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1. Introduction

This specification describes a 19" color TFT LCD monitor which supports analog input with optional DVI-D interface solution as well as maximum resolution to 1280x1024 at the refresh rate of 76Hz. It has the following features:

- User controls:

- (a) "Power on/off" switch.
- (b) "Exit" key (Exit to previous menu and hot-key of input priority).
- (c) "iKey" key (Intelligent key for automatic adjustment function by pressing one button).
- (d) "Enter" key (for enter OSD sub-menu and select items).
- (e) "Right" key (Select right, increasing adjust and hot-key of brightness mode).
- (f) "Left" key (Select left, decreasing adjust and hot-key of contrast mode).

- OSD window for control and information display with 8 languages selection.

- DPMS (Display Power Management System)

- High quality advanced scaling function.

- Power on/off indicator.

- Tilt base (with tilt function up/down from -2 to +22 degree).

- DDC2B function supported.

- Dual Input (optional for DVI-D).

- A LCD monitor

(a) Head part:

- (1) A LCD module (LG - LM190E03).
- (2) An Inverter + AC-DC power board
- (3) An Interface board.
- (4) A control board.
- (5) A 15 pin D-sub connector and 24 pin DVI-D connector (optional).

(b) Base part:

- A tilt base.
- A power cord
- A user menu.

2. Operational Specification

2.1 Environment

2.1.1 Temperature

-Operating	0	to	+40	degrees Celsius
-Non-operating	-20	to	+60	degrees Celsius

2.1.2 Humidity

-Operating	10	to	90%	Max. non-condensing
-Non-operating	5	to	95%	Max. non-condensing

2.1.3 Altitude

-Operating	0	to	3,048m (10,000ft)
-Non-operating	0	to	12,192m (40,000ft)

2.2 Transportation

2.2.1 Vibration Test (Package, Non-Operating)

Random Vibration

Frequency (Hz)	Slope (dB/Oct)	Spectrum Level (g ² /Hz)
5 ~ 100	0	0.015
100 ~ 200	-6	---
200	---	0.0038

Equivalent to 1.47 G rms

* Duration: 30 Minutes / Per Axis (X, Y and Z Axis)

Total test time: 90 Minutes

2.2.2 Drop Test (Package, Non-Operating)

A) Drop Height

Weight (Kg)	BenQ Spec. Height (cm)
0 – 9	91
> 9 - 18.2	76
> 18.2 - 27.2	61
> 27.2 - 45.4	46
> 45.4 - 68.1	31
> 68.1 – 113.5	26

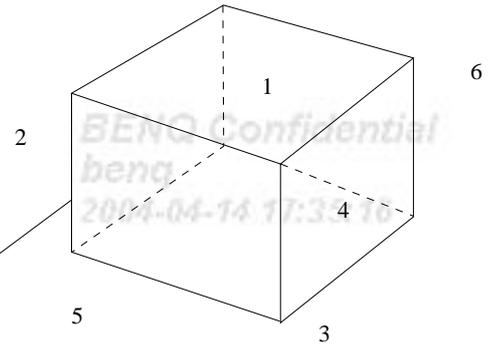
Upgrade one level of height before MP.

B) Drop Sequence

Surface

1. Top
2. Front
3. Bottom
4. Rear
5. Right
6. Left

Manufacturing joint



-Corner 5-3-2 select at weakness side [the low left (or right) corner of the front panel]

- An edge drop with impact on the shortest edge radiating from corner 5-3-2
- An edge drop with impact on the next shortest edge radiating from corner 5-3-2
- An edge drop with impact on the longest edge radiating from corner 5-3-2
- A flat drop with impact on the rear
- A flat drop with impact on the front
- A flat drop with impact on the right
- A flat drop with impact on the left
- A flat drop with impact on the bottom
- A flat drop with impact on the top

After test, there is no electrical and mechanical damage permitted.

