Densitron

MONITOR DISPLAY MODULE

Product Specification

Customer		
Product Number	DM-156GN-MPGR02	
Customer Part Number		
Customer Approval	**Date:**	

Internal Approvals		
Product Mgr	Doc. Control	Electr. Eng
Ryan Lin	Erica Cheng	Evan Huang
Date: Aug 22, 2019	**Date: Aug 22, 2019**	**Date: Aug 22, 2019**

Densitron

Revision Record

Rev.	Date	Page	Chapt.	Comment	ECR no.
0.1	Aug 22, 2019	-	-	Preliminary	-

Densitron

Table of Contents

Densitron

1. General Description

1.1 Introduction

This is a 15.6” size industrial TFT LCD bezel frame monitor with touch panel, providing high image from the DisplayPort, HDMI and VGA. The resolution of the TFT-LCD monitor is up to 1920 x 1080 and can display up to 262K colours.

1.2 Main Features

Item	Contents
Display Type	TFT LCD
Screen Size	15.6” Diagonal
Display Format	1920 x 1080 Dots
No. of Colour	262K
Overall Dimensions	389.2 (W) x 239.5 (H) x 46 (D) mm
Active Area	344.16 (W) x 193.59 (H) mm
Pixel Pitch	0.17925mm (W) x 0.17925 (H) mm
Viewing Angle	L/R: 170° (Typ.) U/D: 170° (Typ.)
Contrast Ratio	700: 1 (Typ.)
Brightness	300 cd/m^2 (Typ.)
I/O	1 x VGA, 1 x HDMI, 1 x DP, 1 x Audio
Backlight	LED
Mechanism	Bezel Frame (U/D=22.5mm; R/L=22mm)
Plug & Play	DDC2B (VESA Standard)
Response Time	25 msec (Rising + Falling)
Touch Panel	PCT
Touch Interface	USB (B Type)
Bonding Type	Tape Bonding
ROHS	Compliant to RoHS 2.0

1.3 Scanning Frequency

Item	Contents
Horizontal	30 ~ 80KHz
Vertical	56 ~ 76Hz

1.4 Input Resolution [VGA, HDMI, DisplayPort]

Item	Contents
Recommended Resolution	1920 x 1080 @60Hz
Supported Input Resolution	640 x 480 @60Hz 800 x 600 @60Hz 1024 x 768 @60Hz 1280 x 720 @60Hz 1280 x 800@60Hz 1280 x 1024 @60Hz 1366 x 768 @60Hz 1440 x 900 @60Hz 1600 x 900 @60Hz 1680 x 1050 @60Hz 1920 x 1080 @60Hz

1.5 Input Signal

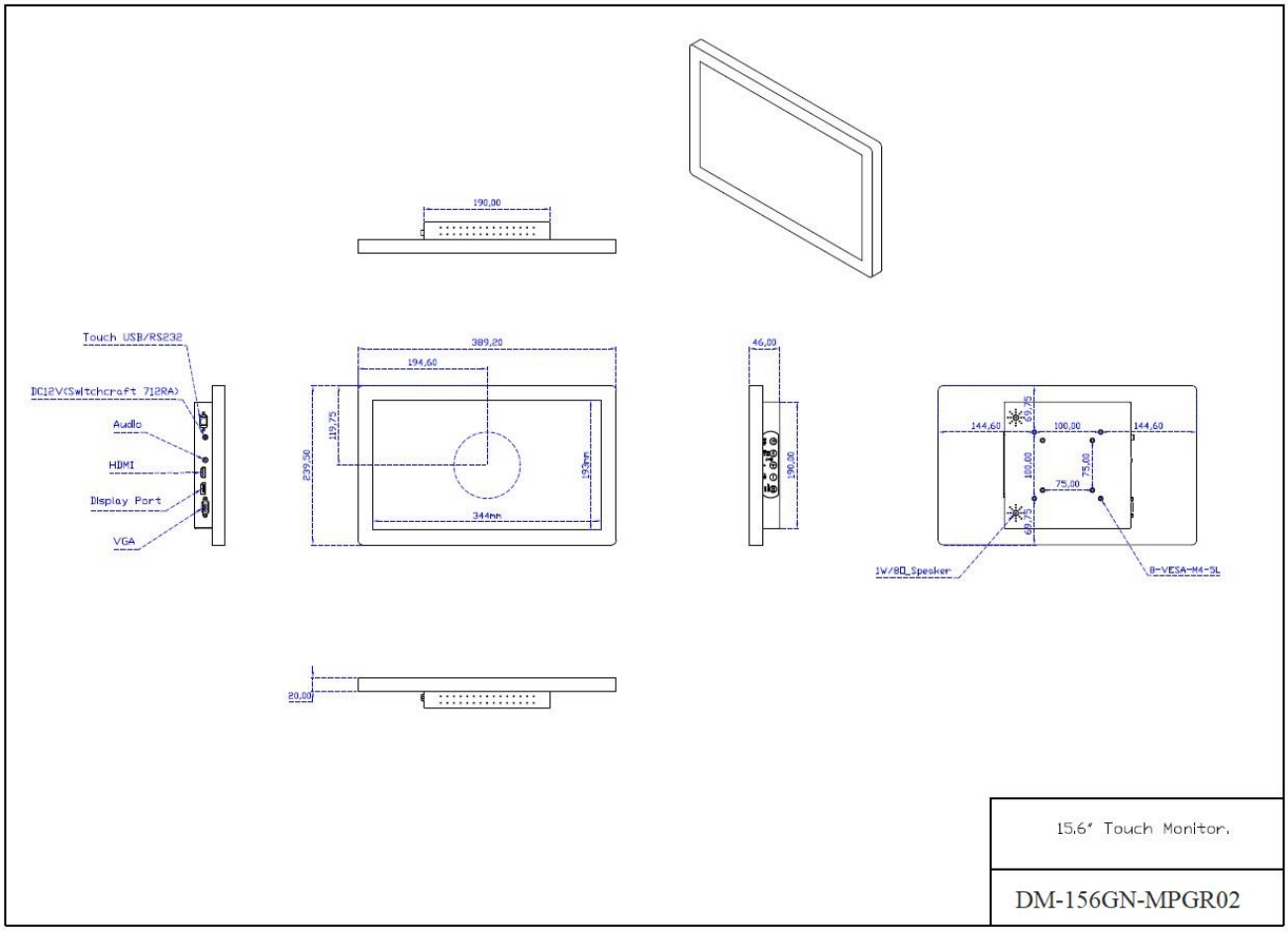
Item	Contents
RGB (VGA)	Analog RGB Amplitude: 0.7 ± 0.05V Input Impedance: 75 ± 2% ohm Sync: H/V Separate (TTL Level)
HDMI	V1.4
DisplayPort	V1.2

