

# VACUUM FLUORESCENT DISPLAY MODULE

# ENGINEERING PROPOSAL

GP1212A02A

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

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Engineering Group
Electronic Components Division

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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.
- The module is equipped with a circuit protection polyswitch.
- 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

GP1212A02A is a graphic display module using a FUTABA 256x64dots VFD.

The module will support the interface of I<sup>2</sup>C, RS-232C and USB2.0 communications.

The module include flash ROM (4Mbyte), the customer will definable the BMP data and download character.

It realizes displaying a Japanese font (refer to Table-24) and BMP by I<sup>2</sup>C, RS-232C or USB2.0 communications. Other font tables (ex. Chinese, Korean, European and custom font) can be appended to flash ROM.

Since a DC/DC converter is included, 5V power source is required to operate the module.

#### 2. GENERAL SPECIFICATIONS

# 2-1. Outer dimension, Weight, (Refer to FIGURE-1)

		Table-1
Item	Specification	Unit
	(W) $159.0 \pm 1.0$	
Outer dimension	(H) 50.0±1.0	mm
	(T) 21.2 Max.	
Weight	130	g

#### 2-2. Display specification

Table-2

Item	Specification	Unit
Display area	115.1(W)×28.7(H)	mm
Number of pixels	256(W)×64(H)	dots
Dot size	0.35(W)×0.35(H)	mm
Dot pitch	0.45(W)×0.45(H)	mm
Illumination color	Green (λp=505nm)	_

#### 2-3. Environmental conditions

Table-3

				1 4010 3
Item	Symbol	MIN	MAX	Unit
Operating temperature	Topr	-40	+85	°C
Storage temperature	Tstg	-40	+85	°C
Operating humidity (Note)	<i>H</i> pr	20	85	%
Storage humidity (Note)	Hsg	20	90	%
Vibration (10~55Hz)	_	_	4	G
Shock	_	_	40	G

Note) Avoid operations and/or storage in moist environmental conditions.

# 2-4. Absolute maximum ratings

Table-4

Item	Symbol	MIN	MAX	Unit
Supply voltage (VBUS)	Vcc1	-0.3	6.0	Vdc
Supply voltage	Vcc2	-0.3	6.0	Vdc
Input signal Voltage (I <sup>2</sup> C)	$V_{ m IS}$	-0.3	Vcc2+0.3	Vdc
Input signal voltage (RS-232C)	$V_{ m IS}$	-30	+30	V
Input signal voltage (USB)	$V_{ m IS}$	-0.3	+3.6	V

# 2-5. Recommended operating conditions

Table-5

					14010 5
Item	Symbol	MIN	TYP	MAX	Unit
Supply voltage (VBUS)	Vcc1	4.75	5.0	5.25	Vdc
Supply voltage	Vcc2	4.75	5.0	5.25	Vdc
Input Signal Voltage	$V_{ m IH}$	0.8Vcc1	_	Vcc2	Vdc
(I <sup>2</sup> C)	$V_{ m IL}$	0	_	0.2Vcc2	v uc
Input Signal Voltage (RS-232C)	$V_{ m IH}$	2.0	_	_	V
Input Signal Voltage (RS-232C)	$V_{ m IL}$	_	_	0.8	V
Input Differential Sensitivity (USB)	$V_{ m DI}$	0.2	_	_	V

# 2-6. Electrical, optical characteristics

Table-6

Item	Symbol	Conditions	MIN	TYP	MAX	Unit
Supply current (Note1)	Icc1	Vccl=5.0V	_	100	120	mA
Power consumption	_	(VBUS)	_	0.5	0.60	W
Supply current (Note1)	Icc2	V 2.50V	_	950	1400	mA
Power consumption	_	<i>Vcc2</i> =5.0V All on	_	4.75	7.00	W
Luminance (Note2)	L	All oli	625	1250	_	cd/m <sup>2</sup>
High-level output voltage (I <sup>2</sup> C)	$V_{ m OH}$	V cc 2 = 5.0 V	4.5	_	Vcc2	Vdc
Low-level output voltage (I <sup>2</sup> C)	$V_{ m OL}$	V cc 2 = 5.0 V	0	_	0.5	Vdc
High level output voltage (RS-232C)	$V_{ m OH1}$	$I_{\mathrm{OH}}$ =-20uA	5.5	7	_	V
Low level output voltage (RS-232C)	$V_{\mathrm{OL1}}$	$I_{\rm OL}$ =-20uA	_	-6	-5	V
High level output voltage (USB)	$V_{ m OH1}$	$I_{\mathrm{OH}}$ =-200uA	2.8	_	_	V
Low level output voltage (USB)	$V_{\mathrm{OL1}}$	$I_{\rm OL}$ =-2mA	_	_	0.3	V

Note1) The surge current can be appox.5 times of specified maximum supply current at power on.

Note2) It indicates the value at 100% luminance adjustment level.

#### 3. BASIC FUNCTIONS

#### 3-1.INTERFACE

#### 3-1-1. $I^2C$

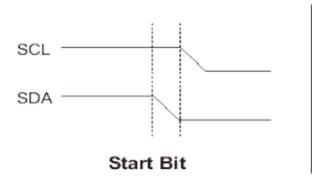
The I<sup>2</sup>C interface supports write command only.

If the bit following device address is set "1", The controller IC will not assert ACK

#### A) Start condition

The START signal is generated only by the master device.

A high-to-low transition of SDA while SCL is high is start condition, which must precede any other command.

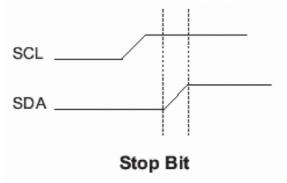


#### B) Stop condition

The Stop signal is generated only by the master device.

A low-to-high transition of SDA while SCL is High is a stop condition.

After a read sequence, the stop command will place the controller IC in initial state.

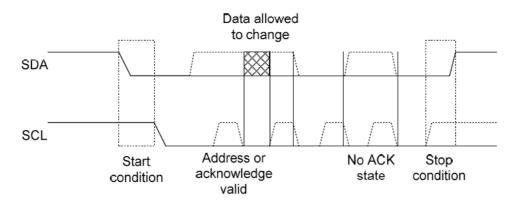


#### C) Acknowledge

All addresses and data words are serially transmitted to and from the controller IC in 8-bit words.

The controller IC sends a zero to acknowledge that it has received each word.

This happens during the ninth clock cycle.



# D) Device addressing

The Controller IC requires an 8-bit device address word following a start condition to enable the chip for a write operation.

The seven bits are the SW 1 to 7 device address bits for the controller IC.

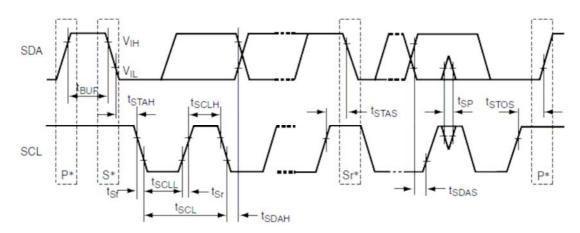
If the comparison of the device address succeeds, the controller IC will output a zero at ACK bit. If not, the chip will return to a standby state.

The R/W bit must set to "0" because controller IC only supports write command.

If the bit following device address is set "1", the controller IC will not assert ACK.

# E) I<sup>2</sup>C BUS Interface timing

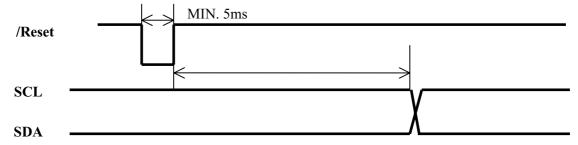
Item	Symbol	Min.	Тур.	Max.	Unite
SCL input cycle time	$t_{SCL}$	2300	-	-	ns
SCL input high width	$t_{SCLH}$	720	-	-	ns
SCL input low width	$t_{SCLL}$	1000	-	-	ns
SCL and SDA input fall time	$t_{Sf}$	-	-	300	ns
SCL and SDA input spike pulse					
removal time	$t_{SP}$	-	-	60	ns
SDA input bus-free time	$t_{\mathrm{BUF}}$	700	-	-	ns
Start condition input hold time	$t_{STAH}$	420	-	-	ns
Retransmission start condition					
input setup time	$t_{STAS}$	420	-	-	ns
input	$t_{STOS}$	420	-	-	ns
Data-input setup time	$t_{SDAS}$	160	-	-	ns
Data-input hold time	$t_{SDAH}$	0	-	-	ns
Capacitive load of SCL and SDA	$C_b$	0	-	400	pF
SCL and SDA output fall time	$t_{Sf}$	-	-	300	ns



#### F) Reset timing

Reset pulse (active low) should be longer than 1ms.

The module sets the SBUSY/PBUSY line upon receipt of Reset signal and clears the line when ready to receive the data.



#### 3-1-2. RS-232C

#### A) Data reception

A module processes the reception data, assuming the state of reception prohibition by disabled RTS signal, when data is transferred to the module.

After processing the data, the module can be ready to receive next data by enabled RTS signal.

The RTS signal is controlled on the module side.

#### B) Communication error

- a) When transferred data cannot be received properly at host system by the reason of the transmission failure, the module makes it the transmitted data.
- b) In case of the command reception, when the overrun or the flaming error occurs, the command is ignored.
- c) In case of the display data reception, when the overrun or the flaming error occurs, the display data is ignored.
- d) In case of the command reception, when the parity error occurs, the command is ignored.
- e) In case of the display data reception, when the parity error occurs, the display data is ignored.
- f) When an illegal command is received, the command is ignored.

#### 3-1-3. USB

Interface function

This module will communicate with the USB 2.0 interface (Full speed) if the USB cable is plugged. The communication with USB is based on HID class.

VFD Control Protocol uses HID report.

HID report consists of the byte number of sending data and the sending data.

For HID, the report of data (IN or OUT) is fixed-length

The sum of data size and data is declared in HID Report Descriptor.

The data size means the size of sending or receiving data. Max is 63.

So the report can send or receive 63bytes data max.

Following is type of report.

|Data Size (8) | Data (8) [63]

#### [Example]

Brightness adjustment (100%)

When the host needs the data (IN stage), more than 64bytes can be requested.

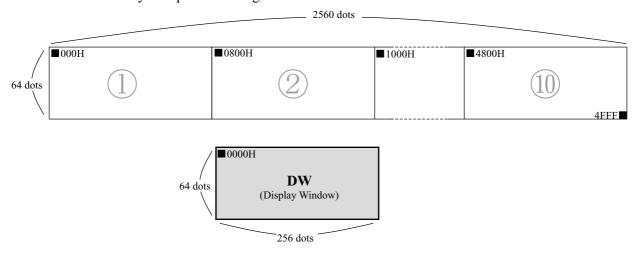
If the length of response from VFD is over 63bytes, Data Size sets 64.

If Data Size is 64, the host must read next data.

#### 3-2. Display memory

#### 3-2-1. Relationship DW (Display Window) and display memory

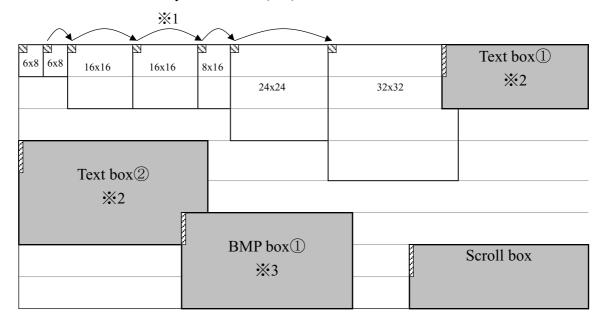
This module includes Data memory of 10 screen and DW. It realizes displaying the DW area. Data memory is copied to setting the BMP box.



