



# EL240.64 and EL240.64-SD

## 240 x 64 Pixel Electroluminescent Display

### Product Profile

### Operations Manual

The EL240.64 and EL240.64-SD displays are low power, rugged, high-resolution electroluminescent (EL) displays which replace an LCD or a 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.

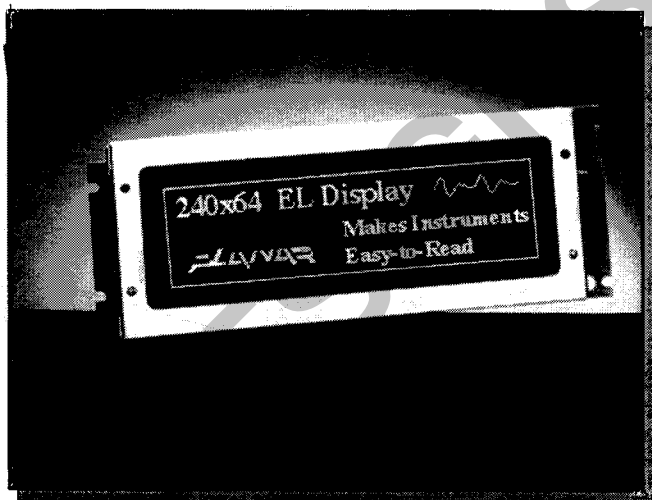
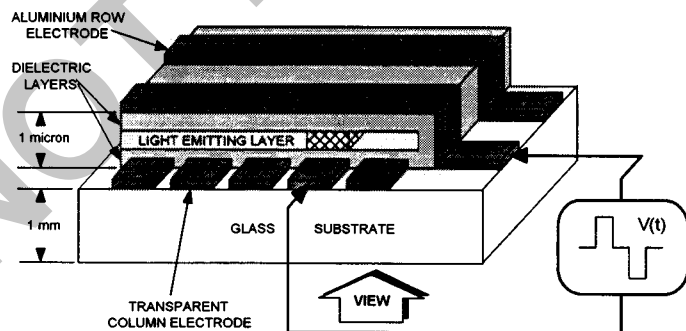
The EL240.64 and EL240.64-SD are 240 column by 64 row flat panel displays with a resolution of 48 dots per inch. The pixel aspect ratio is 1:1. The LCD-type interface is CMOS-compatible and is designed to match the needs of most systems. These displays may be driven at frame rates up to 240 Hz for applications 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

