



EL4836HB and EL4836HB-ICE 276 x 128 Pixel Electroluminescent Display

Product Profile

Operations Manual

The EL4836HB and the EL4836HB-ICE displays are low power, rugged, high-resolution electroluminescent (TFEL) flat panel displays. They replace the LCD or bulky CRT in instrument product designs. Their compact dimensions save space that can allow addition of features or reductions in overall size. They are designed to function in extreme environments, and the crisp displays are viewable under most lighting conditions at wide viewing angles. Their ease of installation reduces system integration costs.

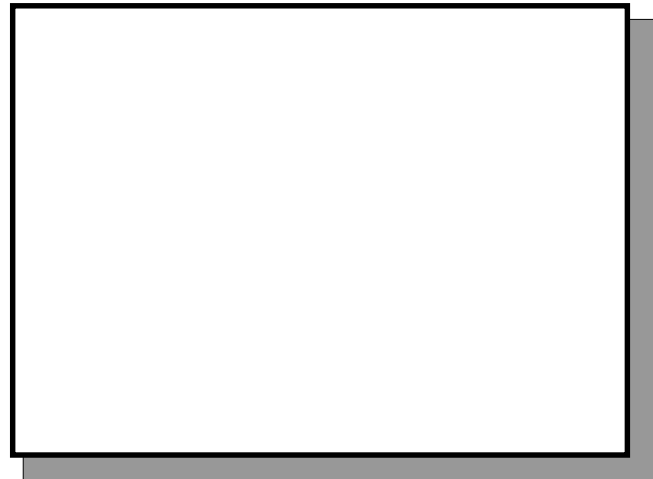
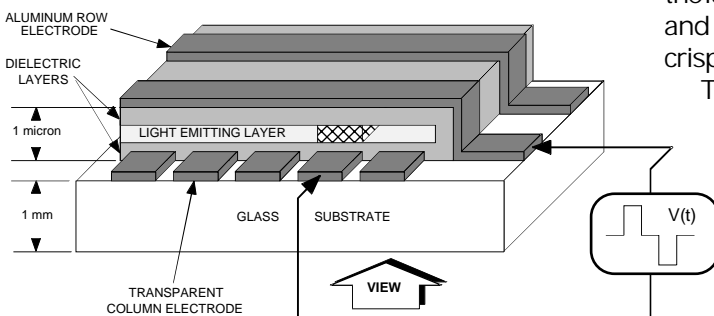
The EL4836HB and the EL4836HB-ICE are 276 column by 128 row displays with a resolution of 48 dots per inch. The pixel aspect ratio is 1:1. The LCD-type interface is TTL-compatible and is designed for hardware compatibility with the Hitachi HD61830B or equivalent LCD controller. These displays may be driven at frame rates up to 120 Hz for applications requiring extra brightness.

The displays require +5V/+12VDC or +12VDC only power and four basic signals to operate:

1. Video Data or pixel information (VID)
2. Video Clock, pixel clock, or dot clock (VCLK)
3. Horizontal Sync (HS)
4. Vertical Sync (VS)

EL Technology

A display consists of an electroluminescent glass panel and a mounted circuit board with control electronics.



The EL glass panel is a solid-state device with a thin film luminescent layer sandwiched between transparent dielectric layers and a matrix of row and column electrodes. The row electrodes, in back, are aluminum; the column electrodes, in front, are transparent. The entire thin film device is deposited on a single glass substrate. A circuit board is connected to the back of the glass substrate. Components are mounted on this circuit board within the same area as the electroluminescent viewing area on the glass panel. The circuit board is connected to the glass with metal-on-elastomer interconnect technology. The result is a flat, compact, reliable and rugged display device.

