To :

# Specification of FUJITSU TFT-LCD module

# FLC51UXC8V-10

| Approval |
| --- |
| Date : |
| By : |

This Product is designed, developed and manufactured as contemplated for general use, including without limitation, general office use, personal use, household use, and ordinary industrial use, but is not designed, developed and manufactured as contemplated for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could lead directly to death, personal injury, severe physical damage or other loss (hereinafter "High Safety Required Use"), including without limitation, nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system. If customer's product possibly falls under the category of High Safety Required Use, please consult with our sales representatives in charge before such use. In addition, Fujitsu shall not be liable against the Customer and/or any third party for any claims or damages arising in connection with the High Safety Required Use of the Product without permission.

Specification No. : Tech Bes LCD-00195

Issue Date : May 26, 2003

Issued by : K. Tanaka

K. Tanaka
Director
Design Dep.
Technology Div.

FUJITSU DISPLAY TECHNOLOGIES CORPORATION

# REVISION HISTORY

| Revision | Date | Prepared | Checked | | Approved | Summary |
|---|---|---|---|---|---|---|
| 01A | May.26.2003 | Y.Furukoshi | | | K.Tanaka | 1st issue |
| | | | | | | |
| | | | | | | |

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| DESIG. | 20030526 | Furukoshi | CHECK | | APPR. K.Tanaka |

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## 1. APPLICATION

This specification is applied to the 20.1-inch UXGA supported TFT-LCD module.

## 2. PRODUCT NAME AND MODEL NUMBER

2–1 Product Name: LCD Module

2–2 Model Name: FLC51UXC8V-10

## 3. OVERVIEW

This LCD module has a TFT active matrix type liquid crystal panel 1600x1200 pixels, and diagonal size of 51cm(20.1-inch). This LCD has a LVDS dual interface and can display 16,777,216 colors.

The power supply of this LCD module is +12V DC single.

This module has the characteristics for applying TCO'99.

## 4. CONFIGURATION

This LCD module consists of a color TFT-LCD panel that is mounted with TFT driver ICs, a cold-cathode fluorescent tube back-light.
The inverter for the backlight is not included.
Figure 4-1 shows a block diagram of this LCD module.

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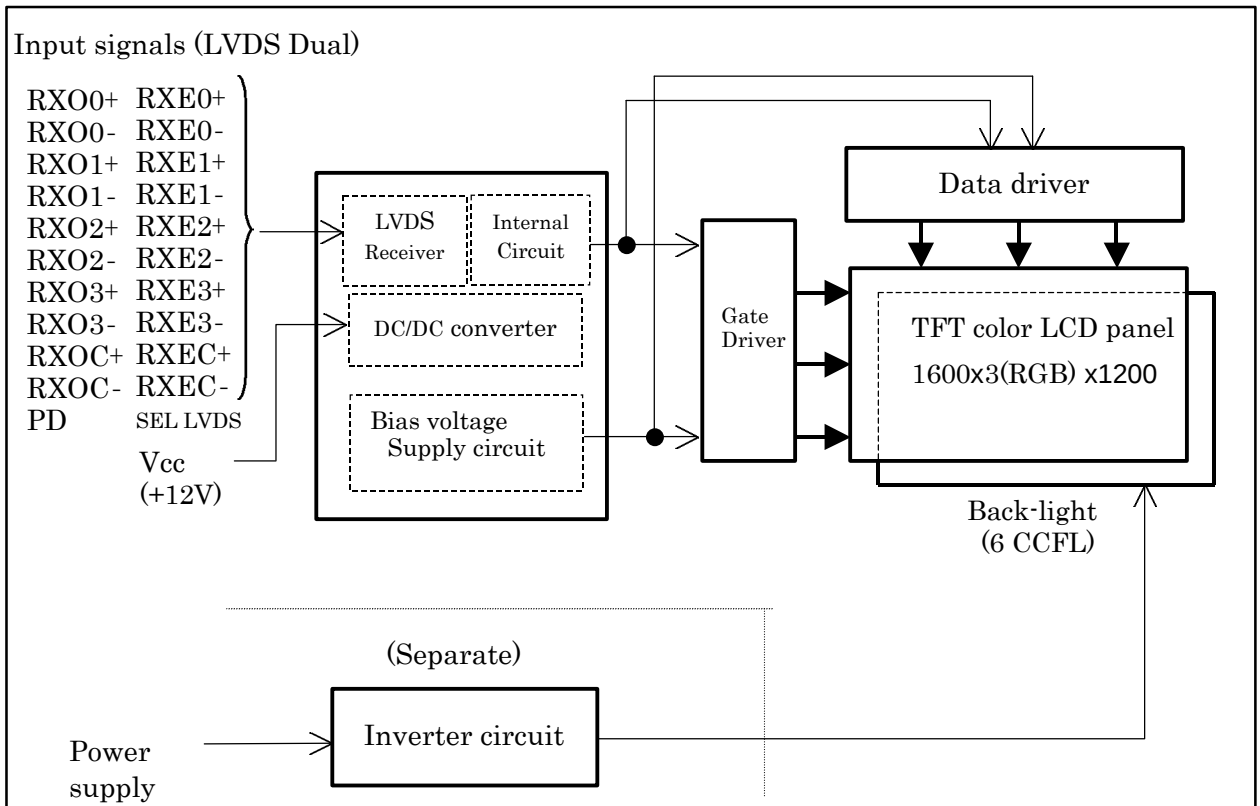


Figure 4-1 Block Diagram

## 5. MECHANICAL SPECIFICATIONS

Table 5-1 shows the mechanical specifications of this LCD module.

Table 5-1 Mechanical Specifications

| Item | Specifications | Unit | Remark |
|---|---|---|---|
| Dimensions | 432 x 331.5 x 25(TYP.) | mm | Edge type back-light is used. (φ2.6 CCFLx6) |
| Display Resolution | (1600x3) x 1200 | — | |
| Display Dot Area | 408.0 x 306.0 | mm | For details on dimensions, See dimensional outline drawing. (At page 34,35) |
| Dot Pitch | (0.085x3) x 0.255 | mm | |
| Aspect Ratio | 1:1 | — | |
| Weight | 3,500 (Max) | g | Excluding inverter. |
| FG-SG | Short circuit | — | |

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## 6. ABSOLUTE MAXIMUM RATING

Table 6-1 shows the absolute maximum rating of this LCD module.

Table 6-1 Absolute Maximum Rating

| Item | Symbol | Condition | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | Ta=25°C | –0.3 | — | 14.0 | V |
| Input Signal Voltage (LVDS signal, PD, SEL LVDS) | $V_{IN}$ | Ta=25°C | –0.3 | — | 3.6 | V |

## 7. RECOMMENDED OPERATING CONDITIONS

Table 7-1 shows the recommended operating conditions of this LCD module.

Table 7-1 Recommended Operating Conditions

| Item | | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage (Logic) | | $V_{CC}$ | 11.5 | 12.0 | 12.5 | V |
| Ripple Voltage | $V_{CC}$ | $V_{RP}$ | — | — | 0.1 | V |

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## 8. ELECTRICAL SPECIFICATIONS

Table 8-1 shows the electrical specifications of this LCD module. Figure 8-1 shows the measurement circuit. Figure 8-2(A) shows the equivalent circuit of the logic signal input area. Figure 8-2(B) shows the equivalent circuit of the supply voltage Input area.

Table 8-1 Electrical Specifications

| Item | | Symbol | Condition | MIN. | TYP. | MAX. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Differential-input Voltage (High) | | $V_{IH}$ | $V_{CM}$=+1.2V | — | — | 100 | mV | |
| Differential-input Voltage (Low) | | $V_{IL}$ | $V_{CM}$=+1.2V | –100 | — | — | mV | |
| Supply Current | | $I_{CC}$ | $V_{CC}$=+12.0±0.5V, $V_{SS}$=0V, DCLK=81MHz, 60Hz | — | 500 | 1000 | mA | *1 |
| Supply Rush Current | | $I_{SCC}$ | $V_{CC}$=+12.0±0.5V, $V_{SS}$=0V, DCLK=81MHz, 60Hz | — | — | 5.8 | A | *2 |
| Supply Rush Current Duration (1A excess) | | $T_{SCC}$ | $V_{CC}$=+12.0±0.5V, $V_{SS}$=0V, DCLK=81MHz, 60Hz | — | — | 0.2. | ms | *2 |
| BACK LIGHT (*3) | CCFL Turn on Voltage | $V_S$ | $f_L$=50kHz, Ta=25ºC | — | 1600 | 1800 | Vrms | *4 |
| | | | $f_L$=50kHz, Ta=0ºC | — | — | 1850 | Vrms | *4 |
| | Lighting Voltage | $V_L$ | $f_L$=50kHz, $I_L$=6mA | — | 800 | — | Vrms | |
| | Lighting Frequency | $f_L$ | $V_L$=800Vrms | 30 | 50 | 60 | KHz | |
| | Tube Current | $I_L$ | $f_L$=50kHz, $V_L$=800Vrms | 3 | 6 | 7 | mArms | *3 |

(*1) Typical current situation : Color bar pattern. Vcc=12.0V
Maximum current situation: White screen. Vcc=11.5V
Without rush current.

(*2) These items prescribe the rush current for starting internal DC/DC.
Charging current to capacitors of Vcc is not prescribed.

(*3) Tube current ($I_L$) shows the value of the current that is consumed at one lamp.
This LCD module has 6 lamps. Each 3 lamps are placed at upper side and lower side of the display.
3 lamps are connected in parallel. Each low voltage terminals are connected with separate Cable to Back-light connecter.

(*4) The voltage above this value should be applied to the lamp for more than 1 second to startup.
Otherwise the lamp may not be turned on.

Measurement circuit is based on Figure 8-1.

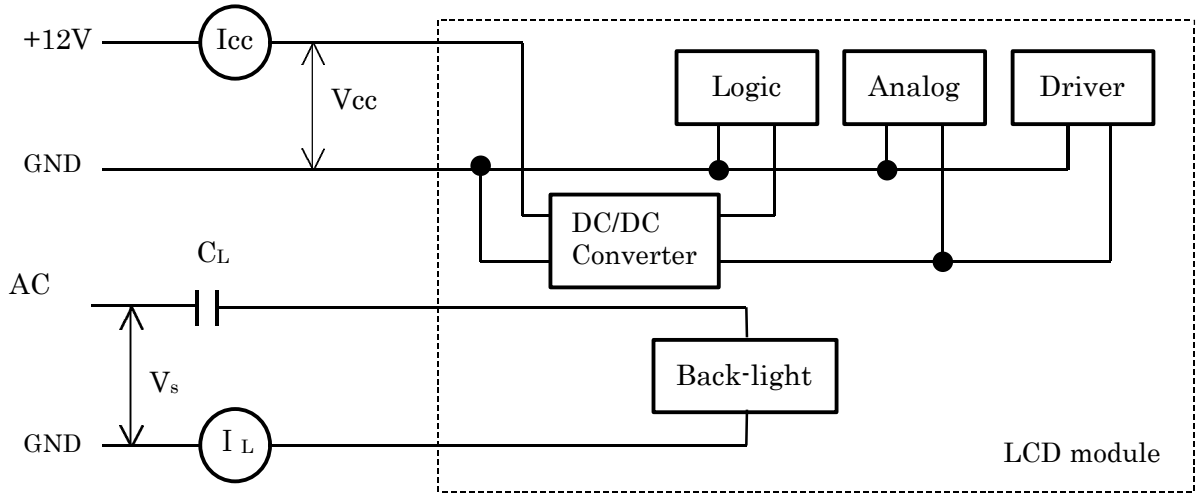
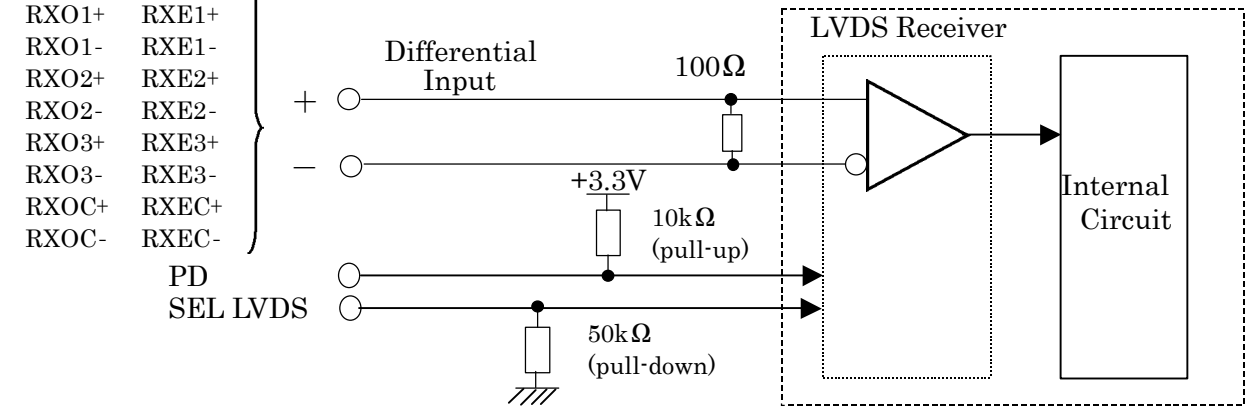



