EL

Model EL8358HR
640 X 400 Pixel Electroluminescent Display

Operations Manual

Product Profile

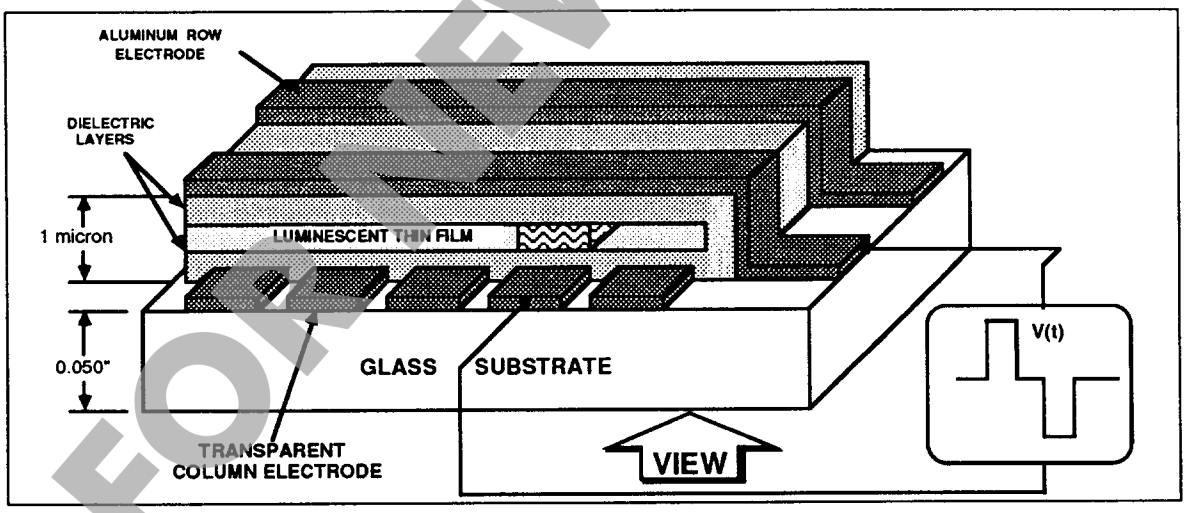
The EL8358HR is a compact, rugged, high-resolution electroluminescent (EL) display which replaces the bulky CRT for virtually all microcomputer-based product designs. Its compact dimensions keep overall system size to an economical minimum. It is designed to function in extreme environments, and its crisp display is viewable under most lighting conditions at wide viewing angles. It is easy to install and reduces system integration costs.

The EL8358HR is a 640 column by 400 row flat panel display. The pixel aspect ratio is 1:1. The display may be user-programmable through the 16-pin input connector to behave as a 200, 350, or 400 line display, providing compatibility with CGA, EGA, and conventional 400 line display formats. Input required is CRT-type and TTL-compatible.

The EL8358HR display requires DC 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 (HSYNC) and
4. Vertical Sync (VSYNC).

