User Manual

15.3 Inch Color LCD Display

Model: HL1530

CONTENTS

1. SCOPE

This document defines the performance requirements for a 15.3-inch TFT LCD color monitor with touch screen for medical use. This product is controlled by model name; any change will be recorded in the list and confirmed by customer.

This high-resolution color display is specifically designed to meet the rigorous performance standards needed for surgery. To guarantee image integrity, features include accurate signal conversion.

Abbreviations

The following abbreviations are used in this document:

Acronym	Definition
AC	Alternating Current
AI	Assembly Instruction
ATE	Automated Test Equipment
BIST	Built In Self Test
BLS	Backlight Stabilization
CCC	China Compulsory Certification
CR	Contrast Ratio
DC	Direct Current
DDC	Display Data Channel
EDID	Extended Display Identification Data
EEPROM	Electrically Erasable Programmable Read only Memory
ESD	Electric Static Discharge
GND	Ground
HDMI	High Definition Multimedia Interface
I2C	IC to IC Communication
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MTBF	Mean Time Between Failures
PCAP	Projective Capacitive
P/N	Part Number
USB	Universal Serial Bus
VESA	Video Electronics Standards Association
WXGA	Wide Extended Graphics Array, a standard resolution

2. ELECTRICAL PERFORMANCE

2.1 Power Supply

Tab. 2.1

-Input Voltage	: DC12V ± 10%
- Current (max)	: 3.0 A
- Frequency	: 50/60Hz ± 3Hz
- Power Consumption	: <30W

2.2 Power Management

The following table shows the power consumption feature:

Tab. 2.2

VESA Modes	Horizontal Sync	Vertical Sync	Video	Power Indicator	Power Consumption
Normal operation	Active	Active	Active	Green	Less than 30 W
Active-off mode	Inactive	Inactive	Blanked	Green blinking	Less than 15W

While there is no sync the monitor power indicator LED will be in green blinking status.

