AUO Display Plus Corporation
Specification for approval

INCOMING INSPECTION STANDARD FOR 18.5" TFT-LCD MODULES (A+ grade)

Model Name: G185 Series

Approved By	Prepared By
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General Display Business Unit/ AUO Display Plus Corporation

Customer	Checked and Approved by

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Inspection criteria's change record				
Version/ Effective Date (Approval)	**Page**	**Inspection Item**	**Previous Inspection Spec**	**New Inspection Spec**
2011.Feb. 28	All	All		Initial Specification
2013.Sep.01	All	All		1. Format changed 2. Add drawing in item3. Inspection sampling method for MIL-STD-105E. 3. Modification: item6.1 Electrical inspection specification,add the criteria for small BP and Image retention. 4.Modification: Item6.2 Appearance inspection specification.
2015.Oct.1	6	Linear particle	0.07＜W≦0.10；5＜L≦10, N≦4,	W≦0.07；L≦2.0, Disregarded
2022.Apr. 28	All	All		New Format

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1 Scope

1.1 The incoming inspection standards shall be applied to TFT-LCD Modules (hereinafter called ""Modules"") that supplied by AUO Display Plus Corporation (Abbreviated as ADP) (hereinafter called ""seller"").

1.2 Specifications contains

- Electrical inspection specifications
- Appearance specifications

2 Incoming inspection

The buyer shall inspect the Modules within the inspection period (twenty calendar days starting from the date of delivery.) The results of the inspection (acceptance or rejection) shall be recorded in writing and a copy will be promptly sent to the seller.

The buyer may, under reasonable commercial rejection procedures, reject an entire lot in the delivery involved. Within the inspection period,if the Modules in the lot show a number of unacceptable defects in accordance with this Incoming Inspection Standards, the buyer must notify the seller in writing of any such rejection promptly, within three business days during the inspection period.

If the buyer fails to notify the seller within the inspection period, the buyer's right to reject the Modules shall be lapsed and the Modules shall be deemed accepted by the buyer.

If any questions arise in regards to the judgement, the outcome shall be decided upon the consultation between both parties.

The buyer shall sign the IIS back to the seller once the buyer verifies the model completely and moves to the mass production stage. The seller has the right to follow internal specifications or ES (engineeering sample) performances if the buyer fails to sign back to the seller.

3 Inspection sampling method

Unless otherwise agreed in writing, the method of incoming inspection shall be based on ANSI/ASQL Z1.4-2003.

Lot size: Quantity per shipment lot per model.

3.1 Sampling type: Normal inspection, single sampling.

3.2 Sampling level: Level II.

3.3 Acceptable quality level (AQL):

Major defect: AQL=1.0%.

Minor defect: AQL=2.5%.

Lot Size	General Inspection Levels			Specific Inspection Levels			
	I	II	III	S-1	S-2	S-3	S-4
2-8	A	A	B	A	A	A	A
9-15	A	B	C	A	A	A	A
16-25	B	C	D	A	A	B	B
26-50	C	D	E	A	B	B	C
51-90	C	E	F	B	B	C	C
91-150	D	F	G	B	B	C	D
151-280	E	G	H	B	C	D	E
281-500	F	H	J	B	C	D	E
501-1200	G	J	K	C	C	E	F
1201-3200	H	K	L	C	D	E	G
3201-10000	J	L	M	C	D	F	G
10001-35000	K	M	N	C	D	F	H
35001-150000	L	N	P	D	E	G	J
150001-500000	M	P	Q	D	E	G	J
500000 and over	N	Q	R	D	E	H	K

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Sample size code letter	Sample size	Acceptance Quality Limits, *AQLs*, in Percent Nonconforming Items and Nonconformities per 100 Items (Normal Inspection)																														
		0.010		0.015		0.025		0.040		0.065		0.10		0.15		0.25		0.40		0.65		1.0		1.5		2.5		4.0		6.5		10		15		25		40		65		100		150		250		400		650		1000	
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
A	2																									0	1																						
B	3																																																
C	5																									0	1			1	2			1	2	2	3	3	4	5	6	7	8	10	11	14	15	21	22	30	31	44	45
D	8																							0	1			1	2	2	3	3	4	5	6	7	8	10	11	14	15	21	22	30	31	44	45				
E	13																					0	1			1	2	2	3	3	4	5	6	7	8	10	11	14	15	21	22	30	31	44	45						
F	20																									1	2	2	3	3	4	5	6	7	8	10	11	14	15	21	22										
G	32																																															
H	50																																															
J	80																																															
K	125																																															
L	200																																															
M	315																																															
N	500																																															
P	800																																															
Q	1250																																															
R	2000																																															

↓ = Use the first sampling plan below the arrow. If sample size equals, or exceeds, lot size, carry out 100 percent inspection.
↑ = Use the first sampling plan above the arrow.
Ac = Acceptance number.
Re = Rejection number.