2.2.3 Vibration Test (Unpackaged, Non-Operating)

5~200Hz at 1.04g rms

FREQUENCY (Hz)	SPECTRUM LEVEL (g ² /Hz)
2.0	0.0185
4.0	0.0300
8.0	0.0300
40.0	0.0030
55.0	0.0100
70.0	0.0100
200.0	0.0010

- DURATION: 15 MINUTES PER AXIS.

2.3 Packing Configuration

2.3.1 Container Specification:

Stowing Type	Container	Quantity of products (sets) (Every container)	Quantity of Products (sets) (Every Pallet)	Quantity of pallet (sets) (Every Container)
With pallet	20'	320	Pallet A: 32	Pallet A: 10
		--	Pallet B: --	Pallet B: --
	40'	704	Pallet A: 32	Pallet A: 22
Without pallet		--	Pallet B: --	Pallet B: --
	20'		X	X
			X	X
	40'		X	X
			X	X

2.3.2 Carton Specification:

Net Weight (Kg)	Gross Weight (Kg)	Dimension w/o Base L*W*H (mm)	Dimension w/ Base L*W*H (mm)
7.4 Kg	10.1 kg	415.4 * 340.2 * 98.6	415.4 * 434.1 * 192.7

2.3.3 Package:

Carton Interior Dimension (mm) L*W*H	Carton External Dimension (mm) L*W*H
492 * 543 * 250	530 * 560 * 257

2.4 Electrostatic Discharge Requirements

The subject product must withstand 4 KV for contact discharge and 8 KV for air discharge of Electrostatic Discharge and meet the acceptance criteria as specified in -- IEC 801-2 (EN61000-3-2).

2.5 Safety Requirements

The display unit complies with the following safety standards and specifications.

- UL compliance...standard for information-processing and business equipment, UL 1950.
- CSA compliance...standard C22.2 No. 950-M89, data processing equipment.
- TUV compliance...EN60950 safety specification-business equipment.
- ISO13406-2 Ergonomic Requirements of Visual Display.

2.6 EMI Requirements

1. This display unit complies with the following EMC rules and regulations.

- FCC compliance...FCC Rule, Part 15, Subpart B, Class B.
- VCCI compliance...VCCI Rule, Class-2.
- CE Mark Compliance... 89/336/EEC.

- EN55022 Class B
 - EN61000-3-2
 - EN61000-3-3
 - EN55024
 - EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5
 - EN61000-4-6, EN61000-4-8, EN61000-4-11
 - DNSF compliance...EN55022, Class B.
 - MPR2 compliance & EN50279
 - MPR3 compliance
 - TCO03
2. The sample for EMI agency approval should be under 4 dB of the limit.
The production pilot run units should be under 3 dB of the limit.
The mass production units should be under 1 dB of the limit.

2.7 Reliability

1. The prediction MTBF of display unit shall be greater than 60,000 hours excluding the lamp. (at 25 °C)
2. Lamp life time: 50,000 hrs minimum at which brightness of lamp is 50% compare to that of initial value at 6.5+/-0.5mA and 25+/-2 °C .

2.8 Mechanical Design for TCO 03:

- 1) Front Frame Reflectance:
 - * diffuse reflectance: > 20%
 - * Gloss <= 30% gloss unit
- 2) Labeling of plastics:

Plastic weight > 25g shall be marked in accordance with ISO11469
- 3) Variety of Plastic:

All plastic components that weight > 100g shall be made from the same type of plastic.
- 4) Painting of Plastic:
 - *Any plastic components that weight >100g shall not be painted lacquer or vanished, so that the paint, lacquer or vanish in dry matter exceed 1 weight-% of the plastic component.
 - * Mould decoration (IMD) is not allowed
 - * All paints, lacquers, vanishes or colour additives used shall be declared by the type and mount.
- 5) Metallization of Plastic Housing:
 - * Metallization is not allowed.
- 6) Plastic components > 25g shall not contain retardants of organically bound chloride or bromide.

