# CUSTOMER'S ACCEPTANCE SPECIFICATIONS

**LMG7400PLFC**

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Accepted by: ___________________  Proposed by: [Signature]

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Sh. No. 3284PS 2701-LMG7400PLFC-5
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<tr>
<td>'93.10.08</td>
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<td>MODIFY:</td>
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<tr>
<td></td>
<td>LMG7400PLFC-3</td>
<td>BRIGHTNES (80.0)  (80.0)</td>
</tr>
<tr>
<td></td>
<td>PAGE 6-2/2</td>
<td>MIN TYP</td>
</tr>
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<td></td>
<td></td>
<td>BRIGHTNES 70.0  90.0</td>
</tr>
<tr>
<td>'93.12.25</td>
<td>3284PS 2709-</td>
<td>MODIFY:</td>
</tr>
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<td></td>
<td>LMG7400PLFC-3</td>
<td>BEZEL OPENING SIZE</td>
</tr>
<tr>
<td></td>
<td>PAGE 5-1/2</td>
<td>「(127)×(72)」 → 「124×70」</td>
</tr>
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| '93.12.25 | 3284PS 2705-                       | CHANGE: I DD & I EE TYP MAX                   |
|          | PAGE 5-1/2                      | I EE: 4.0mA → 2.5mA 4.0mA                   |
|          | LMG7400PLFC-4                  | I DD: 6.0mA → 9.7mA 12.0mA                  |
|          | 3284PS 2706-                       | CHANGE: CONTRAST RATIO K: 18 → 20           |
|          | LMG7400PLFC-4                  | DEL: RESPONSE MAX.                           |
|          | PAGE 6-1/2                      |                                               |
### Record of Revision

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<td>CHANGE:</td>
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<td>LMG7420PLFC-5</td>
<td>ITEM</td>
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<tr>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>MAX.</td>
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<td>AMBIENT TEMPERATURE</td>
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<td>MIN.</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td>MAX.</td>
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<tr>
<td></td>
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<td>CONDITION</td>
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<tr>
<td></td>
<td>VDD - VO</td>
<td>Ta=40°C, φ=10°</td>
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<th>Sheet No.</th>
<th>Summary</th>
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<td></td>
<td>CONDITION</td>
</tr>
<tr>
<td></td>
<td>VDD - VO</td>
<td>Ta=50°C, φ=10°</td>
</tr>
<tr>
<td>Date</td>
<td>Sheet No.</td>
<td>Summary</td>
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<td>---------</td>
<td>-----------------</td>
<td>------------------------------------------------------------------------</td>
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<tr>
<td>'93.08.06</td>
<td>3284PS 2709-LMG7400PLFC-2</td>
<td>MODIFY: 5.6±0.5 → 6.3±0.5</td>
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<tr>
<td></td>
<td>PAGE 9-1/3</td>
<td>MODIFY: FRAME SIZE 「142.4×82.6」 → 「142.4×82.0」</td>
</tr>
<tr>
<td>3284PS 2709-LMG7400PLFC-2</td>
<td>MODIFY: CN1</td>
<td>A18~20 NC NO CONNECTION</td>
</tr>
<tr>
<td>PAGE 9-3/3</td>
<td></td>
<td>A1B D·OFF NC/DIPLAY GND/DISPLAY OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A19~20 NC NO CONNECTION</td>
</tr>
</tbody>
</table>
3. MECHANICAL DATA

(1) PART NAME \hspace{1cm} LMG7400PLFC
(2) MODULE SIZE \hspace{1cm} 159.4 (W)mm \times 101.0 (H)mm \times 11.0 (D)mm max.
(3) DOT SIZE \hspace{1cm} 0.47 (W)mm \times 0.47 (H)mm
(4) DOT PITCH \hspace{1cm} 0.50 (W)mm \times 0.50 (H)mm
(5) NUMBER OF DOTS \hspace{1cm} 240 (W) \times 128 (H)Dots
(6) DUTY \hspace{1cm} 1/128
(7) LCD \hspace{1cm} FILM TYPE BLACK/WHITE (NEGATIVE TYPE)
\hspace{1cm} THE UPPER POLARIZER IS ANTI-GLARE TYPE. (HARDNESS 3H)
\hspace{1cm} THE BOTTOM POLARIZER IS TRANSMISSIVE TYPE.
(8) VIEWING DIRECTION \hspace{1cm} 6 O’CLOCK
(9) BACK LIGHT \hspace{1cm} COLD CATHODE FLUORESCENT LAMP
4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS. VSS=OV:STANDARD