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



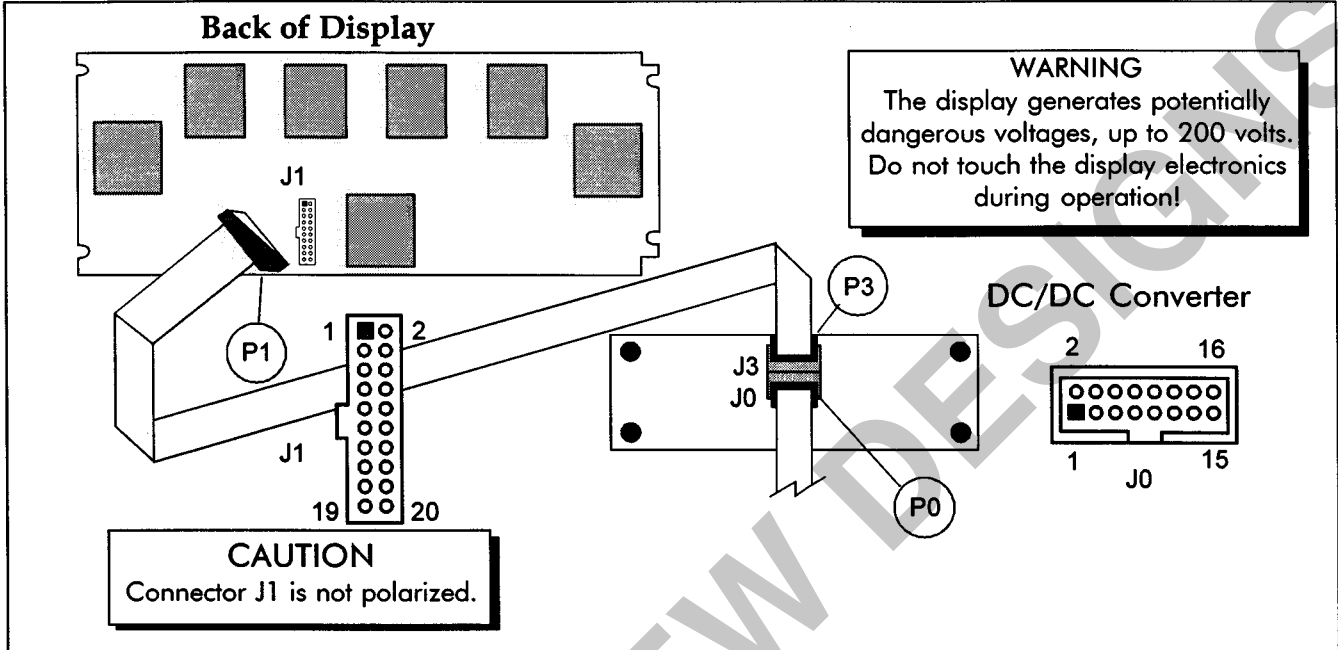
The EL glass panel is a solid-state device with a thin film luminescent layer sandwiched between transparent dielectric layers and a matrix of row and column electrodes. The row electrodes, in back, are aluminum; the column electrodes, in front, are transparent. The entire thin film device is deposited 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 240 column electrodes and 64 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. Operating voltages required are provided by a DC/DC converter.

# Electrical Characteristics

## ■ Display

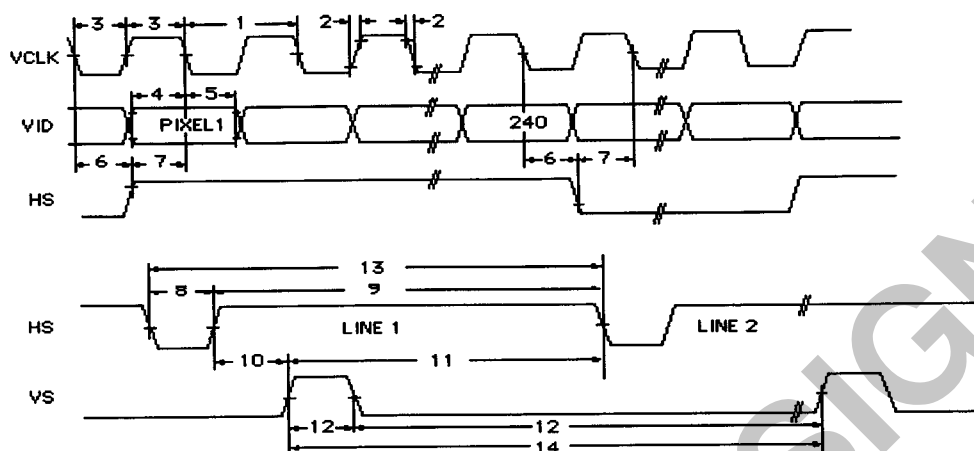
The EL240.64 and EL240.64-SD products consist of a display, a DC/DC converter, and interconnecting cable as shown below.