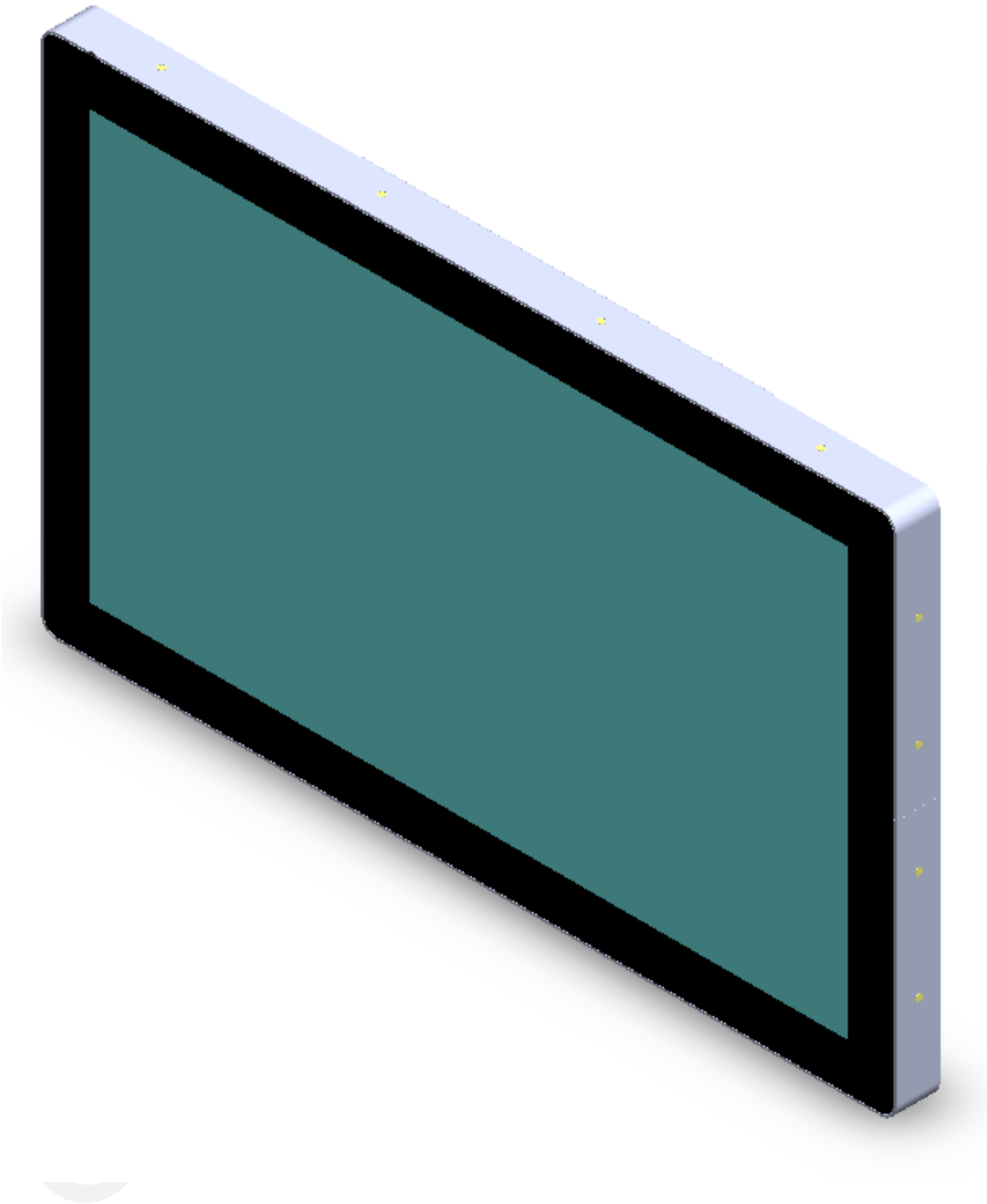
1.6 User Controls

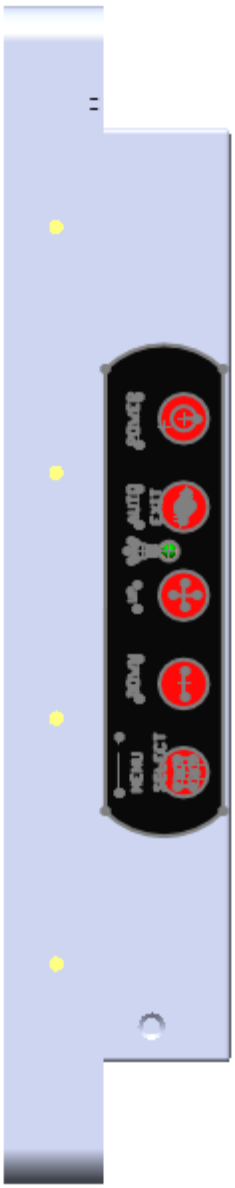
Item	Contents
OSD Key Button	5 Keys
OSD Language	English/Chinese

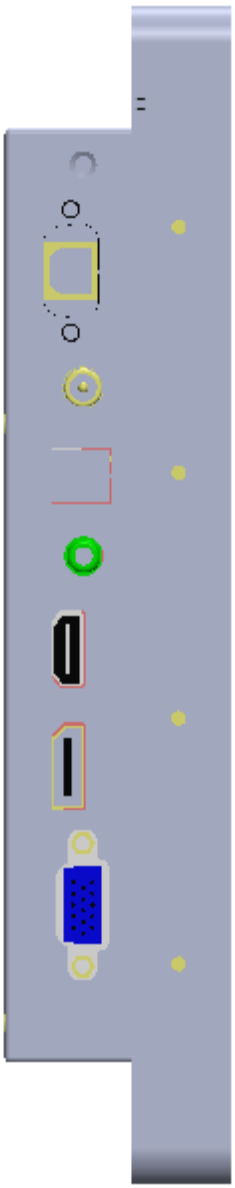
2. Mechanical Specification

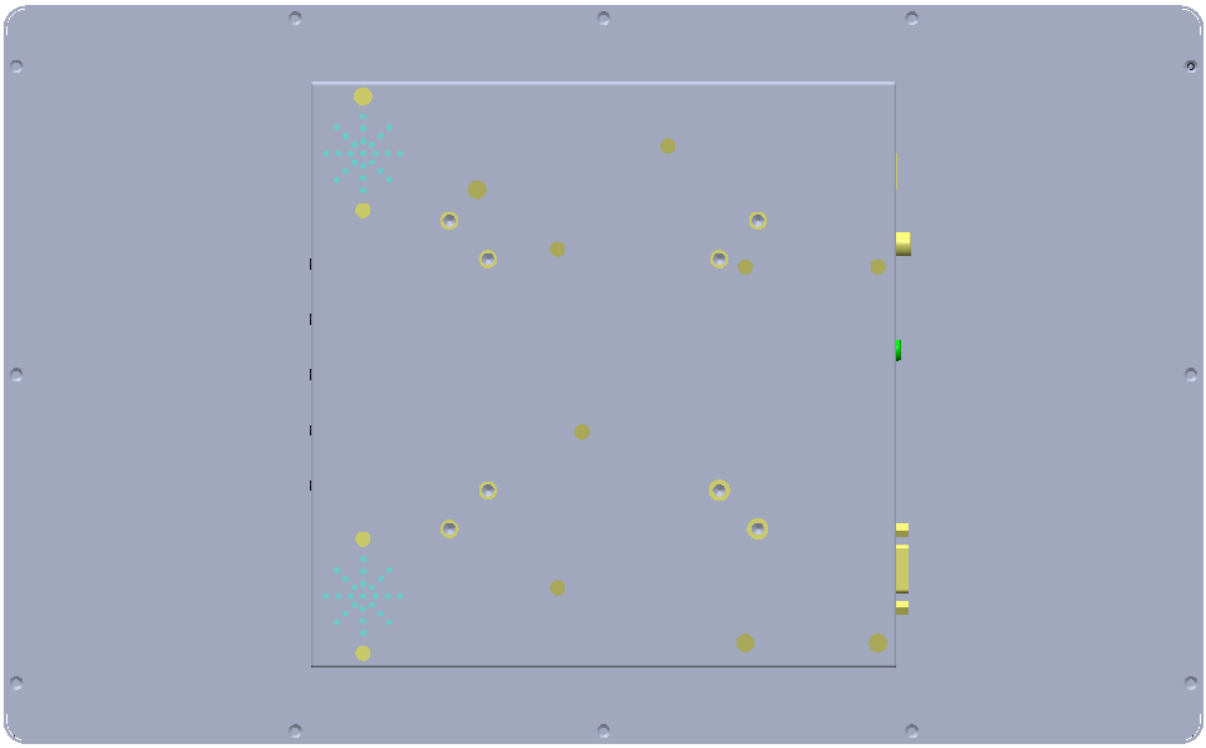
2.1 Mechanical Drawing









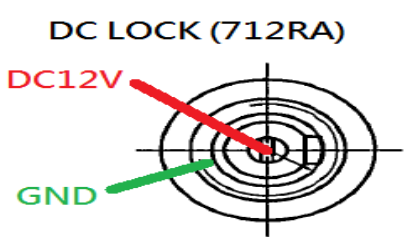


2.2 Mechanical Characteristics

Item	Characteristic	Unit
Display Format	1920 (W) x 1080 (H)	Dots
Overall Dimensions	389.2 (W) x 239.5 (H) x 46 (D)	mm
Active Area	344.16 (W) x 193.59 (H)	mm
Pixel Pitch	0.17925 (W) x 0.17925 (H)	mm
Weight	2.5	kg
Mounting	User hole for VESA M4-5L Screw 100 x 100 / 75 x 75 mm	

