Planar Engineering Specification
023-0433-01 Rev A
8.4 Monitor for Extreme Environments; LX0850PTI
December 12, 2012
Display Design Summary

- Utilize proven design and supplier
- Cost optimized design
- Long product life cycle
- Designed for demanding transportation environment
- Optimized for in cab sunlight viewability
- Glass surface touchscreen for optimal performance in harsh environment
- One button Display/CPU power on/off
- Ultra wide dimming range
- Control of backlight dimming and other OSD functions though USB interface
- Wide Voltage input with transient protection
- Low EMI
- Wide operating temperature range without fans or ventilation
- Vibration and Shock tested to rugged transportation specifications
- Waterproof design
- Rugged Aluminum enclosure

Product Highlights

- 8.4 SVGA high bright display for viewability in all environments
- Infrared touchscreen with strengthened glass touch surface for the best optical clarity
- Wide dimming range controlled via USB or Hard buttons
- Wide input VGA scalar with OSD controls hidden from end user
- Fanless die cast aluminum chassis sealed to IP65 and IP67
- Mil-Std connectors for all connections
1 Proposed Product
Planar will leverage past transportation and marine design and product development experience to offer a product that conforms to the following specification

1.1 Product Versions
All sellable product part numbers ending in LF will be built with RoHS complaint components

<table>
<thead>
<tr>
<th>Planar Part Number</th>
<th>Planar Model Name</th>
<th>Description</th>
<th>UPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>997-5379-03</td>
<td>LX0850PTI</td>
<td>IR touch, 8.4 SVGA LCD</td>
<td>8 10689 05379 8</td>
</tr>
<tr>
<td>997-5459-02 (for Wenco)</td>
<td>LX0850PTI</td>
<td>IR touch, 8.4 SVGA LCD</td>
<td>8 10689 05459 7</td>
</tr>
<tr>
<td>997-5691-01 (for General Market)</td>
<td>LX0850PTI</td>
<td>IR touch, 8.4 SVGA LCD</td>
<td>8 10689 05691 1</td>
</tr>
<tr>
<td>997-6749-01 (for Teck Coal)</td>
<td>LX0850PTI</td>
<td>IR touch, 8.4 SVGA LCD, USB HUB Bypass</td>
<td>8 10689 06749 8</td>
</tr>
</tbody>
</table>

Figure 1 Rendering of the display

2 Product Description
The LX0850PTI is intended for use in an in transportation environment. The initial use will be a dashboard mounted, touch enabled display for a remote computer. The display will consist of an AMLCD, touchscreen, user controls, and a rugged enclosure. The LX0850PTI will be powered by 12 or 24 V DC from a vehicle.

The primary application for this product requires a touch enabled display that is plug and play, and requires little training to use by the end user.

There are a few unique features to this product that are not on standard desktop monitors (DTM):

- No standard OSD buttons are open to the user: All ‘standard’ DTM OSD functionality will work as a hard button or be hidden to the user.
- All-in-One power button: A power button located on the front of the display functions as a pass though to turn on and off the remote computer. It functions very similar to a laptop computer docking station power button. When there is no video detected, the monitor will go into standby mode.
- No Base, mounting brackets, or stand is shipped with this device. It is a monitor head only.
- No cables or power supply are shipped with this monitor, they are available as accessories for order separately.

Refer to the following block diagram for a general description of the product components:
3 Performance Conditions
Performance characteristics are guaranteed over the environmental specification range.
This product will be in used in the following conditions:
- Dusty or damp environments
- High ambient lighting conditions, outdoors and in cab vehicles
- Very high vibration and shock environments
- Areas prone to vandalism and tampering:
  - *This monitor can be driven as configured by remote computer at a maximum distance of 15 foot separation.
  - *For distances > 15 feet, USB cables require a customer provided hub or booster per the USB industry standard.
  Video cable lengths > 15 feet may require customer provided amplification.

