

EPSON

EPSON AMERICA, INC.
OEM Products Division

SPECIFICATIONS

REF. DATE: _____
PAGE _____ OF _____
REV. _____

90315

LIQUID CRYSTAL DISPLAY
DOT MATRIX LCD MODULE
EA-Y SERIES
DEVELOPMENTAL SPECIFICATION

MAY 20, 1982

MODELS: ~~EA-Y16015AZ~~
~~EA-Y16025AZ~~
~~EA-Y20015AZ~~
~~EA-Y20075AZ~~
~~EA-Y20080AT~~
~~EA-Y24015AZ~~
~~EA-Y40015AT~~
~~EA-Y40025AT~~
~~EA-Y40040AT~~
~~EA-Y40080AT~~
~~EA-Y80015AT~~
~~EA-Y80025AT~~
EA-Y80040AT

PRELIMINARY

I. OUTLINE

1. Description

EPSON's new dot matrix LCD modules, EA series, consist of a newly developed TN type FEM liquid crystal display with high-contrast and wide-viewing angle, C-MOS LCD driver and controller. The combination of LCD and semiconductor technology features high reliability and low power consumption.

All models of the EA series have CHARACTER GENERATOR and DATA RAM on board which provide for easy interface with most CPUs, and all the display functions are controlled by the instructions from the controller. A display character is composed of 5 x 7 dot matrix with cursor. Wide variations (16 to 320 characters) offer numerous applications.

I. OUTLINE

2. Features

- Excellent readability
- High contrast/Wide viewing angle
- Easy "Microprocessor" interface
- Single "+5V" power supply
- Low power consumption
- Wide operating temperature range
- C-MOS/TTL compatible signal level
- Easy installation
- Lightweight/Compact construction
- Optional backlighting (With EL panel)
- 5x7 dot matrix format with cursor, alphanumeric and special symbols
- Wide variety of display formats (16 to 320 characters)
- Built-in RAM for display data storage
- 96 ASCII CHARACTER GENERATOR (plus 64 katakana)
- Multiple instruction set (based on 13 commands)

I. OUTLINE

3. Part Number Table & Mechanical Specifications

Part Number	Character Format Characters X Line(s)	Character Size (with cursor)	Character Pitch	Dot Size (W X H)	Effective Viewing Area
EA-YD0040AT	80 X 4	2.1 X 3.30 (0.32) 0.003 X 0.133 (0.170)	2.54 0.1	0.38 X 0.44 0.015 X 0.017	212 X 28 8.346 X 1.102

Unit = $\frac{mm}{inch}$

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Unit = $\frac{mm}{inch}$ & $\frac{gRAM}{ounce}$

Mating Connector Suppliers :

Note 3. T & B Analey P/M 609-3415M or equivalent

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1. OUTLINE

3. Part Number Table & Mechanical Specifications

EA-780090AT	86 x 7	2.1 x 3.38 (4.32) 0.081 x 0.133 (0.170)	2.50 0.1	0.30 x 0.40 0.015 x 0.017	212 x 28 0.346 x 1.102
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Unit = $\frac{mm}{inch}$

Part Number	Module Size/ Without Connector (W x H x D)	Duty Cycle	Weight (Approx.)	Connector Type (No. of Contacts)	Note
EA-780090AT	29.3 x 30.8 x 11.6 11.531 x 3.150 x 1.220	1/16	450 19.9	Card edge (30)	

Unit = $\frac{mm}{inch}$ & $\frac{gram}{ounce}$

Mating Connector Suppliers :

Note 3. T & B Analey P/N 809-3315M or equivalent

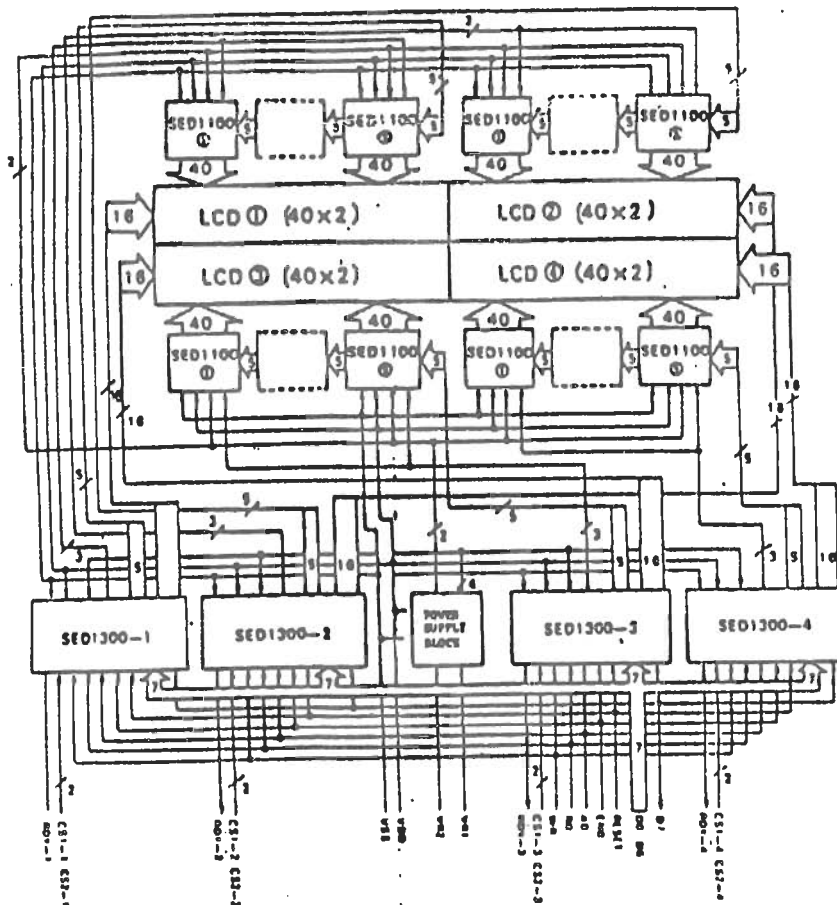
1. OUTLINE

4. Construction

- 1) EPSON EA Series LCD Module is mainly composed of X-Unit (Upper PCB) and Y-Unit (Lower PCB). X-Unit includes TN type FEM Liquid Crystal Display and multiple segment driver LSIs. Y-Unit includes one or multiple controller LSIs with common driver function, and power circuit.
- 2) This EA Series LCD Module is designed to function by single power supply (+5V), and power source for driving LCD is generated in the power circuit installed.
- 3) The contrast of LCD panel depends on the temperature and the viewing angle. This EA series LCD module has adjusting terminals so that you can adjust the contrast to be the best condition in any circumstance guaranteed in the Absolute Maximum Ratings. Contrast Adjusting is obtained by connecting recommended resistor (See "Signal Descriptions" P.18) to the Terminal VR1, VR2. ~~The following module includes Contrast Adjusting Potentiometer, so resistor is not needed.~~