2.9 Environment Protection Design:

Product is Per ES 715-c49 Environment Design Guide.

3. Input / Output Signal Specification

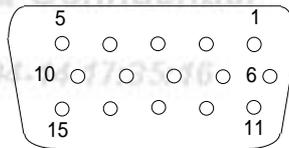
3.1 Input Signal Requirements

3.1.1 Signal cable (Directly attached to unit)

3.1.1.1 Video Inputs:

(1) D-sub (analog signal input)

15pin D-sub connector is on the captive signal cable for IBM VGA, compatible graphic adapters.
The pin assignment of this connector is described as below:

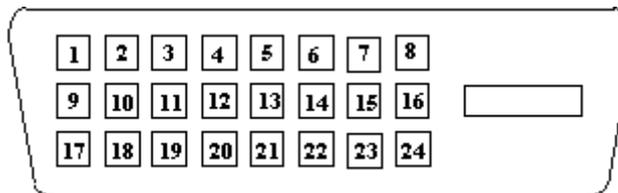


15pin D-sub female

1. RED VIDEO
2. GREEN VIDEO
3. BLUE VIDEO
4. GROUND
5. GROUND
6. RED GROUND
7. GREEN GROUND
8. BLUE GROUND
9. PC5V
10. SYNC GROUND
11. GROUND
12. SDA
13. H SYNC (H+V)
14. V SYNC
15. SCL

(2) DVI (digital signal input) (optional)

24 pins DVI connector is designed to match with DVI-digital signal cable. The pin assignment of this connector is as the following:



* 24 pins DVI female

Pin	Signal Assignment	Pin	Signal Assignment
1	TMDS RX2-	13	Floating
2	TMDS RX2+	14	+5V Power
3	TMDS Ground	15	Ground
4	Floating	16	Hot Plug Detect
5	Floating	17	TMDS RX0-
6	DDC Clock	18	TMDS RX0+
7	DDC Data	19	TMDS Ground
8	Floating	20	Floating
9	TMDS RX1-	21	Floating
10	TMDS RX1+	22	TMDS Ground
11	TMDS Ground	23	TMDS Clock+
12	Floating	24	TMDS Clock-

3.1.1.2 Cable length:

1500mm +/- 20mm

3.1.2 Video signals:

RGB separate, Analog 0.7Vp-p/75 Ohm

3.1.3 Sync signal:

- H/V separate, TTL level
- H/V composite, TTL level

3.2 Function

3.2.1 Support timing

This Interface board is designed to operate in any of the following video mode.

Input Timing				Actual Output			
Resolution	Horizontal Frequency (KHz)	Vertical Frequency (Hz)	Dot Clock Frequency (MHz)	Actual display Resolution	OK	N.A	Remark
640x350	31.47(P)	70.08(N)	25.17	1280x943	√		DOS
720x400	31.47(N)	70.08(P)	28.32	1280x1024	√		DOS
640x480	31.47(N)	60.00(N)	25.18	1280x1024	√		DOS
640x480	35.00(N)	67.00(N)	30.24	1280x1024	√		Macintosh
640x480	37.86(N)	72.80(N)	31.5	1280x1024	√		VESA
640x480	37.50(N)	75.00(N)	31.5	1280x1024	√		VESA
800x600	37.88(P)	60.32(P)	40.00	1280x1024	√		VESA
800x600	48.08(P)	72.19(P)	50.00	1280x1024	√		VESA
800x600	46.86(P)	75.00(P)	49.50	1280x1024	√		VESA
832X624	49.72(N)	74.55(N)	57.29	1280x1024	√		Macintosh
1024x768	48.36(N)	60.00(N)	65.00	1280x1024	√		VESA
1024x768	56.48(N)	70.10(N)	75.00	1280x1024	√		VESA
1024x768	60.02(P)	75.00(P)	78.75	1280x1024	√		VESA
1024X768	60.24(N)	74.93(N)	80.00	1280x1024	√		Macintosh
1152x864	67.50(P)	75.00(P)	108.00	1280x1024	√		VESA
1152x870	68.68(N)	75.06(N)	100.00	1280x1024	√		Macintosh
1152x900	61.80(N)	66.00(N)	94.50	1280x1024	√		SUN 66
1152x900	71.81(N)	76.14(N)	108.00	1280x1024	√		SUN
1280x1024	64.00(P)	60.00(P)	108.00	1280x1024	√		VESA
1280x1024	75.83(N)	71.53(N)	128.00	1280x1024	√		IBM1
1280x1024	80.00(P)	75.00(P)	135.00	1280x1024	√		VESA
1280x1024	81.18(N)	76.16(N)	135.09	1280x1024	√		SPARC2

