AUO Display Plus CORPORATION

Specification for Approval

INCOMING INSPECTION STANDARD FOR 21.5" TFT-LCD MODULES (A+ grade)

Model Name:G215HAN01 series

Approved By	Prepared By
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Customer	Checked and Approved by
DIVA	

Inspection criteria's change record

Version/ Effective Date (Approval)	Page	Inspection Item	Previous Inspection Spec	New Inspection Spec
V0 2021/Nov./24	All	All		Preliminary Specification

1. Scope:

1.1 The incoming inspection standards shall be applied to TFT-LCD Modules (hereinafter called ""Modules"") that supplied by AU Optronics Corporation (hereinafter called ""seller"").

1.2 Specifications contains

- Display specification
- Appearance specification

2. Incoming inspection:

The buyer (customer) shall inspect the modules within ninety calendar days since the delivery date (the ""inspection period"") at its own cost. The results of the inspection (acceptance or rejection) shall be recorded in writing, and a copy of this writing will be promptly sent to the seller.

The buyer may, under commercially reasonable reject procedures, reject an entire lot in the delivery involved. Within the inspection period,if the samples of modules within a 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, and not later than within three business days in the end of the inspection period.

Should the buyer fail 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 to have been accepted by the buyer.

If any questions arise as for the judgement, the determination shall be made upon consultation between both parties.

The buyer (customer) shall sign the IIS back to AUO once the buyer verify the model completely and move to mass production stage. The seller(AUO) has right to follow internal specification or base on ES (engineeering sample) performance to the buyer If the buyer (customer) don't sign back to AUO..

3. Inspection sampling method:

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

3.1 Lot size: Quantity per shipment lot per model.

3.2 Sampling type: Normal inspection, single sampling.

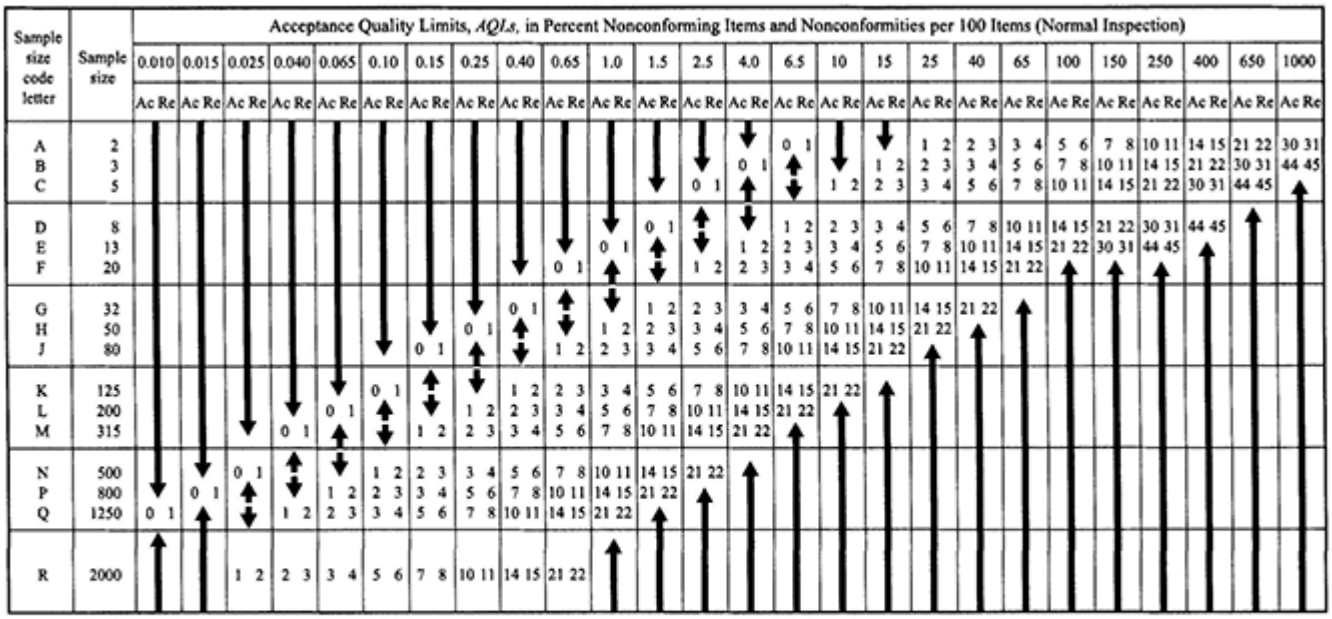
3.3 Sampling level: Level II.