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER SUPPLY FOR LOGIC</td>
<td>VDD-VSS</td>
<td>0</td>
<td>6.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>POWER SUPPLY FOR LC DRIVE</td>
<td>VDD-VEE</td>
<td>0</td>
<td>20.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>INPUT VOLTAGE</td>
<td>Vi</td>
<td>-0.3</td>
<td>VDD+0.3</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>INPUT CURRENT</td>
<td>Ii</td>
<td>0</td>
<td>1</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>STATIC ELECTRICITY</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>NOTE 2</td>
</tr>
</tbody>
</table>

NOTE 1 MAKE CERTAINS YOU ARE GROUNDED WHEN HANDLING LCM

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>OPERATING</th>
<th>STORAGE</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN.</td>
<td>MAX.</td>
<td>MIN.</td>
</tr>
<tr>
<td>AMBIENT TEMPERATURE</td>
<td>0°C</td>
<td>50°C</td>
<td>-20°C</td>
</tr>
<tr>
<td>HUMIDITY</td>
<td>NOTE 1</td>
<td></td>
<td>NOTE 1</td>
</tr>
<tr>
<td>VIBRATION</td>
<td></td>
<td></td>
<td>4.9 m/s²</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.5G)</td>
</tr>
<tr>
<td>SHOCK</td>
<td></td>
<td></td>
<td>29.4 m/s²</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(3 G)</td>
</tr>
<tr>
<td>CORROSIVE GAS</td>
<td>NOT ACCEPTABLE</td>
<td>NOT ACCEPTABLE</td>
<td></td>
</tr>
</tbody>
</table>

NOTE 1 Ta ≤ 40°C: 85%RH max.
Ta > 40°C: ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 85%RH AT 40°C

NOTE 2 Ta AT -20°C ------<48HRS, AT 60°C ------<168HRS

NOTE 3 BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE. THIS PHENOMENON IS REVERSIBLE.
HIGHER SEATING VOLTAGE OF CFL AND HIGHER LCD DRIVING VOLTAGE ARE NEEDED WHILE OPERATING AT 0°C.
The life time of CFL will be reduced while operating at 0°C, need to make sure of value of Ii and characteristics of inverter.
Also the response time at 0°C will be slower.

NOTE 4 5Hz ~ 100Hz (EXCEPT RESONANCE FREQUENCY)
NOTE 5 THIS MODULE SHOULD BE OPERATED NORMALLY AFTER FINISH THE TEST.
### 5.1 Electrical Characteristics of LCM

<table>
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<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
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<td>Power Supply Voltage for Logic</td>
<td>VDD-VSS</td>
<td>-</td>
<td>4.75</td>
<td>5.0</td>
<td>5.25</td>
<td>V</td>
</tr>
<tr>
<td>LC Driver Circuit Power Supply Voltage</td>
<td>VEE-VSS</td>
<td>-</td>
<td>-15.5</td>
<td>-15.0</td>
<td>-14.5</td>
<td>V</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>VI</td>
<td>H Level</td>
<td>0.8VDD</td>
<td>-</td>
<td>VDD</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L Level</td>
<td>0</td>
<td>-</td>
<td>0.2VDD</td>
<td>V</td>
</tr>
<tr>
<td>Power Supply Current for Logic</td>
<td>IDD</td>
<td>VDD-VSS=5.0V</td>
<td>-</td>
<td>9.7</td>
<td>12.0</td>
<td>mA</td>
</tr>
<tr>
<td>Power Supply Current for LCD Driving Voltage</td>
<td>IEE</td>
<td>VDD-VSS=5.0V</td>
<td>-</td>
<td>2.5</td>
<td>4.0</td>
<td>mA</td>
</tr>
<tr>
<td>Recommended</td>
<td></td>
<td>Ta=0°C, φ=0°</td>
<td>-</td>
<td>16.9</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>LC Driving Voltage</td>
<td>VDD-V0</td>
<td>Ta=25°C, φ=0°</td>
<td>-</td>
<td>15.8</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Note 2</td>
<td></td>
<td>Ta=50°C, φ=0°</td>
<td>-</td>
<td>15.2</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Frame Frequency Note 2</td>
<td>FFRAME</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>75</td>
<td>Hz</td>
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</table>

**Note 1**
- FFRAME=75Hz, VDD-V0 =15.8 V, Ta=25°C

**Note 2**
- Recommended LC Driving Voltage fluctuate about ±1.0V by each module.
- Test pattern is all "0".

**Note 3**
- Need to make sure of flickering and rippling of display when setting the frame frequency in your set.
### 5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