2.3 Interface

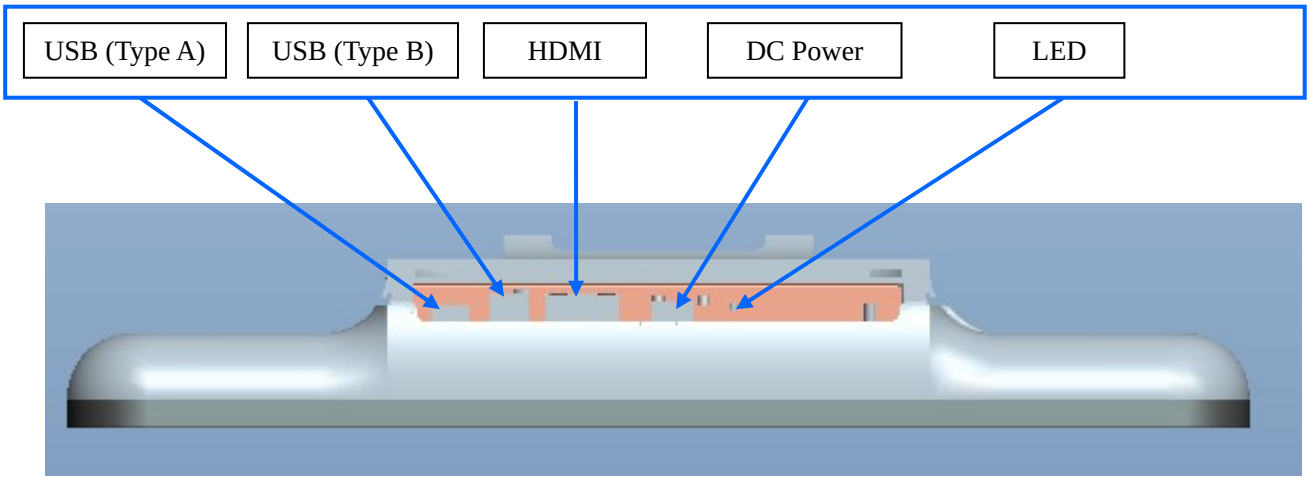


Fig. 2.1

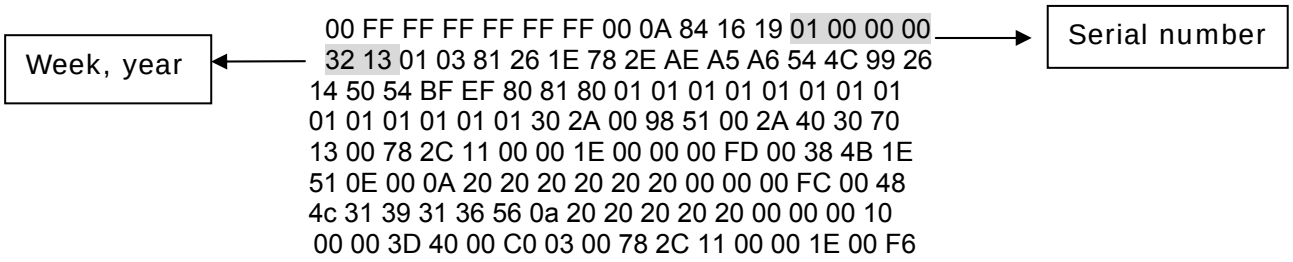
2.3.1 Signal Specifications

Tab. 2.3

Item		SPEC
HDMI Port	HDMI single link	Input Impedance: 50 ohm

	HDMI EDID datum	EDID via HDMI I²C bus

DigitaL (HDMI) EDID

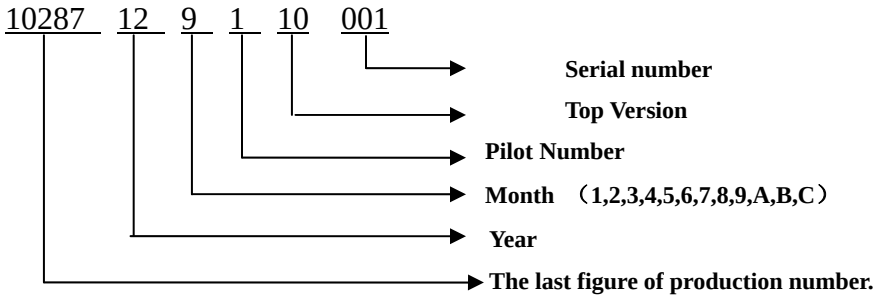


Note: the datum above for reference only. Serial number, week and year will be changed according to manufacture order.

Manufacture Serial Number

Serial Number

The manufacture serial number consists of 14 characters (majuscule and numbers), format as below:



Notes: Month using hexadecimal, A, B, C substitute for October, November, December.

Example: HL1530 products machine Part Number301010287, TOP version 1.0, in March 2013, the first batch , the serial number of the first production is 10287133110001.

2.3.2 HDMI connector

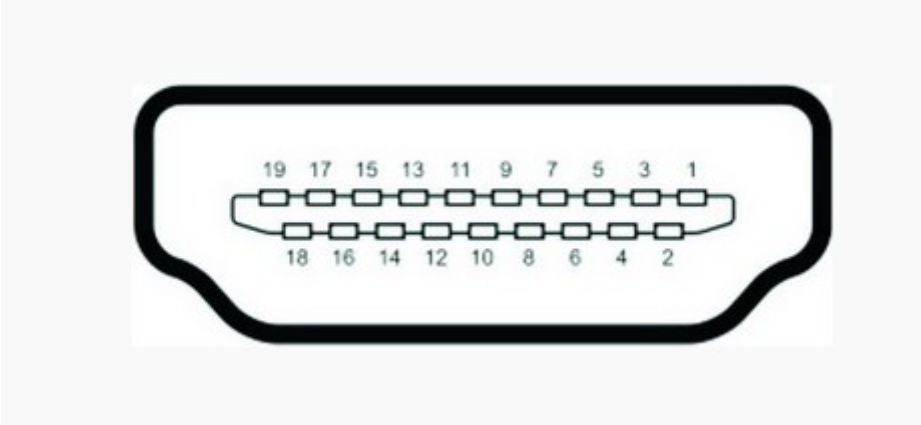


Fig. 2.2 HDMI connector

Tab. 2.4

Pin - Assignment of 19-pin HDMI Female Connector		
Pin 1 - TMDS Data2+	Pin 8 - TMDS Data0 Shield	Pin 15 - SCL
Pin 2 - TMDS Data2 Shield	Pin 9 - TMDS Data0–	Pin 16 - SDA
Pin 3 - TMDS Data2–	Pin 10 - TMDS Clock+	Pin 17 - DDC/CEC Ground
Pin 4 - TMDS Data1+	Pin 11 – TMDS Clock Shield	Pin 18 - +5V Power
Pin 5 - TMDS Data1 Shield	Pin 12 - TMDS Clock–	Pin 19 - Hot Plug Detect
Pin 6 - TMDS Data1–	Pin 13 - CEC	
Pin 7 - TMDS Data0+	Pin 14 - Reserved (N.C. on device)	

2.3.3 USB Interface

The monitor supports touch function, the touch screen can be used in the Microsoft® Windows 7.

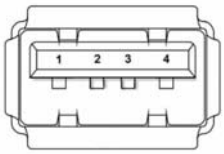


Fig.2.3 USB-A connector

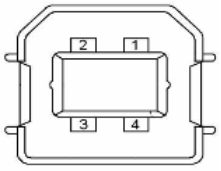


Fig.2.4 USB-B connector

Tab. 2.5

Pin	Signal
1	VBUS
2	D-
3	D+
4	GND

USB A-Type
Used for external USB function, such as a USB mouse, flash disk.

USB B-Type
Used for Touch panel control.

