODULATION

Input Level
TTL compatible.

Maximum Input
50 V p-p.

INTERNAL CALIBRATOR

Output Level
0.5 V p-p, ± 3%.

Waveshape
Square wave, 1 kHz.

CRT DISPLAY

Phosphor
P 31 (P7 optional)

Graticule
External (internal on LBO-514P), 8 x 10 cm with rise-time calibration.

Accelerating Potential
1.8 kV (5.8/1.8 kV on LBO-514P).

Trace Alignment
Front panel trace rotation control.

POWER REQUIREMENTS

115/230 Vac ± 13%, 50 to 60 Hz, 33 VA.

PHYSICAL

Size (W x H x D)
11⅜ x 6⅞ x 14¾ in.
290 x 160 x 375 mm.

Weight
12 lbs, 5.5 kg.

ENVIRONMENTAL

Temperature (Operating)
0 to 40° C.

Vibration
2 mm p-p displacement at 12 to 33 Hz.

Shock
30 g.

SUPPLIED ACCESSORIES

Instruction Manual
Type LP-16AX switchable X1/X10 Probes (two with LBO-514, one with LBO-513).

AVAILABLE ACCESSORIES

(See pages 16 & 17)
LP-2004 Probe Pouch.
LC-2001 Protective Front Cover.
LRA-508 Rack Mount Adapter.

20-MHz Single and Dual Trace Oscilloscopes

- 5" CRT
- 18 Calibrated Sweep Speeds
- Add, Subtract Modes

LBO-507A

LBO-508A/508P

The single trace LBO-507A and the dual trace LBO-508A are both economical and versatile... proven performers for a wide range of lab and field work. Both oscilloscopes offer 17.5-nsec rise time, 18 calibrated sweep speeds and a full range of triggering options. The add and subtract modes of the dual trace LBO-508A permit differential, phase-shift, and similar measurements. Both have a 5-inch CRT with 8 x 10-cm graticule.

The model LBO-508P is available with a higher intensity CRT and internal graticule.

SPECIFICATIONS

VERTICAL DEFLECTION

Bandwidth (−3 dB, 4 cm)
dc: 0 Hz to 20 MHz.
ac: 2 Hz to 20 MHz.

Rise Time
17.5 ns.

Deflection Coefficients
10 mV/cm to 20 V/cm in 11 calibrated steps, 1-2-5 sequence, continuously variable between steps.

Accuracy
±3% (0-40°C).

Input Impedance
1 MΩ, 35 pF.

Maximum Input
600 V (dc plus ac peak).

Display Modes (LBO-508A only)
CH-1, CH-2, alternate (0.5 to 200 µs/cm), chop (0.5 to 200 ms/cm), chop frequency is 250 kHz nominal, add, subtract (CH-2 invert).

EXTERNAL HORIZONTAL DEFLECTION (X-Y MODE) LBO-507A

Input
Via external trigger connector.

Deflection Coefficients
200 mV/cm to 5 V/cm.

Bandwidth (−3 dB, 10 cm)
dc - 250 kHz.

Rise Time
1.4 ms.

EXTERNAL HORIZONTAL DEFLECTION (X-Y MODE) LBO-508A

Input
Via CH-1 input connector.

Deflection Coefficients
See vertical specifications.

Bandwidth (−3 dB, 10 cm)
dc - 800 kHz.

Rise Time
440 ns.

Phase Shift
<3° at 100 kHz.

INTERNAL HORIZONTAL DEFLECTION (SWEEP MODE)

Deflection Coefficients (Sweep Rates)
0.5 µs/cm to 200 ms/cm in 18 calibrated steps, 1-2-5 sequence, continuously variable between steps.

Magnifier
Times 5 magnifier extends maximum sweep rate to 100 ns/cm.

Accuracy
±3% (±5% with magnifier).

TRIGGERING

Sources
Internal CH-1, internal CH-2 (LBO-508A only), external.

Modes
Auto (≥50 Hz).
Normal.

Coupling
Normal or TV (automatic selection of line or frame filtering by position of TIME/CM control).

Slope
+ or −.

Sensitivity
Internal: 0.5 cm.
External: 100 mV p-p.

External Input
Impedance: 1 MΩ, 20 pF.
Maximum Level: 600 V (dc pulse ac peak).

Z-AXIS (INTENSITY) MODULATION

Input Level
TTL compatible.

Maximum Input
50 V p-p.

INTERNAL CALIBRATOR

Output Level
0.5 V p-p, ±3%.

Waveshape
Square wave, line frequency.

CRT DISPLAY

Phosphor
P 31 (P 7 optional)

Graticule
External (internal on LBO-508P), 8 x 10 cm with rise-time calibration.

Accelerating Potential
2 kV (6/2 kV on LBO-508P).

Trace Alignment
Front panel trace rotation control.

POWER REQUIREMENTS

115/230 Vac ±13%, 50 to 60 Hz, 32 VA.

PHYSICAL

Size (W x H x D)
11⅜ x 6⅞ x 14¾ in.
290 x 160 x 375 mm.

Weight
15 lbs, 7kg.

ENVIRONMENTAL

Temperature (Operating)
0-40°C.

Vibration
2 mm p-p displacement at 12 to 33 Hz.

Shock
30 g.

SUPPLIED ACCESSORIES

Instruction Manual.
Type LP-16AX switchable X1/X10 Probes (Two with LBO-508A/P, one with LBO-507A).

AVAILABLE ACCESSORIES

(See pages 16 & 17)
LP-2004 Probe Pouch.
LC-2001 Protective Front Cover.
LRA-508 Rack Mount Adapter.

20-MHz Dual Trace Portable Oscilloscope

- **Lightweight and Compact**
- **2 mV Sensitivity**
- **10 kV Accelerating Potential***
- **Internal Battery Pack****

LBO-308S/308PL

THE LBO-308S and 308PL deliver "lab performance" in a compact package that's perfect for field work. Its broad range of capabilities include 2-mV sensitivity, 17.5 ns rise time, X-Y operation with full sensitivity, and add/subtract modes not normally available in oscilloscopes of this size. It may be operated from either 115/230 Vac, 50-60 Hz, 12 Vdc or an optional 1.5-hour battery pack (LBO-308S only). The battery pack mounts internally and is automatically charged whenever the unit is connected to a source of ac power. The 3-inch rectangular CRT has an internal graticule. The LBO-308S and 308PL have 18 calibrated sweep rates with a X5 magnifier (0.1 μs/div. max) and calibrated 12-step attenuators. A rugged, compact scope with performance unsurpassed in its price range.

The model LBO-308PL offers a higher intensity CRT for viewing narrow pulses at low repetition rates and contains signal delay lines which permit viewing the leading edges of pulses.

NEW

*LBO-308PL model only.
**Optional on LBO-308S only.

SPECIFICATIONS

VERTICAL DEFLECTION

Bandwidth (-3 dB, 4 div)
dc: 0 Hz to 20 MHz.
ac: 2 Hz to 20 MHz.

Rise Time:
17.5 ns.

Deflection Coefficients
2 mV/div to 10 V/div in 12 calibrated steps, 1-2-5 sequence, continuously variable between steps.

Accuracy
± 3% (0-40° C).

Input Impedance
1 MΩ, 35 pF.

Maximum Input
600 V (dc plus ac peak).

Signal Delay (LBO-308PL only)
120 ns.

Display Modes
CH-1, CH-2, chop (0.2 S/div to 0.5 ms/div), alternate (0.2 ms/div to 0.5 μs/div), add, subtract (CH-2 invert).

EXTERNAL HORIZONTAL DEFLECTION (X-Y MODE)

Input
Via CH-1 vertical amplifier.

Bandwidth (-3 dB, 10 div)
dc: 0 Hz to 1 MHz.
ac: 2 Hz to 1 MHz.

Rise Time
350 ns.

Phase Shift
<3° at 100 kHz.

INTERNAL HORIZONTAL DEFELCTION (SWEEP MODE)

Deflection Coefficients (Sweep Rates)
0.5 μs/div to 0.2 s/div in 18 calibrated steps, 1-2-5 sequence continuously variable between steps.

Magnifier
Times 5 magnifier extends maximum sweep rate to 0.1 μs/div.

Accuracy
± 3% (5% with magnifier).

TRIGGERING

Sources
Internal CH-1 or CH-2.
External.

Modes
Auto (≥50 Hz).
Normal.

Coupling
Normal (ac).
HF REJ (Video frame rate filter).

Slope
+ or −.

Sensitivity
Internal: 1 div.
External, AUTO: 400 mV p-p.
External, Normal: 500 mV p-p.

External Input
Impedance: 100 kΩ, 47 pF.
Maximum Level: 600 V (dc plus ac peak).

Z-AXIS (INTENSITY) MODULATION

Input Level
TTL Compatible.

Maximum Input
50 V p-p.

INTERNAL CALIBRATOR

Output
0.1 V p-p ± 3%.

Wave Shape
Square wave, 1 kHz

CRT DISPLAY

Phosphor
P 31 (P7 optional)

Graticule
Internal 8 x 10 div (1 div=6 mm) with rise time calibration.

Accelerating Potential
1.5 kV (10 kV on LBO-308PL)

Trace Alignment
Front panel trace rotation control.

POWER REQUIREMENTS

100/117/200/217/234 Vac ± 13%, 50-400 Hz (normally supplied wired for 117 Vac) or 11 to 30 Vdc, 800 mA.

PHYSICAL

Size (W x H x D)
9 1/5 x 4 3/5 x 12 3/5 in.
233 x 118 x 320 mm.

Weight
Oscilloscope: 10.9 lbs, 5 kg.
Battery Pack: 1.8 lbs, 0.8 kg.

ENVIRONMENTAL

Temperature (Operating)
0-40° C.

Vibration
2 mm p-p displacement at 12 to 33 Hz.

Shock
30 g.

SUPPLIED ACCESSORIES

Instructional Manual.
Two (2) type LP-16AX switchable x1/x10 probes.
One (1) ac power cable.
One (1) viewing hood, LH-2008 (LBO-308S only)
One (1) dc power cable.

AVAILABLE ACCESSORIES

(See pages 16 & 17)

LC-2006 Protective Front Cover.
LC-2215 Carrying Case.
LP-2054 Battery Pack.(LBO-308S only)

General Purpose Oscilloscopes

4-MHz, 3-inch

The LBO-310A is a compact, general purpose instrument designed to provide long, reliable service in production test, repair, and educational applications. Its simple front panel with a minimum of controls makes it ideal for use by production personnel, students, and non-technical operators. Its low cost opens up many applications where waveform monitoring might otherwise be economically prohibitive. Sensitivity is 20 mV/division. Sweep frequencies range from 10 Hz to 100 kHz.

LBO-310A

SPECIFICATIONS

VERTICAL DEFLECTION

Bandwith (−3 dB, 4 div)
dc: 0 to 4 MHz.
ac: 2 Hz to 4 MHz.

Input Sensitivity Control
x100, x10, x1 and variable (20 mV max.)

Input Impedance
1 MΩ, 40 pF.

Maximum Input
600 V (dc plus ac peak).

Direct CRT Connection
10 V p-p sensitivity up to 100 MHz.

EXTERNAL HORIZONTAL DEFLECTION

Bandwidth (−3 dB, 10 div).
dc to 250 kHz.

Input Sensitivity
300 mV/div.

Maximum Input
30 V (dc plus ac peak).

INTERNAL HORIZONTAL DEFLECTION (Sweep Mode)

Type Sweep
Recurrent.

Sweep Rates
10 Hz to 100 kHz four ranges.

Synchronization
Source: Negative peak of input signal.
Sensitivity: 1 div.

Z-AXIS (INTENSITY) MODULATION

Sensitivity
20 V p-p.

CRT DISPLAY

Area
6 x 8 div, 1 div = 6 mm.

Accelerating Potential
1200 V.

Phosphor
P 31.

POWER REQUIREMENTS
100, 115, or 230 Vac, 50 to 60 Hz, 12 VA (normally supplied wired for 115 Vac).

PHYSICAL

Size (W x H x D)
5 x 7½ x 12 in.
125 x 180 x 300 mm.

Weight
9.9 lbs., 4.5 kg.

ACCESSORIES SUPPLIED
Instruction Manual.
Three (3) test Leads.

10-MHz, 5-inch

LBO-511

The LBO-511 is an economical, general-purpose oscilloscope. Ideal for basic electronics courses, it is also widely used in industry and for TV servicing. Features include: a 9-step calibrated vertical input, 10 Hz to 100 KHz sweep frequencies (plus TV-H and TV-V), 2-axis, internal calibration signal, and inputs for color TV vector display.

SPECIFICATIONS

VERTICAL DEFLECTION

Bandwidth (−3 dB)
dc: 0 to 10 MHz.
ac: 2 Hz to 10 MHz.

Rise Time
35 nsec.

Sensitivity
20 mV/cm to 10 V/cm ± 5%, 9 steps

Input Impedance
1 MΩ, 40 pF.

Maximum Input
600 V (dc plus ac peak).

EXTERNAL HORIZONTAL DEFLECTION (X-Y MODE)

Bandwidth (−3 dB)
dc to 250 kHz.

Sensitivity
300 mV/cm.

INTERNAL HORIZONTAL DEFLECTION (SWEEP MODE)

Type Sweep
Recurrent.

Sweep Rate
Int: 10 Hz to 100 kHz in 4 ranges.
TV line: 15.75 kHz/2 for TV-H display.
Line: Line frequency with 0-140° phase adjustment.

Synchronization
Sources: Internal positive and negative slope, external and line frequency.
Sensitivity: 1 cm internal, 1 V pp external.

VECTORSCOPE OPERATION

Input Terminals
R-Y and B-Y signals on rear panel.

Z-AXIS (INTENSITY) MODULATION

Sensitivity
20 V p-p.

CRT DISPLAY

Area
8 x 10 cm.

Accelerating Voltage
1500 V.

Phosphor
P 31.

POWER REQUIREMENTS
100, 115, 200, 215, 230 Vac, 50 to 60 Hz, 16 VA (normally supplied wired for 115 Vac).

PHYSICAL

Size (W x H x D)
9¾ x 7⅛ x 16⅜ in.
250 x 180 x 415 mm.

Weight
15.5 lbs., 7 kg.

ACCESSORIES SUPPLIED
Instruction Manual.
LP-16AX Probe (Switchable x1/x10).
Three (3) Test leads.

Swept Frequency Response Displays

- 200 μV/div. Sensitivity
- Large 100x140 mm Display

The Single Trace Display LBO-801 and Dual Trace Display LBO-802 provide convenient, accurate methods to obtain response curves in swept frequency measurement systems. They offer more versatility and a larger display than is possible with conventional oscilloscopes. Vertical sensitivities of 200 μV/DIV to 0.5 V/DIV are possible in 11 calibrated steps permitting direct connection to RF/microwave detector outputs. Horizontal sensitivity is adjustable from 20 mV/DIV to 20 V/DIV with reversible polarity for direct compatibility with virtually any sweep generator/detector combination. The high input impedance and 300 kHz bandwidth of both vertical and horizontal inputs clearly displays the fine detail in response curves. An external marker input permits superimposing frequency markers on the response curve(s) and a Z-axis input provides for intensity modulation of the display. A vertical clamping function fixes the position of the response curve's base line on the display independent of the curve's shape and/or DC component. The LBO-802 Dual Trace model accomplishes channel switching either on alternate sweeps, at a chop frequency of 2.5 kHz or with an external switching signal.

SPECIFICATIONS

CRT DISPLAY

NEW

Model
C8S30P1

Acceleration Voltage
4.5 kV/1.5 kV.

Effective Display Area
10 x 14 DIV (1 DIV = 10 mm).

VERTICAL AXIS

Sensitivity
200 μV/DIV-0.5 V/DIV; 11 calibrated steps; 1-2-5 sequence. VARIABLE control with detented calibrate position provides deflection factors between settings.

Deflection Accuracy
± 5%.

Bandwidth
DC: DC-300 kHz (−3 dB).
AC: 2 Hz-300 kHz (−3 dB).

Input Impedance
1 MΩ, 70 pF.

Input Coupling
AC-GND-DC.

Maximum Allowable Input Voltage
100 V (DC + AC peak).

Input Terminal
BNC Connector.

Polarity Inversion
Switchable.

DC Clamping
Available with ON-OFF switch. Clamping time can be set in synchronization with horizontal input signal or external signal (square wave of over 5 V p-p) with positive or negative setting of a switch.

HORIZONTAL AXIS

Sensitivity
20 mV/DIV minimum.

Attenuation
3 steps; 1/1, 1/10 and 1/100. Uncalibrated VARIABLE control (at 1/10) provides deflection continuously variable up to 20 V/DIV.

LBO-802 X-Y Amplification
The LBO-802 also permits using one amplifier channel to drive the X-axis. In this case, the specifications for the Horizontal Axis are identical to those for the Vertical Axis.

Bandwidth
DC: DC-300 kHz (−3 dB).
AC: 2 Hz-300 kHz (−3 dB).

Input Impedance
500 kΩ.

Input Coupling
AC-GND-DC.

Maximum Allowable Input Voltage
100 V (DC + AC peak).

Input Terminal
BNC connector.

Polarity Inversion
Switchable.

Z-AXIS (Intensity Modulation Terminal)

Sensitivity
3 V p-p minimum, continuously variable.

Polarity Inversion
Switchable.

Input Impedance
50 kΩ.

Input Terminal
BNC Connector.

EXTERNAL MARKER INPUT

Sensitivity
100 mV/DIV minimum.

Attenuation
Continuously variable to zero.

Polarity Inversion
Switchable.

Bandwidth
DC-300 kHz.

Input Impedance
50 kΩ.

Input Terminal
BNC Connector.

CALIBRATOR

Waveform
Approximately 1 kHz square wave.

Voltage
10 mV ± 3%.

