NEW TECHNOLOGY FOR PREVENTING BLACKENING

AND TOUCH SCREEN PERFORMANCE DEFECT BY SUNLIGHT

- For Panel pc and Industrial LCD Display

Hitec

1. Outdoor PC Installation Problem

1.1 LCD Blackening

1.1-1 What is LCD Blackening?

When the LCD exposes exceeding operating temperature, the black spot appears on the LCD surface.

Ex: Operating temp : - 20 ~ +70 ℃

There's no matter at the low temperature, but when the sunlight hit the LCD surface and the temperature goes over +70 ℃, the LCD cell starts to solid and make black spots temporary.

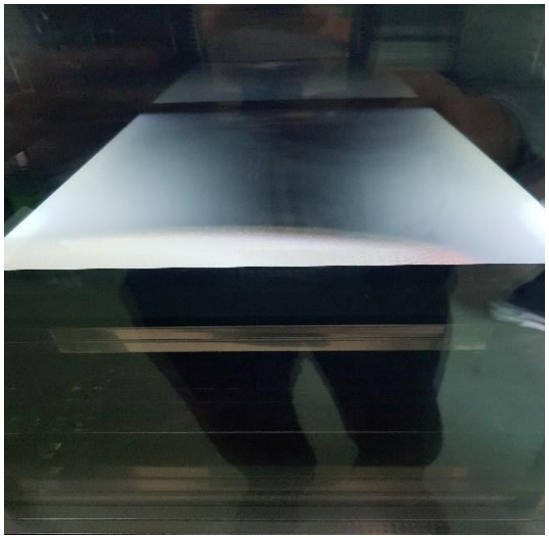
When the sun moves, and the surface temperature goes under +70 ℃, this black spots disappears.

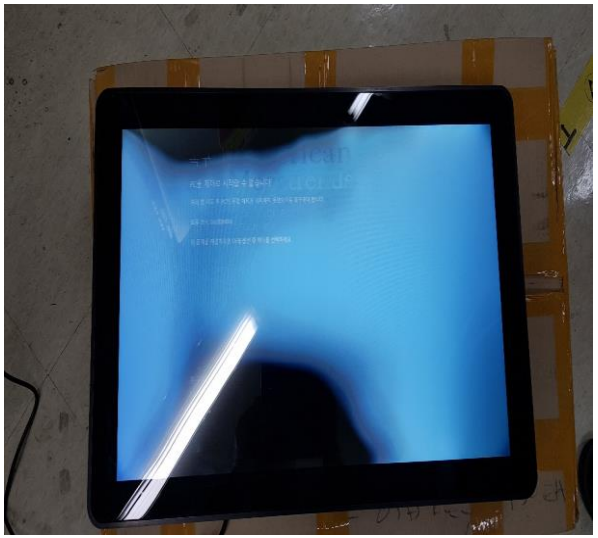
But, if the LCD exposes under the high heats continuously, it causes LC bubbles never disappear.

1. Outdoor PC Installation Problem

1.1 LCD Blackening

1.1-2 Thermal Test



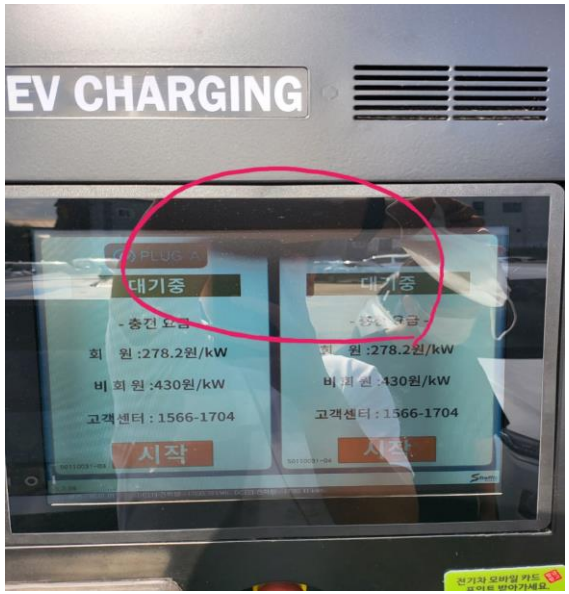


- 15 Inch LCD Operating Temperature : - 20 ~ +70 ℃
- Chamber temperature : 77℃
- Black spot : Y

1. Outdoor PC Installation Problem

1.1 LCD Blackening

1.1-3 Sunlight Test



- Where : Jeju Island
- Time : 9 a.m.
- When the sunlight hit the screen directly in the morning, black spot appeared and disappeared repeatably.
- By repeat symptom, LC bubbles appeared.