- ~~EA-Y16015A8~~
- ~~EA-Y20015A2~~
- ~~EA-Y24015A2~~
- ~~EA-Y40015A7~~
- ~~EA-Y80015A7~~

- 4) All the display function concerning display data, address data, cursor function are controlled by 1) kinds of commands input through data bus.
- 5) The controller LSI includes Data RAM and CHARACTER GENERATOR (Based on ASCII Code). The display is performed only by writing 8 bit data from the MPU into the Data RAM. Therefore, the system design is very easy.



EA-Y80015A7



(TOP VIEW)

II. SPECIFICATIONS

1. Absolute Maximum Ratings

Item	Symbol	Standard Value	Unit
Power Supply Voltage	VSS	0	V
	VDD	6.5	
Input Voltage	VIN	$VSS \leq VIN \leq VDD$	V
Storage Temperature	Tstg	-20 to +60	°C
Operating Temperature	Top	0 to 50	°C

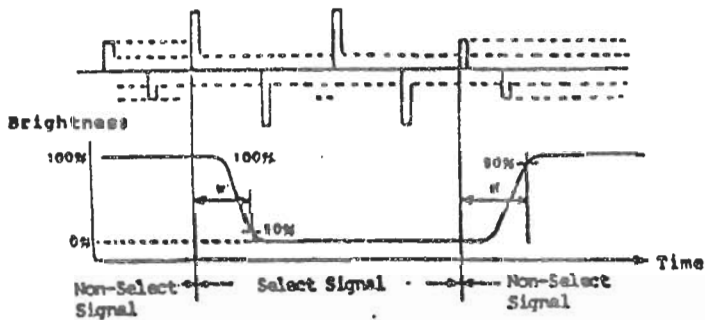
II. SPECIFICATIONS

2. Optical Characteristics

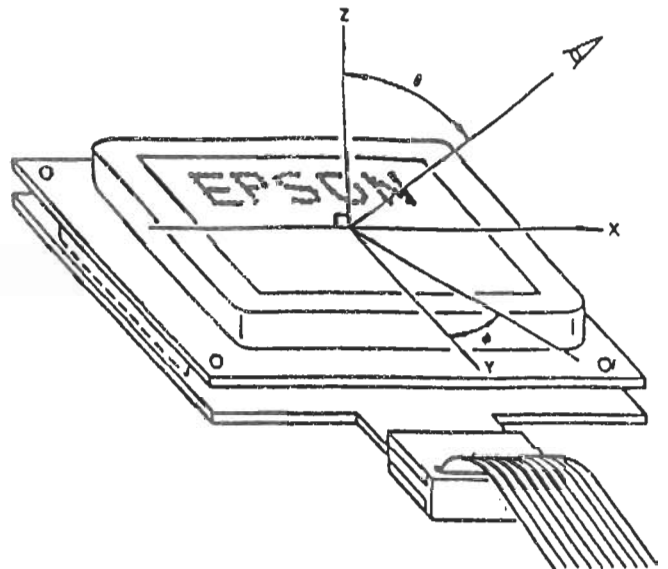
Item	Symbol	Standard Value			Unit	Note	
		Min.	Typ.	Max.			
Response Time	Rise	tr	-	150	180	μS	1
	Fall	tf	-	150	160		
Contrast Ratio	R	-	9:1	10:1			2
Recommended	Front-Rear	θ	±10 to ±30		Degree	3	
Viewing Angle	Left-Right	φ	-30 to +30				
Life	-	-	50,000	-	-	Hour	4

Ta : 25 °C

NOTE 1) Definition of tr, tf

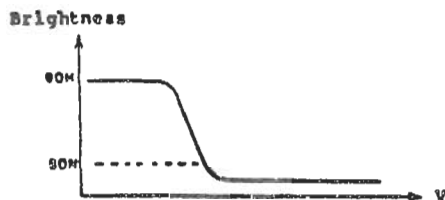


NOTE 3) Definition of Viewing Angle



NOTE 2) Definition of Contrast Ratio

$$R = \frac{\text{Brightness at non Bias State}}{\text{Maximum Brightness at Turn-ON Signal Input State}}$$



NOTE 4) Definition of Life Time

In normal use and storage condition (Room temperature 25°C, without exposing to the sun light directly, and humidity 65%RH), no considerable degradation to be seen on its function, characteristics, appearances, etc.

II. SPECIFICATIONS

1). DC Electrical Characteristics

Item	Symbol	Conditions	Standard Value			Unit	Remarks
			Min.	Typ.	Max.		
Supply Voltage	VDD	-	4.75	5	5.25	V	VDD
Supply Current	IDD	VDD = 5V	Note 1			µA	
"0" Input Voltage	VIL	-	-	-	0.8	V	Note 1
"1" Input Voltage	VIH	-	2.0	-	-	V	
"0" Output Voltage	VOL	IOL = 1.6mA	-	-	0.9	V	Note 2
"1" Output Voltage	VOH	IOL = 250µA	2.0	-	-	V	
"0" Input Leak Current	IIL-1	VI = 0V Pull-Up Resistor Installed(RESET)	-	-12.0	-	µA	RESET WR, RD
"1" Input Leak Current	IIL-1	VI = VDD	-	-	1.0	µA	
"0" Input Leak Current	IIL-2	VI = 0V	-	-	1.0	µA	DS-07, AD CS1, CS2, CS3
"1" Input Leak Current	IIL-2	VI = VDD	-	-	1.0	µA	
"0" Output Leak Current	IOL	VO = 0V - 0.1V	-	-	1.0	µA	07, RDY
"1" Output Leak Current	IOM	VO = 2.4V - VDD	-	-	1.0	µA	

