Customer Specification

15.3 Inch Color LCD Display

Model: HL1530

Name	Department/Title	Date	Signature

Change History

Version	Date	Author	Modification
A0	2013-5-29	Zhai Tao Jin Zhonghua Zou Yanyan	Preliminary
A1	2013-12-10	Zhai Tao Jin Zhonghua Zou Yanyan	Update the Label information Add mechanical color details Update the new 2D drawing illustrate the part of sheet metal. Add 3.1 section, Note1 and Note2 Add 2.3 section Note3

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.

The monitor is a Field Replaceable Unit, and has no field serviceable parts. The monitor is not intended for any disassembly in the field or by Philips.

The touch screen is usable in the WinPE3.0 pre-installation environment or Windows 7 environment.

Monitor Character:

No display settings related controls shall be available for the user

The monitor shall not require any configuration setting.

Abbreviations

The following abbreviations are used in this document:

Acronym	Definition
ABS	Acrylonitrile Butadiene Styrene
CR	Contrast Ratio
DC	Direct Current
DDC	Display Data Channel
EDID	Extended Display Identification Data
FPC	Flexible Printed Circuit
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
PC	Polycarbonate
PCAP	Projective Capacitive
P/N	Part Number
RoHS	Restriction of Hazardous Substances
USB	Universal Serial Bus

2. ELECTRICAL PERFORMANCE

2.1 Power Supply

Table 2.1

-Input Voltage	: DC12V ± 10%
- Current (max)	: 3.0 A
- Power Consumption	: <40W

2.2 Power Management

The following table shows the power consumption feature:

Table 2.2

VESA Modes	Horizontal Sync	Vertical Sync	Video	Power Indicator	Power Consumption
Normal operation	Active	Active	Active	Green	Less than 40 W
Active-off mode	Inactive	Inactive	Blanked	Green blinking	Less than 15W

While there is no sync or active video supplied by the system, the Power indicator LED will be in green blinking status, and the monitor screen will display "No Signal Present".