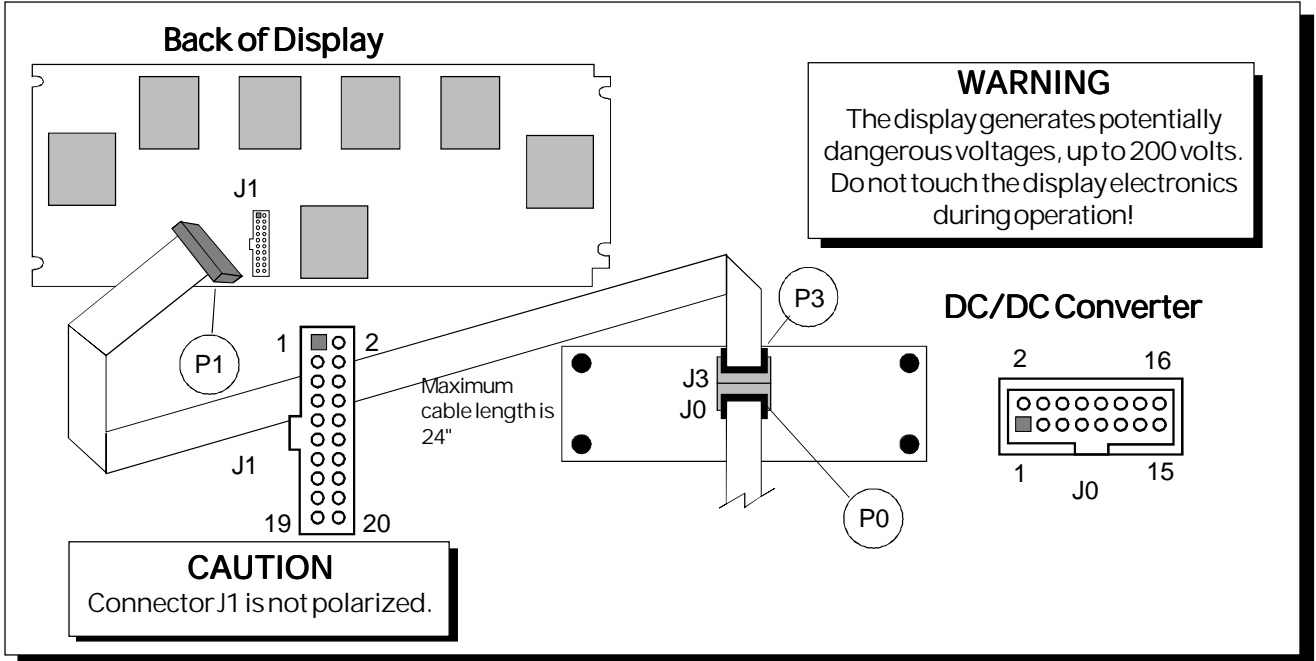
The EL4836HB-ICE display includes a light absorbing Integral Contrast Enhancement (ICE_{TM}) construction of the display glass. ICE_{TM} background significantly improves the luminance contrast of the display in bright ambients, and makes the display easier to read by increasing the crispness of the pixels.

The 276 column electrodes and 128 row electrodes are arranged in an X-Y formation with the intersecting areas performing as pixels. Voltage is applied to both the correct row electrode and the correct column electrode to cause a lit pixel. Special operating voltages required are provided by a DC/DC converter.

Electrical Characteristics

■ Display

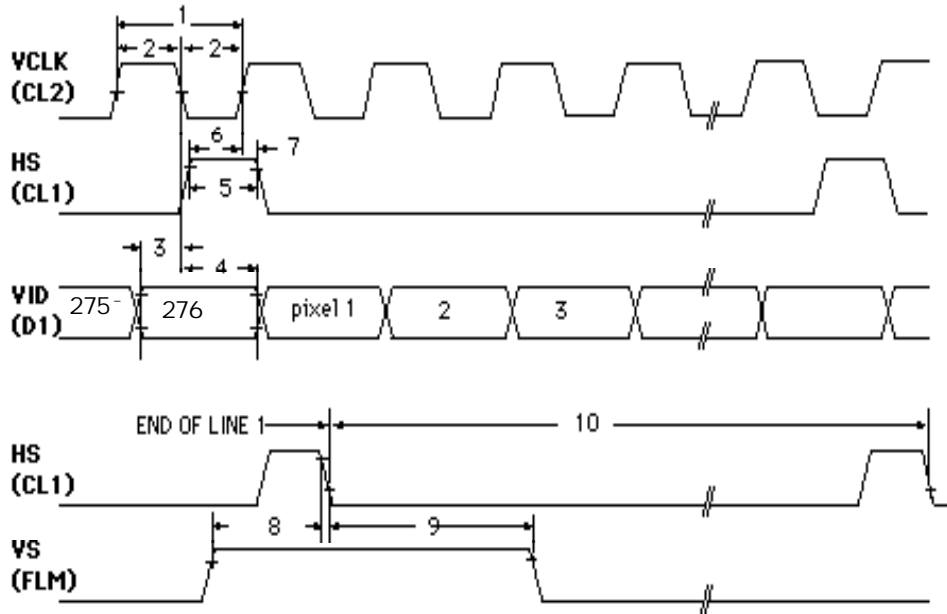
The EL4836HB and EL4836HB-ICE products consist of a display, a DC/DC converter, and interconnecting cable as shown below.