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<thead>
<tr>
<th>ITEM</th>
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<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
<th>NOTE</th>
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<tr>
<td>LAMP VOLTAGE</td>
<td>VL</td>
<td>-</td>
<td>360</td>
<td>-</td>
<td>V</td>
<td>Ta=25°C</td>
</tr>
<tr>
<td>FREQUENCY</td>
<td>fL</td>
<td>30</td>
<td>70</td>
<td>85</td>
<td>KHz</td>
<td>Ta=25°C</td>
</tr>
<tr>
<td>LAMP CURRENT</td>
<td>IL</td>
<td>2.5</td>
<td>5</td>
<td>5.5</td>
<td>mA</td>
<td>Ta=25°C</td>
</tr>
<tr>
<td>STARTING DISCHARGE VOLTAGE</td>
<td>VS</td>
<td>(1000)</td>
<td>-</td>
<td>-</td>
<td>V</td>
<td>Ta=25°C</td>
</tr>
</tbody>
</table>

**NOTE 1** PLEASE CERTAINLY INFORM HITACHI BEFORE DESIGNING LAMP DRIVE CIRCUIT ACCORDING TO THE ABOVE SPECIFICATIONS.

**NOTE 2** STARTING DISCHARGE VOLTAGE IS INCREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE.

**NOTE 3** AVERAGE LIFE TIME OF CFL WILL BE DECREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE.
### 6. OPTICAL CHARACTERISTICS

#### 6.1 OPTICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>ITEM</th>
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<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
<th>NOTE</th>
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<tr>
<td>Viewing Area</td>
<td>φ 2−φ 1</td>
<td>K ≥ 2.0</td>
<td>30</td>
<td>40</td>
<td>-</td>
<td>deg</td>
<td>1.2</td>
</tr>
<tr>
<td>Contrast Ratio</td>
<td>k</td>
<td>φ =10° θ =0°</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Responses Time (Rise)</td>
<td>tr</td>
<td>φ =10° θ =0°</td>
<td>(160)</td>
<td>-</td>
<td>-</td>
<td>ms</td>
<td>4</td>
</tr>
<tr>
<td>Responses Time (Fall)</td>
<td>tf</td>
<td>φ =10° θ =0°</td>
<td>(110)</td>
<td>-</td>
<td>-</td>
<td>ms</td>
<td>4</td>
</tr>
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</table>

(MEASURE CONDITION BY HITACHI)

**NOTE 1. Definition of θ and φ**

![Diagram showing viewing angle definitions](image_url)

**NOTE 2. Definition of Viewing Angle φ1 and φ2**

![Graph showing contrast ratio k vs viewing angle φ](image_url)

**NOTE 3. Definition of Contrast “K”**

\[
K = \frac{\text{Brightness on selected dot (B1)}}{\text{Brightness on non-selected dot (B2)}}
\]

(B1)

(Di = “H”)

φ = 10°

(B2)

(Di = “L”)

**NOTE 4. Definition of Optical Response**

![Diagram showing optical response](image_url)

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6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

(LCM, BACKLIGHT ON, Ta=25°C)

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<thead>
<tr>
<th>ITEM</th>
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<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
<th>NOTE</th>
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</thead>
<tbody>
<tr>
<td>BRIGHTNESS</td>
<td>70.0</td>
<td>90.0</td>
<td>-</td>
<td>cd/m²</td>
<td>IL=5mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NOTE 1, 2</td>
</tr>
<tr>
<td>RISE TIME</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>MINUTE</td>
<td>IL=5mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BRIGHTNESS 80%</td>
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<tr>
<td>BRIGHTNESS UNIFORMITY</td>
<td>-</td>
<td>-</td>
<td>±30</td>
<td>%</td>
<td>UNDERMENTIONED</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NOTE 1, 3</td>
</tr>
</tbody>
</table>

CFL: INITAL, Ta=25°C, VDD-V0 = 15.8 V
DISPLAY DATA SHOULD BE ALL "ON".

NOTE 1 MEASUREMENT AFTER 10 MINUTES OF CFL OPERATING.
NOTE 2 BRIGHTNESS CONTROL : 100%
NOTE 3 MEASUREMENT OF THE FOLLOWING 9 PLACES ON THE DISPLAY.
DEFINITION OF THE BRIGHTNESS TOLERANCE.

\[
\frac{\text{MAX BRIGHTNESS}}{\text{MIN BRIGHTNESS}} \times \text{AVERAGE BRIGHTNESS} \times 100
\]
7. BLOCK DIAGRAM
### 8. INTERFACE TIMING CHART