#### 3-2-2. Display data

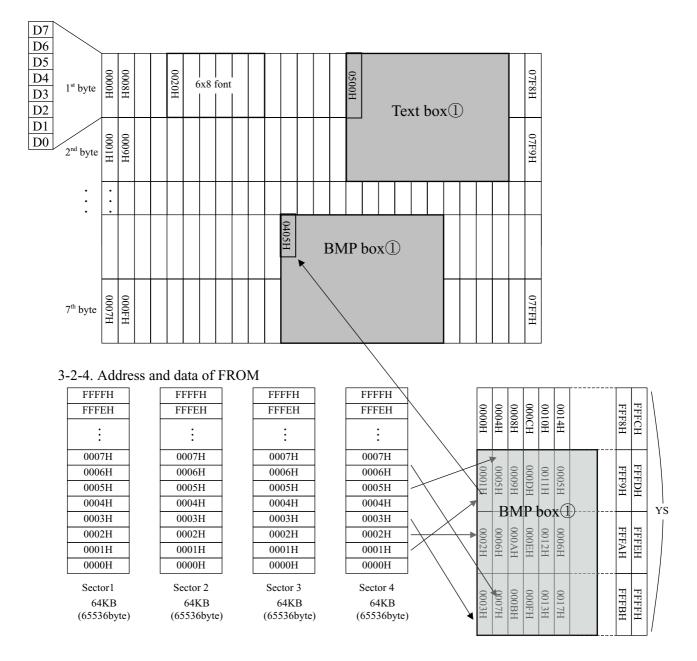
To write a data to the Data memory is two ways. One-way, the write-in address is appointed and writes a text and BMP data. Another way, Text or BMP box appoint and write a text and BMP data.

- If there is a data to write-in address, the new data will be written. The existing data is removed, and display the input new data. But if scroll have stated, the data isn't over-write
- If it writes a text data to appointed an address, the cursor move to right by one character. (X1)
- Box size are specified by the 1 dot horizontally and 8dots vertically. Text box can be defined up to 3 boxes, BMP box can be defined up to 3 boxes, and Scroll box can be defined up to 1 box.
- Character in the Text box can be reverse and blink, and can be used command of BS, CR, and LF. (\*\delta2)
- BMP data in the BMP box can be reverse and blink, and can be displayed to transfer the data from Data memory and DW. The definition data in the Flash ROM (FROM) can be displayed to transfer to the Data memory and the DW. (\*\*3)



#### 3-2-3. Address data of DW

To set position of Text box, BMP box or Scroll box, an address of top left corner dots (8 vertical dots and a horizontal dot) should be specified in bytes. Each box is valid in DW.



Relationship between FROM and Address of definition BMP data is refer to the upper explanation. Sector is 64KB, It Include 4 sector.

- BMP data definition is performed per 64KB, the new data will be written to the FROM after existing data of all FROM area is removed. Therefore, the existing data, which will be not re-written, are set to FFH.
- Although a configuration of register data, a vertical data size (YS) is necessary in case of retrieving the data.
- In case data is retrieved from FROM to BMP box, a selection of sector, specifies of address, setting YS are necessary.

Ex. upper explanation Sector=4、Start address=0001H、YS=4 The data that stored in FROM address (0001H) of sector 4 is written to the top left corner of 「BMP BOX①」 (0405H) .

# 4. Command

# 4-1. General setting command

No	Command name	Code	Function
1	Clear display	1BH,4AH,43H,44H	Display memory all clear.
2	Dimming	1BH,4AH,44H,Ps	Brightness level setting. Ps: 30H(0%)~35H(100%) 6stage
3	RESET	1BH,4AH,52H,53H	Return to default setting
4	VFD Power ON/OFF	1BH,4AH,42H,Ps	Control of the power supply for VFD Ps=30H(Power OFF), 31H(Power ON)
5	BMP data input	1BH,4AH,Pm,aL,aH, Ps,nL,nH,Pd···Pd	The BMP data is written Pm=30H(DW)、31H(Data memory) aL,aH: Address Ps: direction of writing nL,nH: Number of data
6	Character address setting	1BH,4AH,57H,Pm,aL,aH	Setting a number of DW and address Pm=30H(DW)、31H(Data memory) aL,aH: Address
7	Font size select	1BH,4AH,46H,Pf	Setting the font size Pf: font size
8	Character display	XX (XX)	1byte code (ANK) 2byte code (Shift-JIS)
9	Character modify	1BH,4AH,6DH,Ps,Pb	Character modify. Reveres and Magnified Ps=30H(normal), 31H(reveres) Pb=30H(normal) 31H(Double size letter in horizontal) 32H(Double size letter in horizontal and vertical)
10	Clock setting	1BH,6BH,53H,Pd,Ph,Pm	Setting the clock data. Pd: Day of the week Ph: hour Pm: minute
11	Clock display	1BH,6BH,55H,Ps,aL,aH,Pf	Clock is displayed. Ps: Display type select aL,aH: Address Pf: Font size select
12	Clock display cancel	1BH,6BH,3DH,58H	Clock display is canceled.

4-2. Text box group

No	Command name	Code	Function
1	Text box setting	1BH,5BH,54H,Pn,	Setting the font size and number of line.
		aL,aH,Pq,Pf,Pc,Pl	Pn: Number of box(No. $1 \sim 3$ )
			aL,aH: DW address
			Pq : Shift of $\pm 4$ dot at a setting address
			Pf=30H: 6x8 dot
			Pf=31H: 8x16 dot and 16x16 dot
			Pf=32H: 12x24dot and 24x24 dot
			Pf=33H: 16x32dot and 32x32 dot
			Pc: Number of digit Pl: Number of line
2	Text box select	1BH,5BH,48H,Pn	Select the text box.
			Pn: Number of Text box(No. $\mathbb{1} \sim \mathbb{3}$ )
3	Text box modify	1BH,5BH,4DH,Ps,Pb	Character modify in the text box. Reveres and
			Magnified
			Ps=30H(normal), 31H(reveres), 32H(blink)
			Pb=30H(normal)、
			31H(Double size letter in horizontal)
4	Clear display	1BH,5BH,32H,4AH	Display clear in the Text box    *\frac{\delta}{1}
5	Back Space (BS)	08H	The cursor moves to left by one character $\%1$
6	Line Feed (LF)	0AH	The cursor moves to 1 lower line  \infty 1
7	Carriage Return (CR)	0DH	The cursor moves to left end of same line    *1
8	Delete to end of line	1BH,5BH,30H,4BH	Delete from cursor to right end of line.
9	Set virtual cursor	1BH,5BH,Py,3BH,Px,48H	Setting the cursor position **1

<sup>\*1</sup> This command effects in the Text box.

# 4-3. BMP box group

No	Command name	Code	Function
1	BMP box setting	1BH,5CH,42H,Pn,	BMP box size setting
		aL,aH,Pw,Ph	Pn: Nnumber of box(No. $1$ )
			aL,aH: DW address
			Pw: BMP box width
			Ph: BMP box height
2	BMP box select	1BH,5CH,48H,Pn	Select the BMP box.
			Pn: Number of box(No. $1 \sim 3$ )
3	BMP box clear	1BH,5CH,32H,4AH	Display clear in the BMP box.
4	BMP box modify	1BH,5CH,4DH,Ps	Character modify in the BMP box. Reveres and
			Magnified
			Ps=30H(normal), 31H(reveres), 32H(blink)
5	Transfer the BMP data	1BH,5CH,44H,aL,aH,	Transfer the BMP data to Data memory
	from Data memory		aL,aH: Data memory address
6	Transfer the BMP data	1BH,5CH,46H,Se,	Transfer the BMP data to FROM.
	from the FROM to the	aL,aH,YS	Se: Number of sector
	BMP box		aL,aH: FROM address
			YS: BMP data defined Y size.(by 8dots)
7	BMP data input in the	1BH,5CH,5DH,nL,nH,Pd	BMP data is written in the BMP box.
	BMP box	···Pd	nL,nH: Number of data

# 4-4. Scroll box group

No	Command name	Code	Function
1	Scroll box setting	1BH,5DH,53H,aL,aH, Pw,Ph	Setting the Scroll box size. aL,aH: DW address Pw: Text box width Ph: Text box height
2	Text scroll setting	1BH,5DH,42H,Pf,P1	Setting the font size and number of line. Pf: Font size P1: Number of line
3	Character setting of Text scroll	1BH,5DH,43H, Pl,Pn,Pd···Pd	Setting the scroll character by every line. P1: Number of line Pn: Number of character
4	BMP scroll setting (Data memory)	1BH,5DH,44H, aL,aH,wL,wH	BMP scroll setting in the Data memory. aL,aH: Address of Data memory wL,wH: Horizontal size of scroll
5	BMP scroll setting (FROM)	1BH,5DH,46H,Se, aL,aH,YS,wL,wH	BMP scroll setting in the FROM. Se: Number of sector aL,aH: FROM address YS: BMP data defined Y size.(by 8dots) wL,wH: Horizontal size of scroll
6	Scroll start	1BH,5DH,3EH, Pm,Pn,Ps,Pb,	Scroll start Pm=30H(Text scroll)、31H(BMP scroll) Pn: Number of scroll Ps: Scroll speed Pb: Blank time between scroll
7	Scroll stop	1BH,5DH,3DH,58H,	Scroll stop

4-5. FROM group • Other

No	Command name	Code	Function
1	BMP data definition	1ВН,6АН,53Н,	Define the BMP data to the FROM
	(FROM)	Se,nL,nH, Pd···Pd	Se: Number of sector
			nL,nH: Number of definition byte
2	BMP data delete	1BH,6AH,41H,Se	Delete the BMP data to the FROM
	(FROM)		Se: Number of sector
3	Transfer the BMP data	1BH,6AH,55H,aL,aH,	Transfer the BMP data from the FROM to the Data
	from the FROM to the	Pw,Ph,Se,bL,bH,YS	memory
	Data memory		aL,aH: Transferred address
			Pw: BMP image display (width)
			Ph: BMP image display (height)
			Se: Number of sector
			bL,bH: Transfer address
			YS: BMP data defined Y size.(by 8dots)
4	User definable font	1BH,6AH,47H,Pf,	Define the User definable font to the RAM
	Definition (RAM)	cL,(cH),PdPd	Pf: Font size
			cL,(cH): User definable font code
			Pd: User definable font data
5	User definable font	1BH,6AH,45H,Ps	User definable font Stored / Transfer / Delete
	Store / Transfer /		Ps=30H (Store)
	Delete		Ps=31H (Transfer)
	(RAM⇔FROM)		Ps=32H (Delete)
6	Macro Processing	1BH,6AH,6DH,Ps,	Define the macro to the FROM.
	Definition in FROM	nL,nH,Pd…Pd	Ps=30H(Normal), 31H(Reset and start)
			nL,nH: Number of definition byte
7	Macro start / stop /	1BH,6AH,64H,Ps	Macro in the FROM, Start / Delete / Stop
	clear		Ps=30H(Delete), 31H(Start), 32H(Stop)
8	Macro wait	1BH,6AH,77H,Ps	Wait setting in the macro.
			Ps: Wait time (x approx 0.1s)
9	ID code	1BH,6AH,49H,44	Send the ID code
10	Blink setting	1BH,6AH,42H,Ps	Blink setting in the Text box and the BMP box
			Ps=30H (0.5s)、31H (1s)、32H(1.5s)

#### 4-1. General setting command

#### 4-1-1. Clear display

[Code] 1BH,4AH,43H,44H

[Function] Display memory all clear

- · All the displayed character is erased. The write-in position and every box modify is not changed
- · If scrolling or blinking, scroll and blink are stopped and clear display.
- Data memory, FROM and User definable font data are no effect.

#### 4-1-2. Dimming

[Code] 1BH,4AH,44H,Ps

[Function] Luminance can be adjusted into six levels by using this function.

• When the module is turned on, it is set to dimming level 5 (100%).

Ps = Luminance setting

[Definable area] Ps = 30H: Luminance 0%

Ps = 31H: Luminance 32% Ps = 32H: Luminance 45% Ps = 33H: Luminance 54% Ps = 34H: Luminance 79%

Ps = 35H : Luminance 100% (Default)

#### 4-1-3. RESET

[Code] 1BH,4AH,52H,53H

[Function] Returns to default setting.

- The other command is not receive until this command complete. Please don't send the any data from a host during "BUSY"
- Delete the User definable font to the RAM.
- If the VFD Power Off, VFD Power turn ON after the RESET command.

#### 4-1-4. VFD Power ON/OFF

[Code] 1BH,4AH,42H,Ps

[Function] Control of the power supply for VFD

- If VFD power ON or OFF, at interval of 10s or more.
- When the VFD power off, VFD display is turn off, but the module can receive a data and process.

 $P_S = VFD$  Power control

[Definable area] Ps = 30H : VFD Power OFF Ps = 31H : VFD Power ON (Default)

#### 4-1-5. BMP data input

[Code] 1BH,4AH,Pm,aL,aH,Ps,nL,nH,Pd···Pd

[Function] The BMP data is written in the DW(Display Window) or the Data memory.

Pm= DW or Data memory

aL = DW lower byte

aH = DW upper byte

Ps = Direction of writing

nL = number of BMP data length lower byte

nH = number of BMP data length upper byte

Pd = BMP data

\* If X direction is selected as Ps and data is written in the last address, the data in the last address is overwritten with the remaining data.