3.4 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



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	Ac Re
A	2														↓	0 1	↓	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31
B	3													↓	0 1	↑	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑
C	5												↓	0 1	↑	↓	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
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	↑	↓	↓	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑
F	20										0 1	↑	↓	1 2	↓	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
G	32									↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑
H	50								↓	0 1	↑	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑
J	80							↓	↑	↑	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
K	125						0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
L	200					0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
M	315				0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
N	500			0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
P	800		0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Q	1250	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
R	2000	↑	↑	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑

↓ = 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: AU video board or equivalent. The output of the signal should comply with the specification provided by AU.

4.3 Luminance colorimeter: Topcon BM-7 or equivalent model

5. Inspection environment conditions:

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

5.2 Humidity: **65±5**% RH.

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

5.4 To be a distance about **35 ± 5** cm in front of LCD unit and view angle should be **± 40°.**

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 departure from an intended purpose with little bearing on the effective use or operation of the product.

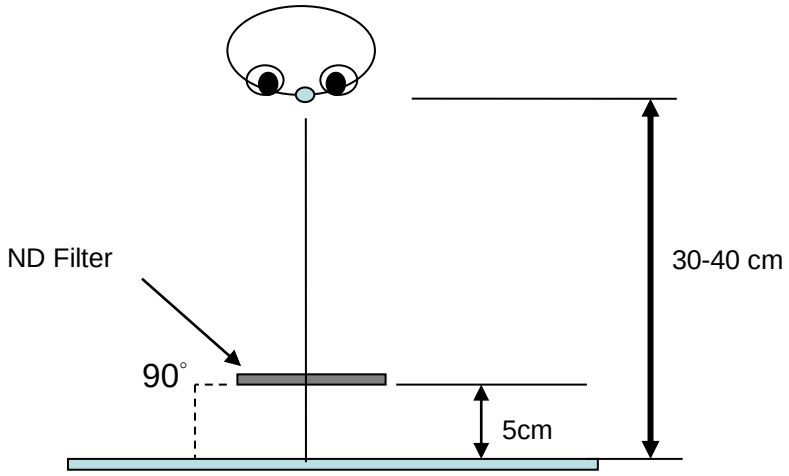
6.1 Electrical inspection specification:

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

Note 1) For dot defect, one sub pixel is defined as one dot. Defect area (of dot defect) should be larger than 1/2 area of one sub-pixel to be count as 1 dot defect.

Note 2) Judgment criteria (For Bright dot and Small Bright dot) : Using ND Filter 6% (distance : 30 cm). If it could be observed, dot defines as one bright dot. If not, dot defines as one small bright dot.

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 **35±5** cm in the front view for **3** seconds.



Note 3) A dot defect that is smaller than the defined dot defect will be treated as small bright dot.

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 shapes (Fig.1). The small bright dots is less than or equal to 5 dots. The maximum of small bright dots are 3 within 20mm.



Fig.1

Note 4) All bright dot defects should not be noticeable by observer under specified inspection environment (Please refer to item 5).

Note 5) Adjacent-dot defect should be observed under the same display pattern in any one of Black/Green/Blue/Red pattern.

Definition of two continuous bright dots: Only for two continuous dots (included vertical, horizontal, oblique type)

*Inspection pattern: Standard inspection patterns of dot defect are listed below. AU uses these patterns as standard criteria for judging dot defect. Please inform AU if any other pattern is to be used to examine dot defect.

