

APOLLO DISPLAY TECHNOLOGIES, INC.
194-22 MORRIS AVENUE
HOLTSVILLE, NY 11742
(516) 654-1143

PRODUCT SPECIFICATIONS



Apollo Display Technologies, Inc.

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OPTREX TYPE No. : DMF-50036ZNBU-FW

This specification is subject to change.
Please consult OPTREX to verify whether any changes
occur in the specification before starting your production.

REVISION No. 1 : JUN. 6. ' 95

OPTREX CORPORATION

This specification covers the technical data of the undermentioned Liquid Crystal Display(LCD)Module which is delivered from Optrex Corporation to Messrs.

2. Product

Liquid Crystal Display (LCD) Module.

3. Type No.

CLIENT Type No. : _____

OPTREX Type No. : DMF-50036ZNBU-FW

4. General Specifications

Operating Temp. : min. 10°C ~ max. 40°C
Storage Temp. : min. -20°C ~ max. 60°C
Dot Pixels : 640 (W) × 200 (H) dots
Dot Size : 0.32 (W) × 0.46 (H) mm
Dot Pitch : 0.35 (W) × 0.49 (H) mm
Viewing Area : 231.0 (W) × 105.0 (H) mm
Outline Dimensions: 270.0 (W) × (142.0)*(H) × 13.5 max.(D) mm
* Without CFL Cable.
LCD Type : NTD-10713
(STN / Blue-mode / Transmissive)
Viewing Angle : 12:00
Data Transfer : 4-bit parallel data transfer
Back-Light : Cold Cathode Fluorescent Lamp (CFL) × 1
Drawings : Dimensional Outline UE-20575B

5.1 Absolute Maximum Rating

$V_{SS}=0V$

ITEM	SYMBOL	CONDITION	MIN.	MAX.	UNIT
Supply Voltage (Logic)	$V_{CC} - V_{SS}$	—	-0.3	7.0	V
Supply Voltage (LCD Drive)	$V_{CC} - V_{EE}$	—	0	35.0	V
Input Voltage	V_i	—	-0.3	$V_{CC} + 0.3$	V

5.2 Electrical Characteristics

$T_a=25^{\circ}C$, $V_{SS}=0V$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage (Logic)	$V_{CC} - V_{SS}$	—	4.5	—	5.5	V
Supply Voltage (LCD Drive)	$V_{CC} - V_{EE}$	—	27.0	—	32.0	V
	$V_{CC} - V_{ADJ}$	Shown in 6.1				V
Input Voltage "H" Level	V_{IH}	$V_{CC}=5.0V \pm 10\%$	$0.7 \times V_{CC}$	—	V_{CC}	V
Input Voltage "L" Level	V_{IL}	$V_{CC}=5.0V \pm 10\%$	0	—	$0.3 \times V_{CC}$	V
Power Supply Current	I_{CC}	$V_{CC}-V_{SS}=5.0V$	—	8.0	30.0	m A
	I_{EE}	$V_{CC}-V_{ADJ}=22.5V$	—	7.0	25.0	m A
Clock Frequency	f_{CP}	Duty = 50%	—	—	6.0	MHz

