Futaba®

REV.-

VACUUM FLUORESCENT DISPLAY MODULE

ENGINEERING PROPOSAL

GP1273A01A

EVALUATION
☐ ACCEPTED WITHOUT ANY CHANGE
☐ THE FOLLOWING CHANGE IS REQUIRED

August 26, 2011

Engineering Group
Electronic Components Factory
Electronic Components Division
Futaba Corporation

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⚠ Important Safety Notice

Please read this note carefully before using the product.

Warning

- The module should be disconnected from the power supply before handling.
- The power supply should be switched off before connecting or disconnecting the power or interface cables.
- The module contains electronic components that generate high voltages which may cause an electrical shock when touched.
- Do not touch the electronic components of the module with any metal objects.
- The VFD used on the module is made of glass and should be handled with care. When handling the VFD, it is recommended that cotton gloves be used.
- Under no circumstances should the module be modified or repaired. Any unauthorized modifications or repairs will invalidate the product warranty.
- The module should be abolished as the factory waste.

1. FEATURES

FUTABA GP1273A01A is a graphic display module using a FUTABA 256×128dots VFD.
It consists of CIG VFD, a control ASIC, Static-RAM of 256 Kbytes and Power supply unit.
The module can be connected directly to the bus line of a host system CPU.
In the module, 4font tables (Japanese, Traditional Chinese, Simplified Chinese and Korea) are installed and the module can display the font by command transmission.

2. GENERAL DESCRIPTION

2-1. DIMENSIONS, WEIGHT (Refer to FIGURE-1)

Table-1

Item	Specification	Unit
Outer dimensions	(W) 183±1 (H) 88±1 (T) 28.0 MAX.	mm
Weight	Approx. 380	g

2-2. SPECIFICATIONS OF THE DISPLAY PANEL

Table-2

Item	Specification	Unit
Display Area	122.78(W)×61.34(H)	mm
Number of Dots	256×128	Dot
Dot Size (H×W)	0.38×0.38	mm
Dot Pitch (H×W)	0.48×0.48	mm
Color Illumination	Green (λ p=505nm)	–
Luminance	700 (Typ.)	cd/m^2

Note)By using a filter, uniform color range from blue to orange (including white) can be obtained.

2-3. ENVIRONMENT CONDITIONS

Table-3

Item	Symbol	Min.	Max.	Unit
Operation Temperature	*T*opr	-20	+70	°C
Storage Temperature	*T*stg	-40	+85	°C
Operating Humidity	*H*opr	20	85	%
Storage Humidity	*H*stg	20	90	%
Vibration (10 ~ 55Hz)	–	–	4	G
Shock	–	–	40	G

Note1) Avoid operations or storage in moist environmental conditions.

2-4. ABSOLUTE MAXIMUM RATINGS

Table-4

Item	Symbol	Min.	Max.	Unit
Supply Voltage	*V*cc	-0.3	14.4	Vdc
Input Signal Voltage	V_{IS}	-0.3	6.0	V

2-5. RECOMMEND OPERATING CONDITIONS

Table-5

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	*V*cc	10.8	12.0	13.2	Vdc
H-Level Input Voltage	V_{IH}	4.5	–	–	V
L-Level Input Voltage	V_{IL}	–	–	0.7	V

2-6. ELECTRICAL CHARACTERISTICS

Table-6

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Current	*I*cc	*V*cc＝12Vdc	–	T.B.D	T.B.D	mA
Luminance	*L*	All on	350	700	–	cd/m^2
H-Level Output Voltage	V_{OH}	I_{OH} = -50 μ A	4.0	–	–	V
L-Level Output Voltage	V_{OL}	I_{OL} = 50 μ A	–	–	1.0	V

3. BASIC FUNCTION

3-1. Words explanation

・Display Window（DW）1、2 ： Frame of display in VFD. There are 2 displays, DW1 and DW2.

・Display Start Address（DSA）1、2 ： Address of the left upper to DW.

・Display Start Bit（DSB）1、2 ： Dot in DSA.

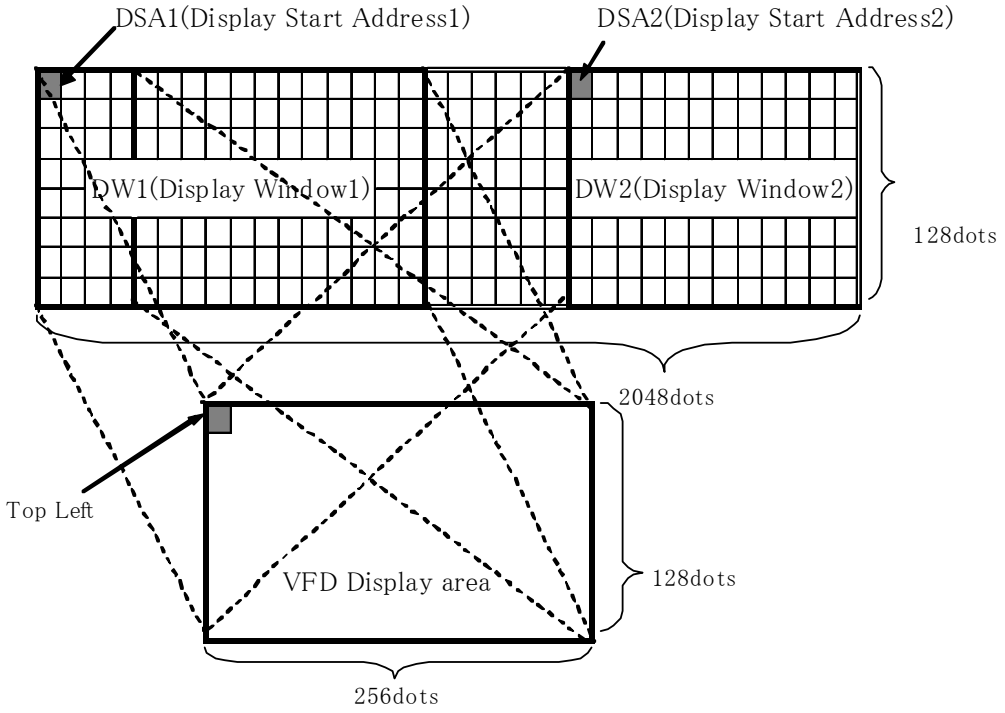
3-2. Function Table

Table-7

$\overline{CS}$	$\overline{WR}$	C/$\overline{D}$	BUSY	MODE
L	↑	H	L	Command Write-in
L	↑	L	L	Data Write-in
L	H	H	L	―
―	―	―	H	BUSY

3-3. Relationship between Memory Area and Display constitute.