1. Outdoor PC Installation Problem

1.2 Touch Screen Performance Defect

1.2-1 What is touch screen performance defect?

Likewise, Touch screen performance is also determined by operating temperature.

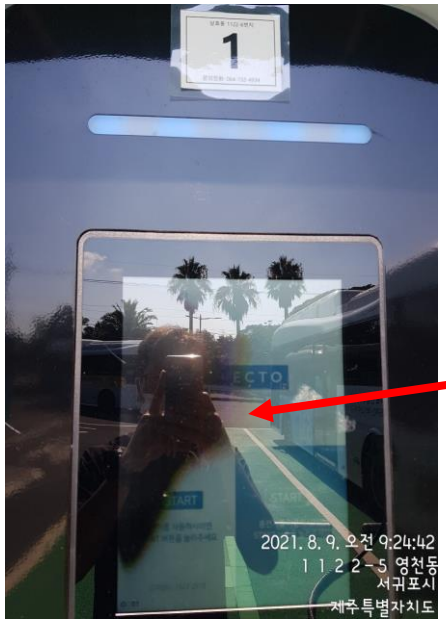
Touch screen operating temperature : - 20 ~ +70 ℃

When the sunlight hit the touch screen directly, the surface temperature is over 80 ℃ and the performance of touch screen stopped.

1. Outdoor PC Installation Problem

1.2 Touch Screen Performance Defect

1.2-2 Touch surface temperature measurement (Outdoor installation)



- Where : Jeju Island
- When the sunlight hit the screen directly in the morning, there was no reaction on the touch screen from 75℃
- By sun moves, touch surface temperature goes up until 90 ℃