Notes : (1) If the incoming display mode is not supported by this I/F board listed above, the picture can show up or doesn't which is unpredictable, even the picture can display but probably isn't good or clear.

(2) Some signals from graphics board may not function properly.

(3) “P”, “N” stands for “Positive”, “Negative” polarity of incoming HSYNC/VSYSNC (input timing).

(4) OSD will show “NO SIGNAL DETECTED” message on the screen to indicate it while no display mode inputs.

3.3 Adjustment function

Auto Adjust

Luminance – Brightness, Contrast

Geometry – H. Position, V. Position, Pixel Clock, Phase

Color – Bluish, Reddish, sRGB, User Preset

OSD – H. Position, V. Position, OSD Time

Language – English, Francais, Deutsch, Italiano, Espanol, 日本語, 繁體中文, 簡體中文

Recall – Color Recall, Recall All

Miscellaneous – Sharpness, Display Information

3.4 Power Supply Requirements

3.4.1 Input Power Requirements

(1) Input Voltage Range

The unit shall meet all the operating requirements with an input voltage range of 90~264 Vac.

(2) Input Current

Maximum Input Current (MAX) 2 Arms	Measuring Range 90Vac 264Vac
---------------------------------------	---------------------------------

(3) Frequency Range

The unit shall operate within a frequency range of 47Hz to 63Hz.

(4) Inrush Current

Power supply inrush current shall be less than the ratings of its critical components (including Power switch, fuse, rectifiers and surge limiting device) for all conditions of line voltage.

(5) Regulator Efficiency

70% minimum (measuring at 115Vac and full load)
Power saving 1 W in power off preferred mode, 115V
2W 220V

(7) Safety concern: 1. Earth leakage current < 3.5mA (at 264VAC)
2. Electric strength: < 10mA

3.4.2 Power Management

Mode	H/Vsync	Power consumption	LED Color (Status)	Recovery Time
Normal	Both exist	< 40W	Green	--
Off	None or Only one exist	< 1W	Amber	5 sec

3.5 Specification of Inverter

3.5.1 General

These specifications are applied to inverter of Q9T3 for SXGA 19" 4 lamps panel.

3.5.2 Output Characteristics

Parameter	Symbol	Min	Nom	Max	Unit	Remarks
Output Current	IO1/IO2 IO3/IO4	6.0	6.5	7.0	mA	Max. Brightness
Output Current	IO1/IO2 IO3/IO4	3.0	3.5	4.0	mA	Min. Brightness
Frequency	FL1/FL2 FL3/FL4	40	50	70	KHz	Max. Brightness
Starting Voltage	Vs1/Vs2 Vs3/Vs4	1400			Vrms	RL1=RL2=RL3=RL4=00

NOTE: 1.All conditions are at 25 ambient unless otherwise specified.

2. Load Panel=SXGA 19".

3.6 Panel optical Characteristics

Optical characteristics are determined after the unit has been 'ON' for 30 minutes in a dark environment at 25° C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0° .
FIG. 7 presents additional information concerning the measurement equipment and method.