3. Electrical Specification

3.1 AD Board



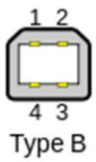
Power Input (DC Jack, Ø2.5)

Item	Remark
Normal Input Voltage Range	12V DC
Power Consumption	10W (Typ.) @Set

Item	Symbol	Min	Max	Unit	Note
Power Input	+12V	10	24	V	-

3.2 Touch Board

USB Connector (B Type)



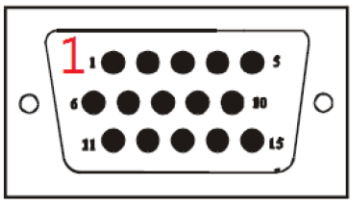
1 VCC
2 D-
3 D+
4 GND

Item	Symbol	Min	Max	Unit	Note
USB 5V Power Input	V BUS	3.5	5.5	V	-
V BUS Reference GND	V BUS	4.75	5.25	V	-

3.3 Interface Pin Assignment

3.3.1 VGA Cable

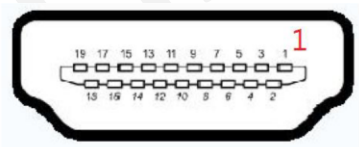
To connect 8514A or IBM-compatible graphics adapters, use a 15 pin mini D-type male connector.



Pin Assignment

1. Red Video	2. Green Video
3. Blue Video	4. Ground
5. No Connection	6. Red Ground
7. Green Ground	8. Blue Ground
9. No Connection	10. Sync Ground
11. Ground	12. Serial Data/I/O
13. H. Sync	14. V. Sync
15. Serial Clock Input	

3.3.2 HDMI Cable



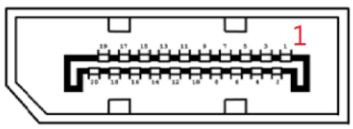
Pin Assignment

1. HDMI DATA2+	2. HDMI DATA2 Shield Cover
3. HDMI DATA2-	4. HDMI DATA1+
5. HDMI DATA1 Shield Cover	6. HDMI DATA1-
7. HDMI DATA0+	8. HDMI DATA0 Shield Cover
9. HDMI DATA0	10. HDMI DATA Clock
11. HDMI DATA Clock Shield	12. HDMI DATA Clock
13. (NC)	14. (NC)
15. DDC SCL	16. DDC SDA
17. GMD	18. +5V
19. HPD	

