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MODEL LB

Incremental Optical Linear Encoder



PRODUCT DATA SHEETS

- **Fully enclosed, incremental, optical linear encoder offering resolutions from .004" to .000020" (English) or 40 microns to .5 micron (Metric)**
- **2" (70 mm) to 48" (1220 mm) travel lengths**
- **Designed for OEM usage**
- **Internal 2X, 5X, or 10X cycle interpolation electronics**
- **Compatible with optional external X50 and X64 cycle interpolation electronics to provide resolutions to .07 micron (.000003")**
- **Single LED light source**
- **.708" by 1.857" cross section**
- **Amplified sinewave or differential, TTL compatible line driver output**
- **Enhanced mounting tolerances**

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SPECIFICATIONS

Available resolutions:
- English units provide a range of resolutions from .002" to .000020".
- Metric units provide a range of resolutions from .04 millimeter (40 microns) to .0005 millimeter (0.5 micron). Note: The above resolutions are attained through the combination of DRC-supplied electronics and user-supplied 1X, 2X, or 4X edge-triggering interface electronics.
- Resolution enhancements to .07 micron (.000003) using external ER module.

Light source:
- Solid state LED 100K hours MTBF.

Light sensors:
- Silicon photovoltaic cells.

Excitation voltages:
- +5 vdc (±5%) at 220 ma (maximum).

Output format:
- Two count channel outputs in phase quadrature (A and B) with an optional zero reference (ZR).

Quadrature specification:
- 90° ± 20 electrical degrees.

Symmetry specification:
- 180° ± 10 electrical degrees.

Zero reference location:
- When the optional zero reference output is selected, its customary position is in the center of travel. Beginning or end of travel zero reference outputs are available at 1.0" (25 mm) from the travel limits. A single zero reference at a selected location is optionally available. Approximate beginning or end of travel ZR locations are indicated by B and E in the top view of the outline drawing.

Zero reference width:
(See Figures 1 and 3)
- Units with amplified sinewave outputs: 1 ± 1/2 count channel cycles wide.
- Units with cycle interpolation provide a 1/4 cycle wide gated zero reference output.

Zero reference alignment:
- Units with amplified sinewave outputs: Zero reference midpoint is between 90° and 180° of Channel A sinewave.
- Units with cycle interpolation electronics: Zero reference aligns with count channel output quadrant AB.

Phase sense:
- Channel A leads Channel B for left to right movement of the readhead as oriented in the top view of the outline drawing.

Rise and fall times:
- 1 microsecond (maximum) 10% to 90%.

Electrical connections:
- See Table 1.

Output specifications:

Waveform

Amplified sinewave: (See Figure 1)
- Note: Output waveform is dictated by resolution requirements. Signal level data follows:
- Count channels: 2.0 volts ±0.5 volts peak-to-peak differential output. Zero reference: 2.0 volts ± 0.5 peak-to-peak differentially with a half amplitude width of 1 ± 1/2 cycle.

Squarewave: with or without cycle interpolation: (See Figure 2)
- Differential, TTL compatible, RS422 line driver outputs with 40 ma sink and -40 ma source current capability.

MECHANICAL

Housing material:
- Anodized aluminum.

Glass scale material:
- Soda lime glass with an inconel deposited pattern.

Lip seal material:
- Synthetic elastometer.

Coefficient of linear expansion:
- 8 PPM/°F (15 PPM/°C) for freestanding encoder. (Note: This is a composite figure that describes the expansion coefficient for the complete encoder.)

Available scale resolutions:
- English scales: 500 lines per inch (.002" pitch) or 1,250 lines per inch (.0008" pitch).
  Metric scales: 50 lines per millimeter (20 micron pitch) or 25 lines per millimeter (40 micron pitch).

Maximum operating speed:
- This parameter varies with the resolution of the glass scales.
  50 LPI: 20 inches/second (500 millimeters/second).
  1,250 LPI: 15 inches/second (380 millimeters/second).
  25 LPMM: 20 inches/second (500 millimeters/second).
  50 LPMM: 15 inches/second (380 millimeters/second).

Slew speed (non-operating):
- 40 inches/second (1 meter/second) maximum.

Maximum acceleration:
- 100 feet/second^2 (30 meters/second^2).

Starting force:
- 1.4 pounds (6 Newtons) maximum.

Readhead weight:
- 5.9 ounces (167 grams). Includes 10.0 feet of cable.

Scale assembly weight:
- .8 ounces/inch (8 grams/cm). 0002/0070 travel = 3.8 ounces (108 grams).

Total weight:
- 3.8 ounces + 1.60 ounces per inch + 5.9 ounces + 8 ounces/inch.

