

Product Usage Guidelines

Get the most out of your display product by reviewing the following guidelines for product usage. Below you will find details for proper care and safe handling procedures.

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Section 1: General Guidelines

- Always follow ESD-safe handling techniques.
Be sure to ground human body and electric appliances during work. Preferably, use a conductive mat on the table & wear cotton clothes or conduction processed fiber, synthetic fiber not recommended. To reduce the generation of static electricity, be sure the working environment air is not too dry. (50-60% relative humidity recommended).
- Inspect display products prior to usage.
If defective, leave manufacturer's plastic liners on the display, do not remove.
- Wear gloves or finger cots to prevent contamination of electrical contacts or glass surfaces.
- Always follow ventilation requirements for soldering.
- Cosmetic defects are only warranted with original plastic liners and no customer assembled materials added to the product.
Polarizers scratched due to mishandling are not considered cosmetic, this is considered customer-induced handling damage.
- Always use devices within the rated voltage and current limitations.
Powering beyond these specifications will result in irreparable damage.

Section 2: Operation & Handling Precautions for LCD Modules

Operation Precautions:

- Viewing angle varies with the change of liquid crystal driving voltage (VO).
Adjust VO to show the best contrast.
- Driving the LCD in the voltage above the limit shortens its life.
- If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear.
A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
- Response time is greatly delayed at temperatures below the operating temperature range
This doesn't mean the LCD will be out of order, it will recover when it returns to the specified temperature range.
- If the display area is pushed hard during operation, the display may become abnormal.
It will return to normal if it is turned off and then turned back on again.
- Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit, therefore it must be used under the relative condition of 40°C, 50% RH.
- When turning power on, input each signal after the positive/negative voltage becomes stable.



Handling Precautions:

- Keep the temperature within a specified range for use and storage.
Polarization degradation, bubble generation or polarizer peel-off may occur with high temperatures and high humidity.
- Do not touch, push or rub the exposed polarizer with anything harder than an HB lead pencil.
- N-hexane is recommended for cleaning the adhesives used to attach the front/rear polarizer. Reflectors made of organic substances will be damaged by chemicals such as acetone, toluene, ethanol and isopropyl alcohol.
- If the display surface becomes contaminated, breath on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, wipe it gently with absorbent cotton or another soft material like a chamois soaked in Isopropyl alcohol or Ethyl alcohol. Scrub gently to avoid damaging the display surface.
- Wipe off saliva or water immediately. Avoid contact with Oil or any greasy substances. Contact with water over a long period of time may cause deformation or color fading.
- Exercise care to minimize corrosion of the electrodes.
Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- Do not put or attach anything on the display area to avoid leaving marks.
- Condensation on the surface and contact with the terminals while cold will damage, stain or dirty the polarizer. After the product is tested at a low temperature, they must be warmed up in a container before being exposed to room temperature environments.
- Do not touch the display with bare hands.
This will stain the display area and degrade the insulation between terminals.
- Since the LCD module has been assembled and adjusted with a high degree of precision, avoid applying excessive shock or force to the module or making any alterations or modifications to it.
 1. Do not alter, modify or change the shape of the tab on the metal frame.
 2. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
 3. Do not damage or modify the pattern wiring on the printed circuit board.
 4. Do not modify the zebra rubber strip (conductive rubber) or heat the seal connector.
 5. Except for soldering the interface, do not make any alterations with a soldering iron.
 6. Do not drop, bend or twist the LCD. Don't forcibly pull or bend the I/O cable or backlight cable.
 7. In order to avoid cracking the FPC, pay attention to the area where the FPC is bent, the edge of the overlay, the surface area of Ni-Au plating, area of soldering land, and the area of the through hole.

