SPECIFICATION

For

EG4801S-AR

This specification consists of two documents as follows.

1. LCD Specification   SC-010006500

2. LCD QA Standard   M3-00100

Customer's Approval	
Date _____ By _____ _____	Date Feb. 4 '93 Presented by Y.Katayama GM QA dep. y. Tokai m. Nakamura _____ SEIKO EPSON CORP. LCD DIV. Quality assuranse Dep.

S P E C I F I C A T I O N S

E G 4 8 0 1 S - A R

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S E I K O   E P S O N   C O R P O R A T I O N
L C D   D I V I S I O N

LD DESIGN Dep.

1. Basic Specifications

1-1 Display Specifications

(1) STN Mode Positive Display type Reflective Model

(2) Display Color

    Display Color   : Display Data"1" : Dark Blue
    Background Color : Display Data"0" : Gray

(3) Viewing Angle   : 6 O'clock direction

(4) Driving Duty   : 1/64 Duty

  *1) Color tone is slightly changed by temperature and driving voltage.
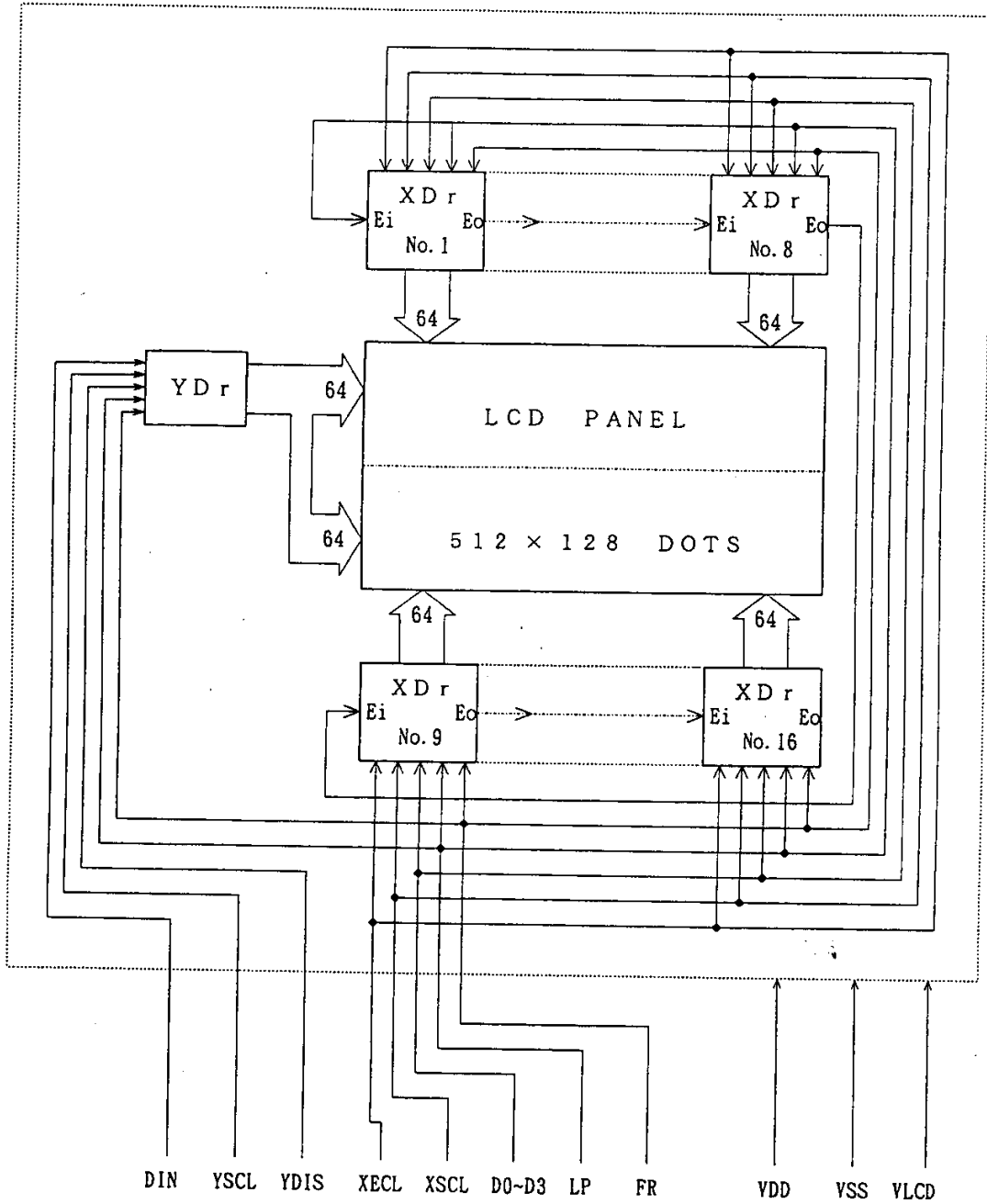

1-2 Mechanical Specifications

(1) Outline Dimensions : Refer to attached Outline Dimensions figure SD-010065-A

(2) Dot Matrix   : 512 dots × 128 dots

(3) Dot Size   : 0.43 (W) × 0.43 (H) (mm)

(4) Dot Pitch   : 0.47 (W) × 0.47 (H) (mm)

(5) Weight   : 320 g (Approx.)