## ■ Input to the Displays at P0

Pins	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	Scan Mode	SMODE1	Mode 1 (Standard timing) is selected by taking pin 5 high (or left unconnected). Mode 2 (LCD timing) is selected by pulling pin 5 low. This signal passes directly from the user to the display via the DC/DC converter. It is not buffered or terminated within the DC/DC converter.
6	Scan Mode	SMODE2	Reserved
7, 8, 10 12, 14, 16	Ground	GND	Signal return and power supply ground.
9	Vertical Sync	VS	VS initiates a new frame scan. To properly position the displayed data, VS rising edge must occur during the first horizontal scan line of the frame (mode 1) or must be high at the end of the first horizontal scan line of the frame (mode 2). 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	Mode 1: HS high time brackets the active pixel data for a horizontal scan line. Mode 2: HS marks the last horizontal pixel to be displayed. HS high time should be less than 1 tVCLK. HS period must be an even multiple of 4 tVCLK. The last 240 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 241 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.

## ■ Video Timing at P0 for Standard CRT Controller (Mode 1)



### ■ Mode 1 Video Parameters

Parameter (Symbol)	Min.	Max.	Units
1 Video clock period (tVCLK)	250	—	ns
2 VCLK rise/fall time (tDR/tDF)	—	15	ns
3 VCLK low time (tWL)	100	—	ns
VCLK high time (tWH)	100	—	ns
4 VID setup to VCLK (tDS)	50	—	ns
5 VID hold from VCLK (tDH)	50	—	ns
6 HS hold from VCLK (tHSH)	50	—	ns
7 HS setup to VCLK fall (tHSS)	50	—	ns

Parameter (Symbol)	Min.	Max.	Units
8 HS low time <sup>3</sup> (tHS low)	4	—	tVCLK
9 HS high time <sup>2</sup> (tHS high)	4	—	—
10 VS hold from HS (tVSD)	0	—	ns
11 VS setup to HS (tHS h/l)	60	—	ns
12 VS high/low width (tVSW)	1	—	tVCLK
13 HS period <sup>1</sup> (tHS)	65	—	μs
14 VS period (tVS)	64	—	tHS
Frame Rate	—	240	Hz

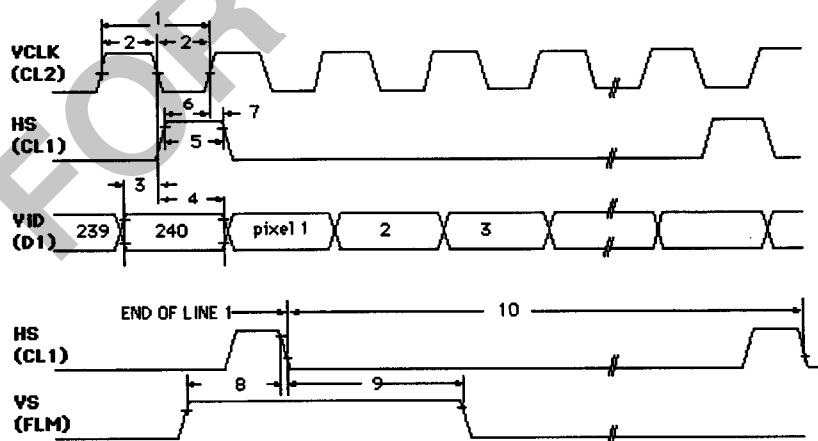
<sup>1</sup>HS period must be an even multiple of 4 tVCLK.

<sup>2</sup>The last 240 pixels prior to the fall of HS will be displayed.

<sup>3</sup>VCLK must be running during HS low time.

<sup>4</sup>240 tVCLK or 64μs, whichever is greater.

## ■ Video Timing at P0 for Hitachi 61830B LCD Controller (Mode 2)



### ■ Mode 2 Video Parameters

Parameter (Symbol)	Min.	Max.	Units
1 Video clock period (tVCLK)	250	1450	ns
VCLK rise/fall time (tDR/tDF)	—	15	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 high time (tHS high)	100	tVCLK	ns

Parameter	(Symbol)	Min.	Max.	Units
6 HS setup time (tHSS)		100	tWL	ns
7 HS hold time (tHSH)		0	tWH	ns
8 VS setup time (tHSD)		400	—	ns
9 VS hold time (tVSD)		1000	—	ns
10 HS period <sup>1</sup> (tHS)		<sup>3</sup>	<sup>2</sup>	—
VS period (tVS)		64	—	tHS
Frame Rate		—	240	Hz

<sup>1</sup>HS period must be an even multiple of 4 tVCLK.