Figure 8-1 Measurement circuit

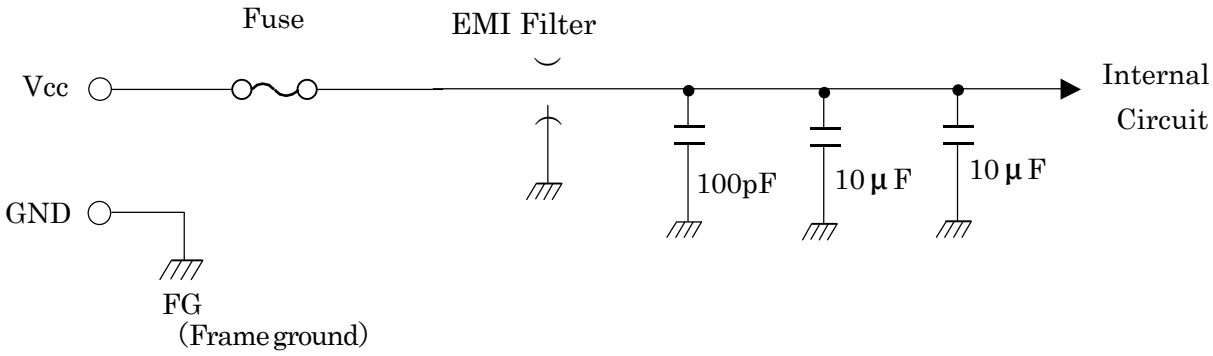
Input signals (LVDS Dual)

| | |
|---|---|
| RXO0+ | RXE0+ |
| RXO0- | RXE0- |
| RXO1+ | RXE1+ |
| RXO1- | RXE1- |
| RXO2+ | RXE2+ |
| RXO2- | RXE2- |
| RXO3+ | RXE3+ |
| RXO3- | RXE3- |
| RXOC+ | RXEC+ |
| RXOC- | RXEC- |




LVDS Receiver: DS90CF386 (National Semiconductor) or
THC63LVDF84B (Thine Electronics)

Figure 8-2(A) Equivalent circuit of logic signal Input




Fuse: KAB240240-4A (Matsuo Electronics Co.LTD)

EMI Filter : SGM45C1H222 (Sumitomo Metal Electronics Devices Inc)

Figure 8-2(B) Equivalent circuit of power supply

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## 9. OPTICAL SPECIFICATIONS

Table 9-1 shows the optical specifications of this LCD module.

Table 9-1 Optical Specifications

Ta=25□ C

| Item | | Symbol | Condition | | Specifications MIN. | Specifications TYP. | Specifications MAX. | Unit | Remark | Remark Note |
|---|---|---|---|---|---|---|---|---|---|---|
| Visual Angle | Horizontal | $\theta_{L,R}$ | CR≧10 | $\theta_{U,D}$=0° | 85 | — | — | deg | | (1)(2)(3)(5)(6) |
| | Vertical | $\theta_{U,D}$ | | $\theta_{L,R}$=0° | 85 | — | — | deg | | |
| | All Direction | θ | | | — | 80 | — | deg | | |
| Contrast Ratio | | CR | $\theta_{L,R,U,D}$=0° | | 400 | 600 | — | — | White/ Black | (1)(2)(3)(5) |
| Response Time (ON) (B→W) | | $t_{on}$ | $\theta_{L,R,U,D}$=0° | Ta=25□ C | — | 15 | 30 | ms | | (1)(4)(5) |
| | | | | Ta=0□ C | — | 50 | 100 | ms | | |
| Response Time (OFF) (W→B) | | $t_{off}$ | $\theta_{L,R,U,D}$=0° | Ta=25□ C | — | 10 | 25 | ms | | |
| | | | | Ta=0□ C | — | 50 | 100 | ms | | |
| Brightness | | I | $\theta_{L,R,U,D}$=0° $V_{CC}$=12.0V $I_L$=6mA | | 200 | 250 | | cd/m² | White *1 | (1)(5) |
| Brightness Uniformity | | △I | | | 70 | — | — | % | | (1)(5)(7) |
| Chromaticity | W | x | | | 0.283 | 0.313 | 0.343 | — | | (1)(5) |
| | | y | | | 0.299 | 0.329 | 0.359 | — | | |
| | R | (x, y) | | Red | (0.641,0.350) Typ. | | | | | |
| | G | | | Green | (0.287,0.595) Typ. | | | | | |
| | B | | | Blue | (0.142,0.070) Typ. | | | | | |
| LCD Panel Type | | | | | TFT Color | | | | | |
| Display Mode | | | | | Normally Black | | | | | |
| Wide Viewing Angle Technology | | | | | MVA | | | | | |
| Optimum Viewing Angle | | | | | — (Symmetry) | | | | | (6) |
| Display Color | | | | | 16,777,216 (8-bit color) | | | | | |
| Color of non-display area | | | | | Black | | | | | |
| Surface Treatment | | | | | Anti-glare (Haze value: (25%) , 2H) | | | | | |

(*1) Value at 15～20 minutes after lighting on.

(Note) ・CS-1000 (MINOLTA Co. Ltd.) , BM-5A (Topcon) and the like should be used as a luminance colorimeter.
Field=1 ° , L=500mm
・Back-light current = 6mA, Dark room condition (1 lux or less)

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Note 1) Definition of Viewing Angle (1)

Based on Figure 9-1.

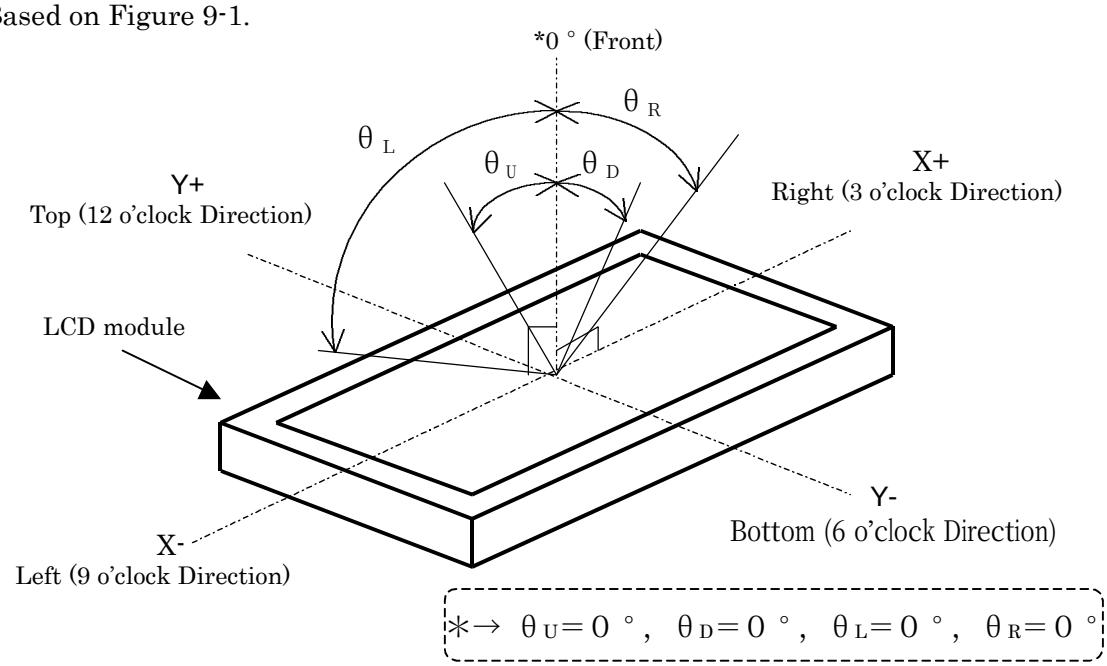


Figure 9-1 Definition of Viewing Angle (1)

Note 2) Definition of Viewing Angle (2)

Based on Figure 9-2.

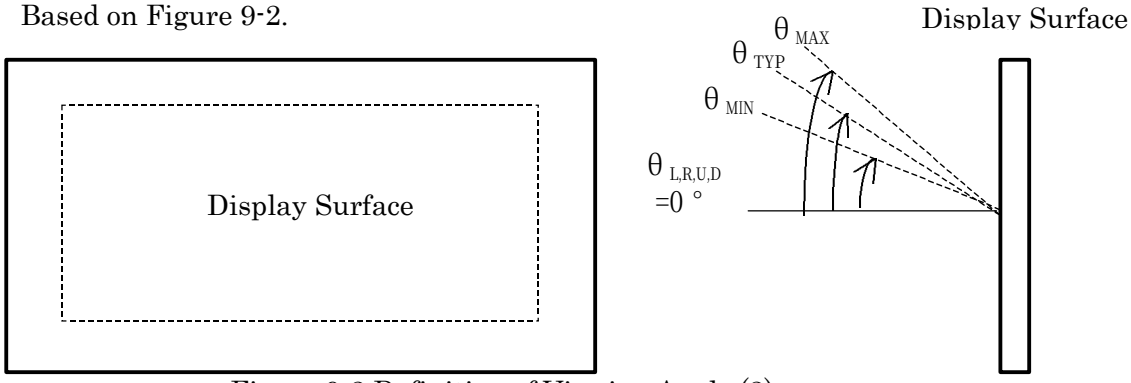


Figure 9-2 Definition of Viewing Angle (2)

Note 3) Definition of Contrast Ratio (CR)

Determined by Formula (1) based on Figure 9-3 Voltage-Brightness characteristics.

$$= \frac{L_W \text{ (Brightness at white)}}{L_B \text{ (Brightness at black)}} \quad \cdots\cdots(1)$$

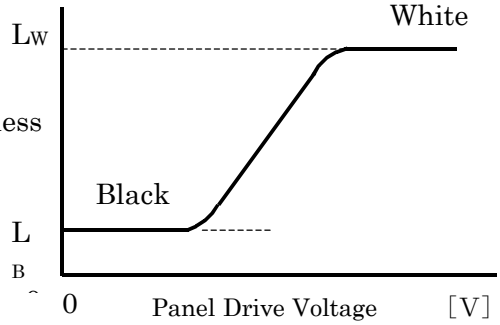


Figure 9-3 Voltage-Brightness Characteristics

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Note 4) Definition of Response Time

Based on Figure 9-4.

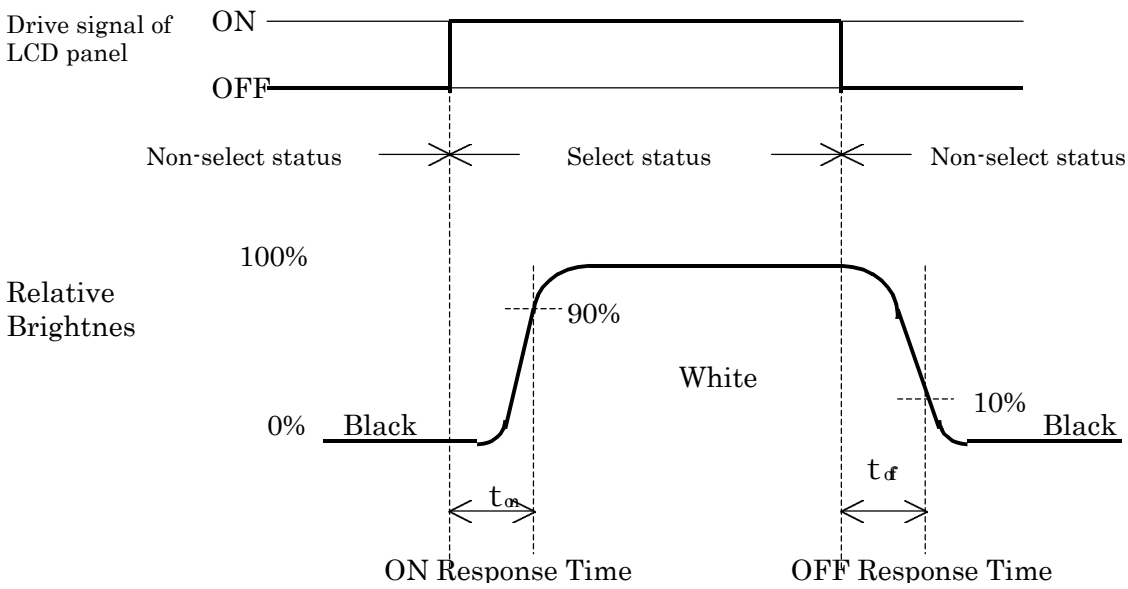


Figure 9-4 Definition of Response Time

Note 5) Contrast Ratio and Response Measurement System

Based on Figure 9-5.