OTHER

Power Supply
117 V ± 10%, 50/60 Hz.
100 V, 200 V, 217 V, or 234 V available by changing the tap wiring of the transformer.

Power Consumption
Approximately 30 W.

Size
300 (W) x 200 (H) x 400 (D) mm.

Weight
Approximately 8.5 kg.

LBO-51M X-Y Display Module

- 100 mV/cm X and Y Sensitivity
- 3 MHz X and Y Bandwidth
- 4 MHz Z-Axis Bandwidth

The LBO-51M is an X-Y CRT display designed primarily for use in OEM applications.

Its 7.6 x 9.5 cm display area is equipped with a removable graticule which may be imprinted with the user's graphics. The combination of 3 MHz bandwidth on the X and Y axis and 4 MHz on the Z-axis (intensity modulation) permits using the LBO-51M in a wide variety of waveform, response curve or alpha-numeric display applications. Phase shift between X and Y-axis is less than 3° at 1 MHz and deflection accuracy is ± 3% on both axes.

The standard sensitivity value of 100 mV per cm for both axes is adjustable over a ± 50% range. Either AC or DC input coupling may be set by internal switches. The Z-axis input is TTL compatible.

The LBO-51M in its standard configuration is supplied with front panel controls for power, illumination, intensity, focus and horizontal and vertical position. Screwdriver adjustments are provided for vertical and horizontal gain, astigmatization and trace rotation. Special configurations are available for use with user-supplied controls, with special graticules internally etched on the CRT, special P7 phosphors and other modifications to accommodate particular user requirements. Contact Leader Instruments Corp., Applications Engineering, for details.

SPECIFICATIONS

CRT

Display Area
7.6 cm x 9.5 cm

Spot Size
0.26mm at 0.5 μA beam current.

Brightness
25 fL measured with 100 line raster and 60 Hz refresh rate.

Phosphor
P31 (other phosphors optional).

Accelerating Voltages
6 kV/2 kV.

V-H DEFLECTION

Bandwidth
DC to 3 MHz, (−3 dB at 5 div deflection).

Coupling
DC or AC (Internal Switch).

Phase Shift
<3° at 1 MHz.

Sensitivity
100 mV/div, adjustable ± 50%.

Linearity
Within 5%.

Input Impedance
1 mΩ, <60 pF (provisions are provided for internal terminating resistor).

Maximum Input Voltage
100 V (DC + AC peak).

Rise Time
<120 nS.

Z-AXIS

Bandwidth
DC to 4 MHz.

Blanking Threshold
TTL (± 5 V).

Blanking Polarity
Switchable.

Input Impedance
1 MΩ, <50 pF.

Maximum Input Voltage
100 V (DC + AC peak).

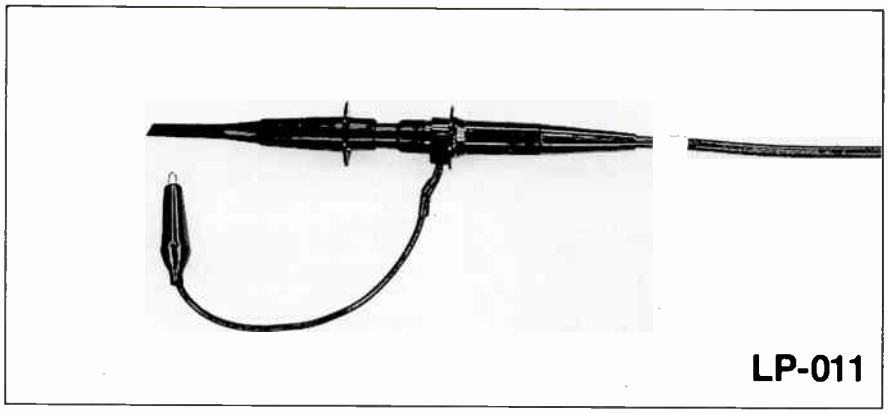
Rise Time
<90 nS.

Power Supply
50/60 Hz, 100/117/220/240 V.

Size
215 (W) x 132 (H) x 425 (D) mm
8.5" x 5 1/5" x 16¾".

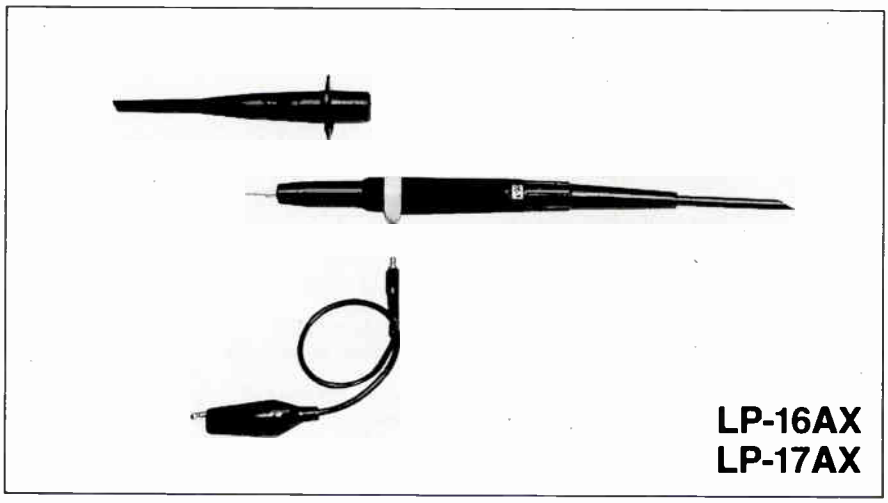
NEW

Oscilloscope Accessories



LP-011

High Impedance 50 MHz, x10 Probe



LP-16AX
LP-17AX

Direct/Low Capacitance 40 MHz Probe

High Impedance 40 MHz Probe (x10/x100)

SPECIFICATIONS
LP-011

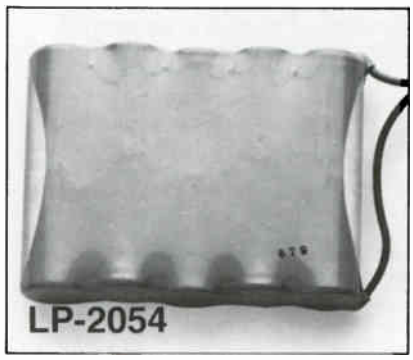
Attenuation
1/10 ± 2% (into 1 MΩ)
Frequency Range
dc-50 MHz
Input Resistance
10 MΩ (connected to oscilloscope of 1 MΩ input)
Input Capacitance
12 pF ± 10%
Compensation Range
20-35 pF.
Maximum Input
600 Vdc
Cable Length
4'9" (1.47m)

SPECIFICATIONS
LP-16AX

AT X10 POSITION
Attenuation
1/10 ± 2%
Frequency range
dc – 40 MHz.
Input resistance
10 MΩ (Connected to oscilloscope of 1 MΩ input).
Maximum input
250 VRMS or 600 Vdc.
Compensation range
20 to 40 pF.
AT X1 POSITION
Frequency range
DC – 5 MHz.
Input resistance
1 MΩ (Connected to oscilloscope of 1 MΩ input).
Input capacity
Less than 250 pF (Connected to oscilloscope of less than 50 pF).
Maximum input
250 VRMS or 600 Vdc.
Connector
BNC.
Cable Length
4'9" (1.47m)

SPECIFICATIONS
LP-17AX

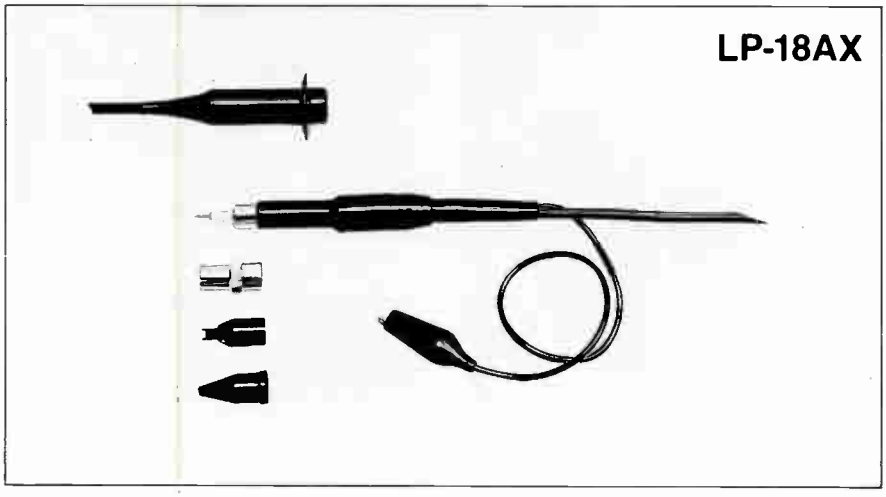
X10 POSITION
Attenuation
1/10 ±2%.
Frequency Range
dc – 40 MHz.
Input Resistance
10 MΩ.
Input Capacitance
Less than 25 pF.
Compensation Range
20-40 pF.
Max. Input
600 Vdc.
Connector
BNC.
X100 POSITION
Attenuation
1/100 ±3%.
Frequency Range
dc – 20 MHz.
Input Resistance
100 MΩ.
Input Capacitance
Less than 8 pF.
Compensation Range
20-40 pF.
Max. Input
1500 Vdc.
Cable Length
4'9" (1.47m)



LP-2054

Battery Pack

Type LP-2054 mounts internally in LBO-308S oscilloscope to provide a minimum of 1.5 hours operation. Unit recharges whenever oscilloscope is connected to ac power; cannot be overcharged. Ni-cad battery pack is easily installed by user.



100 MHz, x10 Probe

SPECIFICATIONS

LP-18AX

Bandwidth
100 MHz.

Rise Time
3.5 ns.

Input Resistance
10 MΩ when used with oscilloscopes with 1 MΩ input (Probe resistance 9 MΩ ±1%).

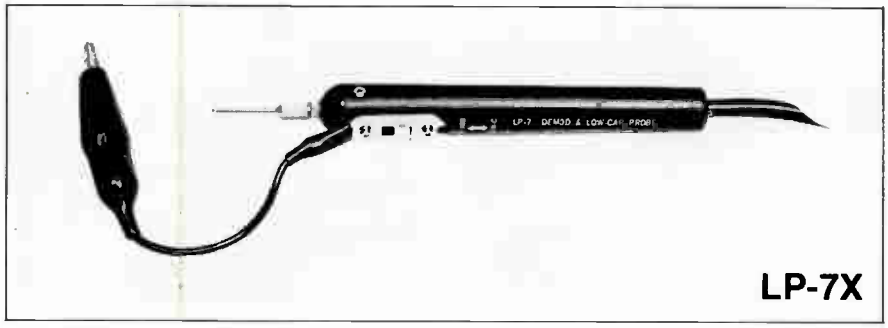
Compensation Range
10-60 pF.

Working Voltage
600 Volts dc (including Peak ac).

Cable Length
1.5 Meters.

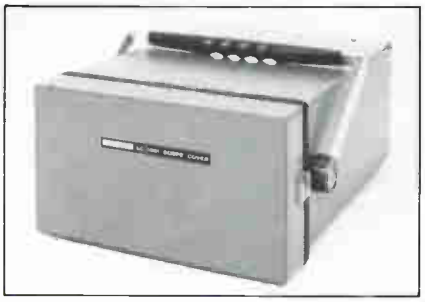
Includes
Insulating tip, spring hook, trimmer tool, BNC adaptor, I.C. tip.

Cable Length
5'1" (1.55m)

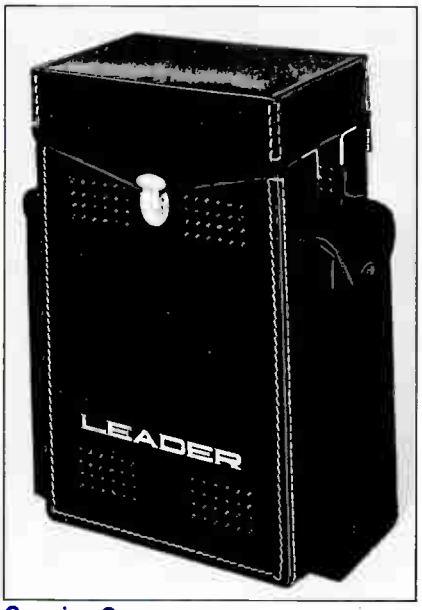


Demodulator & Low Capacitance Probe

The LP-7X demodulator and low capacitance probe is a 10:1 switchable, dual-purpose probe designed for maximum utility. Includes an RF detection circuit and a low-capacitance 10:1 multiplier. Useful for checking sweep oscillator outputs, IF response, etc. BNC connector.

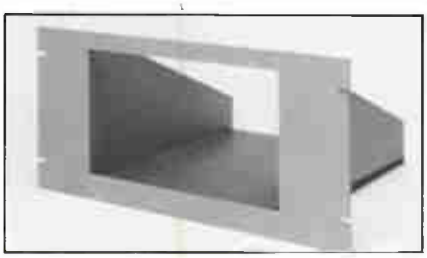


Front-Panel Covers
Type LC-2001 for models LBO- 507A, 508A, 513, 514 and 520.
Type LC-2002 for model LBO-515B.
Type LC-2003 for model LBO-308S and PL.
Type LC-2009 for model LBO-517.



Carrying Cases
Type LC-2215 for model LBO-308S and PL.

Probe Pouches
Type LP-2004 for models LBO-507A, 508A, 513 and 514.
Type LP-2005 for model LBO-515B.
Type LP-2003 for model LBO-520.
Type LP-2010 for model LBO-517.



Rack-mount Adaptors
Type LRA-508 for models LBO-507A, 508A, 513, 514, and 520.
Type LRA-515 for model LBO-515B.
Type LRA-517 for LBO-517.

80, 250, and 520-MHz Frequency Counters

- Well Shielded Metal Housing
- Large Fluorescent Display
- 20 mV Sensitivity
- 0.03 ppm Stability*

The LDC-822 (80 MHz), LDC-823S (250 MHz) and LDC-824S (520 MHz) provide accurate, reliable, frequency and period measurements for a wide variety of electronic and communications testing.

Large flourescent displays make these units particularly well suited to production testing and other applications where a large, bright readout is essential.

All three units are housed in well shielded metal cases which virtually eliminate radiation problems and errors from nearby RF fields.

The LDC-822 provides 20-mV sensitivity up to 80 MHz and 5 ppm stability from 0 to 40°C. The LDC-823S and LDC-824S offer 20 mV sensitivity up to 100 MHz and 50 mV above 100 MHz. Temperature stability of 1 ppm is provided by a TCXO time base in the 250 MHz and 520 MHz models (an ovenized time base with 0.03 ppm stability is available as an option).

SPECIFICATIONS

LDC-822

FREQUENCY MEASUREMENTS

Range
10 Hz-80 MHz.

Gate Time
0.1, 1, 10 s.

Resolution
10, 1, 0.1 Hz.

Accuracy
± 1 count,
± time base accuracy.

PERIOD MEASUREMENT

Range (X1)
100 ms to 1 µs.

Multiplication Factors
Times 10, 100 and 1,000.

Resolution
10, 1, 0.1 ns.

Accuracy
± 1 count,
± time base accuracy,
± trigger error ÷ mult. factor.

INPUT SECTION

Sensitivity
20 mVrms.

Attenuator
Times 1, 10, and 100.

Coupling
ac.

Impedance
1 MΩ nominal.

Maximum Input
10 to 400 Hz; 100 Vrms.
400 Hz to 100 kHz; 20 Vrms.
100 kHz to 80 MHz; 5 Vrms.

TIME BASE

Frequency
10 MHz.

Temp. Stability (0–40°C)
5 ppm.

Aging Rate
1 ppm/yr.

GENERAL

Display
7 digits, 0.5" Fluorescent.

Operating Temperature
0–40°C (32–104°F).

Power
110/220 Vac, ± 10%
50/60 Hz; 10VA.

PHYSICAL

Size (W x H x D).
8 x 3 x 10 in.
203 x 76 x 254 mm.

Weight
5 lbs, 2.3 kg.

LDC-823S
250 MHz

LDC-824S
520 MHz

LDC-823S and LDC-824S

FREQUENCY MEASUREMENTS

Range
LDC-823S: 10 Hz-250 MHz.
LDC-824S: 10 Hz-520 MHz.

Gate Time
0.1, 1, 10 s.

Direct Resolution (up to 80 MHz)
10, 1, 0.1 Hz.

Prescaled Resolution
100, 10, 1 Hz.

Accuracy
±1 count,
± time base accuracy.

PERIOD MEASUREMENT

Range
100 ms to 1 µs.

Multiplication Factors
Times 10, 100 and 1,000.

Resolution
10, 1, 0.1 ns.

Accuracy
± 1 count,
± time base accuracy,
± trigger error ÷ mult. factor.

INPUT SECTION

Sensitivity
20 mV (50 mV above 100 MHz)

Attenuator
Times 1 and 10.

Coupling
ac.

Impedance
1 MΩ or 50 Ω switchable.

Maximum Input
10 to 400 Hz; 100 Vrms.
400 Hz to 100 kHz; 20 Vrm.
100 kHz to 520 MHz; 5 Vrms.

TIME BASE

Frequency
10 MHz.

Temp. Stability (0–40°C)
1 ppm (0.03 ppm optional*)

Aging Rate
1ppm/yr.

Output
1 Vp-p, 10 MHz.

External Input
1 to 10 Vp-p.

GENERAL

Display
8 digits, 0.5" Flourescent.

Operating Temperature
0–40°C (32–104°F).

Power
110/220 Vac, ± 10%
50/60 Hz; 10 VA.

PHYSICAL

Size (W x H x D)
8 x 3 x 10 in.
203 x 76 x 254 mm.