5.3.1 AC Electrical

$V_{CC}=5V \pm 10\%$

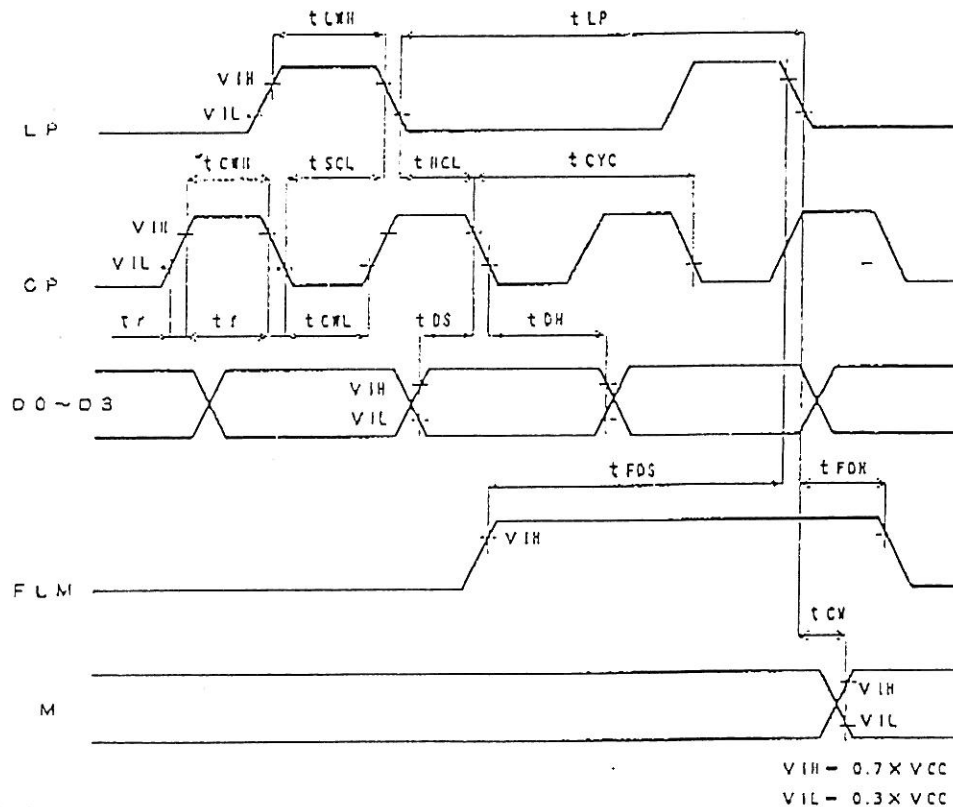
ITEM	SYMBOL	MIN.	MAX.	UNIT
Clock Cycle Time	t_{CYC}	166	—	n S
Load Cycle Time	t_{LP}	1	—	μ S
Clock High Level Width	t_{CWH}	50	—	n S
Clock Low Level Width	t_{CWL}	50	—	n S
Load High Level Width	t_{LWH}	63	—	n S
Clock Set Up Time	t_{SCL}	80 *1	—	n S
Clock Hold Time	t_{HCL}	110	—	n S
Clock Rise / Fall Time	t_r, t_f	—	*2	n S
Data Set Up Time	t_{DS}	30	—	n S
Data Hold Time	t_{DH}	30	—	n S
Frame Data Set Up Time	t_{FDS}	100	—	n S
Frame Data Hold Time	t_{FDH}	100	—	n S
M Signal Phase Shift Time	t_{CM}	—	300	n S

*1 During Latch Pluse is "H" level, Please make sure to keep Clock Pulse in "L" level.

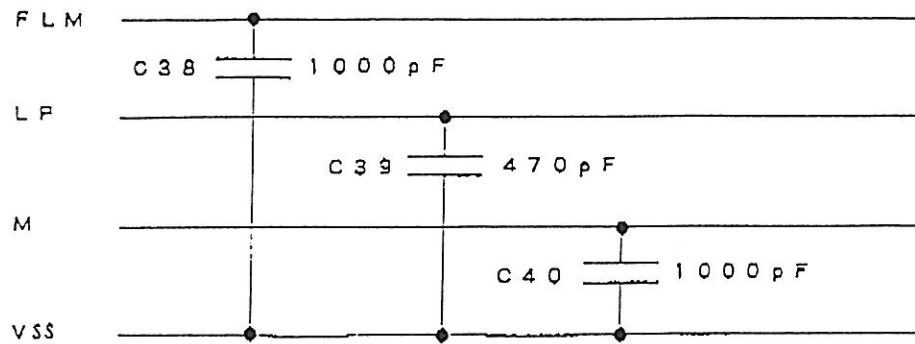
*2 Clock Rise, Fall Time(t_r, t_f) is should be satisfy following [1],[2] be in both condition at the same time.