Section 3: Designing the End-Customer Product

- When available, use the Newhaven provided 3D files for optimal design consideration.
- The product design should allow slack for proper FPC (flex cable) insertion and routing. Designs that inherently involve tightly positioned flex cables should be avoided. This places too much tension on the cable/connector and may contribute to reliability issues.
- Flex (FPC) cables require 1mm bend radius. Creased FPC's are indicative of customer abuse.
- When handling of displays, never apply pressure (or squeeze) the glass area.
- When handling flex cables never allow for contamination of the “golden finger” area. High reliability assembly keeps fingers clean and avoids hand-oil contamination.
- Never perform hot-swaps (inserting/removing displays into powered ON devices)
This may cause corruption or an EOS degradation event.
- Never route the flex cables through housing openings that do not offer enough edge clearance. Rubbing (even through one-time drop events) may cause damage to the flex cable.
- Never apply stiffening tapes (like non-conductive Kapton) to the flex cables.
When stress is applied to the cable (for instance during drop testing), the stress will likely be accommodated in the region where the tapes end. This undue stress often shows as flex cable tearing. Once torn, a flex cable is no longer able to conduct signals as intended and is defective. Torn flex cables are not covered by the warranty.
- Always try to use MOLEX original connectors.
These connectors are designed to accommodate finger width variations (as normally might be expected) and apply well-specified holding forces to the cable. They allow for the best electrical connections to be made and maintained.
- When inserting FPC cables into the MOLEX connectors train your assembly operators the proper techniques.
 1. Cables should enter connectors squarely WITHOUT flex cable buckling during the insertion. Buckling (a momentary light folding of the cable), should always be avoided.
 2. Connectors should then be locked using the tabs on both sides of the connector.
 3. Following insertion an inspection is recommended that insertion instructions have been properly followed.
 4. In the event of failure, consider removing the flex cable, re-inserting, and re-testing.
 5. High reliability designs also include the application of kapton tape overlapping slightly the connector and the flex cable, aiding to prevent long term separation.
- Never remove flex cables from connectors without first unlocking the holding tabs.
Severe golden finger scratch marks are an indicator that cables were violently removed from locked connectors. Units with this type of damage are not covered by the warranty.
- These products are constructed of glass. Always avoid undue stress that may be introduced.
Product stress may be introduced when mounting of the display within the product housings.
- Uneven torques applied across the glass surface may result in glass breakage.



- Preventing uneven stress and product torques require consideration of assembly techniques.
 1. Screw tightening should be a 2-step process
 2. Best practices include loose hand-tightening screws first to provide for best levelled product installation.
 3. Only once all screws are hand-tightened, then in an opposite corner sequencing pattern tighten the mounting screws.
 4. Consider the usage of locking washers to minimize screw force requirements.
 5. Never over tighten mounting screws
 6. Never use electric/pneumatic screwdrivers. This may also result in cross-threading of inserts. Difficult torque calibration methods are often not followed.
 7. Never use screws that are too long that may interfere with the display product or overlays if used.

- Liquid cleaning products should always be avoided.

Liquids may seep into the glass and/or backlight assembly and cause uneven lighting. Always consider a NO-CLEAN assembly process instead. Liquid damage is not covered by the warranty.

- Potting agents permanently holding the product in place should be considered liquid & avoided
 1. Prior to hardening the liquids may cause display damage.
 2. After hardening, the agents may subject the display, cables, and components to high levels of trapped humidity potentially affecting reliability. The usage of RTV as a potting agent is not recommended.

- Never apply force to the backside of the product.

Force applied by other components will appear as display dark spots and cannot be repaired. Unexpected component movements (such as a drop test) may apply backside pressure to the display and should be avoided.

- Both displays and touch panels utilize the ACF bonding techniques.

This involves the usage of double-sided electrically conductive tapes bonding flex cables to glass structures. Once bonded, avoid pulling on the flex cables. General guidelines include limiting loads to <1 Kg. Long-term forces exceeding this may result in damaged bonds and electrical disconnects. Newhaven cannot be held responsible for devices used beyond this pull force.

- Display screen-saver should always be used to minimize display burn-in.

Recommended options include screen blanking, scrolling, random patterning, or otherwise to minimize burn-in. This can be accomplished through the controller SW or HW.

- Products are intended to be used within their normal operating range.

Always take into consideration internal product-level temperatures as these may differ from ambient.

- Flexes may be coated with an ESD protective black paint. Never try to remove this coating.

- Be careful with switching power supplies feeding the display module (both buck and boost).
 - Transient voltages during start-up may exceed device ratings.
 - Consider the usage of a slightly higher voltage Zener diode to clamp safely.

- Do not allow the control line voltages (serial or parallel) to exceed VCC.

It is common for display controller and driver IC's to include ESD clamping Zener diodes. Should the control line voltages exceed VCC (supply voltages) these diodes may conduct forward current enabling portions of the IC to become active (this would be bad).