[Definable area] Pm = 30H : DW

Pm = 31H : Data memory

 $0000H \le aL + aH * 100 \le 07FFH$  (DW)

 $0000H \le aL + aH * 100 \le 4FFFH$  (Data memory)

Ps = 30H : Y direction

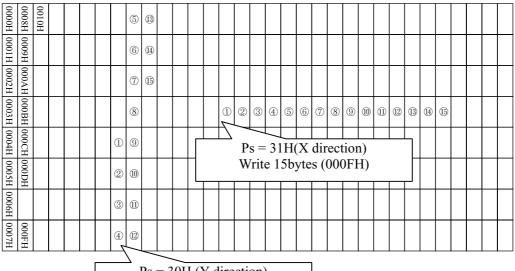
Ps = 31H : X direction

 $0001H \le nL + nH * 100 \le 0100H$  (DW, X direction)

 $0001H \le nL + nH * 100 \le 0800H$  (DW, Y direction)

 $0001H \le nL + nH * 100 \le 0A00H$  (Data memory, X direction)

 $0001H \le nL + nH * 100 \le 5000H$  (Data memory, Y direction)



Ps = 30H (Y direction) Write 15bytes (000FH)

#### 4-1-6. Character address setting

[Code] 1BH,4AH,57H,Pm,aL,aH

[Function] Setting a character data write-in address.

Pm = DW or Data memory

aL = Lower byte of Data memory

aH = Upper byte of Data memory

# [Definable area] $0000H \le aL + aH * 100 \le 07FFH$ (DW)

 $0000H \le aL + aH * 100 \le 4FFFH$  (Data memory)

Ps = 30H : DW

Ps = 31H: Data memory

#### 4-1-7. Font size select

[Code] 1BH,4AH,46H,Pf

[Function] Setting the font size

Pf = Font size

[Definable area] Pf = 30H : 6x8 dot

Pf = 31H : 8x16dot and 16x16 dotPf = 32H : 12x24 dot and 24x24 dot

Pf = 33H : 16x32 dot and 32x32 dot

#### 4-1-8. Character data input

[Code] XX (XX)

[Function] Display the character. The character data is written by ANK (1 byte code) or Shift-JIS (2 byte code). The cursor moves automatically to right by 1 character.

- If the write-in position is at the right end, it is fixed at the right end and the character in right end is overwritten after receiving next character code.
- If the write-in position is outside display memory after the specified dot writing, the write-in position is not moved. In this case, the text can be imperfect.

[Definable area] 1 byte code : ANK

2 byte code: Shift-JIS

#### 4-1-9. Character modify

[Code] 1BH,4AH,6DH,Ps,Pf

[Function] Setting the reverse and magnified by character

• This command doesn't effects the data in the Text box and Scroll box.

Ps = Reverse

Pb = Magnified

[Definable area] Ps = 30H : Normal (not reverse)

Ps = 31H: Reverse

Pb = 30H: Normal size

Pb = 31H : Double size letter in horizontal.

Pd = 32H : Double size letter in horizontal and vertical.

#### 4-1-10. Clock setting

[Code] 1BH,6BH,53H,Pd,Ph,Pm

[Function] Setting the clock data. The setting data is cleared, if the Reset command is input or power is turned off.

Pd = Day of the week

Ph = hour

Pm = minute

[Definable area]

Pd = 00H : Sunday

Pd = 01H : Monday

. . .

Pd = 06H : Saturday

\* Clock setting is canceled, when Pd is input value that is larger than 07H, or Ph is input value that is larger than 18H, or Pm is input value that is larger than 3CH.

#### 4-1-11. Clock display

[Code] 1BH,6BH,55H,Ps,aL,aH,Pf

[Function] Clock is displayed. The display position and the font size can be freely decided.

Ps = Display type select

aL,aH = Address

Pf = Font size select

[Definable area]

Ps = 00H : 24hour Ex.[12:34]

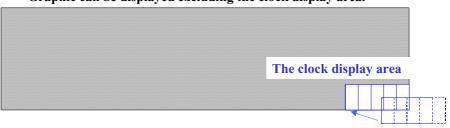
Ps = 01H : 24hour + day of the week Ex.[Wed.\_12:34] Ps = 10H : 12hour Ex.[PM\_00:34]

 $Ps = 11H : 12hour + day of the week Ex.[Wed._PM_00:34]$ 

Pf = 30H : 6x8 dot Pf = 31H : 8x16 dot Pf = 32H : 12x24 dotPf = 33H : 16x32 dot

- \* When the clock data is not input, clock is not displayed.
- \* The clock display is maintained until Clock display cancel · Clear display · RESET command is input or power is turned off.
- \* Excluding the clock display area can be input other display commands.

Graphic can be displayed excluding the clock display area.



The self adjustment for the position that cannot be displayed.

4-1-12. Clock display cancel

[Code] 1BH,6BH,3DH,58H

[Function] Clock display is canceled.

#### 4-2. Text box group

#### 4-2-1. Setting the Text box

[Code] 1BH,5BH,54H,Pn,aL,aH,Pq,Pf,Pc,P1

[Function] Setting the Text box. Text box can be defined up to 3 boxes. Text box position is defined the address. (aL,aH)

- To write data in Text box, execution "Text box select" command is necessary.
- Definable digit (Pc) and line (Pl) are due to the font size. Number of digit is counted to number of bytes. (If the 4 characters are displayed with 16x16 dots, Pc=08H)

Pn = Number of text box

aL = Lower address of DW

aH = Upper address of DW

 $Pq = Shift of \pm 4 dot at a setting address$ 

Pf = Font size

Pc= Number of the digit

Pl = Number of the line

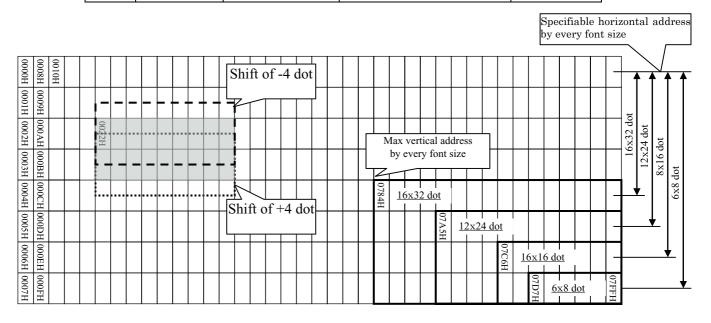
#### [Definable area]

Pn = 31H : Text box① Pn = 32H : Text box② Pn = 33H : Text box③

Pq = 30H: Setting address (no shift)

Pq = 31H: Shift of +4 dot at a setting address Pq = 32H: Shift of -4 dot at a setting address

Pf	Font size	aL + aH * 100	Pc	Pl
30H	6x8 dot	0000H∼07D7H	Max 42 digit	Max 8 line
			01H∼2AH	01H∼08H
31H	8x16 dot	0000H∼07C6H	Max 32 digit (1 byte code)	Max 4 line
	16x16 dot		01H∼20H	01H∼04H
32H	12x24 dot	0000H~07A5H	Max 21 digit (1 byte code)	Max 2 line
	24x24 dot		01H∼15H	01H∼02H
33H	16x32 dot	0000H∼0784H	Max 16 digit (1 byte code)	Max 2 line
	32x32 dot		01H~10H	01H∼02H



#### Ex. Setting the text box

Ex1)	1 1line	2	<b>%</b>	4	5	6	7	8	9	10	11	12	13	14	15	16
	2line															
	3line															
	4line															

Text box①: 16x16 dot 16 digit 4 line (Pf=31H, Pc=20H, Pl=04H)

Ex2)	1	2	3 4	5	6	7	8	9	10
	1	2	3	4	1 2 2 1 1 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1	2 3	4 5	5 6	7 8

Text box①: 24x24 dot 10 digit 1 line (Pf=32H, Pc=14H, Pl=01H)
Text box②: 32x32 dot 4 digit 1 line (Pf=33H, Pc=08H, Pl=01H)
Text box③: 16x16 dot 8 digit 2 line (Pf=31H, Pc=10H, Pl=02H)

Ex3)	1	2	3	4	1	2	3	4	11ine×10digit
- /	1line	Ţ			1line	I			2line×10 digit
					111110				3line × 10 digit
	2line								4line×10 digit
								·	5line×10 digit
	3line		2line				6line×10 digit		
		21111	211110				7line×10 digit		
	4line								8line×10 digit

Text box①: 16x16 dot 4 digit 4 line (Pf=31H, Pc=08H, Pl=04H) Text box②: 32x32 dot 4 digit 2 line (Pf=33H, Pc=08H, Pl=02H) Text box③: 6x8 dot 10 digit 8 line (Pf=30H, Pc=0AH, Pl=08H)

#### 4-2-2. Text box select

[Code] 1BH,5BH,48H,Pn

[Function] Select the Text box.

- Execution "Text box select "is necessary before "Setting the Text box".
- In case of writing by the specified dot writing, it is necessary to cancel this command.

#### [Definable area]

Pn = 30H: Remove the Text box

Pn = 31H : Text box①
Pn = 32H : Text box②
Pn = 33H : Text box③

The commands from 4-2-3 to 4-2-9 are valid in selected Text box. Without selecting Text box, these commands are invalid.

#### 4-2-3. Text modify

#### [Code] 1BH,5BH,4DH,Ps,Pb

[Function] Setting the Reverse, Blink, and Magnified in the selected text box.

- This command doesn't effects the other Text box. If the selected text box remove, modify setting is removed.
- Does not affect to the character already displayed.

[Definable area] Ps = 30H: Normal (Remove reverse and blink)

Ps = 31H : Reverse Ps = 32H : Blink Pb = 30H : Normal size

Pb = 31H : Double size letter in horizontal

#### 4-2-4. Display Clear

#### [Code] 1BH,5BH,32H,4AH

[Function] All the displayed characters are erased. The write-in position is not changed.

# 4-2-5. Back space

[Code] 08H

[Function] The write-in position is shifted to the left one digit and displaying screen is not changed. This command is ignored when write-in position is on the least significant digit.

#### 4-2-6. Line Feed

#### [Code] 0AH

[Function] The write-in position is shifted to the next row on the same digit position. When the write-in position is on the bottom row, the displayed character is scrolled up to the upper row and all characters on the bottom row are cleared. The write in position is not changed.

# 4-2-7. Carriage return

#### [Code] 0DH

[Function] The write-in position is shifted to the most significant digit of the same row. When the write-in position is on the most significant digit, this is ignored.

#### 4-2-8. Delete to end of line

#### [Code] 1BH,5BH,30H,4BH

[Function] The displayed characters from the write-in position to the end on the same row are erased. The write-in position is not shifted.

#### 4-2-9. Set virtual cursor

# [Code] 1BH,5BH,Py,3BH,Px,48H

[Function] The write-in position is shifted with line(Py), digit (Px). (It is based on the half size letter of the font)

- If input the 1BH, 5BH, 48H, 27H, the write-in position is shifted with Home position (left-top).
- 30H regard as 31H, if the data (Py, Px) is over range; the cursor is shifted with the max of line, the max of digit.
- If input value of 10 or more as digit (Px), Px in the command is necessary by two bytes. (Example Px=10,Py=1: 1BH,5BH,31H,30H,48H)

#### 4-3. BMP box group

4-3-1. Setting the BMP box

[Code] 1BH,5CH,42H,Pn,aL,aH,Pw,Ph

[Function] Setting the BMP box. BMP box can be defined the 3 area to DW. The position of BMP box is set based on the address of DW.

- To write data in BMP box, "BMP box select "is necessary.
- Specifiable horizontal size is 256dot (100H) MAX. If horizontal size specify 256dot, Pw = 00H

Pn = Number of a BMP box

aL = Lower byte of address

aH = Upper byte of address

Pw = BMP box width

Ph = BMP box height

[Definable area] Pn = 31H : BMP box(1)

Pn = 32H : BMP box ②

Pn = 33H : BMP box ③

 $0000H \le aL + aH * 100 \le 07FFH$ 

 $01H \le Pw \le 00H (=100H)$ 

 $01H \leq Ph \leq 08H$ 

#### 4-3-2. BMP box select

[Code] 1BH,5CH,48H,Pn

[Function] Select of BMP box

- Execution "BMP box select " is necessary before "Setting the Text box ".
- In case of writing by the specified dot writing, it is necessary to cancel this command.