This module has the 2 Screen displays in the Memory area.
The DW indicated the DSA is displayed left side upper in screen.
The DSA can be set up in Memory Area.
This module can be selected to turn ON/OFF only DW1, 2 or a composite DW1 and 2



3-4. Relationship of Display Window to Address and Data

The following map is shown in case of 0000H on display start address.

dot	bit
1	D7
2	D6
3	D5
4	D4
5	D3
6	D2
7	D1
8	D0

Display Window

Number of dots to Anode

dot	Number of dots to Grid 1	2	3	..	256	257	..	2046	2047	2048
1-8	0000	0010	0020	..	0FF0	1000	..	7FD0	7FE0	7FF0
9-16	0001	0011	0021	..	0FF1	1001	..	7FD1	7FE1	7FF1
17-24	0002	0012	0022	..	0FF2	1002	..	7FD2	7FE2	7FF2
25-32	0003	0013	0023	..	0FF3	1003	..	7FD3	7FE3	7FF3
33-40	0004	0014	0024	..	0FF4	1004	..	7FD4	7FE4	7FF4
41-48	0005	0015	0025	..	0FF5	1005	..	7FD5	7FE5	7FF5
49-56	0006	0016	0026	..	0FF6	1006	..	7FD6	7FE6	7FF6
..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..
73-80	0009	0019	0029	..	0FF9	1009	..	7FD9	7FE9	7FF9
81-88	000A	001A	002A	..	0FFA	100A	..	7FDA	7FEA	7FFA
89-96	000B	001B	002B	..	0FFB	100B	..	7FDB	7FEB	7FFB
97-104	000C	001C	002C	..	0FFC	100C	..	7FDC	7FEC	7FFC
105-112	000D	001D	002D	..	0FFD	100D	..	7FDD	7FED	7FFD
113-120	000E	001E	002E	..	0FFE	100E	..	7FDE	7FEE	7FFE
121-128	000F	001F	002F	..	0FFF	100F	..	7FDF	7FEF	7FFF

3-5. Command Table

The followings are all commands of this module.

After writing the command, necessary setting data should be written.

Table-8

Command (C/$\overline{D}$="H")	Setting Data (C/$\overline{D}$="L")	Function	Default Select
00H	—	1st & 2nd Screens are Displayed off	○
01H	—	1st Screen is Displayed on	
02H	—	2nd Screen is Displayed on	
03H	—	Compose DW1 and DW2	
04H	D0～D7	DW1 Write address is automatically incremented	00H
06H	—	RAM clear （Write-in the 00h All RAM area）	
08H	D0～D7	DW1 Display data write-in	
0AH	D0～D7	Setting lower address for 1st Screen started (DSA1)	00H
0BH	D0～D6	Setting upper address for 1st Screen started (DSA1)	00H
0CH	D0～D7	Setting lower address for 2nd Screen started (DSA2)	00H
0DH	D0～D6	Setting upper address for 2nd Screen started (DSA2)	00H
0EH	D0～D7	DW1 Setting lower address of Write	00H
0FH	D0～D6	DW1 Setting upper address of Write	00H
13H	D0～D7	Luminance Adjustment （00H～FFH）	FFH
14H	D0～D7	Anode data transmit setting (83H or 03H) Note1)	00H
1AH	D0～D1	DSB1 2bit（00H, 01H）	00H
1CH	D0～D1	DSB2 2bit（00H, 01H）	00H
20H	D0～D7	Display Character	
21H	D0～D7	Setting the Character Starting Location of RAM	(x,y)= (00H,00H)
23H	D0～D7	Setting the Font	00H
24H	D0～D7	Setting Brightness of Character	00H

"—" in the above table is shown that the setting data is not needed.

Note1) Please set each case when display data write-in or display character.

Display data write-in : command 14H, data 03H, command 08H, data

Display character : command 14H, data 83H, command 20H, data

3-6. Function of Commands

3-6-1. Screen Display turn on / off Control (00H, 01H, 02H, 03H)

The latest command becomes effective.

At power on, 1st and 2nd screens are set to Display turn off mode.

Therefore, the Display on mode command should be written in, after display pattern data input.

In case of executing Display on mode before display data input at initial, random pattern may be displayed.

3-6-2. Write address is automatically incremented（04H、05H）

These commands select the write address is incremented by single step automatically or is held after data write.

When a memory address is set to 7FFFH, next memory address is set to 0000H.

00H : The write address is incremented by single step automatically After data write.

01H～10H : If the data is written under auto increment mode by assignment times (from 01H to 10H), the address is moved to the right of the first written address.

FFH : The write address is held after data write.

The address is incremented in the following map at the time of each write.

If data 00H is set after command 04H,

If write-in start address is 00H,

1	17	33	49	65	81	97	‥	‥
2	18	34	50	66	82	98	‥	‥
3	19	35	51	67	83	99	‥	‥
⋮	⋮	⋮	⋮	⋮	⋮	⋮	‥	‥
⋮	⋮	⋮	⋮	⋮	⋮	⋮	‥	‥
14	30	46	62	78	94	110	‥	‥
15	31	47	63	79	95	111	‥	‥
16	32	48	64	80	96	112	‥	‥

If write-in start address is 0EH,

3	19	35	51	67	83	99	‥	‥
4	20	36	52	68	84	100	‥	‥
⋮	⋮	⋮	⋮	⋮	⋮	⋮	‥	‥
⋮	⋮	⋮	⋮	⋮	⋮	⋮	‥	‥
15	31	47	63	79	95	111	‥	‥
16	32	48	64	80	96	112	‥	‥
1	17	33	49	65	81	97	‥	‥
2	18	34	50	66	82	98	‥	‥

If data 05H is set after command 04H,

If write-in start address is 00H,

1	6	11	16	21	26	31	‥	‥
2	7	12	17	22	27	32	‥	‥
3	8	13	18	23	28	33	‥	‥
4	9	14	19	24	29	34	‥	‥
5	10	15	20	25	30	35	‥	‥

If write-in start address is 0EH,

3	8	13	18	23	28	33	‥	‥
4	9	14	19	24	29	34		
5	10	15	20	25	30	35		
							‥	‥
							‥	‥
1	6	11	16	21	26	31	‥	‥
2	7	12	17	22	27	32	‥	‥

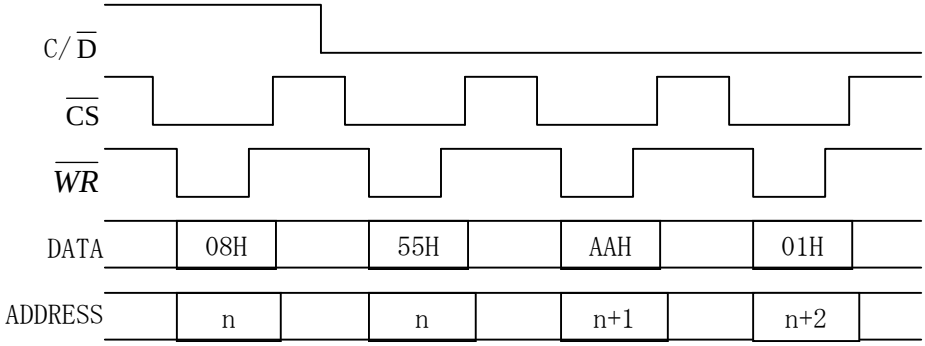
3-6-3. RAM clear command（06H）

The display screen is cleared and the Write address moves 0000H after the RAM clear command was executed. The RAM clear command takes 50ms until command complete.