2.4 Panel Features

Tab. 2.6

Panel Module	NLT12876BC26-32D
Size	15.3” (39 cm diagonal)
Aspect Ratio	15:9(W:H)
Active Display Area	334.08 (H) x 200.45 (V) mm
Resolution	1280(H)x 768 (V)pixels
Pixel Pitch	0.261(H) x 0.261(V) mm
Color Depth	16.7M (At 8-bit input, FRC terminal =Low or Open)
Back Light	LED
Surface treatment	Anti-Glare treatment

2.5 Display Performance

2.5.1 Standard Testing Conditions

Tab. 2.7

- Warm up time	＞20 minutes.
- DC supply voltage	12V DC, 60Hz
- Ambient temperature	20°C -25°C
- Relative Humidity	30% --80%
- Video signal	1280 x 768 @ 60Hz; HDMI
- Ambient Environment	Dark
- LUT Setting	TBD
- Luminance meter	Minolta CA-210 or equivalent

2.5.2 Brightness (TBD)

2.5.3 View angle

Left/Right: 88/88 degree (Typ.); 80/80 degree (Min.) (CR≥10) (Note 2)
Up/Down: 88/88 degree (Typ.)/; 80/80 degree (Min.) (CR≥10) (Note 2)

2.5.4 Brightness Uniformity

Deviation less than 30% (Note 5)

2.5.5 Contrast ratio

700:1 (Typ.) (note 3)
500:1 (Min.)

2.5.6 White Color Coordinates (TBD)

2.5.7 Response Time

Typical (Tr+Td): 14+11ms (Note 6)
Max. (Tr+Td): 20+15ms (Note 6)

2.5.8 Color Gray

64 gray level should seen clearly

256 gray levels should be seen smoothly

2.6 Touch screen Performance

2.6.1 Features

Tab. 2.8

Item	Specification
Type	P-CAP
Input Mode	Finger
Cable	FCC

2.6.2 General Specification

Tab. 2.9

Item	Specification
Frame Size	385.08mm X251.45 mm
Tolerance	[-0.4,0]
Active Area	334.08 X200.45mm
Total Thickness	3.20±0.50 mm

2.6.3 Environmental Characteristics

Tab. 2.10

Item	Specification	
	Temperature	Humidity (Non Condensing)
Operation	-30°C ~ +70°C	20%RH ~ 90%RH
Active Area	-30°C ~ +80°C	10%RH ~ 90%RH

2.6.4 Optical Characteristics

Tab. 2.11

Item	Specification
Transmissivity	⩾90%

2.6.5 Electrical Characteristics

Tab. 2.12

Parameter	Min	Typ.	Max	Units	Remarks
Digital Power Supply (V_{DD})	3.6	5.0	5.5	V	
Active Current	—	30	—	mA	Note 1
Sleep Current	—	5	—	μA	
Accuracy	±1.5	—	—	%	
Resolution	—	—	4096	—	X (long axis)
	—	—	4096	—	Y (short axis)

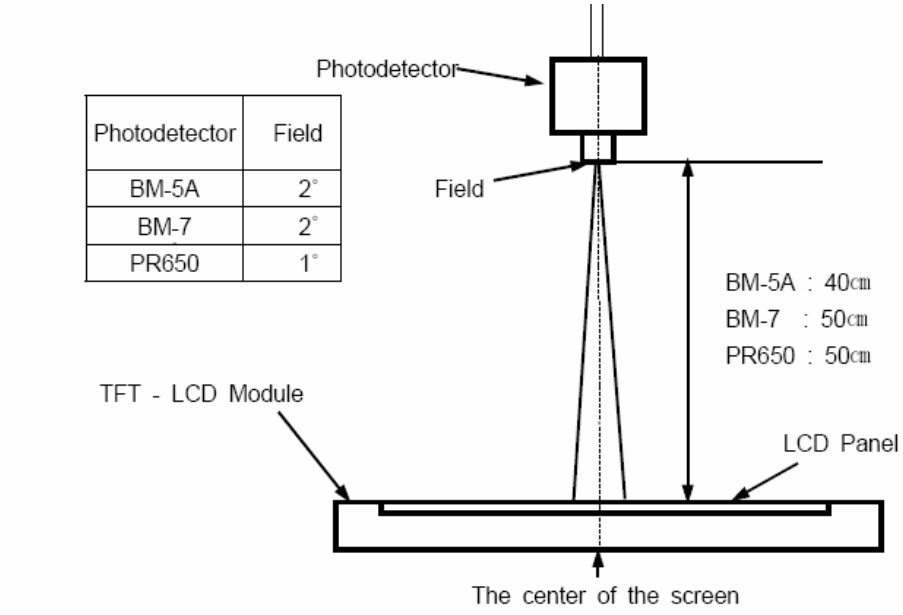
Note : Active power varies based on a number of controllable parameters as well as the number of touches per second.

Note1: Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between 20 minutes after the

backlight at the given temperature for stabilization of the backlight. This should be measured in the center of screen. Test equipment should be equivalent with the following equipment.