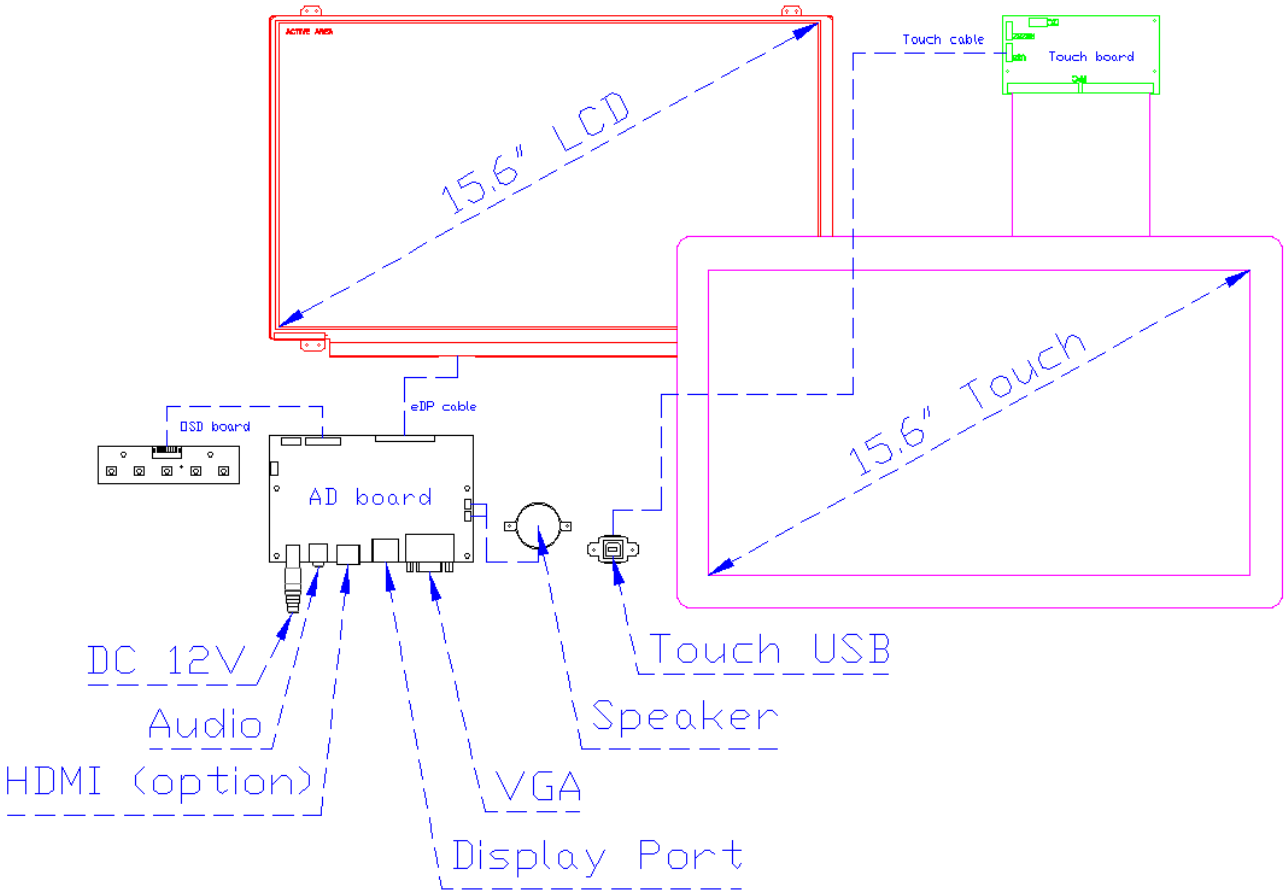
3.3.3 DisplayPort Cable

Pin Assignment

1. DP_RXN3N	2. GND
3. DP_RXN3P	4. DP_RXN2N
5. GND	6. DP_RXN2P
7. DP_RXN1N	8. GND
9. DP_RXN1P	10. DP_RXN0N
11. GND	12. DP_RXN0P
13. GND	14. GND
15. DP_AUXP	16. GND
17. DP_AUXN	18. Hot Plug Detect
19. GND	20. DP Power

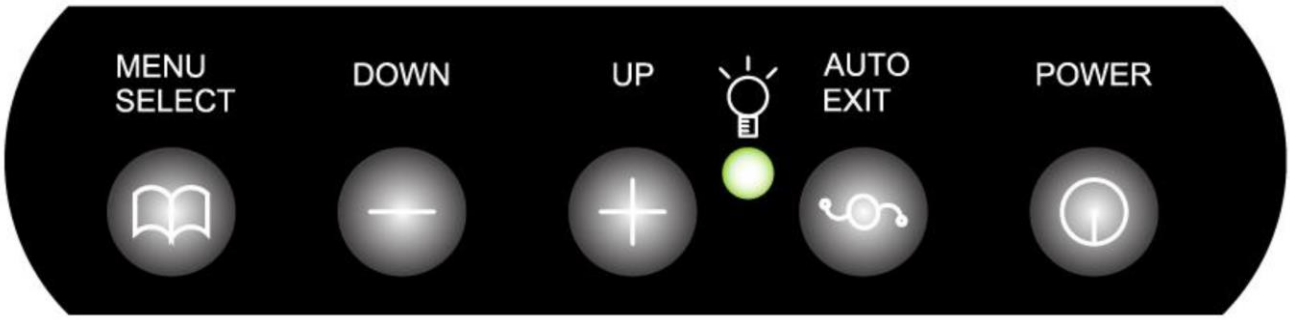


3.4 Block Diagram



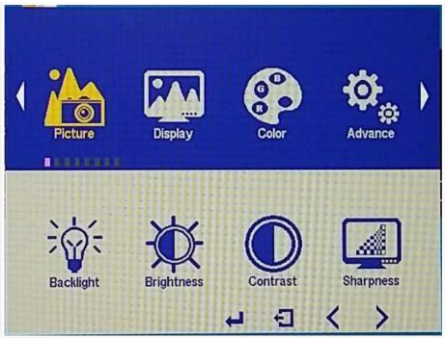
4. OSD Function

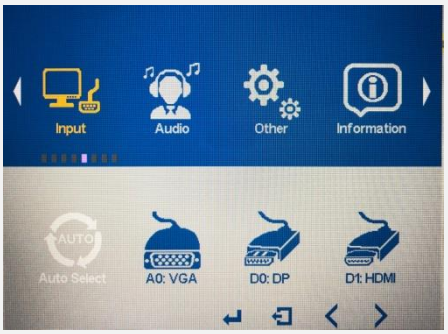
4.1 Key Button Function



Button	Function
Menu / Select	Actives the OSD menu
	Sub Menu select
Down	Adjust Button / Backlight menu on Move the bar left to decrease the Adjustment Move the main menu or sub menu Input Select
Up	Adjust Button / Backlight menu on Move the bar right to increase the Adjustment Move the main menu or sub menu Input Select
Auto / Exit	Input Signal (Hotkey), Previous Menu, Exit
Power	Turns On/Off the system