3.1 Cleaning guidelines
The LX0850PTI will continue to operate normally while being cleaned in a fashion normal for a transportation environment. This includes cleaning with a damp (wring out), mild soapy cloth. The LX0850PTI will withstand cleaning solutions used in transportation. Possible chemicals include:
- 70% isopropyl alcohol
- 1.6% aqueous ammonia
- Formula 409®
- Fantastic®

3.2 Cooling
Cooling will be provided solely by convection cooling (no fan).

4 Functional Specifications

4.1 Manual Dimming Control
Dimming control shall be two buttons that are easy to access and use with gloved hands. Dimming range shall be from max bright to minimum brightness.

4.2 USB dimming control
It is possible to access OSD functions on the Pixelworks scaler via USB

4.3 Auto Sync
The display will Autosync to video if both ‘+’ and ‘‐’ are pushed at the same time

4.4 Volume Control
None: through OS control only

4.5 Function Buttons on Front of display
The LX0850PTI will have buttons and LEDs on the front of the display for user interaction. All buttons are silicon with positive feedback and backlight with white LEDs

4.5.1 Power interrupt button (All-in-one power button)
This button is not connected to the monitor power. The power interrupt button passes though to connector TBD. It shall be a SPST,N.O. momentary push button.

4.5.2 (+) Button
This button increases brightness of the backlight

4.5.3 (-) Button
This button decreases the brightness of the backlight

4.6 Standard DTM OSD Buttons
No OSD buttons or OSD are required on this product.
4.7 LED status light
The Monitor shall have a single LED for video status.

4.7.1 LED green
The LED shall be green when there is video present.

4.7.2 LED amber
The LED shall be amber when there is no video signal present and the monitor will go into standby mode.
5  Module Specifications
This section describes the internal components of this monitor.
(Refer to Block Diagram in the Product Description Section 2)

5.1  AMLCD
Industrial grade with high bright backlight

5.2  Touchscreen
Infrared type: sensors and controller located in bezel

5.2.1  Touch surface
3mm solid glass, chemically strengthened, Anti glare coating AG level 110.
The touchscreen will function even if the surface is scratched or broken.

5.2.2  Touchscreen interface
USB

5.2.3  Touchscreen resolution
4096 X 4096

5.2.4  Touchscreen driver
Windows XP, Linux kernel ( ) support

5.2.5  Touchscreen controller
Built into frame

5.3  Video Controller board
• Requires standard VGA (DVI input TBV)
• Auto sync on power up and any video mode change.
• Video Modes supported

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Vertical refresh rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1024*768</td>
<td>60 Hz</td>
</tr>
<tr>
<td>800*600</td>
<td>60 Hz</td>
</tr>
<tr>
<td>640*480</td>
<td>60 Hz</td>
</tr>
<tr>
<td>More available</td>
<td></td>
</tr>
</tbody>
</table>

• When the is no VGA signal present, it will show “No Signal message" within 1 second and the LED over the power button (B1) will go amber.
• Integrated LED Driver provides 50ma backlight LED current with wide dimming range (Dim to off).

5.4  Piezo function
Function: provides audio for PC applications
Specification:
Frequency range: 700Hz – 20kHz
Max SPL@1m: 81dB Typical (1 Vpp, 1kHz sine wave input @ 25C)
Input 0-1VPP, Caution: Operating the speaker outside of 1VPP input spec can damage the speaker and will void the warranty. If speaker is used for steady tones, limit the duration to 1Second pulses or less.
Location: Rear of display.

5.5  Mechanical enclosure
Function: provides support for internal components and EMI cage
• Must be rugged.
• Material: Aluminum
• Designed to pass IP67
• The enclosure will be powder coated

5.5.1  Front Bezel
Material Aluminum
Color: Black
5.6 Connectors and I/O
Connector Location: To be located on the back of the monitor facing the rear unless otherwise noted.