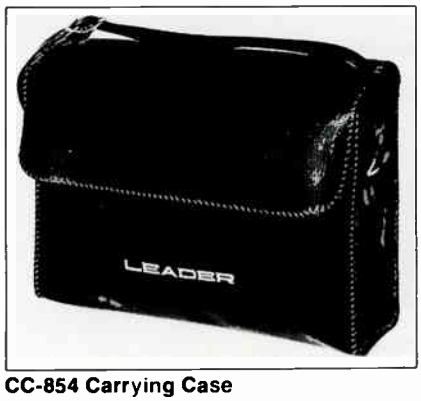
Weight
6 lbs, 2.6 kg.

*LDC-823S-01 and LDC-824S-01 available with optional ovenized time base with 0.03 ppm stability (0–40°C)

3½ Digit True RMS Digital Multimeter

- True RMS AC Measurements
- LCD Readout
- 20 kHz Bandwidth

LDM-854



CC-854 Carrying Case

The LDM-854 is a 3½ Digit, compact Digital Multimeter featuring a wide range of measurement capabilities including True RMS AC measurements to 20 kHz. The unit's rugged construction and battery operation ensure complete portability, making it ideal for both field service and laboratory applications.

Push button controls allow the selection of five AC and DC voltage ranges, six resistance ranges and five alternating and direct current ranges.

Resolutions of 100 µV for ac and dc voltage, 100 nA for ac and dc current and 0.1 Ω for resistance measurements allow using the LDM-854 in applications where very small changes must be observed. Its simple operation and human-engineered front panel permit its use in production environments where ease of operation is a major consideration.

The LDM-854 features include True RMS AC voltage and current measurements with automatic zeroing and an automatic polarity indicator. The 0.5 inch LCD display provides a clear readable display which incorporates a "LO BAT" warning indicator. Available accessories include the LPS-854 AC Adapter, the LP-6 High Voltage Probe and the CC-854 Carrying Case.

NEW

SPECIFICATIONS

DC Voltage
Ranges: 200 mV, 2, 20, 200, 1000 V.
Accuracy: ± 0.2% of reading ± 1 digit.
Input Impedance: 10 MΩ, 100 pF.
Maximum Input: 1000 V (DC).

AC Voltage (all measurements are True RMS)
Ranges: 200 mV, 2, 20, 200, 750 V rms.
Accuracy: 20 Hz – 40 Hz: ± 1% rdg ± 3 digits.
40 Hz–1 kHz: ± 0.5% rdg ± 3 digits.
1 kHz–10 kHz: ± 1.5% rdg ± 3 digits.
10 kHz–20 kHz: ± 5% rdg ± 3 digits.
Crest Factor Range: 1:1 to 3:1 (3:1 to 10:1 add ± 2.5% error).
Input Impedance: 10 MΩ, 100 pF.
Maximum Input: 750 Vrms.

DC Current
Ranges: 200 µA, 2, 200, 2000 mA.
Accuracy: ± 0.5% of reading ± 2 digits except ± 1% of reading ± 2 digits on 2000 mA range.
Overload Protection: 2 A slow-blow fuse.

AC Current
Ranges: 200 µA, 2, 200, 2000 mA rms.
Accuracy: 20 Hz – 40 Hz: ± 1% rdg ± 3 digits.
40 Hz–1 kHz: ± 0.5% rdg ± 3 digits.
1 kHz–10 kHz: ± 1.5% rdg ± 3 digits.
10 kHz–20 kHz: ± 5% rdg ± 3 digits.
Crest Factor Range: 1:1 to 3:1 (3:1 to 10:1 add 2.5% error).
Overload Protection: 2 A slow-blow fuse.

Resistance
Ranges: 200Ω, 2, 20, 2000 kΩ, 20 MΩ.
Accuracy: ± 0.25% of reading ± 2 digits except ± 0.75% of reading ± 2 digits on 20 MΩ range.
Maximum Input Voltage: 250 Vrms or 250 Vdc.

Display
Type: 0.5 in., 7 segment LCD, 1999 max.
Polarity: – indicates reverse polarity.
Over Range: Flashing "1" in most significant digit position. All others blanked.
Low Battery: "LO BAT" will be directly displayed.

Power Requirements
Battery: One 9 volt cell.
AC: 117 Vac, 50-60 Hz (with optional adapter).

Environmental
Storage Temperature: –20°C to +60°C.
Operating Temperature: 18 to 28°C.
Maximum Continuous Humidity: 80% relative humidity.

PHYSICAL

Size (W x H x D).
6⅛ x 2¼ x 4⅞ in.
160 x 58 x 122 mm.

Weight
1.1 lbs., 0.5 kg.

SUPPLIED ACCESSORIES

Instruction Manual.
Test Lead Set.
One 9 V Battery.

3½ Digit Digital Multimeter

- **Audible Tone Indication**
- **Automatic Ranging**
- **Semi-Automatic Zeroing**

LDM-855

The LDM-855 is a general purpose 3½ Digit Multimeter that is ideally suited for both lab and field work. Automatic ranging, semi-automatic zeroing and large LCD display allow straightforward hands-free operation.

A momentary audible tone is sounded when manual range or function selection controls have been changed. In the resistance mode, the tone will be sounded continuously when the meter senses a short. This feature is particularly useful for applications where a large number of continuity checks must be made.

Other features include an automatic polarity indicator, ac and dc current measurement functions, a LOΩ function to provide a lower test voltage and a low battery warning which is incorporated into the LCD display.

NEW

SPECIFICATIONS

DC Voltage
Range: 0.1 mV to 1000 V.
Accuracy: 0.2 V range to 200 V range ± 0.5% rdg. ± 0.2% full scale. 1000 V range ± 0.8% rdg. ± 0.2% f.s.
Input Impedance: 10 MΩ
Overload Protection: 1000. V dc & ac peak.

AC Voltage
Range: 1 mV to 1000 V.
Accuracy:

Range	40 to 500 Hz	.500 to 1.0 kHz
2 V	± 1% rdg. ± 0.4% f.s.	± 1.5% rdg. ± 0.4% f.s.
20 V 200 V	± 1% rdg. ± 0.25% f.s.	± 1% rdg. ± 0.25% f.s.
1000 V	± 1.5% rdg. ± 0.25% f.s.	—

Input Impedance: 10 MΩ.
Overload Protection: 1000 V rms.

DC Current
Range: 10 uA to 200 mA.
Accuracy: ±1% rdg. ± 0.2% f.s.
Overload Protection: .3A.

AC Current
Range: 10 uA to 200 mA.
Accuracy: ± 1.3% rdg./± 0.25% f.s.
Overload Protection: .3A.

Resistance
Range: 0.1 Ω to 2000 kΩ.
Accuracy: ± 0.5% rdg. ± 0.2% f.s. except 2000 kΩ range ± 1.5% ± 1.5% rdg. ± 0.25% f.s.
Overload Protection: 250 Vrms or 250 VDC.

Display
Type: ⅜ in., 7 segment LCD, 1999 max.
Polarity: – indicates reverse polarity.
Over Range: Flashing "1" in most significant digit position, all others "0".
Low Battery: "BATT" will be directly displayed.

Power Requirements
Battery: Two "C" cells.

Environmental
Storage Temperature: – 20°C to +60°C.
Operating Temperature: 0 to 40°C.
Max. Continuous Humidity: 80% relative humidity.

PHYSICAL

Size: (W x H x D)
6⅛ x 2¼ x 4⅞ in.
160 x 58 x 122 mm.

Weight:
1.1 lbs., 0.5 Kg.

SUPPLIED ACCESSORIES

Instruction Manual.
Test Lead Set.
Two "C" Battery Cells.

FET Lab Multimeter

- 10 MΩ Input Impedance
- AC, DC Voltage from 30 mV
- AC, DC Current from 30 μA

LEM-73A

The LEM-73A is a sensitive, versatile electronic multimeter for general purpose laboratory applications. Its high input resistance permits measuring high impedance circuits with minimum loading. Dc and ac voltages can be measured from 30 mV to 1,000 V; dc and ac currents from 30 μA to 300 mA. Resistance, using either high (1.5 V) or low (100 mV) test voltages may be measured from 0.2 Ω to 500 MΩ. DB scales are also provided for sound level measurements in 600 Ω audio systems. Ac operated.

SPECIFICATIONS

DC Voltage
Ranges: 0-0.3, 1, 3, 10, 30, 100, 300, 1,000 Vdc.
Accuracy: ± 3% full scale.
Input Resistance: 10 MΩ.

AC Voltage
Ranges: 0-0.3, 1, 3, 10, 30, 100, 300, 1,000 Vac.
Accuracy: ± 4% full scale.
Input Resistance: 10 MΩ.
Frequency Range: 0.3 V ranges, 25 Hz to 1 MHz, ± 0.5 db; to 1,000 V ranges, 25 Hz to 3 MHz, ± 1 dB.
dB Calibration: −15 to +2 dBm, 0 dB = 1 mw/600 ohms.

DC Current
Ranges: 0.03, 0.1, 0.3, 1, 3, 10, 30, 100, 300 mA.
Accuracy: ± 3% full scale.
Insertion loss: 0.3 V at full scale.

AC Current
Ranges: 0.03, 0.1, 0.3, 1, 3, 10, 30, 100, 300 mA.
Accuracy: ± 4% full scale.
Insertion loss: 0.3 V at full scale.
Frequency range: 40 to 400 Hz.

Resistance
Ranges: 0 to 10 Ω, 100 Ω, 1 KΩ, 10 KΩ, 1 MΩ, 10 MΩ midscale.
Test Voltage: 100 mV or 1.5 V selectable.
Accuracy: ± 3% of arc length.

POWER REQUIREMENTS
ac: 100, 117, 200, 217, 234 Vac ± 10% 50 to 60 Hz (normally supplied for 117 Vac).
Battery: One (1) "C" cell (not supplied).

PHYSICAL
Size (W x H x D)
5⅞ x 6⅞ x 5 in.
150 x 175 x 125 mm.

Weight
1.5 lbs, 0.7 kg.

ACCESSORIES SUPPLIED
Instruction Manual.
One (1) LP-13 Test Probe.

High-Voltage Meter/ Probe

LHM-80A

The LHM-80A permits easy and safe measurement of voltages up to 40,000 Vdc. It is widely used for checking CRT accelerating voltages, testing and servicing X-ray machines, and other high voltage equipment. Completely self-contained (no batteries or external power required), it is made of high-impact polystyrene with a special corona safety shield. Full-scale accuracy is ± 3%. It is supplied with ground wire and heavy-duty cap.

SPECIFICATIONS

Range
0 to 40 kV.

Accuracy
± 3% full scale.

Input Impedance
20,000 Ohms/Volt.

Multiplier Resistance
800 MΩ.

Material
High impact polystyrene.

Length
14 in, 356 mm.

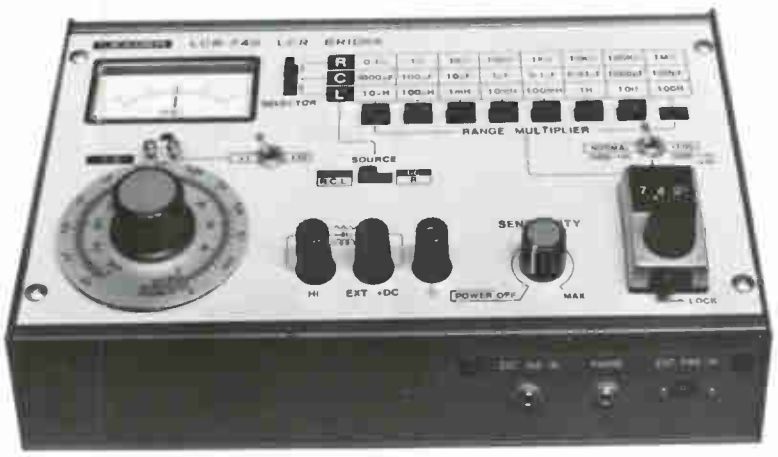
Weight
1 lb, 0.45 kg.

LCR-740 LCR Bridge

- 0.5% Basic Accuracy
- 0.1 μH, 1 pF, 0.001 Ω Resolutions

Terminating RF Power Meter

- 500 MHz
- 120 Watts



LCR-740

LPM-880

The LCR-740 is a versatile instrument for accurately measuring inductance, capacitance, resistance, and loss factor of electronic components. This compact unit provides a basic accuracy of 0.5% and resolutions of 0.1 μH, 1 pF or 0.001 Ω. Its broad measurement ranges make it ideal for use in component design, inspection and selection. It has also found wide use in educational institutions as an aid to teaching the characteristics of inductive, capacitive and resistive components.

SPECIFICATIONS

INDUCTANCE MEASUREMENTS

Range
0.1 μH to 1,100 H in 8 ranges with 10% overlap between ranges.

Resolution
0.1 μH.

Accuracy (15 to 25°C)
100 μH to 10 H: ± 0.5% reading, ± 0.1% full scale.
10 H to 100 H: ± 1% reading, ± 0.1% full scale.
0.1 μH to 10 μH: ± 3% reading, ± 0.1% full scale.

Residual Inductance
0.3 μH max.

CAPACITANCE MEASUREMENTS

Range
1 pF to 11,000 μF in 8 ranges with 10% overlap between ranges.

Resolution
1 pF.

Accuracy (15 to 25°C)
100 pF to 100 μF: ± 0.5% reading, ± 0.1% full scale.
10 pF to 100 pF: ± 1% reading, ± 0.1% full scale.
100 μF to 1,000 μF: ± 3% reading, ± 0.1% full scale.

Residual Capacitance
3 pF max.

DISSIPATION (D) AND QUALITY (Q) FACTOR MEASUREMENTS

Range
0.01 to 30 at 1 kHz in 2 ranges.

Accuracy
± 10% ± 3 scale divisions.

RESISTANCE MEASUREMENTS

Range
0.001 Ω to 11 MΩ in 8 ranges with 10% overlap between ranges

Resolution
0.001 Ω.

Accuracy 15 to 25°C
0.1 Ω to 100 kΩ: ± 0.5% reading, ± 0.1% full scale.
100 kΩ to 1 MΩ: ± 1% reading, ± 0.1% full scale.
0.001 to 0.1 Ω: ± 2% reading, ± 0.1% full scale.

Residual Resistance
0.003 Ω max.

MEASUREMENT SIGNAL SOURCES

dc
Internal or external for resistance measurements.

ac
Internal 1 kHz or external 50 Hz to 40 kHz for inductance and capacitance measurements.

POWER REQUIREMENTS

Internal 9 V battery (supplied).
Ac Adapter (optional).

PHYSICAL

Size (W x H x D)
9½ x 3⅜ x 6⅝ in.
240 x 85 x 170 mm.

Weight
4.5 lbs, 2kg.

Accessories Supplied
Instruction Manual.
Cable for external input.
Miniature earphone (for null detecting).
9 V transistor battery.

Accessories Available
Type LPS-169A ac Adapter.

The LPM-880 provides accurate power measurements of transmitters with 50-ohm outputs. Connected as a dummy load, it is widely used in production-line testing and servicing of mobile, marine VHF-FM radiotelephones, VHF and UHF aircraft transceivers... virtually all types of fixed and mobile transceivers up to 500 MHz. Push-button ranges of 5, 20, and 120 watts are provided. Full-scale accuracy is ± 10%.

SPECIFICATIONS

Frequency Range
1.8-500 MHz.

Load Impedance
50 Ω.

VSWR
1.15:1 max.

Power Range
0 to 5, 20, and 120 W full scale (continuous up to 80 W, max., 1 min above 80 W).

Accuracy
± 10% full scale.

Input Connector
Type M (UHF).

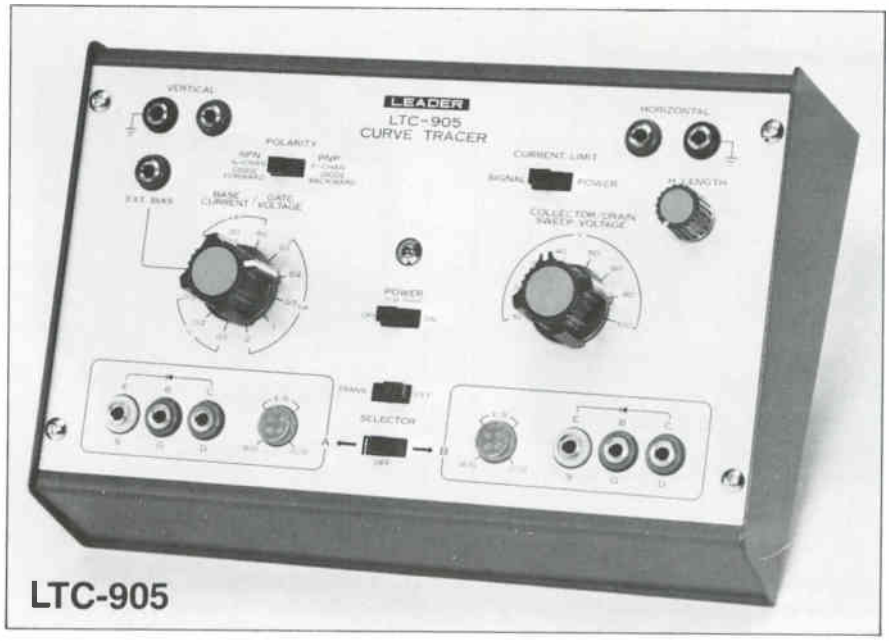
Size (W x H x D)
4.7 x 5 x 9 in.
112 x 150 x 230 mm.

Weight
4 lbs., 1.8 kg.

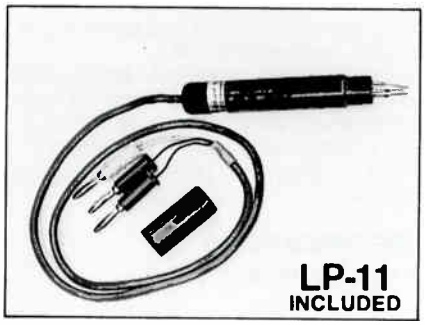
Accessories Supplied
Instruction Manual.