Test Pattern	Defect
Black	For bright dot(s)
Red	For bright and dark dot(s)
Green	For bright and dark dot(s)
Blue	For bright and dark dot(s)

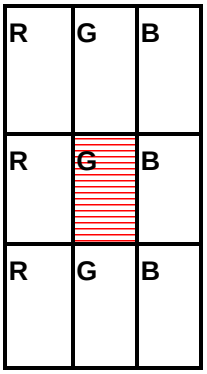
Note 6) In three (or more) adjacent dot defect, for any 3rd dot that adjacent to 2 continuous defective dots (can be of

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

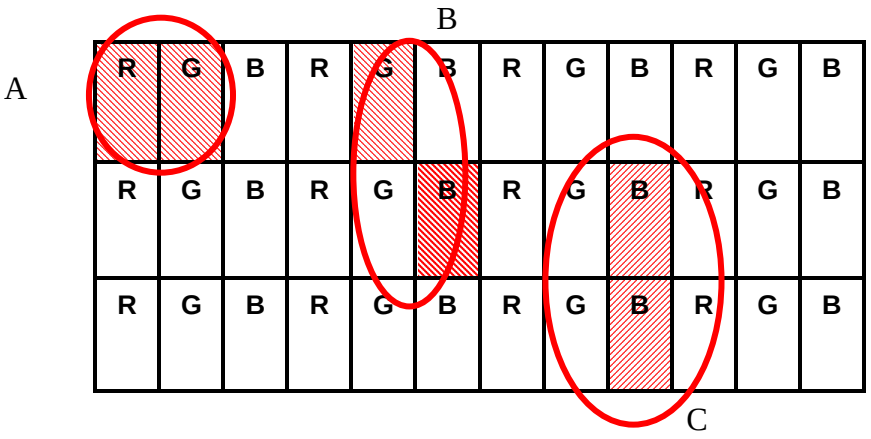
Note 7) Defect criteria diagram

- Dot defect diagram

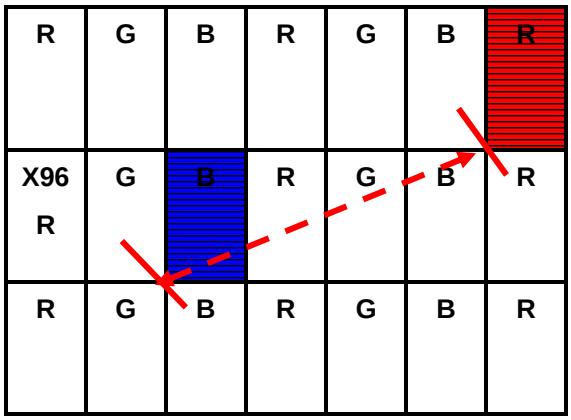
One dot (Bright /Dark)



Two continuous dots(Bright/Dark)



- Definition of distance between defect dots as following



A: Distance between defect dots

Defect Dot

Note 8) Unless otherwise specified by written document or limit samples, Mura (display un-uniformity) should inspected under the ND filter and shall be accepted when it is invisible 6% ND filter is applied.

Note 9) While operating over 50℃ ambient temperature, there should be no function failure occur and Mura (display un-uniformity) should be invisible under 1% ND filter applied.

Note 10) Image Retention: 5secs Test pattern and Image sticking must be disappeared in 5secs 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	Circular	**Average diameter: D (mm)**	**Numbers**		○
			D≦0.15	Disregarded		

	polarizer		0.15＜D≦0.50	n≦3		
			0.50＜D	n＝0		
		Linear	**Width: W (mm)** **Length: L (mm)**	**Numbers**		○
			W≦0.07 or L≦ 0.3	Disregarded		
			0.07＜W≦0.10 and 0.3＜L≦2	n≦3		
			0.10＜W or 2＜L	n＝0		
	Scratch/Dent on the polarizer	Circular	**Average diameter: D (mm)**	**Numbers**		○
			D≦0.15	Disregarded		
			0.15＜D≦0.50	n≦3		
			0.50＜D	n＝0		
		Linear	**Width: W (mm)** **Length: L (mm)**	**Numbers**		○
			0.03＜W≦0.10 and 0.3＜L≦2	n≦3		
			0.10＜W or 2＜L	n＝0		
	Bubble on the polarizer	Circular	**Average diameter: D (mm)**	**Numbers**		○
			D≦0.50	n≦3		
			0.50＜D	n＝0		
	Extraneous substances	Circular	**Average diameter: D (mm)**	**Numbers**		○
			D≦0.15	Disregarded		
			0.15＜D≦0.50	n≦3		
			0.50＜D	n＝0		
		Linear	**Width: W (mm)** **Length: L (mm)**	**Numbers**		○
			W≦0.07 or L≦ 0.3	Disregarded		
			0.07＜W≦0.10 and 0.3＜L≦2	n≦3		
			0.10＜W or 2＜L	n＝0		
Bezel	Gap between front bezel and Polarizer on all sides		H ≦ 1.5mm (refer to Fig 3)			○
	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	No broken, cracks, rising, deformation	○	