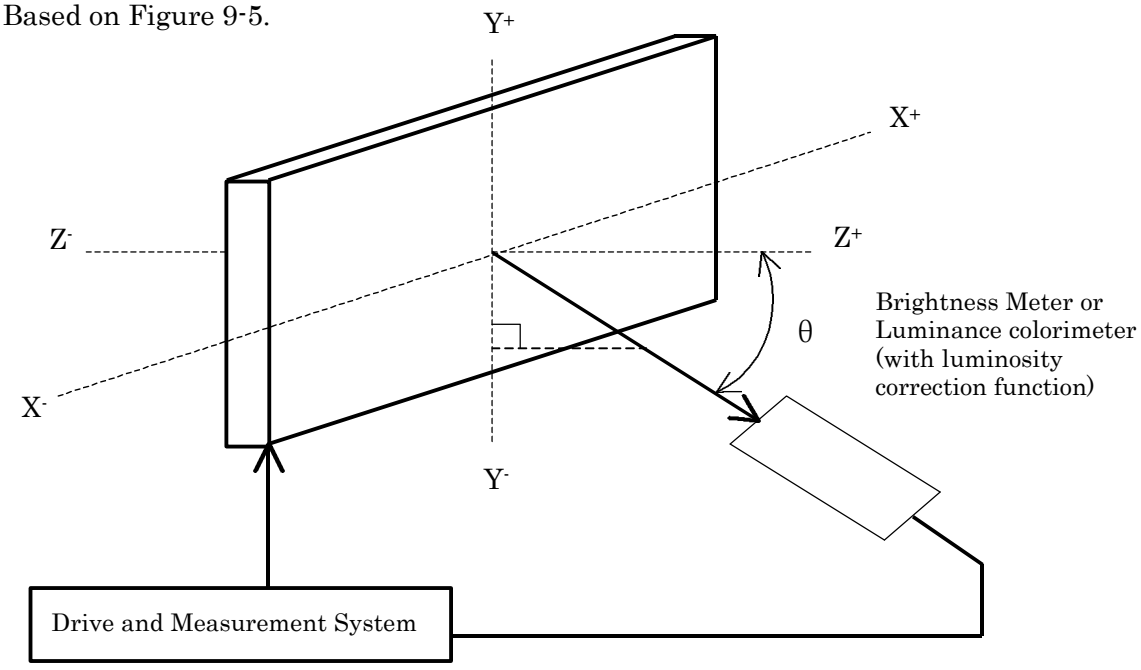


Figure 9-5 Contrast Ratio and Response Time Measurement System

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Note 6) Definition of Optimum Viewing Angle

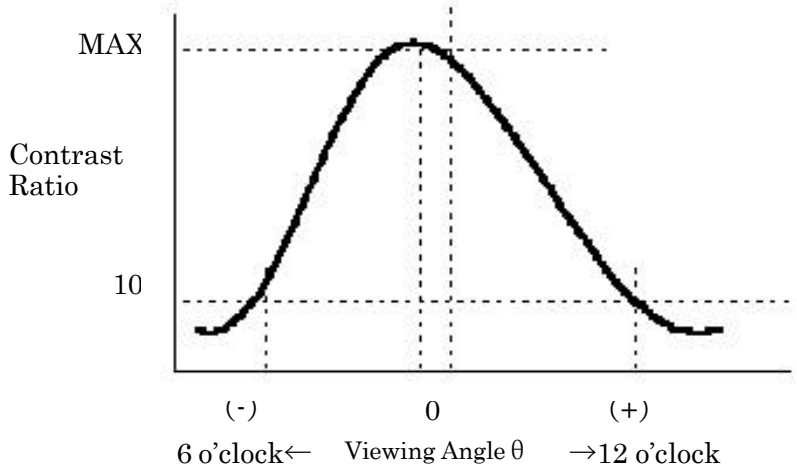
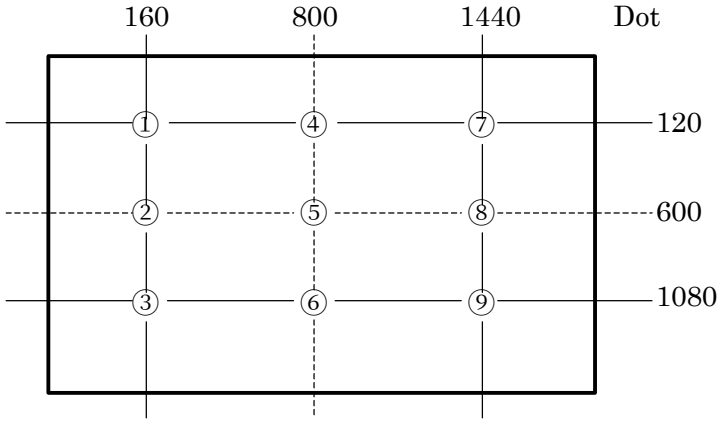



Figure 9-6 Definition of Viewing Angle

Note 7) Definition of Brightness Uniformity

Brightness uniformity is defined by the following formula.
Brightness (I1～I9) art measured at the following 9 points (①～⑨) on the display area that is shown in Figure 9-7.

$$\text{Brightness Uniformity } (\triangle L) = \frac{|\text{Min. In}|}{|\text{Max. In}|} \times 100\ (\%)\ ,\ n = 1 \text{ to } 9$$




Note) Each measurement point (①～⑨) defines the center spot of view of Brightness Meter.
The tolerance of measurement position is±3mm.

Figure 9-7 Measurement Points

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# 10. INTERFACE SPECIFICATIONS

## 10-1 Signal descriptions

Table 10-1 shows the description and configuration of interface signals (CN1).

Table 10-1 Interface signals (CN1)

| Pin No. | Symbol | I/O | Function |
|---|---|---|---|
| 1 | Vcc | — | +12V power supply |
| 2 | Vcc | — | +12V power supply |
| 3 | Vcc | — | +12V power supply |
| 4 | TST | — | Test pin *2 |
| 5 | PD | I | LVDS Core Power Down |
| 6 | SEL LVDS | I | Select LVDS data order *1 |
| 7 | GND | — | Ground |
| 8 | RxE3+ | I | Positive differential input |
| 9 | RxE3- | I | Negative differential input |
| 10 | RxEC+ | I | Positive differential input |
| 11 | RxEC- | I | Negative differential input |
| 12 | RxE2+ | I | Positive differential input |
| 13 | RxE2- | I | Negative differential input |
| 14 | GND | — | Ground |
| 15 | RxE1+ | I | Positive differential input |
| 16 | RxE1- | I | Negative differential input |
| 17 | GND | — | Ground |
| 18 | RxE0+ | I | Positive differential input |
| 19 | RxE0- | I | Negative differential input |
| 20 | RxO3+ | I | Positive differential input |
| 21 | RxO3- | I | Negative differential input |
| 22 | RxOC+ | I | Positive differential input |
| 23 | RxOC- | I | Negative differential input |
| 24 | GND | — | Ground |
| 25 | RxO2+ | I | Positive differential input |
| 26 | RxO2- | I | Negative differential input |
| 27 | RxO1+ | I | Positive differential input |
| 28 | RxO1- | I | Negative differential input |
| 29 | RxO0+ | I | Positive differential input |
| 30 | RxO0- | I | Negative differential input |

Connector : FI-X30S-HF (Japan Aviation Electronics)
User's connector : FI-X30M (Japan Aviation Electronics)
FI-X30H
FI-X30C

*1: 3.3V CMOS Signal input. (High or Low)
*2: Keep open. (Internal test use only.)

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10-2 LVDS Data Assignment

Table 10-2 shows the LVDS Data Assignment.

Table 10-2 LVDS Data Assignment

| Input signal *1 | | | Transmitter DS90CF383,C385 | | Interface connector | | | Receiver DS90CF386 | | LCD input (Sel LVDS) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SEL LVDS | Low | High | pin | INPUT | System side | LCD module pin | | pin | OUTPUT | Low | High |
| LVDS Odd | RO2 | RO0 | 51 | TxIN0 | Tx OUT0+ | 2 | RxO0+ | 27 | RxOUT0 | RO2 | RO0 |
| | RO3 | RO1 | 52 | TxIN1 | | | | 29 | RxOUT1 | RO3 | RO1 |
| | RO4 | RO2 | 54 | TxIN2 | | | | 30 | RxOUT2 | RO4 | RO2 |
| | RO5 | RO3 | 55 | TxIN3 | | | | 32 | RxOUT3 | RO5 | RO3 |
| | RO6 | RO4 | 56 | TxIN4 | Tx OUT0- | 1 | RxO0- | 33 | RxOUT4 | RO6 | RO4 |
| | RO7 | RO5 | 3 | TxIN6 | | | | 35 | RxOUT6 | RO7 | RO5 |
| | GO2 | GO0 | 4 | TxIN7 | | | | 37 | RxOUT7 | GO2 | GO0 |
| | GO3 | GO1 | 6 | TxIN8 | Tx OUT1+ | 4 | RxO1+ | 38 | RxOUT8 | GO3 | GO1 |
| | GO4 | GO2 | 7 | TxIN9 | | | | 39 | RxOUT9 | GO4 | GO2 |
| | GO5 | GO3 | 11 | TxIN12 | | | | 43 | RxOUT12 | GO5 | GO3 |
| | GO6 | GO4 | 12 | TxIN13 | | | | 45 | RxOUT13 | GO6 | GO4 |
| | GO7 | GO5 | 14 | TxIN14 | Tx OUT1- | 3 | RxO1- | 46 | RxOUT14 | GO7 | GO5 |
| | BO2 | BO0 | 15 | TxIN15 | | | | 47 | RxOUT15 | BO2 | BO0 |
| | BO3 | BO1 | 19 | TxIN18 | | | | 51 | RxOUT18 | BO3 | BO1 |
| | BO4 | BO2 | 20 | TxIN19 | Tx OUT2+ | 6 | RxO2+ | 53 | RxOUT19 | BO4 | BO2 |
| | BO5 | BO3 | 22 | TxIN20 | | | | 54 | RxOUT20 | BO5 | BO3 |
| | BO6 | BO4 | 23 | TxIN21 | | | | 55 | RxOUT21 | BO6 | BO4 |
| | BO7 | BO5 | 24 | TxIN22 | | | | 1 | RxOUT22 | BO7 | BO5 |
| | RSVD | RSVD | 27 | TxIN24 | Tx OUT2- | 5 | RxO2- | 3 | RxOUT24 | Not use | Not use |
| | RSVD | RSVD | 28 | TxIN25 | | | | 5 | RxOUT25 | Not use | Not use |
| | ENAB | ENAB | 30 | TxIN26 | | | | 6 | RxOUT26 | ENAB | ENAB |
| | RO0 | RO6 | 50 | TxIN27 | Tx OUT3+ | 11 | RxO3+ | 7 | RxOUT27 | RO0 | RO6 |
| | RO1 | RO7 | 2 | TxIN5 | | | | 34 | RxOUT5 | RO1 | RO7 |
| | GO0 | GO6 | 8 | TxIN10 | | | | 41 | RxOUT1 | GO0 | GO6 |
| | GO1 | GO7 | 10 | TxIN11 | | | | 42 | RxOUT11 | GO1 | GO7 |
| | BO0 | BO6 | 16 | TxIN16 | Tx OUT3- | 10 | RxO3- | 49 | RxOUT16 | BO0 | BO6 |
| | BO1 | BO7 | 18 | TxIN17 | | | | 50 | RxOUT17 | BO1 | BO7 |
| | RSVD | RSVD | 25 | TxIN23 | | | | 2 | RxOUT23 | Not use | Not use |
| | DCLK | | 31 | TxCLK IN | TxCLK OUT+ | 9 | RxCLK IN+ | 26 | RxCLK OUT | DCLK | |
| | | | | | TxCLK OUT- | 8 | RxCLK IN- | | | | |
| LVDS Even | RE2 | RE0 | 51 | TxIN0 | Tx OUT0+ | 13 | RxE0+ | 27 | RxOUT0 | RE2 | RE0 |
| | RE3 | RE1 | 52 | TxIN1 | | | | 29 | RxOUT1 | RE3 | RE1 |
| | RE4 | RE2 | 54 | TxIN2 | | | | 30 | RxOUT2 | RE4 | RE2 |
| | RE5 | RE3 | 55 | TxIN3 | | | | 32 | RxOUT3 | RE5 | RE3 |
| | RE6 | RE4 | 56 | TxIN4 | Tx OUT0- | 12 | RxE0- | 33 | RxOUT4 | RE6 | RE4 |
| | RE7 | RE5 | 3 | TxIN6 | | | | 35 | RxOUT6 | RE7 | RE5 |
| | GE2 | GE0 | 4 | TxIN7 | | | | 37 | RxOUT7 | GE2 | GE0 |
| | GE3 | GE1 | 6 | TxIN8 | Tx OUT1+ | 16 | RxE1+ | 38 | RxOUT8 | GE3 | GE1 |
| | GE4 | GE2 | 7 | TxIN9 | | | | 39 | RxOUT9 | GE4 | GE2 |
| | GE5 | GE3 | 11 | TxIN12 | | | | 43 | RxOUT12 | GE5 | GE3 |
| | GE6 | GE4 | 12 | TxIN13 | | | | 45 | RxOUT13 | GE6 | GE4 |
| | GE7 | GE5 | 14 | TxIN14 | Tx OUT1- | 15 | RxE1- | 46 | RxOUT14 | GE7 | GE5 |
| | BE2 | BE0 | 15 | TxIN15 | | | | 47 | RxOUT15 | BE2 | BE0 |
| | BE3 | BE1 | 19 | TxIN18 | | | | 51 | RxOUT18 | BE3 | BE1 |
| | BE4 | BE2 | 20 | TxIN19 | Tx OUT2+ | 19 | RxE2+ | 53 | RxOUT19 | BE4 | BE2 |
| | BE5 | BE3 | 22 | TxIN20 | | | | 54 | RxOUT20 | BE5 | BE3 |
| | BE6 | BE4 | 23 | TxIN21 | | | | 55 | RxOUT21 | BE6 | BE4 |
| | BE7 | BE5 | 24 | TxIN22 | | | | 1 | RxOUT22 | BE7 | BE5 |
| | RSVD | RSVD | 27 | TxIN24 | Tx OUT2- | 18 | RxE2- | 3 | RxOUT24 | Not use | Not use |
| | RSVD | RSVD | 28 | TxIN25 | | | | 5 | RxOUT25 | Not use | Not use |
| | RSVD | RSVD | 30 | TxIN26 | | | | 6 | RxOUT26 | Not use | Not use |
| | RE0 | RE6 | 50 | TxIN27 | Tx OUT3+ | 23 | RxE3+ | 7 | RxOUT27 | RE0 | RE6 |
| | RE1 | RE7 | 2 | TxIN5 | | | | 34 | RxOUT5 | RE1 | RE7 |
| | GE0 | GE6 | 8 | TxIN10 | | | | 41 | RxOUT10 | GE0 | GE6 |
| | GE1 | GE7 | 10 | TxIN11 | | | | 42 | RxOUT11 | GE1 | GE7 |
| | BE0 | BE6 | 16 | TxIN16 | Tx OUT3- | 22 | RxE3- | 49 | RxOUT16 | BE0 | BE6 |
| | BE1 | BE7 | 18 | TxIN17 | | | | 50 | RxOUT17 | BE1 | BE7 |
| | RSVD | | 25 | TxIN23 | | | | 2 | RxOUT23 | Not use | Not use |
| | DCLK | | 31 | TxCLK IN | TxCLK OUT+ | 21 | RxCLK IN+ | 26 | RxCLK OUT | Not use | |
| | | | | | TxCLK OUT- | 20 | RxCLK IN- | | | | |