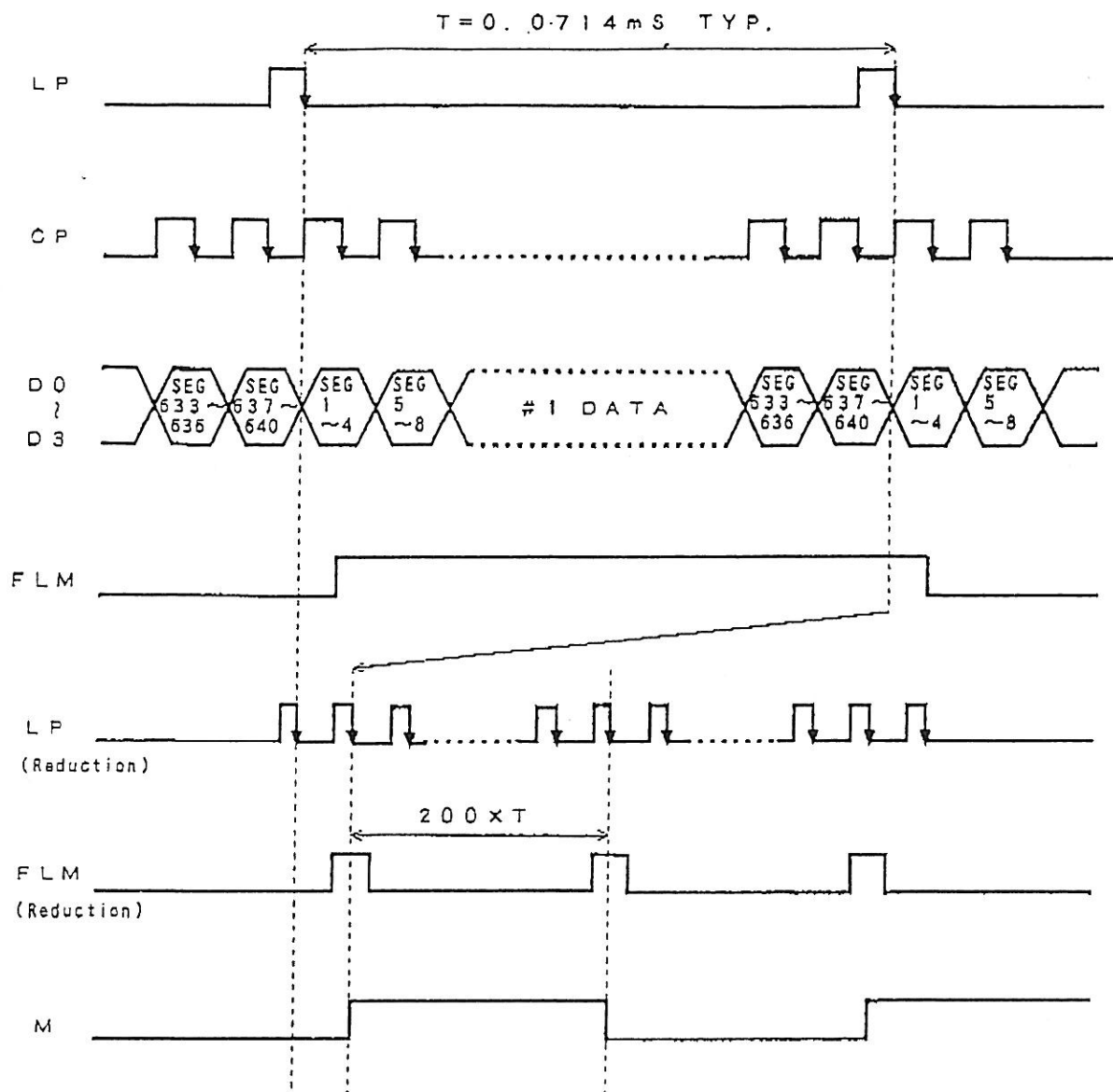
$$[1] t_r, t_f < \frac{t_{CYC} - t_{CWH} - t_{CWL}}{2}$$