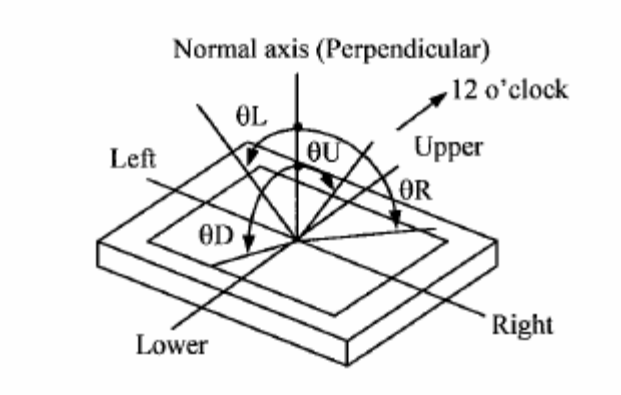
Environment condition: Ta=25 ± 2ºC



Photodetector	Field
BM-5A	2°
BM-7	2°
PR650	1°

Optical Measuring Equipment Setup

Note2: Viewing angle is measured as follow:



Note 3: Definition of contrast Ratio (CR):

Ratio of gray max (Gmax) & gray min (Gmin) at the center point of the panel.

$$CR = \frac{G\max}{G\min}$$

Gmax: Luminance with all pixels white

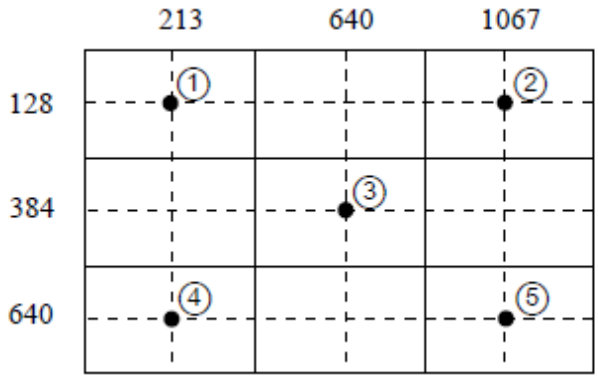
Gmin: Luminance with all pixels black

Note 4: Definition of Luminance of White: Luminance of white at center point.

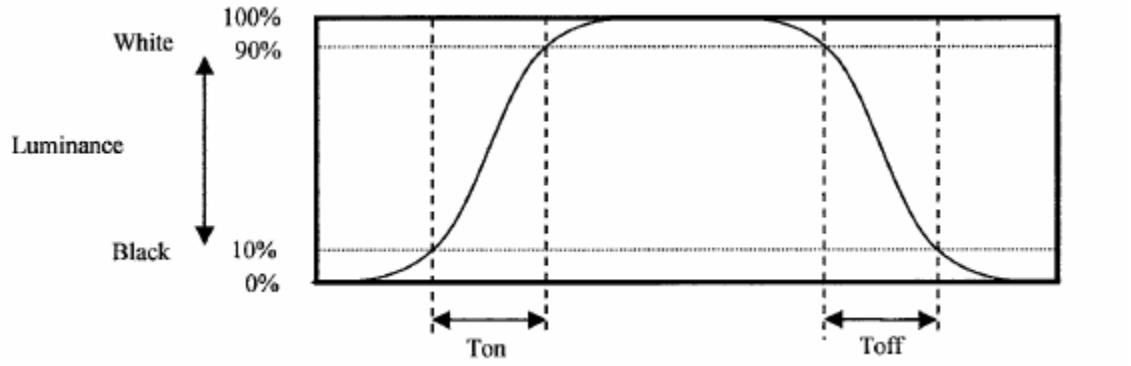
Note 5: Definition of brightness uniformity

The luminance uniformity is calculated by using following formula.

$$\text{Non-Luminance(LU)} = 1 - \frac{\text{Maximum luminance from 1 – 5}}{\text{Minimum luminance from 1 – 5}}$$



Note 6: Definition of response time is as follows:



Response time is measured at the time when the luminance changes from “black” to “white”, or “white” to “black” on the same screen point, by photo-detector. Ton is the time when the luminance changes from 10% up to 90%. Also Toff is the time when the luminance changes from 90% down to 10%(See the following diagram.).