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SYMBOL</th>
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<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
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<tr>
<td>ENABLE CYCLE TIME</td>
<td>tcyc</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
<td>μs</td>
</tr>
<tr>
<td>ENABLE PULSE H LEVEL</td>
<td>tweh</td>
<td>0.45</td>
<td>-</td>
<td>-</td>
<td>μs</td>
</tr>
<tr>
<td>WIDTH</td>
<td>twel</td>
<td>0.45</td>
<td>-</td>
<td>-</td>
<td>μs</td>
</tr>
<tr>
<td>ENABLE RISE TIME</td>
<td>ter</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>ns</td>
</tr>
<tr>
<td>ENABLE FALL TIME</td>
<td>tef</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>ns</td>
</tr>
<tr>
<td>CS,R/W,RS SET UP TIME</td>
<td>tas</td>
<td>140</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>DATA SET UP TIME</td>
<td>tdis</td>
<td>225</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>DATA DELAY TIME</td>
<td>tdd</td>
<td>-</td>
<td>-</td>
<td>225</td>
<td>ns</td>
</tr>
<tr>
<td>DATA HOLD TIME</td>
<td>th</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>CS,R/W,RS→HOLD TIME</td>
<td>tah</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>DATA HOLD TIME</td>
<td>tdh</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

![Diagram of interface timing chart](image)

---

*Kaohsiung Hitachi Electronics Co., Ltd.*

Date: Feb. 10 '95

No: 3284PS 2708-LMG7400PLFC-5

Page: 8-1/2
8.2 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

VDD  4.75V  5V
0~50 ms  initial set time  0~50 ms
SIGNAL

VALID
DATA

0 ms min.

SIGNAL

0 ms min.

VEE

POWER ON  POWER OFF


(INITIAL INSTRUCTIONS): ① MODE CONTROL
② SET CHARACTER PITCH
③ SET NUMBER OF CHARACTER
④ SET NUMBER OF TIME DIVISION.

8.3 POWER SUPPLY FOR LCM (EXAMPLE)

VR: 10~20K Ω
VDD-VO: LCD DRIVING VOLTAGE

Kaohsiung Hitachi Electronics Co., Ltd. Date: Feb. 10 '95 Sh. No.: 3284PS 2708-LM000PLFC-5 Page: 8-2/2
LMG7400PLFC EXTERNAL DIMENSION

UNIT: mm
SCALE: 1:1
TOLERANCE NOT SPECIFIED IS ± 0.5 mm
NOTE 1: MEASUREMENT WHEN ADDING 9.8×10⁶ Pa
11.9 kgf/cm² AT THE MEASURING POINT
NOTE 2: DO NOT CONNECT ANY SIGNAL TO CN3
USE CN1 AS INTERFACE

VIEWING DIRECTION

BEZEL OPENING
EFFECTIVE VIEWING AREA
ACTIVE AREA

159.4
139.4
152.4±0.3
142.4
124.0±0.3
123.0 min
0.5×239±0.47=119.97±0.1
0.5×271±0.47=131.97±0.1
63.0
82.0
68.0±0.3
70.0±0.3
35.0
46.2±0.3
25.4±0.3
12.74
10.3
22.66±0.3
2.54±0.3
6.9
2.64±0.3
30 ± 0.1
4 ± 0.3
10.0
3.5
8.5
5.9
1.515 MAX
1.515 MAX
6.6
2.05 max
(2.015)
2.5
6.5±0.5
12±0.2
0.5x239±0.47=119.97±0.1

NOTE 2
9.2 DISPLAY PATTERN

119.97 (240 DOTS)

63.97 (128 DOTS)

0.5

0.47

0.47

0.5

SCALE: NTS
UNIT: mm
MEASUREMENT TOLERANCE: ±0.1
9.3 INTERNAL PIN CONNECTION

**CN1**

<table>
<thead>
<tr>
<th>PIN No.</th>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>VSS(0V)</td>
<td>Ground</td>
</tr>
<tr>
<td>A2</td>
<td>VDD(+5V)</td>
<td>Power supply for logic</td>
</tr>
<tr>
<td>A3</td>
<td>V0</td>
<td>Power supply for LCD drive</td>
</tr>
<tr>
<td>A4</td>
<td>RS</td>
<td>Register select</td>
</tr>
<tr>
<td>A5</td>
<td>R/W</td>
<td>Read/write</td>
</tr>
<tr>
<td>A6</td>
<td>E</td>
<td>Enable</td>
</tr>
<tr>
<td>A7~14</td>
<td>DBO~DB7</td>
<td>Data bus</td>
</tr>
<tr>
<td>A15</td>
<td>CS</td>
<td>Chip select</td>
</tr>
<tr>
<td>A16</td>
<td>RES</td>
<td>Reset</td>
</tr>
<tr>
<td>A17</td>
<td>VEE(-15.0V)</td>
<td>Power supply for LCD drive</td>
</tr>
<tr>
<td>A18</td>
<td>D·OFF</td>
<td>NC/DISPLAY GND/DISPLAY OFF</td>
</tr>
<tr>
<td>A19~20</td>
<td>N.C</td>
<td>No connection</td>
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**CN2**