$$[2] t_r, t_f \leq 50$$

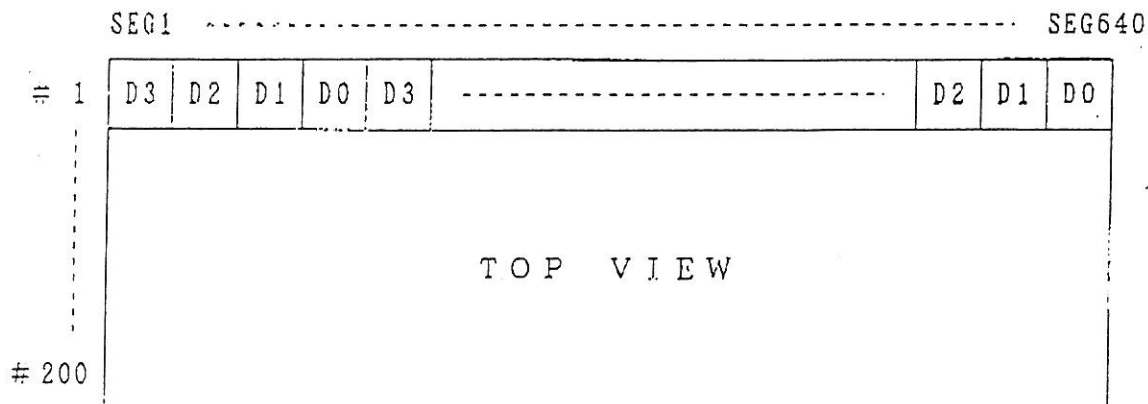


This Module contain these capacitors. Please be careful about timing characteristics.



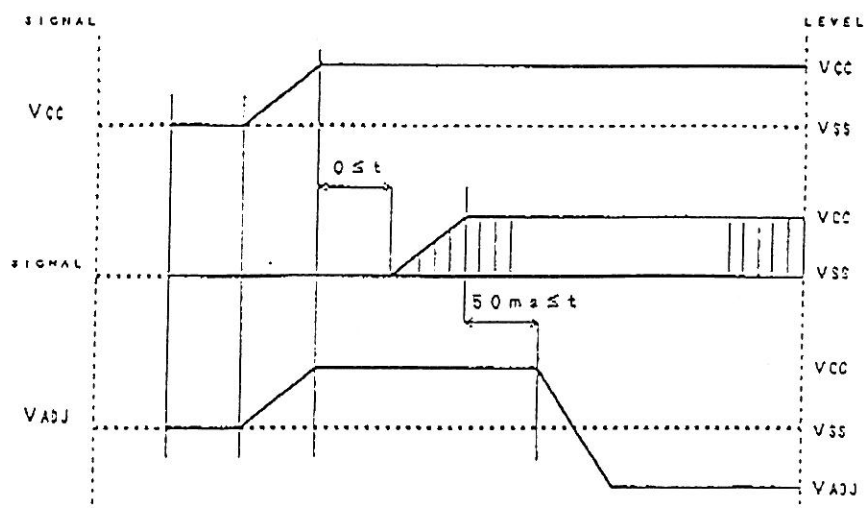


5.3.3 Comparison of Display and Data

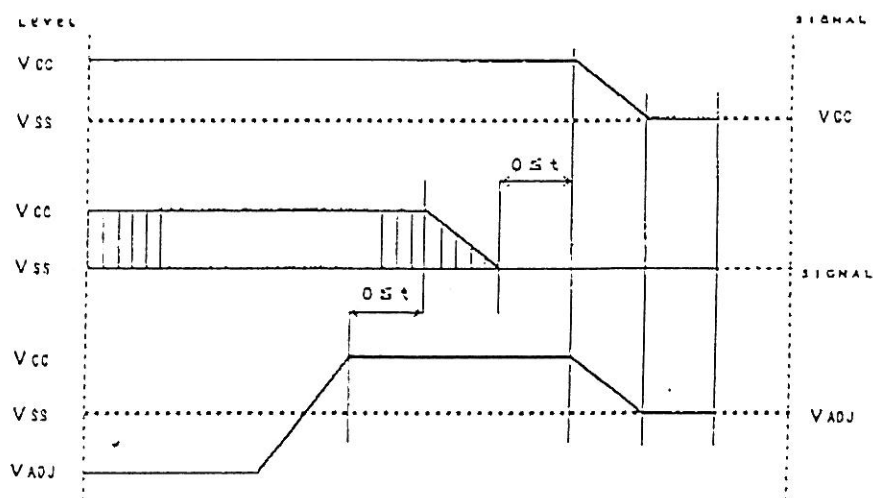


5.4 Power Supply ON/OFF sequence

5.4.1 ON sequence



5.4.2 OFF sequence



Please maintain the above sequence when turning on and off the power supply of the module.