[Definable area] Pn = 30H: Remove the BMP box

Pn = 31H : BMP box① Pn = 32H : BMP box② Pn = 33H : BMP box③

# 4-3-3. Display clear in the BMP box

[Code] 1BH,5CH,32H,4AH

[Function] Display clear in the BMP box

#### 4-3-4. BMP box modify

[Code] 1BH,5CH,4DH,Ps

[Function] Reverse and blink Setting the selected BMP box.

This command doesn't effects the other BMP box. If the selected BMP box remove, modify setting
is removed

[Definable area] Ps = 30H : Normal

Ps = 31H: Reverse Ps = 32H: Blink

#### 4-3-5. Data memory transfer

[Code] 1BH,5CH,44H,aL,aH

[Function] BMP data transfer from Data memory to DW.

• Although source data is updated, data in BMP box is not updated. To reflect the update, re-executing this command is necessary.

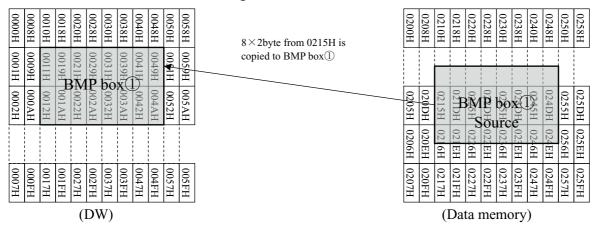
aL = Lower byte of address

aH = Upper byte of address

[Definable area]  $0000H \le aL + aH * 100 \le 4FFFH$ 

Ex.) BMP box①setting address: 0011H size: 8×2byte

BMP box source setting address: 0215H



#### 4-3-6. Transfer the BMP data from the FROM to the BMP box

[Code] 1BH,5CH,46H,Se,aL,aH,YS

[Function] Transfer the BMP data from the selected sector of FROM.

• If the Data memory is re-written, does not affect to the already transferred data. If the transferred data renew, resend this command.

Se = Number of sector

aL = Lower byte of address

aH = Upper byte of address

YS = BMP data defined Y size.

[Definable area] Se = 31H : Sector 1

Se = 32H : Sector 2

Se = 33H : Sector 3

Se = 34H : Sector 4

 $0000H \le aL + aH * 100 \le FFFFH$ 

 $01H \leq YS \leq 08H = 8 \text{ byte } (64\text{dot})$ 

#### 4-3-7. Input BMP data in the BMP box

[Code] 1BH,5CH,5DH,nL,nH,Pd···Pd

[Function] BMP data is written the BMP box

• Number of definable data is due to BMP box size. If the data is over range, the over range data is rewritten the final address.

nL = Lower byte of number of definition byte

nH = Upper byte of number of definition byte

Pd = BMP data

[Definable area] Pn : BMP box size (Pw $\times$ Ph)

#### 4-4. Scroll box group

4-4-1. Setting the Scroll box

[Code] 1BH,5DH,53H,aL,aH,Pw,Ph

[Function] Setting the scroll box. The scroll box can be defined the 1 area to DW.

The position of Scroll box is set based on the address of the address of display memory.

- · If display will be scroll, at first, it needs setting this command.
- Specifiable horizontal size is 256dot (100H) MAX. If horizontal size specify 256dot, Pw = 00H
- Scroll box can be specified only the DW.

aL = Lower byte of address

aH = Upper byte of address

Pw = Scroll box width

Ph = Scroll box height

```
[Definable area] 0000H \le aL + aH * 100 \le 07FFH

01H \le Pw \le 00H (=100H)

01H \le Ph \le 08H
```

# 4-4-2. Setting the Text scroll

[Code] 1BH,5DH,42H,Pf,Pl

[Function] Setting the font size and number of scroll to Text scroll.

- · Setting the Text scroll, after Setting the Scroll box.
- Definable line (Pl) is due to the font size. If the Number of line (Pl) is defined to out of definable area, the command is ignored.

Pf = Font size

Pl = Number of line

```
【Definable area】 Pf = 30H : 6x8 \text{ dot } (01H \le Pl \le 08H) Pf = 31H : 8x16 \text{ dot and } 16x16 \text{ dot } (01H \le Pl \le 04H) Pf = 32H : 12x24 \text{ dot and } 24x24 \text{ dot } (01H \le Pl \le 02H) Pf = 33H : 16x32 \text{ dot and } 32x32 \text{ dot } (01H \le Pl \le 02H) 01H \le Pl \le 08H
```

#### 4-4-3. Character setting of Text scroll

[code] 1BH,5DH,43H,Pl,Pn,Pd···Pd

[Function] Character setting of Text scroll by every line.

- · Number of character is counted, ANK is 1byte, and Shift-JIS is 2byte.
- Definable the character data is 100 characters to all ANK, or 50 characters to all Shift-JIS.

Pl = Number of line

Pn = Number of digit

Pd = Character data

[Definable area] 
$$01H \le Pl \le 08H$$
  
 $01H \le Pn \le 64H$ 

```
4-4-4. BMP scroll setting (Data memory)
   [Code] 1BH,5DH,44H,aL,aH,wL,wH
   [Function] Setting the data in the Data memory to BMP scroll.
      aL = Lower byte of Data memory address
      aH = Upper byte of Data memory address
       wL = Lower byte of scroll length
       wH = Upper byte of scroll length
   [Definable area] 0000H \le aL + aH * 100 \le 4FFFH
      0000H \le wL + wH * 100 \le 0A00H
4-4-5. BMP scroll setting (FROM)
   [Code] 1BH,5DH,46H,Se,aL,aH,YS,wL,wH
   [Function] Setting the data in the FROM to BMP scroll.
      Se = number of sector
      aL = Lower byte of Data memory address
      aH = Upper byte of Data memory address
       YS = Y-direction size to FROM image
       wL = Lower byte of scroll length
       wH = Upper byte of scroll length
   [Definable area] Se = 31H: Sector 1
      Se = 32H : Sector 2
      Se = 33H : Sector 3
      Se = 34H : Sector 4
      0000H \le aL + aH * 100 \le FFFFH
      01H \leq YS \leq 08H = 8 \text{ byte } (64\text{dot})
      0000H \le wL + wH * 100 \le 2000H
4-4-6. Scroll start
   [Code] 1BH,5DH,3EH,Pm,Pn,Ps,Pb
   [Function] Scroll start. Define the number of scroll, scroll speed and scroll gap time.
   Endless scroll when the number of scroll is 00H. If scroll stop, input the scroll stop command.
       Pm = Text scroll or BMP scroll
       Pn =Number of scroll
       Ps =Scroll speed
       Pb =Blank time between scroll
   [Definable area] Pm = 30H: Text scroll
      Pm = 31H : BMP scroll
      00H \leq Pn \leq FFH
                              (00H: Endless)
      Ps = 30H : 1dot / approx 20ms
      Ps = 31H : 1dot / approx 40ms
      Ps = 32H : 1dot / approx 60ms
      00H \leq Pb \leq FFH
```

#### 4-4-7. Scroll stop

[Code] 1BH,5DH,3DH,58H

[Function] Scroll stop.

#### 4-5. FROM group • Other

4-5-1. Define the BMP data to FROM

[Code] 1BH,6AH,53H,Se,nL,nH, Pd···Pd

[Function] Define the BMP data to FROM.

- Define the BMP data to FROM, after delete the BMP data to FROM.
- Every sector includes 64KB in FROM, BMP data definition is performed per 64KB.
- The MAX value of Specifiable number of definition is 65536 byte (10000H). If number of definition is 65536byte, nH nL = 00 00H

Se = Number of sector

nL = Lower byte of number of definition byte

nH = Upper byte of number of definition byte

Pd = Definition data

#### [Definable area] Se = 31H : Sector1

Se = 32H : Sector2Se = 33H : Sector3

Se = 34H : Sector4

 $0000H \le nL + nH * 100 \le FFFFH$ 

#### 4-5-2. Delete the BMP data to FROM

[Code] 1BH,6AH,41H,Se

[Function] Delete the BMP data to specified sector in the FROM.

Se = Number of sector

#### [Definable area] Se = 31H : Sector1

Se = 32H : Sector2 Se = 33H : Sector3 Se = 34H : Sector4

#### 4-5-3. Transfer the BMP data from the FROM to the Data memory

[Code] 1BH,6AH,55H,aL,aH,Pw,Ph,Se,bL,bH,YS

[Function] Transfer the BMP data from the FROM

aL: Lower address of transfer to

aH: Upper address of transfer to

Pw: BMP image display (width)

Ph: BMP image display (height)

Se: Number of sector

bL: Lower address of transfer from the FROM

bH: Upper address of transfer from the FROM

YS: BMP data defined Y size (by 8 dots)

#### [Definable area] $0000H \le aL + aH * 100 \le 4FFFH$

 $01H \le Pw \le 00H (=100H)$ 

 $01H \leq Ph \leq 08H$ 

Se = 31H : Sector1, Se = 32H : Sector2, Se = 33H : Sector3, Se = 34H : Sector4

 $0000H \le bL + bH * 100 \le FFFFH$ 

 $01H \leq YS \leq 08H = 8 \text{ byte } (64\text{dot})$ 

#### 4-5-4. Define the User definable font (RAM)

[Code] 1BH,6AH,47H,Pf,cL,(cH),Pd···Pd

[Function] Define the User definable font into RAM. A maximum 16 characters can be defined within each font size.

- The User definable fonts are displayed the defined code. It is a same process to normal fonts.
- The User definable fonts are valid until they redefined, Reset command, or the power off.
- · If define the user definable font over 16 characters, at first defined user definable font is removed
- If the defined code is specified, existing data is re-written.
- If the 16x16, 24x24, 32x32 size define, it must specify the "cH"

Pf = Font size

cL = Lower byte of User definable font code

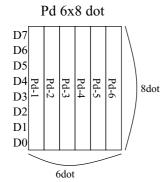
cH = Upper byte of User definable font code

Pd = Definition data

# [Definable area] Pf = 30H : 6x8 dot (Pd=6 byte)

Pf = 31H : 8x16 dot (Pd=16 byte)
Pf = 32H : 12x24 dot (Pd=36 byte)
Pf = 33H : 16x32 dot (Pd=64 byte)
Pf = 34H : 16x16 dot (Pd=32 byte)
Pf = 35H : 24x24 dot (Pd=72 byte)
Pf = 36H : 32x32 dot (Pd=128 byte)
cL = ANK code (Pf=30H~33H : 1 byte code)

 $cL,cH = Shift-JIS code (Pf=34H\sim36H : 2 byte code)$ 



# Pd 16x16 dot Pd-31 Pd-31 Pd-32 Pd-29 Pd-27 Pd-27 Pd-28 Pd-28 Pd-19 Pd-11 Pd-11 Pd-11 Pd-11 Pd-12 Pd-16 Pd-12 Pd-16 Pd-17 Pd-18 Pd-10 Pd-10 Pd-20 Pd-10 Pd

4-5-5. User definable font store / transfer / delete

[Code] 1BH,6AH,45H,Ps

[Function] Store, transfer, or delete the User definable font to FROM.

- · Define the user definable font, after the user definable font is stored
- The user definable font store is stored the all defined user definable font data.
- The use definable font delete is deleted the all defined to FROM and RAM user definable font data.

 $P_S = store / transfer / delete$ 

[Definable area] Ps = 30H: Store

Ps = 31H : Transfer Ps = 32H : Delete

# 4-5-6. Define the Macro

[Code] 1BH,6AH,6DH,Ps,nL,nH, Pd···Pd

[Function] Define the command and data as Macro to FROM

- If select the execution at a reset, FROM macro execution at a reset. These macros are executed continuously.
- · Please don't define the following commands

RESET, Define the macro, Macro Execution / stop / delete

Ps = Select of start

nL = Number of definition lower byte

nH = Number of definition upper byte

Pd = Definition data

[Definable area] Ps = 30H: Normal macro

Ps = 31H: Execution at a reset

 $0000H \le nL + nH * 100 \le FFFFH$ 

#### 4-5-7. Macro execution/stop/delete

[Code] 1BH,6AH,64H,Ps

[Function] To defined the macro to FROM execute/stop/delete

- Macro is stopped the Macro stop command. Don't send without Macro stop, when the Macro processing.
- If it didn't define the Macro, Macro doesn't not execute.
- Normal macro execute only one cycle, when the macro is end, the module send the ID code to Host system.

Ps = Macro execution / stop / delete

[Definable area] Ps = 30H: Delete the Macro

Ps = 31H: Macro execution Ps = 32H: Macro stop

#### 4-5-8. Macro wait

[Code] 1BH,6AH,77H,Ps

[Function] Wait time setting in the Macro processing.