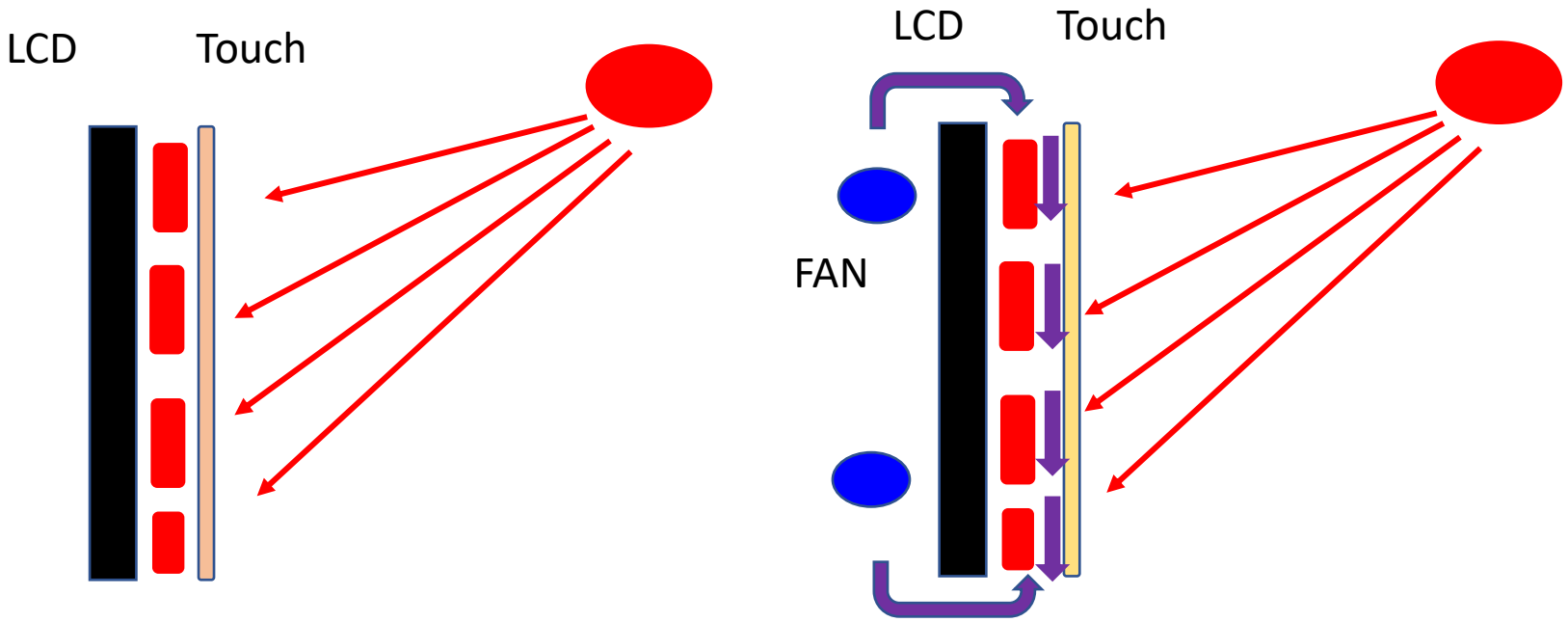
2. Solutions

2.1 LCD Blackening Prevention

2.1-1 How to prevent LCD Blackening?

■ **Fan installation**

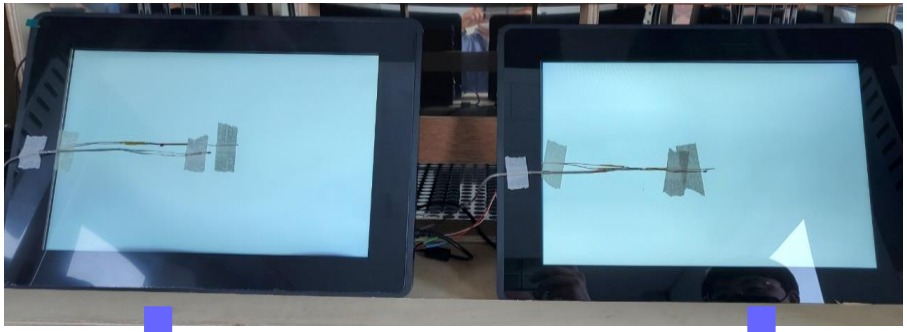
- Fans will circulate high heats between LCD and Touch screen.
- Patent Application : 10-2022-0031668 (Korea)



2. Solutions

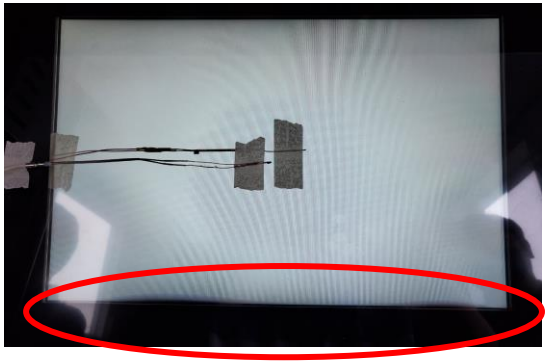
2.1 LCD Blackening Prevention

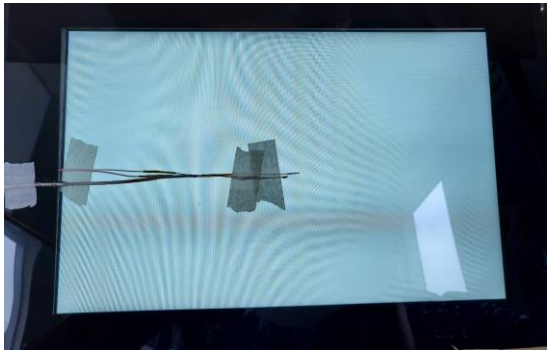
2.1-2 Thermal Test (Chamber inside temperature : 88.6℃)



Without Fan

With Fan





- Blackening : NG
- Touch Performance : NG

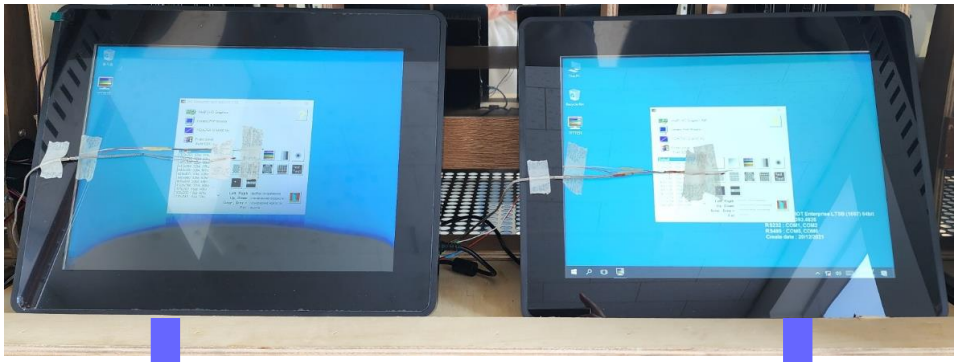
- Blackening : NG
- Touch Performance : OK