2.3 Interface

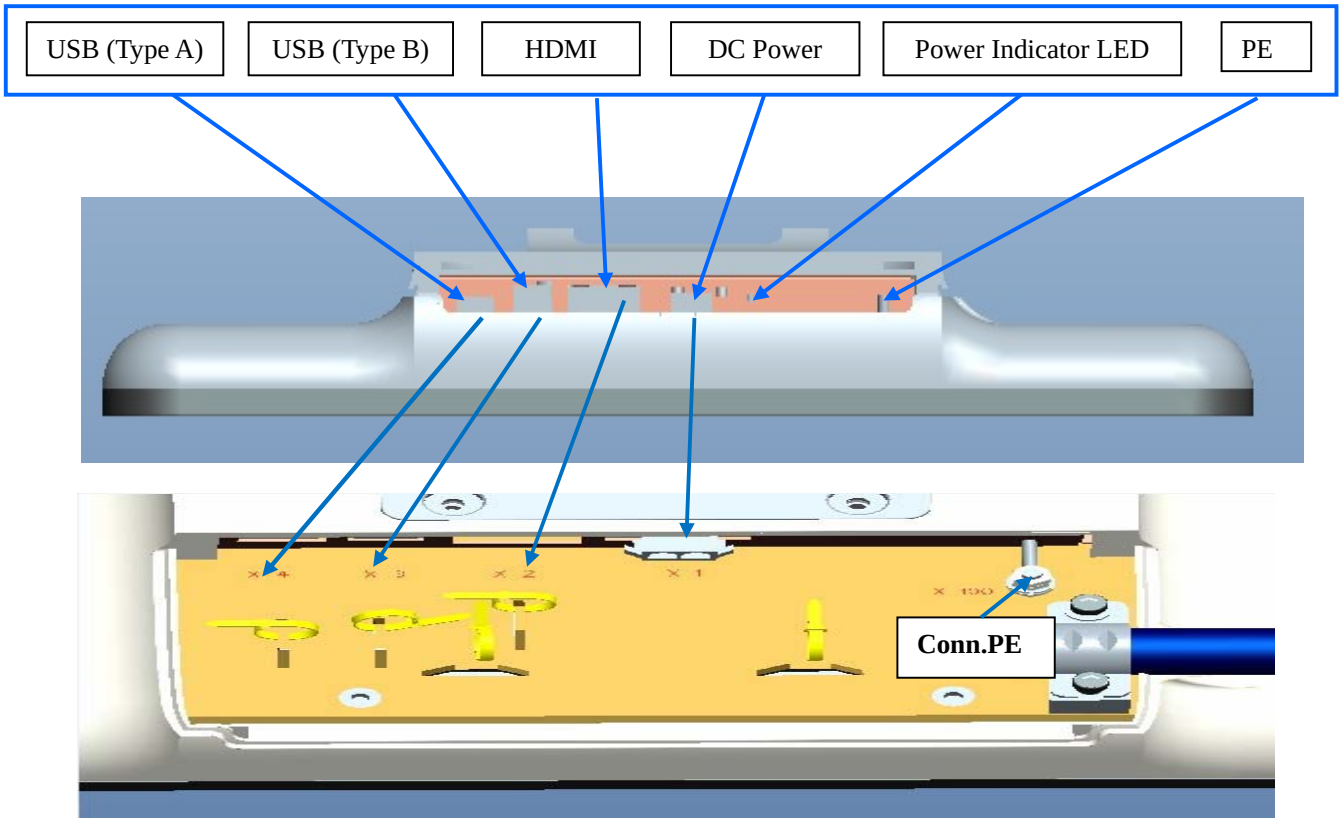


Figure 2.1

Notes:

1. The monitor shall have a receptacle connector for power supply, capable for mating a “2-P UMNL Universal Mate-N-Lock” connector.

2. Print the following information in specific regions on the surface of metal plate: X1, X2, X3, X4, X100.
3. Conn.PE(X100) is M4*14mm stud with 2 flat washers and nut. Use to secure protective earth connection from the Host cable.

The corresponding relations as follows:

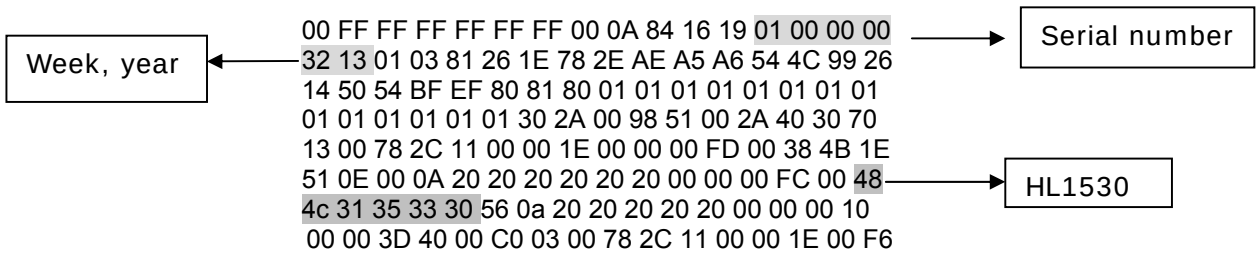
Connector	Label
USB out	X4
USB in	X3
HDMI	X2
Power	X1
Ground(PE)	X100

2.3.1 Signal Specifications

Table 2.3

Item		SPEC
HDMI Port	HDMI single link	TMDS: 600mV for each differential line 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.

2.3.2 HDMI connector

Table 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)	

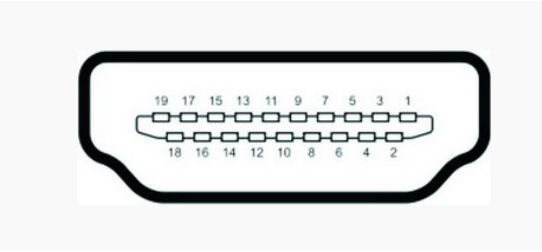


Figure 2.2 HDMI connector

2.3.3 USB 2.0 Interface

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

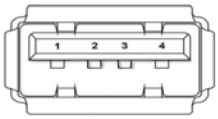


Figure 2.3 USB-A connector

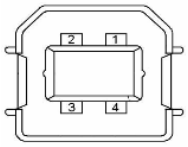


Figure 2.4 USB-B connector

Table 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

USB is connection to host system, in order to enable Touch panel.

2.3.4 Power connector

The power connector use TE AMP 1-350942-0.

Figure 2.5 Power connector

Power connector could mate a “2-P UMNL Universal Mate-N-Lock” connector.

2.3.5 Serial Port

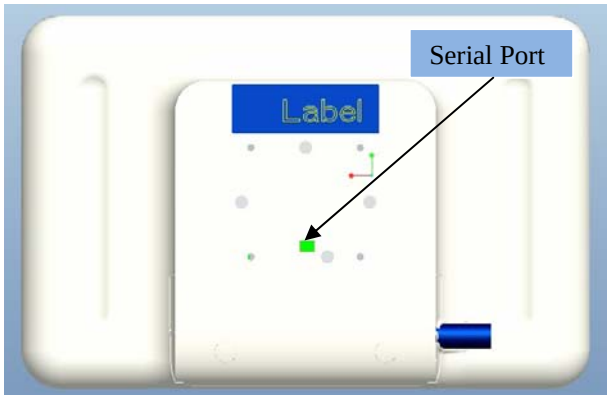


Figure 2.5 Serial Port

Serial port for factory firmware upgrade(Port located under the VESA plate mounting).

