Noritake ***itron***

VACUUM FLUORESCENT DISPLAY MODULE SPECIFICATION

Customer: POWER MESUREMENT
Model : FU209SCPB-T22A

SPECIFICATION NO. : GGM126A
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1.General Description

1.1 Application: Readout of computer, micro-computer, communication terminal and automatic instruments.

1.2 Construction: Single board display module consists of 20 characters(1X20)VFD, refresh memory, character generator, control circuit, DC/DC converter and all necessary control logics. Interface level is TTL compatible and the module can be connected tot the CPU bus of host directly.

1.3 Drawing: See para. 12. Outline dimension

2.Abusolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Condition
Logic Input Voltage	VI	0	—	Vcc	VDC	—
Power Supply Voltage	Vcc	0	—	5.5	VDC	—

3.Electrical Ratings

Parameter		Symbol	Min.	Typ.	Max.	Unit.	Condition
Logic Input Voltage	"H"	VIH	2.0	—	Vcc	VDC	—
	"L"	VIL	—	—	0.8	VDC	
Power Supply Voltage		Vcc	4.75	5.0	5.25	VDC	—

4.Electrical Characteristics

Measuring Conditions : TA(Ambient temperature)=25°C,Vcc=5.0V

Parameter		Symbol	Min.	Typ.	Max.	Unit.	Condition
Logic Output Voltage	"H"	VOH	3.5	—	—	VDC	IOH = - 5.0mA
	"L"	VOL	—	—	0.5	VDC	IOL = 2.0mA
Power Supply Current		Icc	—	430	600	mADC	Vcc = 5 V

Notes : Slow start power supply may cause erroneous operation.
Icc might be anticipated twice as usual at power on rush.

5.Optical Specifications

Number of characters	:	20 (1line×20chars)
Character format	:	14Segment with DP , Comma
Character Height	:	9.0mm
Character Width	:	5.4mm
Character Pitch	:	8.4mm
Luminance	:	700 cd/m^2(200 fL) Typ.
Color of illumination	:	Blue-green

6.Environmental Specifications

Operating temperature	:	0 to +50°C
Storage temperature	:	-20 to +70°C
Humidity	:	20 to 85 % RH non-condensing

7.Functional Descriptions

The module has three basic functions, which are 8bit parallel /serial data write and Test mode. Some ASCII control codes , standard ASCII characters , can be written by both parallel and serial modes . Some commands can be written by parallel modes. All characters in the Character Generator are displayed at Test Mode for Display and Module function check .

7.1 Parallel Read / Write ($\overline{CS}$ =" 0" , $\overline{WR}$ =" 0 → 1" , TO=" 1")

Data is written into the display by changing signal $\overline{WR}$ =" 1" from $\overline{WR}$ ="0" during TO ="1" and $\overline{CS}$ ="0" . Standard ASCII characters and some control codes , shown in Table 1 , can be written into the module .

Some commands , shown in Table 2 , can be written into the module .

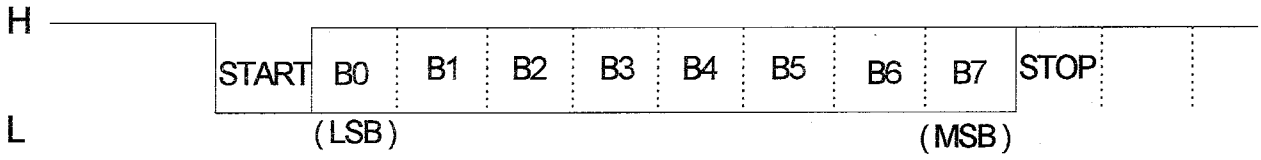
Function and Bus directions are shown in the table below .

$\overline{WR}$	$\overline{RD}$	A0	$\overline{CS}$	Function	Direction of data bus
0→1	1	0	0	Data write	Host → Module (write)
0→1	1	1	0	Command write	Host → Module (write)
1	0	0	0	Data read	Host ← Module (read)
1	0	1	0	Status read	Host ← Module (read)

7.2 Serial Data Write

Serial data can be written into the module through " TO " line while $\overline{CS}$ = " 1 " .
Input level is TTL compatible .
Serial data shall be consisted with following 11 bit data from .
The baud rate is fixed 600 bps at the factory .
However , baud rate of 600,1200,2400,4800,9600,19200 and 38400 can be selected by jumper wire .
Standard ASCII Characters and some control codes , shown in Table1 , can be written into the Module .