*1 ・RSVD (reserved) pin on a transmitter should be connected with Ground.

・Input odd or even data depending on the display position of the LCD module.

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10-3 Color Data Assignment

Table 10-3 shows the Color Data Assignment.

Table 10-3 Color Data Assignment

| Color | | | R Input data | | | | | | | | G Input data | | | | | | | | B Input data | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Odd | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| | Even | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Color | Black | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Green | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cyan | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Red | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Magenta | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Red | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Brighter | 253 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇩ | 254 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 255 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Brighter | 253 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇩ | 254 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 255 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Blue | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ⇧ | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | ⇧ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | ⇩ | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Brighter | 253 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | ⇩ | 254 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue | 255 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note.1) Definition of gray scale:Color (n)…"n" indicates gray scale level.
Larger number means brighter level.
Note.2) Data; 1:High, 0:Low

Note 3) Color data consist of 8 bit red, green and blue data of odd and even number pixel data. Total data number is 48 signals. This module is able to display 16,777,216 colors because each red, green and blue data is controlled independently.

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10-4 Input Signal Timing

Table 10-4 and Figure 10-1 shows the Input Signal Timing at LVDS transmitter.

Table 10-4 Timing Characteristics (Ta=0~45□ C, Vcc=12±0.5V)

| Item | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| DCLK signal (Clock) | Period | Tc | 11.765 | 12.345 | 20.000 | ns | |
| | Frequency | 1/Tc | 50.000 | 81.000 | 85.000 | MHz | |
| | Duty | Tch/Tc | 45 | 50 | 55 | % | |
| | High time | TclkH | 3.5 | — | — | ns | |
| | Low time | TclkL | 3.5 | — | — | ns | |
| DCLK-Data Timing | Setup time | Tset | 3 | — | — | ns | |
| | Hold time | Thold | 2 | — | — | ns | |
| ENAB signal | Horizontal Period | Th | 865*1 | 1080 | 1130*1 | DCLK | |
| | Hor. Period | Th | 13.0 | 13.3 | 14.65 | μs | |
| | Hor. Display period | Thd | 800 | 800 | 800 | DCLK | *2 |
| | Vertical Period | | | | | Th | |
| | Ver. Frequency | Tv | 1207*1 | 1250 | 1280*1 | Hz | |
| | | 1/Tv | 50 | 60 | 62 | Hz | |
| | | Tvd | 1200 | 1200 | 1200 | Hz | |
| | Ver. Display period | | | | | Th | |
| | Data-ENAB timing | Tdn | — | 0 | — | DCLK | *3 |

*1)・horizontal display position is specified by the rise of ENAB.
The data latched at falling edge of DCLK after rise of ENAB is displayed at the left edge of the display area.
・Vertical display position is specified by the rise of ENAB after low level continuation over 5500 DCLK.
The data latched at the rise of ENAB is displayed at the top line of the display area.

*2)・If the "High" level period of ENAB is less than 800 DCLK, black color is displayed at the rest of the display area.

*3)・If ENAB does not synchronize with the effective display data, the display position does not fit to the display area.

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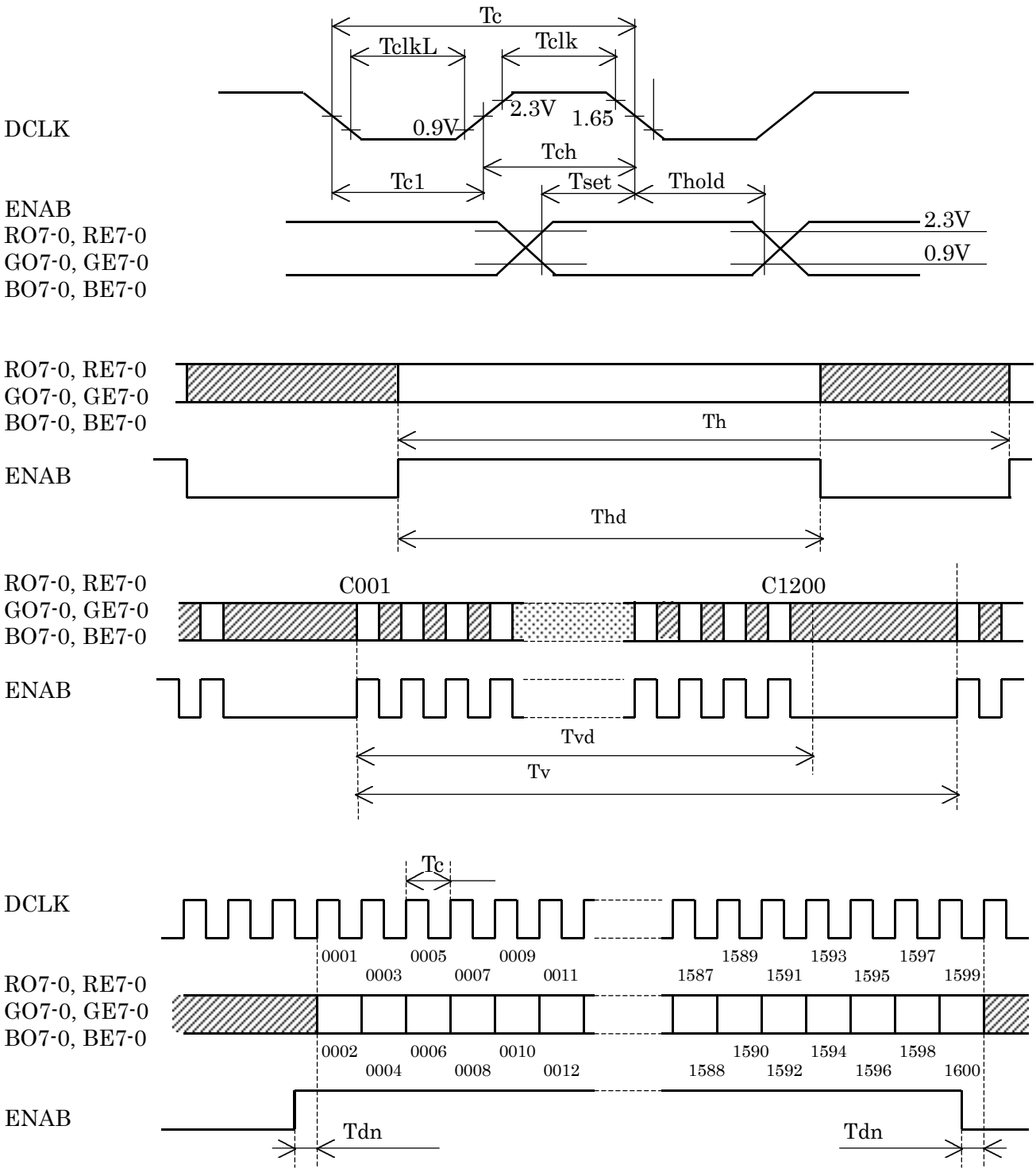


Figure 10-1 Input Signal Timing Chart

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## 10-4 Correspondence between Data and Display Position

Figure 10-2 shows the Correspondence between Data and Display Position.

| | S0001 | S0002 | S0003 | S0004 | S0005 | S0006 | S0007 | | S4799 | S4800 |
|---|---|---|---|---|---|---|---|---|---|---|
| C001 | RO 0001 | GO 0001 | BO 0001 | RE 0002 | GE 0002 | BE 0002 | RO 0003 | GO 0003 | GE 1600 | BE 1600 |
| C1200 | RO 0001 | GO 0001 | BO 0001 | RE 0002 | GE 0002 | BE 0002 | RO 0003 | GO 0003 | GE 1600 | BE 1600 |

Figure 10-2 Correspondence Data and Display Position

## 10-5 Power Supply Sequence

The sequence of input signals and On/Off of the power supply of this LCD module should be in the specification shown in Figure 10-3 to prevent latch-up of the driver ICs and DC driving of the LCD panel.

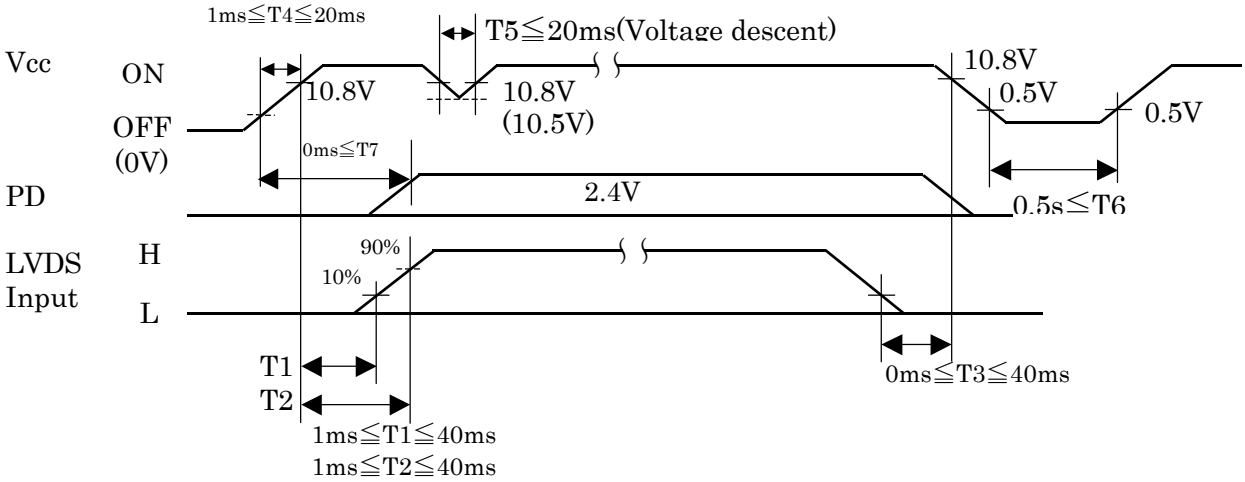


Figure 10-3 Power Supply Sequence(Logic)

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# 11. BACK-LIGHT SPECIFICATION

## 11-1 Pin configuration for Back-light

Table 11-1 shows the description and Pin assignment of the connectors (CN-A to D) for the Back-light of this LCD module.