Semiconductor Curve Tracer

- **Tests NPN, PNP, FET's, MOSFET's etc.**
- **Measures Gain, Cut-off, Leakage, Admittance**



LTC-905



The LP-11 Three-Point Probe permits convenient, one-handed connection to transistors installed on printed circuit boards. The probe is equipped with three flexible, spring loaded, pointed tips which are easily manipulated for simultaneous connection transistor leads.

The LTC-905 permits displaying the characteristic curves of all types of semiconductors (NPN, PNP, triacs, SCR's, FET's, MOSFET's, zener, signal, and rectifier diodes, etc.) on virtually any oscilloscope. Used in labs, classrooms, and for production-line testing, the LTC-905 will measure (both in-and out-of-circuit) gain (beta), cutoff, leakage, and output admittance. The LTC-905 provides 8 selectable collector sweep voltages from 10 to 100 Volts along with a full set of step-generator currents and voltages.

SPECIFICATIONS

COLLECTOR/SWEEP

Sweep Frequency
120 Hz.

Sweep Waveform
Full wave rectified waveform.

Sweep Voltages
10, 20, 30, 40, 50, 60, 80, and 100 V selectable in 8 steps, ± 10%.

Current
100 mA maximum.

Step Polarity
+ or −.

Dissipation Limiting Resistor
Small-signal devices - 1,000 Ω.
Power devices – 100 Ω.

STEP GENERATOR

Current Ranges
10, 20, 50 μA and 0.1, 0.2, 0.5, 1, 2 mA per step, ± 5%.

Voltage Ranges
0.1, 0.2, 0.5 V per step. ± 5%.

Number of steps
7.

Ext. Bias
Write one curve, using external bias supply.

H. Length
Horizontal gain control for oscilloscope.

SOCKETS

Two T0-5 type transistor sockets, each pin paralleled by cables and special in-circuit probe.

Output Terminals
Vertical, horizontal, external bias and ground connectors.

POWER REQUIREMENTS

115 Vac, 50/60 Hz.

PHYSICAL

Size (W x H x D)
9⅜ x 3½ x 6¼ in.
240 x 89 x 160 mm.

Weight
7 lbs, 3.2 kg.

ACCESSORIES SUPPLIED

Instruction manual.
Two test cables.
Three oscilloscope cables with alligator clips.
LP-11 Three Point Probe for in-circuit testing.

Automatic Transistor Checker

- Automatically Identifies Leads
- Automatic Good/Bad Check
- In & Out of Circuit Testing
- Measures h_{fe}, V_{be} and V_d

LTC-906

The LTC-906 is a portable, multi-purpose transistor checker widely used in laboratories, schools, servicing, and for production trouble-shooting. In the automatic mode, activating a single switch initiates a programed test that automatically identifies emitter, base, collector, and type of device (NPN, PNP, FET, diode, or other) with an audible and visual good-or-bad indication . . . both in-and out-of-circuit. In the dc parameter mode, out-of-circuit measurements can be made of leakage current, h_{fe}, V_{be} and V_d. Powered by a single 9 V battery, it easily fits in a technician's tool kit.

SPECIFICATIONS

AUTOMATIC MODE

Test Voltage
± 2 V. 10% duty cycle.

Test Current
Low Drive: 4.5 mA.
High Drive: 60 mA.

Current Limiting Resistance
Low Drive: 470 Ω.
High Drive: 33 Ω.

Scanning Rate
0.1 s per test, complete scan is 1 s.

Devices Tested
Transistors (low/medium power), FETS, UJTs, SCRs, Diodes.

Tests Performed (In or Out of Circuit)
Good bad.
NPN/PNP or diode polarity.
Lead identification (E, B, C).

Indicators
LEDs for all tests.
Audible tone for good bad test (may be silenced).

DC PARAMETER MODE (OUT OF CIRCUIT ONLY)

Leakage Current/I_{CEO}
Ranges: 0 to 100, 1,000 and 10,000 μA full scale.
Accuracy: ± 6%.

V_{BE}/V_D
Range: 0 to 3 V full scale.
Accuracy: ± 6%.
Test Current: 2 mA.

h_{FE}
Ranges: 0 to 100, 1,000, 10,000.
Base Current: 1 μA.
Collector Current: 30 mA max.
Test Voltage: ± 5 V max.

POWER REQUIREMENTS

Internal: 9 V transistor battery (supplied).
External dc: 8 to 10 Vdc, 25 mA.
External ac: 117 Vac (requires optional LPS-169A adapter).

PHYSICAL

Size (W x H x D)
4¼ x 6 x 2⅛ in.
108 x 152 x 54 mm.

Weight
1 lb, 0.45 kg.

ACCESSORIES SUPPLIED

Instruction Manual.
Test Cable with 3 Alligator Chips.

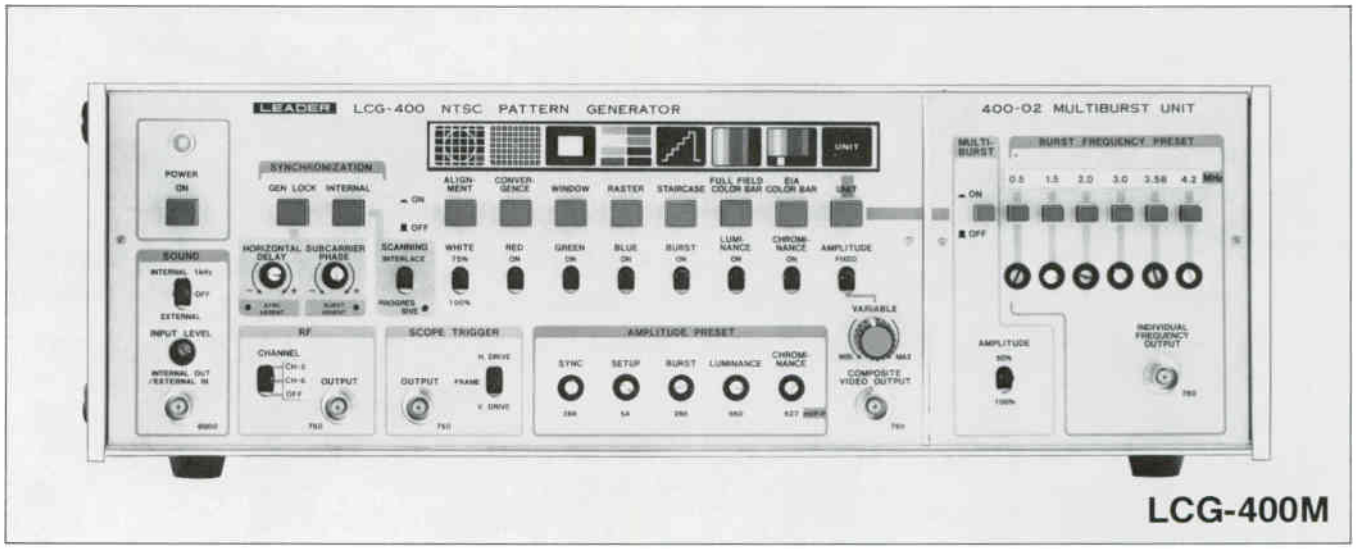
ACCESSORIES AVAILABLE

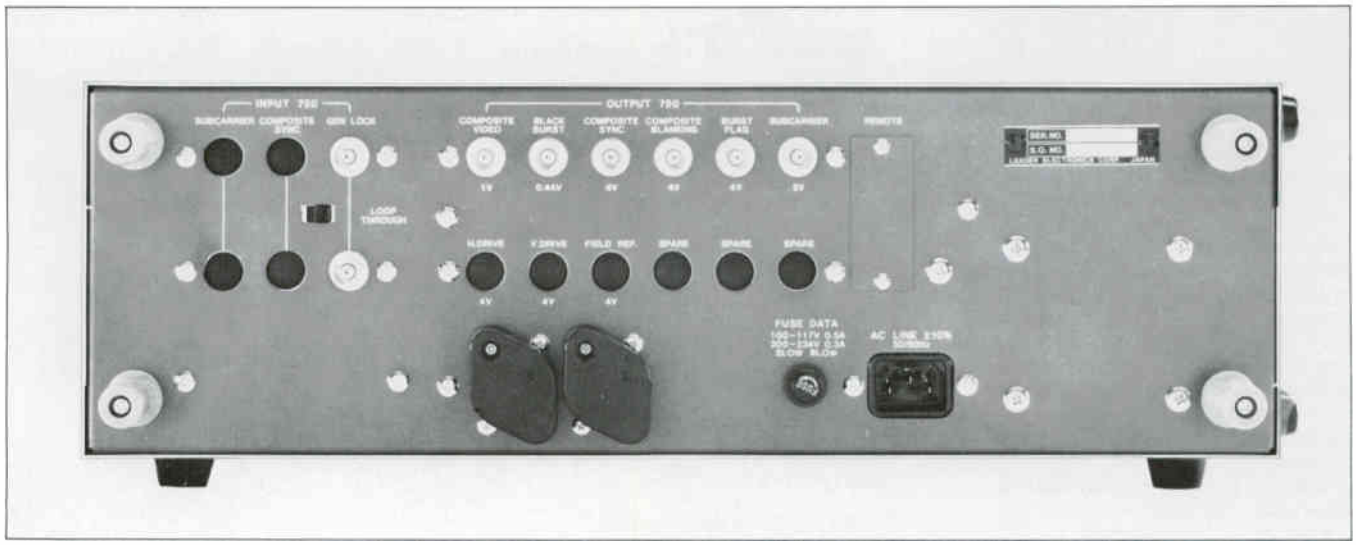
LP-11Y Three Point Probe for in-circuit testing.
LPS-169A ac Adapter.

LP-11Y
OPTIONAL

The LP-11Y Three-Point Probe permits convenient, one-handed connection to transistors installed on printed circuit boards. The probe is equipped with three flexible, spring loaded, pointed tips which are easily manipulated for simultaneous connection to transistor leads.

NTSC Video Sync/Test Generators

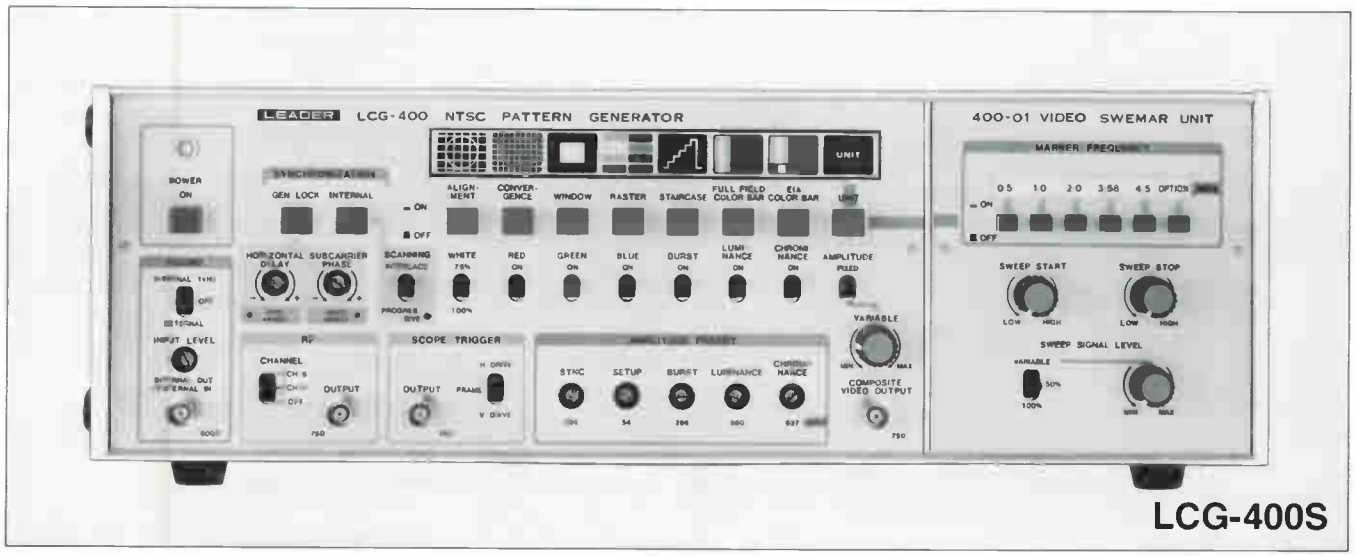




The LCG-400 provides both gen-lock and internal synchronization with the full range of video signals needed for testing and adjusting monitors, cameras, VTR's and overall performances of color and B&W TV systems. It is available with either multiburst (LCG-400M) or sweep-marker (LCG-400S) generators. The LCG-400 will sync with all standard composite video signals including those from quad head and helical scan VTR's.

Patterns include EIA and full field color bars, 5-step stair case, 8 color rasters, cross hatch and dot convergence, circle and corner marker with on/off control of chroma and luminance. Both interlace and progressive scanning are provided. Outputs include composite video, subcarrier, black burst, vertical and horizontal drive, and CH 5/6 RF. Units are supplied for either bench-top or rack-mounting.

- **Gen-Lock Capabilities**
- **7 Test Patterns**
- **Versions With Either Multiburst or Sweep/marker Outputs**



SPECIFICATIONS

SYSTEM
NTSC-M.

PATTERNS
EIA Color Bar
EIA standard RS-189A
75 % amplitude – 100 % saturated color bar with gray (75% white), yellow, cyan, green, magenta, red, blue – I, 100% white, "Q" and black.

Full Field Color Bar
75 % Amplitude – 100 % saturated color bar with gray (75% white), yellow, cyan, green, magenta, red, blue, and black.

Stair Case
5 step.

Raster
8 colors – red, green and blue (combined), white (100% and 75%), yellow, cyan, green, magenta, red, blue and black.

Window
White window on black background.

Convergence
Cross hatch 17 x 13; dot 16 x 12, and center.

Alignment
Cross hatch 9 x 7, circle, and corner marker.

Multiburst Frequency (LCG-400M only)
0.5, 1.5. 2.0, 3.0, 3.58, 4.2 MHz (± 3% adjustable) with 100% white reference level at left end of burst; 50 and 100% amplitude with ± 1 dB flatness.

Video Sweep (LCG-400S only)
50 kHz to 7 MHz synchronized with field; amplitude is 50 or 100% fixed or 0 to 100% variable with ± 1 dB flatness; 0.5, 1.0, 2.0, 3.5, 3.58, and 4.2 MHz marker frequencies.

SYNC SIGNAL
EIA Standard RS-170A.

Scanning System
Interlace and progressive.

No. of Scanning Line
Interlace 525 and progressive 262.

Line Frequency
15.734 KHz.

Field Frequency
Interlace 59.94 Hz and progressive 60.05 Hz.

Gen-Lock
Synchronized to video signal input.

Horizontal Delay
Continuously variable.

Sub-Carrier Phase
0 – 360° continuously variable.

SOUND
Intercarrier system F3 (FM).

Carrier Frequency
4.5 MHz.

Int. Mod
1 kHz sine wave.

1 kHz Output
3 V p-p.

Output Impedance
600 Ω.

EXT MOD
Frequency
50 Hz – 10 KHz.

Input Voltage
3 V p-p.

Input Impedance
600 Ω.

Pre-Emphasis
No.

COMPOSITE VIDEO OUTPUT
Polarity
Negative Sync.

Voltage
1 V fixed and 0 – IV Variable.

Impedance
75 Ω.

SUBCARRIER OUTPUT
Frequency
3.579545 MHz ± 5 Hz (0° – 40°C).

Voltage
2 V p-p.

Impedance
75 Ω.

BLACK BURST OUTPUT
Voltage
Sync Signal 286 mV and burst 286 mV.

Impedance
75 Ω.

SCOPE TRIGGER OUTPUT
Mode
Vertical, horizontal or frame.

Voltage
1 V.

Impedance
75 Ω.

RF OUTPUT
Channel
CH-5, 77.25 MHz ± 0.5%.
CH-6, 83.25 MHz ± 0.5%.

POWER REQUIREMENTS
115/230 Vac, 50-60 Hz.

PHYSICAL
Size (W x H x D)
16¾ x 5¼ x 15¾ in.
426 x 132 x 400 mm.

Weight
16.5 lbs, 7.5 kg.

ACCESSORIES SUPPLIED
Cable, BNC – alligator clip.
Rack mount adaptor kit.

NTSC Video Pattern Generator

- **11 Test Patterns**
- **NTSC Color Bars**
- **Selectable Interlaced or Progressive Scanning**

The LCG-396 is a versatile NTSC video generator suitable for testing, servicing and evaluating a broad range of video systems including video tape recorders, CATV and MATV systems, video monitors and television receivers. It provides 11 test patterns including the standard NTSC color bars for measuring and adjusting color purity, white balance, luminance, chromanance, and convergence. Outputs include composite video, H or V scope trigger, subcarrier and RF (CH5 or 6). Other features include variable chroma, luminance and set-up levels, and selectable interlaced or progressive scanning. The LCG-396 is supplied with a comprehensive user's manual including detailed VTR, TV and monitor application data.

SPECIFICATIONS

PATTERNS

NTCS Color Bars
Split field color bars with upper 75% white, yellow, cyan, green, magenta, red, blue and black; lower 25% Q, −I, and 100% white (IQW).

Full Field Color Bars
As above without IQW.

Rasters
Separate red, blue, green and white.

Stair Case
Obtained from color bars with chrominance component deleted.

Crosshatch
21 vertical x 16 horizontal white lines centered on black raster and one center dot.

Dots
20 vertical x 15 horizontal white dots equally spaced on black raster.

Rasters
Red, blue, green and white.

Center Cross
One vertical and one horizontal white line centered on black raster.

COMPOSITE VIDEO OUTPUT

Level
0 to 1.5 V p-p, 1 V p-p in preset position.