- This command is valid at the macro.
- · 0.1s/01H

Ps = Wait time

[Definable area]  $00H \le Ps \le FFH \quad (0.0s \sim 25.5s)$ 

#### 4-5-9. ID code

[Code] 1BH,6AH,49H,44H

[Function] Send the ID code to the Host system. ID code is software version.

Ex. Software version is "00.10".

STX	Software Version (00.10)	ETX
02H	30Н,30Н,2ЕН,31Н,30Н	03H

# 4-5-10. Blink setting

[Code] 1BH,6AH,42H,Ps

[Function] Setting the blink cycle to Text box and BMP box.

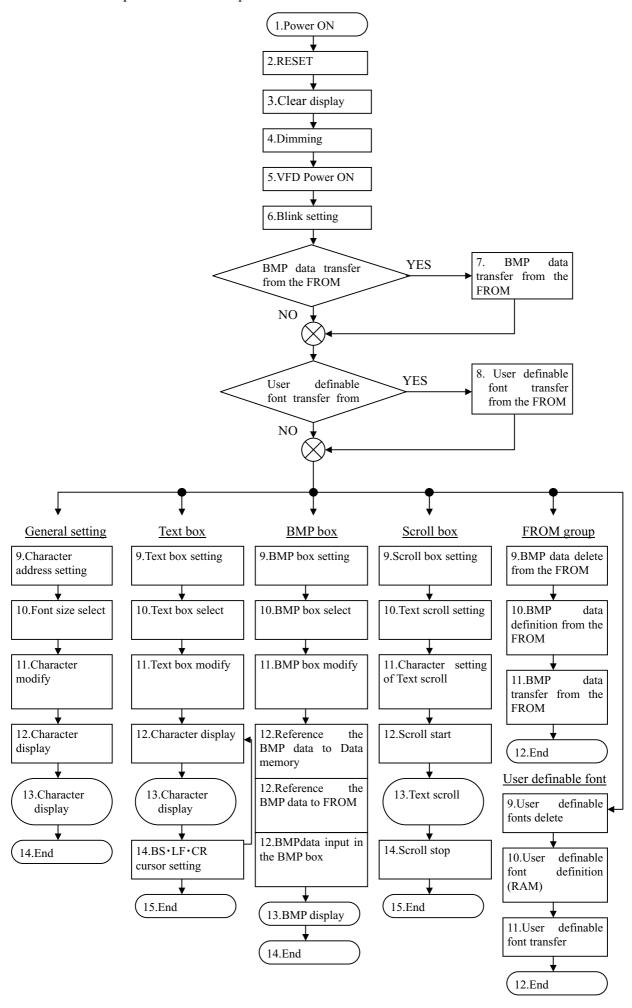
- Control the blink cycle with this command to every box.
- If the blink start, setting the blink by every box.

Ps = Blink cycle

[Definable area] Ps = 30H : approx 0.5s

Ps = 31H : approx 1sPs = 32H : approx 1.5s

#### 4-6. For example of command sequence



#### 5. The test function

# 5-1. The self-memory test

When the module is turned on, displayed the software Version for 500 ms.

If an error is occurred, RTS signal line of the module becomes disable against a host system to notice the state of reception prohibition.

#### 5-2. The display test

The display test starts when one of the following is executed.

- a) When the J5 is short.
- b) When both signal line connections RTS-CTS and RXD-TXD are connected.

The screen shows the following test patterns.

- 1) All dots are turned on. ... Check the Anode and Grid Open, and check the uneven display.
- 2) Horizontal lines in every one line are turned on ... Check the Grid short.
- 3) Vertical lines in every four line are turned on. ... Check the Anode short.
- 4) All dots are turned on.

#### 6. INTERFACE CONNECTION

#### 6-1. Connector pin assignment

 $CN1 (I^2C)$  5267-04A-X (MOLEX) Table-7

Pin No	Signal	Description
1	5V	Power supply*
2	SCL	Input
3	SDA	Input/Output
4	GND	Ground

#### CN2 (RS-232C) 5267-06A-X (MOLEX) Table-8

Pin No	Signal	Description
1	RTS	Output
2	CTS	Input
3	GND	Ground
4	RXD	Input data
5	TXD	Output data
6	+5V	Power supply*

#### CN3(USB) 5267-07A-X (MOLEX) Table-9

Pin No	Signal	Description
1	VBUS (+5V)	USB Power
2	D+	USB D+
3	D -	USB D -
4	GND	GND
5	FG	Frame GND
6	GND	GND
7	+5V	Power supply*

<sup>\*</sup>The wire rod of "Power supply" is recommended to be AWG#26.

# 7-2. Interface configuration

# 7-2-1. $I^2C$

The module is operated as a slave by  $I^2C$  interface either in 'slave receive' or 'slave transmit' mode with a fixed address of 70H.

#### 7-2-2. RS-232C

Table-10

Signal level	RS-232C serial communication
Data transfer format	Un-synchronous and bi-directional communication
Data length	8bits (LSB first)
Parity bit	EVEN/ODD/NON (Initial setting: NON)
Start bit	1 bit
Stop bit	1 bit
Baud rate	38400/19200/9600bps (Initial setting: 9600bps)

#### 7-2-3. USB

Table-11

Signal level	USB2.0 compliant
Data transfer format	USB2.0 compliant
BUS Speed	Full Speed
End point	EP0: Control Transfers
	EP3: Interrupt Transfers(IN)
Vendor ID	1008H
Product ID	1015H

# 7-3. RS-232C Jumper setting

The following Table-12 indicates the Jumper setting for Baud-rate/Parity/self test.

Table -12

Circuit sign	Function	Initial setting
J1	D 1 4 -	Open
J2	Baud-rate	Open
J3	D- ::414	Open
J4	Parity select	Open
J5	Initialization*	Short
J6	Self-test	Open

<sup>\*</sup> Please do not change.

# 7-3-1.Baud-rate setting

It is possible to select a baud rate 9600 to 38400bps by the combination of the J1 and J2 as shown below. (Initial setting: 9600bps)

Table -13

			14010 15
J1	Open	Short	Open
J2	Open	Open	Short
Baud-rate (bps)	9600	19200	38400

#### 7-3-2. Parity select

It is possible to set parity bit by the combination of the J3 and J4 as shown below. (Initial setting: Parity NON)

Table -14

J3		J4	
Short	Open	Short	Open
OOD/EVEN	NON	ODD	EVEN

#### 7-3-3. Self-test

Either self-test mode or normal mode, the J6 has to be set at power on.

It starts the self-test when the J6 is short, at power on.

To release the test mode, the module has to be turned off and the J6 has to be set Open.

(Initial setting: Normal)

Table -15

Ј6			
Short	Open		
Self-test	Normal mode		

#### 7-4. USB Descriptor Specifications

Standard Device Descriptor

Table -16

Standar	d Device Descriptor		1		Table -16
Offset	Field	Description	Size [byte]	Value	Comment
0	bLength	Size of descriptor in bytes	1	12H	
1	bDescriptorType	DEVICE Descriptor Type	1	01H	
2	bcdUSB	USB Release Number in BCD	2	0200H	Rev.2.0
4	bDeviceClass	Class code	1	00H	
5	bDeviceSubClass	Subclass code	1	00H	
6	bDeviceProtocol	Protocol code	1	00H	
7	bMaxPacketSize	Maximum packet size for endpoint zero	1	40H	64 bytes
8	idVendor	Vendor ID	2	1008H	Futaba
10	idProduct	Product ID	2	1013H	GP1212A02*
12	bcdDevice	Device release number in BCD	2	0100H	1.00
14	iManufacturer	Indexof string descriptor describing manufacturer	1	01H	
15	iProduct	Index of string descriptor describing product	1	02H	
16	iSerialNumber	Index of string descriptor describing the device's serial number	1	00H	
17	bNumConfigurations	Number of possible configurations	1	01H	

Standard Configuration Descriptor

Table -17

Offset	Field	Description	Size [byte]	Value	Comment
0	bLength	Size of this descriptor in bytes	1	09H	
1	bDescriptorType	CONFIGURATION Descriptor Type	1	02H	
2	wTotalLength	Total length of data returned for this configuration	2	003BH	59 bytes
4	bNumInterfaces	Number of interfaces supported by this configuration	1	01H	
5	bConfigurationValue	Value to use as an argument	1	01H	
6	iConfiguration	Index of string descriptor describing this configuration	1	00Н	
7	bmAttributes	Configuration characteristics	1	СОН	Bus powered Disable Remove Wakeup
8	MaxPower	Maximum power consumption	1	FAH	500mA

Interface Descriptor (#1)

Table -18

Offset	Field	Description	Size [Byte]	Value	Comment
0	bLength	Size of this descriptor in bytes	1	09H	
1	bDescriptorType	INTERFACE Descriptor Type	1	04H	
2	bInterfaceNumber	Number of this interface	1	00H	VFD Control
3	bAlternateSetting	Value used to select this alternate setting	1	00H	
4	bNumEndpoints	Number of endpoints used by this interface	1	01H	
5	bInterfaceClass	Class code	1	03H	HID
6	bInterfaceSubClass	Subclass code	1	00H	
7	bInterfaceProtocol	Protocol code	1	00H	
8	iInterface	Index of string descriptor describing this interface	1	02H	

HID Descriptor (#1)

Table -19

	THE Extension (W1)				
Offset	Field	Description	Size [Byte]	Value	Comment
0	bLength	Size of HID descriptor	1	09H	
1	bDescriptorType	HID descriptor type	1	21H	HID Class descriptor
2	bcdHID	HID class specification	2	0110H	HID Revision 1.10
4	bCountry	Country code of the localized hardware	1	00Н	Not defined
5	bNumDescriptors	Number of class descriptors	1	01H	1 report descriptor
6	bReportType	Type of class descriptor	1	22H	REPORT descriptor
7	wReportLength	Descriptor length	2	0027H	39 bytes

# Endpoint Descriptor (#1)

Table -20

Offset	Description	Size [Byte]	Value	Comment
0	Size of this descriptor in bytes	1	07H	
1	ENDPOINT Descriptor Type	1	05H	
2	The address of the endpoint on the USB device described by this descriptor	1	83H	EP3, IN
3	The endpoint's attributes	1	03H	Interrupt Transfer
4	Maximum packet size this endpoint	2	0040H	
6	Interval for polling endpoint for data transfers	1	04H	4[ms]

# HID Report Descriptor (#1)

Table-21

HID Report Descriptor (#1)	1able-21
Part	Value (HEX)
Usage Page (Vendor-defined),	06 7F FF
Usage (VFD_CONTROL),	09 06
Collection (Application),	A1 01
Usage (VFD_DATA_SIZE),	09 80
Logical Minimum (0),	15 00
Logical Maximum (255),	26 FF 00
Report Size (8),	75 08
Report Count (1),	95 01
Input (Data, Variable, Absolute),	81 02
Usage (VFD_DATA_INPUT),	09 81
Report Count (63),	95 3F
Input (Data, Variable, Absolute),	81 02
Usage (VFD_DATA_SIZE),	09 80
Report Count (1),	95 01
Output (Data, Variable, Absolute),	91 02
Usage (VFD_DATA_OUTPUT),	09 82
Report Count (63),	95 3F
Output (Data, Variable, Absolute),	91 02
End Collection	C0

Table-22

Description	Value (HEX)
VFD_CONTROL	06
VFD_DATA_SIZE	80
VFD_DATA_INPUT	81
VFD_DATA_OUTPUT	82

String	Descriptor		Table-23
No	Part	Description	Value
No.0	bLength	Length	0x04
	bDescriptorType	Type=STRING	0x03
	bSting	LangID (English US)	0x0409
No.1	bLength	Length	0x0E
	bDescriptorType	Type=STRING	0x03
	bSting	Manufacturer	Futaba
No.2	bLength	Length	0x22
	bDescriptorType	Type=STRING	0x03
	bSting	Product	121X VFD DISPLAY

#### 8. ENVIRONMENTALLY CONSCIENTIOUS

This VFD Module complies with RoHS Directive.

#### 8-1. With respect to EU RoHS Directive

This product does not contain more of each banned 6 materials (cadmium, hexavalent chromium, lead, mercury, polybrominated biphenyl:PBB and polybrominated diphenyl ether :PBDE) than is stipulated in the standard, or comply wit the exempting items.

Materials and components of electrical and electronic equipment (EEE), which conform to Article 4 of EU RoHS, are exempt from EU RoHs Directive.