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1-3 Block Diagram

X D r			X D r	
Ei	Eo		Ei	Eo
No. 1			No. 8	

64

64

YDr

64

LCD PANEL

5 1 2 × 1 2 8 DOTS

64

64

64

64

X D r			X D r	
Ei	Eo		Ei	Eo
No. 9			No. 16	

DIN   YSCL   YDIS   XECL   XSCL   D0~D3   LP   FR   VDD   VSS   VLCD

1-4 Terminal Functions

Pin No.	Symbol	Function
1	V D D	Power supply for logic
2	V S S	Ground
3	V L C D	Power supply for LCD
4	L P	Latch pulse signal input
5	F R	Switch signal input to convert LC drive waveform to AC
6	YDIS	Display control (Display off "0", Normal state "1")
7	YSCL	Row scan shift clock input
8	DIN	Row scan start-up pulse input
9	XSCL	Display data shift clock input
10	XECL	Enable transition clock input
11 ~ 14	D 0 ~ D 3	Display data pulse input
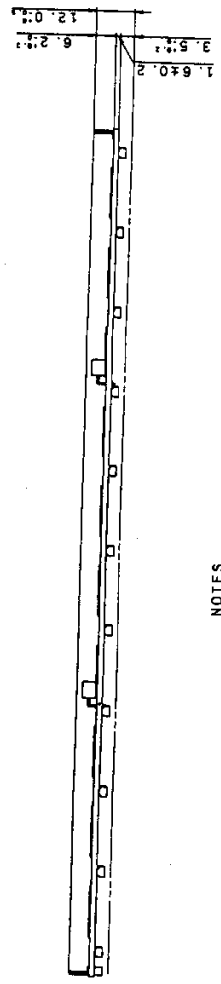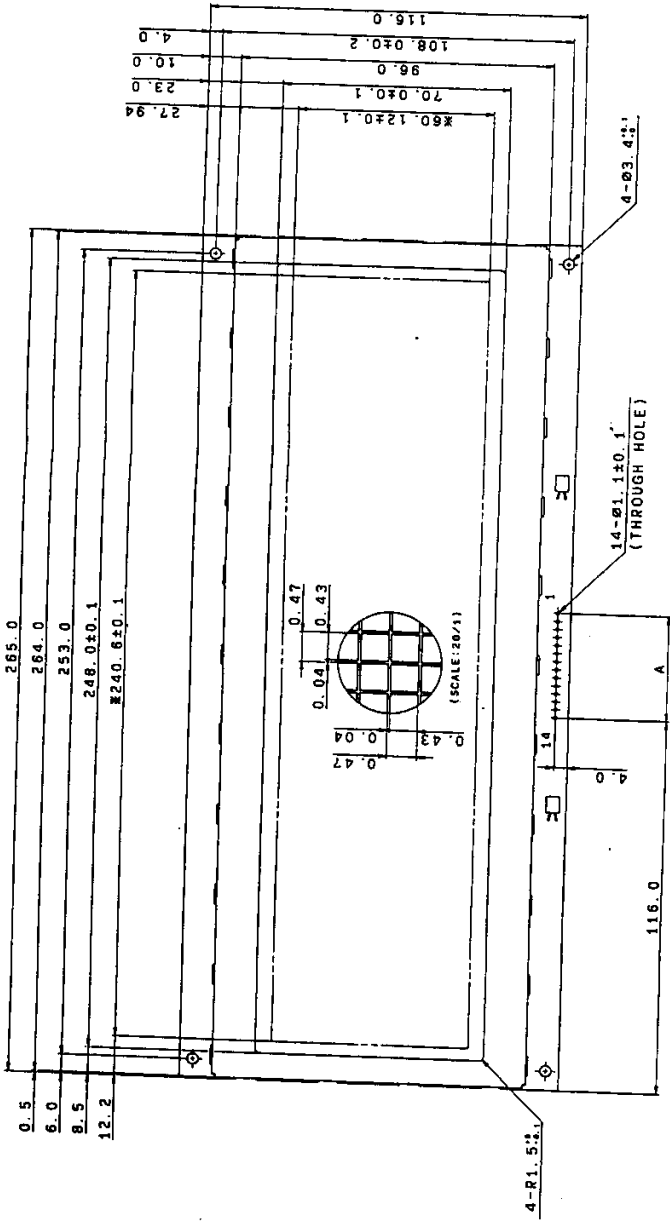
NOTES

1. A:PITCH2.54±0.1X(14-1)=33.02±0.2

2. ※:ACTIVE AREA

265.0
264.0
253.0
248.0±0.1
※240.6±0.1

0.5
6.0
8.5
12.2

116.0
108.0±0.2
96.0
70.0±0.1
※60.12±0.1
27.94

4.0
10.0
23.0

4-Ø3.4

14-Ø1.1±0.1
(THROUGH HOLE)

0.47
0.43
0.04
(SCALE:20/1)