(Both Input and Output are TTL compatible and can be directly connected to LSTTL or C-MOS)

- * IOL : "0" Output Current / IOM : "1" Output Current
- Note 1 : DS-07, RESET, WR, RD, CS1, CS2, CS3, CS1-n (n:1-4), CS2, CS3-n (n:1-4)
- Note 2 : 07, RDY
- Note 3 : Supply Current (Power Current Consumption)

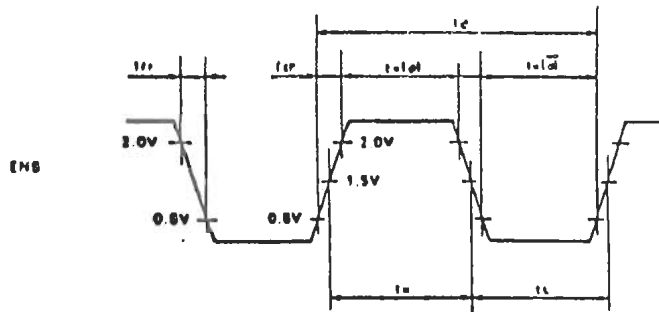
Part Number	Max	Part Number	Max
EA-716015AG (16x1)	0.8	EA-740025AF (20x2)	1.1
EA-716025AG (16x2)	0.8	EA-740040AF (40x1)	1.0
EA-720015AG (20x1)	1.0	EA-740080AF (40x2)	2.4
EA-720025AG (20x2)	1.0	EA-740015AF (80x1)	2.4
EA-720080AF (20x8)	1.2	EA-740025AF (80x2)	1.0
EA-724015AG (24x1)	1.0	EA-740040AF (80x1)	2.6
EA-740015AF (40x1)	1.1		

VDD = 5V / Unit 1 mA

II. SPECIFICATIONS

4. AC Electrical Characteristics and Timing Chart

1) Clock Signal

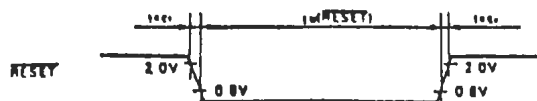


Item	Symbol	Standard Value			Unit	Remarks
		Min.	Typ.	Max.		
Enable Clock Pulse Period	tP	500	-	2000	nSec	
Enable Clock Pulse Width	tw(0), tw(1)	220	-	1050	nSec	
Enable Clock Pulse Transition Time	tER, tEF	-	-	50	nSec	
Enable Clock Pulse Duty	Duty	45	50	55	%	See Note

Top : 0 to +50°C, VDD : 5V ± 5%

$$\text{Note : Duty} = \frac{TH}{TH + TL} \times 100 (\%)$$

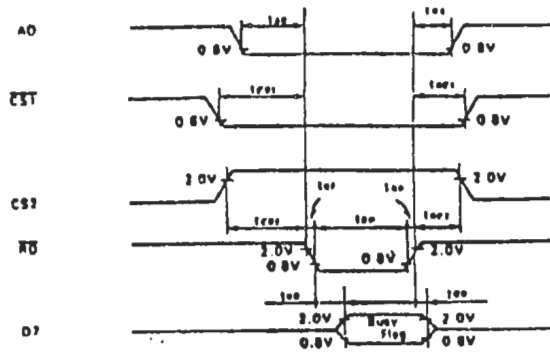
2) Reset Signal



Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Reset Pulse Width	tw(RESET)	5	-	-	nSec
Reset Pulse Transition Time	tER, tEF	-	-	500	µSec

Top : 0 to +50°C, VDD : 5V ± 5%

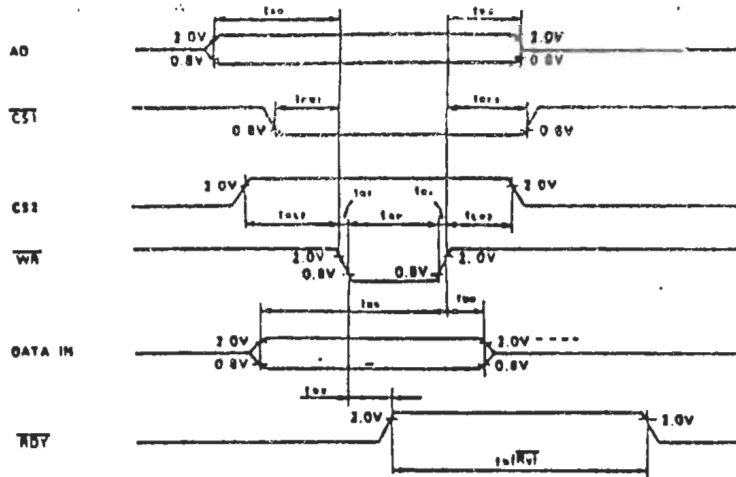
3) Read Timing



Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
AD→RD Set Time	tAS	0	-	-	nSec
CS1→RD Set Time	tCS1	0	-	-	nSec
CS2→RD Set Time	tCS2	0	-	0	nSec
Read Pulse Width	tRP	150	-	to x 8	nSec
Read Pulse Transition Time	tAR, tAF	-	-	50	nSec
RD RDY Output Delay Time	tAD	-	-	150	nSec
AD Hold Time	tRA	30	-	-	nSec
CS1 Hold Time	tCA1	30	-	-	nSec
CS2 Hold Time	tCC2	30	-	-	nSec
Data Output Disable Time	tOD	-	-	100	nSec