4.2 OSD Structure

Menu	Pictures	Function
Picture		• Backlight: Adjust Backlight • Brightness: Adjust Brightness • Contrast: Adjust the Contrast • Sharpness: Adjust the Sharpness
Display (VGA only)		• Auto Adjust: Adjust VGA only • H Position: Adjust H Position • V Position: Adjust V Position • Clock: Adjust lock • Phase: Adjust Phase
Color		• Gamma On/Off • Adjust the color temperature • Adjust Color Effect
Advance		Aspect Ratio: Adjust Aspect Ratio

Menu	Pictures	Function
Audio		• Volume: Adjust the volume • Mute On/Off • Audio Source: Switch between Analog or Digital sources
Other		• Reset: OSD setup • Menu Time: OSD show time • OSD H Position: Adjust OSD window • OSD V Position: Adjust OSD window
Information		Displays information regarding current input signal, preset mode, and FW version
Input Signal		• Auto Select • VGA • DisplayPort • HDMI

5. Standard Display Mode

5.1 VGA, HDMI, DP Signal Resolution (PC)

No.	Resolution	V-Frequency [Hz]	Proposed
1	640 x 480	60.00	-
2	800 x 600	60.00	-
3	1024 x 768	60.00	-
4	1280 x 720	60.00	
5	1280 x 800	60.00	
6	1280 x 1024	60.00	-
7	1366 x 768	60.00	
8	1440 x 900	60.00	-
9	1600 x 900	60.00	
10	1680 x 1050	60.00	
11	1920 x 1080	60.00	-

6. Optical Specification

6.1 Optical Characteristics

Characteristics		Symbol	Conditions	Min	Typ	Max	Unit
Contrast Ratio		CR	-	-	700:1	-	-
Response time		TR + TF		-	25	-	ms
Viewing Angle	Left/ Right	-	CR>10	-	170	-	deg
	Up/ Down	-		-	170	-	
Colour Chromaticity	Red	Rx	-	TBD	0.642	TBD	-
		Ry		TBD	0.345	TBD	
	Green	Gx		TBD	0.333	TBD	
		Gy		TBD	0.620	TBD	
	Blue	Bx		TBD	0.142	TBD	
		By		TBD	0.052	TBD	
	White	Wx		TBD	0.313	TBD	
		Wy		TBD	0.329	TBD	
Brightness		-	Default: 300	255	300	-	cd/m^2

7. Functional Specification Touch

7.1 Touch Screen

Touch Type	PCAP
Touch IC solution	EETI 80H84
Size and Dimension	386.81 mm x 237.12 mm
Touch Structures	Glass + Glass (GG)
Total Thickness	2.95 ± 0.25 mm (Cover_2.0 & Sensor_0.75)
Cover Glass	2.0 mm
Touch point	Multi touch points (up to 10 fingers)
Report rate(points/sec)	＞100 Hz
Response Time:	Average < 25 ms
Touch Accuracy	1pt ± 1mm
Interface	USB Type B
Communication	USB 1.1 Full Speed
OS Support	Wndows10/8/7/VISTA/XP/2000/CE, Linux, Mac, QNX
F/W Version	AiM_20181218J
USB VID/PID	0EEF/C002
Treatment (Clear, Anti-Glare, Anti Smudge)	Clear
Light Transmission	85 ± 2%
Surface Hardness	≧ 7H

7.2 Support System List

OS	Version	Interface
Windows	Windows10/8/7/VISTA/XP/2000/CEnet5.0/6.0/7.0 Embedded/XP Tablet PC edition	USB/IIC/RS232
Linux	Distribution based on Kernel 2.6.24 and later. CentOS, Ubuntu/Linux, Debian, Fedora, Red Hat, Gentoo, Meego, Slackware, SUSE/openSUSE, Magaie/Mandriva/Mandrake and Yellow Dog etc.	USB/IIC/RS232
Mac	Mac OS, Mac OS X (PowerPC, Intel CPU)	USB
QNX	RTOS V6.3 to V6.6	USB/IIC

8. Packaging

8.1 Labelling and Marking

Screen net weight: 2.5kg
Outer box size: 55 x 17 x 40cm; gross weight: 3.1kg

9. Environmental Specification

Item	Remark
Operating Temperature	0°C ~ +50°C
Storage Temperature	-20°C ~ +60°
Operating Humidity	20% ~ 90% RH
Storage Humidity	20% ~ 90% RH

10. Quality Assurance Specification

10.1 Conformity

The performance, function and reliability of the shipped products conform to the Product Specification.

10.2 Environment Required

Customer's test & measurement are required to be conducted under the following conditions:
Ambient Temperature: 25 ± 5°C
Humidity: 65% ± 10% RH
Ambient Illumination: Under Normal office lighting (300 ~ 700 Lux)
Viewing distance: 30 - 50cm between the monitor and the inspector's eyes
Finger glove (or finger cover) must be worn by the inspector.
Inspection table or jig must be anti-electrostatic.