The other command is not receive until this command complete.

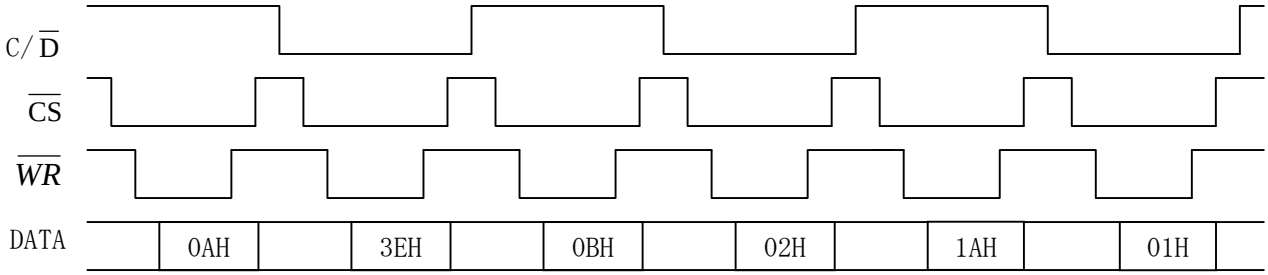
3-6-4 Data Write (08H,18H)

After executing the Write address setting command, this command shall be executed.
The following indicate the display data 55H, AAH and 01H write-in.



3-6-5. DSA、DSB setting（0AH、0BH、0CH、0DH、1AH、1CH）

The display start address is just pointed to the left and top line of the display Window.
DSA1 and DSA2 screens can be independently set the display start address each other.
This address is divided to the two portions with upper and lower address.
The smooth scroll of displaying can be achieved by synchronizing with the change of display address by the INT signal at every frame.
The following indicate the display start address of DSA1 screen to set to 023EH, and DSB1 screen to set to 01H.



DSB Table-9

データ	
00H	1st dot
07H	2nd dot
06H	3rd dot
05H	4th dot
04H	5th dot
03H	6th dot
02H	7th dot
01H	8th dot

Note) It become null to set up without upper data.

3-6-6. Setting of Write Address (0EH, 0FH)

This command is set the write address of displaying data.

This address is divided the two portions with upper and lower address, and lower address shall be set first, then set the upper address. And only the upper address is available to be changed independently. When the lower address is changed, it is required to change the both address.

3-6-7. Luminance Adjustment (13H)

Luminance is set by input command 13H and below data.

Table-10

Command 13H	Luminance
00H	0%
14H	20%
15H	21%
16H	22%
17H	23%
⋮	⋮
5FH	95%
60H	96%
61H	97%
62H	98%
63H	99%
64H～FFH	100%

Note 1) Default setting is FFH (100%). But DW1/DW2 is Display OFF.

Note 2) Luminance levels are defined by light-emitting time.

3-6-8. Anode data transmit setting（14H）

Set up the anode data transmit.

Write-in the command 14H follows to write the data.

Please set each case when display data write-in or display character.

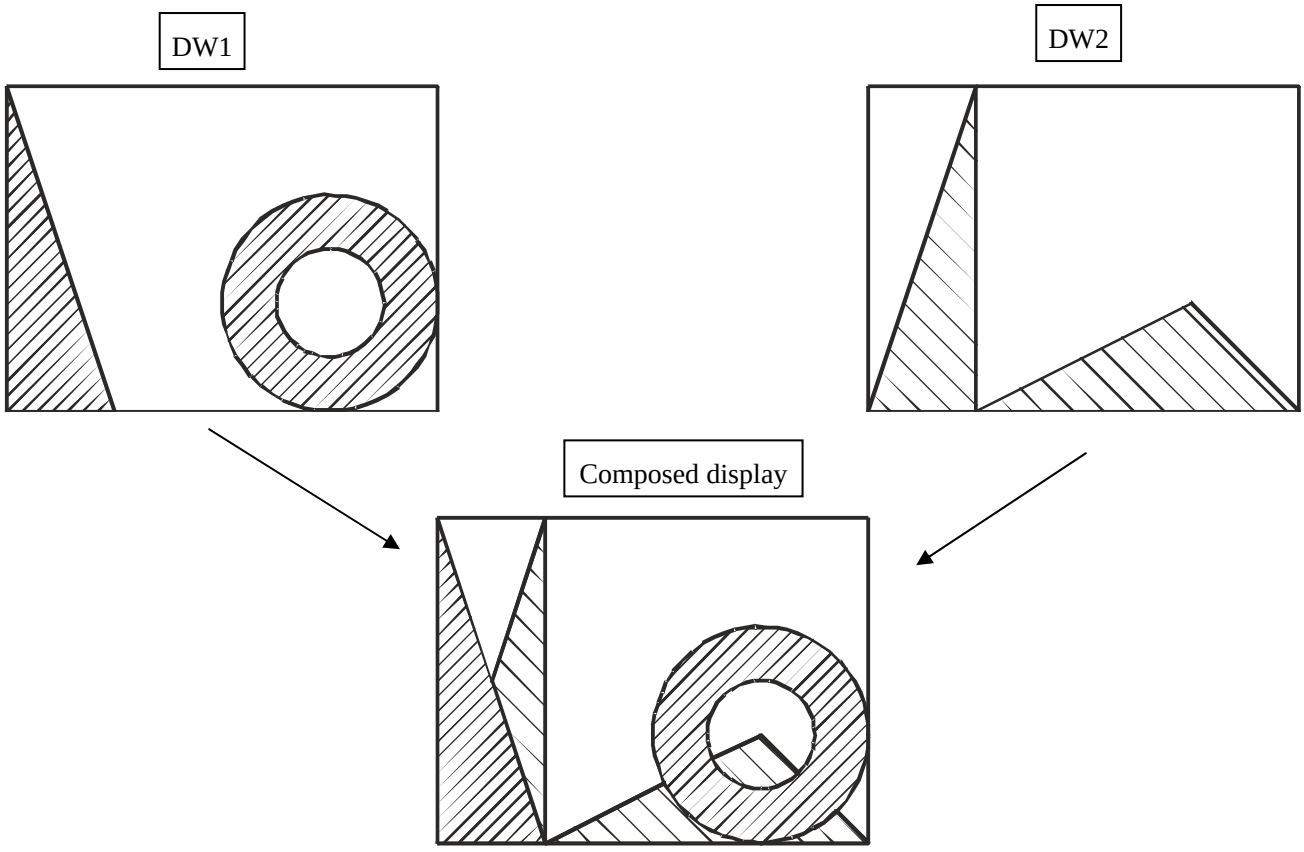
Display data write-in : command 14H, data 03H, command 08H, data

Display character : command 14H, data 83H, command 20H, data

3-6-9. The Composite DW1 and DW2

This module has 2 Display Window (DW1、DW2), These Display Windows can be composed.

