

NHD-12232AZ-FSW-GBW

Graphic Liquid Crystal Display Module

NHD- Newhaven Display
12232- 122 x 32 Pixels
AZ- Model
F- Transflective
SW- Side White LED Backlight
G- STN- Gray
B- 6:00 Optimal View
W- Wide Temperature
RoHS Compliant

Newhaven Display International, Inc.

2661 Galvin Ct.

Elgin IL, 60124

Ph: 847-844-8795

Fax: 847-844-8796

www.newhavendisplay.com

nhtech@newhavendisplay.com

nhsales@newhavendisplay.com

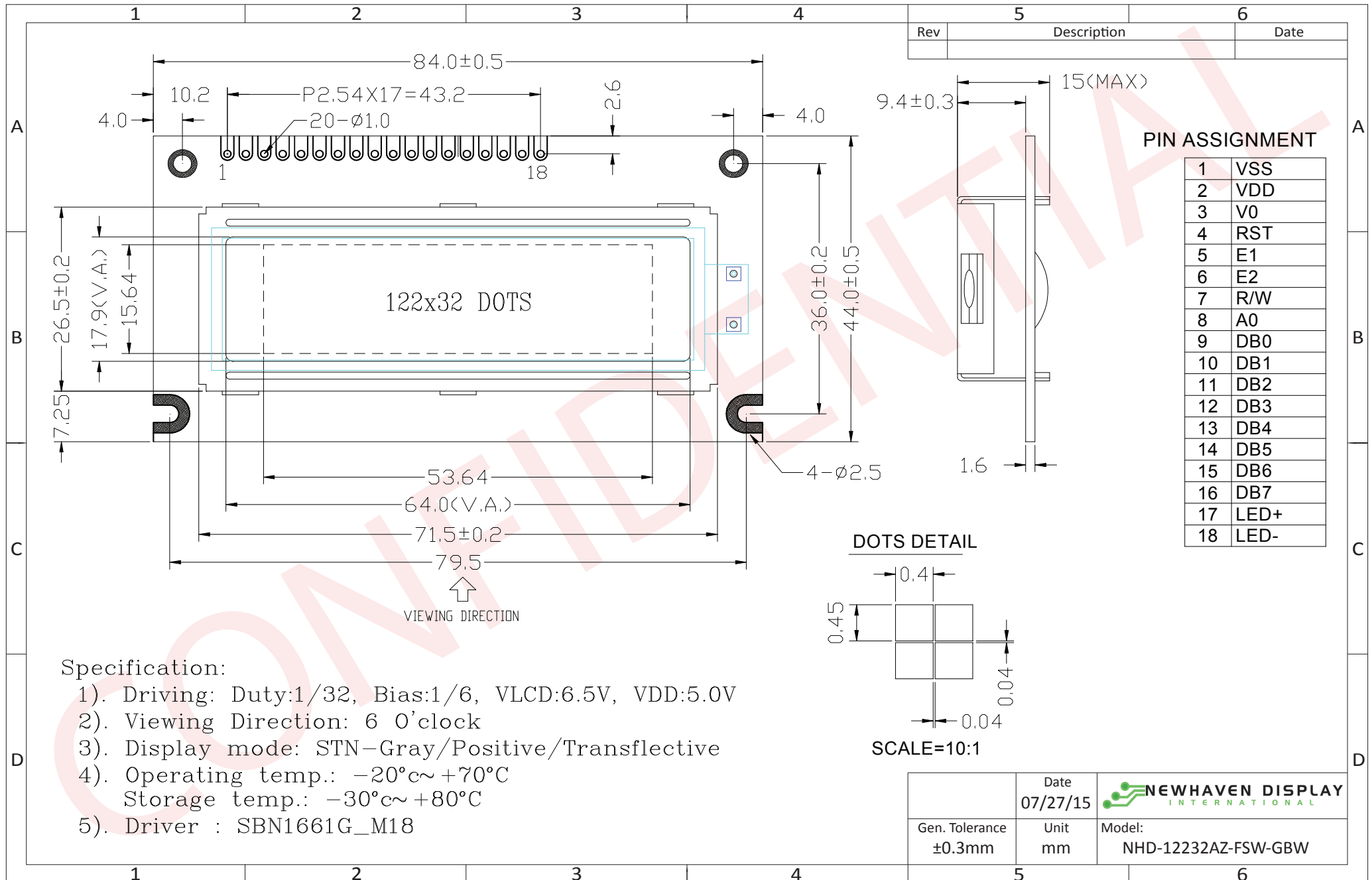
Document Revision History

Revision	Date	Description	Changed by
0	10/22/2008	Initial Release	-
1	3/16/2010	User guide reformat	BE
2	4/15/2010	Controller update	BE
3	8/5/2010	Electrical Characteristics Update	MP
