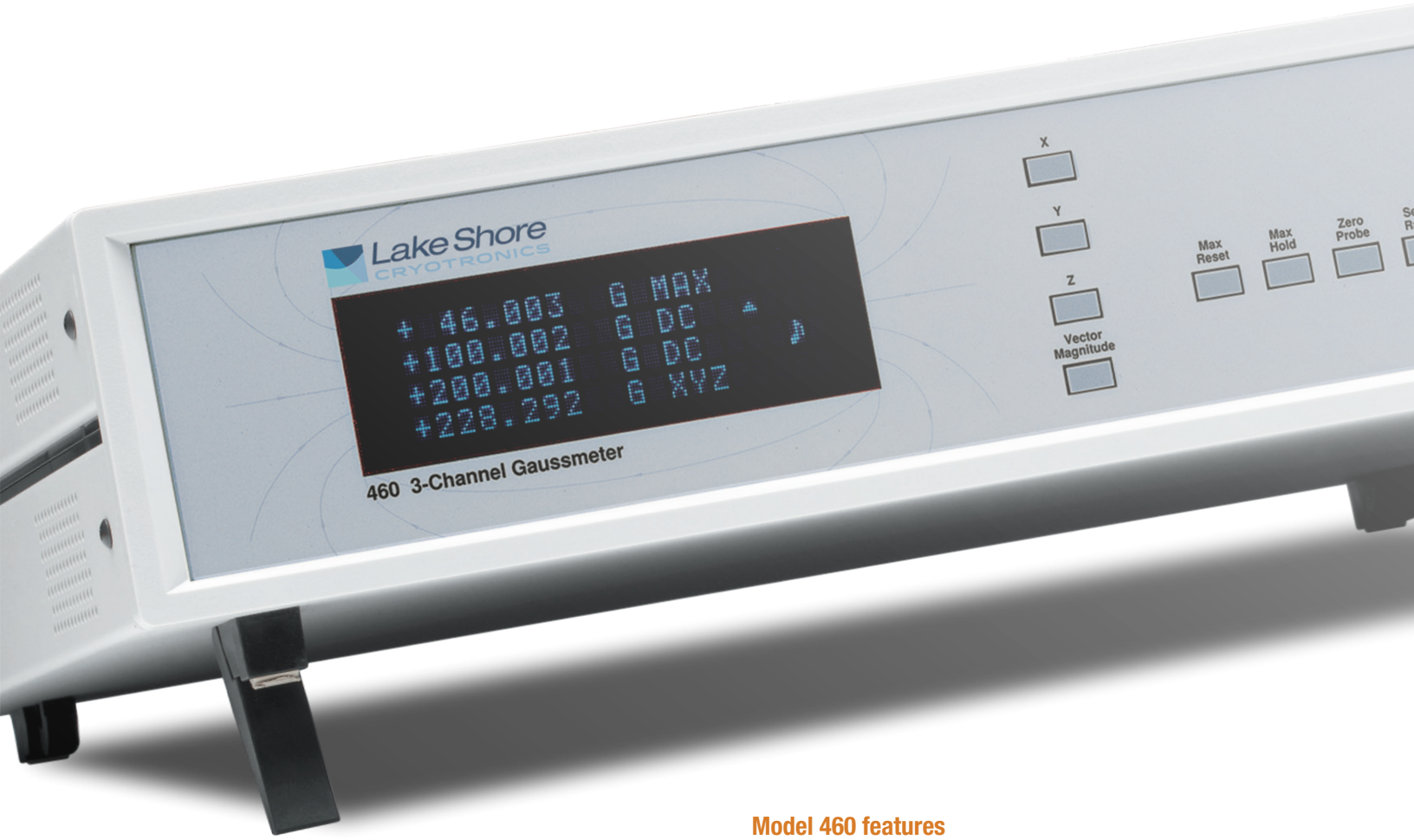
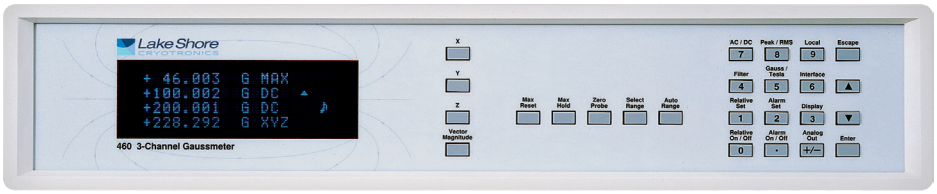
Model 460 3-Channel Gaussmeter



Model 460 features

- Displays each axis simultaneously
- Vector magnitude reading
- Resolution to 5¾ digits (1 part out of ±3000,000)
- Accuracy to ±0.10% of reading
- Peak capture
- Analog voltage outputs
- IEEE-488 and serial interface
- Can be operated with three individual probes, a single 2-axis probe and one individual probe, or a single 3-axis probe



Introduction

The Model 460 3-channel Hall effect gaussmeter is the best choice for applications requiring 3-axis measurements or three simultaneous single axis measurements. The Model 460 combines the performance of three gaussmeters into one package, making it an excellent value for materials analysis and field mapping applications. The large vacuum fluorescent display shows readings for all three channels simultaneously as well as vector magnitude or differential readings. The full-function keypad provides easy access to measurement features.