FIG. 7 Optical Characteristic Measurement Equipment and Method

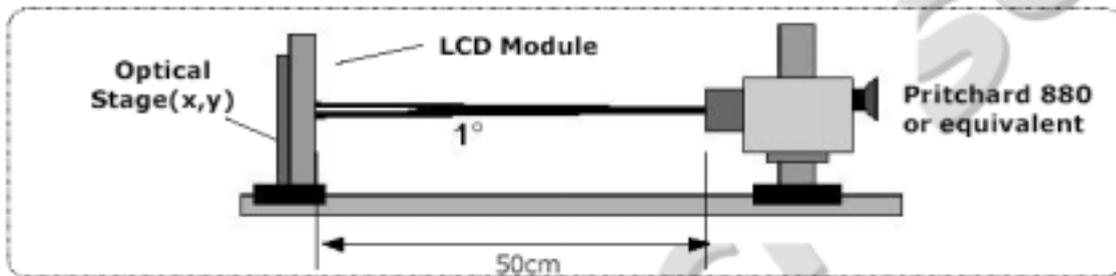


Table 10. OPTICAL CHARACTERISTICS

Ta= 25° C, V_{LCD}=5.0V, f_v=60Hz Dclk=54MHz, I_{BL}=6.5mA

Parameter	Symbol	Values			Units	Notes
		Min	Typ	Max		
Contrast Ratio	CR	300	500	-		1
Surface Luminance, white	L _{WH}	200	250	-	cd/m ²	2
Luminance Variation	δ _{WHITE} 5P			1.3		3
Response Time	Rise Time	T _R	4	6	ms	4
	Decay Time	T _D	12	24	ms	4
Color Coordinates [CIE1931]	RED	R _x	Typ -0.03	0.639	Typ +0.03	
		R _y		0.342		
	GREEN	G _x		0.297		
		G _y		0.615		
	BLUE	B _x		0.146		
		B _y		0.068		
	WHITE	W _x		0.313		
	W _y	0.329				
Viewing Angle (CR>5)						
	x axis, right(φ=0°)	θ _r	70	80	degree	5
	x axis, left(φ=180°)	θ _l	70	80		
	y axis, up(φ=90°)	θ _u	70	80		
	y axis, down(φ=270°)	θ _d	70	80		
Viewing Angle (CR>10)						
	x axis, right(φ=0°)	θ _r	60	70	degree	5
	x axis, left(φ=180°)	θ _l	60	70		
	y axis, up(φ=90°)	θ _u	60	70		
	y axis, down(φ=270°)	θ _d	60	70		
Gray Scale			2.2			6

Notes :

1. Contrast ratio(CR) is defined mathematically as :

$$\text{Contrast ratio} = \frac{\text{Surface luminance with all white pixels}}{\text{Surface luminance with all black pixels}}$$

It is measured at center point(1)

