Liquid Crystal Display - LCD

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

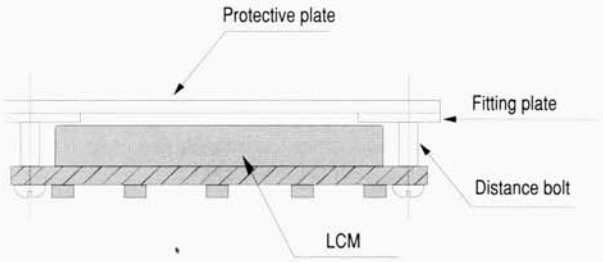
- Please keep the temperature within the specified range for use and storage Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass tweezers, etc.)
- Petrolium benzin 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 isoprpylalcohol.
- When the display surface becomes dusty, wipe gently with absorbent cotton or other soft materials like chamois soaked in petrolium benzin. Do not scrub hard to avoid damaging the display surface.
- Wipe off saliva or water drops immediatly. Contact with water over a long period of time may cause deformation or color fading.
- Avoid contact with oils and fats.
- Condensation on 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 in contact with room temperature air.
- Do not put or attach anything on the display area to avoid leaving marks.
- Do not touch the display area with bare hands. This will stain the display area and degradate insulation between terminals. (Some cosmetics are detrimental to the polarizers.)
- As glass is fragile, it tends to become cracked or chipped during handling especially on the edges. Please avoid dropping or jarring.

Liquid Crystal Display Module - LCM

■ Installing LCD Module

The hole in the printed circuit board is used to fix the LCM as shown in the picture below. Pay Attention to the following items when installing the LCM:

- Cover the surface with a transparent protective plate to protect the polarizer and LC cell.
- To prevent the module cover from being pressed, the spacers between the module and the fitting plates should be longer than 6.0 mm. (measurement tolerance +/-0.1 mm)



■ Precautions in Handling LCD Modules

Since the 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.

- Do not alter, modify or change the shape of the clips on the metal frame.
- Do not drill holes in the printed circuit board, modify its shape or change the positions of components.
- Do not damage or modify the pattern wiring on the printed circuit board.
- Absolutely do not modify or change the internal connector (conductive rubber) or alow it to come into contact with another object.
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist the LCM.

■ Static Electricity

Since this module uses a CMOS LSI, the same careful attention should be paid to static electricity as for an ordinary CMOS IC.

- Make certain that you are grounded when handling LCM.
- Before removing LCM from its packing case or incorporating it into a set, be sure that the module and your body have the same electical potential.
- When soldering the terminal of LCM, make certain that the AC power source for the soldering iron does not leak.
- When using an electic screwdriver to attach LCM, the screwdriver should be grounded to minimize as much as possible any transmission of electromagnetic waves producted by sparks coming from the commutator of the motor.
- Make sure, as much as possible, that there is no static electricity in your work clother or work area.
- To reduce the generation of static electricity, be careful that the air in the work area is not too dry. (A relative humidity of 50% - 60% is recommended).

■ Precaution in Soldering to the LCM

- Observe the following when soldering lead wire, connector cable etc., to the LCM:

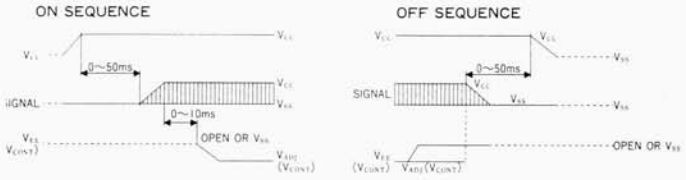
Soldering Iron Temperature: 280°C+/- 10°C
Soldering Time: 3 - 4 sec.
Solder: Eutectic Solder

If soldering flux is used, be sure to remove any remaining flux after finishing the 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 splatters.

- When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three 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.
- When removing the electroluminescent panel from the PC board, be sure that the solder has completely melted first. If you try to pull the components apart before the solder is completely melted, the soldered pad on the PC board could be damaged.

Precautions for Operation

- Viewing angle varies with voltage V_0. Adjust V_0 to give the best contrast.
- Driving an LCD at a voltage above the limit shortens its life.
- Response time is greatly increased at temperatures below the operating temperature range. The display area becomes dark blue at temperatures above this range. However, this does not mean LCD charged, it will recover when it returns to the specified temperature range.
- If the display area is pressed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- 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.
- Condensation on PCB can cause destruction of the CMOS driver.
- When turning on power, input each signal after the positive/negative voltage becomes stable.