Compose display for example

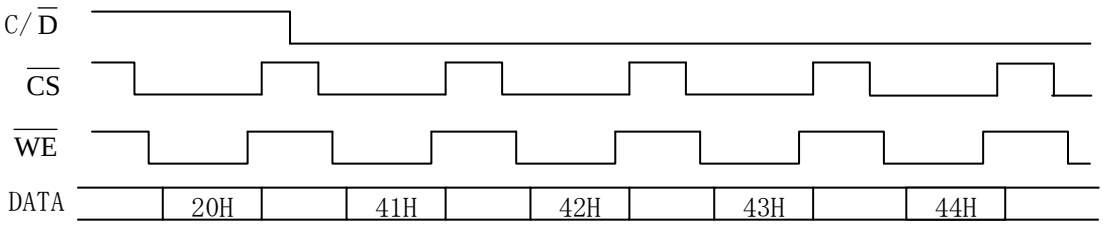


3-6-10. Display Character (20H)

By this command, character can be displayed.
Character location of the RAM and Font is applied by the following commands.

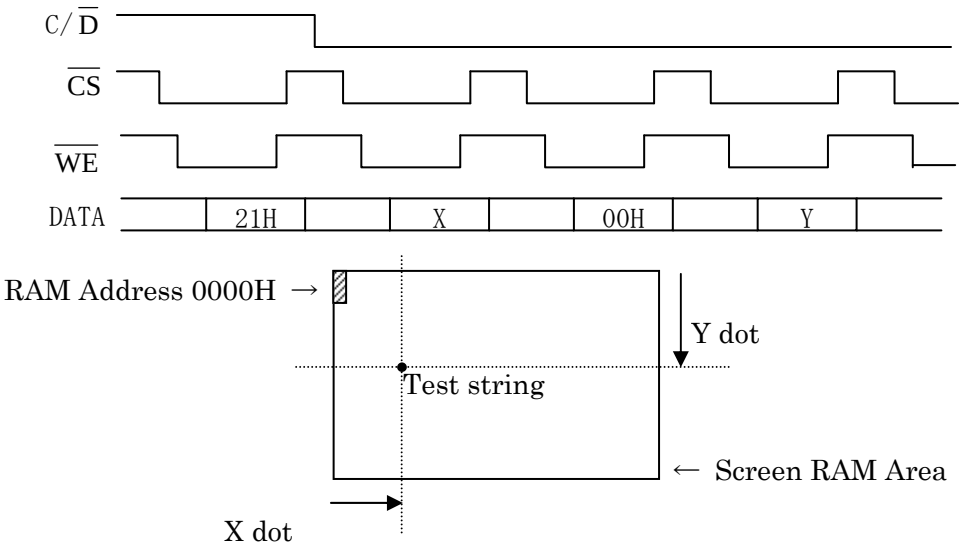
- Setting the Character Starting Location of RAM (Command 21H)
- Setting Size of Character (Command 22H)

After this command, the data should be written as string.
If the character is displayed, the location of character will be moved.
The following indicate when the string ”ABCD” is displayed.



3-6-11. Setting the Character Starting Location of RAM (21H)

By this command the location of character is set.
X and Y should be set.



3-6-12. Setting the Font (23H)

The Font of display is set by data after this command.

Table-11

DATA	Font（Character code）	Font Size
00H	Japanese（Shift-JIS）	16×16, 16×8
01H	Traditional Chinese（Big5）	16×16, 16×8
02H	Simplified Chinese（GB2312）	16×16, 16×8
03H	Korea（KSC5601）	16×16, 16×8
11H	CodePage1252	16×8
20H	ANK（Alphabet Numeric Kana）	5×8
21H	CodePage1252	5×8
23H	Korea（KSC5601）	5×8

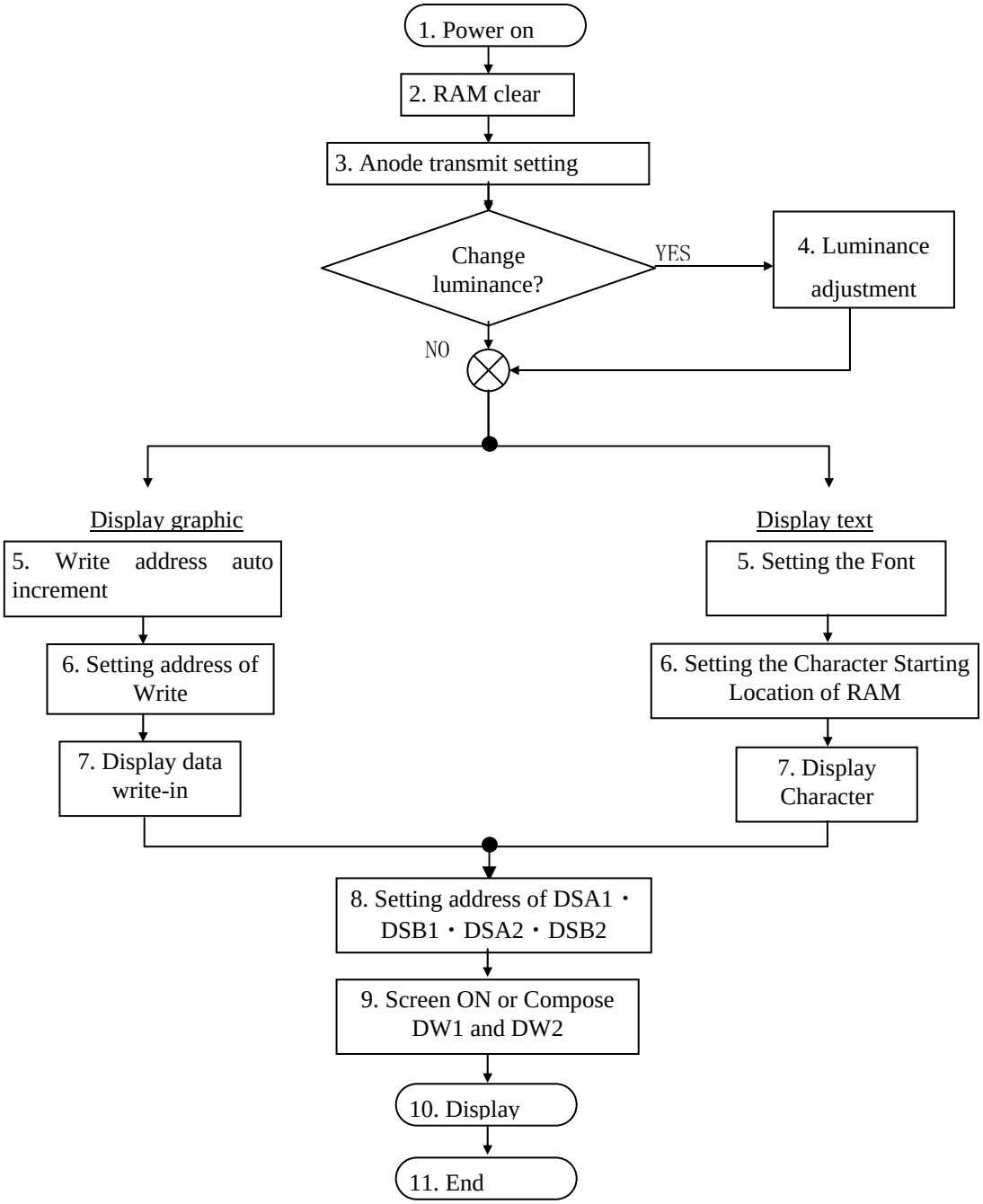
3-6-13. Setting Brightness of Character (24H)

By this command the brightness of character is set.