<sup>2</sup>The last 240 pixels prior to the fall of HS will be displayed.

<sup>3</sup>240 tVCLK or 65μs, whichever is greater.

# Video Electrical Specifications

Symbol	Parameter	Min.	Max.	Units
	maximum input voltage	—	5.5	V
VIL	low-level input voltage	-0.3	0.9	V
VIH	high-level input voltage	3.7	5.0	V
IIL	low-level input current	—	-0.2	μA
IIH	high-level input current	—	10	μA
VOH	output high voltage @ IOH= -2 μA	3.0		V
VOL	output low voltage @ IOL = 2 μA		0.7	V

Note: All inputs are CMOS. SMODE1 and SMODE2 have 24W pull-up resistors, all other inputs have weak pullups. All user I/O lines have 130W 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.

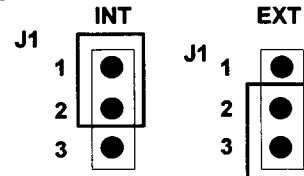
### ■ DC Power Consumption

Power is dependent on the actual text or graphics displayed. For a typical screen of text and graphics, power is under 1.2 watts. Maximum power is 1.4 watts at 60 Hz frame rate and 4.0 watts at 240Hz.

### ■ DC Power Input Specifications

Description	Min.	Nom.	Max.	Unit
Input voltage (VH)	10.8	12.0	13.2	VDC
Input voltage absolute max. (VH)	—	—	15.0	VDC
Input current (IH)				
VH=Min, 240 Hz frame rate	—	—	0.37	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.

### ■ 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:

PS SN: \_\_\_\_\_  
V(ALL ON):+ \_\_\_\_\_

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 ±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

<b>Humidity</b>	per standard IEC 68-2-3 & 30
Operating	93% RH (non-condensing)
Non-Operating	95% RH (condensing)

<b>Altitude</b>	per IEC 68-2-13
Operating	16,000 ft. (4,572 m) above sea level
Non-Operating	58,000 ft. (17,678 m) above sea level

**Vibration (Random)** per IEC 68-2-36, Test Fdb 20-500 Hz  
ASD Level 0.02 g<sup>2</sup>/Hz, 30 minutes each axis

<b>Shock</b>	per IEC 68-2-27, Test Ea
Magnitude	50 g peak acceleration
Duration	11 ms (half sine wave)
Number of tests	3 on each of 6 surfaces

### Reliability

**MTBF** >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.

## ICE<sub>TM</sub>

Integral Contrast Enhancement (ICE<sub>TM</sub>) incorporates a new thin film layer in the EL structure which significantly reduces light reflections from the display's rear electrode. The EL240.64-SD is the ICE<sub>TM</sub> version of the EL240.64 display, and offers the following performance advantages:

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

## ■ Optical

### Display Color

Peak wavelength (typ) 585 nm, Yellow-Orange

### Areal Luminance

ON luminance in fL (cd/m <sup>2</sup> )		
EL240.64	Typical	Min.
at 60 Hz	15.3 (52.3)	9.2 (31.5)
at 240 Hz	61.2 (209.6)	36.7
(125.8)		
EL240.64-SD		
at 60 Hz	5.0 (16.8)	3.0 (10.4)
at 240 Hz	20.2 (67.3)	12.1 (41.6)
Luminance measured at center of display screen, full ON pattern, 25°C ambient.		

OFF luminance 0.3 fL maximum (0.7 cd/m<sup>2</sup>)  
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 three points (center, left, right edges): 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.

### Fill Factor

30.6% luminance area/total active area.