<table>
<thead>
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<th>PIN No.</th>
<th>Symbol</th>
<th>LEVEL</th>
<th>Function</th>
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<td>CFL</td>
<td>1</td>
<td>GND</td>
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<td>CFL GND</td>
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<td>CFL</td>
<td>2</td>
<td>N.C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFL</td>
<td>3</td>
<td>N.C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFL</td>
<td>4</td>
<td>H.V</td>
<td></td>
<td>POWER SUPPLY FOR CFL</td>
</tr>
</tbody>
</table>

**CFL 1/F : MITSUMI M63M83-04**

**SUITABLE CONNECTOR : MITSUMI M61M73-04**

- MITSUMI M60-04-30-114P(Straight)
- MITSUMI M60-04-30-134P(ANGLE)
10. APPEARANCE STANDARD

10.1 APPEARANCE INSPECTION CONDITION
VISUAL INSPECTION SHOULD BE DONE
UNDER THE FOLLOWING CONDITION.

(1) IN THE DARK ROOM
(2) WITH CFL PANEL LIGHTED WITH PRESCRIBED INVERTER CIRCUIT.
(3) WITH EYES 25cm DISTANCE FROM LCM
(4) VIEWING ANGLE WITHIN 45 DEGREES FROM THE VERTICAL LINE TO THE CENTER OF LCD

10.2 DEFINITION OF EACH ZONE
A ZONE: WITHIN THE EFFECTIVE DISPLAY AREA SPECIFIED AT PAGE 9-1/3 OF THIS DOCUMENT.
B ZONE: AREA BETWEEN THE WINDOW OF BEZEL LINE AND THE EFFECTIVE DISPLAY AREA LINE SPECIFIED AT PAGE 9-1/3 OF THIS DOCUMENT.
### 10. 3 Appearance Specification

**1. LCD Appearance**

*If the problem occurs about this item, the responsible person of both party (customer and Hitachi) will discuss more detail.*

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Criteria</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scratch</td>
<td>Distinguished one is not acceptable (to be judged by Hitachi standard)</td>
<td>※</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Dent</td>
<td>Same as above</td>
<td>※</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Wrinkles in Polarizer</td>
<td>Same as above</td>
<td>※</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bubbles</td>
<td>Average diameter D (mm) Maximum number acceptable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$0.2 \leq D \leq 0.3$</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$0.3 \leq D \leq 0.5$</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$0.5 \leq D$</td>
<td>NONE</td>
<td></td>
</tr>
</tbody>
</table>

| L  | Stains, Foreign Materials   | Filamentous                                   | O  | ※ |
|    | Dark Spot                   |                                              |    |   |
|    |                             | Length $L$ (mm) Maximum number acceptable     |    |   |
|    |                             | $L \leq 2.0$                                  | Ignore |   |
|    |                             | $L \leq 3.0$                                  | $0.03 \leq T \leq 0.05$ | 3  |
|    |                             | $0.05 \leq T$                                 | NONE |   |
|    |                             | Round                                        |    |   |
|    |                             | Average diameter $D$ (mm) Maximum number acceptable |
|    |                             | $D \leq 0.2$                                  | Ignore |   |
|    |                             | $0.2 \leq D \leq 0.3$                         | 3  | 10mm |
|    |                             | $0.3 \leq D \leq 0.4$                         | 2  | 30mm |
|    |                             | $0.4 \leq D$                                  | NONE |   |
|    |                             | The whole number filamentous+round=5          |   |   |
|    |                             | Those wiped out easily are acceptable          |   |   |