Impedance
75 Ω.

Polarity
Positive (Sync signal is negative).

RF OUTPUT

Frequencies
CH-5, 77.25 MHz ± 0.5%; CH-6, 83.25 MHz ± 0.5%.

Level
10 mVrms.

Impedance
75 Ω unbalanced.

Modulation System
Negative modulation.

SUBCARRIER OUTPUT

Frequency
3.579545 MHz ± 100 Hz (Calibration to ± 5 Hz is possible).

Level
1 Vpp (no load).

Impedance
75 Ω.

TRIGGER OUTPUT

Frequency
At either horizontal or vertical frequency.

Level
1 V p-p (no load).

Impedance
75 Ω.

SYNCHRONIZATION

Type
60 Hz field of 525 lines interlaced with equalizing pulse, switchable to progressive scanning.

Horizontal Scanning Frequency
15.734 Hz.

Vertical Scanning Frequency
Interlaced 59.94 Hz and progressive 60.05 Hz.

Horizontal Blanking Pulse Width
11.3 μs.

Vertical Blanking Pulse Width
Interlaced 1.24 ms and progressive: 1.21 ms.

Horizontal Sync
4.61 μs.

Front Porch
1.3 μs.

Burst
8 cycles min.

ENVIRONMENTAL

Operating Temperature
0-40°C.

POWER REQUIREMENTS

100, 117, 200, 234 Vac, 50-60 Hz, 20 VA (normally supplied wired for 117 Vac).

PHYSICAL

Size (W x H x D)
7⅞ x 4¾ x 11⅞ in.
200 x 120 x 300 mm.

Weight
7 lbs, 3.2 kg.

ACCESSORIES SUPPLIED

Instruction Manual
One (1) cable, BNC to alligator clips.

LVS-5850 NTSC Vectorscope

- CRT Displayed Error Limits
- Standard Half Rack Configuration
- Accuracy ±2° Phase, ±3% Ampl.

LVS-5850

NEW

The LVS-5850 Vectorscope provides a convenient method for observing and measuring the relative phase and amplitude of chrominance signal components. It utilizes a unique technique* which electronically displays the "inner boxes" which represent error limits of ±2.5° and ±2.5 IRE units. This improves the accuracy of phase and amplitude adjustments by eliminating errors dues to CRT non-linearities.

The LVS-5850 includes two loop-through inputs which can be selected for display by front panel push buttons. A test circle pattern is also selectable. The phase reference is selected from either of the two composite video inputs, one of which can also be switched to phase lock to a subcarrier input. Another front panel push button provides for either 100% or 75% saturation levels. A gain control, with a detented calibrated position, provides for continuous amplitude adjustment. A phase control permits rotating the display through 360°.

The LVS-5850 is available in either a protective carrying case or in a ½ rack width configuration.

*patent pending

SPECIFICATIONS

COMPOSITE VIDEO INPUTS

Sensitivity
1 V p-p full scale and continuously variable from 2 V p-p to 0.2 V p-p.

Connectors
BNC, loop-through.

Impedance
10 Kohm.

Saturation
100% or 75% (switchable).

SUBCARRIER INPUT

Sensitivity
1 to 4 V p-p.

Connectors
BNC, loop-through.

Inpedance
1 m ohm.

CHROMINANCE BANDWIDTH

3.579545 MHz ± 500 kHz

ACCURACY

Phase Shift
±2°.

Amplitude
±3%.

Differential Phase
±2°.

Differential Gain
±5%.

SYNCHRONIZATION

Horizontal Source
Horizontal sync signal of composite video input.

Subcarrier Capture Range
3.579545 MHz ± 50 Hz.

Amplitude
0.29 V p-p ± 6 dB.

Phase Adjustment Range
360°.

CRT DISPLAY

Accelerating Potential
6.5 kV.

Area
8 x 10 cm.

Graticule
External with electronically generated error limits of ±2.5° ±2.5 IRE units.

POWER REQUIREMENTS

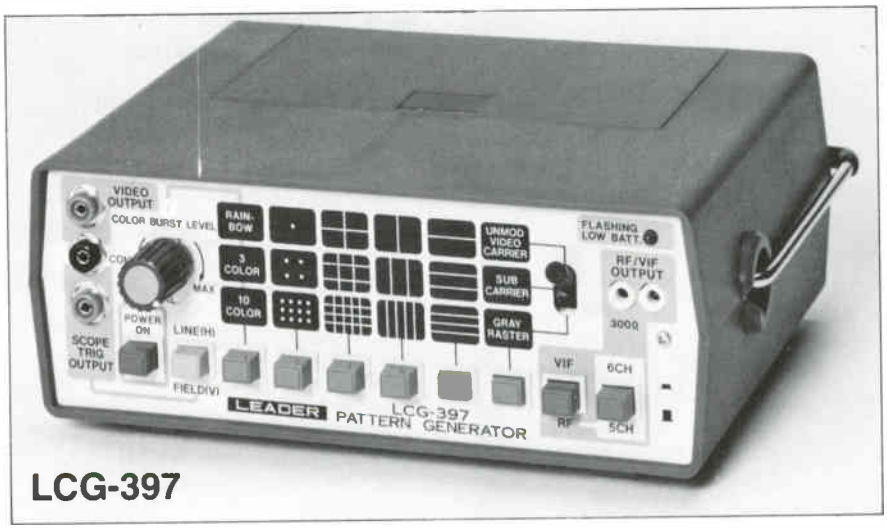
100/120/200/240 Vac switchable, 50/60 Hz.

OPERATING TEMPERATURE RANGE

0 to 40°C.

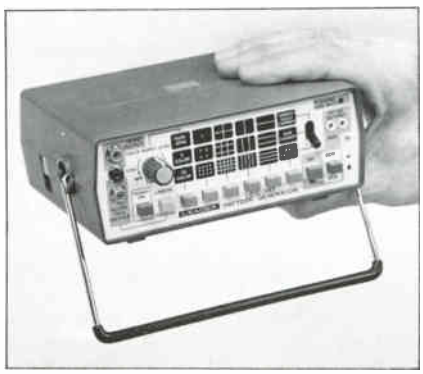
Battery-Operated Color Generator/TV Analyzer

- **Battery Operated for Portability**
- **18 Crystal Controlled Test Patterns**
- **Compact and Lightweight**



LCG-397

The LCG-397 is a very portable, comprehensive source of video signals for testing, trouble-shooting, and adjusting TV receivers and monitors. It provides 18 crystal controlled test patterns for virtually all necessary picture adjustments in color and monochrome units. Composite video, IF, and RF signal-injection outputs are provided. In addition, a separate trigger output simplifies obtaining stable oscilloscope displays at both line and field rates. A front panel control for adjusting the colorburst level permits rapid checking and adjustment of AFPC and color killer circuits. The LCG-397 is powered by four standard "C" cells (an ac adapter is optional) and is equally valuable to both the bench and outside technicians.



SPECIFICATIONS

PATTERNS

General
Color bar system uses an offset subcarrier at 3.563795 MHz, ± 20 Hz; Color burst level is continuously variable to 100%;
Color bar level is fixed at 100%.

Color (3)
10-Color Bar (30° phase angle), 3 Color Bar [R-Y, B-Y, -(R-Y)] and rainbow.

Dots (3)
Located at intersections of corresponding crosshatch patterns; white dots on black background; single center dot, 7 x 11 and 15 x 21 patterns.

Crosshatch (3)
White lines on black background; center cross, 7 x 11 and 15 x 21 patterns.

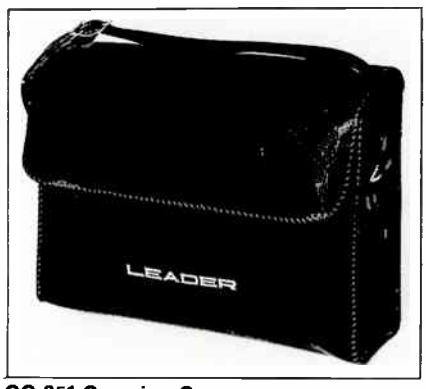
Vertical Lines (3)
White line on black backgrounds; 1, 11 and 21 lines.

Horizontal Lines (3)
White lines on black background; 1, 7 and 15 lines.

Gray Raster
0 % level black raster.

Subcarrier
Continuous color subcarrier, no sync.

Video Carrier
Unmodulated RF carrier (CH5 and CH6).



CC-851 Carrying Case

SYNCHRONIZATION

Type Generation
Crystal controlled progressive scanning.

Horizontal Frequency
15.75 kHz.

Vertical Frequency
60.11 Hz.

RF/IF OUTPUTS

Frequencies
RF CH-5 77.25 MHz; RF CH-6 83.25 MHz; IF 45.5 MHz.

Impedance
300 Ω, unbalanced.

Level
10 mV (open circuit).

COMPOSITE VIDEO OUTPUT

Level
2 V pp (open circuit).

Impedance
10 KΩ.

Polarity
Negative sync signal.

TRIGGER OUTPUT

Frequency
Line or Field rate.

Level
5 V p-p (open circuit).

Output Impedance
1 KΩ.

POWER REQUIREMENTS

Internal: Four (4) "C" cells (not supplied).
External: 6 Vdc, 300 mA.
With Optional Adapter: 117 Vac, 50-60 Hz.

PHYSICAL

Size (WxHxD)
6⅛ x 2¼ x 4⅜ in.
156 x 57 x 111 mm.

Weight
1.5 lbs, 0.7 kg.

ACCESSORIES SUPPLIED

Instruction Manual.
One (1) RF/IF cable (alligator clips).
Three (3) Test leads.

ACCESSORIES AVAILABLE

Type LPS-166F ac Adapter.

All-Channel Sweep/Marker Generator

- VHF/UHF, VIF, FM, FM-IF Outputs
- 3 Bias Supplies
- Vert. & Hor. Polarity Reversal

LSW-333

The LSW-333 is a complete test and alignment instrument for the RF and IF tuned circuits of VHF and UHF television receivers and FM radios. It is used in production testing and aligning, and in servicing. Front-panel displays of ideal IF and chroma response curves with marker positions permit fast and precise alignment in accordance with manufacturers' recommendations. The LSW-333 has three bias supplies, selectable marker tilt (vertical or horizontal), and vertical and horizontal polarity reversal.

SPECIFICATIONS

Marking Method
Post injected birdy type.

Sweep Rate
60 Hz.

Sweep Linearity
Within 10% (3 point method).

Output Voltage
Over 100 mVrms into 75 Ω.

Output Impedance
75 Ω, unbalanced.

Output Control
30 dB in 10 dB steps and variable (40 dB range); 30 dB in 10 dB steps (UHF only).

Marker Size
0 to 1 volt p-p, adjustable.

Marker Tilt
Vertical or horizontal.

Display Polarity
Normal or inverted for vertical and/or horizontal axes.

Bias Supplies
Two, 0 to ±25V;
One, 0 to ±75V.

Horizontal Out
10 V p-p, special 15.75 kHz. filter for line rate suppression.

Power Requirements
115 Vac, 50 to 60 Hz, 8 VA

Size (W x H x D)
13⅞ x 8½ x 8½ in.
350 x 216 x 216 mm.

Weight
11 lbs, 5 kg.

FREQUENCY DATA

Band	Freq. (MHz)	Cent. Freq. (MHz)	Width Sweep (MHz)	Markers, (MHz)
VHF	Channels 2-13	Center of Channel	8 MHz	39.75, 41.25, 41.67, 42.17, 42.67, 42.75, 44.00, 45.00, 45.75, 47.25. A separate 45.75 video carrier is available on all channels at 10 dB below 45.75 marker.
UHF	470-890 MHz	Center, Continuously Variable	8 MHz	41.25, 41.67, 42.17, 42.67
FM-RF	83-113 MHz	98 MHz	30 MHz	85.5, 88.0, 90.0, 91.5, 94.5.
FM-IF	10.7 MHz	10.7 MHz	1 MHz	10.6, 10.7, 10.8.
Video (Chroma & Sound IF)	1.8-5.5 MHz	—	3.7 MHz	±100 KHz side markers & ±1 KHz modulation may be applied.
Video IF	39-48 MHz	43.5 MHz	8 MHz	39.75, 41.25, 41.67, 42.17, 42.67, 42.75, 44.00, 45.00, 45.75, 47.25.
Video Sweep	0-6 MHz on 45.75 MHz	45.75 MHz	6 MHz	—
Video IF	All Markers (39.75, 41.25, 41.67, 42.17, 42.67, 42.75, 44.00, 45.00, 45.75, 47.25) available separately with 1000 Hz or 100 KHz modulation applied.			

CATV Level Meter

- 54 to 300 MHz and 470 to 890 MHz
- Ac Voltage Measurement Capability
- Small, Lightweight and Rugged

LFC-945

NEW

The LFC-945 CTAV Level Meter is a rugged, accurate instrument for measuring signal levels in CATV and MATV Systems. It covers the two frequency ranges 54 to 300 MHz and 470 to 890 MHz with accuracies of ± 1.5 dB and ± 2 dB respectively. Tuning of individual channels is facilitated by large dials marked with both frequency and channel, an electronic fine tuning control and a built-in sound amplifier and a loudspeaker.

Three 20 dB switchable attenuators and a 25 dB meter scale provide an input signal range of −35 to +50 dBm (0 dBm = 1 mV).

The LFC-945 will also measure ac voltages on the cable system from 0 to 50 Vac with an accuracy of ± 5% f.s.

Power is supplied by rechargeable Nicad cells and the power switch is automatically set to off when the protective cover is closed.

The LFC-945 weighs just 8.8 lbs. and is supplied with batteries, 300:75 ohm balum and nylon web carrying/ operation strap.

SPECIFICATIONS

Frequency Range
VHF, 40-300 MHz.
UHF, 470-890 MHz.

Level Range
−30 to +60 dBmv.

Response & Indication
Peak detect 75Ω terminated indication.

Accuracy (at 20°C)
VHF, Within ± 1.5 dB.
UHF, Within ± 2 dB.

Temperature Characteristics
Within ± 1.5 dB (0°C-40°C).

Input Impedance
75Ω F type connector.

VSWR in Input
VHF, 1.5 or less (ATT OUT).
1.3 or less (ATT IN).
VHF, 1.8 or less (ATT OUT).
UHV, 1.5 or less (ATT IN).

Attenuator
20 dB x 3.

Accuracy of ATT
VHF, Within ± 0.5 dB.
UHF, Within ± 1.5 dB.

IF Frequency
45.75 MHz.

Bandwidth
Approx. 500 KHz (−3 dB).

Ratio of Interface to Nearest Channel
30 dB or less.

Image Ratio
35 dB or less.

Ratio of Direct Signal Leakage
VHF, 70 dB or less.
UHF, 60 dB or less.

Indication
30 dB Span Range, 1 dB Resolution.

Voltage Measurement
AC 50 V.

Accuracy of V Measure
± 5% f.s.

Audible Monitor
By speaker, slope demodulation.

Operational Temperature Range
0°C-40°C.

Maximum Working Temperature Range
−10°C-45°C.

POWER

DC 15V, rechargeable batteries.

Size (WxHxD)
9.8 x 5.9 x 9.25 in.

Weight
8.8 lbs. 3.9 kg.

ACCESSORIES

10 Rechargeable Batteries, 1 Strap, 1 Balun (300Ω to 75Ω)

C/MATV Field Strength Meter

LFC-944B

- **Battery Operation for Portability**
- **VHF Range from −40 to +60 dBmv**
- **UHF Range from −30 to +40 dBmv**

The LFC-944B is a portable battery operated field strength meter designed for testing and measuring the performance of CATV and MATV systems. It provides for measuring levels of −40 to +60 dB_{mv} on VHF channels and −30 to +40 dB_{mv} on UHF channels. The meter scale is also calibrated to make measurements in microvolts. An accurate attenuator provides up to 70 dB attenuation in 10 dB steps. Accurate detent tuning is provided for VHF channels and UHF tuning for channels 14 to 83 is with a continuous control. The LFC-944B is supplied with a sturdy carrying case.

SPECIFICATIONS

Range
VHF, −40 to +60 dB_{mv} (10 μV to 1 V);
UHF, −30 to +40 dV_{mv} (30 μV to 0.1 V).
Accuracy
VHF, ± 3 dB;
UHF, ± 4 dB.
Amplifier Bandwidth
1 MHz at 3 dB points.
Input Impedance
75 Ω.
Power Requirements
13.5 Vdc using 9 Type "C" cells.
Size (WxHxD)
8 x 4 x 8 in.
200 x 100 x 200 mm.
Weight
5.7 lbs, 2.6 kg.

ACCESSORIES SUPPLIED

One (1) 300:75 ohm matching coupler.
One (1) Earphone for monitoring video carrier.
One (1) Carrying Case.

LCC-138 VHF-TV Signal Source

LCC-138

- **Battery Operation for Portability**
- **Calibrated Test Signals for Channels 2, 3, 12 & 13**

The LCC-138 is a calibrated source of test signals for injection into MATV and CATV systems. Used in conjunction with the LFC-944B VHF/UHF Field Strength Meter, it permits accurate, quantitative measurements of cable losses, amplifier gain, and overall system gain or loss.

This compact, battery operated unit provides calibrated test signals on channels 2, 3, 12 and 13 from 0 to 40 dB_{mv} in 10 dB steps.

SPECIFICATIONS

Frequencies
CH 2, CH 3,
CH 12, CH 13.
Frequency Accuracy
± 1%.
Output Levels
0 to 40 dB_{mv} in 10 dB steps.
Output Level Accuracy
± 2 dB.
Output Impedance
75 Ω.
VSWR
1.3:1 max.
Power Requirements
Eight (8) type "AA" cells.
Size (W x H x D)
6⅛ x 2⅛ x 7⅞ in.
155 x 55 x 200 mm.
Weight
3 lbs, 1.3 kg.