ENVIRONMENTAL

Operating temperature range:
- +32° to 140°F (0° to +60°C).

Storage temperature range:
- -4° to 158°F (-20° to +70°C).

Shock:
- 10G's for 11 milliseconds duration.

Humidity:
- To 98% R.H. (non-condensing).

PERFORMANCE

Available travel lengths:
- 2" (70mm) to 48" (1,220 mm).

Accuracy:
- Grade A: ±5 μm (±.0002") over the selected travel length.
- Grade B: ±10 μm (±.0004") over the selected travel length.
  Note: 1. All accuracies stated at 68°F (20°C).

Maximum cable lengths:
- Determined by output configuration
- Amplified analog: 40 feet (12 meters).
- Squarewave (all configurations) 25 feet (15 meters).

Maximum allowable parallel misalignment:
- .010" (2.5 mm) T.I.R. in either axis.
- For best accuracy, mount units within .002" T.I.R.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

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FIGURE 1

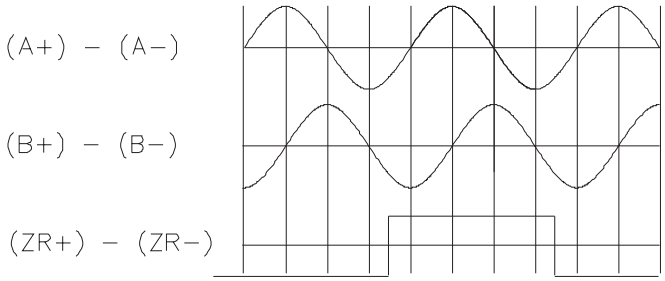


TABLE 1

WIRE DESIGNATIONS FOR MODEL LB	
COLOR	FUNCTION
ORANGE	CHANNEL A+ (A) OUTPUT
GREEN	CHANNEL A– ($\overline{A}$) OUTPUT
YELLOW	CHANNEL B+ (B) OUTPUT
BLUE	CHANNEL B– ($\overline{B}$) OUTPUT
BROWN	CHANNEL ZR+ (ZR) OUTPUT
GRAY	CHANNEL ZR– ($\overline{ZR}$) OUTPUT
BLACK	COMMON
RED	+5VDC (± 5%)
WHITE	UNUSED AT THIS TIME
VIOLET	CASE GROUND
WHITE/BLACK	UNUSED AT THIS TIME
DRAIN	CABLE SHIELD DRAIN

Notes:

1. In the event of modifiers, the feature difference(s) in the model no. will be replaced with designators.
2. If unit has an English scale, denote travel length in inches. If Unit has a metric scale, denote travel length in millimeters. The LB was designated as a metric device; as a result, the English (inch) travel lengths have been rounded off to the lowest significant inch i.e., 120mm = 4.72", 820mm = 32.28".
3. If unit has an English scale, denote cable length in feet. If unit has a metric scale, denote cable length in meters. Use two charaters to denote cable length ie., 03 = f feet (for units with English scales) or 03 = 3 meters (for units with metric scales).