2.4 Panel Features

Table 2.6

Panel Module	NL12876BC26-32D
Panel Type	a-Si TFT-LCD
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
Lamp Type	LED (Replaceable module)
Surface	Anti-glare polarizer

2.5 Display Performance

2.5.1 Standard Testing Conditions

Table 2.7

- Warm up time	＞20 minutes.
- DC supply voltage	12V DC
- Ambient temperature	25 ± 2ºC
- Relative Humidity	30% --80%
- Video signal	1280 x 768 @ 60Hz; HDMI
- Ambient Environment	Dark
- LUT Setting	Native
- Luminance meter	Minolta CA-210/CA310 or equivalent

2.5.2 Brightness

The light output shall be set on 370Cd/m2 output during manufacturing. When this light output cannot be reached, but the panel is within specification, the light output should be set to maximum output.

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 Luminance Uniformity

LU less than 1.3 (Note 5)

2.5.5 Contrast ratio

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

2.5.6 White Color Coordinates

x=0.313±0.05 y=0.329±0.05

2.5.7 Response Time

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

2.5.8 Color Gray

256gray levels should be displayable

2.6 Touch screen Performance

2.6.1 Features

Table 2.8

Item	Specification
Type	PCAP
Input Mode	Finger
Cable	FPC
Interface Type	USB 2.0 interface (Voltage & connection provide by host system.)

2.6.2 General Specification

Table 2.9

Item	Specification
Frame Size	385.08mm X251.45 mm
Tolerance	-0.2,+0.2mm
Active Area	334.08 X200.45mm
Black Silkscreen	25mm perimeter outside viewable area
Surface Treatment	Chemically hardened glass, no anti-reflective treatment
Total Thickness	3.20±0.50 mm
Attachment	Optically bonded to TFT LCD Module

Notes:

The touch screen controller support grip suppression and palm rejection algorithms.

2.6.3 Environmental Characteristics

Table 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

Table 2.11

Item	Specification
Transmissivity	⩾85%

2.6.5 Electrical Characteristics

Table 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.

Remark:

1. Parameters

   The relevant touch panel parameters are developed between Philips and Ocular. The parameter settings are pre-loaded by standard firmware loading of the touch panel controller at Ocular factory. The parameter file shall be under configuration control.

2. Firmware Version

   Firmware is released by Ocular to maintain manufacturing configuration control.

   Version: F153-1664S-001 V2.0.xcfg

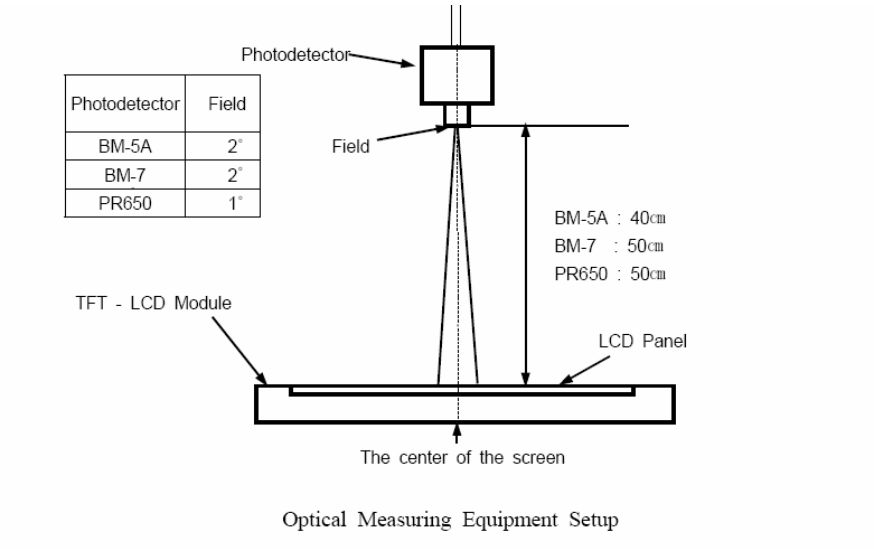
3. Calibration

   The P-Cap sensor is matrix based. No calibration is required.

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.