<p>|    | Color Tone                  | To be judged by Hitachi standard              | O  | - |
|    | Color Uniformity            | Same as above                                 | O  | - |
|    | Pinhole                     | $(A+B)/2 \leq 0.15$ Maximum number: ignored   | O  | - |
|    |                             | $0.15 \leq (A+B)/2 \leq 0.3$ Maximum number: ignored | O |   |
|    |                             | $C \leq 0.03$ Maximum number: ignored          | O  | - |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Criteria</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CONTRAST IRREGULARITY (SPOT)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AVERAGE DIAMETER D(mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td></td>
<td>D ≤ 0.25</td>
<td>TO BE JUDGED</td>
<td>IGNORE</td>
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<tr>
<td></td>
<td></td>
<td>0.25 &lt; D ≤ 0.35</td>
<td>BY HITACHI STANDARD</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td>0.35 &lt; D ≤ 0.5</td>
<td>STANDARD</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>0.5 &lt; D</td>
<td>NONE</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>CONTRAST IRREGULARITY (A PAIR OF SCRATCH)</td>
<td>WIDTH W(mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>LENGTH L(mm)</td>
<td>MAXIMUM NUMBER ACCEPTABLE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>W ≤ 0.25</td>
<td>L ≤ 1.2</td>
<td>2</td>
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<td></td>
<td></td>
<td>W ≤ 0.15</td>
<td>L ≤ 2.0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W ≤ 0.1</td>
<td>L ≤ 3.0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>THE WHOLE</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RUBBING SCRATCH</td>
<td>TO BE JUDGED BY HITACHI STANDARD</td>
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<tr>
<td>NO.</td>
<td>ITEM</td>
<td>CRITERIA</td>
<td>A</td>
<td>B</td>
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<td>---------------------------</td>
<td>---------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
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<td>DARK SPOTS IRREGULARITY</td>
<td>AVERAGE DIAMETER D(mm)</td>
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<tr>
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<td>FOREIGN (SPOT)</td>
<td>$D \leq 0.4$</td>
<td>O</td>
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<tr>
<td>FL</td>
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<td>$0.4 &lt; D$</td>
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<tr>
<td>BACKLIGHT</td>
<td>FOREIGN MATERIALS (LINE)</td>
<td>WIDTH $W$ (mm)</td>
<td>LENGTH $L$ (mm)</td>
<td>MAXIMUM NUMBER ACCEPTABLE</td>
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<tr>
<td></td>
<td></td>
<td>$W \leq 0.2$</td>
<td>L $\leq 2.5$</td>
<td>1</td>
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<tr>
<td></td>
<td></td>
<td>$2.5 &lt; L$</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$0.2 &lt; W$</td>
<td>-</td>
<td>NONE</td>
</tr>
<tr>
<td></td>
<td>SCRATCHES</td>
<td>WIDTH $W$ (mm)</td>
<td>LENGTH $L$ (mm)</td>
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<td>$W \leq 0.1$</td>
<td>-</td>
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<td>$0.1 &lt; W \leq 0.2$</td>
<td>L $\leq 11.0$</td>
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<td>$11.0 &lt; L$</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>$0.2 &lt; W$</td>
<td>-</td>
<td>NONE</td>
</tr>
</tbody>
</table>
NOTE

(1) DEFINITION OF AVERAGE DIAMETER D

\[ D = \frac{a+b}{2} \]

(2) DEFINITION OF LENGTH L AND WIDTH W

(3) DEFINITION OF PINHOLE

C : SALIENCE
11. PRECAUTION IN DESIGN

11.1 MOUNTING METHOD

Since the module is so constructed as to be fixed by utilizing fitting holes in the module as shown below, it is necessary to take consideration the following items on attachment to a frame.

![Diagram of mounting method]

**Example of Mounting**

152.0 ± 0.3

**UNIT:** mm  
**SCALE:** NTS

CFL SIDE

**Location of Spacers**

1. Use of protective plate, made of an acrylic plate, etc., in order to protect a polarizer and LC cell.

2. To prevent the module cover from being pressed, the spacers between the module and the fitting plates should be longer than 0.5mm.

3. We recommend you to use protective spacer as figure for protecting LCD module from any kind of shock to your set.

11.2 LC Driving Voltage (V0) and viewing angle range.

Setting V0 out of the recommended condition will be a cause for a change of viewing angle range.

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11.3 CAUTION AGAINST STATIC CHARGE

AS THIS MODULE IS PROVIDED WITH C-MOS LSI, THE CARE TO TAKE SUCH A PRECAUTION AS TO GROUNDING THE OPERATOR’S BODY IS REQUIRED WHEN HANDLING IT.

11.4 POWER ON SEQUENCE

INPUT SIGNALS SHOULD NOT BE APPLIED TO LCD MODULE BEFORE POWER SUPPLY VOLTAGE IS APPLIED AND REACHES TO SPECIFIED VOLTAGE (5 ± 0.25V). IF ABOVE SEQUENCE IS NOT KEPT, C-MOS LSIS OF LCD MODULES MAY BE DAMAGED DUE TO LATCH UP PROBLEM.

11.5 PACKAGING

(1) NO. LEAVING PRODUCTS IS PREFERABLE IN THE PLACE OF HIGH HUMIDITY FOR A LONG PERIOD OF TIME. FOR THEIR STORAGE IN THE PLACE WHERE TEMPERATURE IS 35°C OR HIGHER, SPECIAL CARE TO PREVENT THEM FROM HIGH HUMIDITY IS REQUIRED. A COMBINATION OF HIGH TEMPERATURE AND HIGH HUMIDITY MAY CAUSE THEM POLARIZATION DEGRADATION AS WELL AS BUBBLE GENERATION AND POLARIZER PEEL-OFF. PLEASE KEEP THE TEMPERATURE AND HUMIDITY WITHIN THE SPECIFIED RANGE FOR USE AND STORING.