2. Solutions

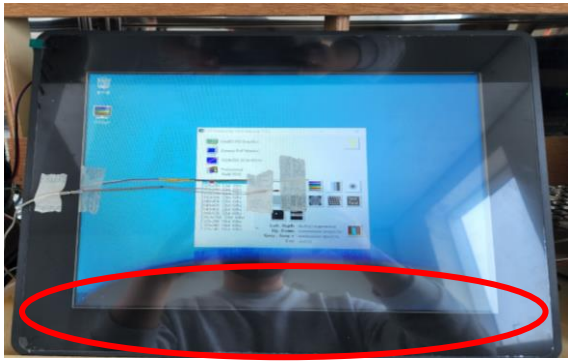
2.1 LCD Blackening Prevention

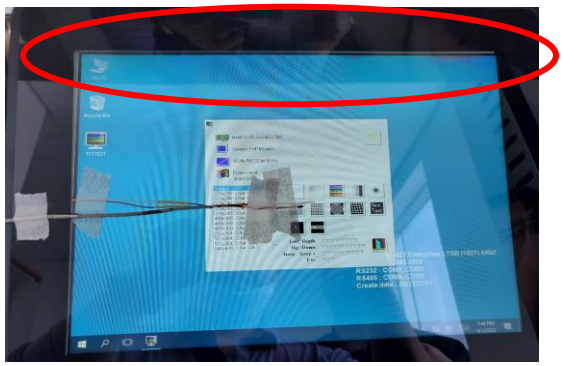
2.1-2 Thermal Test (Chamber inside temperature : 88.9℃)

Without Fan



With Fan





- Blackening : NG
- Touch Performance : OK

- Blackening : NG
- Touch Performance : OK

2. Solutions

2.1 LCD Blackening Prevention

2.1-2 Thermal Test

Without Fan

	Temp	70	75	80	85
Touch surface	0 h	71	77	81	87
	0.5 h	72	77	82	88
	1 h	73	78	83	91
	1.5 h	73	77	83	91
	2 h	72	78	82	91
Between LCD and Touch	0 h	74.5	82.7	86.3	91.5
	0.5 h	79.2	83.9	87.4	93.8
	1 h	79.3	83.9	88.6	95.2
	1.5 h	79.3	84	88.6	97.7
	2 h	79.6	83.9	88.7	96.8
Dark Spot	0 h	OK	OK	OK	**NG**
	0.5 h	OK	OK	OK	**NG**
	1 h	OK	OK	**NG**	**NG**
	1.5 h	OK	OK	**NG**	**NG**
	2 h	OK	OK	**NG**	**NG**
Touch Performance	0 h	OK	OK	OK	OK
	0.5 h	OK	OK	OK	**NG**
	1 h	OK	OK	**NG**	**NG**
	1.5 h	OK	OK	**NG**	**NG**
	2 h	OK	OK	**NG**	**NG**

With Fan

	Temp	70	75	80	85
Touch surface	0 h	71	77	80	86
	0.5 h	72	77	82	87
	1 h	72	77	82	89
	1.5 h	72	77	82	90
	2 h	72	77	82	90
Between LCD and Touch	0 h	72.1	78.4	82.4	87.2
	0.5 h	73.7	78.6	82.9	88.9
	1 h	73.7	78.8	83.7	90.8
	1.5 h	73.7	78.8	83.7	91.9
	2 h	73.8	78.8	83.7	91.7
Dark Spot	0 h	**OK**	**OK**	**OK**	OK
	0.5 h	**OK**	**OK**	**OK**	NG
	1 h	**OK**	**OK**	**OK**	**NG**
	1.5 h	**OK**	**OK**	**OK**	**NG**
	2 h	**OK**	**OK**	**OK**	**NG**
Touch Performance	0 h	**OK**	**OK**	**OK**	OK
	0.5 h	**OK**	**OK**	**OK**	OK
	1 h	**OK**	**OK**	**OK**	OK
	1.5 h	**OK**	**OK**	**OK**	OK
	2 h	**OK**	**OK**	**OK**	OK

- Without Fan, the internal temperature reached 93.8 degree and dark spot and touch function problem occurred (Dark spot – 88.6 / Touch function problem – 83)
- With Fan, the internal temperature reached 88.9 degree and only dark spot appeared.