4 Inspection instruments

4.1 Pattern generator: LD-2000 or equivalent model

4.2 Video board: ADP video board or equivalent. The output of the signal should comply with the specification provided by ADP.

4.3 Luminance colorimeter: follow product specification

5 Inspection environment conditions

5.1 Room temperature : **20 ~ 25** °C.

5.2 Humidity: **65±5**% RH.

5.3 Distance: **30±5** cm in front of LCD unit with a viewing angle of θ=10°.(refer to figure 1)

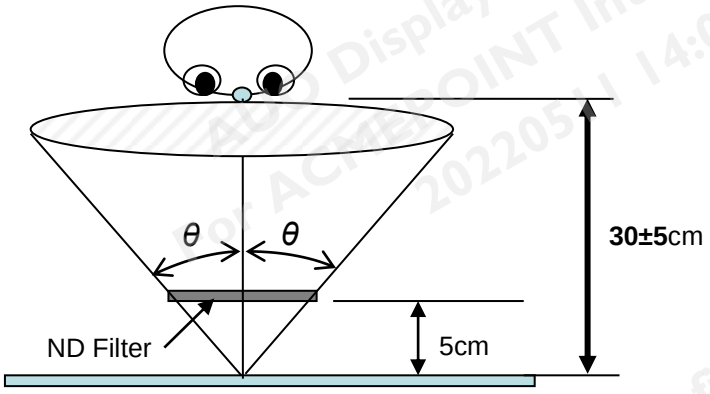


Fig. 1

5.4 Take off the protector of the polarizer while inspecting the display area.

5.5 If there is any question with the inspection, check the panel again-when powered on.

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6 Classification of defects

Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

Major defects:

A major defect is a defect that is likely to result in failure, or to reduce materially the usability of the product for its intended purpose.

Minor defects:

A minor defect is either a defect that is not likely to reduce materially the usability of the product for its intended purpose, or a deviation from an intended purpose with little bearing on the effective use or operation of the product.

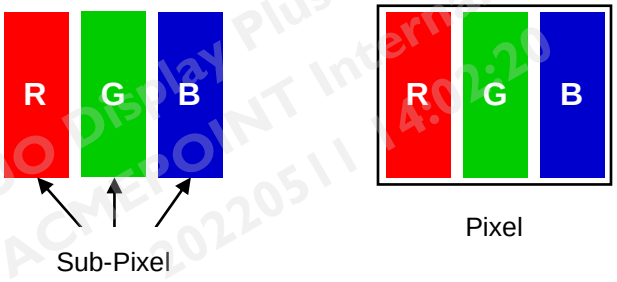
6.1 Electrical inspection specification

No.	Inspection Item		Max. acceptable number / Distance	Unit	Note
1	Bright dots	1 dot	0	dot	1, 2, 6
2		2 Adjacent dots	0	pair	4, 5, 6
3		3 Adjacent dots	0	pair	4, 5, 6
4		Over 3 Adjacent dots	0	pair	4, 5, 6
5		Distance between bright dots	-	mm	3
6		Total (1+2+3+4)	0	dot	
7	Dark dots	1 dot	3	dot	1, 2, 6
8		2 Adjacent dots	1	pair	4, 5, 6
9		3 Adjacent dots	0	pair	4, 5, 6
10		Over 3 Adjacent dots	0	pair	4, 5, 6
11		Distance between dark dots	≥ 15	mm	3
12		Total (7+8+9+10)	3	dot	
13	Bright dot and Dark dot	2 Adjacent dots	0	pair	4, 5, 6
14		Distance between dots	-	mm	3
15	Total amount of Dot Defects (1~13)		3	dot	
16	Line defect		Not allowed	-	
17	Mura		Use 6% ND filter or judged by equivalent limit sample(JND 2.5)		6, 7

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- Note 1) Definition of pixel and sub-pixel: refer to figure 2.

Fig. 2



- Note 2) Bright dot and Small bright dot judgment criteria.