When the display data is changed from white to black, response time is measured

3. MECHANICAL SPECIFICATIONS

3.1 Outline Dimensions & Weight

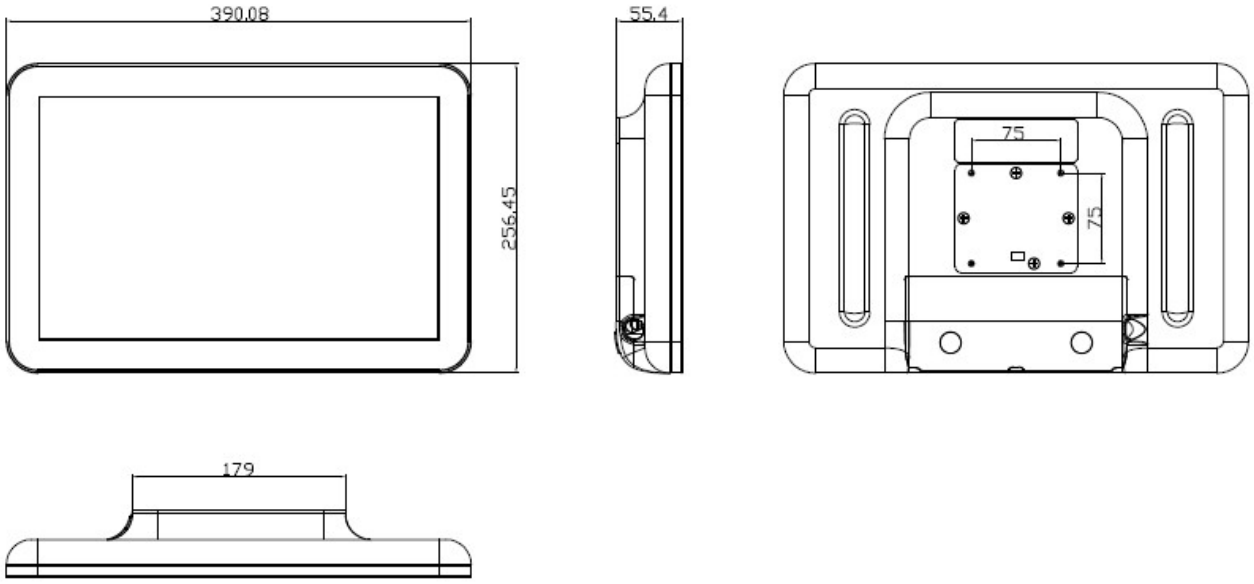


Fig. 3.1

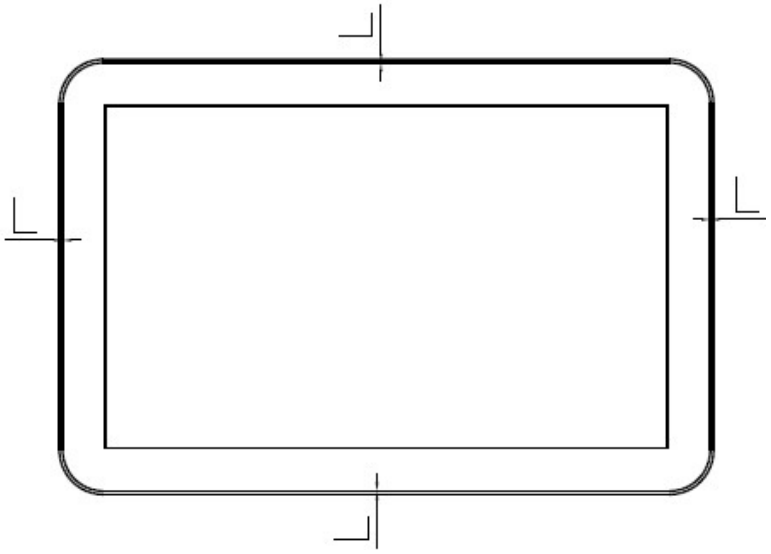
Tab. 3.1

Item	Set	
	Width	390.08mm
	Depth	256.45mm
	Height	55.4 mm
Housing components	Plastic	
Visible screen surface	Approx. 334.08 (H) x 200.45 (V) mm	
Degree of protection	IP21	
Connection panel	At rear VESA 75 x 75 mm	
Net weight	TBD	