FIGURE 2

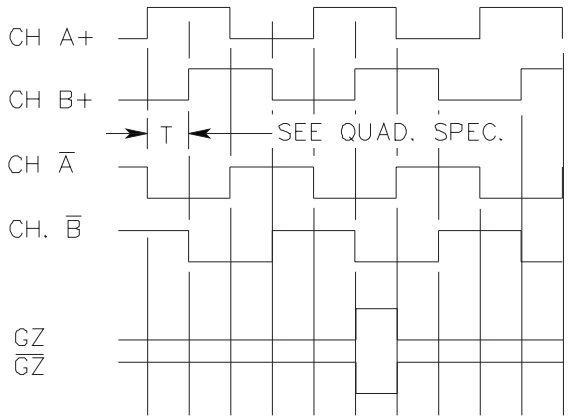
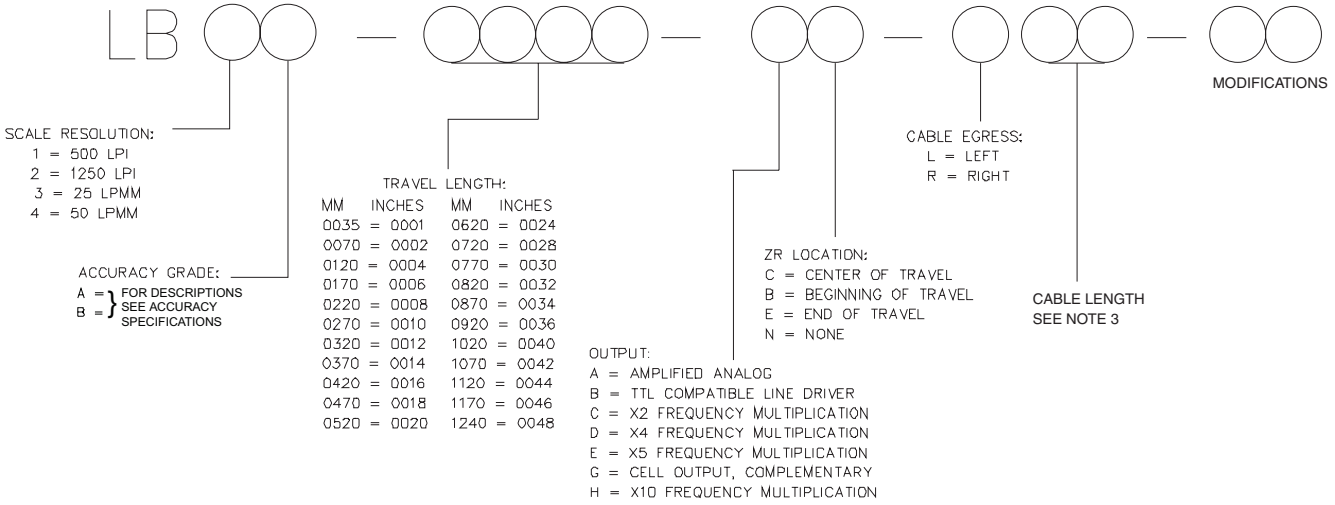
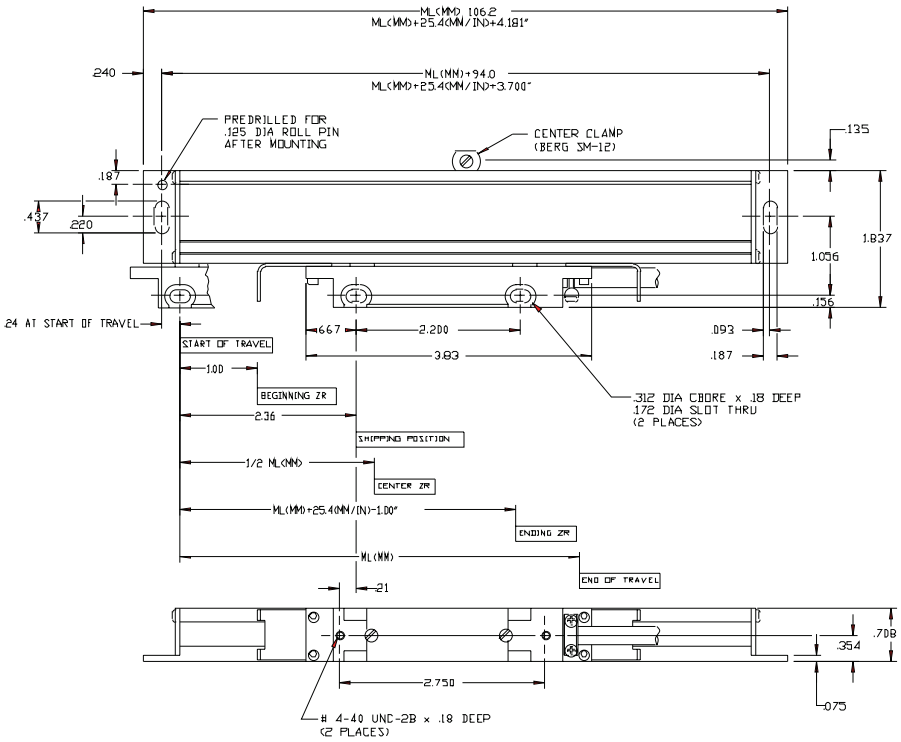


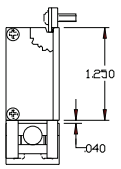
FIGURE 3

Above timing diagram applies for left to right movement of the readhead when the scale is held stationary and when the linear is oriented as shown in the top view of the outline drawing.