10.3 Delivery Assurance

10.3.1 Delivery Inspection Standards

- Level II, Normal Inspection, Single Sampling, MIL-STD-105D

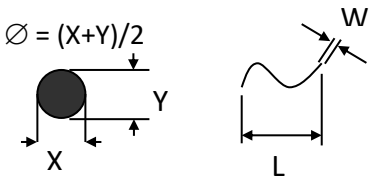
10.3.2 Criteria & Acceptable Quality Level

Partition	AQL	Definition
Major	0.65	Defects in Pattern Check (Display On)
Minor	1.5	Defects in Cosmetic Check (Display Off)

10.3.3 Criteria & Classification

10.3.3.1 LCM Module

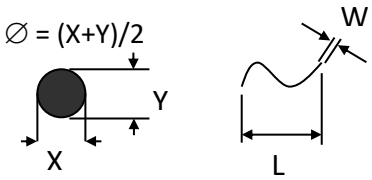
L: length; W: width; N: number



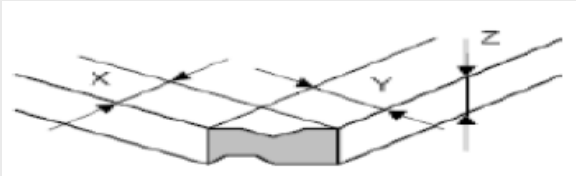
Item			Standard	
Bright Dot			Dots (sub-pixels) which appeared brightly in the screen when the LCM displayed with dark pattern.	
			R, G or B 1 dot	N ≤ 2
			2 adjacent	N ≤ 1
			Total	N ≤ 2
			Bright dot distance	Min. 10mm
Dark Dot			Dots (sub-pixels) which appeared darkly in the screen when the LCM displayed with bright pattern.	
			1 dot	N ≤ 3
			2 adjacent	N ≤ 1
			Total	N ≤ 3
			Dark dot distance	Min. 10mm
Total			N ≤ 4 (Combination)	
Polarizer	Scratches	Linear	0.1mm ≤ W ≤ 0.2mm, 0.3mm ≤ L ≤ 4.0mm	N ≤ 4
	Dent	Circular	0.2mm ≤ ∅ ≤ 0.5mm	N ≤ 4
Foreign Material	Linear		0.01mm ≤ W ≤ 0.1mm, 0.3mm ≤ L ≤ 3.0mm	N ≤ 4
	Circular		0.2mm ≤ ∅ ≤ 0.5mm	N ≤ 4
Line defect			All kinds of line defects such as vertical, horizontal or cross are not allowed.	
Bezel Appearance			Scratches, minor bents, stains, particles on the Bezel frame are not considered as a defect.	

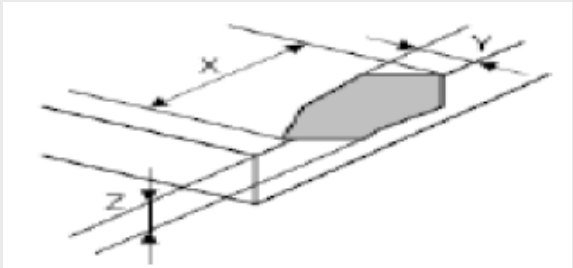
10.3.3.2 Touch Panel

L: length; W: width; N: number



Item		Criteria	
Linear Defects	Scratch/Scrub	W ≤ 0.1mm, L ≤ 15mm	Ignore
		0.1mm < W ≤ 0.2mm, L ≤ 15mm	N ≤ 5
		W > 0.2mm or L > 15mm	Not allowed
	Fiber/Particle	W ≤ 0.1mm, L ≤ 10mm	Ignore
		0.1mm < W ≤ 0.3mm, L ≤ 10mm, 5mm ≤ distance	N ≤ 5
		W > 0.3mm or L > 10mm	Not allowed
Dot Defects	Active Area	∅ ≤ 0.2mm	Ignore
		0.2mm < ∅ ≤ 0.4mm, 5mm ≤ distance	N ≤ 5
		∅ > 0.4mm	Not allowed
	Printing Area	∅ ≤ 0.2mm	Ignore
		0.2mm < ∅ ≤ 0.5mm, 5mm ≤ distance	N ≤ 5
		∅ > 0.5mm	Not allowed
	Bubble (icon, camera hole, etc.)	Not allowed	
Printing Defects	Pinhole	*Judge only from the front of touch panel	
		∅ ≤ 0.3mm, 2mm ≤ distance	N ≤ 4
		∅ > 0.3mm	Not allowed
	Light Leakage	Distance from the highest to the lowest points ≤ 0.2mm	
		Distance from the highest to the lowest points ≤ 0.1mm	
	Peeling paint	Cover paint peeled off	Not allowed
		Sensor paint peeled off	Ignore
	Color of Logo/OSD/Icon	Mismatch with limit sample	Not allowed
	Color shift	Mismatch with customer's AI drawing and "PANTO" or golden sample	Not allowed

<table>
<tr><th colspan="2">Item</th><th colspan="2">Criteria</th></tr>
<tr><td>Attrition Defects</td><td>Attrition</td><td>Incomplete</td><td>Not allowed</td></tr>
<tr><td rowspan="4">Other defects</td><td>FPC</td><td>Breakage/Residue/Dirt</td><td>Not allowed</td></tr>
<tr><td>Glass Crack</td><td colspan="2">Not allowed</td></tr>
<tr><td rowspan="2">Breakage</td><td colspan="2">X: length, Y: width, Z: height, N: number, T: glass thickness</td></tr>
<tr><td colspan="2"> 

TP corner broken:
1) Cover: not allowed
2) Sensor: X ≤ 3.0mm; Y ≤ 3.0mm; Z ≤ T/2 mm</td></tr>
<tr><td colspan="2"> 

TP edge broken:
1) Cover: not allowed
2) Sensor: X ≤ 3.0mm; Y ≤ 3.0mm; Z ≤ T/2 mm (N ≤ 3 for each side, distance ≧ 10mm)</td></tr>
</table>

10.4 Dealing with Customer Complaints

10.4.1 Non-conforming Analysis

Purchaser should supply Densitron with detailed data of non-conforming sample.