■ Input to the Display at P0

Plns	Signal	Symbol	Description
1, 2	Voltage	VH	+12V. See also the descriptions of DC power requirements on page 4.
3, 4	Voltage	VL	+5V optional input, see page 4.
5	not connected		
6	not connected		
7, 8, 10 12, 14, 16	Ground	GND	Signal return.
9	Vertical Sync	VS	VS initiates a new frame scan. To properly position the displayed data, VS rising edge must be high at the end of the first horizontal scan line of the frame. This signal passes directly from the video source to the display via the DC/DC converter. It is not buffered or terminated within the DC/DC converter.
11	Horizontal Sync	HS	HS marks the last pixel of a horizontal scan line. HS period must be an even multiple of 4 tVCLK. The last 276 pixels prior to the falling edge of HS will be visible on the display. This signal passes directly from the video source to the display via the DC/DC converter. It is not buffered or terminated within the DC/DC converter.
13	Video Clock	VCLK	VID and HS are referenced to VCLK. Data latching occurs on the falling edge of VCLK. This signal passes directly from the video source to the display via the DC/DC converter. It is not buffered or terminated within the DC/DC converter.
15	Video Data	VID	VID contains the serial video data to be displayed. A logic high corresponds to a lit pixel. Pixel information on VID is supplied from left to right and from top to bottom; the first bit of data on VID following HS is displayed as the pixel at the upper left corner of the display. Bit number 240 is at the upper right corner. Bit number 276 is directly beneath pixel number 1 and so on. This signal passes directly from the video source to the display via the DC/DC converter. It is not buffered or terminated within the DC/DC converter.

Hitachi 61830BLCD Controller Compatible Video Timing Input at PO



Video Parameters

Parameter (Symbol)	Min.	Max.	Units
1 Video clock (CL2) period (tVCLK)	235	630	ns
2 VCLK lowtime (tWL)	100	—	ns
VCLK high time (tWH)	100	—	ns
3 VID setup to VCLK (tDS)	50	—	ns
4 VID hold from VCLK (tDH)	50	—	ns
5 HS (CL1) high time (tHShigh)	100	tVCLK	ns

Parameter (Symbol)	Min.	Max.	Units
6 HS setup time (tHSS)	100	tWL	ns
7 HS hold from VCLK (tHSH)	0	tWH	ns
8 VS (FLM) setup to HS (tHSD)	400	—	ns
9 VS hold from HS (tVSD)	1000	—	ns
HS (CL1) period (tHS)	276	—	tVCLK
VS period (tVS)	128	—	tHS
FrameRate(1/VSperiod)	120	—	Hz

Video Electrical Specifications

Symbol	Parameter	Min.	Max.	Units
	maximum input voltage	—	5.5	V
VIL	low-level input voltage	-0.3	0.8	V
VIH	high-level input voltage	2.4	5.0	V
IIL	low-level input current	-0.4	mA	
IIH	high-level input current	—	10	μA
VOH	output high voltage @ IOH = 0.4 mA	2.0		V
VOL	output low voltage @ IOL = 2.1 mA		0.4	V

Note: All inputs are TTL-compatible CMOS with 24KΩ pull-up resistors and 100Ω series resistors to minimize under- and over-shoot of input signals.

DC/DC Converter - PS512-1

The display and the separate DC/DC converter are calibrated together at the factory. Replacements to these matched units must be adjusted according to specifications. Consult Planar for design specifications.