Section 4: Guidance for Capacitive & Resistive Touch Panels

- Most capacitive touch panels are adhered to the displays around the edge perimeters. Never attempt to separate these assemblies.
- Optically bonded touch panels utilize full screen adherence to the display. Never attempt to separate these assemblies.
- The appearance of small air bubbles around the edges or corners of optically bonded panels indicates uneven forces being applied to the product. These forces are attempting to separate the panel from the display and result in bubbles formations in the glass.
- Avoid un-pressurized air travel of TFT's adhered to CTP panels. Extreme air pressure changes may also cause bubbles to appear within the glue agents.
- Never apply chemicals to RTP/CTP surfaces. This will result in long term degradation of the panels. Cleaning should only be done with dry lint-free cloth.
- Only use the stylus intended for the touch panel. Super-sharp stylus tips can damage the finish. Consider providing a proper stylus for end user to avoid damage.
- Bezels should be designed to avoid interference with the touch panel surface. When designing consider any expected bezel stamping variations (planar or burrs) to ensure high reliability.
- Never apply more force to the touch panels than is normally expected. The application of excessive force for the purpose of recognition is indicative of a touch panel failure.
- When using fingers for actuation, ensure hands are clean of excessive oils or particles. Wet or dirty fingers may not be properly recognized by the touch panels. This is by design.
- Resistive touch panels are not capable of recognizing multiple-contact points. This is by design.

Section 5: Special Guidance for Medical Devices

- Medical devices often require sanitization/fumigation after each usage. Displays and Touch Panels should not be exposed to caustic chemicals used during this process.
 - This includes: Chlorine Dioxide, Sodium Hypochlorite (Bleach), Ethyl Alcohol, Alconox, Liquinox, Cidex, Chlorides, or similar.
 - EPA Studies have shown these chemicals cause damage to electronic devices.
- Sealed housings should be considered for medical devices to avoid any electronics to contacting any of the above agents.

Section 6: Safety-Critical Use Cases

- Our displays are not intended for safety-critical systems.
Newhaven Display products are targeted for the normal conditions under which light industrial equipment is typically specified.
- Safety critical systems are those whose failure may result in death or serious injury, loss or severe damage to property, or environmental harm.
The product use case should always be considered when selecting and engineering any customer solution.

Section 7: Water Sensitivity

- Exposure to water may corrode PCB's, displays, and touch panels.
Sealed product housings may offer protection if exposure to water is likely.
- Continued exposure to water vapors may also cause product level corrosion leading to malfunctions.
- Exposure to salt water may expedite device corrosion and should always be avoided.
- Capacitive touch panels may not work as expected when the glass surface is wet.
This is by design.
- Product usage in a watercraft should carefully consider water/vapor exposure.
IP67 rated sealed housing should always be considered.
- In extreme conditions, users should consider the usage of added conformal coating to best protect PCB's, displays, and touch panels.
- Corrosion induced damage caused by exposure to water vapor is not covered by the warranty.

Section 8: Display Contrast Adjustments

- Different devices from different material lots may differ in performance.
It is well known in the display industry that this may likely be seen in display color and contrast performance variations. Minor variations are not considered defects if the deviation is within acceptable ranges.
- Newhaven Display maintains sets of color charts for each of our sales models.
Glass color variations are then compared to the acceptable ranges prior to customer shipments.
- Newhaven cannot be held responsible for minor lot-to-lot deviations in the VOP contrast performance when tuneability is specifically provided or recommended.
This is specifically not covered by the Newhaven warranty.



- Variations in contrast should be expected.
 - a. Hardware solutions typically “tune” the VOP voltage between a negative Supply VEE and GND. This tuning is most often done using a potentiometer.
 - b. Customers then adjust the potentiometer for the best display performance prior to use. Parts from the same lot code may exhibit similar performance while parts from a multitude of lot codes may differ. This is the justification for the potentiometer.
 - c. Software solutions are also available on some products. The “Volume Control” command allows for contrast tunability (much like the potentiometer solution) during manufacturing.

Section 9: Storage Procedure for LCD Displays

- When storing LCD's, the following precautions are necessary:
 1. Store them in a sealed polyethylene bag. If properly sealed, there is no need for desiccant.
 2. Store them in a dark place; do not expose them to sunlight or fluorescent light. Keep the temperature between 0°C and 35°C.
 3. The polarizer surface should not be in contact with any other objects. (We advise you to store them in the container in which they were shipped).
 4. Environmental conditions:
 - a. Do not leave them for more than 160 hours at 70°C
 - b. They should not be left for more than 48 hours at -20°