116.0

4.0

14

A

4-R1.5

12.0
6.2
3.5
1.6±0.2

2. Absolute Maximum Ratings

Item	Symbol	Standard Value	Unit	Condition
Power supply Voltage	VDD − VSS	0 ~ +7.0	V	
LCD Driving Voltage	VDD − VLCD	0 ~ +25.0		
Input Voltage	VIN	VSS ≦ VIN ≦ VDD		
Operating Temperature Range	TOP	0 ~ +50	°C	Not to be dewy
Storage Temperature Range	TST	−20 ~ +60		

3. Electrical Characteristics

3-1 DC Characteristics

(1) Module DC Characteristics

$$Ta = 0 \sim 50\,°C,\ VDD = 5\,V \pm 5\%$$

Item	Symbol	Standard Value			Unit	Applicable Terminal	Condition
		MIN	TYP	MAX			
Power Supply Voltage	VDD	4.75	5.0	5.25	V	VDD	
	VDD-VLCD	Depending on Optical Characteristics				VLCD	
"0" Input Voltage	VIL	0	–	0.2VDD	V	LP, FR YDIS, YSCL DIN, XSCL XECL D0~D3	
"1" Input Voltage	VIH	0.8VDD	–	VDD	V		
I/O Leak Current	|IL|	–	–	50	μA		
Power Supply Current	IDD	–	–	8	mA	VDD	*1
LCD Power Supply Current	ILCD	–	–	5	mA	VLCD	

*1) VLCD=-8V, Frame Frequency 60Hz

3-2 AC Characteristics

Item	Symbol	Standard Value			Unit	Condition
		MIN	TYP	MAX		
Allowable FR Delay Time	TFD	-500	0	500	nsec	
LP, YSCL Period	TLC	-	220	-	μsec	
XSCL Period	TXSC	166	-	-	nsec	
YSCL "L" Time	TSL	180	-	-	nsec	
YSCL Pulse Width	WYSC	180	-	-	nsec	
LP "L" Time	TLL	220	-	-	nsec	
LP Pulse Widhte	WLP	250	-	-	nsec	
XECL "L" Time	TEL	100	-	-	nsec	
XECL Pulse Width	WECL	100	-	-	nsec	
XSCL "L" Time	TXSL	63	-	-	nsec	
XSCL Pulse Width	WXSC	63	-	-	nsec	VDD=
XECL Setup Time	TL1	140	-	-	nsec	5 V
XECL Hold Time	TL2	50	-	-	nsec	
Latch Timing	TLT1	125	-	-	nsec	
	TLT2	0	-	-		
	TLS1	100	-	-		
	TLS2	0	-	-		
XECL Switching Time ("H")	TS1	70	-	-	nsec	
XECL Switching Time ("L")	TS2	-10	-	-	nsec	
Data Setup Time	TDS	50	-	-	nsec	
Data Hold Time	TDH	30	-	-	nsec	
DIN Setup Time	TDIS	100	-	-	nsec	
DIN Hold Time	TDIH	30	-	-	nsec	
Input Wave Form Rise Time	tr	-	-	※1	nsec	
Input Wave Form Fall Time	tf	-	-	※1	nsec	

*1) (TXSC-TXSL-WXSC)/2 with 50nsec max.