After accepting it, Densitron should complete the analysis in two weeks from receiving the sample.
If the analysis cannot be completed on time, Densitron must inform the purchaser.

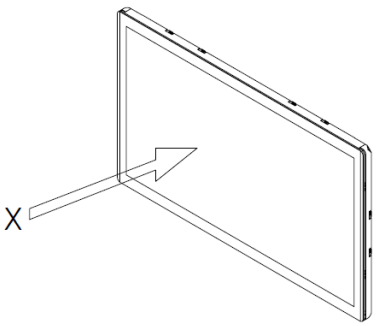
10.4.2 Handling of Non-conforming Displays

If any non-conforming displays are found during customer acceptance inspection which Densitron is clearly responsible for, return them to Densitron.
Both Densitron and customer should analyse the reason and discuss the handling of non-conforming displays when the reason is not clear.
Equally, both sides should discuss and come to agreement for issues pertaining to modification of Densitron quality assurance standard.

11. Handling Precautions

11.1 Handling Precautions

1) Since the display panel is being made of glass, do not apply mechanical impacts such us dropping from a high position.
2) If the display panel is broken by some accident and the internal organic substance leaks out, be careful not to inhale nor lick the organic substance.
3) If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water
4) If pressure is applied to the display surface or its neighbourhood of the display module, the cell structure may be damaged and be careful not to apply pressure to these sections.
5) The polarizer covering the surface of the display module is soft and easily scratched. Please be careful when handling the display module.
6) When the surface of the polarizer of the display module has soil, clean the surface. It takes advantage of by using following adhesion tape.
   a. Scotch Mending Tape No. 810 or an equivalent
   b. Never try to breathe upon the soiled surface nor wipe the surface using cloth containing solvent such as ethyl alcohol, since the surface of the polarizer will become cloudy.
   c. Also, pay attention that the following liquid and solvent may spoil the polarizer:
      - Water
      - Ketone
      - Aromatic Solvents
7) Hold the display module very carefully when placing it into the system housing. Do not apply excessive stress or pressure to display module. And, do not over bend the film with electrode pattern layouts. These stresses will influence the display performance. Also, secure sufficient rigidity for the outer cases.



8) Do not apply stress to the LSI chips and the surrounding molded sections.
9) Do not disassemble nor modify the display module.
10) Do not apply input signals while the logic power is off.
11) Pay sufficient attention to the working environments when handing display modules to prevent occurrence of element breakage accidents by static electricity.
    a. Be sure to make human body grounding when handling display modules.
    b. Be sure to ground tools to use or assembly such as soldering irons.
    c. To suppress generation of static electricity, avoid carrying out assembly work under dry environments.

d. Protective film is being applied to the surface of the display panel of the display module. Be careful since static electricity may be generated when exfoliating the protective film.

12) Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. If the display module has been stored for a long period of time, residue adhesive material of the protection film may remain on the surface of the display panel after removed of the film. In such case, remove the residue material by the method introduced in the above Section 5).
13) If electric current is applied when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful to avoid the above.

11.2 Storage Precautions

1) When storing display modules, put them in static electricity preventive bags avoiding exposure to direct sun light nor to lights of fluorescent lamps, etc. and, also, avoiding high temperature and high humidity environments or low temperature (less than 0°C) environments. (We recommend you to store these modules in the packaged state when they were shipped from Densitron) At that time, be careful not to let water drops adhere to the packages or bags nor let dewing occur with them.
2) If electric current is applied when water drops are adhering to the surface of the display module, when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful about the above.

11.3 Designing Precautions

1) The absolute maximum ratings are the ratings which cannot be exceeded for display module, and if these values are exceeded, panel damage may be happen.
2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.
3) We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VDD). (Recommend value: 0.5A)
4) Pay sufficient attention to avoid occurrence of mutual noise interference with the neighbouring devices.
5) As for EMI, take necessary measures on the equipment side basically.
6) When fastening the display module, fasten the external plastic housing section.
7) If power supply to the display module is forcibly shut down by such errors as taking out the main battery while the display panel is in operation, we cannot guarantee the quality of this display module.

11.4 Operation Precautions

1) It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life.
2) Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Give careful consideration to prevent direct current during ON/OFF timing and during operation.
3) Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged.
4) To protect display modules from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the display modules.
   a. Pins and electrodes
   b. Pattern layouts such as the FPC
5) When the driver is being exposed (COG), semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, if the driver is exposed to light, malfunctioning may occur.
   a. Design the product and installation method so that the driver may be shielded from light in actual usage.
   b. Design the product and installation method so that the driver may be shielded from light during the inspection processes.
6) Although the display module stores the operation state data by the commands and the indication data, when excessive external noise, etc. enters into the module, the internal status may be changed. It therefore is necessary to take appropriate measures to suppress noise generation or to protect from influences of noise on the system design.
7) We recommend you to construct its software to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.

11.5 Other Precautions

1) Request the qualified companies to handle industrial wastes when disposing of the display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.