Table 11-1 Pin Assignment of CN-A to CN-D

| № | Pin No. | Symbol | Function | Cable Color |
|---|---|---|---|---|
| CN-A | 1 | $V_{H1}$ | Power supply (High voltage) | Pink |
| | 2 | $V_{H2}$ | Power supply (High voltage) | Orange |
| | 3 | - | NC | |
| | 4 | $V_{L1}$ | Power supply (Low voltage) | Blue |
| | 5 | $V_{L2}$ | Power supply (Low voltage) | Gray |
| CN-B | 1 | $V_{H3}$ | Power supply (High voltage) | Red |
| | 2 | $V_{L3}$ | Power supply (Low voltage) | White |
| CN-C | 1 | $V_{H4}$ | Power supply (High voltage) | Pink |
| | 2 | $V_{H5}$ | Power supply (High voltage) | Orange |
| | 3 | - | NC | |
| | 4 | $V_{L4}$ | Power supply (Low voltage) | Blue |
| | 5 | $V_{L5}$ | Power supply (Low voltage) | Gray |
| CN-D | 1 | $V_{H6}$ | Power supply (High voltage) | Red |
| | 2 | $V_{L6}$ | Power supply (Low voltage) | White |

Connector : Housing(CN-A, CN-C):BHR-05VS-1
(CN-B, CN-D):BHSR-02VS-1
Contact : SBH-001T-P0.5
SBHS-002T-P0.5
User's Connector : Post with base: SM04(9-E2)B-BHS-1
SM02B-BHSS-1-TB

Supplier : Japan Solder less Terminal manufacturing Company LTD. (J.S.T.)

## 11-2 CCFL

Supplier: SANKEN ELECTRONICS Co.LTD. Part No.: SS26E4175E8550C2882710S

## 11-3 Life

The life of the back-light is a minimum of 50,000 hours at the following conditions.

(1) Working conditions
①Ambient temperature : 25±5℃
②Tube current ($I_L$) : (6mA or less)

(2) Definition of life

①Brightness becomes 50% or less than the minimum brightness value shown in Table 9-1.
②Flashing.

## 11-4 Lamp assembly set (for replacement)

Lamp assembly set (with charge) is prepared for replacing old lamp to new one.
This set consists of an upper lamp assembly and a lower lamp assembly.
Type number: FLCL-26

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# 12. APPEARANCE SPECIFICATIONS

## 12-1 Appearance

### 12-1-1 Appearance specification

| No. | Item | | Judgment method and standard | | |
|---|---|---|---|---|---|
| 1 | Bright spot (high and Low) | | ≦6 dots | | (Note 1 ) |
| 2 | Bright spot connection (high and low) | | ≦2 pair | | (Note 1) |
| 3 | Total of bright spot | | ≦6 dots | | |
| 4 | Dark spot | | ≦10 dots | | (Note 2) |
| 5 | Dark spot connection | | ≦4pairs | | (Note 2) |
| 6 | Total of dark spot | | ≦10 dots | | (Note 2) |
| 7 | Total of dot defect (bright and dark) | | ≦ 10 dots | | |
| 8 | Distance of bright spot | high-hgh | ≧15mm | | |
| | | others | ≧ 5mm | | |
| 9 | Distance of dark spot | | ≧ 5mm | | |
| 10 | Scratch on polarizer, line shape | | W≦0.03 | ———— | Ignore |
| | | | 0.03<W≦0.05 | L≦6 | Ignore |
| | | | | 6<L≦12 | ≦7 |
| | | | | 12<L | 0 |
| | | | 0.05<W≦0.10 | L≦0.6 | Ignore |
| | | | | 0.6<L≦5 | ≦5 |
| | | | | 5<L | 0 |
| | | | 0.10<W | ———— | 0 |
| 11 | Dent on polarizer, dot shape | | D≦0.3 | | Ignore |
| | | | 0.3<D≦0.4 | | ≦9 |
| | | | 0.4<D | | 0 |
| 12 | Bubble in polarizer | | D≦0.3 | | Ignore |
| | | | 0.3<D≦0.5 | | ≦4 |
| | | | 0.5<D | | 0 |
| 13 | Black white spot (Foreign circular matter) | | D≦0.15 | | Ignore |
| | | | 0.15<D≦0.5 | | ≦5 |
| | | | 0.5<D | | 0 |
| 14 | Light leakage by foreign articles | | D≦0.3 | | Ignore |
| | | | 0.3<D≦0.6 | | ≦5 |
| | | | 0.6<D | | 0 |
| 15 | Lints, black/white line | | W≦0.03 | ———— | Ignore |
| | | | 0.03<W≦0.05 | L≦6 | Ignore |
| | | | | 6<L≦12 | ≦6 |
| | | | | 12<L | 0 |
| | | | 0.05<W≦0.10 | L≦0.6 | Ignore |
| | | | | 0.6<L≦5 | ≦3 |
| | | | | 5<L | 0 |
| | | | 0.10<W | (W+L)/2=D | Conform to No.13 |

D:Average diameter [mm], W:Width [mm], L:Length [mm], S=(bright spot size)/(dot size)

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12-1-2 Light leakage outside the active area.

The light leakage that occurs minimum of 2.0mm outside the peripheral of the active area is overlooked.

A leakage of light may occur between the BM section and the bezel at the peripheral of the active area.

12-2 Dot defects (Bright spots, Dark spots)

12-2-1 Zone

- Inside display dot area (408.0 X 306.0mm)
- Display dot area means active area.
- One pixel consists of 3 dots (red, green and blue).
- Foreign particle and scratch unharmful to display image, such as the foreign particle under polarizer film but outside of the display area and scratch on metal bezel, backlight module or polarizer film out of the display area, etc., are not counted.

12-2-2 Bright spots

(1) Bright spots by the defect of TFT.
- Visible under bias of 2% ND filter ..... High bright spot R・G
- Visible under 5% but invisible under 2% ND filter..... Low bright spot R・G・B
- Invisible under bias of 5% ND filter..... Not counted

(2) Bright spots by the light passing through tears, breaks, etc in color filter.
- Exceed size of a half dot ..... High bright spot
- A half dot or less..... Not counted

(3) Bright spots by the light passing through tears, breaks, etc in chromium mask.
- Exceed 50μm ..... High bright spot
- 50μm or less ..... Not counted

12-2-3 Test condition

- Inspector must observe the LCD screen from the normal direction under the illumination by a single 20W fluorescent lamp. The distance between the LCD screen and the inspector should be a height of 50cm above the worktable.
  The vertical illuminance is 300 to 600lux (reference value).
- Bright spot should be counted under entire black screen.
- Dark spot should be counted under entire white screen.
- Input signal timing should be typical value.

(Note1) Please do not mistake a single bright spot for a bright spot connection due to Cs(supplemental capacitance) line at the center of each dot.

(Note2) If a pixel is dark partially, it connects into the number of dark spots in accordance with following rule.
- (a) A<1/3 : Not count. Only one of 4 dark connection is allowed.
- (b) 1/3≦A<2/3 : Considered as 0.5 dot.
- (c) 2/3≦A : Considered as 1 dot.

(A=Dark spot size/dot size)

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## 13. ENVIRONMENTAL SPECIFICATIONS

Table 13-1 show the environmental specifications.

Table 13-1 Environmental specifications

| Item | Condition | | Remark |
|---|---|---|---|
| Temperature | Operation | 0~45ºC | Temperature on surface of LCD panel (display area.) |
| | Storage | –20~60ºC | |
| Humidity | Operation | 20~85%RH | Maximum wet-bulb temperature should not exceed 29ºC. No condensation. |
| | Storage | 5~85%RH | |
| Vibration | Non-operation | 10~500Hz, 1octave/20minute, 2G, 1.5mm max, 1hour each X, Y and Z directions | For single module without package. |
| Shock | Non-operation | 30G, 6ms, 1time each ±X, ±Y and ±Z directions. | |

NOTE： Table 13-2 and Figure 13-1 show the shock resistance standard when module is packaged.

Table 13-2 Shock resistance standard when module is packaged

| Dropping location | Dropping height | Count |
|---|---|---|
| A~J | 60cm | 1 time |

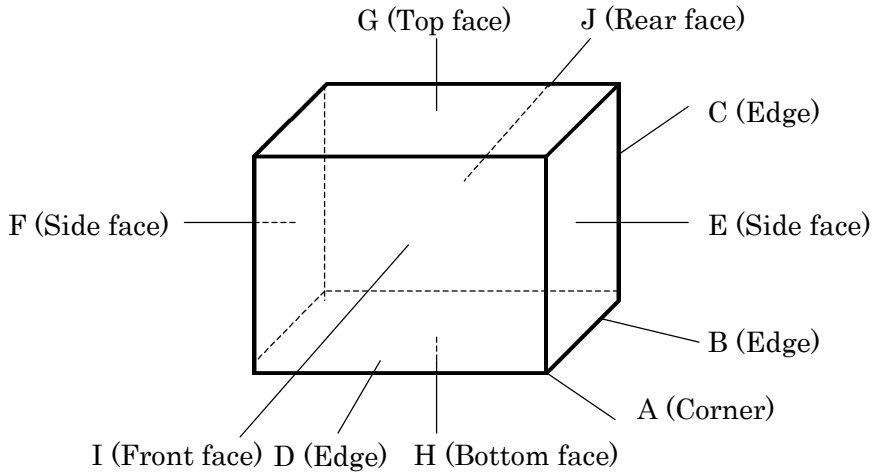


Figure 13-1 Direction to apply shock to package

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## 14. INDICATIONS

This module has the following indications.

(1) Product name : LCD **unit**. (See Figure 14-2)

(2) Model Number : FLC51UXC8V-10 (See Figure 14-2)

(3) Product Drawing Number : NA19025-C451 (See Figure 14-2)

(4) Manufacturing Number : 3 9 0 0 0 0 1

- Serial number (To be reset every month on 1st.)
- Manufacturing month (Oct. = X, Nov. =Y, Dec. =Z)
- Last digit of manufacturing year.

(5) Version number : 01A (Example)
-1st 2 digits "01" means operational version.
-3rd alphabet means functional version.

(6) Manufacturer Country Name : MADE IN JAPAN

(7) Company Name : FUJITSU DISPLAY TECHNOLOGIES CORPORATION

(8) Disposal method of cold-cathode tubes. (See Figure 14-1)

(9) Caution when changing cold-cathode tubes. (See Figure 14-1)

・WHEN CHANGING COLD CATHODE FLUORESCENT LAMPS, FOLLOW OPERATING SPECIFICATIONS. ESPECIALLY BE CAREFUL ABOUT THE LAMP'S SIDE-EDGE.
・蛍光管の交換は作業仕様書に従って行って下さい。特に蛍光管ホルダ側面のエッジに気をつけて下さい。

・THIS TFT COLOR LCD CONTAINS COLD CATHODE FLUORESCENT LAMPS. PLEASE FOLLOW LOCAL ORDINANCES OR REGULATIONS FOR ITS DISPOSAL.
・当該液晶ディスプレイユニットには蛍光管が組み込まれていますので、地方自治体の条例または規則に従って廃棄して下さい。

Figure 14-1

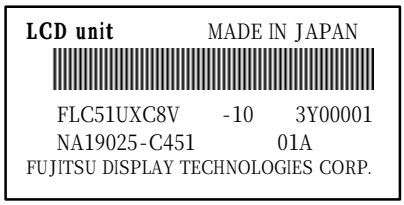


Figure 14-2

## 15. PACKAGING

15-1 Packing specifications

(1) 4LCD modules/1package.
(2) Weight: approximately 17kg/1package.
(3) Outline dimensions: 576mm(W)x316mm(D)x508mm(H)

15-2 Packing method

Figure 15-1,2 shows the packing method.