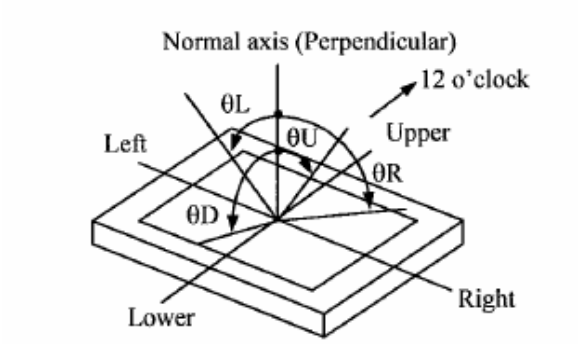
Environment condition: Ta=25 ± 2ºC



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

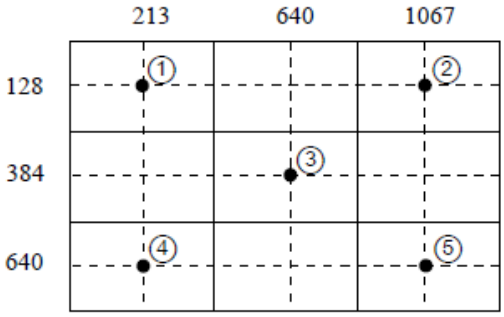
Gmin: Luminance with all pixels black

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

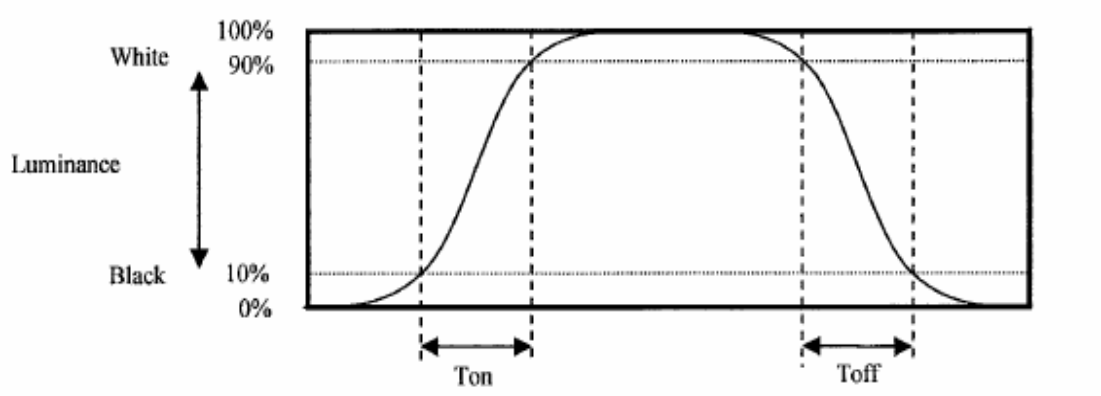
Note 5: Definition of luminance uniformity

The luminance uniformity is calculated by using following formula.(Under White Screen Status)

$$\text{Luminance uniformity (LU)} = \frac{\text{Maximum luminance from ① to ⑤}}{\text{Minimum luminance from ① to ⑤}}$$



