

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

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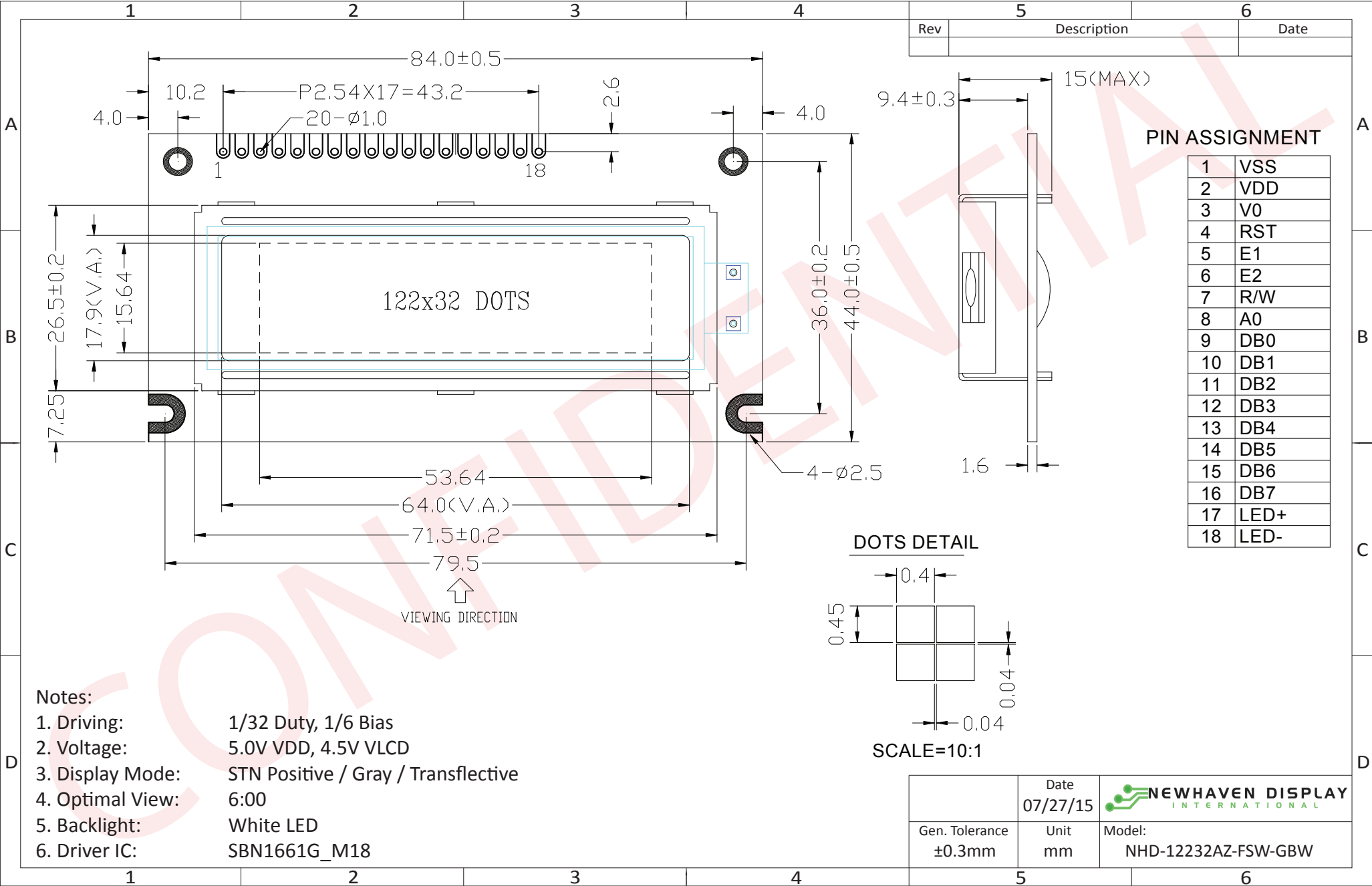
Document Revision History

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
9	9/26/16	Updated Electrical & Optical Characteristics	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