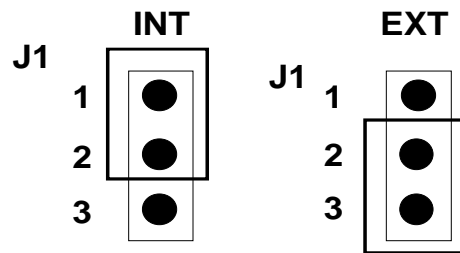
DC Power Consumption

Power is dependent on the actual text or graphics displayed. For a typical screen of text and graphics, power is under 2.1 watts. Maximum power is 3.0 watts at 60 Hz frame rate and 5.3 watts at 120 Hz.

DC Power Input Specifications

Description	Min.	Nom.	Max.	Units
Input voltage (VH)	10.8	12.0	13.2	VDC
Input voltage absolute max. (VH)	—	—	15.0	VDC
Input current (IH)	—	—	0.4	A
VH=Min, 120 Hz frame rate	—	—	0.4	A
Optional 5V (VL)	4.75	5.0	5.25	VDC
Absolute max. (VL)	—	—	7.5	VDC
Input current (IL)	—	—	0.04	A

J1 Jumper Function on PS512-1



EXT = +5V (VL) supplied by customer from an external source.

INT = +5V (VL) generated from VH within the DC/DC converter. Shipped set for INT from factory.

DC/DC Converter Calibration - PS512-1

The DC/DC converter cannot be tested separately. It requires an active low enable signal from the display to activate the high voltage section. The display provides this signal after detecting the presence of video signals at its input.

The DC/DC converter has been properly calibrated at the factory to the EL display by means of a voltage output adjustment. The converter should not need adjustment in the field. If the DC/DC converter and display become separated the following procedure can be used to set the converter to the proper voltage:

1. Ensure power to the DC/DC converter is off.
2. Turn trimpot R20 on the DC/DC converter fully counterclockwise (ccw). Do not adjust R19.
3. Connect the DC/DC converter to the display using the flat cable.

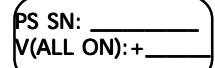
4. Apply a full on video pattern to the display (full white field). At the factory, calibration is done with all pixels on.

5. Set the DVM to measure a 250VDC voltage.

6. Connect the DVM positive and negative leads to the test points marked HV2 and GND respectively on the DC/DC converter. See drawing on p. 7.

7. Apply power to the DC/DC converter.

8. Note the voltage statement on the display as shown:



9. Adjust trimpot R20 on the DC/DC converter clockwise (cw) until the voltage reading of the DVM is equal to the V (ALL ON) voltage $\pm 1V$, as specified on the display. Do NOT exceed 235V. Do NOT adjust R19.

10. Calibration is complete.

Operational Specifications

■ Environmental

Temperature

Operating	0°C to +55°C
Operating Survival	-20°C to +70°C
Non-Operating	-40°C to +75°C

Humidity 95% MIL-STD-202F method 106E

Altitude tests performed for 8 hours
 Operating 15,000ft. (4,572 m) above sea level
 Non-Operating 50,000ft. (17,678 m) above sea level

Vibration (Random)

20-500Hz
 ASD Level 0.02 g²/Hz, 30 minutes each axis

Shock

Magnitude 50 g peak acceleration
 Duration 4 ms (half sine wave)
 Number of tests 3 on each of 6 surfaces

Mean Time to Failure

Greater than 30,000 hours

Electromagnetic Compatibility

The display is capable of being operated in a final product that complies with FCC Docket, Part 15, Subpart J, class B. The bezel is electrically isolated from the display circuit nodes.

Safety

The display will not inhibit the end product from obtaining any of the following certifications: UL 114/478, CSA 154, IEC 380.

Health

An inert, non-toxic, silicon-based oil is used in the construction of the electroluminescent panel.

Viewing Angle

Greater than 160° viewing angle.