(2) SINCE UPPER POLARIZERS AND LOWER ALUMINUM PLATES TEND TO BE EASILY DAMAGED, THEY SHOULD BE HANDLED WITH FULL CARE SO AS NOT TO GET THEM TOUCHED, PUSHED OR RUBBED BY A PIECE OF GLASS, TWEEZERS AND ANYTHING ELSE WHICH ARE HARDER THAN A PENCIL LEAD 3H.

(3) AS THE ADHESIVES USED FOR ADHERING UPPER/LOWER POLARIZERS AND ALUMINUM PLATES ARE MADE OF ORGANIC SUBSTANCES WHICH WILL BE DETERIORATED BY A CHEMICAL REACTION WITH SUCH CHEMICALS AS ACETONE, TULUENE ETHANOLE AND ISOPROPYLALCOHOL. THE FOLLOWING SOLVENTS ARE RECOMMENDED FOR USE:

NORMAL HEXANE

PLEASE CONTACT US WHEN IT IS NECESSARY FOR YOU TO USE CHEMICALS OTHER THAN THE ABOVE.

(4) LIGHTLY WIPE TO CLEAN THE DIRTY SURFACE WITH ABSORBENT COTTON WAIST OR OTHER SOFT MATERIAL LIKE CHAMOIS, SOAKED IN THE CHEMICALS RECOMMENDED WITHOUT SCRUBBING IT HARDLY.

TO PREVENT THE DISPLAY SURFACE FROM DAMAGE AND KEEP THE APPEARANCE IN GOOD STATE, IT IS SUFFICIENT, IN GENERAL, TO WIPE IT WITH ABSORBENT COTTON.
(5) IMMEDIATELY WIPE OFF SALIVA OR WATER DROP ATTACHED ON THE DISPLAY AREA BECAUSE ITS LONG PERIOD ADHERANCE MAY CAUSE DEFORMATION OR FADED COLOR ON THE SPOT.

(6) FOGY DEW DEPOSITED ON THE SURFACE AND CONTACT TERMINALS DUE TO COLDNESS WILL BE A CAUSE FOR POLARIZER DAMAGE, STAIN AND DIRT ON PRODUCT. WHEN NECESSARY TO TAKE OUT THE PRODUCTS FROM SOME PLACE AT LOW TEMPERATURE FOR TEST, ETC. IT IS REQUIRED FOR THEM TO BE WARMED UP IN A CONTAINER ONCE AT THE TEMPERATURE HIGHER THAN THAT OF ROOM.

(7) TOUCHING THE DISPLAY AREA AND CONTACT TERMINALS WITH BARE HANDS AND CONTAMINATING THEM ARE PROHIBITED, BECAUSE THE STAIN ON THE DISPLAY AREA AND POOR INSULATION BETWEEN TERMINALS ARE OFTEN CAUSED BY BEING TOUCHED BY BARE HANDS.

THERE ARE SOME COSMETICS DETRIMENTAL TO POLARIZERS.)

(8) IN GENERAL THE QUALITY OF GLASS IS FRAGILE SO THAT IT TENDS TO BE CRACKED OR CHIPPED IN HANDLING, SPECIALLY ON ITS PERIPHERY. PLEASE BE CAREFUL NOT TO GIVE IT SHARP SHOCK CAUSED BY DROPPING DOWN, ETC.

11.6 CAUTION FOR OPERATION

(1) IT IS AN INDISPENSABLE CONDITION TO DRIVE LCD'S WITHIN THE SPECIFIED VOLTAGE LIMIT SINCE THE HIGHER VOLTAGE THAN THE LIMIT CAUSES THE SHORTER LCD LIFE. AN ELECTROCHEMICAL REACTION DUE TO DIRECT CURRENT CAUSES LCD'S UNDESIRABLE DETERIORATION, SO THAT THE USE OF DIRECT CURRENT DRIVER SHOULD BE AVOIDED.

(2) RESPONSE TIME WILL BE EXTREMELY DELAYED AT LOWER TEMPERATURE THAN THE OPERATING TEMPERATURE RANGE AND ON THE OTHER HAND AT HIGHER TEMPERATURE LCD'S SHOW DARK BLUE COLOR IN THEM. HOWEVER THOSE PHENOMENA DO NOT MEAN MALFUNCTION OR OUT OF ORDER WITH LCD'S WHICH WILL COME BACK IN THE SPECIFIED OPERATING TEMPERATURE RANGE.