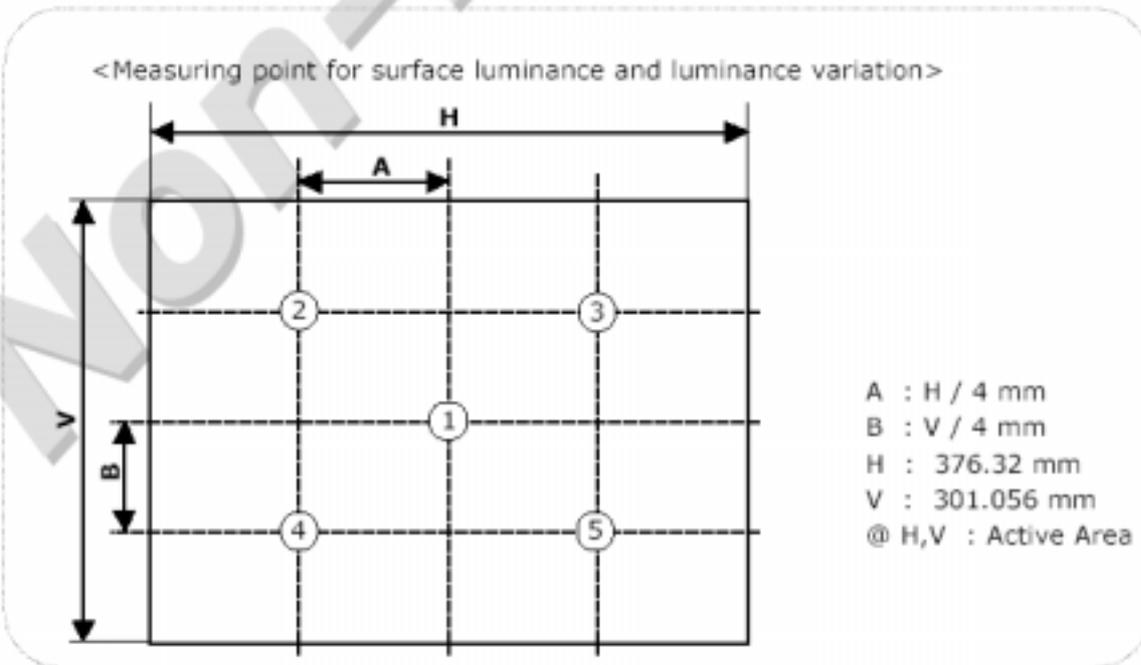
2. Surface luminance is the luminance value at center 1 point(1) across the LCD surface 50cm from the surface with all pixels displaying white. For more information see FIG 8.

3. The variation in surface luminance, δ_{WHITE} is defined as

$$\delta_{\text{WHITE}} = \frac{\text{Maximum (P1,P2P5)}}{\text{Minimum (P1,P2P5)}}$$

For more information see Figure 8.

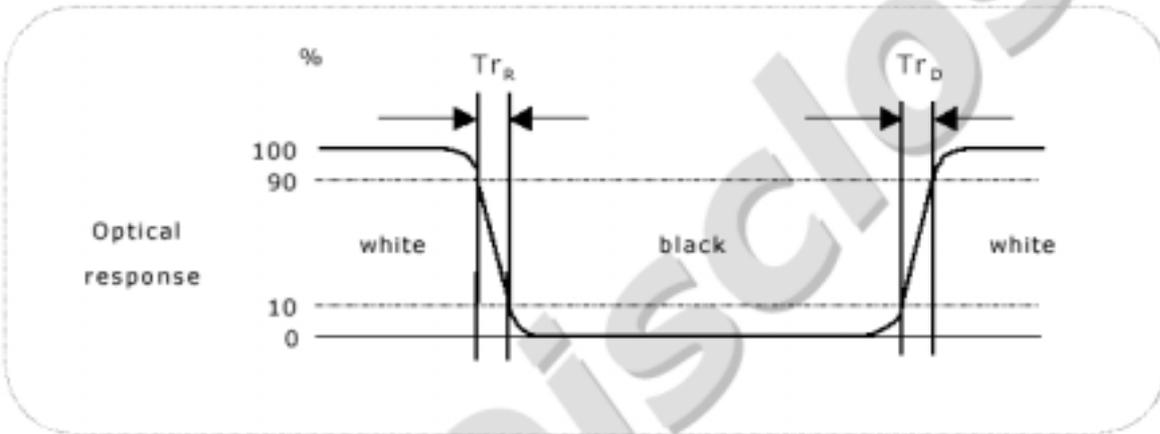
FIG. 8 Luminance measuring point



4. Response time is the time required for the display to transition from black to white (Rise Time, Tr_R) and from white to black (Decay Time, Tr_D). The sampling rate is 2,500 sample/sec. For additional information see FIG. 9.