Technology



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

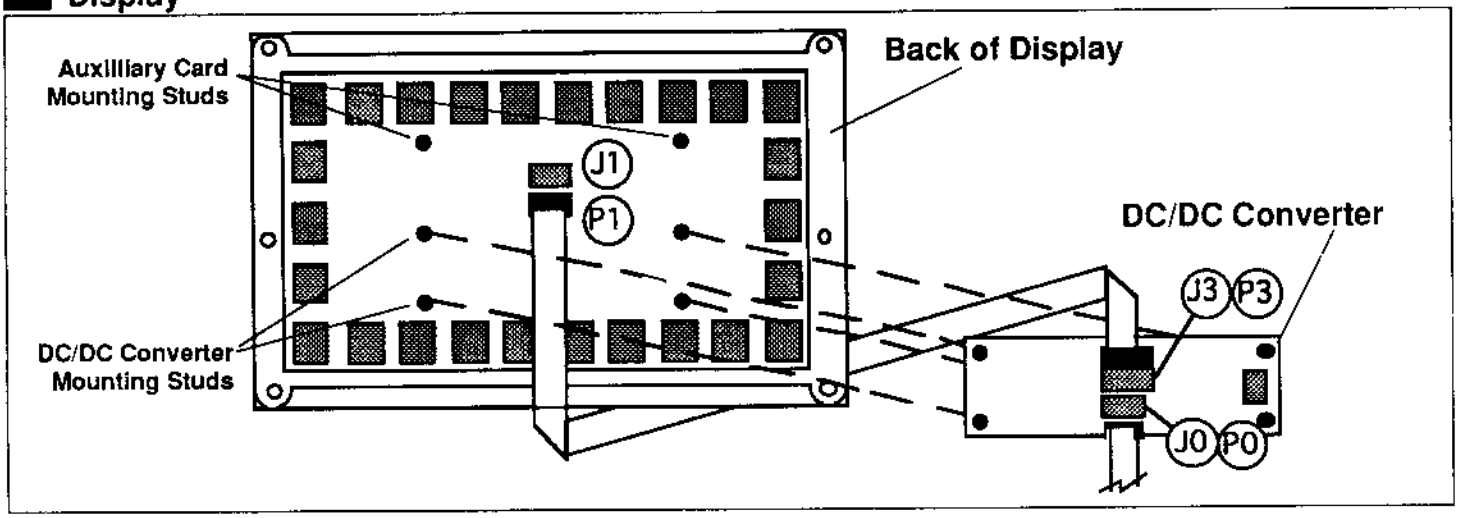
The EL glass panel is a solid-state device with a thin film luminescent layer sandwiched between transparent dielectric layers and a matrix of row and column electrodes. The row electrodes, in back, are aluminum; the column electrodes, in front, are transparent. The entire thin film device is deposited 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 conductive silicone rubber interconnect technology. The result is a flat, compact, reliable and rugged display device.

In the EL8358HR, the 640 column electrodes and 400 active row electrodes are arranged in an X-Y formation with the intersecting areas performing as pixels. Voltage must be 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. The converter may be either mounted to the display or mounted elsewhere in the final assembly.

Electrical Characteristics

The EL8358HR consists of a display, a DC/DC converter, and interconnecting cables as shown below. The DC/DC converter may b mounted on the back of the display unit or can be mounted separately.