Table-12

Gray Scale Number	0FH	Brightness 15/15
	0EH	Brightness 14/15
	0DH	Brightness 13/15
	0CH	Brightness 12/15
	0BH	Brightness 11/15
	0AH	Brightness 10/15
	09H	Brightness 9/15
	08H	Brightness 8/15
	07H	Brightness 7/15
	06H	Brightness 6/15
	05H	Brightness 5/15
	04H	Brightness 4/15
	03H	Brightness 3/15
	02H	Brightness 2/15
	01H	Brightness 1/15
	00H	Brightness 0/15

3-7. Example of command sequence



4. INTERFACE CONNECTION

Connector: IMSA-9617S –26A-T (IRISO ELECTRONICS) or equivalent

Table-13

Pin No.	Description	Pin No.	Description
1	D0	2	D1
3	D2	4	D3
5	D4	6	D5
7	D6	8	D7
9	BUSY	10	INT
11	WRB	12	NC
13	CSB	14	C/DB
15	RESETB	16	NC
17	NC	18	GND
19	GND	20	GND
21	Vcc	22	Vcc
23	Vcc	24	Vcc
25	GND	26	GND

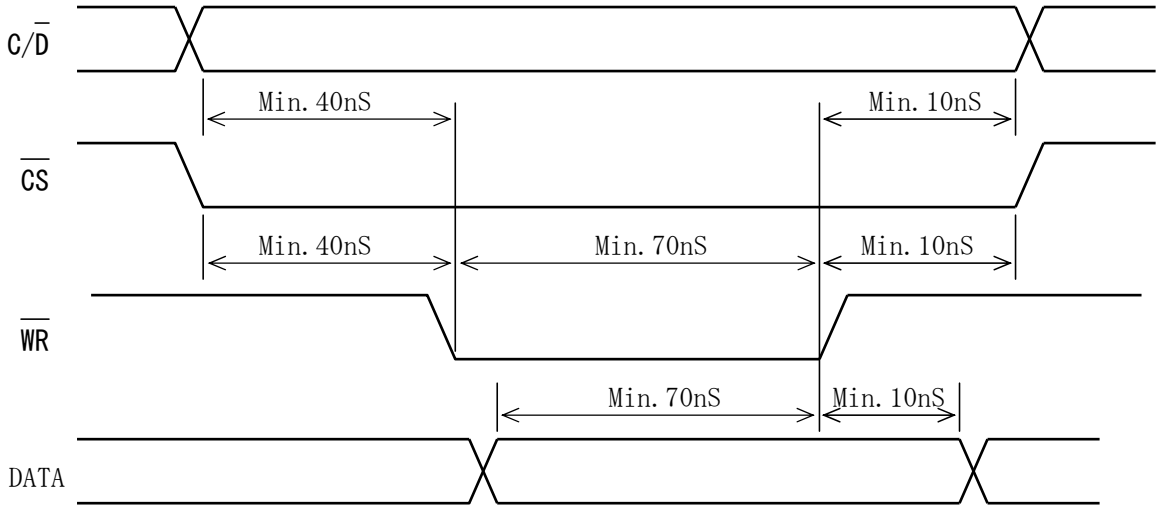
Function of Signal Lines

Table-14

Signal	I/O	Function
D0～D7	I/O	8bit Data Bus
$\overline{WR}$	I	Write Signal
$\overline{CS}$	I	Chip Select Signal
C/$\overline{D}$	I	Command / Data Select Signal C/$\overline{D}$ ="H" : Command ,C/$\overline{D}$ ="L" : Data Write
INT	O	Frame Signal (One output pulse per one display frame)
$\overline{RESET}$	I	Reset Signal
BUSY	O	VFD module busy
*V*cc	—	+12V
GND	—	GND

5. TIMING CHART

5-1. Write-in timing

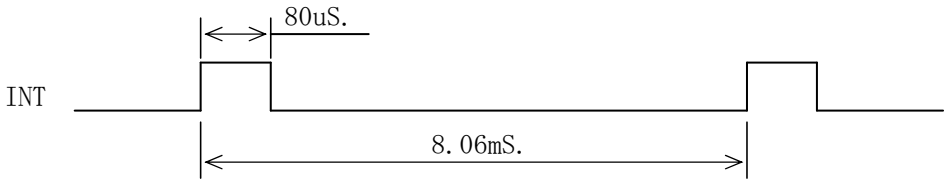


Note) The time of each one byte access is neccessary with 1us min.

5-2. INT timing

INT signal synchronizes frame frequency.

For smooth scroll, Setting Start Address should be executed during period of INT＝"H".



6. The environmental specifications for this product

6-1. With respect to EU RoHS Directive

The contained amount of six prohibited substances in this product , which are cadmium, hexavalent chromium, lead, mercury, polybrominated biphenyl:PBB and polybrominated diphenyl ether :PBDE, is less than the permitted level stipulated in the EU RoHS Directive, or these substances are not included in the Directive.

The substances excluded are based on Article 4 of the EU RoHS Directive.

6-2. With respect to Chinese RoHS

This product contains only “lead and its compound” from among six controlled substances, which are cadmium, hexavalent chromium, lead, mercury, polybrominated biphenyl:PBB and polybrominated diphenyl ether :PBDE.

The contained amount of the controlled substances except lead and its compound in this product is less than the level stipulated in the Chinese RoHs.

As for the display of information on containing EHS, please refer to the following.

< Display of information on containing EHS >

*Product and part the substances are contained : Vacuum Fluorescent Display(VFD) and solder on the Printed Wiring Board(PWB)

*Chemical materials contained : Lead and its compound

*Time limit of use for environmental protection : 10 years

*Reason for containing the substances: No materials are available except them under the current technology.

7. CAUTIONS FOR OPERATION

7-1. Applying lower voltage than the specified may cause non activation for selected pixels. Conversely, higher voltage may cause non-selected pixel to be activated. If such a phenomenon is observed, check the voltage level of the power supply.