Input Wave Form

FR
LP
XECL
XSCL
DO-D3
YSCL
DIN

S E I K O E P S O N CORPORATION

| Sheet Code | 33-B0000000 |

3-4 Timing Chart 2

Display Period of 1 line

Enlarged

XSCL × (64/4)   PULSES

XSCL × (1024/4)   PULSES
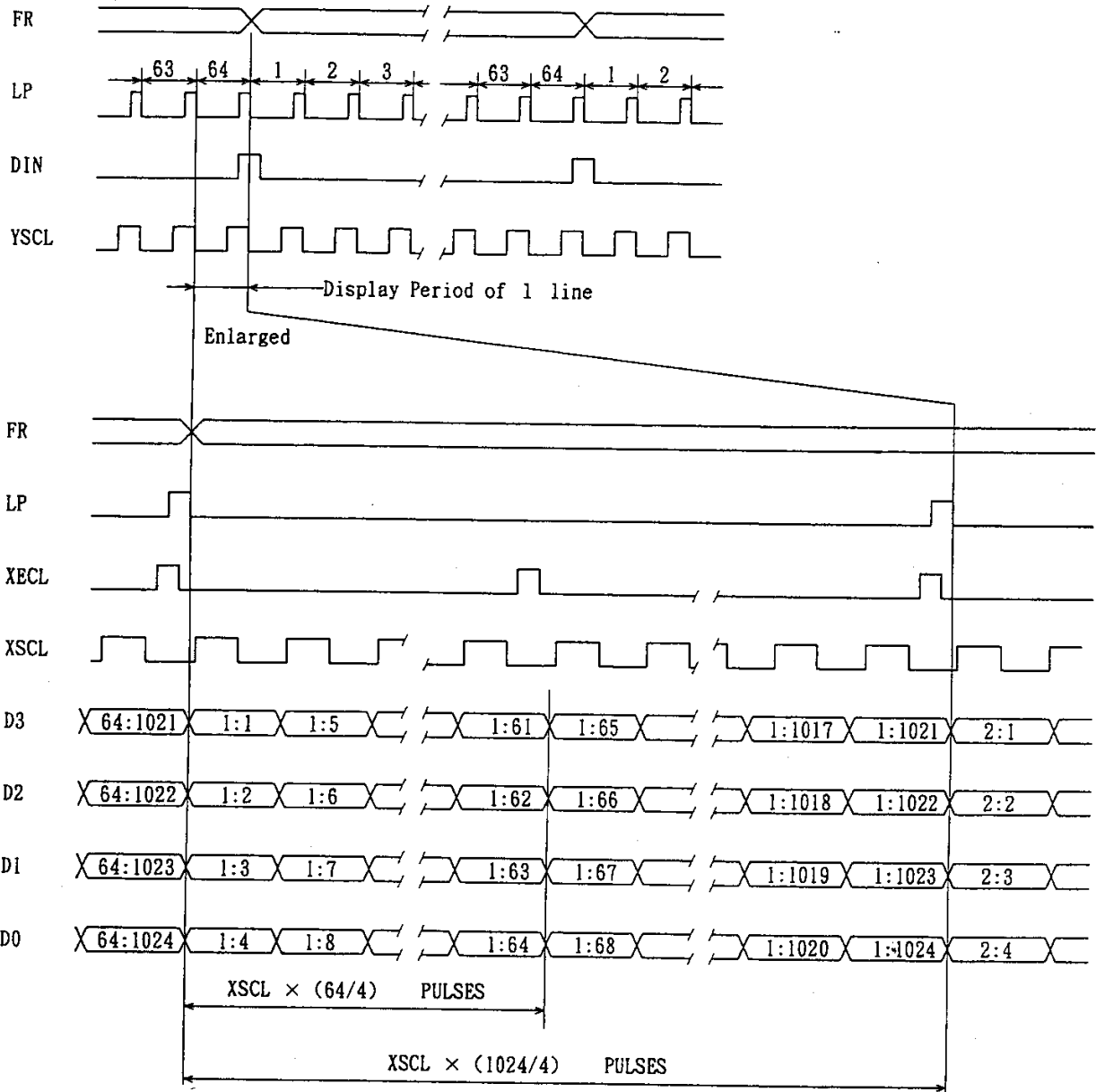
3-5 Relation between Data and Display

1: 1	1: 2	1: 3	1: 4	1:509	1:510	1:511	1:512
2: 1	2: 2	2: 3	·	·	2:510	2:511	2:512
3: 1	3: 2	·	·	·	·	3:511	3:512
4: 1	·	·	·	·	·	·	4:512
61: 1	·	·	·	·	·	·	61:512
62: 1	62: 2	·	·	·	·	62:511	62:512
63: 1	63: 2	63: 3	·	·	63:510	63:511	63:512
64: 1	64: 2	64: 3	64: 4	64:509	64:510	64:511	64:512
1:513	1:514	1:515	1:516	1:1021	1:1022	1:1023	1:1024
2:513	2:514	2:515	·	·	2:1022	2:1023	2:1024
3:513	3:514	·	·	·	·	3:1023	3:1024
4:513	·	·	·	·	·	·	4:1024
61:513	·	·	·	·	·	·	61:1024
62:513	62:514	·	·	·	·	62:1023	62:1024
63:513	63:514	63:515	·	·	63:1022	63:1023	63:1024
64:513	64:514	64:515	64:516	64:1021	64:1022	64:1023	64:1024

4. Optical Characteristics

4-1 Optical Characteristics

f FR＝７５Hz

Item	Symbol	Temp ℃	Standard Value			Unit	Condition
			MIN	TYP	MAX		
Driving Voltage	VOP	0	－	14.6	15.6	V	
		25	－	13.6	－		
		50	11.3	12.3	－		
Response Time	Tr	0	－	300	600	ms	
		25	－	100	200		
	Tf	0	－	500	1000		
		25	－	150	300		
Viewing Angle	θY1	25	20	－	－	DEG	K≧2
	θY2		30	－	－		
	θX1		25	－	－		
	θX2		25	－	－		
Contrast	K	25	－	3	－		

*1) Vop=LCD Driving Voltage getting maximum contrast
=VDD-VLCD

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4-2 Definition of Optical Characteristics

(1) Optical Measuring Equipment

Thermostatic Oven

L

P. M

M
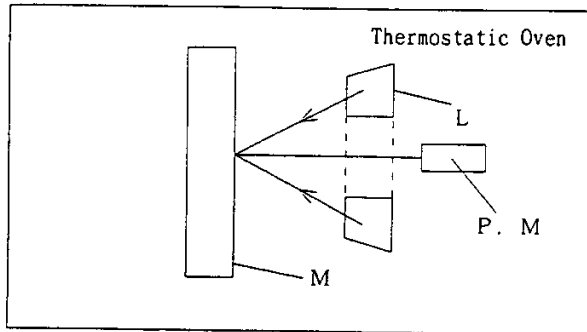
L   :   Lighting Source
P. M :   Lighting Sensor
M   :   Module