5.6.1 I/O connector
Manufacture: Glenair; Mighty Mouse
Part number: 801-011-07M13-37PA
Description 37 pin, round
Recommended Mating connector: 801-007-16M13-37SA

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Pin</th>
<th>Description</th>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Audio in</td>
<td>23</td>
<td>RX2-</td>
<td>17</td>
<td>Gnd Logic 4</td>
</tr>
<tr>
<td>3</td>
<td>Audio gnd</td>
<td>16</td>
<td>RX2+</td>
<td>20</td>
<td>H plug detect</td>
</tr>
<tr>
<td>2</td>
<td>H- sync VGA</td>
<td>25</td>
<td>DVI VGA SCL</td>
<td>19</td>
<td>+5 V DVI</td>
</tr>
<tr>
<td>1</td>
<td>V- sync VGA</td>
<td>24</td>
<td>DVI VGA SDA</td>
<td>34</td>
<td>12 V power Backlight</td>
</tr>
<tr>
<td>30</td>
<td>All-in-one</td>
<td>11</td>
<td>RX1-</td>
<td>35</td>
<td>12 V power Logic</td>
</tr>
<tr>
<td>31</td>
<td>All-in-one</td>
<td>10</td>
<td>RX1+</td>
<td>36</td>
<td>GND Logic</td>
</tr>
<tr>
<td>26</td>
<td>USB - downstream</td>
<td>12</td>
<td>RX0+</td>
<td>29</td>
<td>GND Backlight</td>
</tr>
<tr>
<td>27</td>
<td>USB + downstream</td>
<td>13</td>
<td>RX0-</td>
<td>33</td>
<td>USB -</td>
</tr>
<tr>
<td>28</td>
<td>USB power downstream</td>
<td>9</td>
<td>RXC-</td>
<td>32</td>
<td>USB +</td>
</tr>
<tr>
<td>21</td>
<td>USB gnd downstream</td>
<td>15</td>
<td>RXC+</td>
<td>22</td>
<td>USB power</td>
</tr>
<tr>
<td>18</td>
<td>VGA blue</td>
<td>7</td>
<td>Gnd Logic 1</td>
<td>37</td>
<td>USB GND</td>
</tr>
<tr>
<td>6</td>
<td>VGA Green</td>
<td>5</td>
<td>Gnd Logic 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>VGA red</td>
<td>14</td>
<td>Gnd Logic 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 Physical Specifications

6.1 Optical requirements

6.1.1 Maximum luminance through touchscreen:
750 cd/m² (nits) typical

6.1.2 Maximum luminance at full dimming
Less than 5 nits. There is no uniformity spec when the unit is at full dimming

6.1.3 Uniformity
Per LCD spec at full brightness.
Measured: Non-uniformity for white screen is 26% defined as \( (1 - \min / \max) \)

6.1.4 Contrast
Per LEC Spec and standard indoor brightness
Measured: 500 typical, max = 570, min = 400

6.1.5 High ambient contrast
Per Mil-Std-85762A Greater than 7:1 at 5000 lux
7:1 is required for Color graphics.
Measured: \( CR = 11:1 \) with daylight (diffused) at 10,000 fc. \( CR = 3.5 \) for glare source of 2000 fl.
6.2 Power requirements
The LX0850 will be powered from a vehicle 12 or 24 volt system with wide voltage ranges and transient conditions.

6.2.1 Voltage Range
8 to 32 V, 12 V nominal.

6.2.2 Voltage Transients
Voltage transients up to 60V for 100ms
Voltage transients below -40V for 100ms

6.2.3 Reverse polarity protection
The display shall have reverse polarity protection as long as there is a slow blow fuse for power
12 V use fuse 2A
24 V use fuse 1A

6.2.4 Maximum Power Consumption
Maximum: 12 W @ 12 or 24V
Typical power consumption: 12W @ 12 or 24V

6.2.5 Power consumption in standby Power (LED amber)
2.5 W @ 12 or 24V typical.
3.5 W @ 12 or 24V with USB
6.3 Mechanical Outline
6.4 VESA Mount
A VESA mount feature must be included on the LX0850PTI, located on the back cover.
Standard 75 mm VESA mount M4 x .7 threaded hole pattern. The holes shall be blind.
Additional M4 threaded mounting or cable management locations on rear of display also included.