ACCESSORIES SUPPLIED

One (1) Instruction Manual.
One (1) Carrying Case.
One (1) Test Cable.

2-MHz Sweep/ Function Generator

- Sine, Square, Triangle, Ramp & Pulse Output
- Adjustable Pulse Width
- Linear or Log Sweep, 1000 = 1 Range

LFG-1300S

LPA-1305

The LPA-1305 Log Amplifier is designed to aid swept frequency measurements in conjunction with the LFG-1300S Generator. It features switchable linear/logarithmic sweep operation and its DC to 300 kHz bandwidth make it suitable for a wide range of measurement applications. Three adjustable frequency markers and built-in detector circuit eliminate the need for additional test equipment and cable connections. The design of the front panel ensures simple operation making the LPA-1305 ideally suited for production test environments.

NEW

The LFG/1300S is a general-purpose signal source with a broad range of research, design and service applications. Outputs include sine, square, triangle, ramp and pulse signals. Pulse symmetry is variable over a 9:1 range and, unlike many other instruments, changing the symmetry does not appreciably affect the output frequency. Linear and logarithmic sweep frequency outputs are available with sweep widths up to 1,000:1. Output level is controlled by a calibrated 70-dB attenuator (10-dB/step) with continuous adjustment between steps. The output may be frequency or amplitude modulated by an external signal. A level control also provides suppressed carrier outputs. The LFG-1300S is housed in a sturdy metal housing with a "human-engineered" front panel for convenient, simple operation.

SPECIFICATIONS

FREQUENCY

Ranges (0.02 Hz–2 MHz in 8 ranges, uncalibrated to 0.002 Hz):
0.02 Hz–0.2 Hz.
0.2 Hz–2 Hz.
2 Hz–20 Hz.
20 Hz–200 Hz.
200 Hz–2 kHz.
2 KHz–20 kHz.
20 KHz–200 kHz.
200 KHz–2 MHz.

Accuracy
0.02 Hz to 200 kHz: ± 3% rdg., ± 3% f.s.
200 kHz to 2 MHz: ± 5% rdg., ± 5% f.s.
(for sawtooth ±10% rdg., ±5% f.s.)

WAVEFORMS

Sine Wave
Voltage: 20 V p-p (7 V rms) open circuit.
Distortion: 10 Hz-20 kHz; < 0.5%
20kHz-100 kHz; < 1%
100 kHz-2 MHz; < 3%
Flatness: 0.02 Hz–2 MHz within ± 0.3 dB.

Triangle
Voltage: 20 V p-p open circuit.
Symmetry: 1% (0.02 Hz to 100 KHz).

Sawtooth
Voltage: 20 V p-p open circuit.
Symmetry: 15:85 or 85:15 fixed.

Square Wave Output
Voltage: 20 V p-p open circuit.
Symmetry: 1% (0.02 Hz to 100 KHz).
Rise Time: Less than 100 ns.

Pulse
Voltage: 20 V p-p open circuit.
Symmetry: 9:1–1.9 Continuously Variable.

TTL Output
Fan Out: 20 TTL.

DC Level
Controlled by dc Offset: ± 10 V.

SWEEP CAPABILITIES

Type
Linear or Logarithmic.

Rate (duration)
0.2 Hz to 50 Hz (5 s to 20 ms).

Width
1,000:1 max, continuously variable.

Ramp Output (for oscilloscope H-input)
0 to + 10 V.

AM Capabilities
Modulation Level: 0 to 100%
Carrier Level: Adjusted by front panel control.

OUTPUT LEVEL CONTROL

Attenuator
10, 20, 40 dB (0-70 dB, 10 dB steps).

Impedance
50 Ω.

Max Level
20 V p-p adjustable.

REAR PANEL INPUTS/OUTPUTS

VCO
Input for external frequency control signal.

MOD
Input for AM signal.

GCV
Output for oscilloscope H-Axis.

TTL
Fixed level TTL output, fan out = 20.

PHYSICAL

Size (W x H x D)
250 x 125 x 250 mm

Weight
9 lbs., 4 kg approx.

Power Requirements
100, 117, 200 or 234 Vac, 50-60 Hz.

Audio and RF Signal Generators

- Low Cost
- Reliable
- Easy To Use

LAG-26

LSG-16

Stable, durable and economical, the LAG-26 (audio) and LSG-16 (RF) signal generators are a proven pair of performers widely used in education, service shops, home, and industry. The LAG-26 provides both low-distortion sine and rapid-rise square waves that are free-running or externally synchronized. It has four ranges to 200 kHz with vernier frequency control and variable output level. The LSG-16 uses solid-state FET circuitry to provide 5 fundamental frequency bands from 100 kHz to 100 MHz and a sixth harmonic band to 300 MHz. It has a vernier frequency control with switchable high and low level outputs. Crystal-controlled outputs from 1 to 15 MHz are also available by front-panel plug-in of the appropriate Type FT-243 crystal.

SPECIFICATIONS

LAG-26 Audio Signal Generator

Frequency Range
20 Hz to 200 KHz in four decade bands.

Calibration Accuracy
± (3% + 2 Hz) direct reading.

Sync Signal
1 V for ±3% frequency control.

Sine Wave Output
Range, 20 Hz-200 kHz;
voltage, 0-5 Vrms;
flatness, ±1 dB, ref. 1 kHz;
Distortion, less than 0.5 %, below 20 kHz.

Square Wave Output
Range, 20 Hz-20 kHz;
voltage, 0-10 Vp-p;
rise time, 0.5 µs.

Power Supply
115/230 Vac, 50/60 Hz; 3 VA approx.

Size (W x H x D)
10 x 6 x 5 in.
150 x 250 x 125 mm.

Weight
5.5 lbs, 2.5kg.

LSG-16 RF Signal Generator

Frequency Range
100 kHz to 100 MHz. Up to 300 MHz on harmonics.

RF Output
100 mVrms max.

Output Control
High-Low switch & fine adjuster.

Modulation
Int, 1 kHz @ 30 % or higher;
Ext, 50 Hz-20 kHz @ less than 1 Vrms.

Audio Output
1 kHz at 1 Vrms into 10 k ohms.

Crystal Oscillator
For 1-15 MHz (crystal not included); type FT-243.

Power Requirements
115/230 Vac, 50/60 Hz. 3 VA approx.

Size (W x H x D)
10 x 6 x 5 in.
150 x 250 x 125 mm.

Weight
5.5 lbs, 2.5kg.

Audio Sweep/Marker Generator Response Curve Storage

- **Combined Sweep Generator, Detector and Display**
- **Digital Storage of Response Waveforms**

LBO-115M

LSW-115

The LSW-115 is a 2-channel Audio Frequency Sweep Generator designed for use in observing the frequency response characteristics of a wide range of audio equipment and devices. It employs a digital waveform storage capability to provide stable displays at slow sweep rates. Response curves may be reproduced on an X-Y Recorder or on the Model LBO-115M CRT Display.

SPECIFICATIONS

INPUT SECTION

NEW

Frequency Range
20 Hz to 300 kHz.

Input Resistance
500 k.

Input Ranges
0.01, 0.1, 1, 10 V.

Input Voltage Level
100 μV to 100 V (−80 to +40 dBV).

Level Measurement Accuracy

Range	Scale	Accuracy
50 dB	+10 dB	± 1.5 dB + 0.2 dB (bit error)
	0	± 1 dB + 0.2 dB (bit error)
	−10, 20, 30	± 1 dB + 0.2 dB (bit error)
	−40	± 1.5 dB + 0.2 dB (bit error)
25 dB	+ 5 dB	± 1 dB + 0.2 dB (bit error)
	0	± 1 dB + 0.2 dB (bit error)
	− 5	± 1 dB + 0.2 dB (bit error)
	−10	± 1 dB + 0.2 dB (bit error)
	−15	± 1 dB + 0.2 dB (bit error)
	−20	± 1 dB + 0.2 dB (bit error)

(Accuracy measured at the TO SCOPE terminal, in 1 kHz)

Output flatness
20 Hz to 30 kHz; ± 0.5 dB.
30 kHz to 100 kHz; ± 0.8 dB.
100 kHz to 300 kHz; ± 1.2 dB.

Response
Average, calibrated in RMS of a sine wave.

Response Time
HIGH; about 0.1 sec.
LOW; about 0.3 sec.

Automatic 0 dB Function:
Reference frequency 1 kHz or 333 Hz
Pull-in range ± 10 dB for 0 dB set value.

Automatic Start
By pilot signal at input.

Gain Control
More than ± 10 dB (with calibration)
(This works as the position control knob.).

DIGITAL MEMORY

Resolution
8 bits x 1 k words/channel.

Sampling Rate
Corresponds to sweep time of the sweep oscillator.

Panel Operation
Hold – a respective single sweep response is fixed for both channels or for CH-2 only.
Clear – The memory is cleared manually or automatically at the sweep start.
Hard Copy – A single screen waveform is recorded by an X-Y recorder in dual channel hold operation.

Hard Copy
Recording time – 1, 2, 5, 16, 53 seconds.
Pen movement time – 0.4 seconds.

Hard Copy Output Terminals (to a recorder)

X Axis (frequency):
Output voltage: −2 to +2 V.
Output impedance: 600 ±20%.

Y Axis (level):
Output voltage: − 2 to +2 V.
Output impedance: 600 ±20%.
(CH-1 and CH-2 output switching is available)

Recorder Calibration Signals

High:
X axis (frequency upper limit).
Y axis (level upper limit).

Low:
X axis (frequency lower limit).
Y axis (level lower limit).

Pen Lift Output
By contact closures.

SWEEP GENERATOR SECTION

Log Sweep Width
20 Hz to 30 kHz.
200 Hz to 300 kHz.

Linear Sweep Width
1/10 to 1 of maximum center frequency value of the range selected.

Center Frequency Variable Ranges

30 to 100 Hz.	3 to 10 kHz.
100 to 300 Hz.	10 to 30 kHz.
300 Hz to 1 kHz.	30 to 100 kHz.
1 to 3 kHz.	100 to 300 kHz.

Pilot Signal Reference Frequency
1 kHz and 333 Hz, switchable.

Distortion:
Sweep Signal:
LOG sweep: less than 1% (20 Hz to 10 kHz).
less than 1.5% (10 to 30 kHz).
less than 2% (30 to 300 kHz).
LINEAR sweep: less than 1.5% (20 Hz to 300 Hz).
Pilot Signal: less than 0.5% (1 kHz and 333 Hz).

Sweep Accuracy (Linearity)
LOG Sweep: 20 Hz to 30 kHz ± (5% + 2 Hz).
200 Hz to 300 kHz ± (5% + 20 Hz).
LINEAR Sweep: ±5% (measured at the "TO SCOPE" terminal).

Output Model
Automatic Sweep: Single or repeated, with or without pilot signal.
CW (manual operation): Frequency adjustment by front panel control.
SPOT: Output of pilot signal.

Sweep Operation
Reset and start switches.

Signal Duration
Sweep Signal: 1, 2, 5 seconds.
16, 53 seconds (applicable test discs).
Pilot Signal: 1 second (sweep time: 1 to 5 sec.)
5 seconds (sweep time: 16, 53 sec.).
Repeat Interval: About 1 second.

Output Voltage
More than 3 Vrms (600 load).

Output Deviation
ATT. 0 to −40 dB: 20 Hz to 100 kHz ± 2 dB.
100 to 300 kHz ± 0.3 dB.
ATT. 60 dB: 20 Hz to 100 kHz ± 0.3 dB.
100 to 300 kHz ± 0.5 dB.

Output Impendance
600 ± 10%.

Output Attenuator
Ranges: Four ranges (0, 20, 40, 60 dB).
Accuracy (1 kHz): 2%.

Output Voltmeter Accuracy
± 5% of full scale.

MARKER SECTION

Level Markers:
Two lines (with ON/OFF function).

Frequency Markers
Fixed: Five points on measurement waveform and each of line markers.
Variable Marker: One point in memory hold operation.
Variable Marker Accuracy: LOG sweep F ± (1% + 2 counts).

Marker Set Function
Line Markers: By output meter and output attenutators.
Frequency Markers: By built-in counter.
Marker Terminal
Positive pulse, about 5 V p-p.

CH-2 Intensity Modulation Signal Terminal
Open collector (negative logic)
TTL Level.

FREQUENCY COUNTER SECTION

Operation:
In CW Mode – Frequency indication of output signal.
In Hold Mode – Frequency indication of variable marker.
In Marker Setting – Frequency indication of frequency marker calibration signal.

Gate Time
0.5 and 0.05 seconds, automatic switching.

Accuracy (In CW mode)
Reference time ± 2 counts.

Reference Time Frequency
7.53664 MHz within ± 4 x 10 −5.

GENERAL

Size
150 (H) x 400 (W) x 400 (D) mm.

Weight
10.5 kG (approx.)

Power
100, 117, 200, 234 Vac, ± 10%, 50/60 Hz.

Cables Supplied
BNC – BNC (4 ea.).
BNC – Clip Type (2 ea.).
Pair Plug – Clip Type (1 ea.)
Pin Plug – Pin Plug (4 ea.).

Audio Frequency Response Recorder

- 20 Hz to 30 kHz
- Automatic Start/Stop
- Linear or Logarithmic Sweeps
- Contains Audio Sweep Oscillator

LFR-5600

LEA-5610

The LFR-5600 is a complete, self-contained system for measuring and recording the frequency response of a broad range of audio equipments. It employs an audio sweep oscillator, level meter and chart recorder to automatically produce frequency response curves from 20 Hz to 30 kHz with 0.5 dB accuracy. Automatic start/stop circuitry using either 333 Hz or 1 kHz pilot signals greatly simplifies measurements on recording equipment and systems. An accurate attenuator (0, 20, 40 dB) permits use with a wide range of signal levels including those of sensitive preamplifiers. Both linear and logrithmic (25 and 50 dB range) recordings may be made within one minute. In addition, a faster sweep rate is provided for use with an oscilloscope. Manual sweep is also possible. A panel meter monitors input/output levels and sweep oscillator frequency. Accessories available include the LEA-5610 Equalizer/Amplifier for phono cartridge measurements and the LSP-5621 Speaker Analyzer for loudspeaker measurements.

SPECIFICATIONS

INPUT SECTION

Frequency Range
20 Hz to 30 kHz.

Impedance
500 KΩ, 50 pF

Voltage Ranges
0 dB = 0.1 V, 1 mV to 3.16 V (−60 to +10 dB);
0 dB = 1 V, 10 mV to 31.6 V (−40 to +30 dB);
0 dB = 10 V 100 mV to 316 V (−20 to +50 dB_v).

Accuracy (ref 0 dB at 1 kHz)
dB scale, ±0.5 dB; linear scale, ±2% of full scale.

Frequency Response (ref 0 dB at 1 kHz)

Indication (dB)	1 to 20 kHz	20 to 30 kHz
+10	±0.5 dB	±0.5 dB
0	±0.5 dB	±0.5 dB
−10	±0.5 dB	±0.5 dB
−20	±0.5 dB	±1 dB
−30	±1 dB	±1.5 dB
−40	±1.5 dB	±2 dB

Span Range
25 dB, 50 dB, linear.

Detection Method
Average responding.

Response Time
Selectable 0.1, 0.2, 0.5 and 1 s.

Auto 0 dB Referencing
Reference frequency, 333 Hz or 1 kHz; capture range, within ± 10 dB of range setting.

METERING SECTION

Frequency
Range is 20 Hz to 30 kHz; accuracy is ± 3% ± 2 Hz ± 5% full scale.

Input or Output Level
Ranges are 0 to 0.3, 3 and 30 V full scale (−30 to −10 dB_v, −10 to +10 dB_v and 0 to +20 dB_v); accuracy is ± 5% of full scale.

SWEEP OSCILLATOR SECTION

Frequency Range
20 Hz to 30 kHz.

Pilot Frequencies
333 Hz and 1 kHz.

Output Level
3 V max.

Attenuator
0, −20, and −40 dB; ± 2%.

Impedance
600 Ω.

Frequency Response
20 Hz to 10 kHz; ±0.2 dB; 10 kHz to 30 kHz; ±0.5 dB.

Distortion
20 Hz to 100 Hz, 0.9%;
100 Hz to 1 kHz, 0.6%;
1 kHz to 5 kHz, 0.6%;
5 kHz to 10 kHz, 0.7%;
10 kHz to 20 kHz; 1%;
20 kHz to 30 kHz; 1.4%.
333 Hz and 1 kHz ref, 0.1%.

Operating Modes
Manual sweep using front panel frequency control and automatic (logrithmic frequency vs. time).

Sweep Rates
Settings for 0.1, 0.3, 1 and 3 mm/s chart speed and 10 s sweep duration for oscilloscope display.

Sweep Sequence (at 3 mm/s Chart Speed)
Pilot signal 5 seconds;
sweep signal 54 seconds; and
zero level signal (for S/N measurements) 8.5 sec.

RECORDING CONTROL SECTION

Chart Speeds
0.1, 0.3, 1 and 3 mm/s automatically synchronized with sweep rates.

Start Methods
Manual by push button or automatic by detection of pilot signal. (333 Hz or 1 kHz)

CHART RECORDER

Writing Method
Liquid ink pen

Chart Size
Overall width is 73 mm with a 50 mm writing width; rolls are 60 m long.

DC Recording Capabilities
Input ranges are 10, 100 and 1,000 mV/cm within ±2% full scale accuracy; input impedance is 500 KΩ, 500 pF.

POWER REQUIREMENTS

100, 117, 200, 230 Vac, 50 to 60 Hz, 28 VA (normally supplied wired for 117 Vac).

PHYSICAL

Size (W x H x D)
15¾ x 5⅞ x 9⅞ in.
400 x 150 x 250 mm.