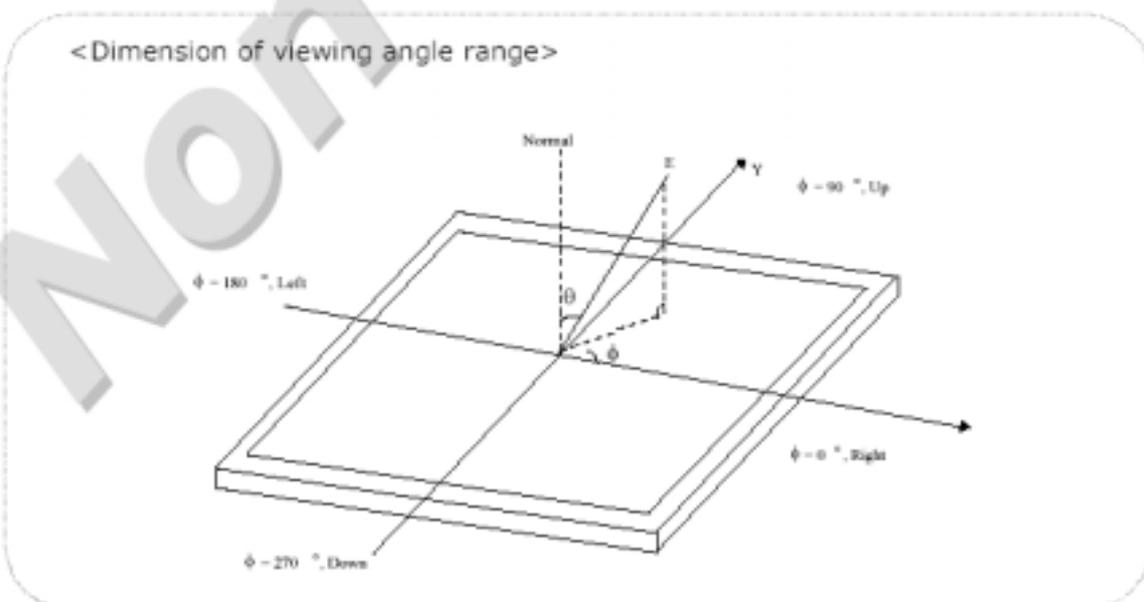
The response time is defined as the following figure and shall be measured by switching the input signal for each gray to gray.

FIG. 9 Response time



5. Viewing angle is the angle at which the contrast ratio is greater than 10 or 5. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG. 10 .

FIG. 10 Viewing angle



3.7 BACK-LIGHT UNIT

The backlight system is an edge-lighting type with 4 CCFLs (Cold Cathode Fluorscent Tube).

The characters of dual lamps are shown in the following tables.

Ta=25 ± 2°C

ITEM	SYMBOL	MIN	TYP	MAX	Unit	Condition
CCFL operation range	IRCFL	3.0	6.5	7.0	mA	(Ta=25) NOTE 1
CCFL Frequency	fCFL	40	-	70	KHz	(Ta=25) NOTE 2
CCFL Ignition Voltage	ViCFL (25) (reference)	-	-	1100	Vrms	(Ta=25°C) NOTE 2
CCFL Discharge Voltage (Reference)	VCFL	675	715	790	Vrms	(Ta=25°C) Note 3
PCFL	CCFL Power consumption	-	18.60	20.46	Watt	(Ta=25°C) Note 3
LIFE		50,000	-	-	Hour	For 6.5mA

Note 1: CCFL life time 50,000 hrs under 6.5mA, it's defined as when the brightness is reduced by half. To exceed 6.5mA, life time accelerate drop down and if to exceed 7.0mA has safety problem.