Serial data transmission form is as follows :



7.3 Status read (Parallel)

Bit 0 (LSB) : Status of data read : data read is valid only when BIT 0 =" 1 " .
Bit 1 : Status of data write : data / command write is valid only when BIT 1=" 0 " .
Bit 2~Bit 7 : do not care .

Table 1

Function of each control code (Data write / A0= " 0 ") are as follows :

BS	: back space cursor location one position
HT	: advance cursor location one position
LF	: line feed (clears display)
CR	: carriage return (return cursor to left-most character position : does not clear display)
DC1	: end of line mode • automatic carriage return
DC2	: end of line mode • overwrite of right-most character
DC3	: end of line mode • horizontal scroll right to left
VT	: start blink field (sent before characters which are desired to blink)
FF	: stop blink field (characters which follow will not blink)
SI	: make cursor indicator invisible (this is a blinking indicator of where the next character will be located)
SO	: make cursor indicator invisible (the cursor location counter continue to function but there is no visible indicator of next character location)
ESC	: move cursor to following position (2 byte function)

Table 2

Function of each command (command write / A0 = "1") are as follows :

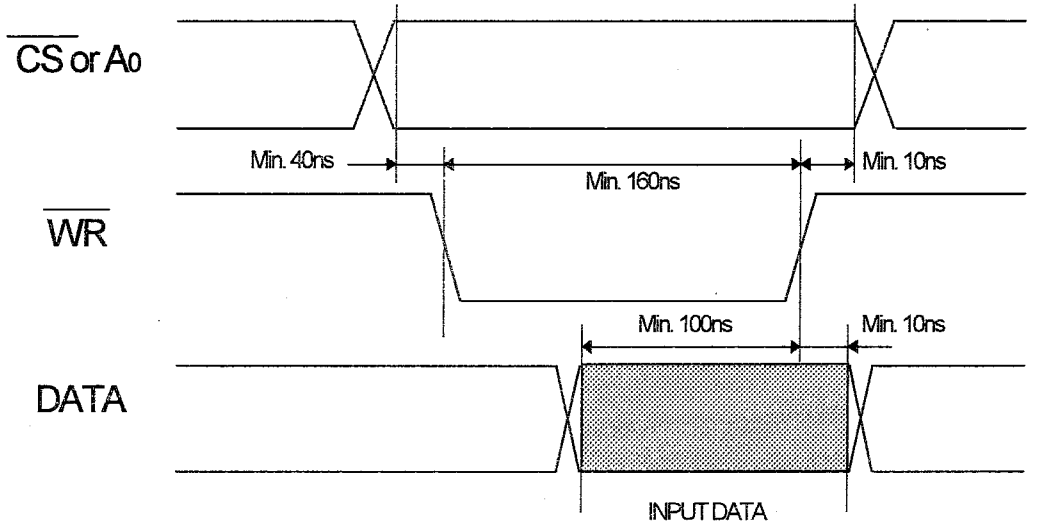
00~13Hex	: move cursor location 00 → left end 13 → right end
80~93Hex	: prepare to read ASCII data st each character location 80 → left end 93 → right end
40 Hex	: reset
41 Hex	: prepare to read cursor location value in binary
42 Hex	: prepare to read data at present cursor location
43Hex	: prepare to read data at present cursor location and increment cursor

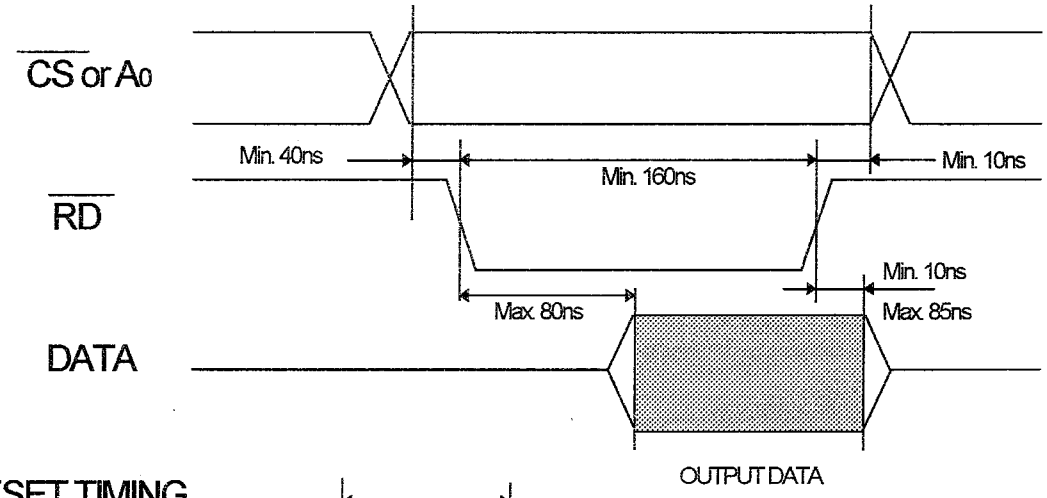
7.4 Test Mode ($\overline{WR}$ = " 1 " , TO = " 0 " at power-on)