Top : 0 to +50°C, VDD : 5V ±5%

4) Write Timing



Item	Symbol	Standard Value			Unit	Remarks
		Min.	Typ.	Max.		
AD→WR Set Time	tAW	0	-	-	nSec	
CS1→WR Set Time	tCW1	0	-	-	nSec	
CS2→WR Set Time	tCW2	0	-	-	nSec	
Write Pulse Width	tWP	150	-	to x 8	nSec	
Write Pulse Transition Time	tWR, tWF	-	-	50	nSec	
Data Set Up Time	tDS	150	-	-	nSec	
AD Hold Time	tWA	30	-	-	nSec	
CS1 Hold Time	tWC1	30	-	-	nSec	
CS2 Hold Time	tWC2	30	-	-	nSec	
Data Hold Time	tDN	30	-	-	nSec	
WR RDY Output Delay Time	tWR	-	-	150	nSec	
Ready Signal Pulse Width	tW(RT)	-	-	to x 26	nSec	See Note

Top : 0 to +50°C, VDD : 5V ±5%

Note : The above tW(RT) is valid in all instructions except "CLEAR DISPLAY DATA". tW(RT) of "CLEAR DISPLAY DATA" is as follows,

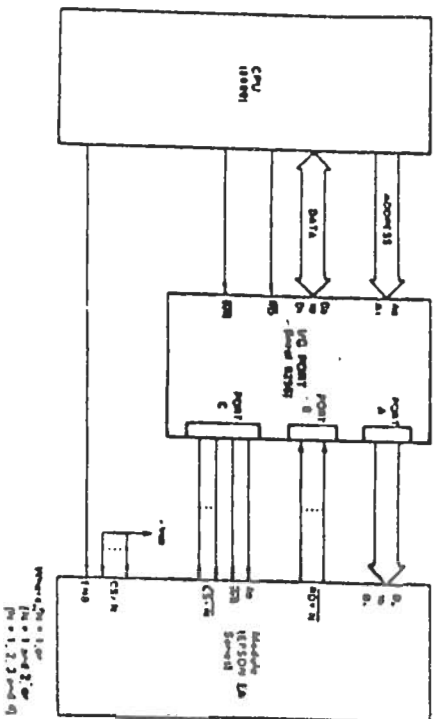
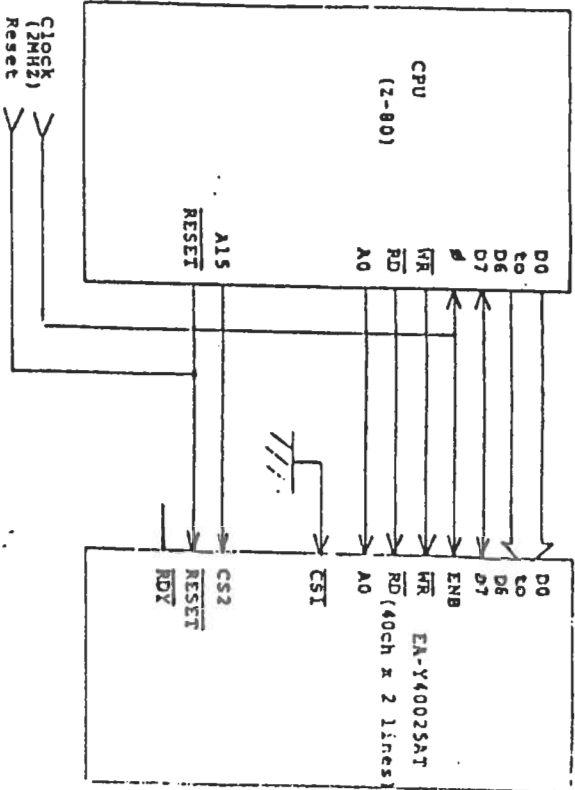
Part Number	Max.	Part Number	Max.
EA-Y16015AZ (16x1)	5.0	EA-Y40025AT (40x2)	2.5
EA-Y16025AZ (16x2)	2.5	*EA-Y40040AT (40x4)	2.5
EA-Y20015AZ (20x1)	5.0	*EA-Y40080AT (40x8)	1.68
EA-Y20025AZ (20x2)	2.5	EA-Y80015AT (80x1)	5.0
*EA-Y20080AT (20x8)	1.68	*EA-Y80025AT (80x2)	2.5
EA-Y24015AZ (24x1)	5.0	*EA-Y80040AT (80x4)	2.5
EA-Y40015AT (40x1)	5.0		

Unit : nSec

* These models employ multiple LSI controllers. The above values indicate tW(RT) per each display area controlled by one LSI.

III. INTER FACE


1. Examples of System Block Diagram



III. INTER FACE

2. Signal Descriptions

Signal	I/O	Function
VDD	I	Power Supply (+5V)
VSS	I	GND (0 V)
RESET	I	Active-Low Input for Initialization. (When power is supplied, the controller LSI is reset to be following status) DISPLAY : off, CURSOR : off, CURSOR POINT : underline, UNDERLINE CURSOR : blinking off, CURSOR DIRECTION : forward DISPLAY SUPPRESS : off, CURSOR DIRECTION : forward As for RESET signal, refer to "Reset Signal" P.18 (Note) This terminal includes Pull-Up resistor of about 500K .
A0	I	This signal changes command to either Character Code Input or Instruction Code Input. A0 = "1" : Character Code Input A0 = "0" : Instruction Code Input
ENB	I	External system clock input. As for Clock Signal, refer to "Clock Signal" P.18
RD	I	Read signal input. (Active-Low) RD will pulse low when master processor reads status of Busy Flag register.
WR	I	Write signal input. (Active-Low) WR will pulse low when master processor writes Character Code or Instruction Code to the module.
D0 to D7	I/O (Data)	8 bit input port which interface to the master system data bus. (MSB : DT, LSB : D0) Only DT is I/O port and outputs Busy Signal : DT = "1" : Busy DT = "0" : Not Busy