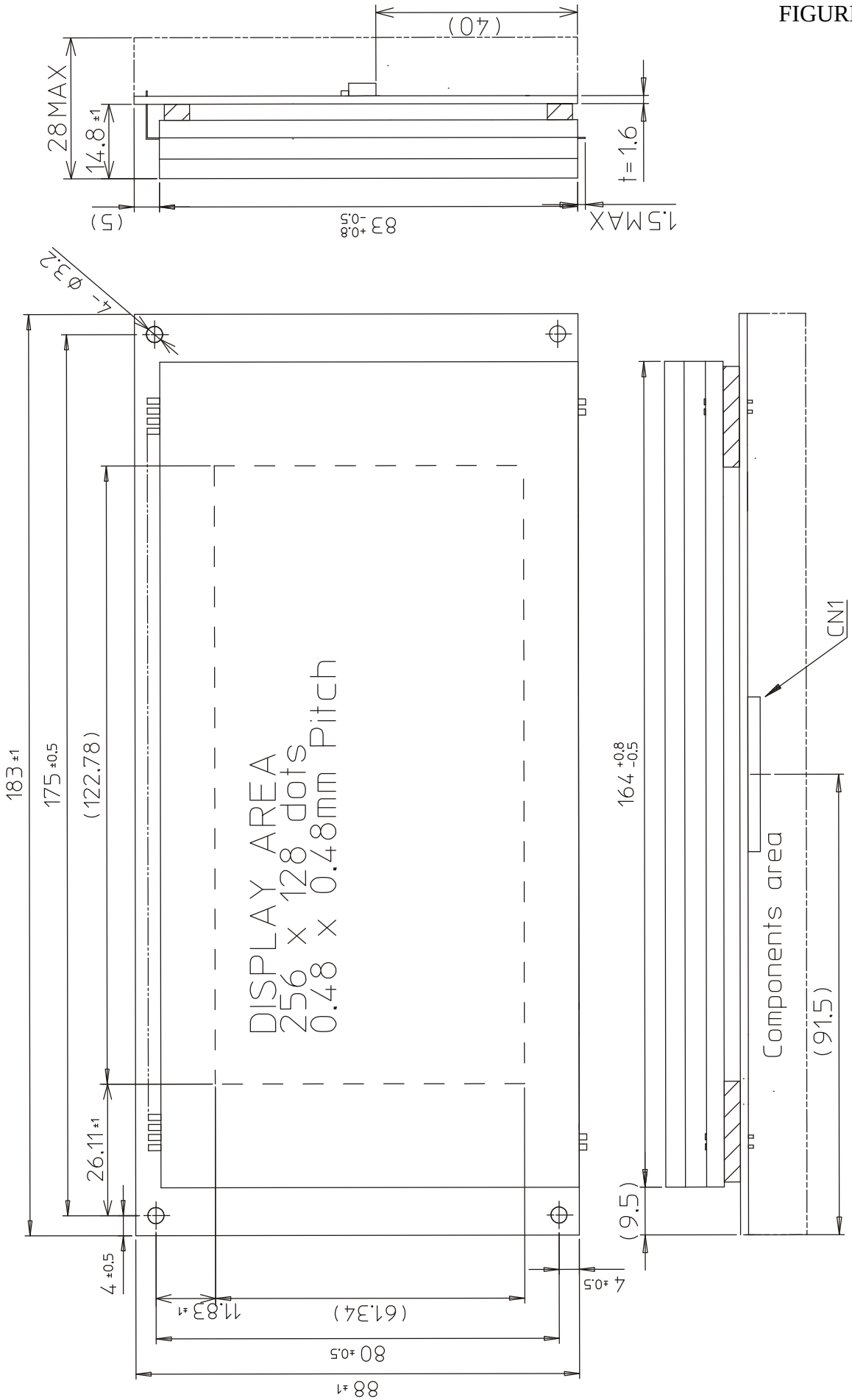
7-2. Avoid using the module where excessive noise interface is expected. Noise affects the interface signal and causes improper operation. Keep the length of the interface cable less than 30cm. (When the longer cable is required, please confirm there is no noise affection.)

6-3. When power is turned off, the capacitor will not discharge immediately. Avoid touching IC and others. The shorting of the mounted components within 30 sec., after power off, may cause damage.

6-4. When fixed pattern is displayed for a long time, you may see uneven luminance. It is recommended to change the display patterns sometimes in order to keep best display quality.