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DRAW. NO.: Tech Bes LCD-00195
CUST.:
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SHEET 22

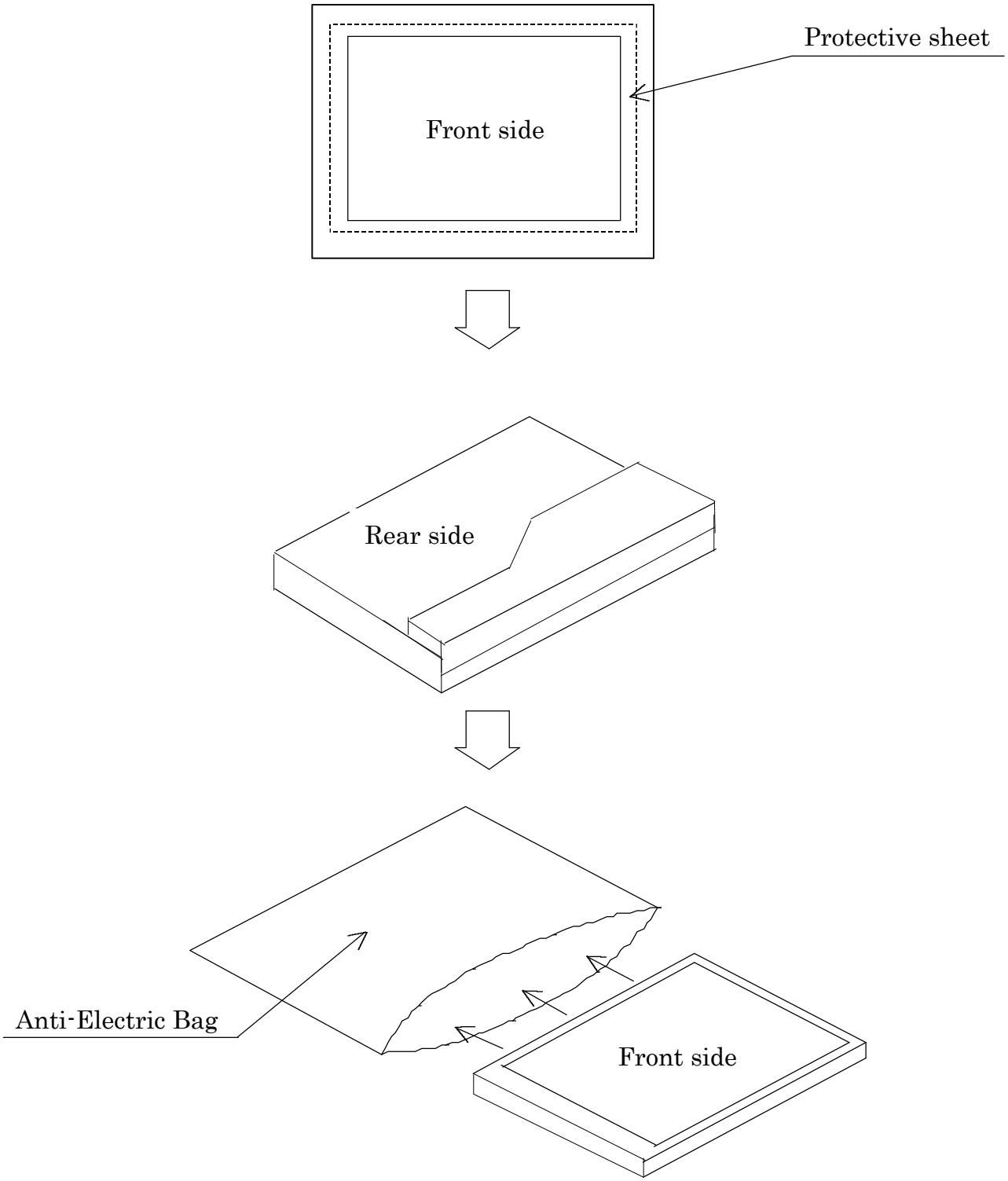


Fig.15-2 (a)　Packaging Method

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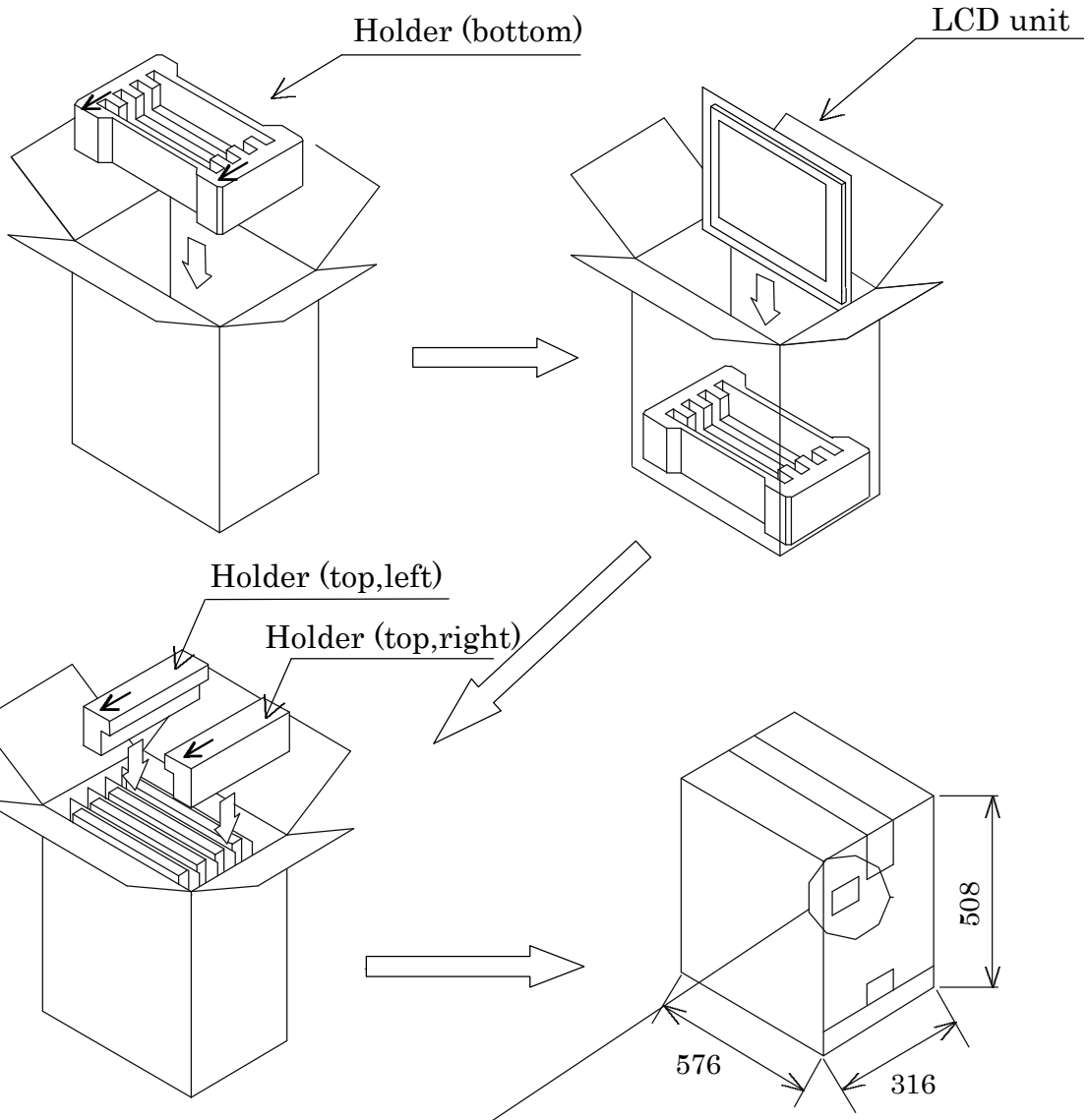


Label (example)

| | | | |
|---|---|---|---|
| 型 格 (TYPE) | FLC51UXC8V-10 | 数 量 (QTY.) | 4 |
| 図 番 (DRWG. NO.) | NA19025-C451 | 版 数 (REV. NO.) | 01A |
| Bar code | 2900001 | Bar code | |
| | 2900002 | | |
| | 2900003 | | |
| | 2900004 | | |
| | Bar code | | |

MADE IN JAPAN

- Taping
  Top : H or I method
  Bottom : H method
- Top and bottom holders should be anti-electrostatic type.

Fig.15-2 (b) Packaging Method

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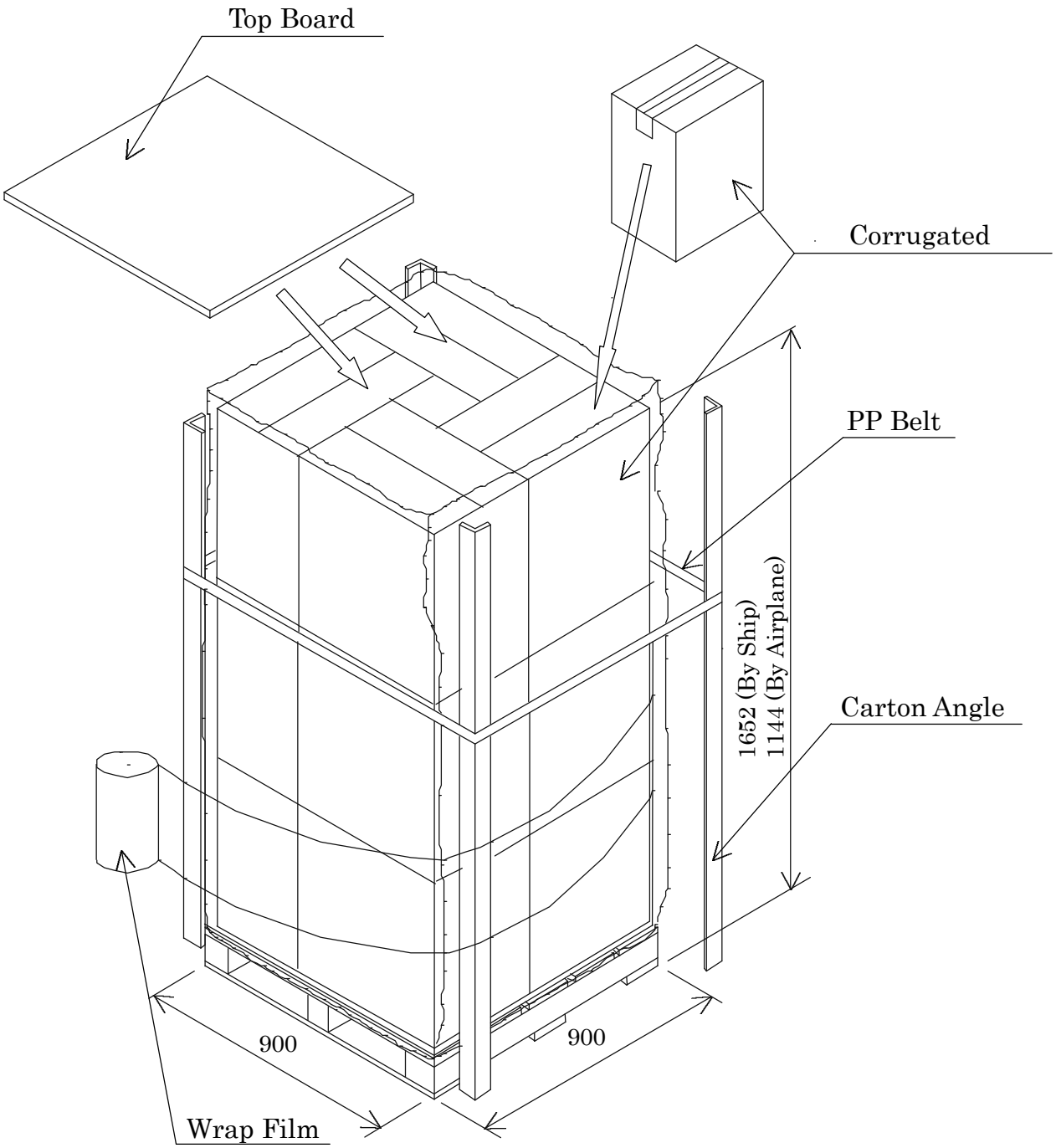


Up and Down : 3 times wrap
Middle : 2 times wrap

Note:1) 4 boxes×3 layers (maximum 12 boxes) : by ship
4 boxes×2 layers (maximum 8 boxes) : by airplane
Note:2) This drawing shows marine transportation specification.

Fig.15-2 (c) Packaging Method

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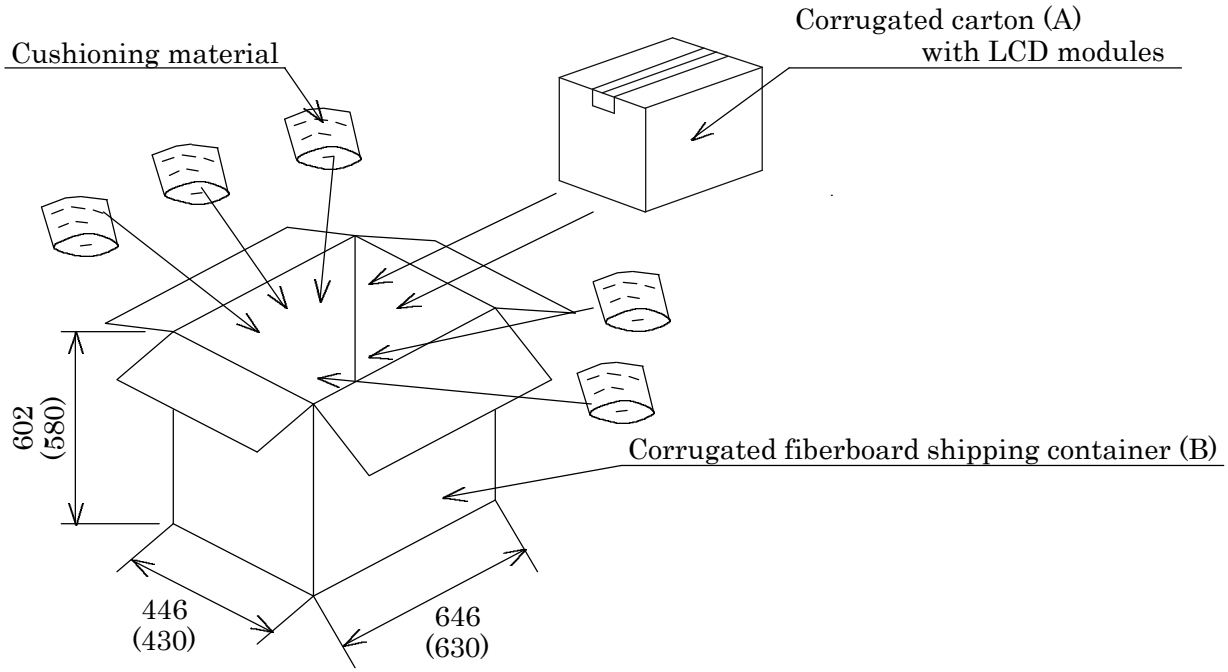


Note 1) The carton (A) should be placed in the middle of the container (B) with enough cushioning materials.

