AU OPTRONICS CORPORATION

Specification for Approval

INCOMING INSPECTION STANDARD FOR 19" TFT-LCD MODULES

Model: M190ETN (A Grade)

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Approved by	*Checked by*	*Prepared by*

Desktop Display Business Group / AU Optronics Corporation

Customer	Checked & Approved by
TPI	

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

- Electrical inspection specification
- Appearance specification
- Outside dimension specification

2 Incoming inspection:

The buyer (customer) shall inspect the modules within twenty calendar days of the delevery 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 if, within the inspection period ,such samples of modules within such lot show an unacceptable number of defects in accordance with this incoming inspection standards, provided however that the buyer must notify the seller in writing of any such rejection promptly, and not later than within three business days of 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.

3 Inspection sampling method:

Unless otherwise agree in writing, the method of incoming inspection shall be based on MIL-STD-105E.

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%

4 Inspection instruments:

4.1 Pattern generator: LD-2000 or equivalent model.

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

4.3 Luminance colorimeter: Topcon BM-7 or equivalent model

5 Inspection environment conditions:

5.1 Room temperature : 20 ~ 25℃.
5.2 Humidity: 65±5% RH.
5.3 Illumination: Fluorescent light (Day-Light Type) display surface illumination to be *300 ~ 700 Lux. (standard 500Lux.)*
5.4 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 eye*s (±30°viewing edge will be allowed).*
5.5 Take off the protector of polarizer while judging the display area.
5.6 If there is any question while judging, check the panel again while operating.

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

6.1 Electrical inspection specification

	Inspection Item	Specification	
1	Line / Block defect	Can't be seen.	
2	Bright dots	≦ 2 dots (Note1, 4)	
3	Dark dots	≦ 5 dots	
4	Total dots defect	≦ 5 dots	
5	Adjacent dot defect (Note 1, 2, 3)	Two continuous bright dots (vertical, horizontal, oblique):	≦ 1 pairs
		Three or more continuous bright dots (vertical, horizontal, oblique):	NA
		Two continuous dark dots (vertical, horizontal, oblique):	≦ 2 pairs
		Three or more continuous dark dots (vertical, horizontal, oblique):	NA
		Distance between 2 Bright dots:	≧ 15 mm
		Distance between 2 Dark dots:	≧ 15 mm
		Distance between Bright and Dark dot:	≧ 15 mm
6	Display non-uniformity Or Mura (Note 5,6)	Use 5% ND filter or judged by equivalent limit sample	

Note 1: For bright dot defect, bright area should be larger than 1/2 area of a sub-pixel to be count as 1 dot defect. 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).



Fig.1

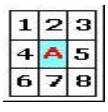


Fig.2

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

Note 2: (Fig.2) Adjacent-dot defect (refer to picture, dot 1,2,..,8 around A are all A's adjacent dots) should be inspected under the same display pattern in any one of White /Black /Red /Green /Blue /Monotone Gray pattern.

Note 3: Adjacent-dot defect should be observed under any one of White /Black /Red /Green /Blue pattern. 1 pair of bright dots equals 2 dots. Inspection patterns: Standard inspection patterns of dot defect are listed below. AUO uses these patterns as standard criteria for judging dot defect. Please inform AUO if any other pattern is to be used to examine dot defect.

Test Pattern	Defect
Full Black	For bright dot(s)
Full White	For dark dot(s)
Monotone Red /Green /Blue	For bright and dark dot(s)

Note 4: The judgment criteria of particle occurred bright dot is the same as bright dot judgment criteria.

Note 5: The display uniformity (general mura) symptoms will use 5% ND Filter. That is, the definition of Not Noticeable means the symptom can be covered by 5% ND Filter. Movable mura should be ignored if the mura disappear after lightly patting on the mura area. And the weak line defect can be counted as mura which can be invisible while 5% ND filter applied.

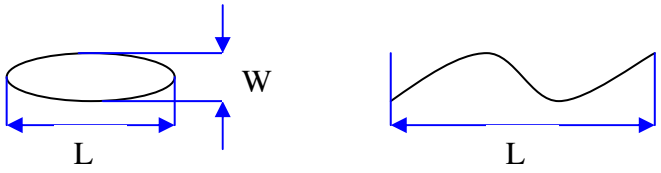
Note 6: The inspection method of ND Filter - holding ND filter in front of the panel around 1 cm and examine the panel from 35±5 cm in the front view for 3 seconds.