While alternate signal for LCD driving (M signal) is unstable if V_{ADJ} is supplied to the module, DC component will be supplied to the LCD panel.

This may cause damage the LCD module.

Note that YAMAHA controller V6366 will not produce alternate signal without proper software programming.

5.5.1 CFL Specification

Measurement Condition $T_a=25^{\circ}\text{C}$ after 3 min.power on.

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Lamp Voltage	V_L	—	—	380	—	V_{rms}
Lamp Current	I_L	—	4.0	5.0	6.0	mA_{rms}
Starting Voltage	V_s	—	—	900	—	V_{rms}

5.5.2 Module Surface Brightness

Measurement Condition $T_a=25^{\circ}\text{C}$ after 20 min.power on.

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Surface Brightness	B	$I_L=5.0 \text{ mA}$	50	—	—	cd/m^2
Lifetime	L	$I_L=5.0 \text{ mA}$	—	10000	—	Hrs

1) Surface brightness is the initial measurement of brightness on the surface of the LCDP.(Measurent point at center of display.)

2) Definition

a. Lifetime

CFL life is defined as the point at which brightness reaches 50%.

Lifetime shall refer to module surface brightness being least 50% of the initial value.

b. Lamp Voltage(V_L)

The voltage to maintain the electric discharge of the lamp V_{rms} is measured at three munutes after the lamp is thuned ON.

c. Lamp Current(I_L)

The lamp current of three minutes after the lamp is turned ON.

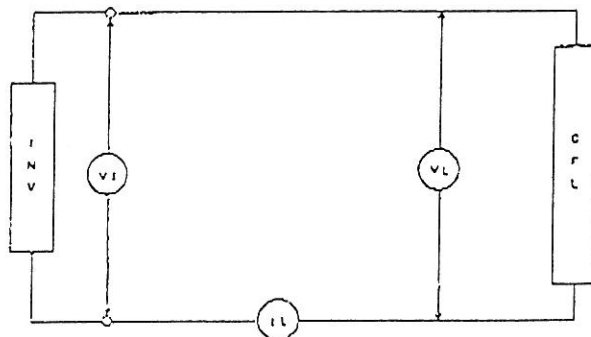
d. Starting Vóltage(V_s)

The voltage at starting the electric discharge when the voltage is increased gradually from 0V.

Roccommended Inverter : CXA-M10A / Input Voltage 5V (Product by TDK)

CXA-M10L / Input Voltage 12V (Product by TDK)

5.5.3 CFL Testing Circuit



6.1 Optical Specifications

$T_a = 25^\circ\text{C}$, $V_{CC} - V_{AOL} = 22.5\text{V}$, $\theta = 0^\circ$, $\phi = -^\circ$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Recommended LCD Driving Voltage (1/200 Duty)	$V_{CC} - V_{AOL}$	$T_a = 10^\circ\text{C}$	—	—	25.0	V
		$T_a = 25^\circ\text{C}$	20.9	22.5	24.1	V
		$T_a = 40^\circ\text{C}$	20.5	—	—	V
Contrast Ratio	CR	Note1 $\theta = 0^\circ, \phi = -^\circ$	—	5	—	
Viewing Angle		Shown in 6.2				
Response Time	Rise	τ_r	Note2 $T_a = 25^\circ\text{C}$	—	150	230 m S
	Decay	τ_d	Note3 $T_a = 25^\circ\text{C}$	—	330	500 m S