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

Figure 3.1

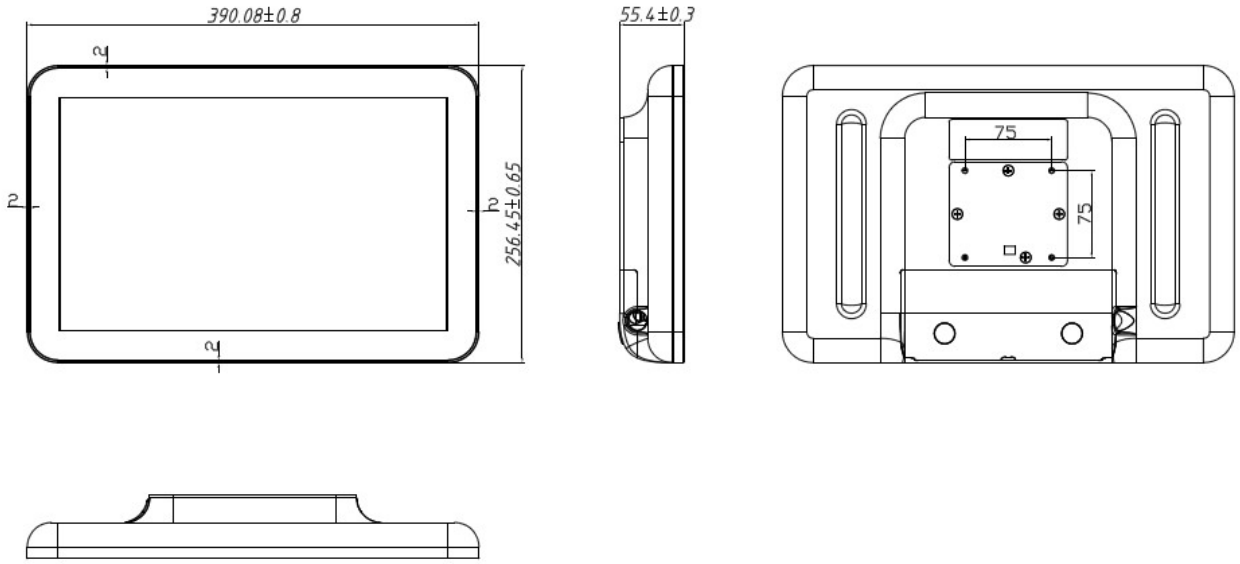


Table 3.1

Item	Set	
	Width	390.08mm
	Depth	256.45mm
Color of main enclosure and rear cover	Pantone Cool Grey 1M	
Color of bezel	Pantone Black 2M	
Housing components	Plastic(ABS+PC)	
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	4Kg	

Note 1: The monitor shall not require specialized mechanical installation tools. Use of slotted or Phillips screwdrivers or Allen keys is allowed. Torx is not allowed.
Note 2: VESA screws should be between 8.2mm and 9.7mm. Entrance of screws longer than 9.7mm will be blocked by threaded nuts, to prevent and damage to internal components.

3.2 Mechanical Color

The monitor has two colors for the bezel/housing design:

- Philips: Mushroom (40383); Pantone: Cool Gray 1M
- Philips: Ultra Dark Gray (10714); Pantone: Black 2M

3.3 Packaging

Figure 3.2(Carton)

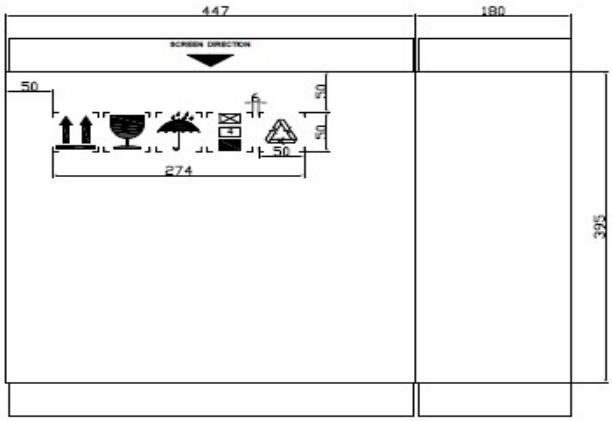


Table 3.2

	Carton Box	
Dimension	Width (mm)	447
	Depth (mm)	180
	Height (mm)	395
Gross weight	5Kg	

Foam inserts illustration:

Figure 3.3 Front illustration(30°)

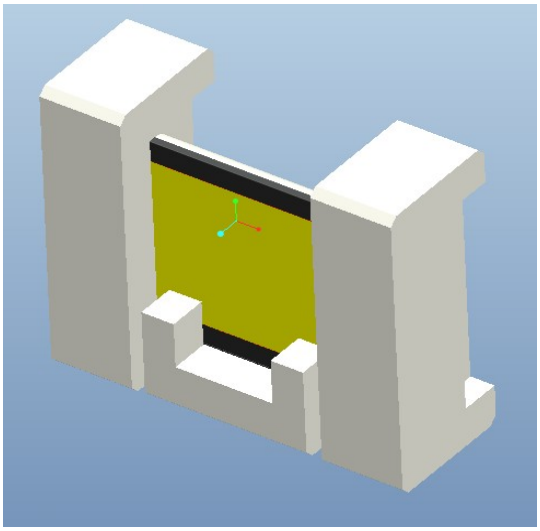
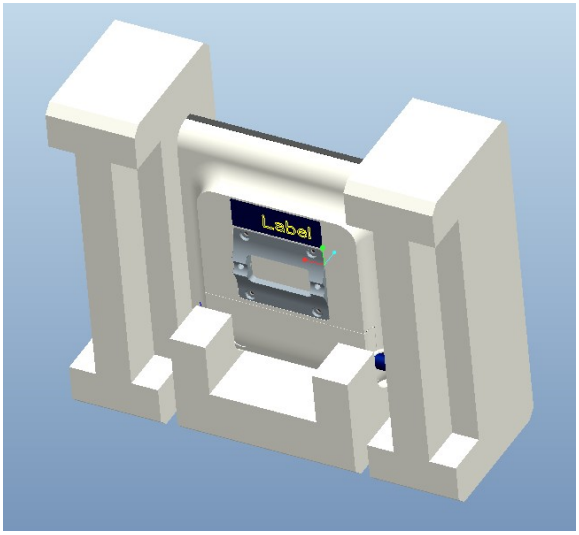


Figure 3.4 Back illustration(30°)



3.4 Texture

Texture of plastic parts shall be: VDI 3400 REF 30 (Supplier reference VDI3400 REF 22G allowed as equivalent).

