

PROPERLY USE OF LCD MODULES

Liquid Crystal Display Modules

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

- (1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- (2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.)
- (3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by such chemicals as acetone, toluene, ethanol and isopropyl alcohol.
- (4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum benzene. Do not scrub hard to avoid damaging the display fading.
- (5) Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause deformation or color fading.
- (6) Avoid contacting oil and fats.
- (7) Condensation in the surface and contact terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperatures they must be warmed up in a container before coming to contact with room temperature air.
- (8) Do not put or attach anything on the display area to avoid leaving marks on it.
- (9) Do not touch the display with bare hands. This will stain the display area and degrade insulation between terminals. (Some cosmetics are detrimental to the polarizers).

- (10) As glass is fragile, it tends to become chipped during handling especially on the edges. Please avoid dropping or jarring.

Precautions when Handling LCD Modules

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- (1) Do not subject to excessive shock by dropping units.
- (2) Do not alter, modify or change the shape of the tab on the metal frame.
- (3) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- (4) Do not damage or modify the pattern wiring on the printed circuit board.
- (5) Absolutely do not modify the zebra rubber strip (conductive rubber) or touch it with another object.
- (6) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- (7) Do not drop, bend or twist LCM.

Electro-Static Discharge Control

For modules use CMOS LSI or CMOS IC:

- (1) Do not take LCM from its anti-static bag until it is time to assemble.
- (2) Make certain that you are grounded when handling LCM.
- (3) Before removing LCM from its packing case or incorporating it into a set, be sure that the module and your body have the same electric potential.
- (4) When soldering the terminal of LCM, make certain that the AC power source for the soldering iron does not leak.

- (5) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potential to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- (6) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- (7) Peel off the LCM protective film slowly. A film is placed on the face of the LCM to protect the display surface from contamination, flaws, adhesion of flux, etc. Peeling off this film too quickly may cause static electricity to be generated. Thus peel off the tape slowly.
- (8) To reduce the generation of static electricity be careful that the air in the working environment is not too dry. (A relative humidity of 50% ~ 60% is recommended.)

Precaution for Soldering to the LCM

- (1) Observe the following when soldering lead wire, connector cable, etc., to the LCM.
 - Soldering iron temperature : $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$
 - Soldering time : 3 ~ 4 sec.
 - Solder ; eutectic solderIf soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.
- (2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than 3 times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

- (3) When removing the electroluminescent panel from the PC board, be sure that the solder has completely melted, the soldered pad on the PC board could be damaged.

Precautions for Operation

- (1) The viewing angle can be adjusted by varying the LCD driving voltage.
- (2) Driving voltage should be kept within specified range; excess voltage shortens display life.
- (3) Response time increases with decrease in temperature.
- (4) Display may turn black or dark blue at temperatures above its operational range, however, this is not destructive and the display will return to normal once the temperature falls back to range.
- (5) Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear “fractured”. They will recover once the display is turned off.
- (6) Condensation at terminals will cause malfunction and possible electro-chemical reaction. Relative humidity of the environment should therefore be kept below 60%.
- (7) For LCM, when turning on power, input each signal after the positive / negative voltage becomes stable.

Storage

When storing LCDs as spares for some years, the following precautions are necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there's no need for desiccant.
- (2) Store them in a dark place, do not expose to sunlight or fluorescent light. Keep the temperature between 0°C and 35°C .

- (3) The polarizer surface should not come in contact with any other object. (Advise to store them in the container in which they were shipped).
- (4) Environmental conditions:
 - Do not leave them for more than : 168 hrs. at 60 °C.
 - Should not be left for more than 48 hrs. at -20 °C.

Safety

- (1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- (2) If any fluid leaks out of a damaged glass cell, wash off with soap and water any human part that comes into contact with the fluid. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all times.

Limited Warranty

Unless otherwise agreed between DDT and customer, DDT will repair any of its LCDs functionally defective when inspected in accordance with DDT LCD acceptance standards for a period of 60 days from date of shipments. Cosmetic/visual defects must be returned to DDT within 30 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of DDT is limited to repair and/or replacement on the terms set above. DDT will not be responsible for any subsequent or consequential events.

Returning LCD under Warranty

No warranty can be granted if the precautions stated above have been disregarded. Broken glass, scratches on polarizers, mechanical damage as well as defects that are caused by accelerated environmental tests are excluded from warranty.

Return LCM under Warranty

No warranty can be granted if the precautions stated above have been disregarded. Typical examples of violations are:

- Broken LCD glass;
 - PCB eyelet's damaged or modified;
 - PCB conductors damaged;
 - Circuit modified in any way, including addition of components;
 - PCB tampered with by grinding, engraving or painting varnish;
 - Soldering to or modifying the bezel in any manner.
- Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned in antistatic packaging together with sufficient description of the failures or defects. Any connectors or cables installed by the customer must be removed completely without damaging the PCB eyelet's, conductors and terminals.