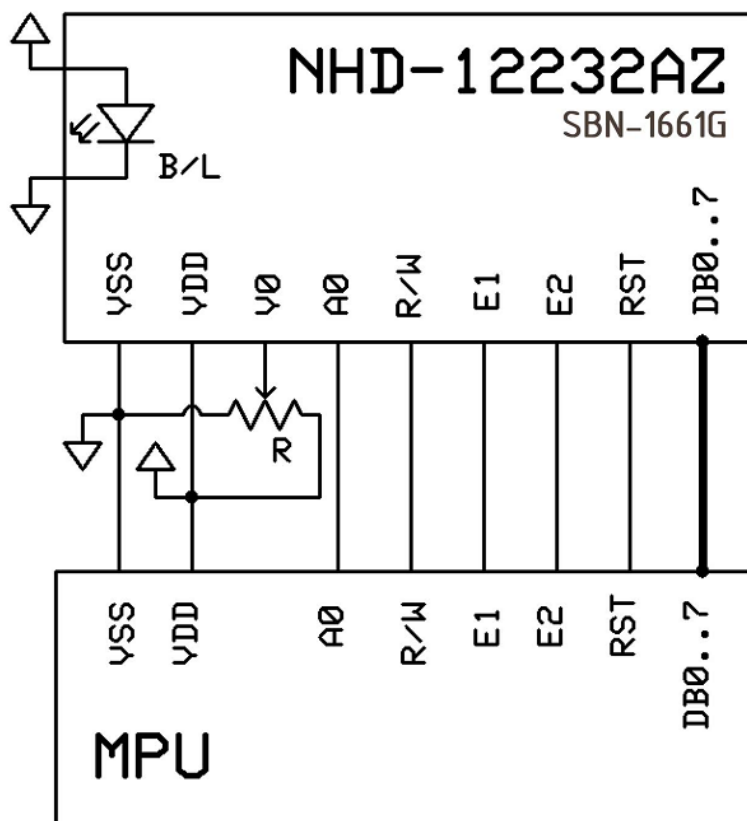
The drawing contained herein is the exclusive property of Newhaven Display International, Inc. and shall not be copied, reproduced, and/or disclosed in any format without permission.

Pin Description and Wiring Diagram

Pin No.	Symbol	External Connection	Function Description
1	VSS	Power Supply	Ground
2	VDD	Power Supply	Supply Voltage for logic (+5.0V)
3	V0	Adj Power Supply	Supply Voltage 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	Backlight Anode (+5.0V via on-board resistor)
18	LED-	Power Supply	Backlight Cathode (Ground)

Recommended LCD connector: 2.54mm pitch pins

Backlight connector: - Mates with: -



Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	T_{OP}	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T_{ST}	Absolute Max	-30	-	+80	°C
Supply Voltage	V_{DD}	-	4.8	5.0	5.2	V
Supply Current	I_{DD}	$V_{DD} = 5.0V$ $T_{OP} = 25^{\circ}C$	0.5	1.0	1.5	mA
Supply for LCD (contrast)	V_{LCD}		4.3	4.5	4.7	V
"H" Level input	V_{IH}	-	3.5	-	V_{DD}	V
"L" Level input	V_{IL}	-	V_{SS}	-	1.1	V
"H" Level output	V_{OH}	-	$V_{DD} - 0.3$	-	V_{DD}	V
"L" Level output	V_{OL}	-	V_{SS}	-	0.3	V
Backlight Supply Voltage	V_{LED}	-	4.8	5.0	5.2	V
Backlight Supply Current	I_{LED}	$V_{LED} = 5.0V$	10	15	20	mA

Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Optimal Viewing Angles	Top	$\phi Y+$	$CR \geq 2$	-	40	-	°
	Bottom	$\phi Y-$		-	60	-	°
	Left	$\theta X-$		-	60	-	°
	Right	$\theta X+$		-	60	-	°
Contrast Ratio		CR	-	2	5	-	-
Response Time	Rise	T_R	$T_{OP} = 25^{\circ}C$	-	150	250	ms
	Fall	T_F		-	200	300	ms

Controller Information

Built-in SBN1661G_M18 Controller.