Signal	I/O	Function																						
$\overline{CS1}$ $CS1-N (N:1-4)$ $CS2$ $CS2-N (N:1-4)$	I	Chip Select input. $CS1, CS1-N (N:1-4) = "0"$ and $CS2, CS2-N (N:1-4) = "1"$: Active Some models which display over 80 total characters employ multiple controller LSIs, and each controller LSI controls a specific portion of the display. These are selected by the Chip Select signal. (See "Address Code Map" P.32)																						
\overline{RDY} $RDY-N (N:1-4)$		Outputs "Ready" or "Not Ready" signal. $\overline{RDY} = "0"$: Ready $\overline{RDY} = "1"$: Not Ready Some models which display over 80 total characters employ multiple controller LSIs, and each controller LSI has Ready Output corresponding to the each display area. (See "Address Code Map" P.32) (Note) When Reset Signal is applied, this signal status will be "Ready".																						
VRI $VRI2$	I	These potentiometer terminals / signals are for adjusting the contrast ratio and viewing angle. These signals have been pre-set by the factory for the following models. (no connection required). $EA-Y16015AZ$ $EA-Y20015AZ$ $EA-Y24015AZ$ $EA-Y40015AT$ $EA-Y80015AT$																						
		The following models utilize a potentiometer for adjusting the contrast ratio and viewing angle. <table border="1" style="margin: 10px auto;"> <thead> <tr> <th rowspan="2">Part Number</th> <th colspan="2">Potentiometer</th> </tr> <tr> <th>(KΩ)</th> <th>(W)</th> </tr> </thead> <tbody> <tr><td>EA-Y16025AZ</td><td>50</td><td rowspan="10" style="text-align: center; vertical-align: middle;">1/8</td></tr> <tr><td>EA-Y20025AZ</td><td>50</td></tr> <tr><td>EA-Y20080AT</td><td>20</td></tr> <tr><td>EA-Y40025AT</td><td>50</td></tr> <tr><td>EA-Y40040AT</td><td>30</td></tr> <tr><td>EA-Y40080AT</td><td>20</td></tr> <tr><td>EA-Y80025AT</td><td>30</td></tr> <tr><td>EA-Y80040AT</td><td>10</td></tr> </tbody> </table>	Part Number	Potentiometer		(K Ω)	(W)	EA-Y16025AZ	50	1/8	EA-Y20025AZ	50	EA-Y20080AT	20	EA-Y40025AT	50	EA-Y40040AT	30	EA-Y40080AT	20	EA-Y80025AT	30	EA-Y80040AT	10
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EA-Y40080AT	20																							
EA-Y80025AT	30																							
EA-Y80040AT	10																							
																								
FG	I		Frame Ground (connected to the metal bezel) can be used when ground is required for the metal bezel.																					

II. INTER FACE

1) Command Code Table

3. Command Descriptions

No.	Instruction	CS1	CS2	WR	RD	A0	BDT	DT	D6	D5	D4	D3	D2	D1	D0	Max. Execute Time (mSec)	Remarks
1	SYSTEM RESET	0	1	0	1	0	0	0	0	0	1	0	0	0	0	to 26	
2	CLEAR DISPLAY DATA	0	1	0	1	0	0	0	0	0	0	0	0	0	1		Note 1
3	CURSOR AT HOME	0	1	0	1	0	0	0	0	0	0	0	0	1	0	to 26	
4	CURSOR RETURN	0	1	0	1	0	0	0	0	0	0	0	0	1	1	to 26	
5	SET CURSOR DIRECTION	0	1	0	1	0	0	0	0	0	0	0	1	0/1		to 26	Note 2
6	CURSOR INC/DEC	0	1	0	1	0	0	0	0	0	0	0	1	1	0/1	to 26	Note 3
7	SET CURSOR FONT	0	1	0	1	0	0	0	0	0	0	1	0	0	0/1	to 26	Note 4
8	UNDERLINE CURSOR BLINKING ON/OFF	0	1	0	1	0	0	0	0	0	1	0	1	0/1		to 26	Note 5
9	CURSOR ON/OFF	0	1	0	1	0	0	0	0	0	1	1	1	0/1		to 26	Note 6
10	DISPLAY ON/OFF	0	1	0	1	0	0	0	0	0	1	1	0	0/1		to 26	Note 7
11	DISPLAY SUPPRESS ON/OFF	0	1	0	1	0	0	0	0/1	1	0	0	0	0		to 26	Note 8
12	SET CURSOR ADDRESS	0	1	0	1	0	0	1	Address Data (See Address Code Map P.32)							to 24	
13	SET CHARACTER DATA	0	1	0	1	1	0	Character Data (See Character Code Map P.38)							to 25		

- Notes : 1. Refer to "Write Table" P.16
- | | |
|------------------------------------|--------------------------|
| 2. (0/1) 0 : FORWARD (INCREMENT) | 3 : REVERSE (DECREMENT) |
| 3. (0/1) 0 : INCREMENT (RIGHT) | 1 : DECREMENT (LEFT) |
| 4. (0/1) 0 : UNDERLINE | 1 : S = 7 BLINKING |
| 5. (0/1) 0 : BLINKING OFF | 1 : BLINKING ON |
| 6. (0/1) 0 : CURSOR DISPLAY OFF | 1 : CURSOR DISPLAY ON |
| 7. (0/1) 0 : THE WHOLE DISPLAY OFF | 1 : THE WHOLE DISPLAY ON |
| 8. (0/1) 0 : SHARP OFF | 1 : SHARP ON |
- (CORNERS SUPPRESS REQUEST)

2) Operation

The EA series contains a CHARACTER GENERATOR for 160 character patterns based on ASCII and a Display Data RAM for the display refresh. For a display over 80 total characters, multiple C-MOS controller LSIs are used. In these cases, each LSI controls a specific part of the Display. Therefore, the following instruction commands must be given to each controller LSI. Refer to "Address Code Map" for display area controlled by each controller LSI (See P.32).

When you use the "CURSOR AT HOME" and "CURSOR RETURN" commands, be careful because these commands are effective only in the display areas controlled by each controller LSI.

You are required to preset the CURSOR ADDRESS in case of line-feed or return or when the cursor moves to the display area of the other controller LSI.

No.1 SYSTEM RESET :

AO	WR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	1	0	0	0	0	10

The following registers are set to the initial status by executing the "SYSTEM RESET" command. The Display Data RAM is not cleared and its contents remain unchanged.