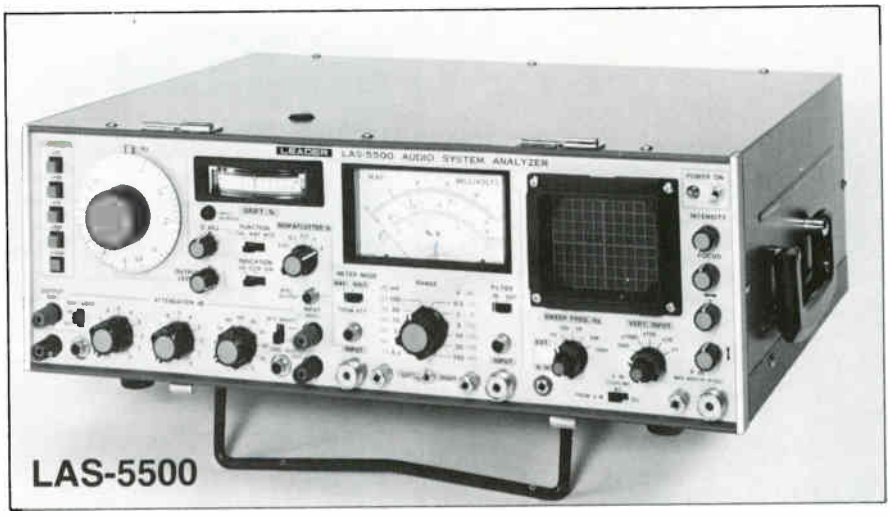
Weight
21 lbs, 9.5 kg.

ACCESSORIES SUPPLIED

1 ea BNC to Clips.
1 ea BNC to Pin Plug.
1 ea Pin Plug to Pin Plug.
1 ea Pin Plug to Clips.
1 ea Pin Plug to Miniplug.
LI-068 50 cc Red Ink.
1 Roll LC-057 Linear Chart Paper.
1 Roll LC-056 Log Chart Paper.

Audio Analyzer

- Oscilloscope
- Audio Oscillator
- Ac Millivolt Meter
- Wow/Flutter/Drift Meter
- Attenuator
- All in One System



The LAS-5500 is a complete, all-in-one audio test center widely used in sound engineering, high-fidelity equipment testing and repair, in recording studios, and for production-line testing. It combines in one unit, an oscilloscope, audio oscillator, ac millivolt meter, and a wow/flutter/drift meter. The dc to 5 MHz, 10 mV oscilloscope has selectable input attenuation (X1, X10, X,100, X 1000) and sweep frequencies (10 Hz, 100 Hz, 1000 Hz, 10 kHz, 100 kHz), plus continuous fine adjustment. The five-range, 10 Hz to 100 kHz audio generator features a 0 to 101 dB calibrated output attenuator with 0.1 dB steps and ± 2% accuracy. Distortion is less than 0.05% between 500 Hz and 20 kHz. The ac millivolt meter has 12 ranges from 30 μV to 100 Vrms with 3% full scale accuracy and a 5 Hz to 500 kHz frequency response. Wow and flutter measurements are made to CCIR, DIN, and JIS standards with ± 5% accuracy. Drift measurements are also accurate within ± 5%. This combination of instruments in a single package permits making a wide variety of audio measurements without cluttering the work bench with up to seven separate instruments. In addition, connections between instruments can be made internally with front panel switches, thereby eliminating the need for external cables and cords.

SPECIFICATIONS

AUDIO GENERATOR

Frequency Range
10 Hz to 1 MHz in 5 ranges.

Frequency Accuracy
10 Hz to 100 Hz: ± 5%.
100 Hz to 1 MHz: ± 3%.

Wave Form
Sine wave.

Output Level
Up to 3 Vrms, 600 Ω.

Distortion
10 Hz to 1 MHz, <1%;
50 Hz to 500 kHz, <0.5%;
100 Hz to 100 kHz, <0.1%;
500 Hz to 20 kHz, <0.05%.

AUDIO ATTENUATOR

Range
0 to 101 dB in 0.1 dB steps.

Accuracy
± 2%.

Input/Output Impedance
600 Ω.

Frequency Response
dc to 200 kHz.

AC MILLIVOLT METER

Range
0.3 mV to 100 V in 12 ranges;
− 90 to + 42 dB (0 dB = 0.775 V) and
− 90 to + 40 dB (0 dB = 1 V).

Accuracy
± 3% full scale at 1 kHz.

Frequency Response
20 Hz to 100 kHz, ± 3%;
10 Hz to 200 kHz, ± 5%;
5 Hz to 500 kHz, ± 10%.

Input Impedance
10 MΩ, 65 pF.

DUMMY LOAD

Dissipation
50 W per channel (2 channels).

Impedance
8 Ω.

WOW, FLUTTER AND DRIFT METER

Reference Frequency
3 kHz ± 10% or 3.15 kHz ± 10% (switchable).

Input Level Requirement
15 mV to 10 Vrms.

Drift Measurement Range
0 to ± 5%.

Drift Accuracy
Within 0.25%.

WOW & Flutter Ranges
0 to 0.03, 0.1, 0.3, 1 and 3% full scale.

WOW & Flutter Accuracy
Within 0.05 times full scale value.

Frequency Response (− 3 dB ± 1 dB)
CCIR, 0.3 to 20 Hz;
JIS, 0.5 to 200 Hz; and
DIN, 0.3 to 300 Hz.

Internal Test Frequency Source
3 kHz ± 0.05%, 0.3 Vrms.

Output Impedance
5 KΩ.

OSCILLOSCOPE

Display
3 in CRT, P31 phosphor, 8 x 10 div.

Vertical Amplifier
Sensitivity is 10 mV/div with a 5 MHz bandwidth (−3 dB); input impedance is 1 MΩ (40 pF) with a 4-step attenuator (Times 1, 10, 100, and 1000) that is continuously variable between steps.

Horizontal Amplifier
Sensitivity is 20 mV/div to 10 V/div; Bandwidth is dc to 250 kHz (− 3 dB).

Time Base
Triggered Sweep from 10 Hz to 100 kHz in four ranges.

POWER REQUIREMENTS

100, 115, 200, 230 Vac, 50 to 60 Hz, 36 VA (normally supplied for 115 Vac operation).

PHYSICAL

Size (W x H x D)
17¾ x 5⅞ x 16⅞ in.
450 x 150 x 430 mm.

Weight
25 lbs, 11.5 kg.

ACCESSORIES SUPPLIED

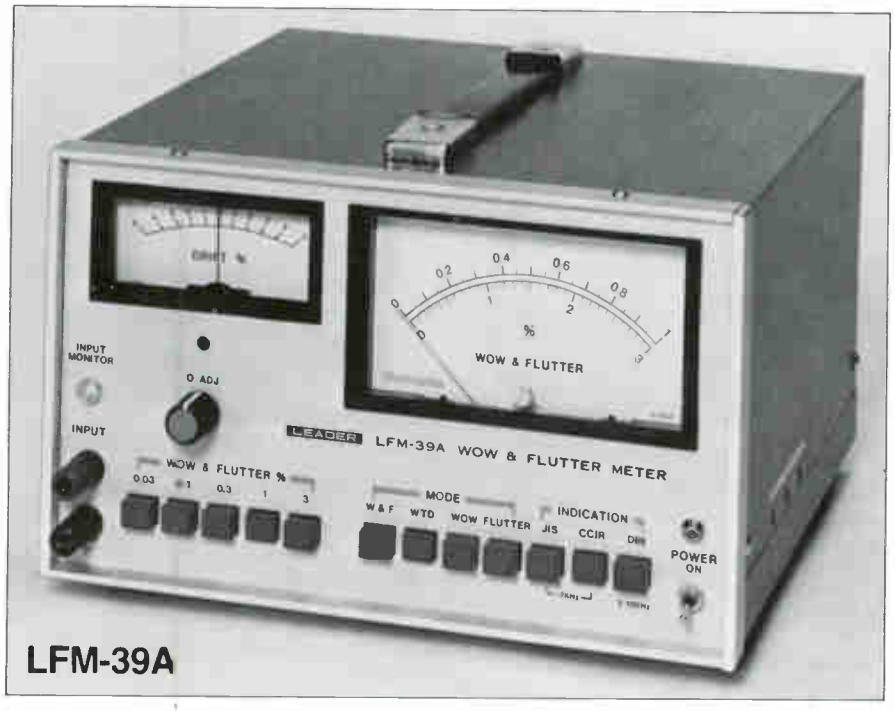
Instruction Manual.
Protective Front Cover.
LP-16AY Oscilloscope Probe.
Three (3) Test Cables, Banana Plug/Alligator Clips.
Two (2) Test Cables, Photo Plug/Phono Plug.
Two (2) Adapters, UHF Plug/Screw Terminal.

ACCESSORIES AVAILABLE

Type TR-39 Test Record.
Type TC-39 Test Tape (Cassette).

Wow and Flutter Meter

- **Measures Wow & Flutter to 0.003%**
- **Measures Drift to 0.25%**



LFM-39A

The LFM-39A is a precision audio instrument which incorporates all of the functions required to measure wow and flutter as low as 0.003% and drift as low as 0.25% in turntables, tape decks and other record/playback equipment. Measurements on turntables are made using an optional test record which has been accurately recorded with 3 kHz and 3.15 kHz test tones. Measurements on tape playback equipment can be made using an optional test tape with similar test tones. An internal 3 kHz reference oscillator (3.15 kHz is available as an option) permits measuring the combined contributions to wow, flutter and drift of both the record and playback functions in tape recorders. In all cases wow and flutter may be measured either separately or combined.

The LFM-39A permits making measurements to either CCIR, JIS or DIN standards. (The optional 3.15 kHz reference oscillator is required for DIN measurements of recording equipment.)

SPECIFICATIONS

INPUT REQUIREMENTS

Frequency
3 kHz ± 10% (CCIR, JIS) and 3.15 kHz ± 10% (DIN).

Level
15 mV to 10 Vrms.

Input Impedance
300 KΩ.

DRIFT MEASUREMENTS

Range
0 to ± 5% full scale.

Accuracy
Within ± 0.25%.

WOW AND FLUTTER MEASUREMENTS

Range
0.003 to 3% in 5 ranges (0.03, 0.1, 0.3, 1 and 3% full scale).

Accuracy
Within ± 0.05 times full scale.

Frequency Characteristics

MEASUREMENT	STANDARD	FREQ. RANGE (-3 dB ± 1 dB)
W & F	CCIR	0.3 to 200 Hz
	JIS	0.5 to 200 Hz
	DIN	0.3 to 300 Hz
WOW	CCIR, DIN	0.3 to 6 Hz
	JIS	0.5 to 6 Hz
FLUTTER	CCIR, JIS	6 to 200 Hz
	DIN	6 to 300 Hz

REFERENCE OSCILLATOR

Frequency
3 kHz, within ± 0.1% (3.15 kHz available as an option).

Output Level
0.3 Vrms, ± 10%.

OSCILLOSCOPE OUTPUT

Level
1 Vrms ± 10% corresponds to full scale indication.

Impedance
2 kΩ (optimum load > 20 kΩ).

RECORDER OUTPUT

Level
1 Vdc ± 10% corresponds to full scale indication.

POWER REQUIREMENTS

115, 230 Vac; 50-60 Hz; 15 VA; (normally supplied for 115 Vac operation).

PHYSICAL

Size (W x H x D)
9⅞ x 5⅞ x 9⅞ in.
250 x 150 x 250 mm.

Weight
10 lbs., 4.5 kg.

ACCESSORIES SUPPLIED

One (1) Instruction Manual.

ACCESSORIES AND OPTIONS AVAILABLE

Type TR-39 Test Record.
Type TC-39 Test Tape (Cassette).
Model LFM-39A-01. Similar to above but with both 3 kHz and 3.15 kHz reference oscillators.

Single and Dual Channel AC Millivoltmeters

- 5 Hz to 1 MHz
- Amplified Output Signal Terminals
- Calibrated in Millivolts and dB
- 30 μV or 100 μV Sensitivity

The LMV-181A and LMV-185A are general purpose average responding ac voltmeters with a measurement range of 100 uV to 300 V. The LMV-182A is an average responding ac voltmeter with increased sensitivity featuring an effective measurement range of 30 uV to 100 V. Bandwidth is 5 Hz to 1 MHz permitting use in a broad range of applications including audio, IF and ultrasonic circuits and systems.

The meter scales are conveniently calibrated in both millivolts and dB (0 dB = 1 V and 0 dB = 0.775 V). Output terminals on all three models permit using these instruments as sensitive, accurate pre-amplifiers.

The LMV-185A is a dual channel instrument employing a dual movement meter and concentric range switches for each channel. This permits convenient measurement and comparison of input/output levels and direct indications of gain/attenuation.

The LMV-181A, LMV-182A and LMV-185A are accurate to within ± 2% f.s.

SPECIFICATIONS

NEW

METER

Sensitivity
(LMV-181A/LMV-185A)
100 µV.
(LMV-182A)
30 µV.

Voltage Range (full scale)
(LMV-181A/LMV-185A)
1 mV to 300 V in 12 ranges
−60 to +50 dB.
(LMV-182A)
(300 uV to 100 V in 12 ranges
−70 to +40 dB.

Accuracy
±2% of full scale at 1 kHz or 400 Hz.

Frequency Response (1 kHz ref.)
5 Hz to 1 MHz, ± 10%;
10 Hz to 500 kHz, ±5%;
20 Hz to 200 kHz ±2%.

Input Impedance
10 MΩ, 50 pF.

Maximum Input
600 V (dc plus ac peak).

Noise
Less than 2% full scale.

AMPLIFIER

Output
1 V (no load) corresponds to a full scale indication on each range.

Frequency Response (1 kHz ref.)
10 Hz to 500 kHz, −3 dB.

Output Impedance
600 Ω, ± 20%.

Distortion (1 kHz)
<1% full scale.

ENVIRONMENTAL

Operating Temperature
0-40° C

Operating Humidity
85%.

POWER REQUIREMENTS

100, 115, 200, 230 Vac, 50 to 60 Hz, 2.5 VA; normally supplied for 115 Vac operation.

PHYSICAL

Size (H x W x D)
5⅞ x 5¼ x 9⅞ in.
150 x 132 x 250 mm.

Weight
0.5 lb, 0.2 kg.

ACCESSORIES SUPPLIED (LMV-181A/LMV-182A)

One (1) Instruction Manual.
One (1) Test Cable (banana plugs to alligator clips).
One (1) Adapter, UHF to banana jack.

ACCESSORIES SUPPLIED (LMV-185A)

One (1) Instruction Manual.
Two (2) Test Cables (banana plugs to alligator clips).
Two (2) Adaptors, UHF to banana jack.

Audio Sine/Square Wave Generators

- Distortion from <0.03%
- 10 Hz to 1 MHz

The LAG-120A and LAG-125 are 10 Hz to 1 MHz precision audio generators used for designing, testing and servicing amplifiers, loudspeakers . . . any application requiring low-distortion sine waves or fast rise-time square waves. Both units have five frequency ranges with 3% dial accuracy above 100 Hz and a ± 1%, 50 dB output attentuator selectable in 10 dB increments with continuous fine adjustment. Sine wave distortion ranges from less that 0.03% between 500Hz and 20kHz to less than 1% over the full frequency range. Square wave rise time of the LAG-125 is less than 150 ns, less than 200 ns for the LAG-120A. The LAG-125 also has an output level meter and a burst signal that is gated for loudspeaker testing.

SPECIFICATIONS

LAG-120A

FREQUENCY

Range
10 Hz to 1 MHz in 5 decade ranges.

Accuracy
± (3% + 1 Hz).

SINE WAVE

Level
3 Vrms, 600 Ω.

Distortion
500 Hz to 20 kHz, 0.05%;
50 Hz to 200 kHz, 0.4%;
20 Hz to 500 kHz, 0.8%.

SQUARE WAVE OUTPUT

Level
3 V p-p, 600 Ω.

Rise Time
200 ns.

EXTERNAL SYNCHRONIZATION

Lock Range
± 1% of dial frequency per volt rms of input signal.

Maximum Input
10 Vrms.

Input Impedance
10 kΩ.

GENERAL OUTPUT CHARACTERISTICS

Impedance
600 Ω unbalanced.

Frequency Response
± 0.5 dB into 600 Ω load (1 kHz ref).

Amplitude Control
−50 to +12 dBm;
2.4 mV to 3 Vrms
(0-50 dB step attenuator, 10 dB steps).

POWER REQUIREMENTS
100, 115, 200, 230 Vac, 50 to 60 Hz, 12 VA; normally supplied for 115 Vac operation.

PHYSICAL

Size (W X H X D)
5¼ x 6¾ x 12 in.
132 x 170 x 300 mm.

Weight
6.5 lbs., 3 kg.

ACCESSORIES SUPPLIED
Instruction Manual.
Type LJ-10 600 Ω terminator.

SPECIFICATIONS

LAG-125

FREQUENCY

Range
10 Hz to 1 MHz in 5 decade ranges.

Accuracy
± 3%.

SINE WAVE OUTPUT

Level
3 Vrms, 600 Ω.

Distortion
500 Hz to 20 kHz, 0.03%
100 Hz to 100 kHz, 0.1%
50 Hz to 500 kHz, 0.5%
10 Hz to 1 MHz, 1%

SQUARE WAVE OUTPUT

Level
3 Vp-p, 600 Ω.

Overshoot
<3% at maximum output.

Sag
<5% at 10 Hz.

Rise Time
0.15 µs (0.45 µs unterminated).

BURST OUTPUT

Type
Gated sine wave.

Level
1.5 V p-p, 600 Ω.

Gating Intervals
(1) 4 cycles on, 4 cycles off;
(2) 4 cycles on, 12 cycles off;
(3) 8 cycles on, 8 cycles off.

Leakage
<2% during off interval at 20 kHz.