6.5 Weight
~ 5lbs, 2.3kg

6.6 Color

6.6.1 Monitor Bezel and Back Chassis
Powder coated Black

6.6.2 Button color
Background BLACK Pantone 426C

6.7 Product Graphics

6.7.1 Product Branding Graphics
Location: Customer defined
Size: Customer defined

6.7.2 Product Model Name
Location: Customer defined
Size: Customer defined

6.7.3 Button Graphics
Power Button

Brightness Up
“+”
Brightness Down
“-”

6.7.4 Product Label Requirements
Location: Rear
Rating Label: Content (minimum):
  - Model Number: LX0850PTI
  - Serial Number TBD
  - Barcode of Serial Number
  - Power Requirements
  - Regulatory Marks: CE, FCC, UL file number for LX0850PTI
  - Country of Origin: “Made in USA”
  - Manufacturing date code
  - Planar Part Number and Revision level (e.g., XXX-XXXX-XXLF)
  - HG Logo
  - WEEE Trash bin

  Color: Silver lettering on black label
  Size: 14 point
Durability: Label will be tamper resistant. Must prevent easy removal by user.
7 Cosmetic Defects, Viewing Area of Display Screen
The Cosmetic specification for the LX0850PTI will follow the Touchscreen glass and AMLCD cosmetic specifications.
No foreign articles are allowed within the optical bond.
See Appendix A

8 Cosmetic Defects, External Surfaces
The monitor chassis shall follow Planar document 002-0112-00.
All labels must be attached squarely in their designated locations.

9 Shipping Box
- Must limit contents to shock and vibration levels given in this specification when 50G shock and 3G (zero to peak) vibration levels are applied to a fully loaded shipping box
- Conform to ISTA-2A (32 inch drop)
- Planar labeling on box
- Package will be designed to fit maximum units per container.

10 Shipping box label
- UPC
- Hg information must be on the outside of the box.
- Planar part number
- Planar model number

11 Maintenance Requirements/Service Support

11.1 Service Requirements
The LX0850PTI requires no routine maintenance.

11.2 Service BOM
Service BOM provided on request.

12 Environmental Specifications

12.1 Temperature
Operating Temperature: -20° C to + 60° C (-4° to 140° F)
Storage Temperature: -40° C to + 70° C (-40° to 158° F)
*Operating Survival Temp Range: -40° C to + 70° C (-40° to 158° F)
* Product will be fully functional over this extended survival temperature range. Full specification performance attained at "Operating Temperature" range.

12.2 Humidity
Operating: MIL-STD-810F (95% RH with 20° C to 60° C temperature cycle for 11 days)

12.3 Altitude
Non-operating: 30K ft (IEC 60068 PT2-13, 4 hr)

12.4 Vibration
Note: Tests performed with assemblies mounted in a rigid retaining fixture.
Operating (Random): 10-500 Hz, 3.0G rms acceleration, 3 hours per axis
Vibration, Endurance Sine Sweep: 100-1100 Hz, 5 Gs rms, 1hr/axis

12.5 Shock
Note: Tests performed with monitor mounded in a rigid retaining assembly.
Operating/Non-operating: 50 g, 11 ms duration, ½ sine, 3 shocks per axis (IEC 60068 PT2-27)
13 Regulatory Compliance

13.1 Electromagnetic Compatibility (EMC)
Must be verified to comply with the following:
- ESD, 6kV contact and 8 kV air discharge

13.2 Emissions
- 47 CFR. Part 15, Subpart B, Class B
- CE EMC Directive 2004/108/EC
- EN55022: 2010, Class B
- EN61000-3-3: 2008 Conducted Emissions, Voltage Flicker

13.3 Immunity Characteristics
- EN55024: 2010
- IEC 61000-4-2:2008 Electrostatic Discharge test
- IEC 61000-4-5:2005 Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test
- IEC 61000-4-6:2008 Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields
- IEC 61000-4-8:2009 Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test
- IEC 61000-4-11:2004 Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

13.4 Safety
Must be certified to comply with the following:
- UL/CSA 60950-1
- Designed to Class 1 Div 2 certification optional TBV
- Designed and tested to IP67

13.5 RoHS Compliance
Planar guarantees RoHS compliance with on all part numbers ending in LF.

13.6 WEEE Compliance
Will comply

13.7 Reliability
The MTBF of the LX0850PTI shall be 30,000 hours at 25°C with a 90% confidence level, excluding brightness degradation.