4	6/2/2011	Mechanical drawing updated	AK
5	10/25/2011	Electrical characteristics updated	AK
6	1/27/2012	Pin description updated	AK
7	4/19/2012	Sample code updated	SB
8	7/27/2015	Mechanical Drawing, Controller Information Updated, Electrical and Optical Characteristics Updated, Table of Commands	SB

Functions and Features

- 122 x 32 pixels
- Built-in SBN1661G_M18 Controller
- +5.0V power supply
- 1/32 duty cycle; 1/9 bias
- RoHS Compliant

Mechanical Drawing



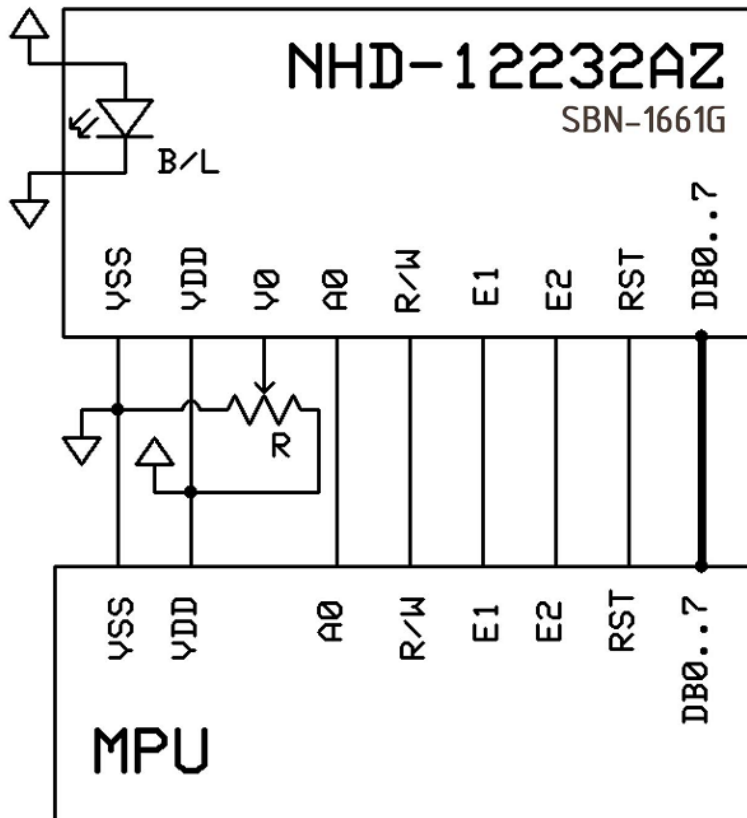
The drawing contained herein is the exclusive property of Newhaven Display International, Inc. and shall not be copied, reproduced, and/or disclosed in any format without permission.