Measurement modes

The Model 460 operates in DC, RMS, and Peak modes, with superior accuracy and resolution in DC measurement mode. Measurements to 5¾ digits are possible due to the low noise floor. With low noise and high stability, the Model 460 is ideal for multiple-axis field mapping applications. Changing fields that are often used in material analysis systems can be measured on all three inputs up to 18 times per second over the computer interface, with excellent resolution.

Best suited for fringe field measurements or measurement of magnets and solenoids driven at line frequency, RMS mode measures periodic AC fields from 10 Hz to 400 Hz. Instrument circuitry accommodates wave forms with crest factors up to 7, with true RMS conversion.

Peak circuitry in the Model 460 captures single event peaks or monitors the peak amplitude of periodic wave forms from 10 Hz to 400 Hz, with reproducible single peak measurements down to 5 ms rise time. Instrument software accommodates indefinite hold time with no decay. The Model 475 DSP gaussmeter is a good choice if faster peak or RMS measurements are required.

Range and resolution

When used with appropriate probes, the Model 460 3-channel gaussmeter offers full scale ranges from 300 mG to 300 kG. A different range can be used with each input. With 5¾-digit resolution, DC field variations approaching 0.010 mG can be detected; in larger DC fields, resolution to one part in 300,000 is possible. For RMS and Peak measurement, resolution is 4¾ digits or one part in 30,000 because in these modes environmental noise is more difficult to separate from the desired signal. The filter feature of the Model 460 improves resolution in noisy environments by taking a running average of field readings. DC mode requires filtering to achieve 5¾-digit resolution.

Interface

The Model 460 is equipped with both parallel (IEEE-488) and serial (RS-232C) computer interfaces for command and data exchange; maximum reading rate can be achieved with the IEEE-488 interface. Nearly every function on the Model 460 front panel can be performed via computer interface. The Model 460 also includes one corrected and three monitor analog voltage outputs. Corrected for sensor linearity, offset, and temperature effects, the corrected output is a DC voltage proportional to the display reading. It is generated by a digital-to-analog converter programmed at the update rate of the Model 460, with software error correction. Corrected output is compatible with the Model 460 vector calculation software. The three monitor outputs are real time analog voltages proportional to each input's field; uncorrected, they provide output across the full DC to 400 Hz bandwidth at real-time speed.

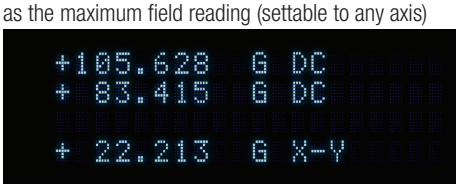
Display and interface features

The Model 460 has a 4-line by 20-character vacuum fluorescent display. During normal operation, the display is used to report field readings and give results of other features such as max/min or relative. When setting instrument parameters, the display gives the operator meaningful prompts and feedback to simplify operation. The operator can also control display brightness.

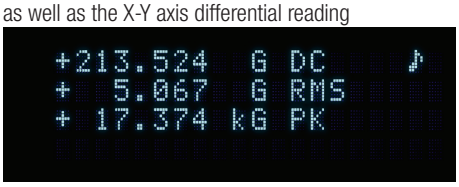
Following are four examples of the various display configurations:

Normal reading—the display configured to show the live DC field readings for the X, Y, and Z axis, as well as the vector magnitude

Max DC hold on—the display configured to show the live DC field readings for the X, Y, and Z axis, as well as the maximum field reading (settable to any axis)



Differential reading on—the display configured to show the live DC field readings for the X and Y axis, as well as the X-Y axis differential reading



3 separate probe readings on—the display configured to show the X, Y, and Z axis as three separate gaussmeters: the X axis as a DC field reading with audible and visual alarm, the Y axis as an RMS field value, and the Z axis as a peak field value

Model 460 specifications

General measurement

Number of inputs: 3
Update rate: Up to 4 rdg/s on display; up to 18 rdg/s with IEEE-488 interface
Measurement modes: DC, RMS, Peak
Probe compatibility: Standard, multi-axis, and custom probes
Probe features: Linearity Correction, Temperature Correction, Auto Probe Zero
Measurement features: Autorange, Max Hold, Relative Mode, Filter, Vector Magnitude, Differential Reading
Probe connector: 15-pin D style