[Specification of Equipments and Measuring Condition]
   Luxmeter :   Canon LC-3S
                   Brightness Measurement Spot Diameter ϕ2mm

   Lighting Source :   Halogen Lamp(Circular)

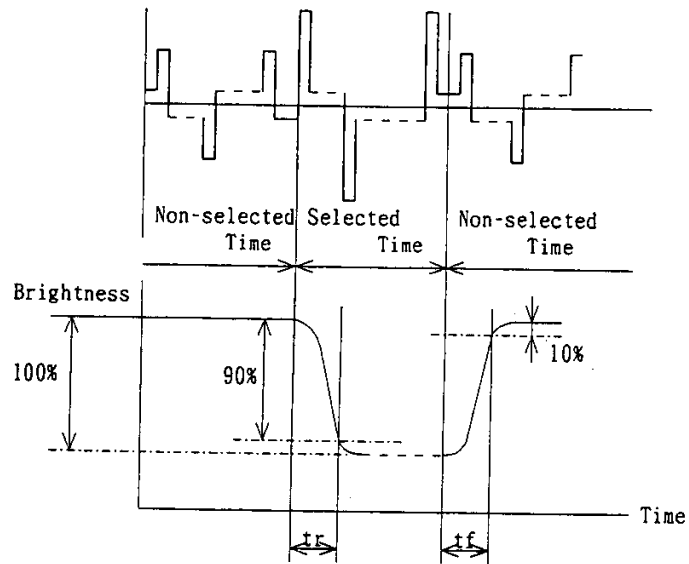(2) Definition of Viewing Angle

TOP
θ
θ Y 2
ドット 1 : 1
θ X 1
θ X 2
θ Y 1
BOTTOM
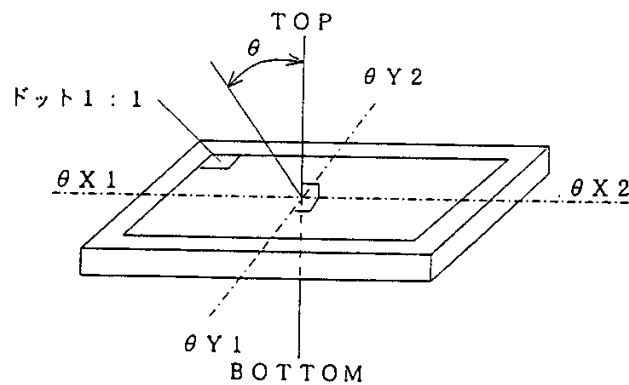
(3) Definition of Response Time

[Measuring Condition]
   · V OP = TYP. value at Operating Temperature
   · θ X = θ Y = 0°

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(4) Definition of Contrast Ratio
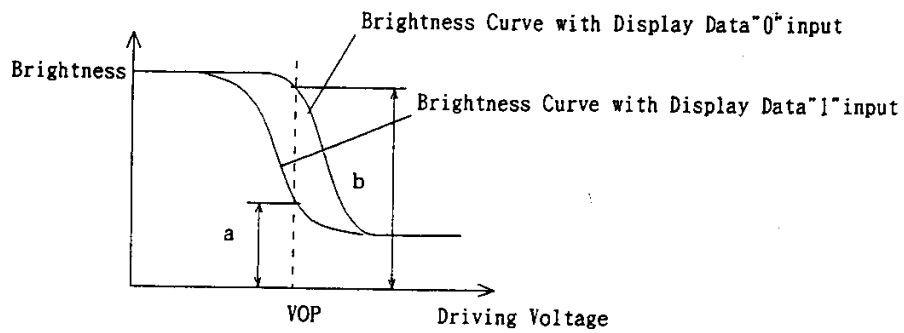
Brightness Curve with Display Data"0" input

Brightness

Brightness Curve with Display Data"1" input

b

a

VOP   Driving Voltage

$$\text{Contrast Ratio} = \frac{\text{Brightness Curve with Display Data"0" input}}{\text{Brightness Curve with Display Data"1" input}} \quad \frac{b}{a}$$

[Measuring Condition]
    · VOP = TYP. value at Operating Temperature
    · θX = θY = 0°

5. Reliability

5-1 Content of Reliability Test

Environmental Test				
No	Test Item	Conntent of Test	Test Condition	Applicable standard
1	High temperature storage	Endurance test applying the high storage temperature for a long time.	60 ℃ 200 H	——
2	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-20 ℃ 200 H	——
3	High temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	50 ℃ 200 H	——
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time.	0 ℃ 200 H	——
5	High temperature/ humidity storage	Endurance test applying the high temperature and high humidity storage for a long time.	60 ℃ 90 %RH 96 H	MIL-202E-103B JIS-C5023
6	High temperature/ humidity operation	Endurance test applying the electric stress (Voltage & Current) and temperature/humidity stress to the element for a long time.	50 ℃ 90 %RH 96 H	MIL-202E-103B JIS-C5023
7	Temperature cycle	Endurance test applying the low and high temperature cycle. -20℃ ⟷ 25℃ ⟷ 60℃ ⟷ 25℃ 30min. 5min. 30min. 5min. ⟵———————————⟶ 1 cycle	-20℃/60℃ 10 cycle	——
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz →1.5G Total 0.5H	MIL-202E-201A JIS-C5025 JIS-C7022-A-10
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11msec 3 times of each direction	MIL-202E-213B
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115 mbar 40 H	MIL-202E-105C
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS = 800 v RS = 1.5 kΩ CS = 100 PF 1 time	MIL-883B-3015.1