Display



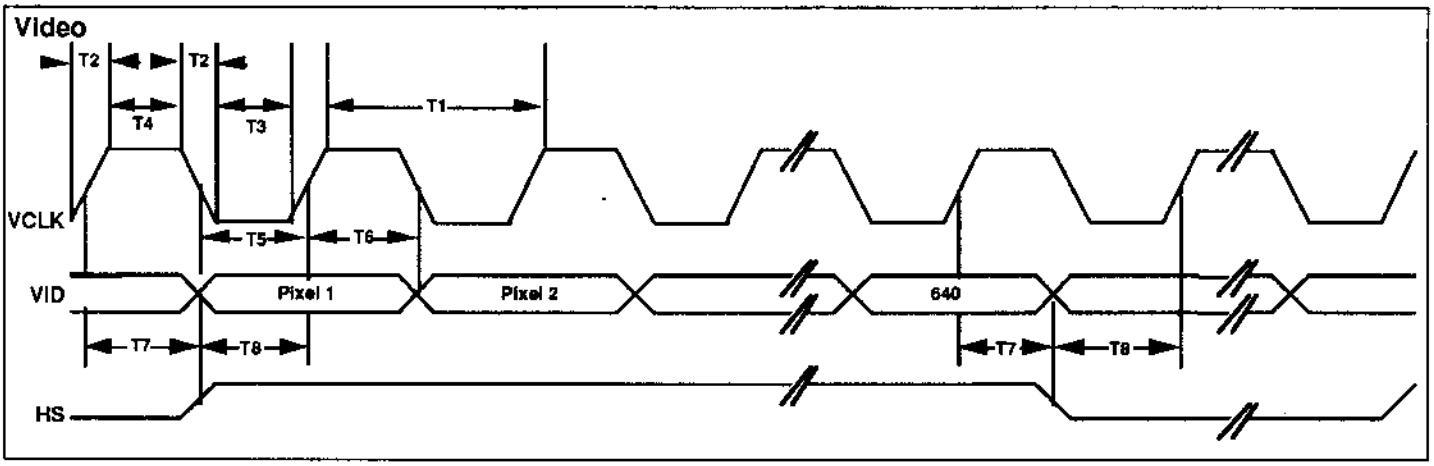
Input to the DC/DC Converter at P0

Pin(s)	Signal	Symbol	Description
1 2	Voltage	VH	+12V. See also the descriptions of DC power requirements on page 4.
3 4	Not Used		
5	Scan Mode 1	SMODE 1	Used to select 400 line, 350 line (EGA) or 200 line doublescan (CGA) modes. These signals pass directly from the user to the display through the DC/DC converter. It is not buffered or terminated within the DC/DC converter.
6	Scan Mode 2	SMODE 2	
7	Ground	GND	Signal return.
8	Ground	GND	Signal return.
9	Vertical Sync	VSYNC	A new frame is initiated by the rising edge of VSYNC. To properly sync the EL display, this edge must occur during the first horizontal sync high time of valid data for that frame. This signal passes directly from the user to the display via the input and output connectors. It is not buffered or terminated within the DC/DC converter.
10	Ground	GND	Signal return.
11	Horizontal Sync	HSYNC	The rising edge of HSYNC marks the beginning of valid data for any given row while the falling edge marks the end of valid data for that row. HSYNC must be high during active (valid) video data. If HSYNC is high for more than 640 pixel clock periods, then the last 640 pixels prior to the fall of HSYNC will be visible on the EL display. This signal passes directly from the user to the display via the input and output connectors. It is not buffered or terminated within the DC/DC converter. For best shadow performance (luminance variation vs. pattern) HS high time should be equal to, or only marginally greater than 640 pixels.
12	Ground	GND	Signal return.
13	Video Clock	VCLK	VCLK provides the necessary signal to latch in the information present on VID. All control signals are referenced to VCLK. This signal passes directly from the user to the display via the input and output connectors. It is not buffered or terminated within the DC/DC converter.
14	Ground	GND	Signal return.
15	Video Data	VID	Pixel information on VID is supplied from left to right and from top to bottom; the first bit of data on VID at the beginning of a frame is displayed as the pixel at the upper left corner of the display. Bit number 640 is at the upper right corner. Bit number 641 is directly beneath pixel number 1 and so on. 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.
16	Ground	GND	Signal return.

SMODE 1	SMODE 2	Config.	Power Save
1	1	400 line	Disabled
1	0	400 line	Enabled
0	1	350 line	Disabled
0	0	200 line	Disabled

Video Timing Input at J0

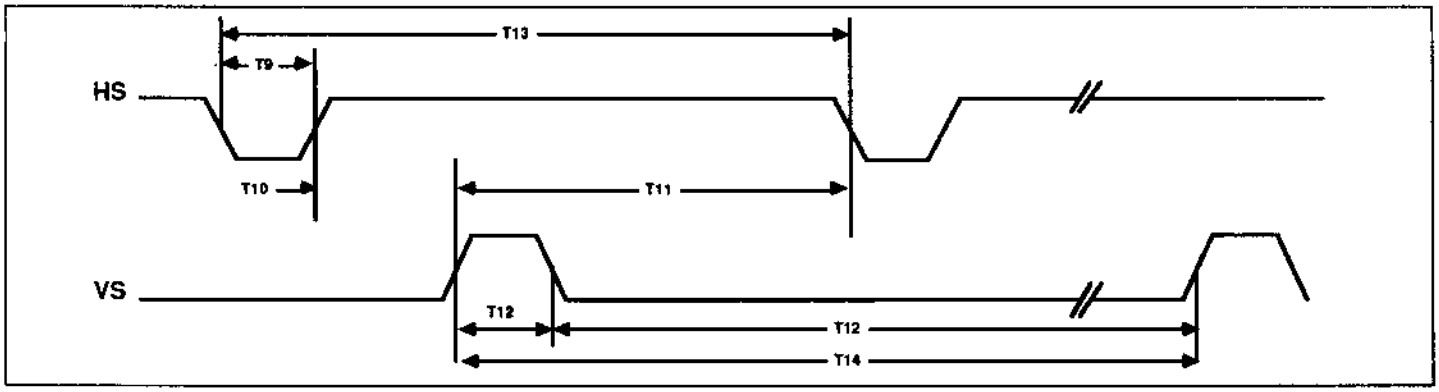
Data Signals



	Description		Min	Max	Units
T1	Video Clock period	(tVCLK)	50	—	nsec
T2	VCLK rise, fall time	(tRF)	—	10	nsec
T3	VCLK low width	(tWL)	20	—	nsec

	Description		Min	Max	Units
T4	VCLK high width	(tWH)	20	—	nsec
T5	VID setup to VCLK	(tSVID)	20	—	nsec
T6	VID hold from VCLK	(tHVID)	20	—	nsec