### Viewing Angle

Greater than 160° viewing cone.

## ■ Safety and Health

### Safety

The display will not inhibit the end product from obtaining any of the following certifications: UL114/478, CSA 154, IEC 380.

### Health

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

# Installation and Handling

## ■ Safety and Health

**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

As shown on Page 7, this display has four mounting tabs, two on each side of the display. When mounting the display, use all four of these tabs; failure to do so will invalidate the product warranty. To avoid breaking the glass, use appropriate length standoffs and avoid deflecting the mounting holes out of the plane of the display when tightening the mounting hardware. The vibration and shock specifications listed on Page 5 are valid only if all four mounting tabs are used.

## ■ Cleaning

Display Face	Any non-abrasive mild glass cleaner can be used.
Circuit Boards	Only isopropyl alcohol should be used on the ECB assemblies.

## ■ Interconnections

- J0 Connector: T & B Ansley 609-1627 or equivalent
- P0 Connector: T & B Ansley 609-1630 or equivalent\*
- J3 Connector: T & B Ansley 609-2627 or equivalent
- P3 Connector: T & B Ansley 609-2630 or equivalent
- J1 Connector: 3M 962343-01-10-30 or equivalent
- P1 Connector: 3M 87320-1600 or equivalent

\*customer supplied

# Mechanical Characteristics

## ■ Display External Dimensions

Height	2.54 in.	64.6 mm
Width	6.89 in.	175.1 mm
Depth	0.53 in.	13.3 mm
Weight (max)	6 oz.	170 grams
Recommended air gap behind display places total depth at 0.70 in (17.9mm).		

## ■ DC/DC Converter Characteristics

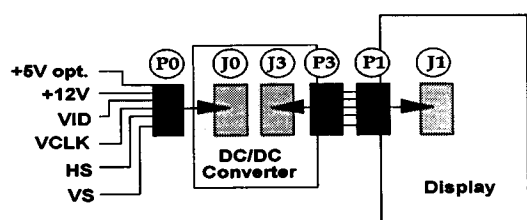
Height	2.00 in.	50.8 mm
Width	5.25 in.	133.4 mm
Depth	0.75 in.	19.1 mm
Weight	5 oz.	142 grams

## ■ Display Viewing Area Characteristics

Active area		
Width	4.982 in	126.5 mm
Height	1.322 in	33.6 mm
Pixel pitch		
Width	0.0208 in	0.528 mm
Height	0.0208 in	0.528 mm
Pixel size		
Width	0.0115 in	0.292 mm
Height	0.0115 in	0.292 mm
Pixel matrix		
Width	240 pixels	
Height	64 pixels	