3.5 Label

3.5.1 Production Label

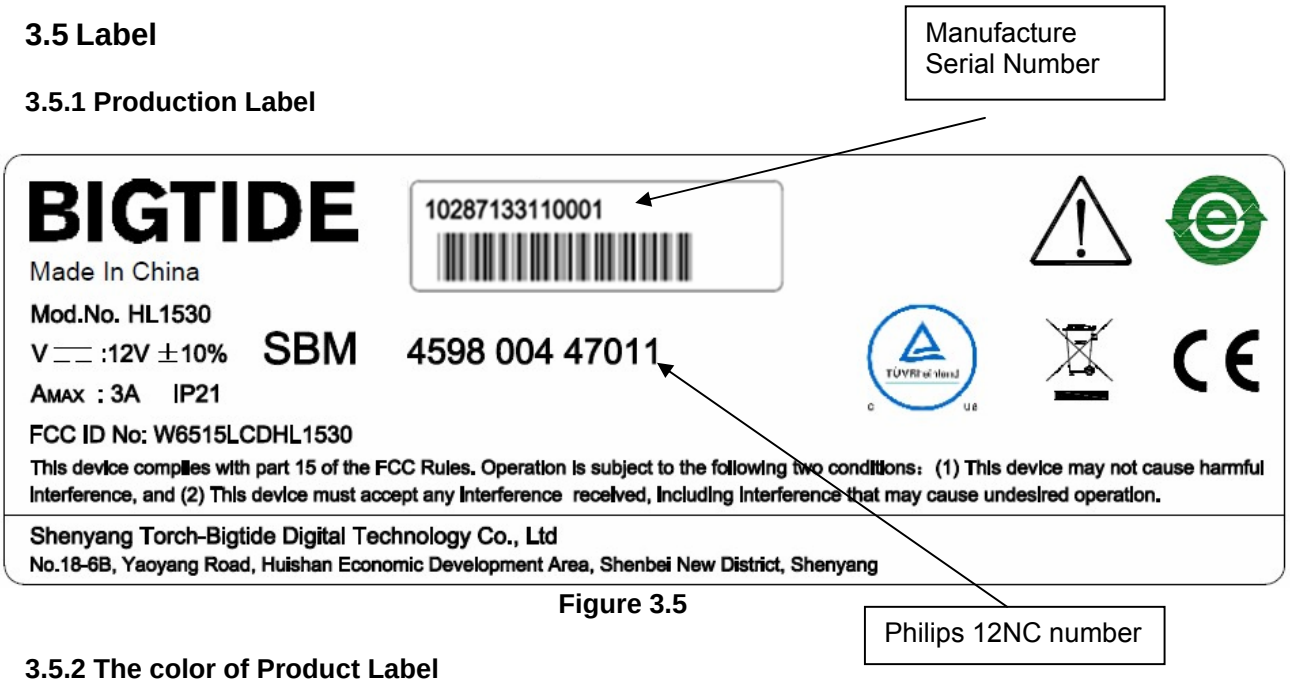


Figure 3.5

3.5.2 The color of Product Label

The colors of the product label shall match:

Background: Matte silver

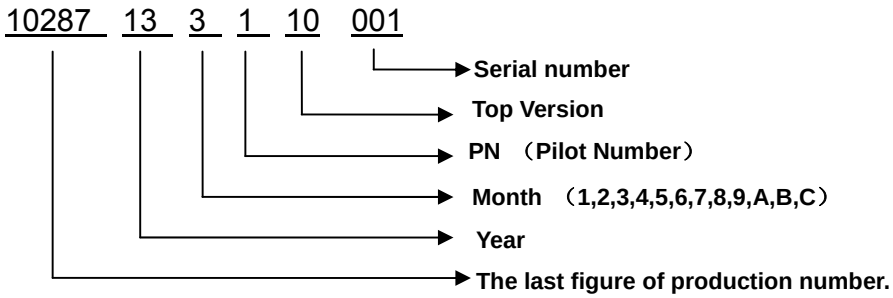
Text: Black.

3.5.3 Packaging Label

Figure 3.6

3.5.4 Manufacture 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 Number 301010287, TOP version 1.0, in March 2013, the first batch, the serial number of the first production is 10287133110001.