Sync Signals



			Min	Max	Units
T7	HSYNC hold from VCLK	(tHHS)	20	—	nsec
T8	HSYNC setup to VCLK fall	(tSHS)	20	—	nsec
T9	HSYNC low time (VCLK must be running)	(tHSL)	8	—	tVCLK
T10	VSYNC hold from HSYNC	(tHVS)	0	—	nsec
T11	VSYNC setup to HYNCS	(tVHS)	60	—	nsec
T12	VSYNC high/low width	(tVSW)	1	—	tVCLK

			Min	Max	Units
T13	HSYNC period, **200-line mode**	(tHS)	62	—	µsec
T14	VSYNC period, **200-line mode**	(tVS)	208	—	tHS
	Frame rate		—	77.5	Hz
T13	HSYNC period, **350-line mode**	(tHS)	40	—	µsec
T14	VSYNC period, **350-line mode**	(tVS)	354	—	tHS
	Frame rate		—	70.0	Hz
T13	HSYNC period, **400-line mode**	(tHS)	40	—	µsec
T14	VSYNC period , **400-line mode**	(tVS)	404	—	tHS
	Frame Rate		—	61.8	Hz
	(Typical vertical frame rate: 60Hz)				

Video Electrical Specifications (TTL compatible)

		Min	Max	Units
Vil	input low voltage	-0.3	0.8	V
Vih	input high voltage	2.4	5.0	V
Iil	input low current	—	-0.4	mA
Iih	input high current	—	10	µA
	Absolute Maximum	**+5.5V**		
Ta = 0°C to 55C unless otherwise stated				

Note: The SMODE 1 and SMODE 2 inputs are TTL-compatible CMOS with 3KΩ pull-up resistors. The VSYNC input is TTL-compatible CMOS with a 1KΩ series resistor and a 24KΩ pull-up resistor. All other inputs are TTL-compatible CMOS with 100Ω series resistors and 24KΩ pull-up resistors.

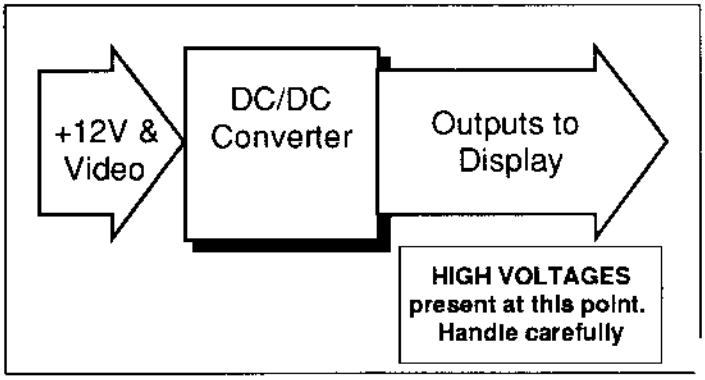
DC/DC Converter - PS512-2

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

DC Power Input Specifications

Description	Min	Nom	Max	Units
Input voltage (VH)	11.4	12.0	12.6	VDC
Input voltage absolute max. (VH)	--	--	15.0	VDC
Input current (IH) (Vh=Min)	--	--	2.0	A

Ta = 0°C to 55°C unless otherwise stated



DC/DC Converter Calibration

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 verify the proper voltage setting.

1. Ensure power to the DC/DC converter is off.

2. Turn the trimpot on the DC/DC converter fully counterclockwise (ccw).

3. Connect the DC/DC converter to the display using the 20 pin flat cable.

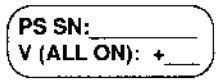
4. Apply a full on video pattern to the display (full white field). At the factory, calibration is done with all pixels on.

5. Set the DVM to measure a 235VDC voltage.

6. Connect the positive lead of the DVM to +V(ALL ON). Be very careful not to short to an adjacent pin. Connect the ground lead of the DVM to Gnd on the DC/DC converter. Please see the DC/DC converter drawing on page 6.