## ■ 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.



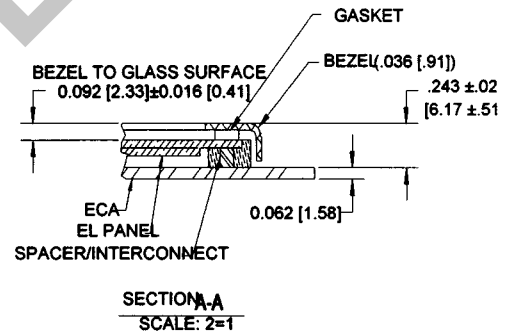
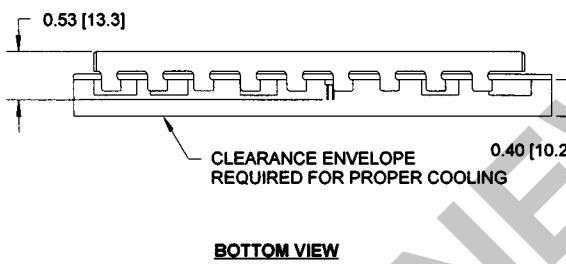
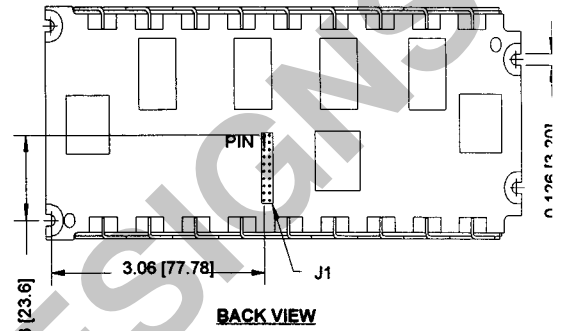
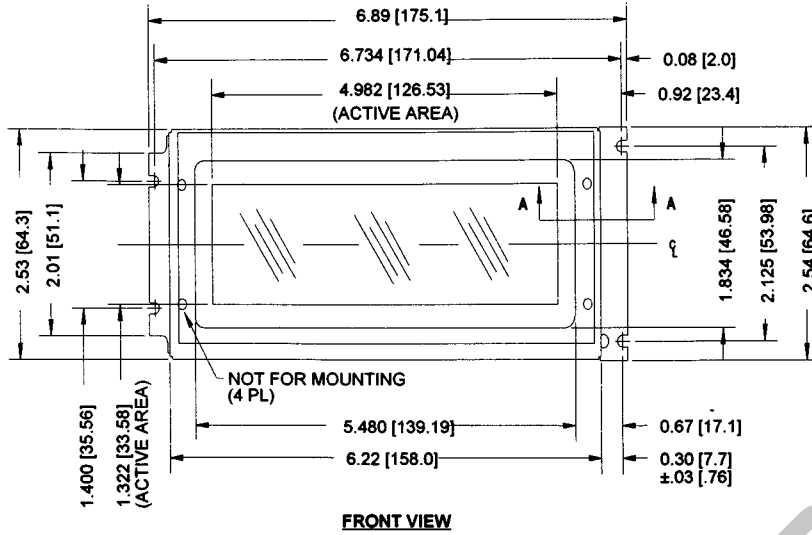
# Display External Dimensions