2. Solutions

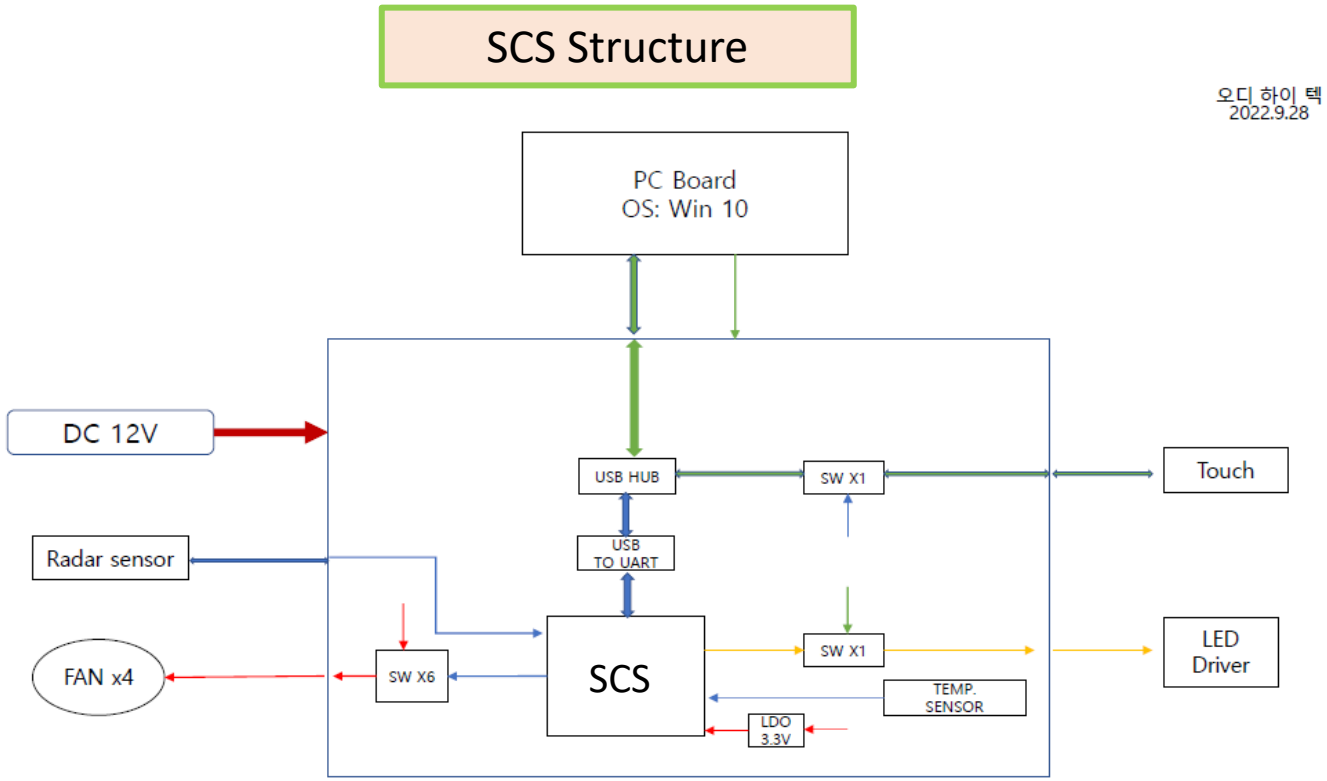
2.1 LCD Blackening Prevention

2.1-3 Fan Application

2. Solutions

2.1 LCD Blackening Prevention

2.2 OD SCS(Solar Control System) Technology



2. Solutions

2.1 LCD Blackening Prevention

2.2 OD SCS(Solar Control System) Technology

- **DAY/NIGHT Fan control by SCS UAT Communication of HMI**

- With this function, HMI can be kept proper level temperature inside during daytime, and at night, turning off the fans then keep fan lifetime and make no noise.

- **Touch reset**

- As the touch resets itself, inconveniences from no touch screen reaction will be reduced.

- **Radar sensor application (option)**

- Applying radar sensor in the panel pc, save the energy in the normal time (brightness default – 40%). When the sensor detects the cars in the 3m, the brightness will reach 100%.

- **LCD BLU Auto dimming**

- **Patent Application : 10-2022-0123310 (Korea)**

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