#### 8-2. With respect to Chinese RoHS

This product contains "lead and its compound" from among restricted 6 materials (cadmium, hexavalent chromium, lead, mercury, polybrominated biphenyl:PBB and polybrominated diphenyl ether:PBDE).

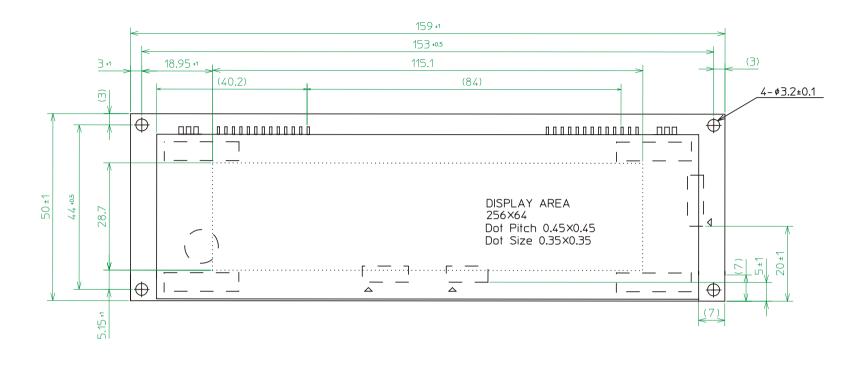
This product does not contain more of each restricted materials except "lead and its compound" than is stipulated in Chinese RoHS.

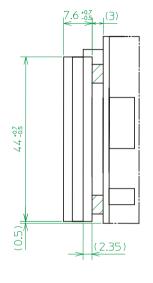
As for the indication of information on containing EHS, please refer to the following.

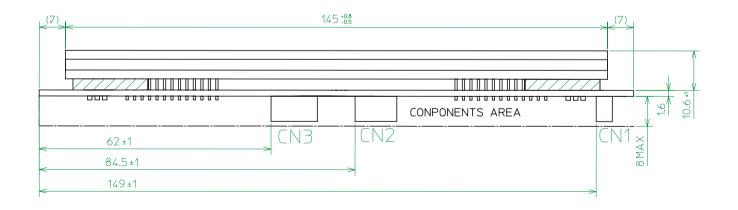
< Indication of information on containing EHS >

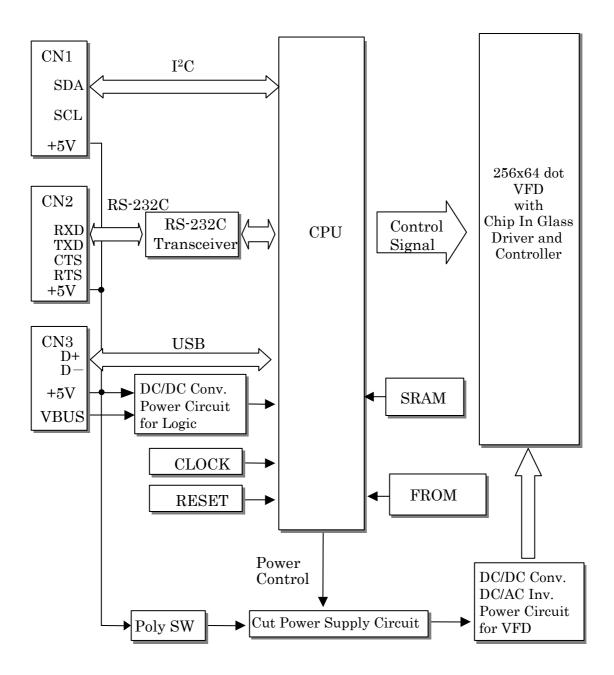
- Areas of its location: Vacuum Fluorescent Tube (VFD)
- Containing chemical material: Lead and its compound
- Environmental protection use period: 10 years
- Reason for containing: Due to no materials to substitute them under the current technology