DC measurement

Probe type Range	5¾ digits with filter	4¾ digits without filter
HST probe		
300 kG	0.001 kG	0.01 kG
30 kG	0.0001 kG	0.001 kG
3 kG	0.00001 kG	0.0001 kG
300 G	0.001 G	0.01 G
HSE probe		
30 kG	0.0001 kG	0.001 kG
3 kG	0.00001 kG	0.0001 kG
300 G	0.001 G	0.01 G
30 G	0.0001 G	0.001 G
UHS probe (discontinued)		
30 G	0.0001 G	0.001 G
3 G	0.00001 G	0.0001 G
300 mG	0.001 mG	0.01 mG

DC accuracy: ±0.10% of reading ±0.005% of range
DC temperature coefficient: ±0.05% of reading ±0.003% of range per °C

AC RMS and peak measurement

AC display resolution: 4¾ digits

Probe type Range	RMS resolution	Peak resolution
HST probe		
300 kG	0.01 kG	0.01 kG
30 kG	0.001 kG	0.001 kG
3 kG	0.0001 kG	0.0001 kG
300 G	0.01 G	×
HSE probe		
30 kG	0.001 kG	0.001 kG
3 kG	0.0001 kG	0.0001 kG
300 G	0.01 G	0.01 G
30 G	0.001 G	×
UHS probe (discontinued)		
30 G	0.001 G	0.001 G
3 G	0.0001 G	0.0001 G
300 mG	0.01 mG	×

AC frequency range: 10 Hz to 400 Hz
AC RMS accuracy: ±2% of reading (50 Hz to 60 Hz)
AC RMS frequency response: 0 to -3.5% of reading (10 Hz to 400 Hz)
(All AC RMS specifications for sinusoidal input >1% of range)
AC peak accuracy: ±5% typical
AC peak speed: 5 ms for single peak

Front panel

Display type: 4-line × 20-character, vacuum fluorescent
Display resolution: Up to ±5¾ digits
Display update rate: 4 rdg/s with vector off, 3 rdg/s with vector on
Displays units: Gauss (G), tesla (T)
Units multipliers: μ, m, k
Annunciators: RMS: AC input signal, DC: DC input signal, MAX: max hold value, s: relative reading, R: remote operation, ♪: alarm on
Keypad: 25 full-travel keys
Front panel features: Display prompts, front panel lockout, brightness control

Interfaces

RS-232C capabilities
Baud: 300, 1200, 9600
Connector: RJ-11 configuration
Update rate: Up to 14 rdg/s at 9600 baud

IEEE-488 capabilities
Complies with IEEE-488.2 SH1, AH1, SR1, RL1, PP0, DC1, DT0, C0, E1
Update rate: 18 rdg/s with vector off, 14 rdg/s with vector on

Alarm
Settings: High and low setpoint, inside/outside, audible
Actuators: Display annunciator, beeper

Monitor analog output (3)
Configuration: Real time analog voltage output
Scale: ±3 V = ±full scale on selected range
Frequency response: DC to 400 Hz
Accuracy: Probe dependent
Minimum load resistance: 1 kΩ (short circuit protected)
Connector: BNC

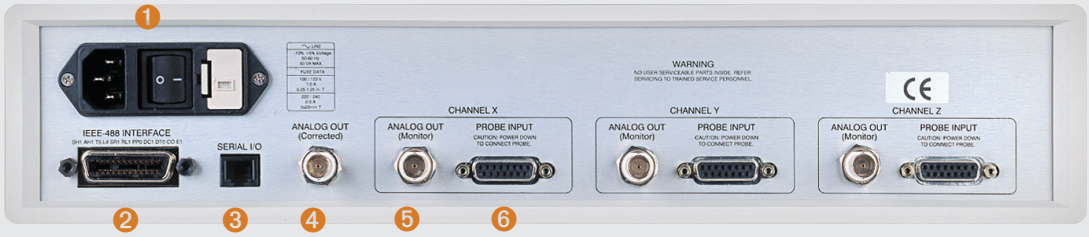
Corrected analog output (1)
Configuration: Voltage output generated by DAC
Range: ±3 V; ±10 V for the Model 460-10
Scale: User-defined
Resolution: 0.366 mV of ±3 V
Update rate: Same as field measurement
Accuracy: ±0.1% full scale in addition to measurement error
Minimum load resistance: 1 kΩ (short circuit protected)
Connector: BNC

General

Ambient temperature: 15 to 35 °C at rated accuracy; 5 to 40 °C with reduced accuracy
Power requirement: 100, 120, 220, 240 VAC (+5%, -10%), 50 or 60 Hz, 40 VA
Size: 432 mm W × 89 mm H × 368 mm D (17 in × 3.5 in × 14.5 in), full rack
Weight: 7.5 kg (16.5 lb)

Model 460 rear panel

1. Line input assembly
2. IEEE-488 interface
3. Serial I/O interface
4. Corrected analog output
5. Monitor analog outputs
6. Probe inputs



Stock probes

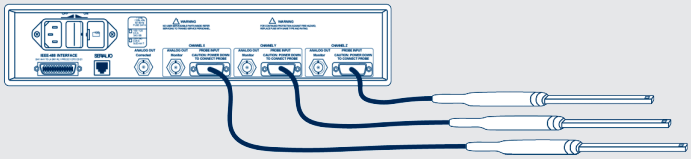
The most commonly ordered probes for this gaussmeter. Others available starting on page 30.