Test Mode is very useful feature and activated by maintaining a logic low on the serial input (TO) at power on time .

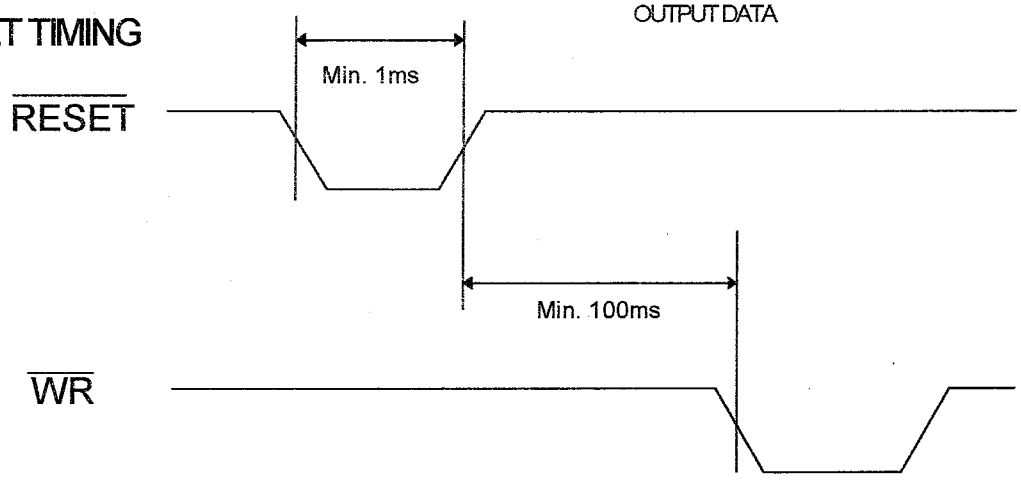
ASCII characters from 20Hex to 5FHex will be displayed advancing through the character field at approximately 4 characters per second rate . The test mode capability can be used to both in-field fault isolation and incoming receiving inspection .