Storage

When storing LCD's for a long time, the following precautions are necessary:

- Store them in a sealed polyethylene bag. If properly sealed, a dessicant is not needed.
- Store them a in dark place; do not expose to sunlight or fluorescent light. Keep the temperature between 0°C and 35°C.
- The polarizer surface should not come into contact with any other object. (We advise you to store them in the container in which they were shipped.)
- Environmental conditions:

Humidity - Observe the following conditions, both in storage and in operation:

Number of dots:	Below 128 x 240
Ambient Temp. Ta < 40°C	95% RH or less
Ambient. Temp. Ta ≥ 40°C	Below maximum absolute humidity of 40°C, 95% RH

How to Handle the Electroluminescent Panel for Transflective Type LCM

■ Selection of Electroluminescent Panel

- The electroluminescent panel is inserted between the liquid crystal display (LCD) and printed circuit board of a liquid module (LCM). Therefore, it is essential to select an electroluminescent panel that is insulated on both the PC board side and the LCD side. It is especially important to make sure that the electroluminescent panel is insulated on the PC board side while the wiring of the through-hole portion is exposed.
- It is recommended that you use an electroluminescent panel with insulated ends as shown in the diagram below. If the ends of the electroluminescent panel are exposed, a short might occur with the liquid crystal module, resulting in damage to the module.

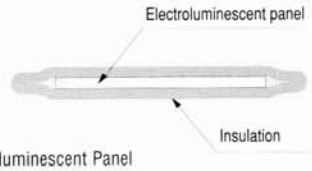


Illustration:
Cross Section of Electroluminescent Panel

- Select the electroluminescent panel that is the right size for each liquid crystal module. There is a recommended size for each standard BATRON liquid crystal module. Information on panel sizes is available upon request.

■ Installing the Electroluminescent Panel

- A cross section of the LCM construction is given in the illustration. The gaps at either end through which the electroluminescent panel is inserted are made of conductive rubber (interconnectors). When inserting the electroluminescent panel, be especially careful not to move the conductive rubber. Do nut push the rubber with the edge of the panel, as the rubber might be moved from its proper position. This could damage the connection between the LCD and the PC board, resulting in a display failure.

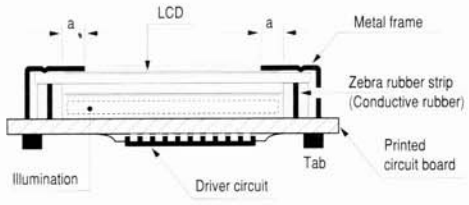


Illustration:Cross Section of a Liquid Crystal Module

- Since high voltage is applied to the feeder terminal of the elctroluminescent panel, be careful to install the panel such that the feeder terminal does not touch the front panel or the PC board. (The voltage is high in comparision with that applied to the C-MOS drive circuit used in the liquid crystal module). If the feeder terminal is touching the front panel or PC board when the lighting voltage is applied to the panel, the drive circuit and LCD will fail. There is also the possibility that other circuits (e. g. controller on the set side, MPU, etc.) may be adversely affected by the passage of voltage through the interface.
- Install the electroluminescent panel so that the luminous part coincides with the windowframe (effective display area) of the LCM front panel. The distance between the windowframe of the front panel and the conductive rubber (dimension a in illustration) varies with each liquid crystal module, but the average is about 2.0 mm. When determining the position where the electroluminescent panel is to be installed, be careful not to move the conductive rubber with the panel.
- Observe the following standards when soldering the electroluminescent panel to the PC board.

Soldering iron temperature:	280°C ± 10°C
Soldering time:	3 - 4 sec.
Solder:	eutectic solder

If a soldering flux is used, be sure to remove any remaining flux after soldering. (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 from flux splatters.

- When soldering the electroluminescent panel and PC board , the panel and board should not be detached more than three 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 gun.
- When removing the electroluminescent panel from the PC board, be sure that the solder has completely melted, otherwise, the soldered pad on the PC board could be damaged.

■ Drive Circuit of Electroluminescent Panel

The luminance and life time of an electroluminescent panel vary depending on the drive voltage and frequency. Therefore, it is recommended that you select the drive circuit suggested by the electroluminescent panel manufacturer. Using the recommended product will assure the optimum brightness and working life of the electroluminescent panel.

Safety

- It is recommended to crush damaged or unnecessary LCDs and wash them with solvents such as acetone and ethanol which should later be burned.
- If hands come into contact with liquid from damaged glass cells, wash hands thoroughly with soap and water.

Returning Modules under Warranty

- **Modules have to be returned with appropriate antistatic packaging.**
- **A sufficient description of the failure has to be included.**
- **Any accessories added by the customer have to be removed carefully without damaging the PCB eyelets or conductors.**
- **No warranty can be granted if the precautions mentioned earlier have been disregarded, or if the module was modified by any means, elctrically or mechanically.**

Not covered by warranty are:

- **Broken LCD glass**
- **PCB eylets damaged**
- **PCB conductors damaged**
- **Circuit modifications of any kind and added components**
- **PC board damaged or modified e. g. by grinding the corner or edges, engraved marking, varnishing or painting**
- **Splice pieces of the frame bent down**
- **Solder connections between frame and PCB, etc.**

Possible repairs of such modules will be invoiced.

Before returning modules - Please contact your sales office.