7. Apply power to the DC/DC converter.

8. Note the voltage statement on the display. A sample is shown at right:

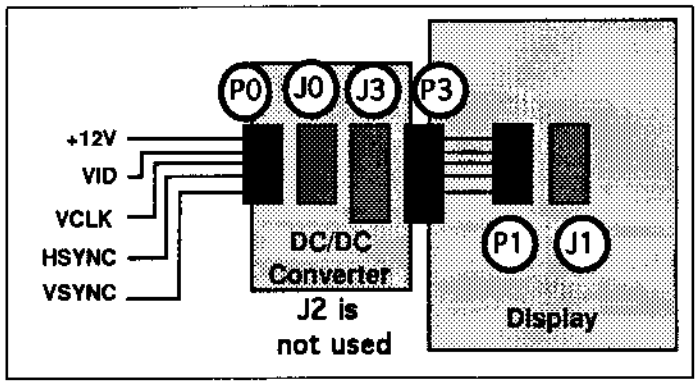


9. Adjust the trimpot on the DC/DC converter clockwise (cw) until the voltage reading of the DVM is equal to the V (ALL ON) voltage ±1V, as specified on the display. Do not exceed 235V.

10. Calibration is complete.

Interconnections

P0 Connector: T & B Ansley 609-1630 or equivalent.
J0 Connector: T & B Ansley 609-1627 or equivalent.
J3 Connector: T & B Ansley 609-2627 or equivalent.
P3 Connector: T & B Ansley 609-2630 or equivalent.
P1 Connector: T & B Ansley 609-2030 or equivalent.
J1 Connector: T & B Ansley 609-2007 or equivalent.



Operational Specifications

Environmental

Temperature

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

The EL display will function at operating survival temperatures for a 24-hour period and incur no damage but may not meet some specifications above the +55°C operating limit.

Humidity

95% relative humidity (non-condensing) as verified by MIL-STD-202F method 106E.

Altitude

Operating	15,000 ft. (4,573 m) above sea level
Non-Operating	50,000 ft. (15,244 m) above sea level
Non-Operating Pressure	6 Atm for 1 hour

Vibration (Operating)

5–25 Hz:

Sweeptime	10 min ea. axis, 1 min sweep rate
Amplitude	0.100 inches p-p displacement
Dwell at resonance	15 min each axis

If no resonance is found, dwell is performed at 55Hz, 0.0600 inches p-p displacement, for 15 minutes.

25–55 Hz :

Sweeptime	5 min ea. axis, 1 min sweep rate
Amplitude	0.060 inches p-p displacement
Dwell at resonance	15 min each axis

If no resonance is found, dwell is performed at 55Hz, 0.0600 inches p-p displacement, for 15 minutes.

Vibration (Non-operating)

55–500 Hz:

Sweeptime	120 min ea. axis, 3.2 min sweep rate
Amplitude	3 g peak acceleration
Dwell at resonance	30 min each axis

Dwell is performed at all resonances of g(out)/g(in) ≥ 5.

Shock

Magnitude	50 g peak acceleration
Duration	11 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.

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 long periods.

Optical

Display Color

Peak emission wavelength	585nm (Yellow-Orange)

Pixel Luminance

ON luminance	Typical 38 fL (130 cd/m² pixel) Minimum 30 fL (103 cd/m² pixel)

Luminance measured at center of display screen, 60 Hz full ON pattern, 25°C ambient temperature.

OFF luminance	0.3 fL maximum (1.0 cd/m² pixel)

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

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.) Maximum variation ±15%
From 25°C over 0°C to +55°C range.

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

Fill Factor

52.6% luminance area/total active area.

Viewing Angle

Greater than 160° viewing cone (80° viewing angle for all axis about the normal display face).

Optional Filter

For best overall performance in high or low light levels, an amber or neutral gray circular polarizing filter with anti-reflective coating or etch is the usual choice. This filter will make the reflective electrodes of the display darker and will improve the contrast ratio. The anti-reflective coating on the filter should face the user, and the tape side of the filter should face the display.

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

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.

Cleaning

Display Face	Any non-abrasive mild glass cleaner can be used.
Filter	Do not clean the Planar-supplied acrylic filter with alcohol.
Circuit Boards	Only isopropyl alcohol should be used on the ECB assemblies.

Mounting and Connector Locations

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

Install the flat flex cables with the exposed conductors toward the wide side of the connector slot.

The EL8358HR has six mounting studs. The DC/DC converter can be separate or mounted directly to the rear of the display using four of the mounting studs. The two additional mounting studs can be used to attach auxilliary interface options.