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	VSS	Power Supply	Ground
2	VDD	Power Supply	Power supply for logic (+5.0V)
3	V0	Adj Power Supply	Power supply for contrast (approx. 0.5V)
4	RST	MPU	Active LOW Reset signal
5	E1	MPU	Operation enable signal. Falling edge triggered, SEG (1~60)
6	E2	MPU	Operation enable signal. Falling edge triggered, SEG (61~120)
7	R/W	MPU	Read/Write select signal, R/W=1: Read R/W: =0: Write
8	A0	MPU	Register select signal. A0=0: Command, A0=1: Data
9-16	DB0-DB7	MPU	This is an 8-bit bi-directional data bus
17	LED+	Power Supply	Power supply for LED Backlight (+5.0V via on-board resistor)
18	LED-	Power Supply	Ground for Backlight

Recommended LCD connector: 2.54mm pitch pins

Backlight connector: - Mates with: -



Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	Top	Absolute Max	-20	-	+70	°C
Storage Temperature Range	Tst	Absolute Max	-30	-	+80	°C
Supply Voltage	VDD		4.7	5.0	5.5	V
Supply Current	IDD	Ta=25°C, VDD=5.0V	-	2.0	2.5	mA
Supply for LCD (contrast)	VDD-V0	Ta=25°C	-	4.5	-	V
"H" Level input	VIH		0.7*VDD	-	VDD	V
"L" Level input	VIL	-	0	-	1.2	V
"H" Level output	VOH	-	VDD-0.3	-	VDD	V
"L" Level output	VOL	-	0	-	0.3	V
Backlight Supply Voltage	VLED		-	5.0	-	V
Backlight Supply Current	ILED	VLED=5.0V	15	-	20	mA

Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Viewing Angle - Vertical (top)	AV	Cr ≥ 3	-	40	-	
Viewing Angle – Vertical (bottom)	AV	Cr ≥ 3	-	60	-	°
Viewing Angle – Horizontal (left)	AH	Cr ≥ 3	-	60	-	
Viewing Angle - Horizontal (right)	AH	Cr ≥ 3	-	60	-	°
Contrast Ratio	Cr		-	5	-	-
Response Time (rise)	Tr	-	-	150	250	ms
Response Time (fall)	Tf	-	-	200	300	ms

Controller Information

Built-in SBN1661G_M18 Controller.

Please download specification at http://www.newhavendisplay.com/app_notes/SBN1661G.pdf