Initial status : DISPLAY : off, CURSOR : off, UNDERLINE CURSOR : blinking off,
CURSOR FONT : underline, DISPLAY SUPPRESS : off, and
SET CURSOR DIRECTION : forward

No.2 CLEAR DISPLAY DATA

AO	WR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	0	0	0	0	1	01

All locations in the Display Data RAM are set to the ASCII space code "20-Hex" (See "Character Code Map" P.36) by executing the "CLEAR DISPLAY DATA" command which clears the display. In addition, the cursor returns to the Home Position.

Note 1) The Home Position is the first address of the first line in the display area controlled by each controller and the address code is "80-Hex" (See "Address Code Map" P.32)

Note 2) In this command, execute time depends upon each model (See "Write Timing" P.16)

No.3 CURSOR AT HOME

AO	WR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	0	0	0	1	0	02

The cursor returns to the Home Position of each LSI by executing the "CURSOR AT HOME" command.

Note) The Home Position is the first address of the first line in the display area controlled by each controller and the address code is "80-Hex" (See "Address Code Map" P.32)

No.4 CURSOR RETURN

AO	WR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	0	0	0	1	1	03

The cursor returns to the first address of the line (in the display area controlled by each controller) by executing "CURSOR RETURN" command.

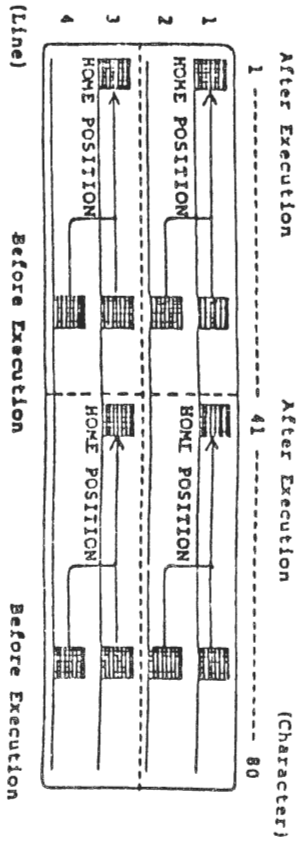
Note 1) This "CURSOR RETURN" command is of no value when the cursor address in the Data RAM is out of the display area.

Note 2) In the case of EA-T800151T, "CURSOR AT HOME" command should be used instead of "CURSOR RETURN" command.

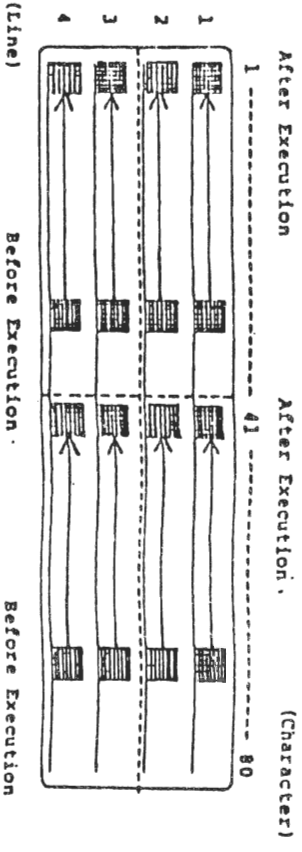
Note 3) In the case of the model which employs multiple LSIs, this "CURSOR RETURN" command is valid in each display area controlled by each controller LSIs. (See following figures)

EA-Y80040AT

CURSOR AT HOME



CURSOR RETURN



No.5 SET CURSOR DIRECTION

A0	VR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	0	0	1	0	0	0/1 04,05

The "SET CURSOR DIRECTION (FORWARD / REVERSE)" command selects the direction to move cursor either in the FORWARD or REVERSE direction according to the value of D0. Upon execution of this command, the cursor address automatically proceeds to the next address, only if the "SET CHARACTER DATA" command is implemented. This command also disables the other.

D0	DIRECTION
0	FORWARD (INCREMENT)
1	REVERSE (DECREMENT)

Note) This command supersedes the "CURSOR INC/DEC" command.

No.6 CURSOR INC/DEC

A0	VR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	0	0	1	1	0/1	06,07

The "CURSOR INC/DEC" command implements the cursor INCREMENT or DECREMENT according to the value of D0. Upon execution of this command, only the cursor will shift RIGHT or LEFT by one address. This command also disables the other.

D0	DIRECTION
0	INCREMENT (RIGHT)
1	DECREMENT (LEFT)

No.7 SET CURSOR FONT

A0	VR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	0	1	0	0	0/1	08,09

The "SET CURSOR FONT (UNDERLINE / 5x7 BLINKING)" selects the cursor style, UNDERLINE or 5x7 BLINKING, according to the value of D0. This command also disable the other.

D0	FONT STYLE
0	UNDERLINE
1	5x7 BLINKING

Note) 5x7 BLINKING can not be stopped.

UNDERLINE CURSOR



(Continuously ON)

5 x 7 BLINKING CURSOR



No.8 UNDERLINE CURSOR BLINKING ON/OFF

A0	VR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	0	1	0	1	0/1	0A,013

The "UNDERLINE CURSOR BLINKING (ON/OFF)" commands the blinking feature ON or OFF according to the value of D0, and also disables the other.

D0	BLINKING
0	OFF
1	ON

Note) For UNDERLINE CURSOR only. This command does not apply to the SET blinking cursor.

No.9 CURSOR ON/OFF

A0	VR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	0	1	1	1	0/1	0E,0F

The "CURSOR ON/OFF" command turns the display of the cursor ON or OFF according to the value of D0, and also disables the other.

D0	CURSOR DISPLAY
0	OFF (ENABLE)
1	ON (DISABLE)

Note) This command supercedes "SET CURSOR FONT" or "UNDERLINE CURSOR BLINKING"

No.10 DISPLAY ON/OFF

A0	VR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	0	0	0	0	1	1	0	0/1	0C,0D

The "DISPLAY ON/OFF" command turn the entire display ON or OFF according to the value of D0, and also disables the other.

D0	DISPLAY
0	OFF (ENABLE)
1	ON (DISABLE)

Note) The Display Data RAM is not cleared and its contents remain unchanged.