Model	Orientation	Frequency range	Full-scale field ranges	Stem material	Stem length (in)	Probe part number
Model 460	Axial	DC and 10 Hz to 400 Hz	HST-2: 300 G, 3 kG, 30 kG	Aluminum	4	MMA-2504-VG
			HSE-1: 30 G, 300 G, 3 kG, 30 kG	Fiberglass	4	MMA-2504-VH
	Transverse	DC	HST-2: 300 G, 3 kG, 30 kG	Aluminum	4	MMT-6J04-VG
		DC and 10 Hz to 100 Hz	HSE-1: 30 G, 300 G, 3 kG, 30 kG	Aluminum	4	MMT-6J04-VH
		DC and 10 Hz to 400 Hz	HST-2: 300 G, 3 kG, 30 kG	Fiberglass	4	MNT-4E04-VG
			HSE-1: 30 G, 300 G, 3 kG, 30 kG	Fiberglass	4	MNT-4E04-VH
	3-Axis	DC and 10 Hz to 400 Hz	HSE-1: 30 G, 300 G, 3 kG, 30 kG	Aluminum	8	MMZ-2508-UH

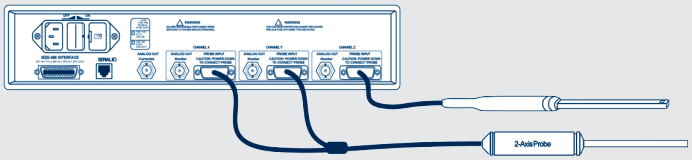
Probes and sensors

Lake Shore offers an extensive line of single, two-, and three-axis probes, standard Hall sensors, and probe accessories. Lake Shore probes are factory calibrated for accuracy and interchangeability. Factory-calibrated probes feature a PROM in the probe connector so that calibration data can be read automatically by the instrument. If the probe is equipped with a temperature sensor, the Model 460 reads both temperature and field signal and continuously adjusts the calculated field value. The customer can also download sensitivity for discrete Hall sensors. In addition, Lake Shore can custom design probes and assemblies to meet specific application needs.

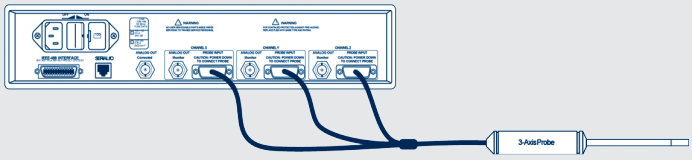
Model 460 rear panel configurations



Model 460 configured as 3 separate gaussmeters



Model 460 configured as a 2-axis and single axis gaussmeter



Model 460 configured as a 3-axis gaussmeter

Ordering information

Part number	Description
460	Model 460 gaussmeter
460-10	Model 460 gaussmeter with corrected analog output set to ±10 V instead of ±3 V

Please indicate your power/cord configuration:

1 100 V—U.S. cord (NEMA 5-15)
2 120 V—U.S. cord (NEMA 5-15)
3 220 V—Euro cord (CEE 717)
4 240 V—Euro cord (CEE 717)
5 240 V—U.K. cord (BS 1363)
6 240 V—Swiss cord (SEV 1011)
7 220 V—China cord (GB 1002)

Accessories included

4060	Zero gauss chamber
119-012	Model 460 user manual

Accessories available—also see Gaussmeter Accessories section

4001	RJ-11 4-wire cable assembly used with RS-232C interface—cable is 4.3 m (14 ft) long
4002	RJ-11 to DB-25 adapter—connects computer to RS-232C port
4003	RJ-11 to DE-9 adapter—connects computer to RS-232C port
4004	IEEE-488 interface cable connects customer-supplied computer to IEEE-488 interface—cable is 1 m (3.3 ft) long
CAL-460-CERT	Instrument recalibration with certificate
CAL-460-DATA	Instrument recalibration with certificate and data
CAL-NEW-DATA	New instrument calibration with certificate and data
RM-1	Rack mounting shelf to attach one Model 460 gaussmeter to a 483 mm (19 in) rack mount space

All specifications are subject to change without notice
Probes ordered separately (see above)
Other probes available — see page 30