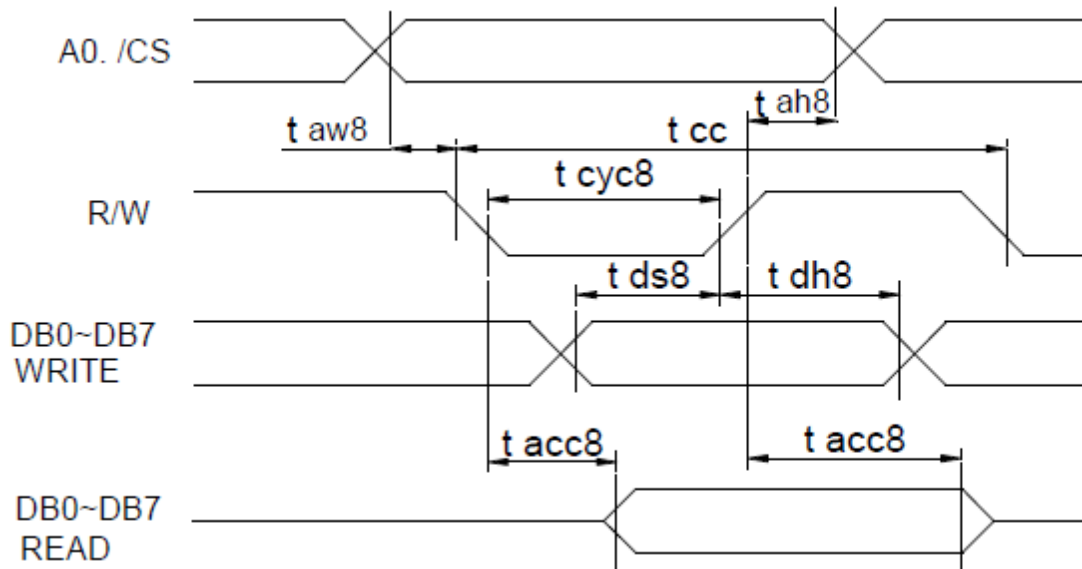
Table of Commands

Parameter	A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0	Note
Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0/1	Turns display on or off 1: ON ; 0 : OFF
Display start line	0	1	0	1	1	0	Display start address (0 to 31)				Specifies RAM line corresponding to top line of display	
Set page address	0	1	0	1	0	1	1	1	0	Page (0 to 3)		Sets display RAM page in page address register
Set column (segment) address	0	1	0	0	Column address (0 to 79)							Sets display RAM column address in column address register
Read status	0	0	1	Bu sy	A D C	ON/ OFF	R E S E T	0	0	0	0	Reads the following status: BUSY 1: Busy 0: Ready ADC 1: CW output 0: CCW output ON/OFF 1: Display off 0: Display on RESET 1: Being reset 0: Normal
Write display data	1	1	0	Write data								Write data from data bus into display RAM
Read display data	1	0	1	Read data								Read data from display RAM onto data bus
Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	0: CW output 1: CCW output
Static driver ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	Selects static driving operation. 1: static driver, 0: Normal driving
Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Select LCD duty cycle 1: 1/32, 0: 1/16
Read-modify write	0	1	0	1	1	1	0	0	0	0	0	Read-modify-write ON
End	0	1	0	1	1	1	0	1	1	1	0	Read-modify-write OFF
Reset	0	1	0	1	1	1	0	0	0	1	0	Software reset

Timing Characteristics

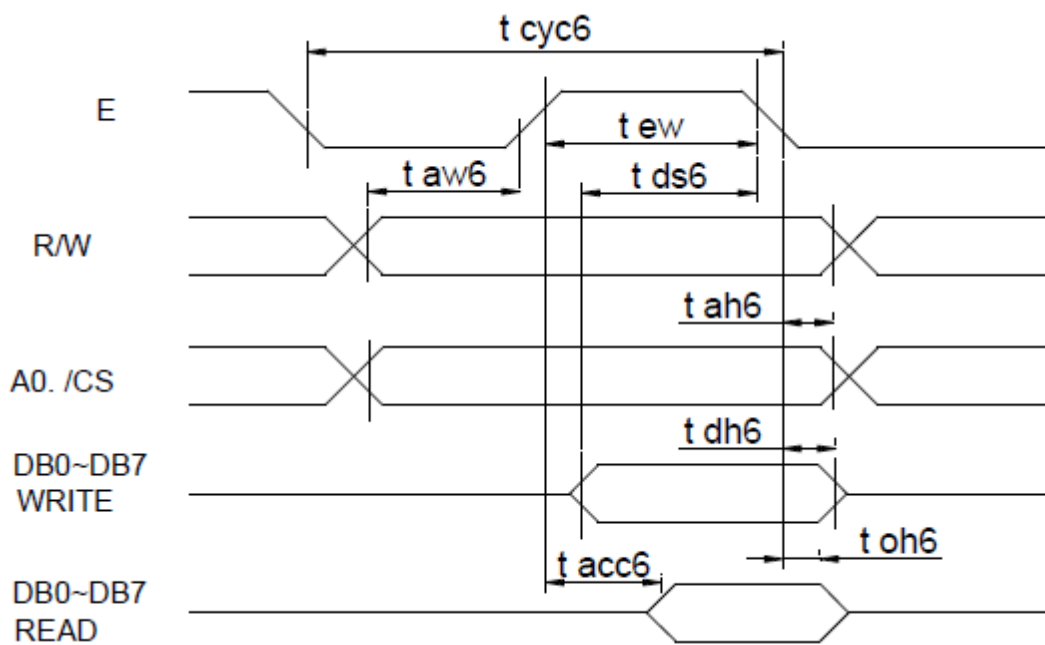
MPU bus Read/Write (8080 Interface)