NOTES: UNLESS OTHERWISE SPECIFIED

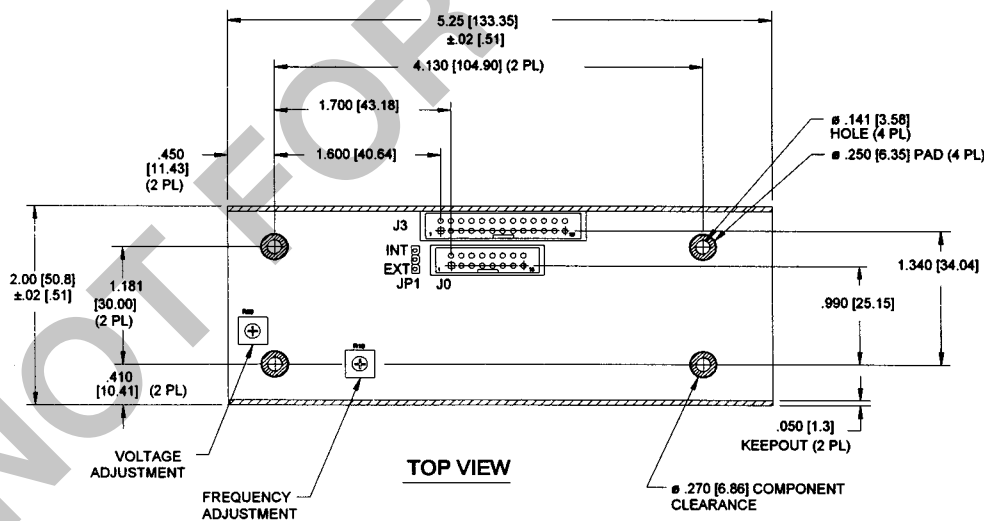
1. DIMENSIONS IN INCHES, MM IN B
2. DIMENSIONS CENTERED FROM C

.X	±.030 [0.76]
.XX	±.020 [0.51]
.XXX	±.010 [0.25]
ANGULAR	±2°

076-4300-00 REV C



# DC/DC Converter - PS512-1

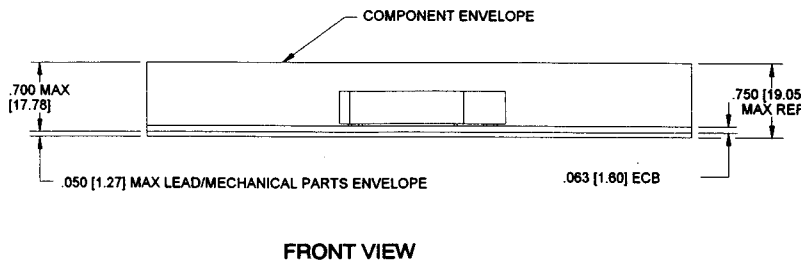


NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS IN INCHES, MM IN BRACKETS

.X	±0.030 [0.76]
.XX	±0.010 [0.25]
.XXX	±0.005 [0.13]
ANGULAR	±1.0°

076-0193-01 REV A



## Description of Warranty

This description is not the full warranty, and should not be construed as a substitute for the full warranty. A copy of the full warranty is available upon request.

Planar warrants that the goods it sells will be free of defects in materials and workmanship, and that these goods will substantially conform to the specifications furnished by Planar, and to any drawings or specifications furnished to the Seller by the Buyer if approved by the Seller. This warranty is effective only if Planar receives notice of such defect or nonconformance during the period of warranty, which begins the day of delivery.

The goods Planar sells are warranted for a period of one year unless otherwise agreed to by Planar and the Buyer. The Buyer must return the defective or non-conforming goods, upon request, to Planar not later than 30 days after Planar's receipt of notice of the alleged defect or non-compliance. Buyer shall prepay transportation charges, and Planar shall pay for return of the goods to the Buyer. No goods are to be returned to Planar without prior written permission.

The warranty does not apply in cases of improper or inadequate maintenance by the Buyer, unauthorized modification of the goods, operation of the goods outside their environmental specifications, neglect or abuse of the goods, or modification or integration with other goods not covered by a Planar warranty when such modification or integration increases the likelihood of damage of the goods.

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North & South American Sales:  
Planar America, Inc.  
1400 NW Compton Drive  
Beaverton, OR USA 97006-1992  
Tel: 503/690-6967  
Fax: 503/690-1493

European & Far East Sales:  
Planar International Ltd.  
P.O. Box 46  
FIN-02201 Espoo, Finland  
Tel: +358-0-42001  
Fax: +358-0-422143

Government & Specialty Sales:  
Planar Advance, Inc.  
P.O. Box 4001  
Beaverton, OR USA 97076-4001  
Tel: 503/614-4111  
Fax: 503/614-4101

## Easy to Use

There are many options available which make Planar flat panel displays easy to use, easy to interface, and easy to package. Call Planar for complete information.

## Support and Service

Planar is a U.S. company based in Beaverton, Oregon and Espoo, Finland with a world-wide sales distribution network. Full application engineering support and service are available to make the integration of Planar displays as simple and quick as possible for our customers.

**RMA Procedure:** For a Returned Material Authorization number, please contact Planar Systems, Inc., or Planar International's Customer Service Department, with the model number(s) and original purchase order number(s). When returning goods for repair, please include a brief description of the problem, and mark the outside of the shipping container with the RMA number.

### Registered Trademarks

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## Ordering Information

EL240.64	Display and interconnecting cable
EL240.64 KIT	Includes DC/DC converter with display and cable
EL240.64 -SD1	ICE™ Display and interconnecting cable
EL240.64-SD1 KIT	Includes DC/DC converter with display and cable

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