No.11 DISPLAY SUPPRESS ON/OFF

The "DISPLAY SUPPRESS ON/OFF" turns the display from the cursor which is directed by the "SET CURSOR DIRECTION" ON or OFF according to the value of D6, and also disables the other.

D6	DISPLAY SUPPRESS
0	OFF (Cancels Suppress Request)
1	ON (Suppresses the display)

Note) The Display Data RAM is not cleared and its contents remain unchanged.

No.12 SET CURSOR ADDRESS

A0	VR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
0	0	1	Address Data							80-ET

The "SET CURSOR ADDRESS" command designates a Data RAM location by an 8 bit address code and is used for presetting the cursor address. As for the correspondence between address code and the cursor address, refer to the address Code Map P.32 (Some models which display over 80 total characters employ multiple controller LSIs and each LSI controls a specific part of the display).

No.13 SET CHARACTER DATA

A0	VR	D7	D6	D5	D4	D3	D2	D1	D0	Hex
1	0	8	CHARACTER CODE							20-7F,80-0F

The "SET CHARACTER DATA" command transfers 8 bits of 16-ASCII Character Code to the Display Data RAM location address by the address pointer.

11

3) Busy Flag

Reads the busy state, indicating internal operation is being performed at D7.
(D7 output is TTL compatible)

ITEM STATE	$\overline{CS1}$	$\overline{CS2}$	\overline{WR}	\overline{RD}	A0	\overline{RDY}	D7	D6 to D0
BUSY	0	1	1	0	*	*	1	*
NOT BUSY	0	1	1	0	*	*	0	*

* Not applicable

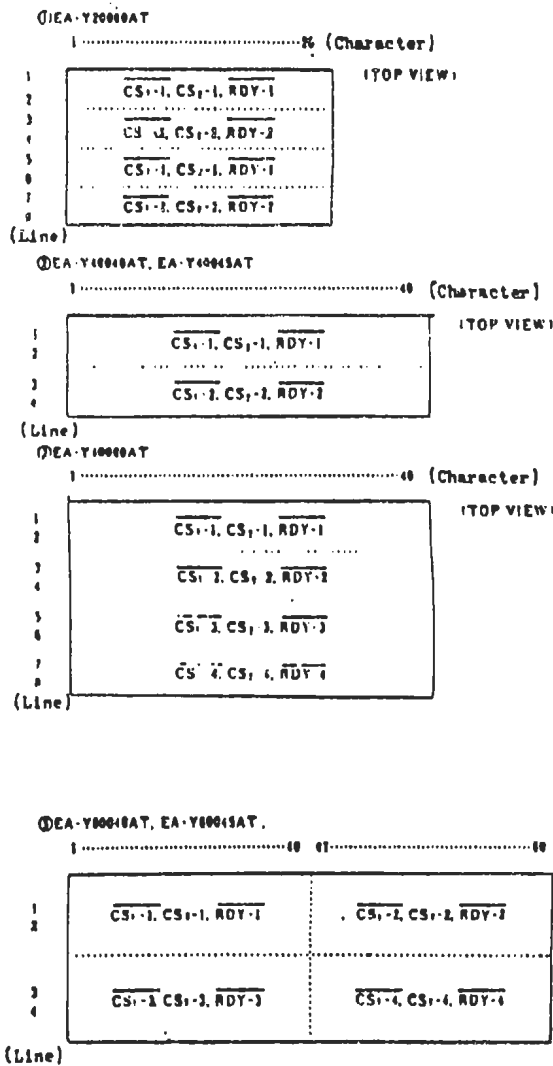
Note) In the case of the models which display over 80 total characters, this "Busy Flag" is performed to the display area selected by the "Chip Select" signal.

Ex.

L	F	$\overline{CS1-1}$	$\overline{CS1-2}$	$\overline{CS1-3}$	$\overline{CS1-4}$	$\overline{CS1-5}$	$\overline{CS1-6}$	$\overline{CS1-7}$	Terminal	D7	D6	D5	D4	D3	D2	D1	D0
1	70	0	1	1	0	1	0	1	0	$\overline{RDY-1}$	1	0	0	1	0	0	1
1	50	1	0	0	1	1	0	1	0	$\overline{RDY-2}$	1	1	0	0	1	0	0
4	40	1	0	1	0	1	0	1	0	$\overline{RDY-3}$	1	1	0	1	0	0	1

L:Line,F:Figure

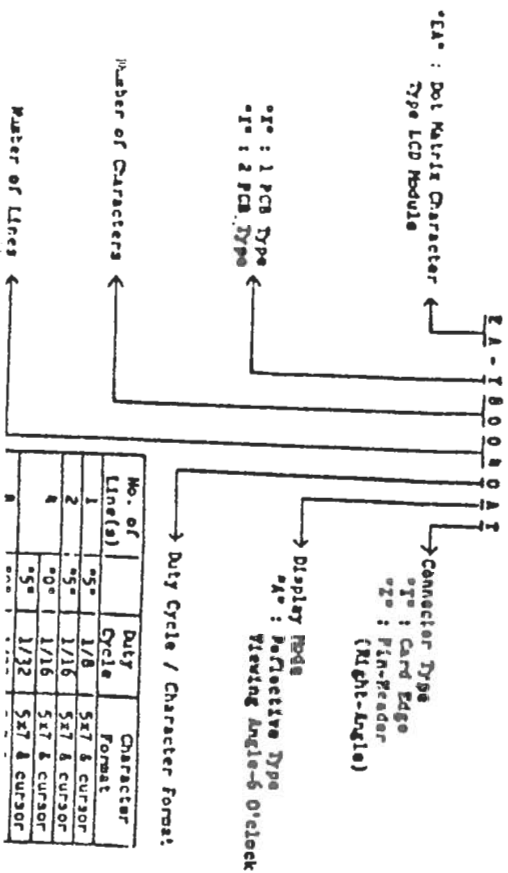
- Correspondence between CS(Chip Select) Terminal and Display Area