Note 2: CCFL Frequency should be carefully determined to avoid interference between inverter and TFT LCD

Note 3: Calculator value for reference (ICFL×VCFL=PCFL)

4. Functional specification

All the tests to verify specifications in this section must be performed under the following standard conditions unless otherwise noted. The standard conditions are:

- Temperature: 0 to 40 degree Celsius
- AC line input voltage: 90 Vac to 264 Vac, 47Hz or 63Hz
- Warm-up time: 30 minutes minimum

4.1 Display Quality

4.1.1 Display Data Area (with full white pattern)

- (1) Horizontal: 376.320 mm
- (2) Vertical: 301.056mm

4.1.2 Video Performance

- (1) Resolution: 1280 X 1024 pixels Maximum
- (2) Contrast ratio: 300 (Min.), 500 (Typ.)
- (3) Response time: 16 mS (Typ.)
- (4)Viewing angle : Up: 70°/Down: 70° R/L:70° (At contrast ratio > 10)
- (5) CIE Coordinate: White (0.313, 0.329) +/- (0.03, 0.03) (at user mode)

(6) Display color: 24 bits color

4.1.3 Light Output

Brightness rating : 250cd/m²(Typ.) @6,5mA

4.1.4 Brightness Adjustment Range

At contrast ratio control set at maximum level, adjusting Brightness control from minimum to maximum position.

5. Physical Specifications

5.1 Physical Dimension & Appearance

5.1.1 Overall Dimensions: 415.4mm (W) X 436.1mm (H) X 98.6mm (D) See Fig 1.

5.2 Construction and Materials on outer surface

- (1) Materials: Plastic
- (2) Color: To be defined for Model

5.3 Base

Tilt: -2 ~ +22 degree.

5.4 Marking & Labels

5.4.1 Reference Label (Rear panel)

- (1) Reference numbers
- (2) Manufacture data
- (3) Agency Approvals
- (4) Power Ratings

5.4.2 Controls & Connectors

- (1) AC power cord input: abbreviated labels
- (2) User's Controls: standard print

5.5 Packaging

5.5.1 Carton Dimension: 560mm (W) X530mm (D) X 187mm (H) (LCD monitor)

5.5.2 Shipping Weight: 10.3kg (LCD monitor)

5.5.3 Shipping Container: 864 sets per 40 feet container with pallet

6. Maintainability Specifications

6.1 General & Requirements

6.1.1 Installation: From outside of unit with standard tools and documentation provided to user.

6.1.2 Periodic Maintenance: No periodic maintenance is required.

6.1.3 Repair & Calibration: Require spare modules or components as specified as followings:

- (1) Interface board ASSY
- (2) Inverter/AC-DC converter board ASSY
- (3) Control board ASSY

6.2 Mean Time to Repair

6.2.1 Module Level: Less than 10 minutes

6.2.2 Component Level: Less than 15 minutes

6.3 Accessibility

6.3.1 General:

All panels, covers, and major assemblies are removable without disruption of permanent mounting or fasteners.

6.3.2 Outside Cabinet, access to the following elements

-Operating Controls

-AC Jack for power cord.

6.3.3 Cover Removal, Access

All sub assemblies and internal adjustable components may be accessed by removing the base and rear cover.

6.4 Equipment & Tools Required

6.4.1 Standard Test Equipment

- (1) Voltmeter
- (2) Dual trace oscilloscope
- (3) Hand tools as required
- (4) Computer with IBM VGA, or compatible graphic adapter

6.4.2 Documentation

A service manual will be available which covers all service requirements. A users manual written in English, France, German, Spanish, Italian, Japanese, Traditional Chinese and Simplified Chinese will be available to ship with the product.

6.5 Electrical Emission and Energy Saving summary for TCO 03

6.5.1 Electrical Field (AC):

*Band I < 10V/m (Center position, "+" pattern)

*Band II < 1V/m (Center position, "+" pattern)

Note: Shielded power cord is not acceptable

6.5.2 Magnetic Field (AC):

*Band I < 200nt (Center position, "+" pattern)

*Band II < 25nt (Center position, "+" pattern)

Note: Shielded power cord is not acceptable

6.5.3 Energy Saving:

1 W in power off preferred mode, 115+-5V (Recovery time: 5 sec)

2W 220V

FIG. 1 PHYSICAL DIMENSION FRONT VIEW AND SIDE VIEW