Judgment Criteria		Bright Dot Defect area	
		＞1/2 sub-pixel	≦1/2 sub-pixel
ND filter 10%	Visible	Bright Dot	Small Bright Dot
	Invisible	Small Bright Dot	Disregarded

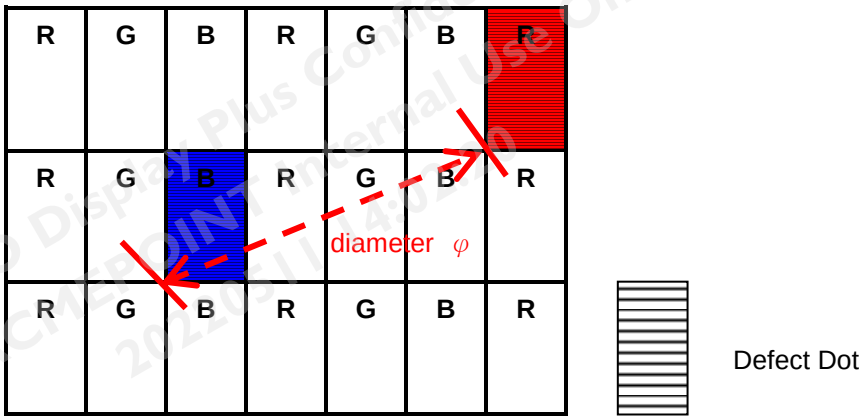
The drawing of 1/2 area sub-pixel definition: The 1/2 area sub-pixel can be defined as below one or more of specific shape (Fig. 3). The amount of small bright dots should be less or equal to 6.



Fig. 3

- Note 3) Definition of diameter φ as following:

Fig. 4



- Note 4) Adjacent-dot defect should be observed under the same display pattern in any one of Black/Green/Blue/Red pattern.

Adjacent-dot defect : refer to Figure 5, dot 1,2,..,8 around A are all A's adjacent dots



Fig. 5

- Note 5) In three (or more) adjacent dot defect, for any 3rd dot that adjacent to 2 continuous defective dots (can

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be of any combination of bright dots and dark dots), the 3rd dot, no matter how large it may be, should be viewed as a dot.

- Note 6) Inspection pattern: Standard inspection patterns of dot defect are listed below. ADP uses these patterns as standard criteria for judging dot defect. Please inform ADP if any other pattern is to be used to examine it.

Defect type	Ambient Luminance	Inspecting Pattern
Mura/ display non-uniformity	300~700 lux (standard 500)	L0/L255、L92/L255、L255/L255
Bright Dot / Small Bright Dot		L0/L255
Dark Dot		L255/L255、 Monotone Red、Green、Blue
BL particle/Scratch		L0/L255、L255/L255
Polarizer particle/Scratch/Bubble		L0/L255、L255/L255
Cosmetic defect		NA

- Note 7) Unless specified in other written document or limit samples, Mura (display non-uniformity) should be inspected under the ND filter and be acceptable when it is invisible through ND filter.

  ND filter use method: The inspection method of ND Filter - holding ND filter in front of the panel around 5 cm and examine the panel from **30±5** cm in the front view for **3** seconds. (Fig. 1)

- Note 8) While operating over 50°C ambient temperature, there should be no function failure occur and Mura (display un-uniformity) should be invisible under 1 % ND filter applied.

- Note 9) Image Retention : 5 seconds test pattern and image retention must be disappeared in 5 seconds after pattern changed.

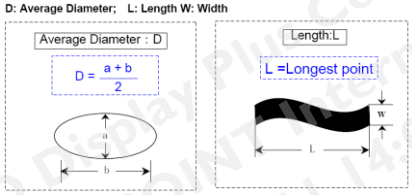
6.2 Scratches, dent, extraneous substances and Appearance inspection specification

Judge area	**Judge item**		**Inspection specification**		**Judge criterion**	
					Major	**Minor**
Active area	Particles on the polarizer	Circular	**Average diameter: D (mm)**	**Numbers**		○
			D＜0.15	Disregarded		
			0.15≦D＜0.5	N≦4		
			0.5≦D	N＝0		
		Linear	**Width: W (mm)** **Length: L (mm)**	**Numbers**		○
			W≦0.07 and L≦2.0	Disregarded		
			0.07＜W or 2.0＜L	n＝0		
	Scratch/Dent on the polarizer	Circular	**Average diameter: D (mm)**	**Numbers**		○
			D≦0.15	Disregarded		
			0.15＜D≦0.50	n≦4		
			0.50＜D	n＝0		
		Linear	**Width: W (mm)** **Length: L (mm)**	**Numbers**		○
			1) W≦0.05(w A/G) 2) W≦0.20	1) L≦2(w A/G) 2) L≦30	1) Disregarded 2) Disregarded	