Note2) The figures in ( ) show inside measurements of the container (B).

Figure.15-2 (d) Packing method

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## 16.WARRANTY

The warranty period is one year after shipping. Products which fail during this period are repaired or replaced without charge, unless the failure is caused by user.

## 17.PRECAUTIONS

Adhere to the following precautions to use this LCD module properly.

(1) Handling of LCD panel

① Do not apply any strong mechanical shock to the LCD panel.
Since the LCD panel is made of glass, excessive shock may damage the panel or cause a malfunction.

② Do not press hard on the LCD panel surface.

In the LCD panel, the gap between two glass plates is kept perfectly even to maintain display properties and reliability. The hard pressure on the LCD panel may cause the following problems.

① Ununiformity of color
② Disorder of orientation of liquid crystal

Problem ① returns to normal condition after a while. Problem ② returns to normal condition by turning the power off and turning on again.
However these operations should be avoided to insure reliability.

③ Do not scratch the polarizer film on the LCD panel surface.

•Do not press or rub the display surface with a hard tool, tweezers, etc.

•For handling, use cotton or conductive gloves so that the display surface is not soiled.

•If dust or dirt soils the display surface, clean it as follows with a soft cloth (deerskin, etc.)

[Dust] Wipe off with a soft cloth. (do not rub.)

[Dirt ] Apply clear water to a soft cloth and squeeze hard out of water drops, then lightly wipe off the specified parts. Only if the dirt is hardly wiped off, use isopropyl alcohol or ethanol.

Be careful not to splash the water or the solvents on the edge of polarizer and in the LCD unit.

The polarizer possibly exfoliates due to the solvent and water penetrated between the polarizer and the LCD panel.

Do not use unspecified solvent such as ketone (acetone, etc.) and aromatics (xylene, toluene, etc.)

(Caution) Be careful not to allow the water or solvent to enter the module.

•If saliva or water drops are left for a long period of time, the part may become deformed or discolored.

Wipe off immediately in the same way as for dirt.

•Do not allow oil to adhere to the module since excessive oil is hard to clean.

④ Do not place or contact objects on the display surface for a long period of time.
This may make some parts of the LCD module distorted and the quality of display may deteriorate.

(2) Handling of LCD module

① Do not pull the cold-cathode tube cable strongly.
If the cable is pulled with the strength of 2kg or more, the cable may be damaged or may lose reliability.

② Assemble the module into user's system in a dust free environment.
Conductive foreign matter adheres to the module may cause failures.

③ Take anti-electrostatic measures for assembling the module.

Since the LCD module contains CMOS-ICs, the following points should be observed.

- For assembling the module, operator should be grounded and wear cotton or conductive gloves.
- Floor of work area and work table to assemble the LCD module should be covered with electrostatic shielding in order to discharge static electricity via an earth wire.
- If necessary, ground operation tools (soldering iron, radio pliers, tweezers, etc.).
- Do not take the module out of the conductive bag until the module is assembled.
- Do not assemble the module under low humidity (50%RH or less).

④ Do not pull the connecting cable on the rear face of the LCD module strongly.

⑤ Do not disassemble or remodel the LCD module.
Disassembly or remodeling of the LCD module may result in malfunctions or deterioration of the display quality and reliability.

(3) Precautions in regards of operating the LCD module

① Adhere to the specified power supply sequence.
If not followed, the CMOS-IC may cause a latch-up, or DC voltage may be applied to the liquid crystal, which cause a failure or serious deterioration in display quality.

② Do not operate the LCD module when condensation occurs.
If the LCD module is operated when condensation is on the terminals of the LCD panel, the terminals cause electrochemical reaction, and may reach disconnection. Condensation easily occurs especially when the module is moved from cold environment to warm environment.

③ The following troubles occur when the LCD module is not used under recommended temperature.

•Operation under high temperature(>50℃): Display colors shift to blue.

•Storage under high temperature(>60℃): The polarizer film deteriorates and contrast decreases.

•Operation under low temperature(< 0℃): The response speed decreases considerably.

•Storage under low temperature(<-20℃): The liquid crystal may solidify and become damaged.

④ Be sure to input the control signals at the correct timing.
If control signals (DCLK, ENAB) are not input, or if the timing is out of the specified timing, DC voltage may be applied to the liquid crystal and, as a result, cause image sticking or deterioration of contrast.

(4) Precautions in regards of designing module mounting

① Excessive force should not be applied to the screen or the rear side of the LCD module.
Excessive pressure on the screen caused by the installation of the LCD module may deteriorate display quality and reliability.
Brightness uniformity and the reliability of CCFL may decrease if the pressure is applied to the backlight module.

② Avoid twisting and bending the LCD module.
Excessive twist and bend may damage display quality and reliability.

③ Avoid extending the power cable between the LCD module and inverter.
This may cause the backlight to flicker or not to light.

④ Keep the backlight cable apart fromthe metal enclosure of the LCD module.
When frequency current for backlight driving leak to the metal enclosure, the desired brightness may not be assured.

⑤ When Mounting LCD module with M3 screws (x4), tighten the screws with torque below 29.4Nm(3kgf).

(5) Storage method

① Do not store the LCD module in an atmosphere of organic solvent or corrosive gas.
In an organic solvent atmosphere, the polarizer film discolors and display quality deteriorates.
In a corrosive gas environment, various parts of the module may corrode or deteriorate.

② Store the LCD module in a Fujitsu package.
At storing, Fujitsu packages can be stacked up to 3 boxes.
The LCD module is in an anti-static bag. Keep the module in that status.

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③ The LCD module is recommended to be stored in humidity controlled, cool and dark locations.

Recommended storage environment

- Place : Dark (avoid direct sunlight)
- Temperature : 10～35℃
- Humidity : 50～60%RH

Note) If the module is left in an environment of 60℃ and above for a long period of time, optical characteristics may deteriorate.

(6) Disposal Method

① LCD module

The components of this LCD module can be grouped into metal, resin, glass and so on. As the backlight contains CCFL which includes mercury, it must be disposed according to the local ordinance or regulations.

② Package

All the packages are made of recyclable papers except the anti-ESD bag.

(7) Others

① If the LCD panel is damaged, do not inhale and do not swallow the liquid crystal. If the liquid crystal adhere to the body or cloths, wash it off with soap immediately. Follow regular precautions for electronic components.

② Flux residue on the printed circuit board is harmless to the quality and reliability of LCD module.

Fujitsu has adopted non-wash technology on module assembly process.

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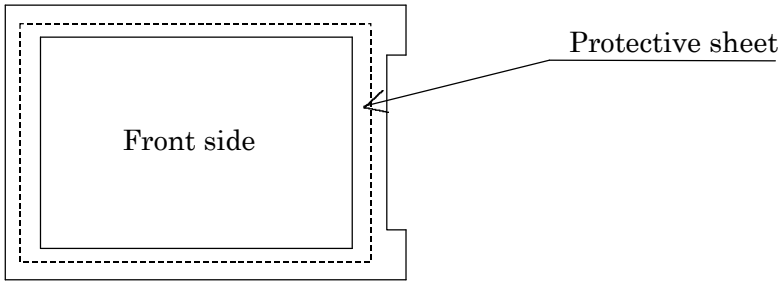
(8) Return method of the LCD unit requested for repair oranalysis of the problem

・When the LCD unit is packaged and returned, adhere to the following procedures not to damage the LCD panel or the backlight cables. (Fig. 18-1(a)~(b))
When the LCD unit is returned without following the specified packaging procedures, FDTC will not take responsibility for the damages caused by the failure of the packaging method.

①Attach protective sheet.




②Put the LCD unit into the anti-electric bag

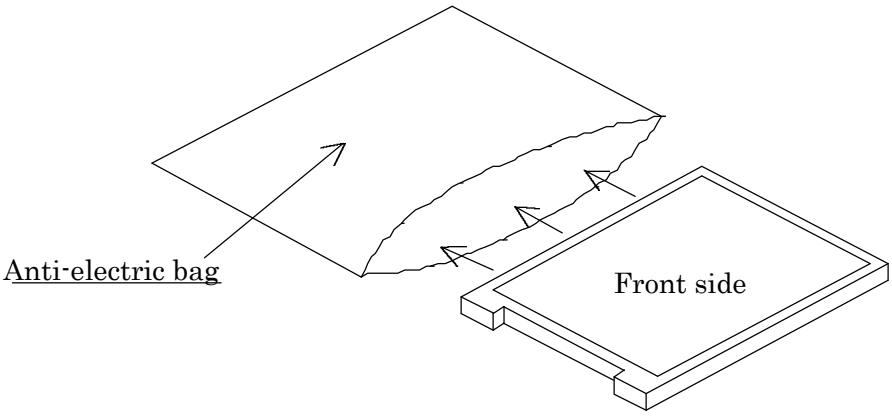



Fig. 17-1(a) Packaging method

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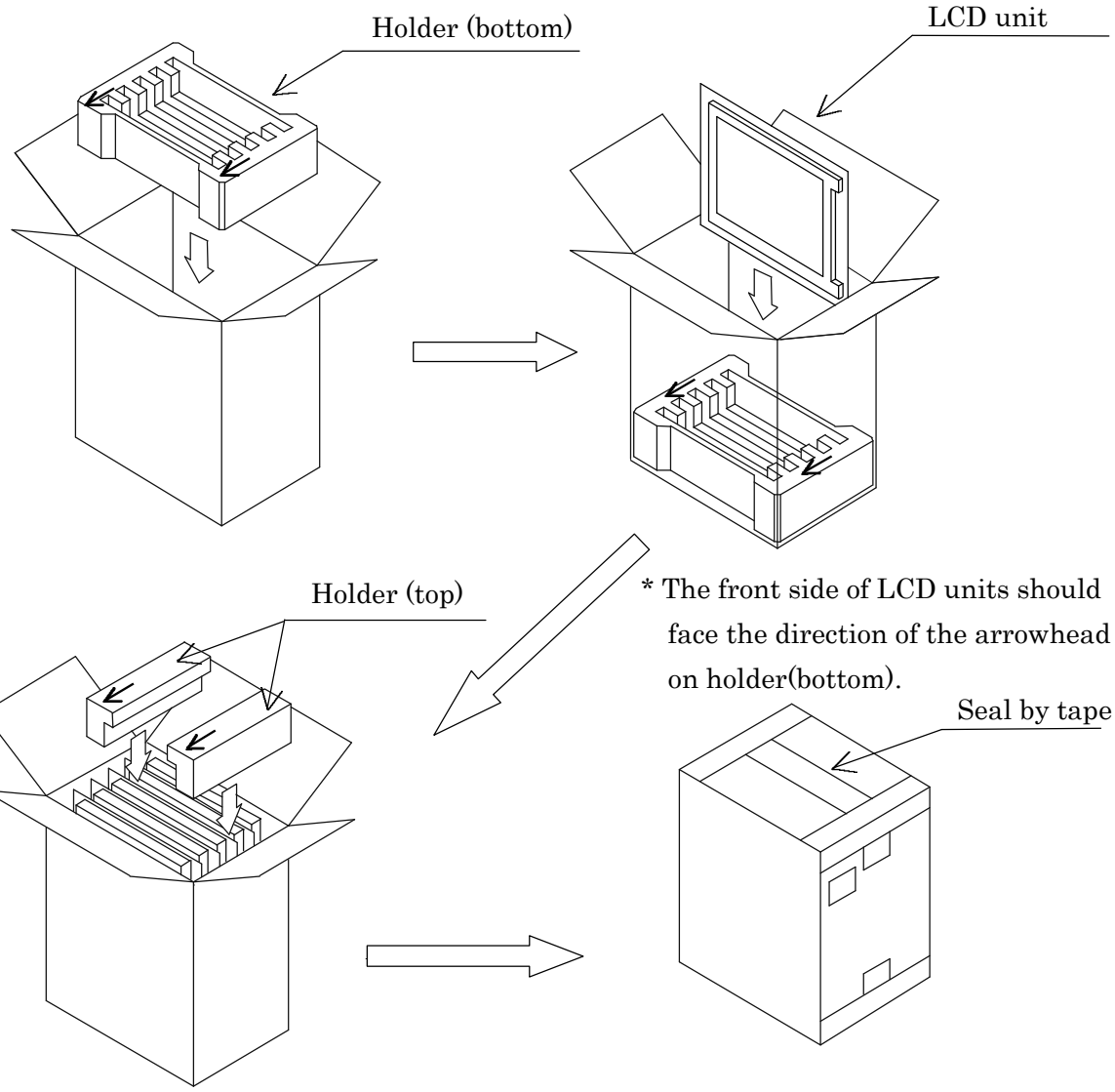
③ Storage into the container box

・When using the container box manufactured by FDTC




* The front side of LCD units should face the direction of the arrowhead on holder(bottom).