6.2 Appearance inspection specification

Judge area	Judge item		Inspection specification			Judge criterion	
						Major	Minor
Active Area (Note 4)	Particles, scratch and bubbles in display area (include bright & dark spot, Note 1, 2, 3)	Round	Average diameter (D) :(mm)		Numbers (N)		❍
			D < 0.15		Disregarded		
			0.15 ≤ D ≤ 0.5		N ≤ 4		
			0.5 < D		N = 0		
		Linear	Width: W (mm)	Length: L (mm)	Numbers		O
			W< 0.07 and L < 2		Disregarded		
			0.07≤ W≤ 0.1 or 2 ≤ L ≤ 10		N ≤ 4		
			W> 0.1 or L >10		N = 0		
BM area polarizer dent (Note 5)	Dent	Round	D ≤ 2.0		N ≤ 2		O
Bezel	Scratch		No harm				O
	Dirt						O
	Wrap		No dangerous			O	
	Sunken		No harm			O	
Label (S/N, B/L, Week code)	No label		No			O	
	Invert label					O	
	Broken					O	
	Dirt		Word can be read.				O
	Not clear						O
	Word out of shape						O
	Mistake		No				O
	Position		Be attached on right position				O
Solder	Appearance		Can't see the abnormal color, shape, hurt, dirt (fused goods, etc.). If it is necessary, please prepare sample.			O	
Screw	Not enough		No			O	
	Limp		No			O	
Connector	Connection status		Need correct connection.			O	
FPC/FFC	Broken		No			O	

Note 1: When L>=2W, defect count as liner defect.

Note 2: D=1/2(W+L)

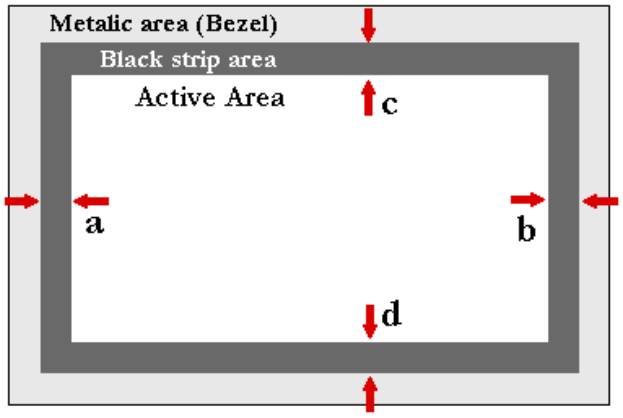


Note 3: To verify the responsbility of following defects was caused by supplier, the IQC checks as requested on above items before mass production such as the Polarizer Scratch, Gap Mura, TFT Glass broken…etc.

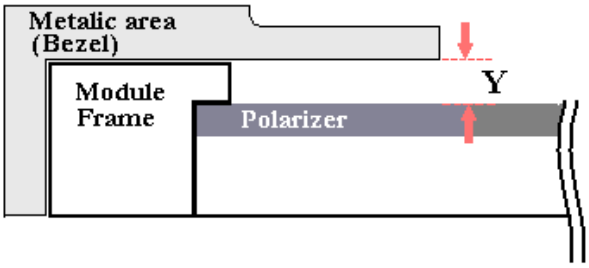
6.3 Outside dimension specification:

Testing Order	Inspection Item		Specification	Note
	Name	Unit	Tolerance	
1	Outside dimension (vertical)	mm	± 0.5 mm	(Please refer to the product spec for detailed dimension definition) Note 1
2	Outside dimension (horizontal)	mm	± 0.5 mm	
3	Outside dimension (thickness)	mm	± 0.5 mm	
4	Weight	g	± 100 g	
5	Display tolerance ABS (a-b)	mm	1.2 mm (Max.)	Note 2
6	Display tolerance ABS (c-d)	mm	1.2 mm (Max.)	Note 2
7	Panel gap (Y)	mm	1.0 mm (Max.)	Note 3

Note 1: Thickness doesn't include bending reason.
Note 2: Display tolerance definition



Note 3: Panel gap (Y) definition



7 Inspection judgement:

7.1 The judgement of the shipped lot (acceptance or rejection) should follow the sampling plan of MIL-STD-105E, 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 Adopt measures for good heat radiation. Be sure to use the module with in the specified temperature.

8.3 Avoid dust or oil mist during assembly.

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

8.5 Less EMI: it will be more safety and less noise.

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

8.7 Avoid displaying a fixed pattern (exclude the white pattern) for a long period, which may lead to image sticking.

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

8.9 Polarizer scratches easily, please handle it carefully.

8.10 Display surface never likes dirt or stains.

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 Acetic acid or chlorine compounds are not friends with TFT display module.

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

8.16 No parts of the panel should be dismantled without the presence of AU engineer or the product will not be warranted.

8.17 Be careful do not touch the rear side directly because of the backlight high voltage.

8.18 No strong vibration or shock. It will cause module broken.

8.19 Storage the modules in suitable environment with regular packing.

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

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