EXTERNAL SYNCHRONIZATION

Lock Range
± 0.5% of dial frequency per volt rms of input signal.

Maximum Input
10 Vrms.

Input Impedance
10 kΩ.

GENERAL OUTPUT CHARACTERISTICS

Impedance
600 Ω unbalanced/floating.

Frequency Response
± 0.3 dB at 600 Ω unbalanced output.

Amplitude Control
− 50 to + 10 dBm;
2.45 mV to 3.1 Vrms
(0-50 dB step attenuator, 10 dB steps).

OUTPUT METER

Range
0 to 1 and 0 to 3 Vrms;
−10 to +2 dB (0 dB = 0.775 V).

Accuracy
± 5% full scale.

POWER REQUIREMENTS
100, 115, 200, 230 VAc, 50 to 60 Hz, 12 VA; (normally supplied for 115 Vac operation).

PHYSICAL

Size (W x H x D)
7⅞ x 6 x 9⅞ in.
200 x 150 x 250 mm.

Weight
12 lbs., 5.5 kg.

ACCESSORIES SUPPLIED
Instruction manual.
Test cables, banana plugs to alligator clips.

LSG-231 FM Stereo Signal Generator

- 50 dB Channel Separation
- Composite, Pilot & Audio Outputs
- SCA, 67 kHz Modulation
- 0-75 kHz Deviation

The LSG-231 is a compact instrument which provides all of the signals required for testing, troubleshooting and aligning FM multiplex receivers and tuners. The RF output is a complete FM stereo broadcast signal with 50 dB channel separation. An internal 1 kHz signal may be applied to either or both audio channels, in or out of phase. Other outputs include composite, pilot and 1 kHz audio signals. The LSG-231 may also be modulated by external audio signals in the 50 Hz to 15 kHz range with switchable pre-emphasis of 50 or 75 µs.

SPECIFICATIONS

RF OUTPUT

Carrier Frequency
100 MHz, ± 1 MHz adjustable.

Level
0.1, 1, 10 mV switchable, 75 Ω.

Modulation Signals
Composite, L−R, L+R, L, and R (internal 1 kHz);
SCA, 67 kHz ± 5% or external;
external, L and R, 50 Hz to 15 kHz.

Frequency Modulation Levels
Composite, 0-100% (0-75 kHz deviation) adjustable;
pilot, 10% (7.5 kHz deviation) adjustable;
SCA, 0-20% adjustable.

Modulation Distortion
<0.5% at 100% modulation.

COMPOSITE SIGNAL OUTPUT

Signal Levels
L−R, L+R, L, and R, 0-1 Vrms adjustable;
pilot, 10% (7.5 kHz deviation) adjustable; SCA, 0-20% adjustable.

Impedance
600 Ω, unbalanced.

Subcarrier Leakage
< −40 dB at 100% modulation.

L−R Separation
Internal 1 kHz modulation, >50 dB; external 100 Hz to 3 kHz modulation, >45 dB; external 50 Hz to 15 kHz modulation, >35 dB.

PILOT SIGNAL OUTPUT

Frequency
19 kHz ± 2 Hz.

Level
0.8 Vrms adjustable, 150 Ω unbalanced.

AUDIO OUTPUT

Frequency
1 kHz ± 1%.

Level
1 Vrms, 1 kΩ.

Distortion
<0.5%.

L AND R AUDIO INPUTS

Level
<1 Vrms.

Impedance
Direct: 100 kΩ.
With pre-emphasis: 10 kΩ.

Pre-emphasis
Off, 50 µs and 75 µs switchable.

Frequency Range
50 Hz to 15 kHz.

SCA INPUT

Level
150 mVrms produces 10% modulation (7.5 kHz deviation).

Impedance
100 kΩ.

Frequency Range
10 to 100 kHz.

POWER REQUIREMENTS

100, 115, 200, 230 Vac, 50 to 60 Hz, 10 VA; (normally supplied for 115 Vac operation).

PHYSICAL

Size (W x H x D)
8 x 3⅛ x 10 in.
200 x 80 x 250 mm.

Weight
5 lbs., 2.3 kg.

ACCESSORIES SUPPLIED

Instruction Manual.
Type LBN-06 Dummy Antenna with BNC connector.
Two (2) test cables, miniature plug to alligator clips.
Two (2) miniature plugs.

Distortion Meter

- **Distortion to 0.01%**
- **Signal to Noise to 70 dB**
- **Audio Level Measurements to 100 μV**

LDM-170

The LDM-170 is a compact, versatile instrument for measuring distortion, signal-to-noise ratio and signal levels in audio equipment and systems.

Total distortion measurements of 0.01 to 100% can be made over a frequency range of 20 Hz to 20 kHz. Signal to noise ratio measurements can be made up to 70 dB with signal levels from 0.35 to 30 Vrms. Audio level measurements from 100 µV to 300 Vrms can be made up to 200 kHz with ± 5% full-scale accuracy.

SPECIFICATIONS

DISTORTION MEASUREMENTS

Ranges
0.3, 1, 3, 10, 30 and 100% full scale.

Accuracy
Within 0.05 times full scale.

Frequency Range
20 Hz to 20 kHz in three ranges.

Input Level Range
0.35 to 30 Vrms.

Input Impedance
100 kΩ, 50 pF.

Fundamental Frequency Suppression
Over 70 dB.

Residual Distortion
0.03% max.

SIGNAL-TO-NOISE RATIO MEASUREMENTS

Range
0 to 70 dB below ref. level.

Input Level
0.35 to 30 Vrms.

LEVEL MEASUREMENTS

Range
1 mV to 300 Vrms full scale in 12 ranges, minimum reading 100 µV.

Accuracy
± 5% of full scale.

Frequency Range
20 Hz to 200 kHz.

Highpass Filter
Cutoff at 500 Hz, 6 dB/Octave.

Output Level
1 Vdc corresponds to full scale indication.

POWER REQUIREMENTS

100, 115, 230 Vac, 50 to 60 Hz, 5 VA; (normally supplied for 115 Vac operation).

PHYSICAL

Size (W x H x D)
11¾ x 5⅞ x 9⅞ in.
300 x 150 x 250 mm.

Weight
13 lbs, 6 kg.

ACCESSORIES SUPPLIED

Instruction manual.
Test cable, dual banana plug to alligator clips.

Attenuators

LAT-45

SPECIFICATIONS

LAT-45

Attenuation
0 to 101 dB in 0.1 dB steps.

Accuracy
Within ± 2% at 1 kHz.

Input/Output Impedance
600 Ω, Unbalanced.

Frequency Characteristic
dc to 100 kHz (70 dB).
dc to 50 Hz (101 dB).

Internal Termination
Open or 600 Ω, switched.

Maximum Input
0.5 W (17 Vrms or dc, or +27 dBm).

Size (W x H x D)
11 13/16 x 4 x 5⅜ in.
300 x 100 x 150 mm.

Weight
4 lbs, 1.8kg.

LAT-47

SPECIFICATIONS

LAT-47

Attenuation
0 to 121 dB in 0.1 dB steps.

Accuracy
Within ± 1.5 % at 1 kHz.

Input/Output Impedance
600 Ω, Unbalanced dc to 100 kHz (70 dB).

Frequency Characteristic
dc to 80 kHz (121 dB).

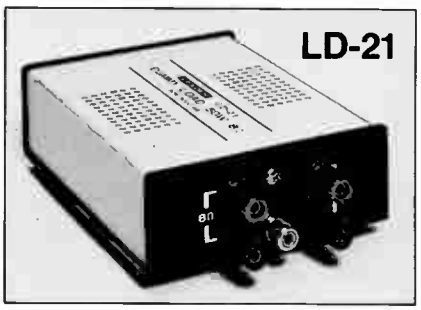
Internal Termination
Open, or 600 Ω, switched.

Maximum Input
0.5W (17 Vrms or dc, or + 27 dBm).

Size (W x H x D)
13¾ x 3½ x 5⅛ in.
350 x 90 x 130 mm.

Weight
5 lbs, 2.3kg.

Dummy Load



LD-21

SPECIFICATIONS

Channels
Two.

Impedance
8 Ω.

Power
50 Watts per channel.

Connectors
Combination binding post, banana jack.

Size (W x H x D)
4⅜ x 2 x 6½ in.
110 x 50 x 165 mm.

Weight
1 lb, 0.45 kg.

Special Products

Leader Instruments Corporation is a leading supplier of production test instrumentation for many segments of the electronics industry. The following instruments are representative of over 150 products which permit rapid, accurate and consistent testing in a high volume production environment.

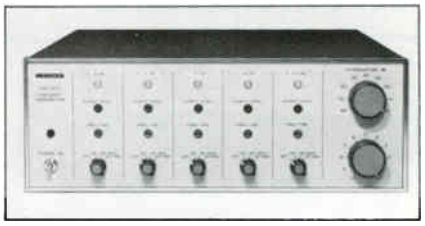
To obtain additional information on these products, write or call (800) 645-5104.

Centralized, Multiband Sweep/Marker Generator System

The LSW-1481 is a complete, central sweep/marker generator system for use in the production of AM/FM/SW radio receivers. It will supply up to 8 test stations with simultaneous swept frequency test signals for the AM/RF, AM/IF, FM/RF, FM/IF and SW/RF bands. Each band includes five marker frequencies. A complete selection of distribution system accessories including splitters, attenuators, connectors and terminations are also available.

Sweep Generator/Display

The LGO-620 combines a 3-band sweep generator and a CRT display for adjusting AM IF circuits (262.5 and 455 kHz) and FM IF circuits (10.7 MHz). Three marker frequencies are provided on each band.



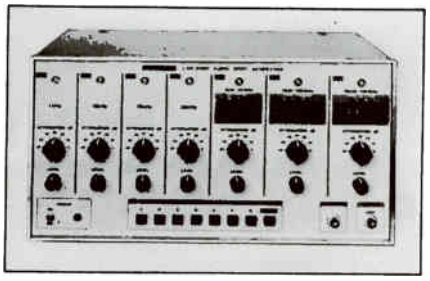
5-Frequency FM Spot Generator

The LSG-3071 is one of five spot frequency generator models available covering the LW, AM, FM and SW radio bands. Each model simultaneously produces five frequencies which may be distributed to up to 6 work stations. All models provide for external modulation of each spot frequency.

20 MHz to 310 MHz Sweep/Marker

The LSW-355 is a sweep marker generator designed for use in adjusting VHF TV tuners, CATV converters and IF amplifiers. Picture carriers are generated by a synthesizer which permits adapting the instrument to various national TV channel allocations by simply replacing an IC memory.

Two channels of frequency response curves can be displayed simultaneously. An auto-tracking system is employed which automatically sets the sweep output in accordance with the setting of the tuner under test.



Synthesized Audio Spot Generator

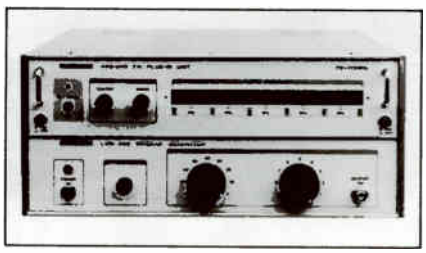
The LAG-2500 provides four fixed spot frequencies (1, 15, 19 and 38 kHz) and three adjustable spot frequencies (10-39.9, 50-100 and 100-199 kHz). The level of each frequency may be independently adjusted over an 80 dB range by switched and continuously variable attenuators. The LAG-2500 is ideal for adjusting and testing various audio filters, traps, crossovers, inductors, etc.

Frequency Response Checker

The LAT-4011-02 combines a number of functions in a single instrument for checking the frequency response of audio tape recorders. It generates a multi-frequency test signal which is recorded and then played back into the instrument.

The test signal consists of a lower frequency (30, 60, 125, 250 or 400 Hz or external) a 1 kHz reference signal and an upper frequency (4, 6, 8, 9, 10, 13 or 15 kHz or external.).

The played-back upper and lower frequency levels are measured and compared to the reference level. GO/NO GO lamps indicate the status of the unit tested and a meter is provided to measure the level of both lower and upper frequencies.



Sweep/Marker Generator System

The LSW-480 is a main-frame sweep/marker generator with plug-ins available for AM/IF, AM/RF, FM/IF, FM/RF and SW/RF frequency ranges. Each of the five plug-in units provide 5 marker frequencies which are set by digital thumbwheel switches. Distribution amplifiers are available for use in centralized systems of up to 8 stations.

PAL and SECAM Color Bar Generators

Leader also supplies a full line of Color Bar Generators for PAL and SECAM video systems applications. For more information on these products, contact your local sales representative, or Leader directly.

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Effective
December 1, 1984

	Model No.	Description	Unit Price
		OSCILLOSCOPES	
NEW	LBO-5825	35 MHz, 2-CH, Digital Storage Oscilloscope	$ 3,850.00
	LBO-518	100 MHz, 4-CH, Calibrated Delayed Sweep	2,050.00
NEW	LBO-516	100 MHz, 3-CH, Calibrated Delayed Sweep	1,795.00
	LBO-525L	50 MHz, 2-CH, Calibrated Delayed Sweep	1,195.00
	LBO-524L	35 MHz, 2-CH, Calibrated Delayed Sweep, D.L.	1,050.00
	LBO-524	35 MHz, 2-CH, Calibrated Delayed Sweep	995.00
	LBO-523	35 MHz, 2-CH, 0.5 mV Sensitivity	895.00
	LBO-308S	20 MHz, 2-CH, 3" Portable, AC/DC w/Battery Pack	950.00
	LBO-308PL	20 MHz, 2-CH, 3" Compact, PDA CRT, AC/DC	1,195.00
	LBO-522	20 MHz, 2-CH, 0.5 mV Sensitivity	695.00
	LBO-513A	15 MHz, 1-CH, 1 mV Sensitivity	470.00
	LBO-514A	15 MHz, 2-CH, 1 mV Sensitivity	595.00
	LBO-310A	4 MHz, 1-CH, Recurrent Sweep	305.00
	LOC-7005	Oscilloscope Calibrator	1,395.00
		DISPLAY AND IMAGING PRODUCTS	
NEW	LBO-51MA	High Resolution X-Y Display Module	995.00
	LBO-9S	X-Y Display, 10 kHz, Long Persistence Phosphor	685.00
	LBO-9C	X-Y Display, 10 kHz	650.00
	LBO-9D-01	X-Y Display, 10 kHz, Dual Channel	995.00
	LBO-9D-02	X-Y Display, 10 kHz, Dual Channel, DC Clamp	1050.00
	LBO-12C	X-Y Display, 10 kHz, Single Channel	750.00
	LBO-12D	X-Y Display, 10 kHz, Dual Channel	1,225.00
	LBO-552C	Stereo Oscilloscope, 10 MHz	585.00
		VIDEO PRODUCTS	
	LBO-5860A	NTSC Waveform Monitor, Lines 14-21 Line Select	2,050.00
	LBO-5860L	NTSC Waveform Monitor, Lines 7-21 Line Select	2,300.00
	LBO-5861A	PAL Waveform Monitor	2,050.00
	LVS-5850B	NTSC Vectorscope	2,050.00
	LVS-5851A	PAL Vectorscope	2,200.00
	LBO-51MV	Vector Display Module	995.00
	LCG-400M	Video Generator w/Multiburst	1,990.00
	LCG-400S	Video Generator w/Sweep	1,990.00
	LCG-396	NTSC Color Bar/Pattern Generator	995.00
	LCG-397	RF/IF/Video Generator	240.00
	LCG-396 PAL-M	PAL-M Version of LCG-396	1,050.00
NEW	LVG-1600	Programmable Video Generator with Keypad Entry of Parameters	10,000.00
NEW	LVG-1601A	Programmable Video Generator with Parameters Stored on ROM	5,500.00
NEW	LVG-1601-02	Video Generator Programmer for LVG-1601	1,650.00
	LCG-398B	SECAM III Color Bar Generator	1,345.00
	LCG-399A	PAL-B Color Bar Generator	1,445.00
	LCG-402	PAL-N Color Bar Generator	1,395.00
	LSW-333	VHF/UHF TV/FM Sweep Marker Generator	775.00
	LHC-909B	(6 Pack) Beta/Umatic VTR Head Checker	570.00
	LHC-909B	(Individual) Beta/Umatic VTR Head Checker	95.00
	LHC-909V	(6 Pack) VHS VTR Head Checker	570.00
	LHC-909V	(Individual) VHS VTR Head Checker	95.00
	LFC-945B	VHF/UHF CATV Level Meter	775.00
	LFC-944B	VHF/UHF TV Field Strength Meter	525.00

(over)

Model No.	Description	Unit Price
	ACCESSORIES (Continued)	
LC-2021	Double Banana to Miniature Alligator Clips; 1m Cable	12.00
LC-2022	Double Banana to Double Banana; 1m Cable	9.50
LC-2026	BNC to Miniature Alligator Clips; 1m 75Ω Cable	11.00
LC-2048	BNC to Miniature Alligator Clips; 1m 50Ω Cable	11.00
LC-2027	BNC to BNC; 1m 75Ω Cable	12.00
LC-2028	Two Single Banana Plugs to Miniature Alligator Clips; 1m Cable	11.00
LC-2043	Double Banana to BNC; 1m Cable	11.00
BNC-BP	BNC to Single Binding Post Adapter	7.00
LT-2049	BNC 50Ω In-Line Terminator	37.00
LT-1551	BNC 75Ω In-Line Terminator	37.00
215-U01	Plug-In ROM Unit with Type 2716 ROM for LSG-215A, 216	80.00
LC-2067	GPIB Cable, 1 Meter Length	80.00
LC-2068	GPIB Cable, 3 Meter Length	100.00

TERMS: Net 30 Days • All Prices and Specifications Subject to Change Without Notice • Prices are F.O.B. Hauppauge, New York or Torrance, California • Minimum Order $100 • No Returns Without Prior Written Authorization

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