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				1)W＞0.05(w A/G) 2)W＞0.20	-	N＝0		
	Bubble on the polarizer	Circular	**Average diameter: D (mm)**			**Numbers**		○
			D≦0.15			Disregarded		
			0.15＜D≦0.50			n≦4		
			0.50＜D			n＝0		
	Extraneous substances	Circular	**Average diameter: D (mm)**			**Numbers**		○
			D≦0.15			Disregarded		
			0.15＜D≦0.50			n≦4		
			0.50＜D			n＝0		
			Width: W (mm) **Length: L (mm)**			**Numbers**		○
			W≦0.10 and L≦2.0			Disregarded		
			0.10＜W≦0.30 and L≦2.0			n≦3		
			0.30＜W or 2.0＜L			n＝0		
Bezel	Gap between front bezel and Polarizer on all sides		H ≦ 1.1 mm (Note 13)					○
	Scratches, Warp, Sunken and Color Difference		1. No sharp burr/edge to cause safety issue. 2.The bezel defect to be accepted if it is not affecting display performance.					○
	Assembly Fail		Not allowed				○	
Label (S/N, B/L, WEEK)	No label		Not allowed				○	
	Upside Down						○	
	Content Error						○	
	Dirt		Word can be read. Barcode can be scanned.					○
	Not clear							○
	Font Deformation							○
	Label Broken							○
	Crease							○
	Label overlapping							○
	Position		Be attached on right position					○
Screw	Missing screw		Not allowed				○	
	Loose		Not allowed				○	
Connector	Appearance		As long as no function issues →CN can be allowed.				○	

- Note 10) Extraneous substances which can be wiped out, such as fingerprint and particles are not considered as a defect.
- Note 11) Defects on the Black Matrix are not considered as a defect.
- Note 12) Defect size definition: (Unit:mm). When L≧2W, defect count as liner defect.



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- Note 13) The gap between front bezel and Polarizer.

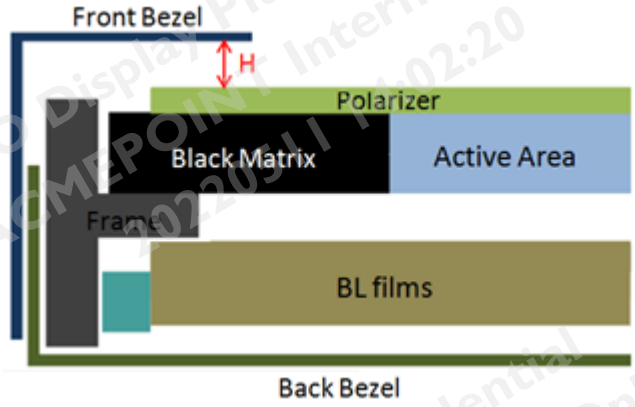


Fig. 7

7 Inspection judgement

7.1 The judgement of the shipped lot (acceptance or rejection) should follow the sampling plan of ANSI/ASQL Z1.4-2003, single sampling, normal inspection, level II.

7.2 If the number of defects is equal to or less than the applicable acceptance level, the lot shall be accepted.

7.3 If the number of defects is more than the applicable acceptance level, the lot shall be rejected and the buyer should inform the seller of the result of incoming inspection in writing.

8 Precaution:

Please pay attention to the following items when you use the LCD Module with back-light unit.

8.1 During the Module's assembly, do not twist, bend or add unsuitable external force to the Module.

8.2 Do not use an air gun or blower to clean the Module during the Module's assembly to avoid the contamination of external dust or particles.

8.3 Only operate the Modules in the specified temperature range and a ventilated environment.

8.4 Avoid dust or oil mist during Module assembly.

8.5 Follow the correct power sequence while operating the Module. Module will be damaged otherwise.

8.6 Avoid electrical magnetic interference for higher safety and lesser noise.

8.7 Operate the Module in the specified temperature range as the temperature will affect the response time and brigthness.

8.8 Avoid displaying the fixed pattern (especially the white pattern) for a long period of time as it will cause image sticking.

8.9 Be sure to turn off the power when connecting or disconnecting the circuit.

8.10 Avoid dirt and stain on the surface of modules. As it can easily scratch the surface polarizer.

8.11 Wipe off any moistures before operating the Modules as the dewdrop may damage the Modules.

8.12 Avoid drastic temperature changes, as the condensation or expansion reactions will damage (destroy) the polarizer.

8.13 Avoid exposing the modules under sunglight as the high temperature and humidity will degrade the performance.

8.14 Avoid any harmful materials/ components/ chemiclas on the modules, such as acid or chlorine.

8.15 Connect grounded devices while operating the Module as the static electricity will damage the Module.

8.16 Disassemble or reassemble the Modules are forbidden.

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8.17 Avoid direct contact on the rear side as the backlight's high voltage will cause electrical shocks.

8.18 Avoid strong vibration or shock on the Module as they will damage the Module.

8.19 Store the Modules in suitable environment with regular packing.

8.20 Do not press on the surface (either front or rear side) of the Module as it will lead to non-uniformity or other function issues. Be cautious of the broken Module to avoid damages.

8.21 Softly tear the sticking tape of the protective film to prevent bezel out of shape and non-uniform display.

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