*1) Driving condition for operation test
    Power supply voltage for Logic system = 5V
    Power supply voltage for LCD system = Getting Optimum Contrast at 25℃

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5-2 Failure Judgement Criterion

Criterrion Item	Test Item No.											Failure Judgment Criterion
	1	2	3	4	5	6	7	8	9	10	11	
Basic Specification	○	○	○	○	○	○	○	○	○	○	○	Out of the Basic Specification
Electrical characteristic	○		○	○	○	○					○	Out of the DC and AC Characteristic
Mechanical characteristic						○	○	○	○			Out of the Mechanical Specification Color change : Out of Limit Apperance Specification
Optical characteristic	○	○	○	○	○	○	○			○	○	Out of the Apperance Standard

SEIKO EPSON CORPORATION

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6. Package Specifications

6-1 Inner Carton Box

Each LCD module is wrapped with a antistatic pouch, and put into the inner carton box for containing 10 pcs of LCD module.
The following contents should be indicated on the inner carton box.

Type EG4801S-AR
Q'ty 10pcs.
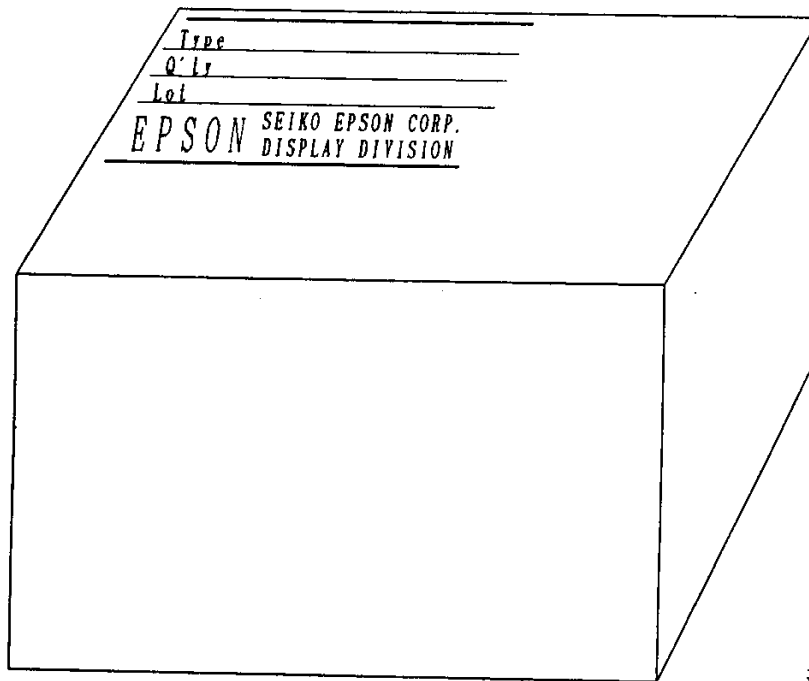Lot Lot No.
EPSON SEIKO EPSON CORP.
    DISPLAY DIVISION