Note1 : Definition of Contrast Ratio

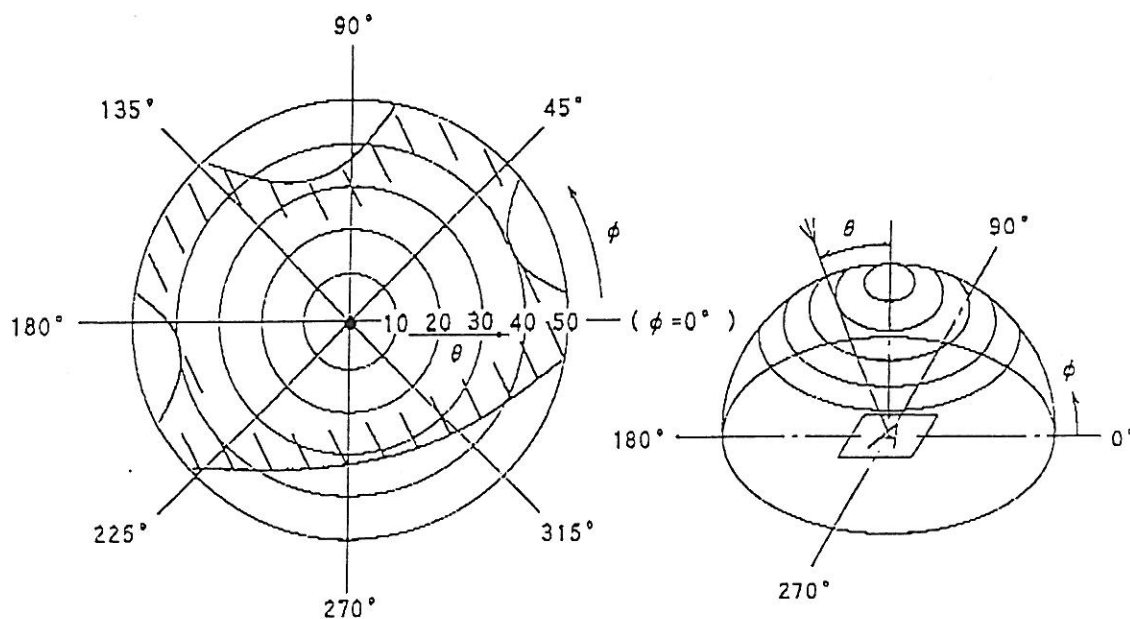
When brightness of non-selected signal was A and brightness of selected signal was B, contrast ratio defined. (CR=B/A)

Note2 : The time of that the brightness level reaches 90% level of the saturation level from 0% level when ON signal is applied.

Note3 : The time of that the brightness level reaches 10% level of the saturation level from 100% level when OFF signal is applied.

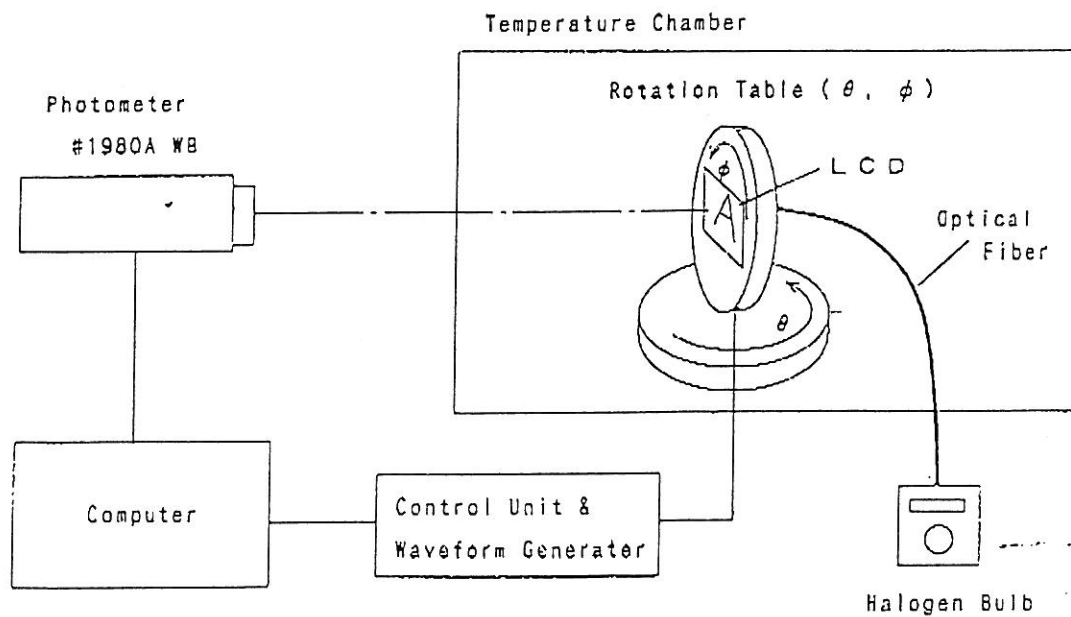
6.2 Definition of Viewing Angle and Optimum Viewing Area