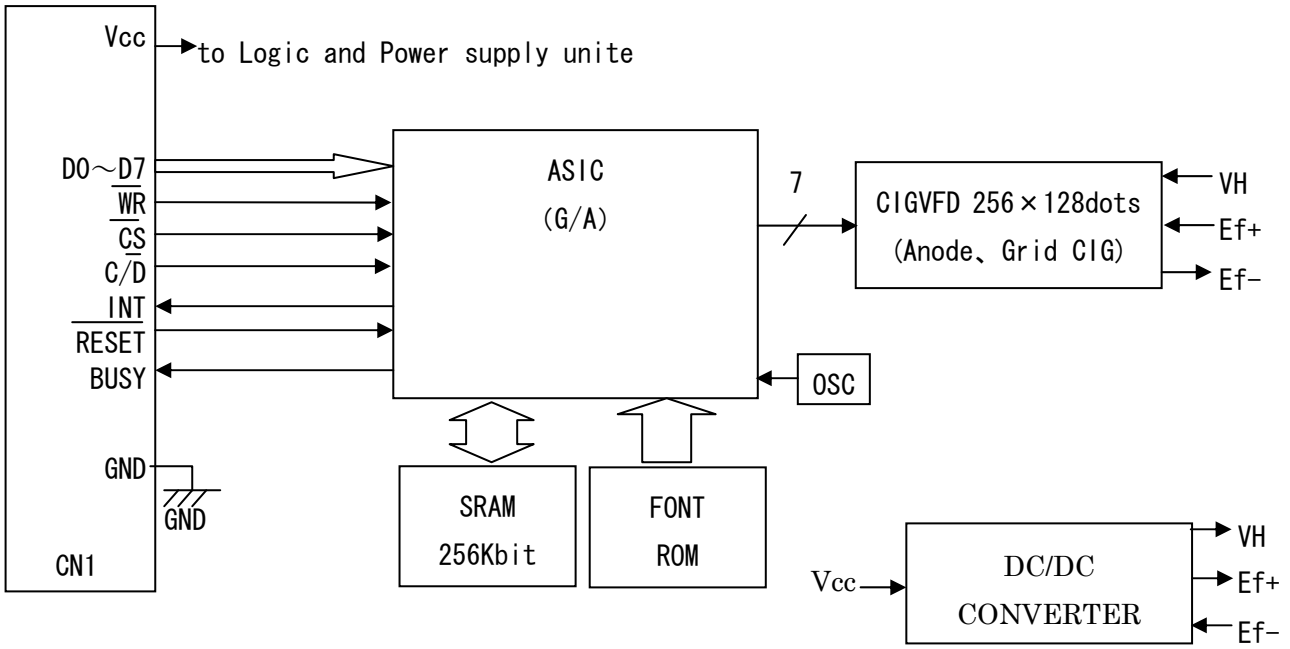
OUTER DIMENSION

FIGURE-1



CIRCUIT BLOCK DIAGRAM

FIGURE -2



ASIC→VFD signal 7 line

Anode : 4 lines

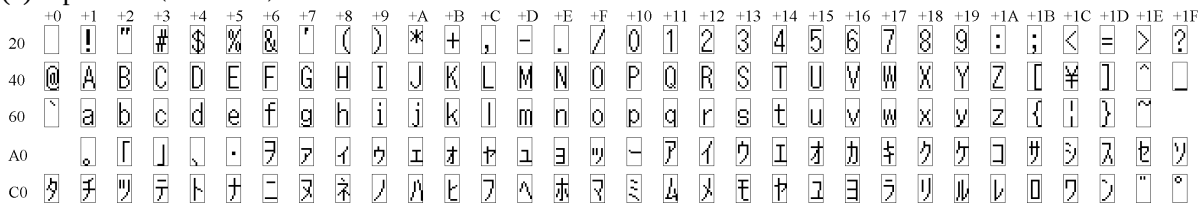
AD3, ACLK, LAT, ABLK, GCP

Grid : 3 lines

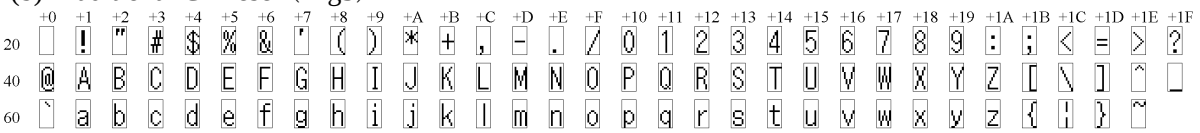
GDATA, GCLK, GBLK

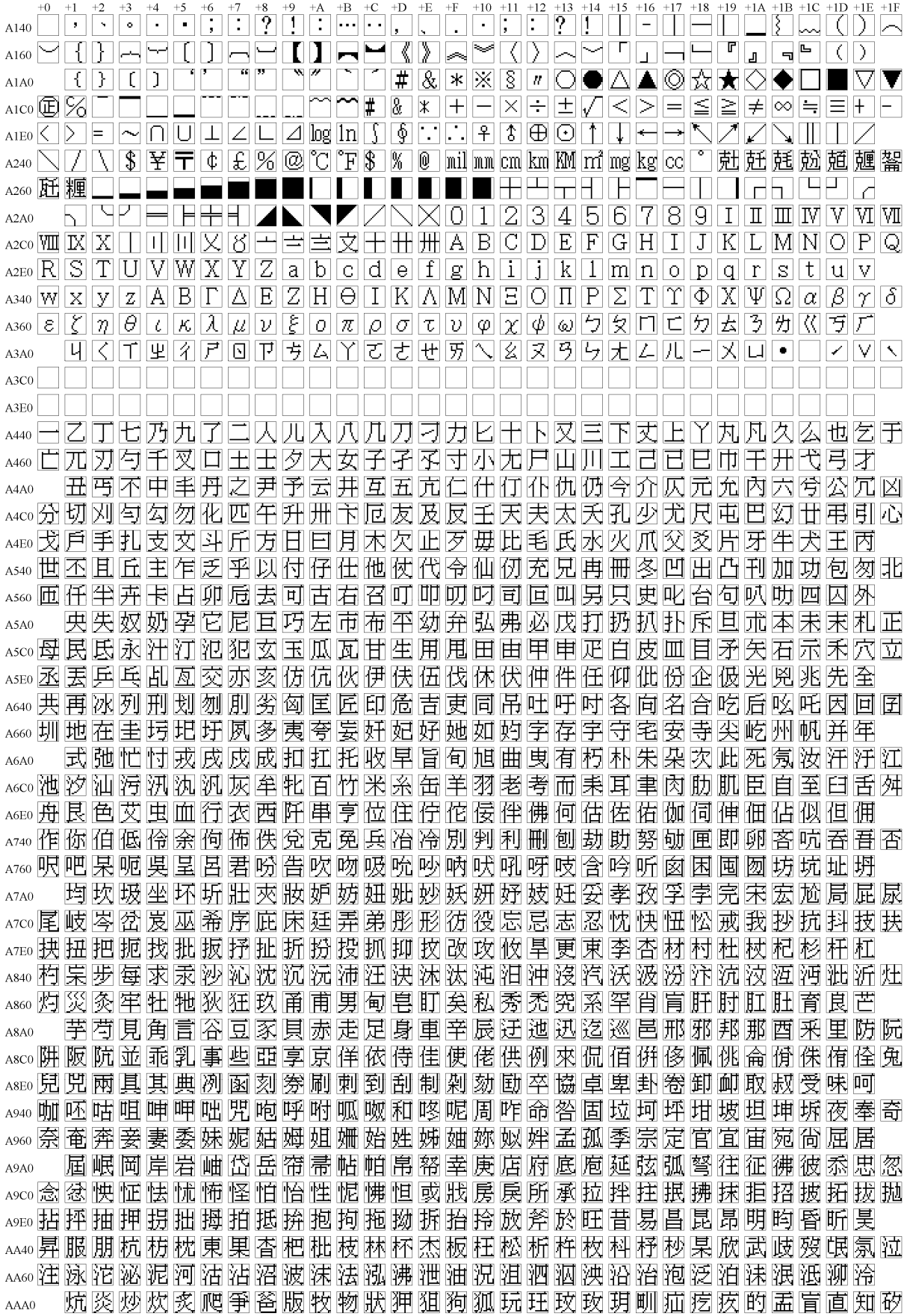
Font Tables