FIGURE-1









#### DISPLAY CHARACTER CODE

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Japanese font (shift JIS)
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82E0 もややゅゆょよらりるれろわわぬゑをん
8360 月月回回四月月万万万万
                   タネフハバパヒビピフブプへべへホボポマミ
8380 ムメモヤヤュコョヨラリルレロヮワヰヱヲンヴヵヶ
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83A0 B C A E Z H O I K A M N E O M P S T M Ф X W Ω
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ssco 安庵按暗案誾鞍杏以伊位依偉囲夷委威尉惟意慰易椅為畏異移維緯胃萎衣
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sso 謂違遺医井亥域育郁磯一壱溢逸稲茨芋鰯允印咽員因姻引飲淫胤蔭

```
8940 院陰隠韻时右宇鳥羽迂雨卯鵜窺丑碓臼渦嘘唄欝蔚鰻姥厩浦瓜閏噂云運雲
蜿 荏餌叡営嬰影映曳栄永泳洩瑛盈穎頴英衛詠鋭液疫益駅悦謁越閱榎厭円
8980 園堰奄宴延恕掩援沿演炎焔煙燕猿縁艷苑薗遠鉛鴛塩於汚甥凹央奥往応押
8940 旺横欧殴王翁襖鶯鴎黄岡沖荻億屋憶臆桶牡乙庵卸恩温穏音下化仮何伽価
soo 佳加可嘉夏嫁家寡科暇果架歌河火珂禍禾稼箇花苛茄荷華菓蝦課嘩貨迦過
8950 霞蚊俄峨我牙画臥芽蛾賀雅餓駕介会解回塊壞廻快怪悔恢懷戒拐改
8440 魁晦械海灰界皆絵芥蟹開階貝凱劾外咳害崖慨概涯碍蓋街該鎧骸浬馨蛙垣
8460 柿蛎鈎劃嚇各廓拡撹格核殼獲確穫覚角赫較郭閣隔革学岳楽額顎掛笠樫
8/80 橿梶鰍潟割喝恰括活渴滑葛褐轄且鰹叶椛樺鞄株兜電蒲釜鎌噛鴨栢茅萱粥
8AA0 刈苅瓦乾侃冠寒刊勘勧巻喚堪姦完官寬田幹患感慣憾換敢柑桓棺款歓汪漢
8ACO 澗潅環甘監看竿管簡緩缶翰肝艦莞觀諫貫還鑑問閑関陥韓館館丸含岸巌玩
8AEO 癌眼岩閻贋雁頑顔願企伎危喜器基奇嬉岛岐希幾忌揮机旗既期棋棄
8840 機帰毅気汽畿祈季稀紀徽規記貴起軌輝飢騎鬼亀偽儀妓宜戯技擬欺犠疑孤
880 義蟻誼議掬菊鞠吉吃喫桔橘詰砧杵黍却客脚虐逆丘久仇休及吸宮弓急救
8880 朽求汲泣灸球究窮笈級糾給旧牛去居巨拒拠挙渠處許距鋸漁禦魚亨享京供
8BAO 侠僑兇競共凶協匡卿叫喬境峡強彊怯恐恭挟教橋況狂狭矯胸脅興蕎郷鏡響
8BCO 饗驚仰凝尭暁業局曲極玉桐粁僅勤均巾錦斤欣欽琴禁禽筋緊芹菌衿襟謹近
8BEO 金 吟 銀 九 倶 句 区 狗 玖 矩 苦 躯 駆 駈 駒 具 愚 虞 喰 空 偶 寓 遇 隅 串 櫛 釧 屑 屈
844 掘窟沓靴轡窪熊隈粂栗縔桑鍬勲君薫訓群軍郡卦袈祁係傾刑兄啓圭珪型契
800 形径恵慶慧憩掲携敬景柱溪畦稽系経継繋罫茎荊蛍計詣警軽頚鶏芸迎鯨
sco 劇 戟 撃 激 隙 桁 傑 欠 決 潔 穴 結 血 訣 月 件 倹 倦 健 兼 券 剣 喧 圏 堅 嫌 建 憲 懸 拳 捲 検
scao 権牽犬献研硯絹県肩見謙賢軒遣鍵険顕験餓元原厳幻弦減源玄現絃舷言諺
sco 限 乎 個 古 呼 固 姑 孤 己 庫 弧 戸 故 枯 湖 狐 糊 袴 股 胡 菰 虎 誇 跨 銛 雇 顧 鼓 五 互 伍 午
sco 呉吾娯後御悟梧檎瑚碁語誤護醐乞鯉交佼侯候倖光公功効勾厚口向
8040 后喉坑垢好孔孝宏工巧巷幸広庚康弘恒慌抗拘控攻昂晃更杭校梗構江洪浩
800 港溝甲皇硬稿糠紅紘絞綱耕考肯肱腔膏航荒行衡講貢購郊酵鉱砿鋼閤降
8080 項香高鴻剛劫号合壞拷濠豪轟麹克刻告国穀醋鵠黒湖漉腰甑忽惚骨狛込此
8DAO頃今困坤墾婚恨懇昏昆根梱混痕紺艮魂些佐叉噯嵯左差査沙瑳砂謂鎖裟坐
8DCO 座 挫 債 催 再 最 哉 塞 妻 宰 彩 才 採 栽 嚴 済 災 采 犀 砕 砦 祭 斎 細 菜 裁 載 際 剤 在 材 罪
8DEO 財 冴 坂 阪 堺 榊 肴 咲 崎 埼 碕 鷺 作 削 咋 搾 昨 朔 柵 窄 策 索 錯 桜 鮭 笹 匙 冊 刷
8E40 察拶撮擦札殺薩雑皐鯖捌錆鮫皿晒三傘参山惨撒散桟燦珊産算纂蚕讃賛酸
8E00 餐斬暫残什仔伺使刺司史嗣四士始姉姿子屍市師志思指支孜斯施旨枝止
8880 死氏獅祉私糸紙紫肢脂至視詞詩試誌諮資賜雌飼歯事似侍児字寺慈持時次
8EAO 滋治爾璽痔磁示而耳自蒔辞汐鹿式識鳴竺軸宍雫七叱執失嫉室悉湿漆疾質
8ECO 実部篠偲柴芝屡蕊縞舎写射捨赦斜煮社紗者謝車遮蛇邪借勺尺杓灼爵酌釈
8EEO 錫若寂弱惹主取守手朱殊狩珠種腫趣酒首儒受呪寿授樹綬需囚収周
8F40 宗就州修愁拾洲秀秋終繍習臭舟蒐衆襲讐蹴輯週酋酬集醜什住充旪従戎柔
sro 汁渋獸緇重銃叔夙宿淑祝縮粛塾熟出術述俊峻春瞬竣舜駿准循旬楯殉淳
880 準潤盾純巡遵醇順処初所暑曙渚庶緒署書薯藷諸助叙女序徐恕鋤除傷價勝
8FAO 匠升召哨商唱嘗奨妾娼宵将小少尚庄床廠彰承抄招掌捷昇昌昭晶松梢樟樵
sco 沼消涉湘焼焦照症省硝礁祥称章笑粧紹肖菖蒋蕉衝裳訟証詔詳象賞醫鉦鍾
seo 鐘障鞘上丈丞乗冗劆城場壌嬢常情擾条杖浄状畳穣蒸譲醸錠嘱埴飾
咖 拭植殖燭纖職色触食蝕辱尻伸信侵唇娠寝審心慎振新晋森榛浸深申疹真神
900 秦紳臣芯薪親診身卒進針震人仁刃塵壬尋甚尽腎訊迅陣靭笥諏須酢図厨
>>>> 逗吹垂師推水炊睡粋翠衰遂醉雖錘随瑞髓崇嵩数枢趨雛据杉椙菅頗隺裾澄
% · 超 寸 世 瀬 畝 是 凄 制 勢 姓 征 性 成 政 整 星 晴 棲 栖 正 清 牲 生 盛 精 聖 声 製 西 誠 誓 請
咖 逝醒青静斉税脆隻席惜戚斥昔析石積籍績腎責赤跡蹟碩切拙接摄折設窃節
®® 説雪絕舌蝉仙先千占宣専尖川戰扇撰程栴泉浅洗染潜煎煽旋穿箭線
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9140 纖羨腺好船薦詮賎践選遷銭銑閃鮮前善漸然全禪繕膳糎噌塑岨措曾曽楚狙
910 疏疎礎祖租粗素組蘇訴阻遡鼠僧創双叢倉喪壮奏爽宋層匝惣想捜掃挿搔
918 操早曹巢槍槽漕燥爭痩相窓糟総綜聡草荘葬蒼藻装走送遭蹌霜騒像増憎臓
གམळ 蔵贈造促側則即息捉束測足速俗属賊族続卒袖其揃存孫尊損村遜他多太汰
9100 詑唾堕妥惰打柁舵楕陀駄騨体堆树耐岱带待怠態戴替泰滞胎腿苔袋貸退逮
916 隊黛鯛代台大第颶題鷹滝瀧卓啄宅托択拓沢濯琢託鐸濁諾茸凧蛸只
924 叩但違辰奪脱異竪辿棚谷狸鱈樽誰丹単嘆坦担探旦歎淡湛炭短端單綻耽胆
920 蛋誕鍛団壇弾断暖檀段男談値知地弛恥智池痴稚置致蜘遲馳築畜竹筑蓄
9280 逐秩窒菜嫡着中仲宙忠抽昼柱注虫衷註酎鋳駐樗瀦猪苧著貯丁兆凋喋寵帖
9240 帳 庁 弔 張 彫 徴 懲 挑 暢 朝 潮 牒 町 眺 聴 脹 腸 蝶 調 諜 超 跳 銚 長 頂 鳥 勅 捗 直 朕 沈 珍
920 賃鎮陳津墜椎槌追鎚痛通塚栂掴槻佃漬柘辻蔦綴鍔椿潰坪壷嬬紬爪吊釣鶴
9260 亭低停頂剃頁呈堤定帝底庭廷弟悌抵挺提梯汀碇禎程締艇訂諦蹄逓
9340 邸鄭釘鼎泥摘擢敵滴的笛適鏑溺哲徹撒轍迭鉄典填天展店添纏甜貼転顛点
9360 伝殿澱田電兎吐堵塗妬屠徒斗杜渡登莵賭途都鍍砥砺努度土奴怒倒党冬
9380 凍刀唐塔塘套宕島嶋悼投搭東桃梼棟盗淘湯涛灯燈当痘祷等答筒糖統到董
9340 蕩藤討謄豆踏逃透鐙陶頭騰闘働動同堂導憧撞洞瞳童胴萄道銅峠鴇匿得徳
950 渍特督禿篤毒独読栃橡凸突椴届鳶苫寅酉瀞噸屯惇敦沌豚遁頓呑曇鈍奈那
9360 内乍凪薙謎灘捺鍋楢馴縄畷南楠軟難汝二尼武迩匂賑肉虹廿日乳入
940 如尿韮任妊忍認濡禰袮寧葱猫熱年念捻撚燃粘乃廼之埜嚢悩濃納能脳膿農
940 覗蚤巴把播覇杷波派琶破婆罵芭馬健廃拝排敗杯盃牌背肺軰配倍培媒梅
948 楳煤狽買売賠陪這蝿秤矧萩伯剥博拍柏泊白箔粕舶薄迫曝漠爆縛莫駁麦函
940 箱 硲 箸 肇 筈 櫨 幡 肌 畑 畠 八 鉢 溌 発 醗 髮 伐 罰 抜 筏 閥 鳩 噺 塙 蛤 隼 伴 判 半 反 叛 帆
940 搬斑板氾汎版犯班畔繁般藩販範釆煩頒飯挽晚番盤磐蕃蛮匪卑否妃庇彼悲
946 扉批披斐比泌疲皮碑秘緋罷肥被誹費避非飛樋簸備尾微枇毘琵眉美
9540 鼻柊稗匹疋髭彦膝菱肘弼必畢筆逼桧姫媛紐百謬俵彪標氷漂瓢票表評豹廟
‱ 描病秒苗錨鋲蒜蛭鰭品彬斌浜瀕貧賓頻敏瓶不付埠夫婦富富布府怖扶敷
9580 斧普浮父符腐膚芙譜負賦赴阜附侮撫武舞葡蕪部封楓風葺蕗伏副復幅服福
9540 腹複覆淵弗払沸仏物鮒分吻噴墳憤扮焚奮粉糞紛雰文間丙併兵塀幣平弊柄
950 並蔽閉陛米頁僻壁癖碧別瞥蔑箆偏変片篇編辺返遍便勉娩弁鞭保舗鋪圃捕
9550 歩甫補輔穂募墓慕戊暮母簿菩倣俸包呆報奉宝峰峯崩庖抱捧放方朋
%% 法泡息砲縫胞芳萌蓬蜂褒訪豐邦鋒飽鳳鵬乏亡傍剖坊妨帽忘忙房暴望某棒
5660 冒紡肪膨謀貌貿鉾防吠頬北僕卜墨撲朴牧睦穆釦勃没殆堀幌奔本翻凡盆
‱ 摩磨魔麻埋妹昧枚每哩槙幕膜枕鮪柾鱒桝亦俣又抹末沫迄侭繭麿万慢満漫
%~~ 蔓味未魅日箕岬密蜜湊蓑稔脈妙粍民眠務夢無牟矛霧鵡椋婿娘冥名命明盟
960 迷銘鳴姪牝滅免棉綿緬面麺摸模茂妄孟毛猛盲網耗蒙儲木黙目杢勿餅尤戻
%® 籾貫問悶紋門匁也沼夜爺耶野弥矢厄役約薬訳躍靖柳薮鑓隃愈油癒
9740 諭輸唯佑優勇友宥幽悠憂揖有柚湧涌猶猷由祜裕誘遊邑郵雄融夕予余与誉
970 輿預傭幼妖容庸揚揺擁曜楊様洋溶熔用窯羊耀葉蓉要謡踊遥陽養慾抑欲
9780 沃浴翌翼淀羅螺裸来莱頼雷洛絡落酪乱卵嵐欄濫藍蘭覧利吏履李梨理璃痢
9740 裏裡里離陸律率立葎掠略劉流溜琉留硫粒隆竜龍侶慮旅虜了亮僚両凌寮料
9700 梁涼猟療瞭稜糧良諒遼量陵頜力緑倫厘林淋燐琳臨輪隣鱗麟瑠塁涙累類令
9750 伶例冷励嶺恰筠扣苓鈴隷零霊麗鼢暦歴列劣烈裂廉恋憐漣煉簾練臘
984 蓮連錬呂魯櫓炉賂路露労婁廊弄朗楼榔浪漏牢狼篭老聾蝋郎六麓禄肋録論
980 倭和話歪賄脇惑枠鷲亙亘鰐詫藁蕨椀湾碗腕
                                     Ħ,
%約 丐丕个兜\丼刀又乖乘亂」豫事舒弎于亞亟呂亢亰亳亶从仍仄化仂仗仞仅
98co 任价仿佚估佛佝佗佇佶侈侏侘佻偑佰侑佯來侖儘俔俟俎俘俛俑悝俐俤偅倚
986 据倔倪倥倅伜俶倡倩倬俾俯們倆偃假會階偐偈做侰偬偸傀儞儞儞쏎
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>>> 敵兮冀口囘册冉冏冑冓冕□冤冦冢冩幂〕决冱冲冰况冽凅凉凛几處凩凭
998 凰口函刃刋刔刎刧刪刮刳刹剏剄剋剌剞剔剪剴剩剳剿剽劍劔劔剱劈劑辨辧