4. Character Code Map

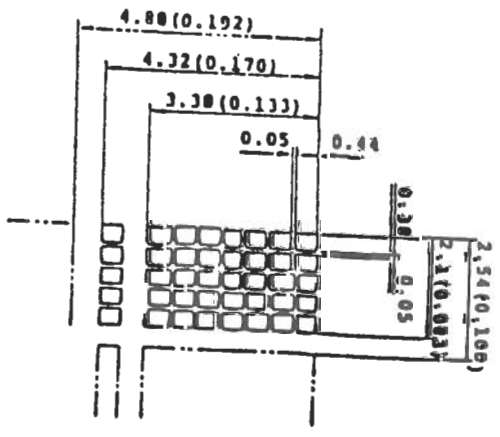
		Lower 4 bit of Character Code (Hexadecimal)															
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Higher 4 bit of Character Code (Hexadecimal)	0	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
	1	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
2	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	
3	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	
4	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	
5	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	
6	60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F	
7	70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F	
8	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	
9	90	91	92	93	94	95	96	97	98	99	9A	9B	9C	9D	9E	9F	
A	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF	
B	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF	
C	C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF	
D	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF	
E	E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF	
F	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF	

IV. MODEL NUMBER STRUCTURE

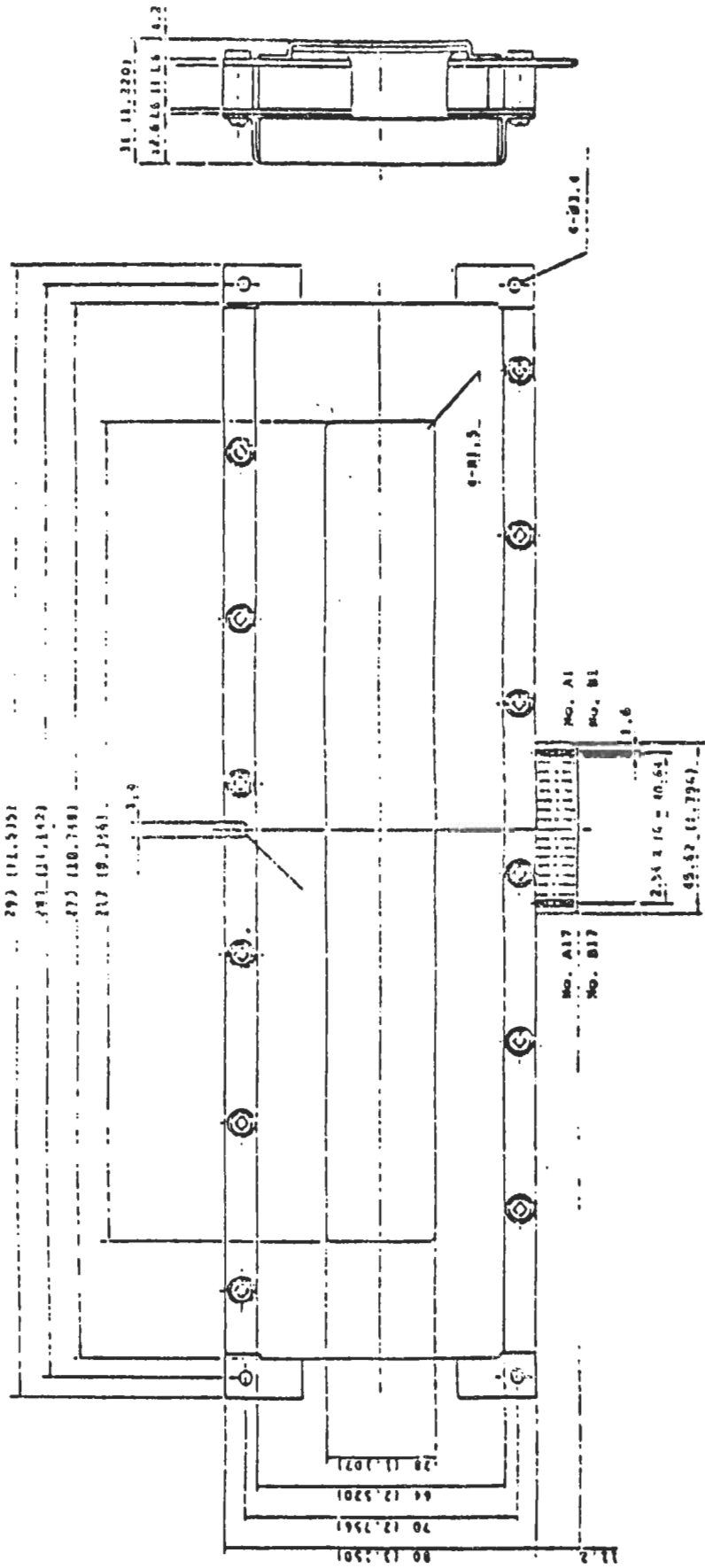


VI. HANDLING PRECAUTIONS

1. EPSON LCD modules employ CMOS LSI drivers, so we recommend that you:
 - a) Do not input any signals before power is turned on.
 - b) Ground your body, work/assembly areas and assembly equipment to protect the module against STATIC ELECTRICITY.
2. The LCD panel consists of two thin pieces of glass with polarizers, so we recommend that you:
 - a) Do not touch or press the glass surface.
 - b) Do not wipe the polarizer surface with dry or hairy materials.
3. To avoid degradation of the device, do not operate or store the module under the conditions of direct sunlight, high-temperature or high-humidity.



13



Unit : mm (Inch)

EA-T8000A7 (180 x 4)

No.	Signal	No.	Signal
A1	VDD (+5V)	B1	RESET
A2	ENB	B2	NC
A3	NC	B3	NC
A4	NC	B4	RDY-1
A5	RDY-2	B5	RDY-3
A6	RDY-4	B6	A0
A7	WR	B7	CS1-1
A8	CS1-2	B8	CS1-3
A9	CS1-4	B9	CS2-1
A10	CS1-2	B10	CS2-3
A11	CS2-4	B11	A1
A12	D0	B12	D1
A13	D1	B13	D2
A14	D2	B14	D3
A15	D3	B15	D4
A16	VR1	B16	VR2
A17	FG	B17	VSS (GND)