8 .Timing

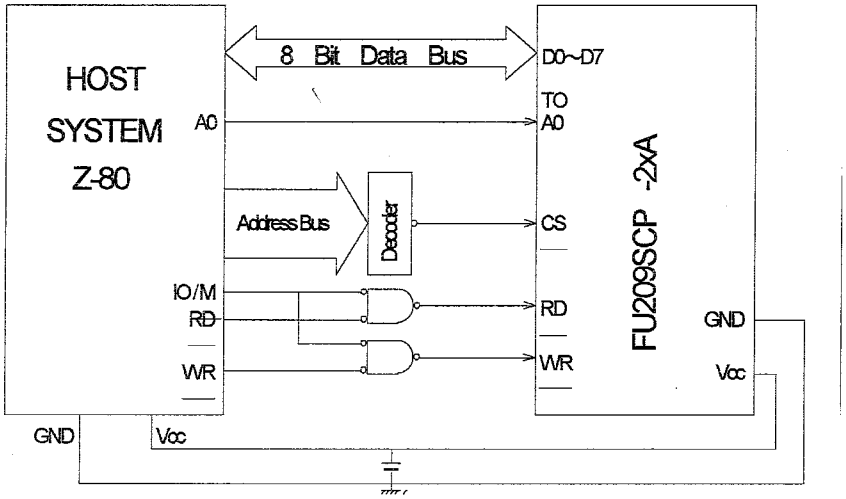




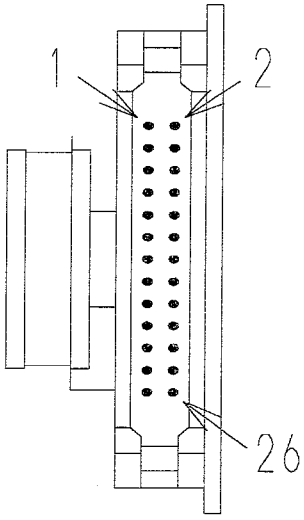
RESET TIMING



9 .Interfacing

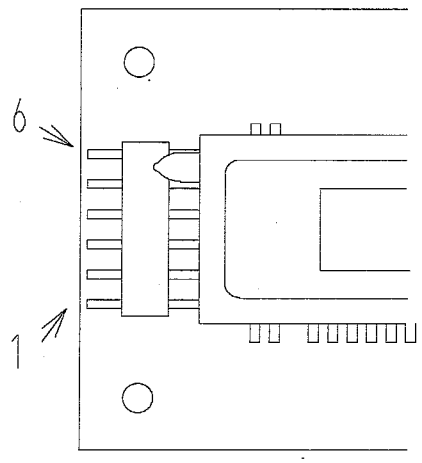


10 .Pin Assignment



Data Connector Assignments

No	NAME	No	NAME
1	TO	2	COMMON
3	CS	4	COMMON
5	RD	6	COMMON
7	A0	8	COMMON
9	WR	10	COMMON
11	D0 (LSB)	12	COMMON
13	D1	14	COMMON
15	D2	16	COMMON
17	D3	18	COMMON
19	D4	20	COMMON
21	D5	22	COMMON
23	D6	24	COMMON
25	D7	26	COMMON



Power Connector Assignments

No	1	2	3	4	5	6
NAME	+5V	NC	NC	GND	NC	RESET

11 .Character fonts

D3 D2 D1 D0	D7 D6 D5 D4	0 0 0 0	0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 1	1 0 0 0	1 0 0 1	1 0 1 0	1 0 1 1	1 1 0 0	1 1 0 1	1 1 1 0	1 1 1 1
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	0	NLU	DLE														
0 0 0 1	1	SOH	DC1														
0 0 1 0	2	STX	DC2														
0 0 1 1	3	ETX	DC3														
0 1 0 0	4	EOT	DC4														
0 1 0 1	5	ENQ	NAK														
0 1 0 1	6	ACK	SYN														
0 1 1 0	7	BEL	ETB														
0 1 1 1	8	BS	CAN														
1 0 0 0	9	HT	EM														
1 0 0 1	A	LF	SUB														
1 0 1 0	B	VT	ESC														
1 0 1 1	C	FF	FS														
1 1 0 0	D	CR	GS														
1 1 1 0	E	SO	RS														
1 1 1 1	F	SI	US														

00 - 1F (Hex) Not Displayed . Several of their ASCII control code locations correspond to control functions supported by the Display Module .

20 - 5F (Hex) 64 - character ASCII subset of upper-case alphabet , numerals and punctuation .

60 - 7F (Hex) ASCII Lower-case alphabet location are displayed as upper-case . Six supplemental punctuation marks at location 60 ,7B ,7C ,7D ,7E ,7F (Hex) .