Fig.1 Outline of Inner Carton Box

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6-2 Master Carton Box

The master carton box is for sending to each user.
The master carton box contains 2 pcs of inner carton box.
The indications are applied to four faces A, B, C and D of the master carton as shown Fig. 1 below.
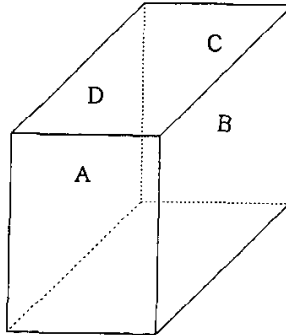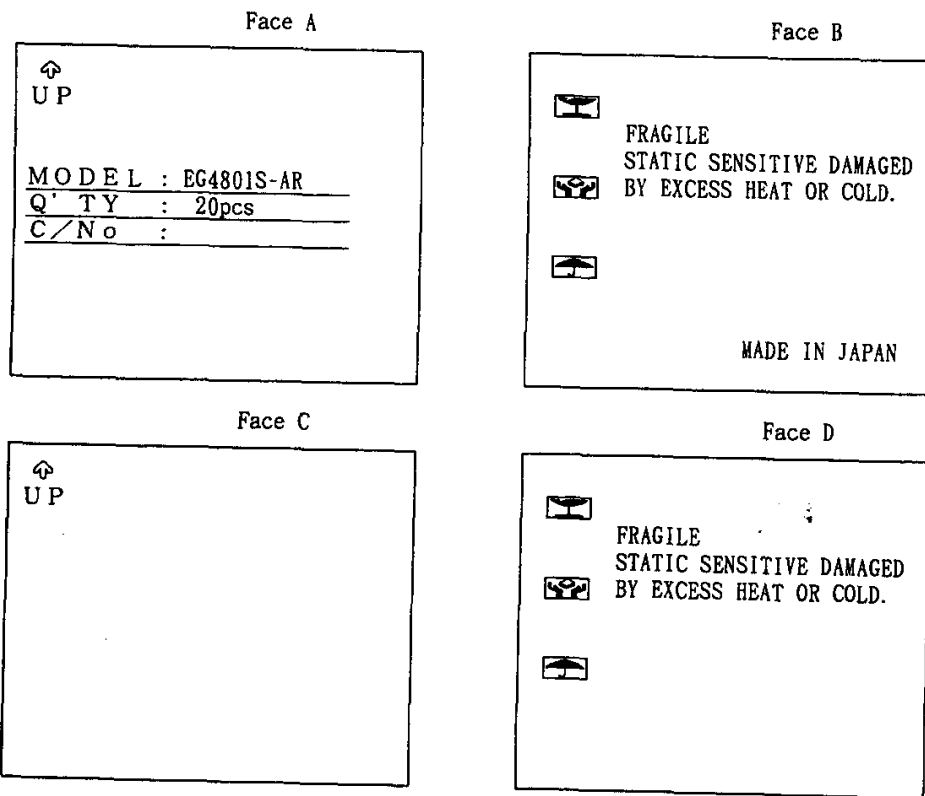
Fig. 1 Outline of Master Carton Box

Face A

```
↑
U P


M O D E L  : EG4801S-AR
Q' T Y    :   20pcs
C／N o     :
```

Face B

```
FRAGILE
STATIC SENSITIVE DAMAGED
BY EXCESS HEAT OR COLD.



                    MADE IN JAPAN
```

Face C

```
↑
U P
```

Face D

```
FRAGILE
STATIC SENSITIVE DAMAGED
BY EXCESS HEAT OR COLD.
```

Fig. 2 Contents of Indication for Master Carton Box

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Precautions for use of LCD Modules

<Handling Precautions>

• The display panel is made of glass. Do not subject it to a mechanical shock
  by dropping it from a high place, etc.

• If the display panel is damaged and the liquid crystal substance inside it leaks out,
  be sure not to get any in your mouth. If the substance comes into contact with
  your skin or clothes, promptly wash it off using soap and water.

• Do not apply excessive force to the display surface or the adjoining areas
  since this may cause the color tone to vary.

• The polarizer covering the display surface of the LCD module is soft and
  easily scratched. Handle this polarizer carefully.

• If the display surface becomes contaminated, breathe on the surface and gently
  wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth
  with one of the following solvents.

  - Isopropyl alcohol
  - Ethyl alcohol

  Solvents other than those mentioned above may damage the polarizer.
  Especially, do not use the following.

  - Water
  - Ketone
  - Aromatic solvents

• Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes
  is accelarated by water droplets, moisture condensation or a current flow
  in a high-humidity environment.

• Install the LCD Module by using the mounting holes. When mounting the LCD Module
  make sure that it is free of twisting, warping, and distortion.
  In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

• Do not attempt to disassemble or process the LCD Module.

• NC terminal should be open. Do not connect anything.

• If the logic circuit power is off, do not apply the input signals.

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• To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

   • Be sure to ground the body when handling the LCD Modules.

   • Tools required for assembly, such as soldering irons, must be properly grounded.

   • To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

   • The LCD Module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

<Storage Precautions>

• When storing the LCD Modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature/normal humidity conditions (avoid high temperature/ high humidity and low temperatures below 0 ℃). Whenever possible, the LCD Modules should be stored in the same conditions in which they were shipped from our comany.

<Design Precaustions>

• The absolute maximum ratings represents the rated value beyond which LCD Modules cannot exceed. When the LCD Modules are used in excess of this rated value, their operating characteristics may be adversely affected.

• To prevent the occurrence of erroneous operation caused by noise, attention must be paied to satisfy VIL, VIH, and the other specification values, including taking the precaution of using signal cables that are short.

• The liquid crystal display exhibits temperature dependency characteristics. Since recognition of the display becomes difficult when the LCD is used outside its designated operating temperature range, be sure to use the LCD within this range. Also, keep in mind that the voltage levels necessary for clear displays (Vop) will vary according to temperature.

• If DC is impressed on the liquid crystal display panel, display definition is rapidly deteriorated by the electrochemical reaction that occurs inside the liquid crystal panel. To eliminate the opportunity of DC impressing, be sure to maintain the AC characteristics of the input signals sent to the LCD Module (especially, LP, DIN, and FR).