14 Included in the Shipping Box
- LX0850PTI touch monitor
- Plastic bag

15 Shipping Configuration (State of monitor when shipped)
The unit will be shipped in the ‘ON’ state
Brightness Control: Set to Maximum

16 Product accessories
- Upon customer request
## 17 Product Specifications Overview

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Type</td>
<td>LCD Active Matrix Flat Panel Display (TFT)</td>
</tr>
<tr>
<td>Viewable Size</td>
<td>8.4 inch</td>
</tr>
<tr>
<td>Display Viewing Area</td>
<td>304 (W) x 228 (H) mm</td>
</tr>
<tr>
<td>Display Color</td>
<td>262 K (6 bit/color)</td>
</tr>
<tr>
<td>Touchscreen Type</td>
<td>IR touch</td>
</tr>
<tr>
<td>Touchscreen Interface</td>
<td>USB</td>
</tr>
<tr>
<td>Touchscreen surface</td>
<td>strengthened glass with AntiGlare</td>
</tr>
<tr>
<td>Contrast Ratio (Typical)</td>
<td>650:1</td>
</tr>
<tr>
<td>Viewing Angle (Typical)</td>
<td>160° H / -60° 80° V</td>
</tr>
<tr>
<td>Response Time (Typical)</td>
<td>25 ms</td>
</tr>
<tr>
<td>Brightness (Typical)</td>
<td>750 cd/m² Min</td>
</tr>
<tr>
<td>Display Resolution</td>
<td>SVGA</td>
</tr>
<tr>
<td>Refresh Rate</td>
<td>56 to 60 Hz</td>
</tr>
<tr>
<td>Dimensions</td>
<td>9.55” W x 7.58” T x 2.22” D (no connectors)</td>
</tr>
<tr>
<td>Display Weight</td>
<td>5lbs, 2.3kg</td>
</tr>
<tr>
<td>Audio input</td>
<td>Mono 0-1VPP</td>
</tr>
<tr>
<td>External Connections</td>
<td>37 pin Military connector</td>
</tr>
<tr>
<td>Power Supply</td>
<td>None provided</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>8-32 V DC</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>12W typ @ 12V</td>
</tr>
<tr>
<td>VESA Compatible/Location</td>
<td>Built-in 75 mm VESA on monitor back</td>
</tr>
</tbody>
</table>

## 18 Revision History

<table>
<thead>
<tr>
<th>REV</th>
<th>ECO</th>
<th>DATE</th>
<th>SECTIONS</th>
<th>DESCRIPTION OF CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>ECO-1004164</td>
<td>12-10-2012</td>
<td>INITIAL RELEASE, LED Version</td>
<td></td>
</tr>
</tbody>
</table>
Appendix A

19.1 AMLCD cosmetic specification

- Planar part number 933-0952-00 references NEC supplied specification.

19.2 Optical bonding cosmetic specification

Planar defined.

<table>
<thead>
<tr>
<th>Panel size</th>
<th>&lt; 9”</th>
<th>10” to 13”</th>
<th>14” to 18”</th>
<th>19” to 24”</th>
<th>25” to 29”</th>
<th>30” to 36”</th>
<th>&gt; 37”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opaque Defect</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; .020”</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>.020” - .030”</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>&gt; .030”</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Lint</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; .002” x .1”</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>Disregard</td>
<td>Disregard</td>
<td>Disregard</td>
</tr>
<tr>
<td>.002” - .003” x .15”</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>.003” - .004” x .1”</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>&gt; .004” x &gt; .04”</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bubble/Translucent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; .020”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>Disregard</td>
<td>Disregard</td>
<td>Disregard</td>
</tr>
<tr>
<td>.020” - .035”</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>.035” - .050”</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>&gt; .050”</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

19.3 Protective cover glass

Meets 80-50 (scratch – dig) per MIL-O-13830B.