Note 8 : Extraneous substances which can be wiped out, such as fingerprint and particles are not considered as a defect.

Note 9 : Defects on the Black Matrix (0.3mm away from active area) are not considered as a defect.

Note 10 : Defect size definition: (Unit:mm). When L≧2W, defect count as liner defect.

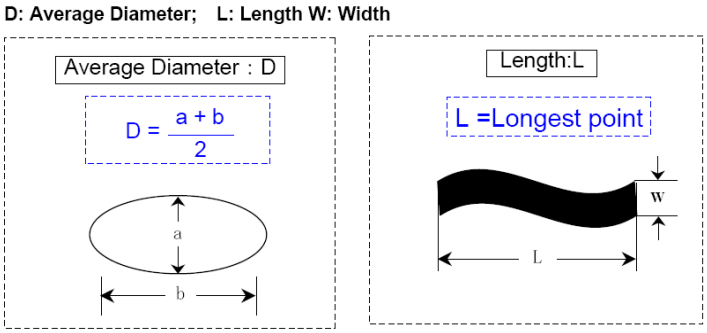


Fig.2

Note 11 : The gap between front bezel and Polarizer :

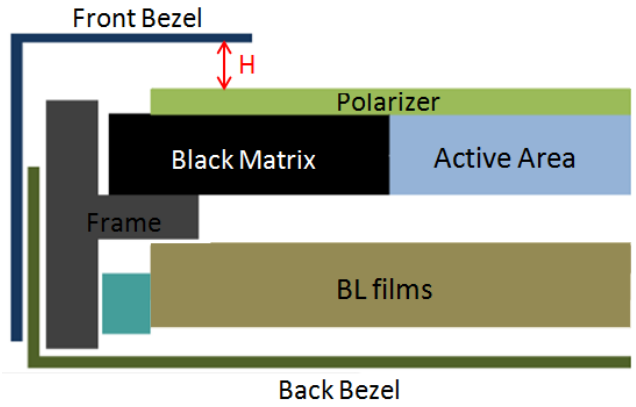


Fig.3

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 Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.

8.2 Do not use air gun or blower to clean LCD module during assembly procedure. Avoid external dust or Particle into the LCD module.

8.3 Adopt measures in adequately ventilated environment. Be sure to use the module in the specified temperature range.

8.4 Avoid dust or oil mist during assembly.

8.5 Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.

8.6 Try to avoid the electrical magnetic interference, and it will be more safety and less noise.

8.7 Please operate module in suitable temperature. The response time & brightness will drift by different temperature.

8.8 Avoid displaying the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image sticking.

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

8.10 Display surface Polarizer scratches easily, please avoid dirt and stains carefully.

8.11 A dewdrop may lead to destruction. Please wipe off any moisture before using module.

8.12 Sudden temperature changes cause condensation, and it will cause polarizer damaged.

8.13 High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.

8.14 Avoid any acid or chlorine compounds, which are harmful to the LCD module.

8.15 Static electricity will damage the modules; please do not touch the module without any grounded device connected.

8.16 Do not disassemble and reassemble the module by self.

8.17 Do not touch the rear side directly to avoid the electrical shock by the backlight high voltage.

8.18 Avoid strong vibration or shock. or it will cause the module broken.

8.19 Store the modules in suitable environment with regular packing.

8.20 Be careful of injury from a broken display module. Please avoid the pressure applying on the surface (front or rear side) of modules, because it will cause the non-uniformity or other function issue to display.

8.21 Please softly tear the sticking tape of protective film to prevent bezel out of shape and un-uniformity display.

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