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• When turning the power supply ON/OFF, strictly follow the sequence shown in Fig.1 so that latch-up and DC driving of the LCD Module can be prevented.
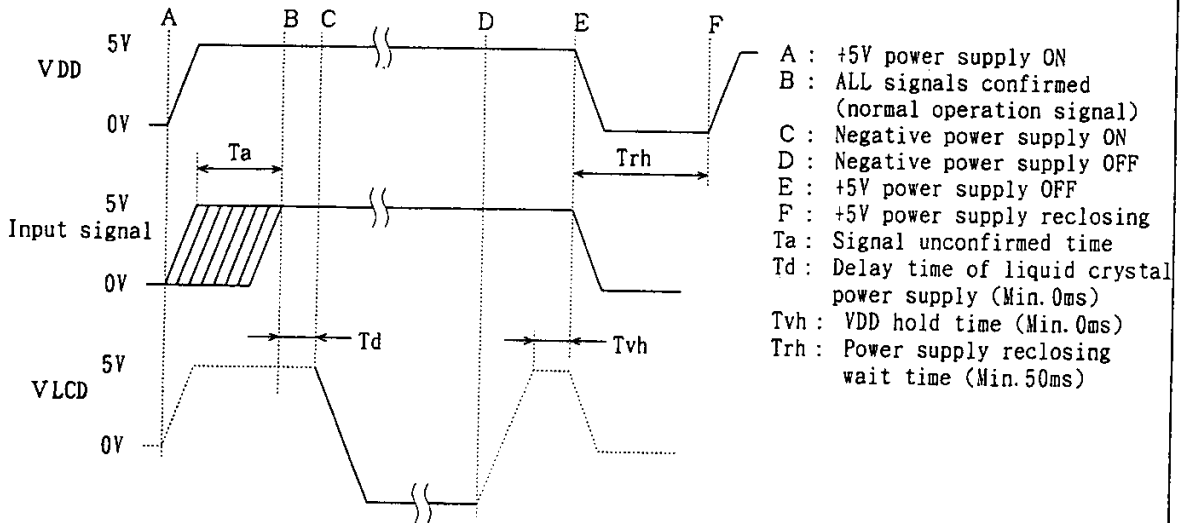

A : +5V power supply ON
B : ALL signals confirmed (normal operation signal)
C : Negative power supply ON
D : Negative power supply OFF
E : +5V power supply OFF
F : +5V power supply reclosing
Ta : Signal unconfirmed time
Td : Delay time of liquid crystal power supply (Min.0ms)
Tvh : VDD hold time (Min.0ms)
Trh : Power supply reclosing wait time (Min.50ms)
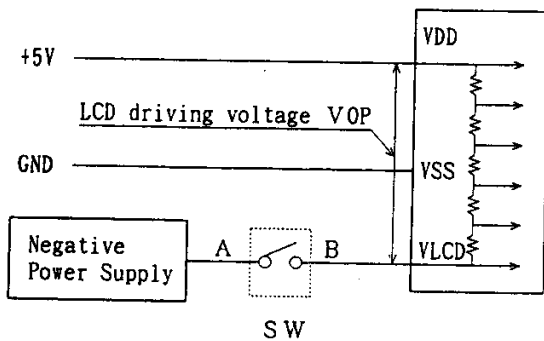
Fig.1 Power supply ON/OFFsequence

Fig.2 Example of power supply connection
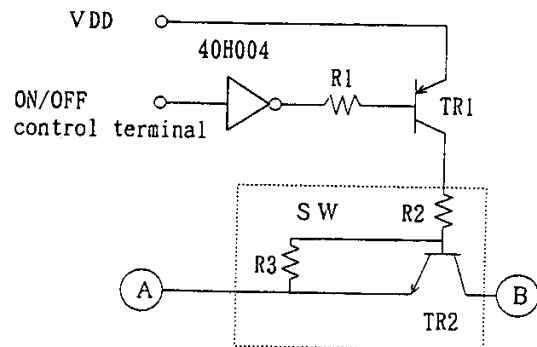

Fig.3 Example of SW section circuit

• Fig.1 shows the voltage levels at the module terminal section when the module is connected to a power supply and signal lines.

• Regarding VLCD in Fig.1, the dashed line shows the OFF status of SW in Fig.2, while the solid line indicates the ON status.

• Prepare the negative power supply shown in Fig.2 with a capacity that is at least sufficient to handle the current of the liquid crystal power supply in DC characteristics.

• Fig.3 provides an example of the circuit for SW section in Fig.2.

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\<Others\>

· Liquid crystals solidify under low temperatures (below the storage temperature range)
leading to defective orientation or the generation of air bubbles (balck or white).
Air bubbles may also be generated if the module is subjected to a strong shock at
a low temperature.

· If the LCD Modules have been operating for a long time showing the same display patterns,
the display patterns may remain on the screen as ghost images and a slight contrast
irregularity may also appear. A normal operating status can be regained by suspending
use for some time.
It should be noted that this phenominon does not advesely affect performance reliability.

· To minimize the performance degradation of the LCD Modules resulting from destruction
caused by static electricity, etc., exercise care to avoid holding the following sections
when handling the modules.

    · Exposed area of the printed circuit board

    · Terminal electrode sections

Revision Record

REV.	Revision Items	Date
	NEW	1993. 1.28
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		
K		
L		
M		
N		
P		
Q		
R		
S		
T		
U		
V		
W		
X		

	Sheet Code	
SEIKO EPSON CORPORATION		00-010006500