Manufacture serial number and Philips 12NC barcodes are Code 39.

3.6 Cleanability

The monitor shall be cleanable with the hospital used cleaning/disinfection fluids.

The list of liquids:

1 - Isopropanol 100%

2 - Ethanol 70%

3 - Chlorehexidine 0,5% in 70% Ethanol

4 - Haemosol 1% in 1 litre water

5 - Chlorine 250 ppm in 1 litre distilled water

6 - Artificial sweat (5% KCL, pH=3)

7 - Natriumchloride 0,9% (NaCL)

8 - Coffee with milk and sugar

9 - Iodine 1% in 70% Ethanol2

10 - Hexabrix 320

11- Chlorehexidine, red colored2

12- Chlorine 500 ppm in 1 litre distilled water2

4. ENVIRONMENT CONDITONS

4.1 Operation Environment（Philips XN-039059）

Table 4.1

Ambient temperature range	+10 -- +40°C
Ambient humidity	20%-80%
Temperature gradient	≤ 0.5°C/min
Atmospheric pressure range	70 – 110 kPa

4.2 Transport and Storage (Packed) （Philips XN-039059）

Table 4.2

Ambient temperature range	-25 -- +70°C
Ambient humidity	5%-95%
Temperature gradient	Max. 10°C/h, no condensation
Atmospheric pressure range	70 – 110 kPa

4.3 Mechanical Load

Operation （Philips XN-039137）

Table 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

Operation （Philips XN-039136）

Table 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

4.4 Packed unit

According to 2M2 EN60721-3-2

5. REGULATION

5.1 Safety Specifications

Table 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.
The unit shall be evaluated for immunity according IEC61000-4-6 against:

a) Normal performance within limits specified by the manufacturer, requester or purchaser; Section 9, meet level a) Specified as: "Normal operation of the monitor and touch panel should be maintained during the emissions test."

5.3 RoHS Compliance

Comply with RoHS

6. MTBF & Warranty

Flat screen without Backlight: ＞60,000 operation hours.

The monitor 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

Table 7.1

<table>
<tr><td>Defect pattern</td><td colspan="4">Condition</td><td>Criteria</td></tr>
<tr><td>Line defect</td><td colspan="4">Display of black, white, red, green, blue</td><td>0 line</td></tr>
<tr><td rowspan="5">Bright dots
Note2, Note3</td><td colspan="4">Red+Green+Blue</td><td>≤3 dots</td></tr>
<tr><td>Close defect dots
Note5</td><td colspan="2">0mm≤D≤15mm
Note7</td><td>Same color and different color</td><td>0 set</td></tr>
<tr><td rowspan="3">Linked defect dots
Note6</td><td rowspan="3">D=0mm
Note7</td><td rowspan="2">2 defect dots</td><td>Same color</td><td>0 set</td></tr>
<tr><td>Different color</td><td>≤1 set</td></tr>
<tr><td>3 defect dots or more</td><td>Same color and different color</td><td>0 set</td></tr>
<tr><td rowspan="4">Dark dots
Note2, Note4</td><td colspan="4">Red+Green+Blue</td><td>≤5 dots</td></tr>
<tr><td>Close defect dots
Note5</td><td colspan="2">0mm≤D≤15mm
Note7</td><td>Same color and different color</td><td>0 set</td></tr>
<tr><td rowspan="2">Linked defect dots
Note6</td><td rowspan="2">D=0mm
Note7</td><td>2 defect dots</td><td>Same color and different color</td><td rowspan="2">0 set</td></tr>
<tr><td>3 defect dots or more</td><td>Same color and different color</td></tr>
<tr><td rowspan="3">Between Bright dots and Dark dots</td><td rowspan="2">Linked defect dots
Note6</td><td rowspan="2">D=0mm
Note7</td><td>2 defect dots</td><td>Same color and different color</td><td>Allowed</td></tr>
<tr><td>3 defect dots or more</td><td>Same color and different color</td><td>0 set</td></tr>
<tr><td>Close defect dots
Note5</td><td colspan="2">0mm≤D≤15mm
Note7</td><td>Same color and different color</td><td>Allowed</td></tr>
<tr><td>Total</td><td colspan="4">Bright dots + Dark dots</td><td>≤7 dots</td></tr>
</table>

Note1: Inspection conditions are as follows.

Table 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.

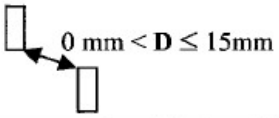
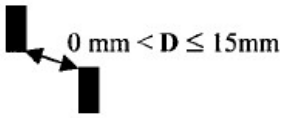
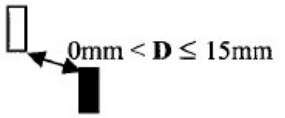
Note4: Dark dots are counted which the display is illuminated with Red, Green or Blue.