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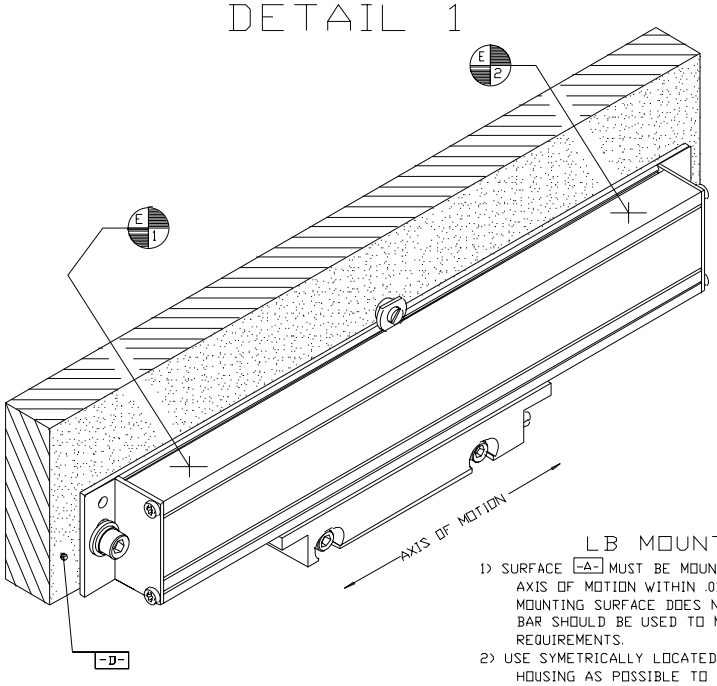


* CONSULT FACTORY IF MODEL NUMBER CONTAINS MORE THAN 2 DIGITS AFTER CABLE EGRESS CODE ("L" or "R").

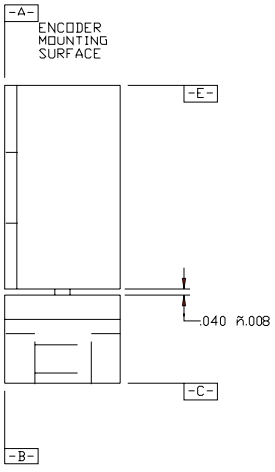
ELECTRICAL CONNECTIONS-STANDARD UNITS ONLY	
WIRE COLOR	FUNCTION
ORANGE	CHANNEL A+ (OR A) OUTPUT
GREEN	CHANNEL A- (OR A) OUTPUT
YELLOW	CHANNEL B+ (OR B) OUTPUT
BLUE	CHANNEL B- (OR B) OUTPUT
BROWN	CHANNEL ZR+ (OR ZR) OUTPUT
GREY	CHANNEL ZR- (OR ZR) OUTPUT
RED	+5vdc (±5%)
BLACK	COMMON
WHITE	UNUSED AT THIS TIME
VIOLET	CASE GROUND
WHITE/BLACK	UNUSED AT THIS TIME

1) TO CALCULATE OVERALL LENGTH AND MOUNTING HOLE LOCATIONS USE THE METRIC TRAVEL LENGTH + 106 MM OR 94 MM RESPECTIVELY
2) SHIPPING SPACER MAY BE USED AS A GAUGE BETWEEN READHEAD AND ENCODER BODY.
3) CENTER SUPPORT WILL BE SUPPLIED FOR UNITS WITH TRAVEL LENGTHS OF 620 MM (24") OR GREATER
4) DIMENSIONS FOR 2" TRAVEL LENGTHS = 1.98" (50.2) FOR 4" TRAVEL LENGTHS AND GREATER = 2.60" (66.0)
5) OUTLINE DRAWING DIMENSIONS UNLESS OTHERWISE STATED ARE ±.020

DETAIL 1



DETAIL 2



LB MOUNTING INSTRUCTIONS

1) SURFACE -A- MUST BE MOUNTED TO A SURFACE THAT IS PARALLEL (//) TO THE AXIS OF MOTION WITHIN .010 TIR AND FLAT WITHIN .002/ INCH. IF THE MOUNTING SURFACE DOES NOT MEET THIS REQUIREMENT A SECONDARY MOUNTING BAR SHOULD BE USED TO MAKE THE ADJUSTMENTS NEEDED TO MEET THESE REQUIREMENTS.
2) USE SYMETRICALLY LOCATED GAGING POINTS AS CLOSE TO THE ENDS OF THE HOUSING AS POSSIBLE TO SET SURFACE -C- PARALLEL TO THE AXIS OF TRAVEL WITHIN .010 TIR
3) SURFACE -B- IS TO MOUNT COPLANER TO SURFACE -A- WITHIN .010 TIR.
4) A CENTER SUPPORT SHOULD BE USED ON ALL UNITS WITH MORE THAN 24" OF TRAVEL. WHEN USING A CENTER SUPPORT THE SURFACE THAT -A- IS TO BE MOUNTED TO MUST BE PARALLEL TO THE CENTER OF MOTION WITHIN .010 TIR
5) MOUNTING DEVIATIONS FROM NORMAL DIMENSION SHOWN HAVE SLIGHT AFFECTS ON MEASURING ACCURACY. TO ACHIEVE THE MOST ACCURATE READING POSSIBLE, MOUNTING DIMENSIONS SHOULD BE HELD TO .002 TIR.

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