ICE_{TM}

Integral Contrast Enhancement (ICE_{TM}) incorporates a new thin film layer in the EL structure which significantly reduces light reflections from the display's rear electrode. The EL4836HB-ICE is the ICE_{TM} version of the EL4836HB display, and offers the following performance advantages:

- inherently higher display contrast
- crisper display images
- a lower cost of display system solution for the user

■ Optical Display Color

Peak wavelength (typ) 585 nm, Yellow-Orange

Pixel Luminance

ON Luminance	Typ.	Min.
EL4836HB		
at 60 Hz	50 fL (171)*	30 fL (103)*
at 120 Hz	100 fL (342)*	60 fL (206)*
EL4836HB-ICE		
at 60 Hz	16.5 fL (56)*	9.0 fL (30.8)*
at 120 Hz	33.0 fL (112)*	18.0 fL (61.6)*

*cd/m²

Luminance measured at center of display screen, full ON pattern, 25°C ambient. Note: the Hitachi 61830B LCD controller is limited in frame rate and will not drive the display to its maximum brightness potential.

OFF Luminance

EL4836HB	0.3 fL maximum	(0.7)*
EL4836HB-ICE	0.1 fL maximum	(0.25)*

Luminance measured at center of display screen, 60 Hz frame rate, full OFF pattern, 25°C ambient.

ON luminance uniformity, maximum difference <26%

Measured between any two of five points (corners and center): Non-uniformity % = (1 - min luminance / max luminance) x 100.

ON luminance variation (temp.) max. variation ±15%
 from 25°C over 0°C to +55°C range.

ON luminance variation (time), max. difference ±10%
 at 25°C within 10,000 hours.

Luminance Contrast Ratio (ICE_{TM}) Typical

8:1 min, @ 500 lux
 3:1 min, @ 2000 lux

Fill Factor

57% luminance area / total active area.

Installation and Handling

■ Unpacking

Electrostatic Caution

The Planar display and DC/DC converter assemblies use CMOS and power MOS-FET devices. These components are electrostatic sensitive. Unpack, assemble and examine these assemblies in a static-controlled area only. When shipping either assembly, use packing materials designed for protection of electrostatic-sensitive components.

Unpack and check contents of shipping container against invoice in a static-controlled area. Use anti-static bags for storage of displays and DC/DC converters awaiting assembly processes. Any discrepancies in materials received and invoiced should be noted to Planar within 10 days.

■ Mounting and Connector Locations

This display has no mounting holes and is designed for clamp mounting similar to an LCD. Do NOT clamp the display by its circuit board. Mounting compression should be made only on the metal bezel itself. Connector locations are shown on Page 7. Contact Planar application engineers for more information.

■ Cleaning

Display Face Any non-abrasive mild glass cleaner can be used.

Circuit Boards Only isopropyl alcohol should be used on the ECB assemblies.

■ Avoiding Burn-in

As with any other display, it is prudent to use screen-saver software to avoid burn-in of images that remain on the screen for extended periods.

■ Interconnections

- J0 Connector:** T & B Ansley 609-1627 or equivalent
- P0 Mating Connector:** T & B Ansley 609-1630 or equivalent. (customer supplied)
- J3 Connector:** T & B Ansley 609-2627 or equivalent.
- P1 Connector:** 3M 3399-7626 or equivalent

Mechanical Characteristics

■ Display External Dimensions

Height	3.885 in.	98.68 mm
Width	6.964 in.	176.88 mm
Depth	0.575 in.	14.60 mm
Weight (max)	9.5 oz.	270 grams
Recommended air gap behind display places total depth at 0.75 in (19.04 mm).		

■ DC/DC Converter Characteristics

Height	2.00 in.	50.8 mm
Width	5.25 in.	133.4 mm
Depth	0.75 in.	19.1 mm
Weight	3 oz.	85 grams

■ Viewing Area Characteristics

Active area		
Width	5.732 in	145.6 mm
Height	2.653 in	67.39 mm
Pixel pitch		
Width	0.021 in	0.533 mm
Height	0.021 in	0.533 mm
Pixel size		
Width	0.016 in	0.399 mm
Height	0.016 in	0.399 mm
Pixel matrix		
Width	276 pixels	
Height	128 pixels	

Caution

Properly mounted, this display can withstand high shock loads as well as severe vibration in aggressive environments. However, the glass panel used in this display will break when subjected to bending stresses, high impact or excessive loads.

To prevent injury in the event of glass breakage, a protective overlay should be used on the viewer side of the display.