Mechanical Characteristics

Display External Dimensions

Height	6.95 in.	176 mm
Width	10.53 in.	267 mm
Depth	0.725 in.	19 mm
Weight	24 oz. max	0.680 kilograms

Mounting DC/DC converter to display makes total depth 1.38".

DC/DC Converter Characteristics

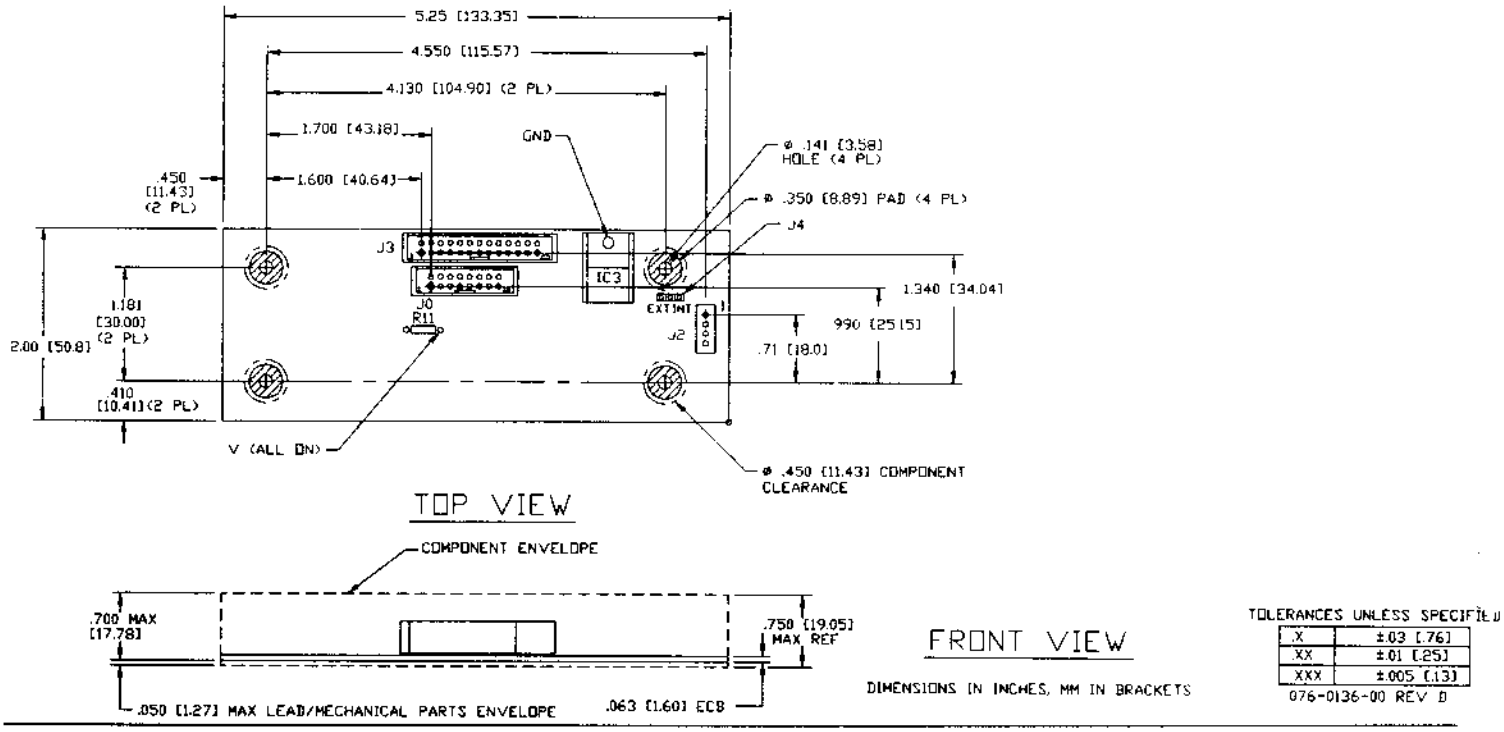
Height	2.00 in	51 mm
Width	5.25 in	145 mm
Depth	.75 in	19 mm
Weight	5 oz. max	152 grams