3.2 Screen Quality

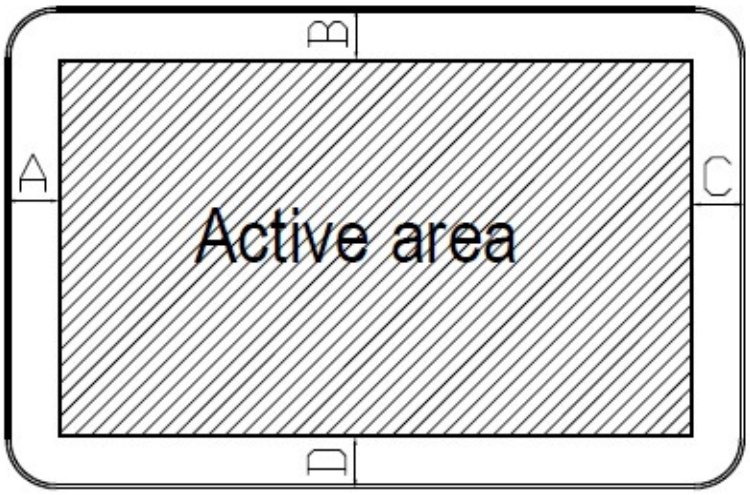
3.2.1 H/V Outline Position

Fig. 3.2



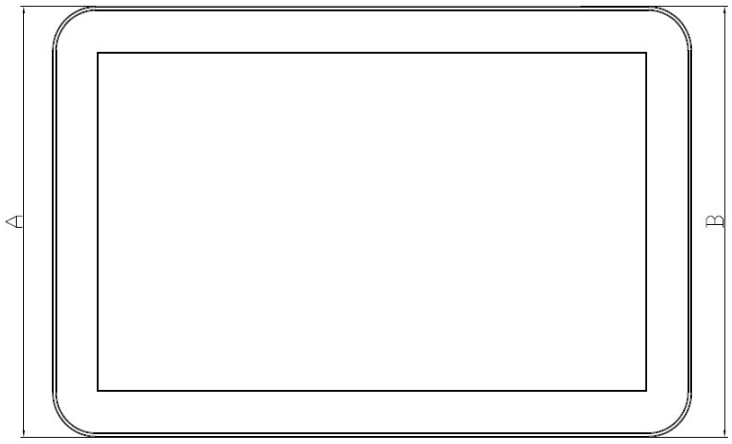
3.2.2 Outline Edge Position

Fig. 3.3



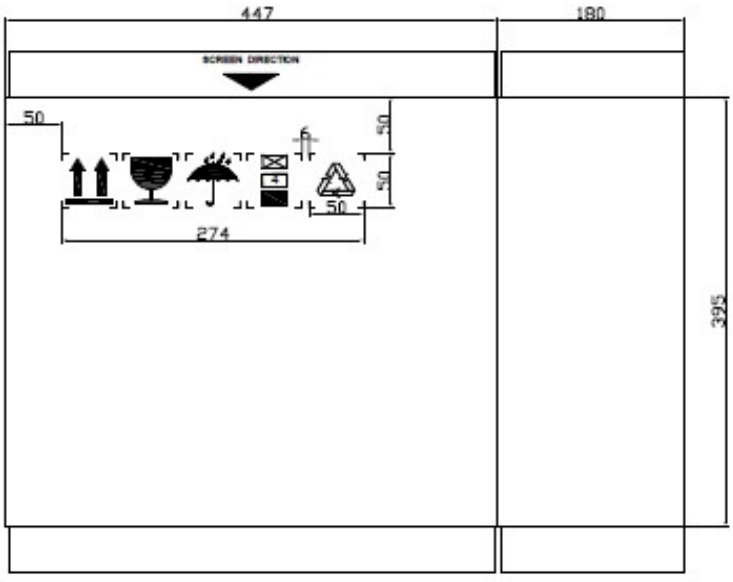
3.2.3 Structure Width Position

Fig. 3.4



3.3 Packaging

Fig. 3.5



Tab. 3.2

	Carton Box	
	Width (mm)	447
	Depth (mm)	180
	Height (mm)	395
Gross weight	TBD	

4. ENVIRONMENT CONDITONS

4.1 Operation Environment（UXN-039059）

Tab. 4.1

Ambient temperature range	+10 -- +35℃

Ambient humidity	20%-80%
Temperature gradient	≤ 0.5°C/min
Atmospheric pressure range	70 – 110 kPa

4.2 Transport and Storage (Packed)

Tab. 4.2

Ambient temperature range	-10 -- +40℃
Ambient humidity	10%-90%
Temperature gradient	Max. 10℃/h, no condensation
Atmospheric pressure range	70 – 106 kPa

4.3 Mechanical Load

Operation （UXN-13600 Class M2）

Tab. 4.3 Vibration

Test direction	X-direction (user position)	Y-direction	Z-direction
frequency range cross-over frequency	10Hz - 150Hz 59.5Hz	10Hz - 150Hz 57.5Hz	10Hz - 150Hz 57.5Hz
acceleration	5g above the cross-over frequency	2g above the cross-over frequency	2g above the cross-over frequency
displacement	0.7mm$_{peak-peak}$ up to the cross-over frequency	0.3mm$_{peak-peak}$ up to the cross-over frequency	0.3mm$_{peak-peak}$ up to the cross-over frequency
sweep rate	1 octave/minute	1 octave/minute	1 octave/minute
initial sweep direction	up	up	up
number of sweeps	10	10	10

Tab. 4.4 Bump

Test direction	X-direction (user position)	Y-direction	Z-direction
Acceleration	25g	10g	10g
Pulse width	6 - 10 msec.	6 - 10 msec.	6 - 10 msec.
Number of bumps	4000	1000	1000

Packed unit:
According to 2M2 EN60721-3-2

5. REGULATION

5.1 Safety Specifications

Tab. 5.1

Safety standards	IEC60950-1、FCC Part 15 Class B、CISPR 11 Group 1 Class B
Approvals	FCC、CB (NCB Lab.)
Protection class	class III

Degree of protection to IEC 60529	IP21
Conformity	CE

5.2 Electromagnetic Compatibility

The unit shall comply with CISPR 11 Group 1 Class B - 3dB for conducted and radiated emission.

TM.Appr.EMC
The unit shall comply with CISPR 11 Group 1 Class B - 3dB for conducted and radiated emission.