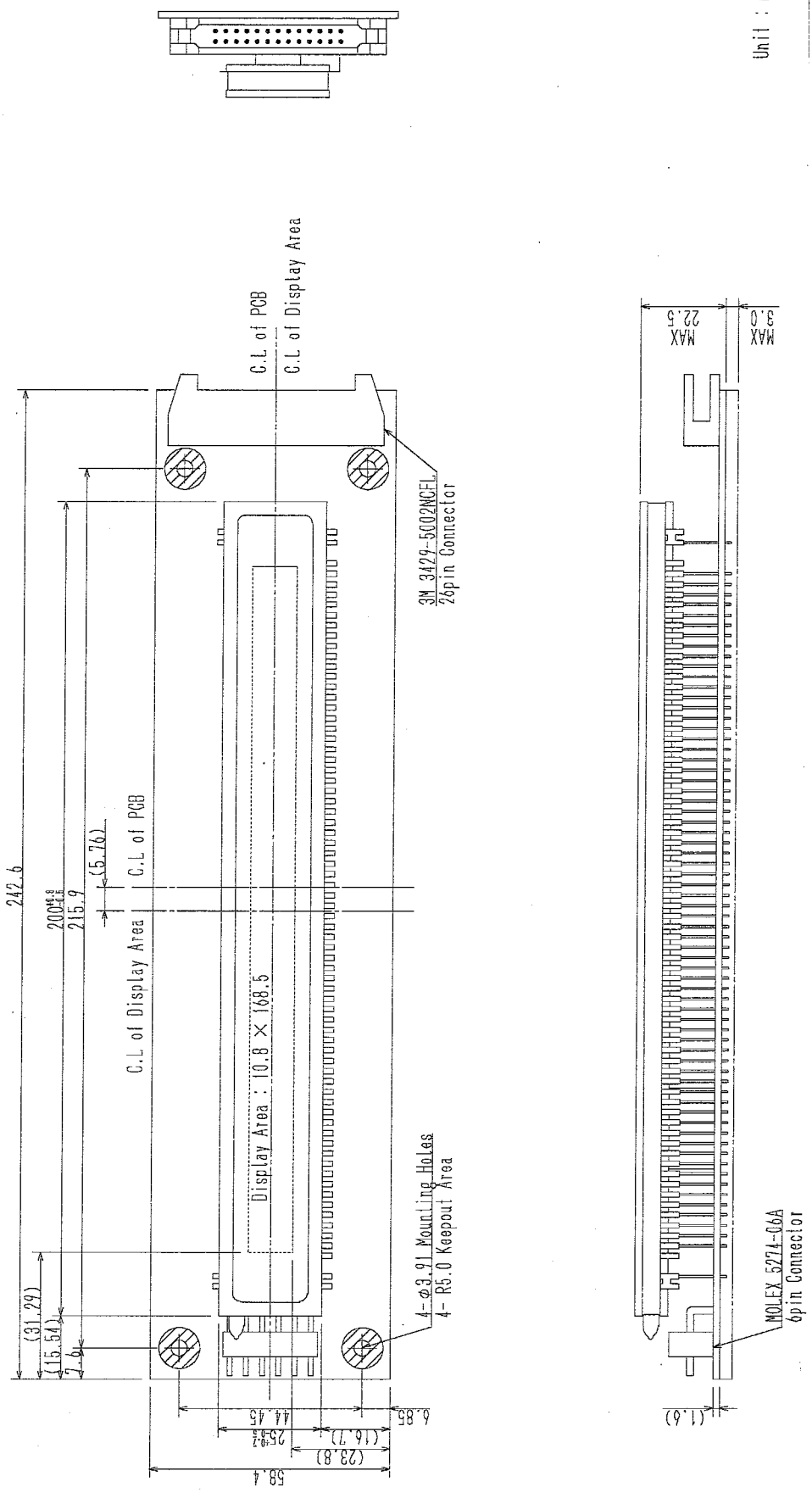
80 - 9F (Hex) ASCII 20 - 3F (Hex) with comma