Note5: See "7.2.1 Close defect dots".

Note6: See "7.2.2 Linked defect dots".

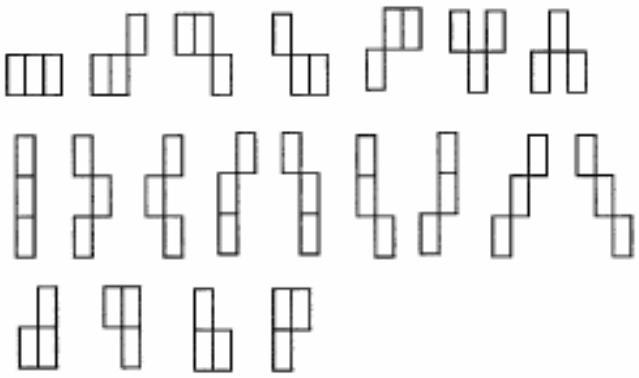
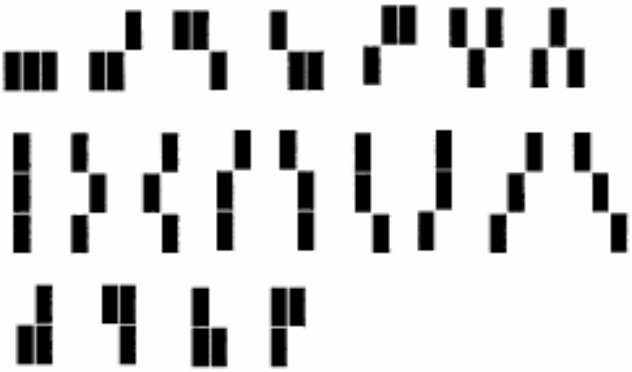
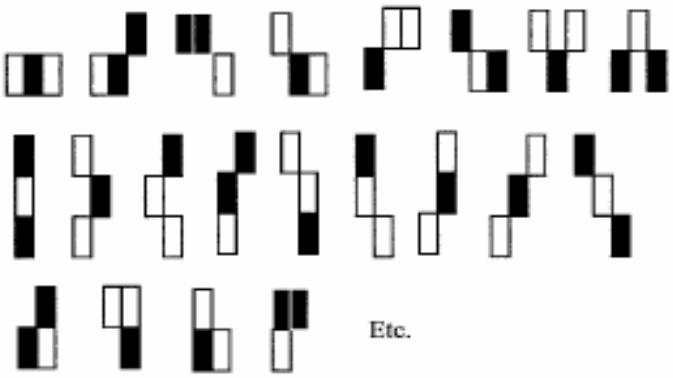
Note7: D is the distance between defect dots.

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

Table 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="4">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="5">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>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.

Table 7.4

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) – TP viewable area >10"			
	Diameter (mm)	Accept Quantity	Minimum Distance Between blemishes
	Diameter ≤ 0.35 mm	Disregard or ignore	/
	0.35 mm < Diameter ≤ 0.50 mm	Quantity ≤ 5	5mm
	0.50 mm < Diameter ≤ 0.80 mm	Quantity ≤ 2	20mm
	Diameter > 0.8 mm	Quantity = 0	/
Lines, Linear Fibers or Scratches in viewable area			
	Width (mm)	Max. Length (mm) And Accept Quantity	Minimum Distance Between blemishes
	W ≤ 0.04	Disregard or ignore	/
	0.04 < W ≤ 0.08 mm	L ≤ 20 mm, Quantity ≤ 5	20mm
	0.08 < W ≤ 0.10 mm	L ≤ 5 mm, Quantity ≤ 1	/
	W > 0.1	Refer to circular blemish criteria.	

Note 1: Defects must be found at Incoming Quality Control (IQC), prior to non-Ocular cover glass (faceplate) or TFT display bonding, or before final manufacturing assembly.

Note 2: Bubbles or contamination outside the viewing area are acceptable. These anomalies do not impact functionality, performance or long term reliability.

Note 3: If a surface blemish or defect can be wiped off, removed by cleaning or blown away using a compressed air gun, the touch panel is acceptable.

Note 4: Blemishes or defects on the touch panel back side that are not visible from the front are acceptable. These anomalies do not impact functionality, performance or long term reliability.

Note 5: Glass chips that do not impact functionality, performance or long term reliability and only observed from the back side are acceptable.

Note 6: Glass cracks or fractures are not acceptable. This is a defect.