TM.Appr.Certification
The monitor shall be certified to the following regulations:

- IEC60950-1
- FCC
- CE

5.3 Rohs Compliance

Comply with RoHs

6. MTBF & Warranty

Flat screen without Backlight: ＞70,000 operation hours.

Minimum backlight life time: ≥20,000 hours (Brightness reduction to 50%)

Warranty items refer to related service contract.

7. DEFECT, SCRATCH and DUST

7.1 Environment condition

Room temperature: 20 ~ 25 C.

Humidity: 65±5% RH.

Illumination: Fluorescent light (Day-Light Type) display surface illumination to be 300 ~ 700 lux. (standard 500 lux.)

To be a distance about 35 ± 5 cm in front of LCD unit, viewing line should be perpendicular to the surface of the module judge the visual appearance with human's eyes.

Take off the protector of polarizer while judging the display area.

If there is any question while judging, check the panel again while operating.

7.2 Dot Defect

Tab. 7.1

Defect pattern	Condition				Criteria
Line defect	Display of black, white, red, green, blue				0 line
Bright dots Note2, Note3	Red+Green+Blue				≤3 dots
	Close defect dots Note5	0mm≤D≤15mm Note7		Same color and different color	0 set
	Linked defect dots Note6	D=0mm Note7	2 defect dots	Same color	0 set
				Different color	≤1 set
			3 defect dots or more	Same color and different color	0 set
Dark dots Note2, Note4	Red+Green+Blue				≤5 dots
	Close defect dots Note5	0mm≤D≤15mm Note7		Same color and different color	0 set
	Linked defect dots Note6	D=0mm Note7	2 defect dots	Same color and different color	0 set
			3 defect dots or more	Same color and different color	
Between Bright dots and Dark dots	Linked defect dots Note6	D=0mm Note7	2 defect dots	Same color and different color	Allowed
			3 defect dots or more	Same color and different color	0 set
	Close defect dots Note5	0mm≤D≤15mm Note7		Same color and different color	Allowed
Total	Bright dots + Dark dots				≤7 dots

Note1: Inspection conditions are as follows.

Tab. 7.2

Temperature	25±5℃
Inspection viewing distance	20cm (The distance between the inspector's eye and screen.)
Inspection direction	0°≤θR≤20°, 0°≤θL≤20°
	0°≤θU≤20°
Inspection illumination	60lx(at a display surface)

Note2: Regardless of bright or intermittent bright, 1/3 or more defects of a dot area is counted as the defect dot.

Note3: Bright dots are counted while the display is black.

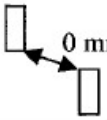
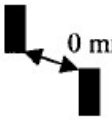
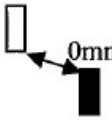
Note4: Dark dots are counted which the display is illuminated with Red, Green or Blue.

Note5: See "7.2.1 Close defect dots".

Note6: See "7.2.2 Linked defect dots".

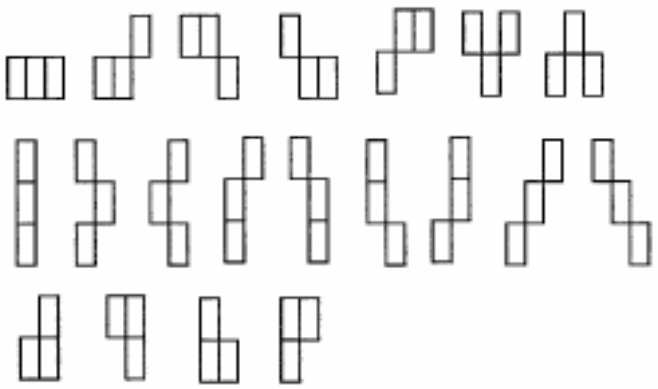
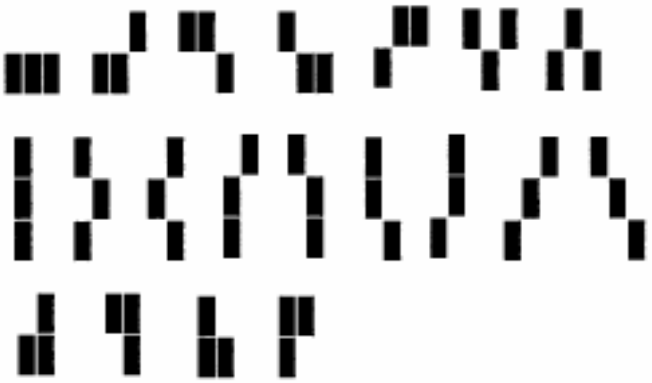
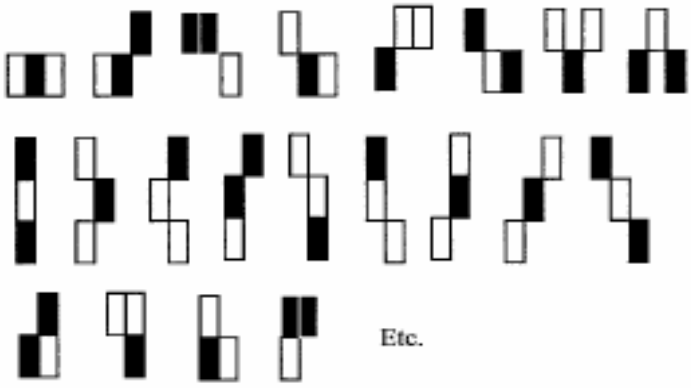
Note7: D is the distance between defect dots.