Display Viewing Area Characteristics

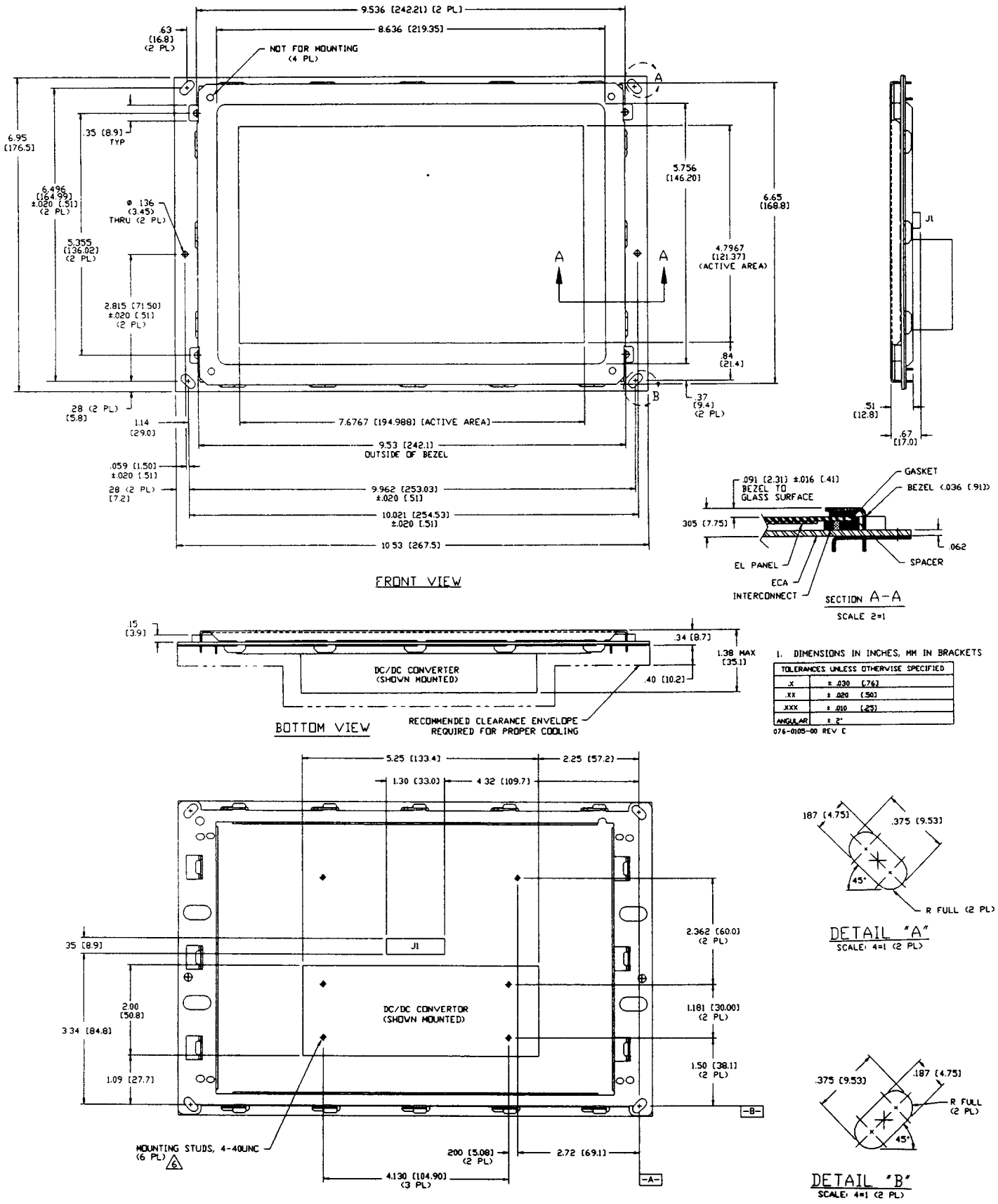
Active Area	Height	4.796 in	121.8 mm
	Width	7.676 in.	195.1 mm
Pixel pitch	Height	0.012 in.	0.305 mm
	Width	0.012 in.	0.305 mm
Pixel size	Height	0.0087 in.	0.203 mm
	Width	0.0087 in.	0.203 mm

Pixel matrix organization:
640 pixels horizontal by 400 pixels vertical

DC/DC Converter - PS512-2



Display External Dimensions



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 nonconforming 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.

Easy to Use

There are many options available which make Planar EL displays easy to use, easy to interface and easy to package. Examples of options which are typically available include RS-232 Interface Adapter, IBM® XT/AT Interface Adapter, Touch Bezels and cables. Call Planar for complete information and availability.

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.

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