A0 - BF (Hex) ASCII 20 - 3F (Hex) with decimal point

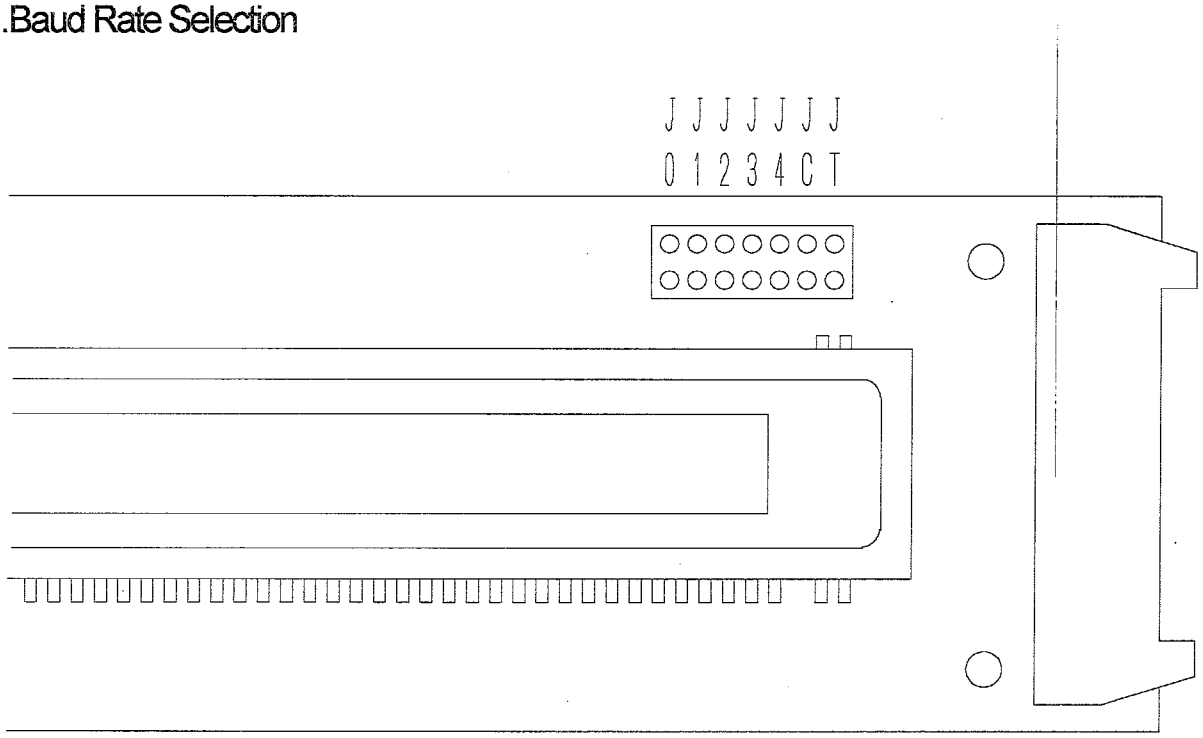
C0 - DF(Hex) ASCII 40 - 5F (Hex) with decimal point

E0 - FF (Hex) ASCII 40 - 5F (Hex) with comma

12 .Outline Dimension



13 .Baud Rate Selection



JT	JC	J4	J3	J2	J1	J0	Function	
1	1	×	×	1	1	1	Baud rate selection	600 BPS
1	1	×	×	1	1	0		600 BPS
1	1	×	×	1	0	1		1200 BPS
1	1	×	×	1	0	0		2400 BPS
1	1	×	×	0	1	1		4800 BPS
1	1	×	×	0	1	0		9600 BPS
1	1	×	×	0	0	1		19200 BPS
1	1	×	×	0	0	0		38400 BPS
1	1	1	×	×	×	×	Parity selection	Non Parity
1	1	0	0	×	×	×		Even Parity
1	1	0	1	×	×	×		Odd Parity
0	1	×	×	×	×	×	Test Mode	
1	1	1	1	1	1	1	Setting at Factory	

0 : Short 1: Open ×: Don't care

IMPORTANT PRECAUTIONS

- All VFD Modules contain MOS LSIs or ICs. Anti-Static handling procedures are always required.
- VF Display consists of Soda-lime glass. Heavy shock more than 100G, thermal shock greater than 10°C/minute, direct hit with hard material to the glass surface - - especially to the EXHAUST PIPE - - may CRACK the glass.
- Do not PUSH the display strongly. At mounting to the system frame, slight gap between display glass face and front panel is necessary to avoid a contact failure of lead pins of display. Twist or warp mounting will make a glass CRACK around the lead pin of display.
- Neither DATA CONNECTOR or POWER CONNECTOR should be connected or disconnected while power is applied. As is often the case with most subsystems, caution should be exercised in selectively disconnecting power within a computer based system. The modules receive high logic on strobe lines as random signals on all data ports. Removal of primary power with logic signals applied may damage input circuitry.
- Stress more than specification listed under the Absolute Maximum Ratings may cause PERMANENT DAMAGE of the modules.
- +5 volts power line must be regulated completely since all control logics depend on this line. Do not apply slow-start power. Provide sufficient output current power source to avoid trouble of RUSH CURRENT at power on. (At least output current of double figure of Icc, listed on the specification of each modules, is required.)
- Data cable length between module and host system is recommended within 300mm to be free from a miss-operation caused by noise.
- Do not place the module on the conductive plate just after the power off Due to big capacitors on the modules, more than 1 min. of discharging time is required to avoid the failure caused by shorting of power line.
- 2 hours pre-running with the test mode operation may help the stability of the brightness of the VFD when power was not applied more than 2 months.
- Steady repeating of a fixed (static) message displaying, longer than 5 hours in a day may cause the phosphor burn-out problem. An automatic shut down Programming, scrolling message using DC2 mode or 2 hours test mode operation during the idling of the host is recommended.