- Point ● show the point where contrast ratio measured.: $\theta = 0^\circ$, $\phi = -^\circ$
- Driving condition 1/200 Duty, 1/14 Bias, 22.5 Vo-p, 70Hz



* Shaded Area Shows TYP. CR ≥ 2

6.3 System Block Diagram



7.1 Pin Assignment

C N 1

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	F L M	H / L	First Line Marker
2	L P	H → L	Data Latch Signal
3	C P	H → L	Clock Signal for Shifting Data
4	M	H / L	Alternate Signal for LCD Drive
5	V _{ADJ}	—	Voltage Level for LCD Contrast Adjustment
6	V _{CC}	—	Power Supply for Logic (+5V)
7	V _{SS}	—	Power Supply (0V, GND)
8	V _{EE}	—	Power Supply for LCD Drive
9	D 0	H / L	Display Data
1 0	D 1	H / L	Display Data
1 1	D 2	H / L	Display Data
1 2	D 3	H / L	Display Data

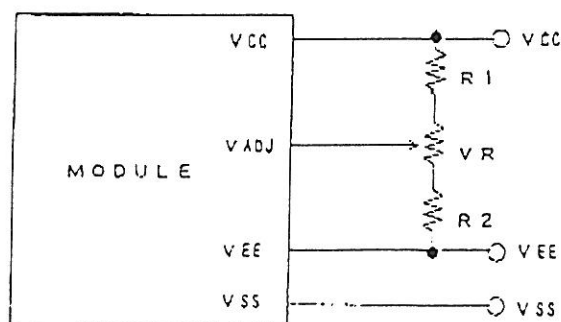
* H:V_{CC} Level L:V_{SS} Level

C N 3

1	FL (HOT)	—	Power supply for CFL (HOT)
2	N C	—	Non Connection
3	N C	—	Non Connection
4	FL (GND)	—	Power supply for CFL (GND)

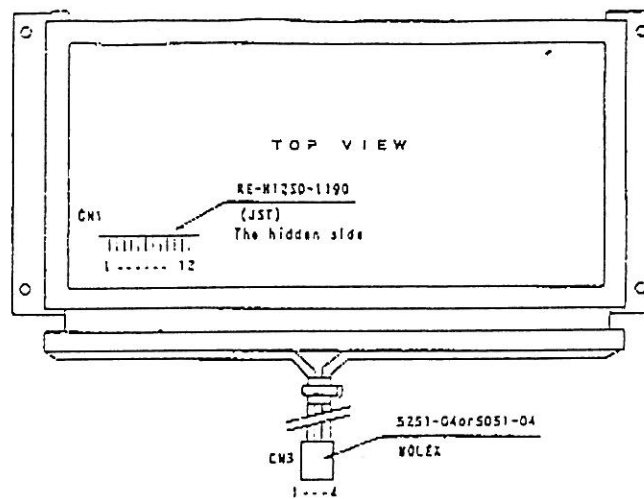
7.2 Illustration of Power Supply

Contrast ratio of the LCD panel affected by surround temperature. While, LCD can be driven at certain range of driving voltage. (Cf. 6.1 Optical Specifications.) Please adjust driving voltage of LCD within rating, by adding potentiometer etc.



$$R1 \div R2 + VR = 10 \sim 20 \text{ k}\Omega$$

7.3 Pin No. Layout



7.4 Block Diagram