* The direction of the arrowhead on holder (top) should face the front side of the LCD units.

**The arrowheads are shown on the holders.**

Fig. 17-1(b) Packaging method

・When not using the container box manufactured by FDTC

Please pack the LCD units one by one and make sure not to damage the LCD unit when transporting.

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## 18.OTHERS

Specifications of the TFT-LCD panel and other components used in this LCD module are subject to change.

Both parties shall discuss together and make the best effort to reach agreement in case of the rising of any doubt to the contents of the specifications.

This LCD module is not designed for the purpose where high reliability is required, such as for aero-space equipment, control system of nuclear power and medical life-support equipment.

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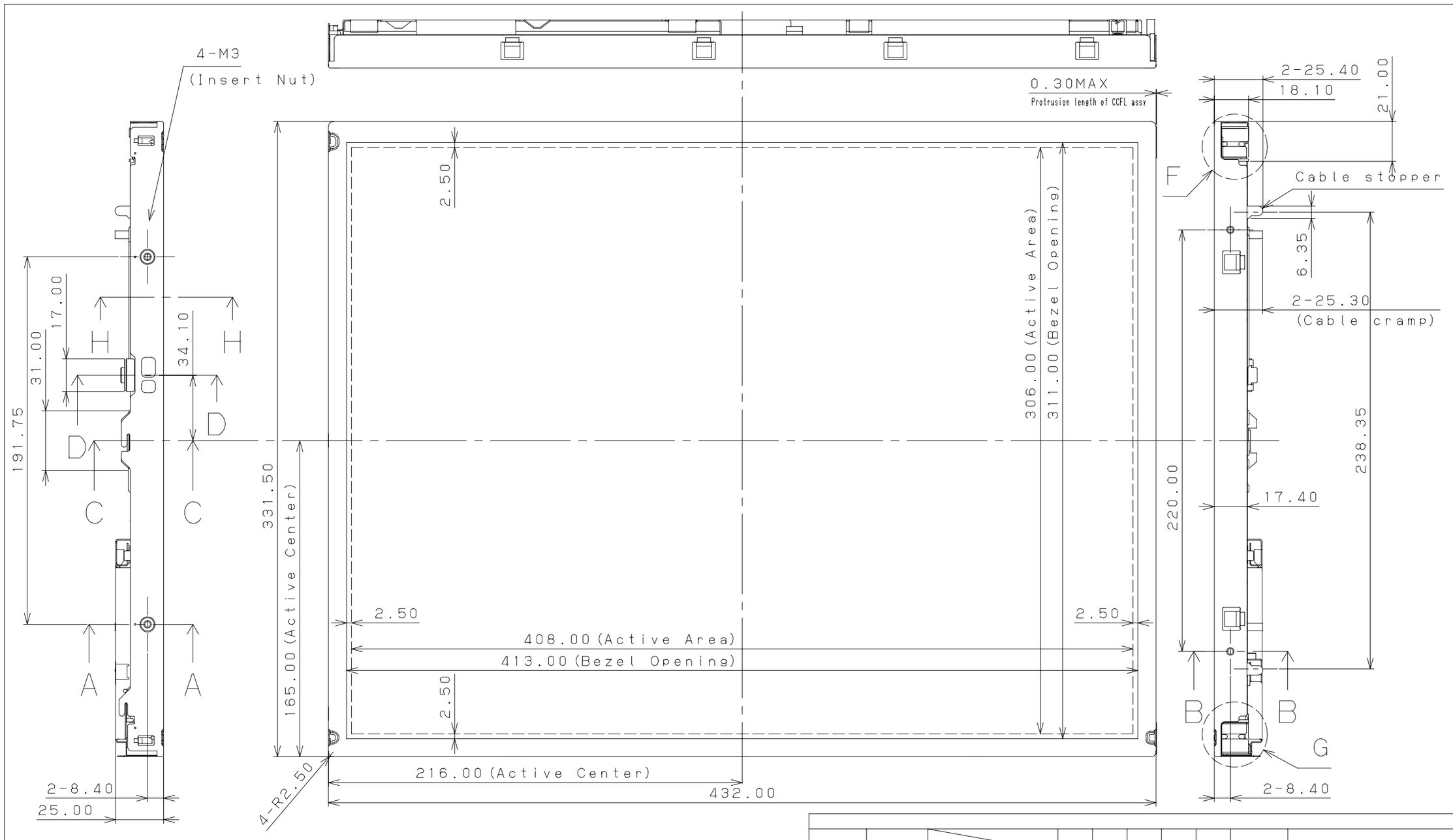


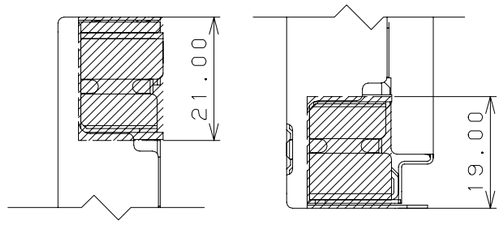


Protrusion area CCFL assy

Detail F, G

NOTE

1) Unspecifild tolerrance to be ±0.5.

| | | | | | | | | | | | |
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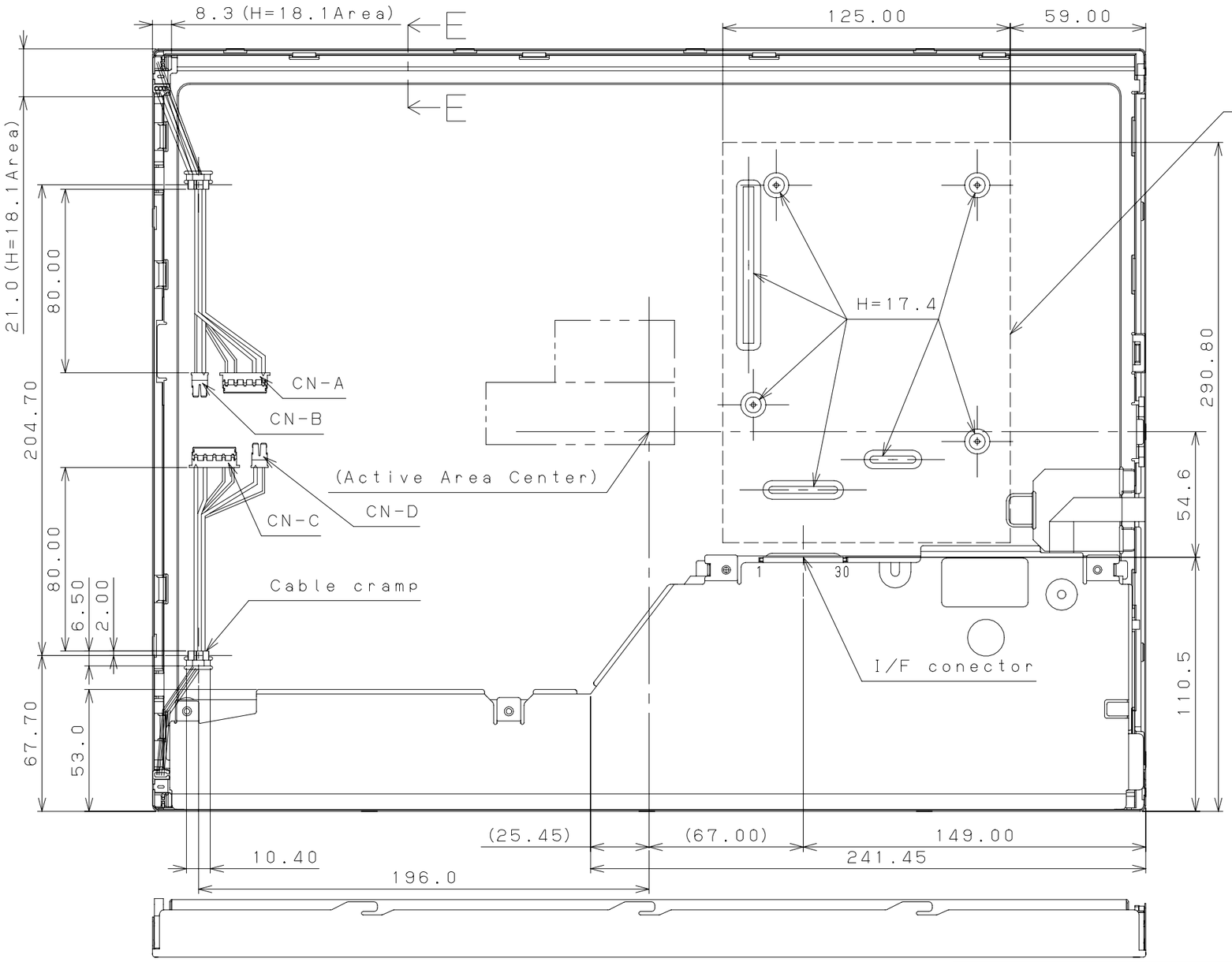
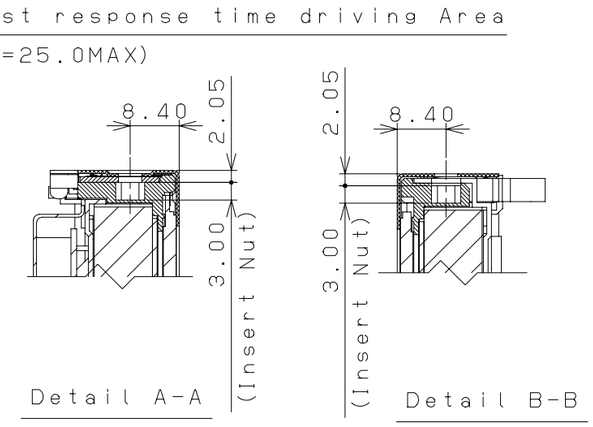
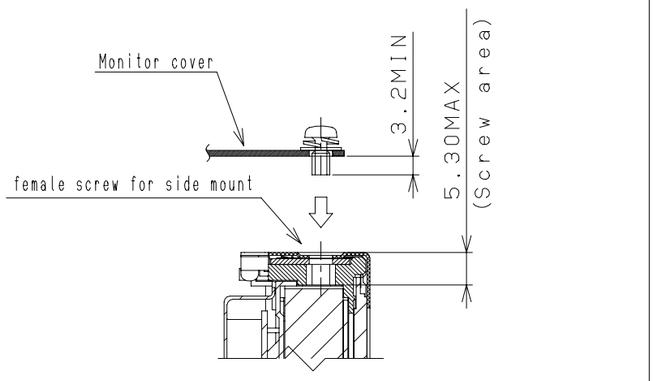
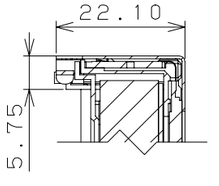


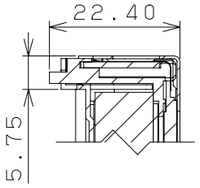




Note 1) Fixing screw of LCD module must have screw part length of more than 3.2mm with unfixing condition. Otherwise fixing screw may not be fixed screwed.
2) The maximum length of the screw insertion to the side of the LCD module is 5.3mm.
If the length of the screw is more than 5.3mm, then the screw may damage the light guide plate which can cause abnormality of display.

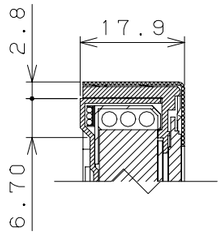
Fig . Notice for side mount fixing screw



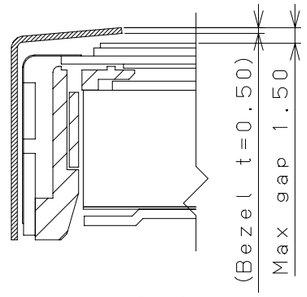

Detail C-C




Detail D-D




Detail E-E




Between Surface of Polarizer and Surface of Bezel

Detail H-H

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