7.2.1 Close defect dots

Defect pattern	: Bright dot : Dark dot	Criteria
Bright dots	Same color and different color 	0 set
Dark dots	Same color and different color 	0 set
Combination between bright dot and dark dot		Allowed

7.2.2 Linked defect dots

Defect pattern	: Bright dot : Dark dot	Criteria
2 defect dots	Same color 	0 set
	Different color 	≤ 1 set
	Same color and different color 	0 set
	Combination between bright dot and dark dot 	Allowed

Defect pattern	: Bright dot : Dark dot	Criteria
3 defect dots	Bright dots 	0 set
	Dark dots 	
	Combination between bright dot and dark dot  Etc.	

7.2.3 Appearance specification

Tab. 7.3

<table>
<tr><th colspan="2">Defect pattern</th><th colspan="2">Condition</th><th>Criteria</th></tr>
<tr><td rowspan="6">Impure ingredient
Stains
Dust</td><td rowspan="3">Dot shape</td><td colspan="2">d＜0.2mm</td><td>Allowed</td></tr>
<tr><td colspan="2">0.2mm ≤d＜0.3mm</td><td>≤10 points</td></tr>
<tr><td colspan="2">0.3mm ≤d≤0.5mm</td><td>≤3 points</td></tr>
<tr><td colspan="2">d＞0.5mm</td><td>0 point</td></tr>
<tr><td rowspan="3">Line shape</td><td colspan="2">W＜0.05mm</td><td rowspan="2">Allowed</td></tr>
<tr><td rowspan="3">0.05mm ≤W≤0.1mm</td><td>L＜0.7mm</td></tr>
<tr><td>0.7mm ≤L≤1.0mm</td><td>≤4 points</td></tr>
<tr><td colspan="2">L＞1.0mm</td><td rowspan="2">0 point</td></tr>
<tr><td colspan="2">W＞0.1mm</td></tr>
<tr><td colspan="2" rowspan="3">Bubbles, Wrinkles, Dent</td><td colspan="2">d＜0.2mm</td><td>Allowed</td></tr>
<tr><td colspan="2">0.2mm ≤d≤0.5mm</td><td>≤2 points</td></tr>
<tr><td colspan="2">d＞0.5mm</td><td>0 point</td></tr>
<tr><td colspan="2" rowspan="2">Scratch(Surface of polarizer)</td><td colspan="2">S≤0.2mm2</td><td>Allowed</td></tr>
<tr><td colspan="2">S＞0.2mm2</td><td>0 point</td></tr>
</table>

Note1: Definition of symbols is as follows.

d : Average diameter

(This diameter is the average length of a long axis and a short axis in each defect pattern.)

W: Width, L: Length, S: Area

Note2: Inspection conditions are as follows.

Temperature	25±5℃
Inspection viewing distance	20cm (The distance between the inspector's eye and screen.)
Inspection direction	0°≤θR≤45°, 0°≤θL≤45°
	0°≤θU≤45°, 0°≤θD≤45°
Illumination	700lx(at an inspection desk surface)

8. Cosmetic Specifications and Acceptance Criteria Summary (Touch Panel)

Spots, Dots or Bubbles, (circular blemishes and defects), in the viewable area

Diameter < 0.35 mm, Disregard or ignore

0.35 mm < Diameter < 0.50 mm, Quantity < 5

0.50 mm < Diameter < 0.80 mm, Quantity < 2

Diameter > 0.8 mm, Quantity = 0

Lines, Linear Fibers or Scratches in the viewable area

Width < 0.02 mm, Disregard or ignore

0.02 mm < Width < 0.04 mm, Length < 20 mm Min. distance between blemishes: 10 mm

0.04 mm < Width < 0.08 mm, Length < 5 mm Quantity < 2, min. distance between: 20 mm

0.08 mm < Width < 0.10 mm, Length < 2 mm Quantity < 1

Width > 0.1 mm, Refer to circular blemish criteria: (a+b) / 2

Note 1: Bubbles or contamination outside the viewing area are considered acceptable.

Note 2: If a blemish can be wiped off or blown away using a compressed air gun, the touch panel is considered acceptable.

Note 3: Defects described above should be found at IQC (Incoming Quality Control), or prior to TFT display bonding or completed manufacturing assembly.

Note 4: Glass chips that do not impact functionality and only observed from the back side are considered acceptable.

Note 5: Glass cracks or fractures are not acceptable.

FCC Statement:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.