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

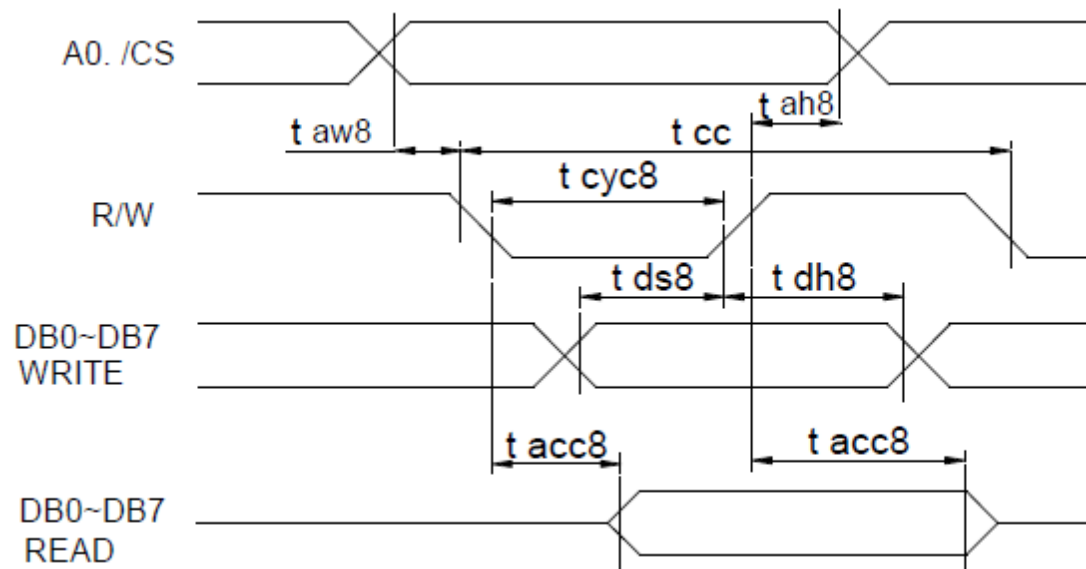
Table of Commands

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

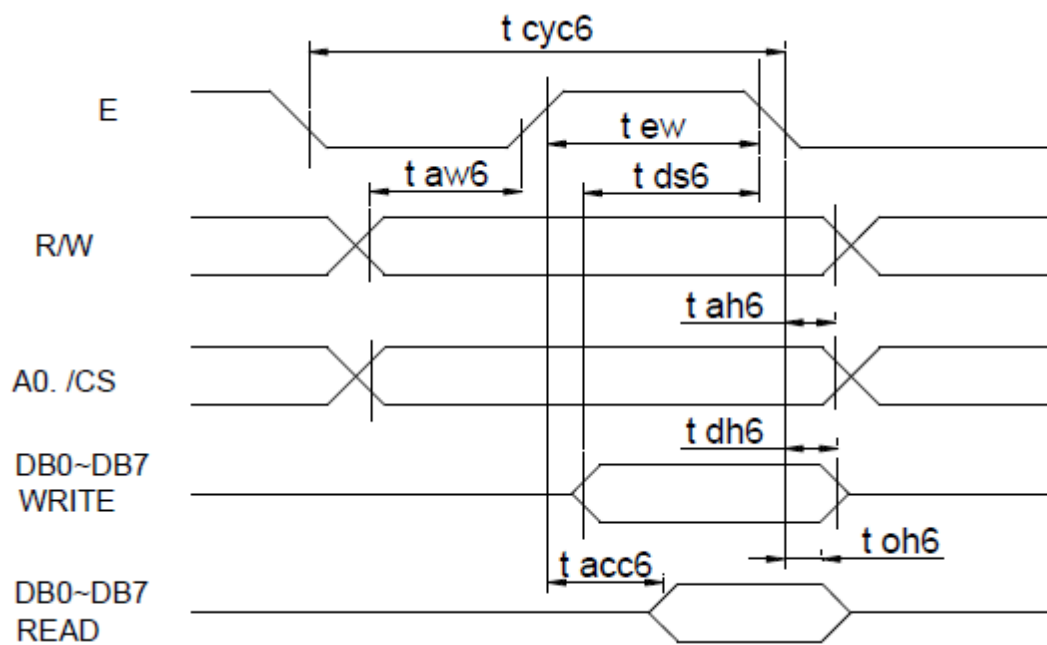
MPU bus Read/Write (8080 Interface)

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 , 48 hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C , 48 hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time.	+70°C 48 hrs	2
Low Temperature Operation	Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time.	-20°C , 48 hrs	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 , 48hrs	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