Item	symbol	Conditions	Min.	Max.	unit
System cycle time	t_{cyc8}	—	1000	—	ns
Address setup time	t_{aw8}	—	20	—	ns
Address hold time	t_{ah8}	—	10	—	ns
Data setup time	t_{ds8}	—	80	—	ns
Data hold time	t_{dh8}	—	10	—	ns
Control pulse width	t_{cc}	—	200	—	ns
RD access time	t_{cc8}	CL=100pf	—	90	ns
Output disable time	t_{ch8}		10	60	ns



MPU bus Read/Write (6800 Interface)

Item	symbol	Conditions	Min.	Max.	unit
System cycle time	t_{cyc8}	—	1000	—	ns
Address setup time	t_{aw8}	—	20	—	ns
Address hold time	t_{ah8}	—	10	—	ns
Data setup time	t_{ds8}	—	80	—	ns
Data hold time	t_{dh8}	—	10	—	ns
Control pulse width	t_{cc}	—	200	—	ns
RD access time	t_{cc8}	CL=100pf	—	90	ns
Output disable time	t_{ch8}		10	60	ns



Example Initialization Program

```
/******  
void Comleft(char i)  
{  
  P1 = i;  
  R_W = 0;  
  D_I = 0;  
  E1 = 1;  
  delay(2);  
  E1 = 0;  
}  
  
void Comright(char i)  
{  
  P1 = i;  
  R_W = 0;  
  D_I = 0;  
  E2 = 1;  
  delay(2);  
  E2 = 0;  
}  
  
void Writeleft(char i)  
{  
  P1 = i;  
  R_W = 0;  
  D_I = 1;  
  E1 = 1;  
  delay(2);  
  E1 = 0;  
}  
  
void Writeright(char i)  
{  
  P1 = i;  
  R_W = 0;  
  D_I = 1;  
  E2 = 1;  
  delay(2);  
  E2 = 0;  
}  
/******  
void bothSides(char i)  
{  
  Comleft(i);  
  Comright(i);  
}  
/******  
  
void init()  
{  
  P1 = 0;  
  P3 = 0;  
  RST = 0;          //Reset RST  
  delay(1);  
  RST = 1;          //Reset RST= M68 Interface  
  delay(10);  
  D_I = 0;  
  R_W = 1;  
  
  bothSides(0xE2);  //0xE2 – Software reset  
  delay(10);  
  bothSides(0xA4);  //0xA4 – Static Driver off  
  bothSides(0xA9);  //0xA9 – select 1/32 duty  
  bothSides(0xA0);  //0xA0 – Memory/Segment mapping normal  
  bothSides(0xEE);  //0xEE – End  
  bothSides(0xC0);  //0xC0 – start at line address 0x00  
  bothSides(0xAF);  //0xAF – display on  
}  
/******  
/******
```

Quality Information

Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	+80°C , 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C 200hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 200hrs	1,2
High Temperature / Humidity Operation	Endurance test applying the electric stress (voltage & current) and the high thermal with high humidity stress for a long time.	+60°C , 90% RH , 96hrs	1,2
Thermal Shock resistance	Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress.	-20°C,30min -> 25°C,5min -> 70°C,30min = 1 cycle 10 cycles	
Vibration test	Endurance test applying vibration to simulate transportation and use.	10-55Hz , 15mm amplitude. 60 sec in each of 3 directions X,Y,Z For 15 minutes	3
Static electricity test	Endurance test applying electric static discharge.	VS=800V, RS=1.5kΩ, CS=100pF One time	

Note 1: No condensation to be observed.

Note 2: Conducted after 4 hours of storage at 25°C, 0%RH.

Note 3: Test performed on product itself, not inside a container.

Precautions for using LCDs/LCMs

See Precautions at www.newhavendisplay.com/specs/precautions.pdf

Warranty Information and Terms & Conditions

http://www.newhavendisplay.com/index.php?main_page=terms