9940 劬劭劼劵勁勍勗勞勣駠飭勠勳勵勸勹匆囫甸匍匐匏匕□匣匯匱匳□區卆卅
∞∞ 丗卉卍準下卩卮夗卻卷厂厖厠厦厥厮厰厶参篡雙叟曼燮叮叨叭叭吁吽呀听
9950 吭吼吮吶吩吝呎咏呵咎咳呱哩呰咒啤咀呶咄咐咆哇咢咸咥咬哄哈咨
9440 咫哂咤咾咼哘哥哦唏唔哽哮哭哺哢唹啀啣啌售啜啅啖啗唸唳啝喙喀咯喊喟
940 啻啾喘唧單啼喃喩喇喨嗚嗅嗟嗄嗜嗤嗔嘔嗷嘖嗾嗽嘛嗹噎噐營嘴嘶嘲嘸
9480 噫喋嚅喋喋喋嘻噢噢嘘嚏嚥嚮嚶嚴囂嚼囁囃囀囈囎囑囓□ 亿 8 8 周 图 图 图
9AAO 國 圍 圓 團 圖 嗇 圜 圦 圷 圸 坎 圻 址 坏 坩 埀 垈 坡 埘 垉 垓 垠 垳 垤 垪 垰 埃 埆 埔 埒 埓 堊
タムᢗ゚埖坪堋堙堝塲堡塢塋塰毀塒堽塹墅墹墟墠墺壞墻墸墮壅壓壑壗壙壘壥壜壤
94回 壟壯壺壹壻壼壽久久夐夛梦夥央氏夲夸夾竒奕奐奎奚奘奢奠奧獎奩
9840 奸妁妝佞佞妣妲姆姨姜妍姙姚娥娟娑娜娉姨婀姪婉娵婜婢婪媚媼媾嫋嫂媽
980 嫣嫗嫦嫩嫖嫺嫻嬌嬋嬖嬲嫐嬪嬶嬾孃孅孀孑孕孚孛孥孩孰孳孵學斈孺宀
9880 它宦宸冤寇寉寔寐寤實寢寞寥寫寰寶寶尅將專對尔勘九尨尸尹屁屆屎屓屐
9840屏孱屬屮乢屶屹岌岑岔妛岫岻岶岼岷峅岾峇峙峩峽峺峭嶌峪崋崕崗嵜崟崛
980 崑崔崢崚崙崘嵌嵒嵎嵋嵬嵳嵶嶇嶄嶂嶢嶝嶬嶮嶽嶐嶷嶼巉巍巓戀嚴巛巫已
9860 巵帋帚帙帑帛帶帷幄幃幀幎幗幔幟幢幤幇幵并么麼广庠廁廂廈廐廏
944 廖廣廝廚廛廢廡廨廩廬廱廳廰廴廸卅弃弉彝彝弋弑弖弩弭弸彁彈彌彎弯彑
xxx 彖彗量彡彭习彷徃徂彿徊很徑徇從徒徘徠徨徭徼忖忻忤忸忱忝悳忿怡恠
%co 怙怐怩怎怱怛怕怫怦怏怺恚恁恪恷恟恊恆恍恣恃恤恂恬恫恙悁悍惧悃悚悄
%CAO 俊悖悦悒俐悋惡悸惠惓悴忰悽惆悵惘慍愕愆惶惷愀惴惺愃惚惻惱愍愎慇愾
xco 憝愧慊愿愼愬愴愽慂慄慳慷慘慙慚怒慴慯慥慱慟慝慓慵喜憖憇憬憔憚憊慿
9CEO 憫憮懌懙應懷懈黮懆憺懋罹懍懦濍懶懺懴懿懽懼懾戀戈戉戍戍戔戛
900 拜拌拊拂拇抛拉掐拮拱挧挂挈拯拵捐挾捏搜捏掖掎擨掫捶掣掏掉掟掵捫
9080 捩掾揩揀揆揣揉插揶揄搖搴搆搓搦搶攝搗搨搏摧摰摶摎攪撕撓撥撩撈撼據
9DAO 擒擅擇撻擘擂擱學舉擠擡抬擣摍攬擶擴擲擺攀擽攐攜攅攤攣攫攴攵攷岋俽
900 畋 效 敖 敕 敍 敘 敞 敝 敲 數 斂 斃 變 斛 斟 斫 斷 旃 旆 旁 旄 旌 旒 旛 旙 无 旡 旱 杲 昊 昃 旻
9DEO 杏 昵 昶 昴 昜 晏 晄 晉 晁 晞 晝 晤 晧 晨 晟 晢 晰 暃 暈 暎 暉 暄 暘 暝 暨 暹 曉 暾 暼
9540 曄暸曖曚曠昿曦曩曰曳曷朏朖朞朦朧霸朮朿朶杁朸朷杆杞杠杙杣杤枉炁枩
9500 杼杪枌枋枦枡枅枷柯枴柬枳柩枸柤柞柝趆柮枹柎柆柧檜栞框栩桀桍栲桎
988 梳栫桙档桷桿梟梏梭梔條梛梃檮梹桴梵梠梺椏梍桾椁棊椈棘椢椦棡椌棍棔
9EAO 棧 棕 椶 椒 椄 棗 棣 椥 棹 棠 棯 椨 椪 椚 椣 椡 棆 楹 楷 楜 楸 楫 楔 楾 楮 椹 楴 椽 楙 椰 楡 楞
9ECO 楝榁楪榲榮槐榿槁槓榾槎寨槊槝榻縏榧樮榑榠榜榕榴槞槨樂樛槿權槹槲槧
9EBO 樅 榱 樞 槭 樔 槫 樊 樒 櫁 様 樓 橄 樌 橲 樶 橸 橇 橢 橙 橦 橈 樸 樢 檐 檍 檠 檄 檢 檣
9540 檗 蘗 榲 櫃 櫂 檸 檳 檬 櫞 櫑 櫟 檪 櫚 櫪 櫻 欅 蘖 櫺 欒 欖 鬱 欟 欸 欷 盜 欹 飮 歇 歃 歉 歐 欽
9F0 歔歔歟歠歸习歿殀殄殃殍殘殕殞殤殪殫殯殱殱殳殷殼毆毋鯍毟毬鼍毳糉
980 磨鲪氓气氛氤氣汞汕汪汪沂沍沚沁沛汾汨汳没沐泄泱泓沽泗泅泝沮沱沾沺
9FA0 泛泯泙泪洟衍洶洏冾洸陎洵洳洒洌浣涓浤浚浹浙涎涕濤涅淹渕渊涵淇淦涸
9FCo 滑淬淞淌淨淒淅淺淙淤淕淪湽渭湮渮渙湲湟渾渣湫渫湶湍渟湃渺湎渤滿渝
9F6 游測溪溘滉溷滓溽溯滄溲滔縢溏溥滂溟潁溉灌滬滸滾漿滲漱滯鴔滌
E040 漾漓滷澆潺潸澁澀潯潛潛潭澂潼潘澎澑濂滾澳澣澡澤澹濆澪濟濕濬濔濘濱
E000 濮濛寫瀋濺瀑淺瀏濾瀛瀚潴瀝瀘瀟瀰瀾瀲灑灣炙炒炯烱炬炸炳炮烟烁烝
E000 烙 焉 烽 焜 焙 焕 熙 熈 煦 煢 煌 煖 煬 熏 燻 熄 熕 熨 熬 燗 熹 熾 燒 燉 燔 燎 燠 煅 燧 燵 燼 燹
EDAD 燿 燦 爐 爛 爨 爭 爬 爰 爲 爻 俎 爿 牀 牆 牋 牘 坻 啎 犂 犁 犇 犒 犖 犢 犧 犹 犲 狃 狆 狄 狎 狒
ENCO 络狠狡狹狷倏猗猊猜猖猝猴猯猩猥猾獎獏默獗獪獨獰獸獵獻獺珈玳珎玻珀
EOEO 珥珮珞璢琅瑯號珸琲琺瑕琿瑟瑙瑁瑜瑩瑰瑣瑪瑶瑾瑋璞璧瓊瓏瓔珱
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E140 瓠瓣瓧瓩瓮瓲瓰瓱瓸瓷甄甃甅甌甎甍甕甓甞甦甬甼畄畍畊畉畛畆畚畩畤畧
Elloo 畫 眯 畸 當 疆 疇 畴 疊 疉 疂 疔 疚 疝 疥 疣 痂 疳 痃 疵 疽 疸 疼 疱 痍 痊 痒 痙 痣 痞 痾 痿
E180 痼 瘁 痰 痺 痲 麻 瘋 瘍 瘉 瘟 瘧 瘠 瘡 癜 瘤 瘴 瘰 瘻 癇 癈 癆 癜 癘 癡 癢 癨 癩 癪 癧 廯 癰 願
ELAO 叉 受 發 包 皃 飯 皋 皎 皖 皓 晳 皚 皰 皴 皸 皹 皺 盂 盍 盖 盒 盞 盡 盥 盧 盪 蘯 盻 眈 眇 眄 眩
EICO 配 眞 眥 眦 眛 眷 眸 睇 睚 睨 睫 睛 睥 睿 睾 睹 瞎 瞋 瞑 瞠 瞞 瞰 瞶 瞹 瞿 瞼 瞽 瞻 矇 矍 矗 矚
EIEO 矜 矣 矮 矼 砌 砒 礦 砠 礪 硅 碎 硴 碆 硼 碚 碌 碣 碩 碪 碯 磑 磆 磋 磔 碾 碼 磅 磊 磬
E240 磧 磚 磽 磴 礇 礒 礑 礙 礬 礫 卍 祠 斌 祟 祚 祕 祓 祺 禄 禊 稷 禧 齋 禪 禮 禳 禹 禺 秉 秕 秧 秬
E260 秡秣稈稍頹稙稠稟禀稱稻稾稷穃穗穉穑穢穩龝穰穹穽窈窗窕窘窖窩竈窰
E280 窶竅竄窿邃竇竊奸竏妢竓站竚竝竡娭竦嵑竰笂笏笊笆笳笘笙笞笵笨笑筐筺
E2A0 笄筍笋筌筅筵笆筴筧筰筱筬筮箝箘箟箍箜箚箋籌箏筝箙篋篁篌篏箴篆篝篩
E2CO 簑簑篦篥籠簀簇簓篳篷簗篗篶簣簧簪簟簷簫簽籌監籔籏籀籐籘籟籤籖籬籬
E2E0 籽 粃 粐 粤 粭 粢 粫 粡 粨 粳 粲 粱 粮 粹 粽 糀 糅 糂 稼 糒 糜 糢 鬵 糯 糲 糴 糶 糺 紆
E340 紂 紜 紕 紊 絅 紘 紮 紲 紹 紵 辉 経 絖 絎 鯀 裓 絮 懇 絣 經 綉 絛 綏 紹 紹 蓇 緊 綣 綵 緇 綽 綫
E360 總調海縣編淚棺鰔緝蹀緞緻緲緡縅縊縣縡縒縱縟縉縋縢繆繦縻艛縹漰艛
E380 縲縺繧繝糤繞繙滾繹繪繩繼繻纃緕窰辮鰮纈纉襩纒纐纓纔纖纎纛纜缸缺罅
E3AO 罌罍罎罐网罕罔罘罟罠罨罩罧罰羂羆羃羈羇羌羔羞羝羚羣羯羲羹羹羶甂譱
ESCO 翅翠翊翕翔翡翦翩翳翹飜耆耄耋未耘耙耜耡耨耿耻聊聆聒聘聚聟聢聨聳聲
E3E0 聰 聶 聹 聽 聿 肄 肆 肅 肛 肓 肚 肭 冐 肬 胛 胥 胙 胝 胄 胚 胖 脉 胯 胱 脛 脩 脣 脯 腋
E440 隋腆脾腓腑胼腱腮腥腦腴膃膈膊膀膂膠膕膤膣腟膓膩膰膵膾膸膽臀臂膺臉
E40 臢臑臙臘臈臚臟臠臧臺臻臾舁春舅與舊舍舐舖舩舫舸舳艀艙艘艝艚艟艤
E480 艢艨艪艫舸艱艷艸艾芍芒芫芟芻芬苡苣苟苒苴苳苺莓范苻苹苞茆苜茉苙茵
E4CO 菎 菽 萃 菘 萋 菁 菷 萇 菠 菲 萍 萢 萠 莽 萸 蔆 菻 葭 萪 萼 蕚 蒄 葷 葫 蒭 葭 蒂 葩 葆 萬 葯 葹
E4E0 髙蓊葢蒹蒿蒟蓙蓍蒻蓚蓐蓁席蔥蒡葾蓿蓴庶蔘蔬蔟蔕蔔蓼蕀蕣蕘蕈
E540 蕁 蘂 蕋 蕕 薀 薤 薈 薑 薊 薨 蕭 薔 薜 藪 薇 薜 蕷 蕾 薐 藉 薺 藏 臺 藐 藕 藝 藥 藜 藹 蘊 蘓 蘋
E560 藾 藺 蘆 蘢 蘚 蘰 蘿 虍 乕 虔 號 虧 虱 蚓 蚣 蚩 蚪 蚋 蚌 蚶 蚯 蛄 蛆 蚰 蛉 蠣 蚫 蛔 蛞 蛩 蛬
ESSO 蛟蛛蛯蜒蜆蜈蜀蜃蛻蜑蜉蜍蛹蜊蜴蜿蜷蜻蜥蜩蜚蝠蝟蝸蝌蝎蝴蝗蝨蝮蝠蝓
ESAO 蝣 蝪 蠅 螢 螟 螂 螯 蟋 螽 蟀 蟐 雖 螫 蟄 螳 蟇 蟆 螻 蟯 蟲 蟠 蠏 蠍 蟾 蟶 蟷 蠎 蟒 蠑 蠖 蠕 蠢
ESEO 裄 裔 裘 裙 裝 裹 褂 裼 裴 裨 裲 褄 褌 褊 褓 襃 褞 褥 褪 褫 襁 襄 褻 褶 褸 襌 褝 襠 襞
E640 襦 褴 襁 襪 襯 襴 襷 襾 覃 覈 覊 覓 覘 覡 覩 覦 覬 覯 覲 覺 覽 靚 觀 觚 觜 觝 觧 觴 觸 訃 訖 訐
E660 江 訊 訝 訥 訶 詁 詛 治 詆 詈 詼 詭 詬 詢 誅 誂 誄 誨 誡 誑 誥 誦 誚 誣 諄 諍 諂 諚 諫 諳 諧
E680 諤諱謔諠渾諷諞諛謌謇諡諡謖謐謗謠謳鞫馨謪謾謨譁譌譏譎證譖譛譚讔譟
EGAO 譬譯譴譽讀讌讎讒讓讖讙讚谺豁谿豈豌豎豐豖豢豬豸犲貂貉貅貊貍貎貔豼
E6CO 貘戝貭貪貽貲貳貮貶賈賁賤賣賚賽賺賻暬暓贊谮驘贍贐齌贓賍贔贖赮赭赱
BGD 赳 趁 趙 跂 趾 趺 跏 跚 跖 趺 跛 跋 跪 跫 跟 跣 跼 疎 跟 跿 踝 踞 踐 踟 蹂 踵 踰 踴 蹊
E740 蹇 蹉 蹌 蹐 蹈 蹙 蹤 蹠 踪 蹣 蹕 蹶 蹲 蹼 躁 躇 躅 躄 躋 躊 躓 躑 飔 躙 躪 躡 躬 躰 軆 躱 躾 軅
E760 軈 軋 軛 軣 軼 軻 軫 軾 輊 輅 輕 輒 輙 輓 輜 輟 輛 輀 輦 輳 輻 輹 轅 毂 輾 轉 轆 轎 轗 轜
E780 轢 轣 轤 辜 辟 辣 辭 辯 辷 迚 迥 迢 迪 迯 邇 迴 逅 迹 迺 逑 逕 逡 逍 逞 逖 逋 逧 逶 逵 逹 迸 遏
E7A0 遐 遑 遒 逎 遉 逾 遖 遘 遞 遨 遯 遶 隨 遲 邂 逮 邁 邀 邊 邉 邏 邨 邯 邱 邵 郢 郤 扈 郛 鄂 鄒 鄙
E7C0 單 鄰 酊 酖 酘 酣 酥 酩 酹 酲 醋 醉 醂 醢 醫 醯 醪 醸 醴 醺 踴 釉 釋 釐 刧 釞 釡 刧 釼 釵 釶
ETEO 鈞新 釼 鈬 鈕 鈑 鉞 鉗 鉅 鉉 鉤 鉈 銕 鈿 鉋 鉐 街 銖 銓 銛 駠 鋏 銹 銷 鋩 錏 鋺 諒 錮
E840 錙錢錚錣錺硴錻鍜鋥鍼鍮踸鎰謞鎭鎔鎹鏖鏗鏨蹜鏘鏃鏝鏐鰱鏤鐚鐔鐓鐃鐇
E860 鐐鐶鐫鐵鐡鐺鑁鑒鑄鑛鱳鑢鑯鑪鈩鑰鑵鑷鑽鑚鑼鑾钁鑿門閇閊焽閖閘閙
E880 閏 里 閧 閭 閼 閻 閹 閾 闊 濶 闃 闍 闌 闞 闔 闖 闡 闡 闥 闢 阡 阨 阮 阯 陂 陌 陏 陋 陷 陝 陞 陝
E8AO 陟 陦 陲 陬 陧 隘 隕 隗 險 隱 隱 隰 隰 隴 隶 隸 隹 雎 雋 雉 雍 襍 雜 霍 雕 雹 霄 霆 霈 霓 霎 霑
ESCO 霏霖 霙 霤 霪 霰 霹 霽 霾 靄 靆 靈 靂 靉 靜 靠 靤 靦 靨 勒 靫 靱 靹 鞅 靼 鞁 靺 鞆 鞋 鞏 鞐 鞜
ESEO 鞨 鞦 鞣 鞳 鞴 韃 韆 韈 韋 韜 韭 齏 韲 竟 韶 韵 頏 頌 頸 頤 頡 頷 頹 顆 顏 顋 顫 顯 顰
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