(a) Japanese（Shift-JIS）

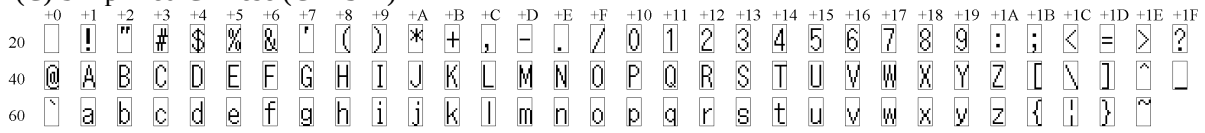


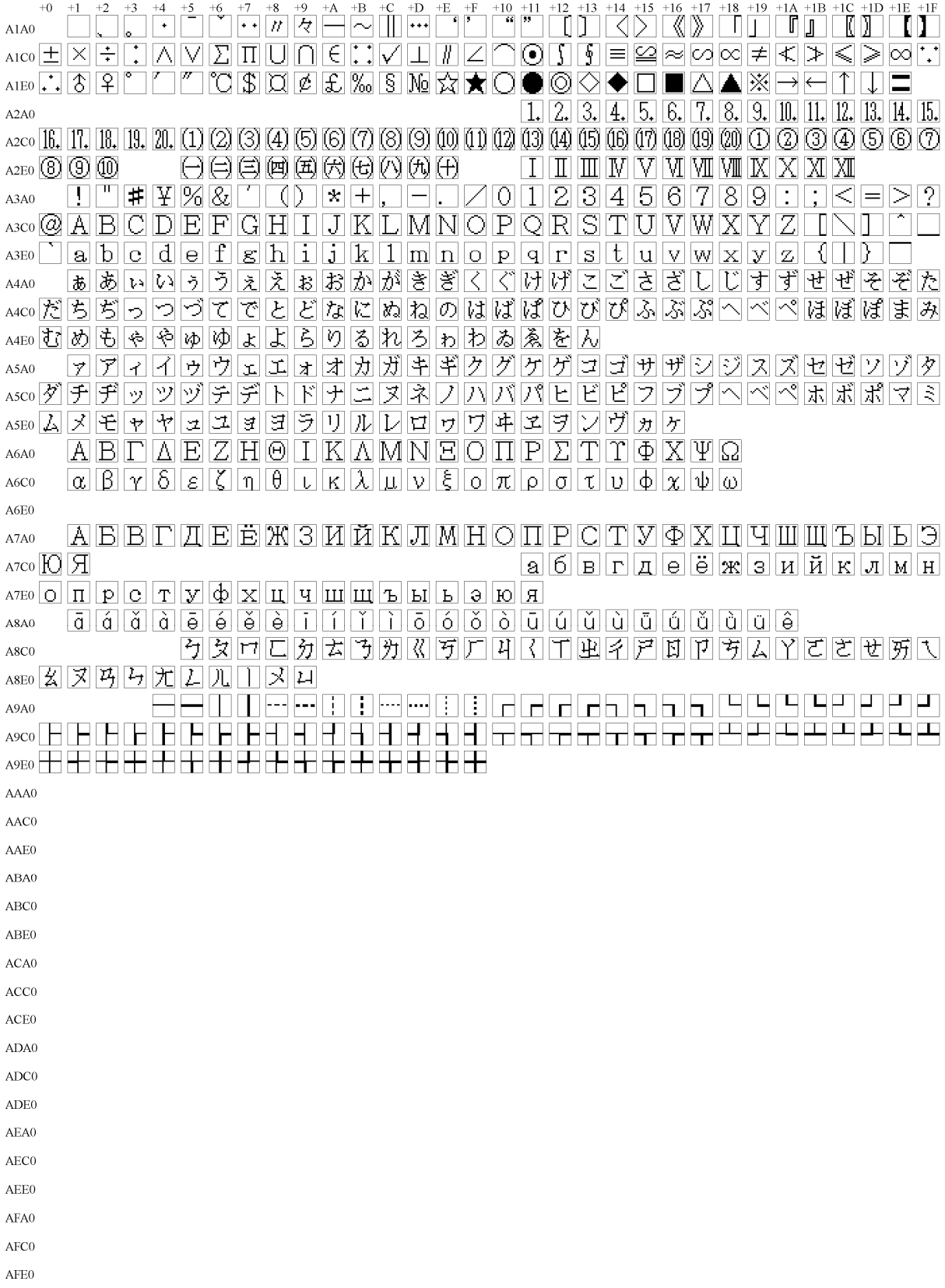
(b) Traditional Chinese（Big5）



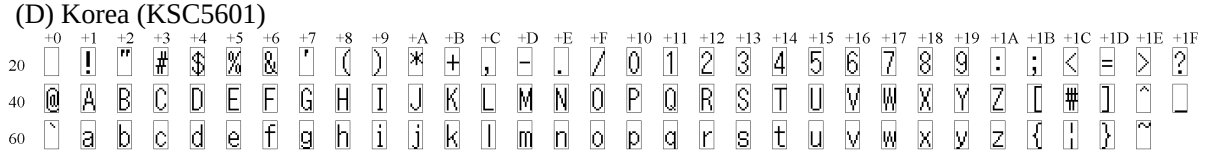


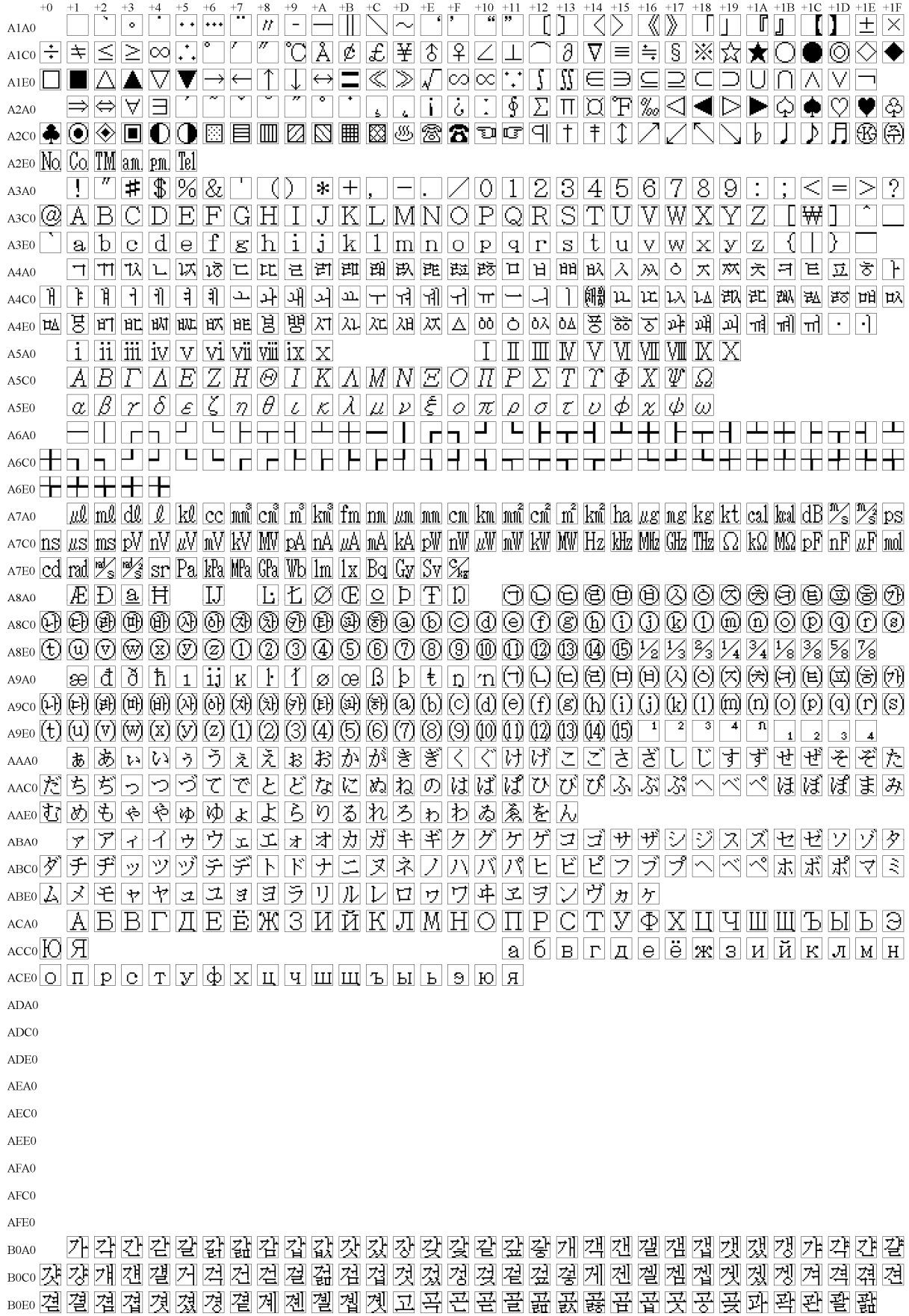
(C) Simplified Chinese (GB2312)





(D) Korea (KSC5601)





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