(3) IF THE DISPLAY AREA IS PUSHED HARD DURING OPERATION, SOME FONT WILL BE ABNORMALLY DISPLAYED BUT IT RESUMES NORMAL CONDITION AFTER TURNING OFF ONCE.
(4) A slight dew depositing on terminals is a cause for electrochemical reaction resulting in terminal open circuit. Usage under the relative condition of 40°C 50%rh or less is required.

11.7 STORAGE

In case of storing for a long period of time (for instance, for years) for the purpose of replacement use, the following ways are recommended.

(1) Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it, and with no desiccant.

(2) Placing in a dark place where neither exposure to direct sunlight nor light is, keeping temperature in the range from 0°C to 35°C.

(3) Storing with no touch on polarizer surface by anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery from us.)

11.8 SAFETY

(1) It is recommendable to crash damaged or unnecessary LCD’s into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.

(2) When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.
12. DESIGNATION OF LOT MARK

LOT MARK
LOT MARK IS CONSISTED OF 4 DIGITS FOR PRODUCTION LOT

```
1
0
3
1
```

<table>
<thead>
<tr>
<th>YEAR</th>
<th>FIGURE IN LOT MARK</th>
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<tbody>
<tr>
<td>1992</td>
<td>2</td>
</tr>
<tr>
<td>1993</td>
<td>3</td>
</tr>
<tr>
<td>1994</td>
<td>4</td>
</tr>
<tr>
<td>1995</td>
<td>5</td>
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<table>
<thead>
<tr>
<th>MONTH</th>
<th>FIGURE IN LOT MARK</th>
<th>MONTH</th>
<th>FIGURE IN LOT MARK</th>
</tr>
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<tbody>
<tr>
<td>JAN.</td>
<td>01</td>
<td>JULY</td>
<td>07</td>
</tr>
<tr>
<td>FEB.</td>
<td>02</td>
<td>AUG.</td>
<td>08</td>
</tr>
<tr>
<td>MAR.</td>
<td>03</td>
<td>SEPT.</td>
<td>09</td>
</tr>
<tr>
<td>APR.</td>
<td>04</td>
<td>OCT.</td>
<td>10</td>
</tr>
<tr>
<td>MAY.</td>
<td>05</td>
<td>NOV.</td>
<td>11</td>
</tr>
<tr>
<td>JUNE.</td>
<td>06</td>
<td>DEC.</td>
<td>12</td>
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</table>

<table>
<thead>
<tr>
<th>WEEK (DAY IN CALENDAR)</th>
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<tbody>
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<td>21〜27</td>
<td>1</td>
</tr>
<tr>
<td>28〜3</td>
<td>2</td>
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<tr>
<td>4〜10</td>
<td>3</td>
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<tr>
<td>11〜17</td>
<td>4</td>
</tr>
<tr>
<td>18〜20</td>
<td>5</td>
</tr>
</tbody>
</table>

LOCATION OF LOT MARK: ON THE BACK SIDE OF LCM

2031
13. PRECAUTION FOR USE

(1) A LIMIT SAMPLE SHOULD BE PROVIDED BY THE BOTH PARTIES ON AN OCCASION WHEN THE BOTH PARTIES AGREED ITS NECESSITY. JUDGEMENT BY A LIMIT SAMPLE SHALL TAKE EFFECT AFTER THE LIMIT SAMPLE HAS BEEN ESTABLISHED AND CONFIRMED BY THE BOTH PARTIES.

(2) ON THE FOLLOWING OCCASIONS, THE HANDLING OF THE PROBLEM SHOULD BE DECIDED THROUGH DISCUSSION AND AGREEMENT BETWEEN RESPONSIBLE PERSONS OF THE BOTH PARTIES.

(1) WHEN A QUESTION IS ARISEN IN THE SPECIFICATIONS.

(2) WHEN A NEW PROBLEM IS ARISEN WHICH IS NOT SPECIFIED IN THIS SPECIFICATIONS.

(3) WHEN AN INSPECTION SPECIFICATIONS CHANGE OR OPERATING CONDITION CHANGE IN CUSTOMER IS REPORTED TO HITACHI, AND SOME PROBLEM IS ARISEN IN THIS SPECIFICATION DUE TO THE CHANGE.

(4) WHEN A NEW PROBLEM IS ARISEN AT THE CUSTOMER’S OPERATING SET FOR SAMPLE EVALUATION IN THE CUSTOMER SITE.

THE PRECAUTION THAT SHOULD BE OBSERVED WHEN HANDLING LCM HAVE BEEN EXPLAINED ABOVE. IF ANY POINTS ARE UNCLEAR OR IF YOU HAVE ANY REQUESTS, PLEASE CONTACT HITACHI.