深圳市拓普微科技开发有限公司
Shenzhen TOPWAY Technology Co., Ltd.

TOPWAY Smart LCD SGTools Handbook

FAST Shorten Development Time

VALUE Simplifies Hardware Saves BOM Costs

RELIABLE High Endurance of noise Industrial Level

in minutes

LOAD & PLAY

Content

1 Quick Start

1.1 How to Use a Smart LCD

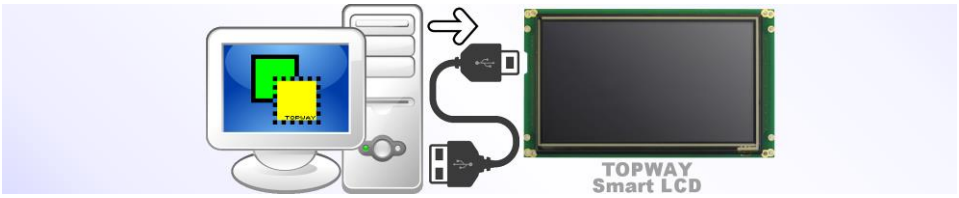
1 Install TOPWAY SGTools

Note: SGTools support Windows XP, Windows Vista, Win7, Win10(Administrator Mode)

2 Design Interface

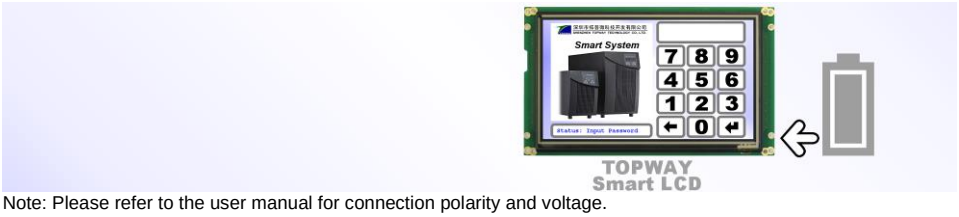
Note: TML Graphics Editor support BMP(32bit), BMP(24bit), JPG, PNG, etc picture format

3 Download to Smart LCD



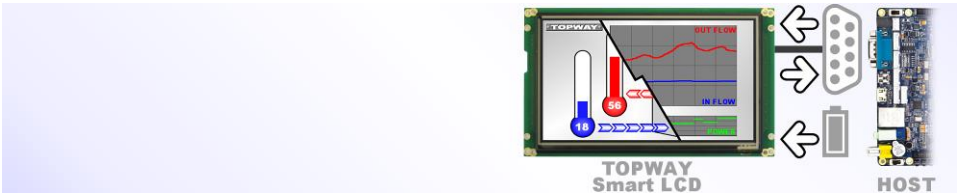
Note: Use High quality USB(A) to USB(mini) cable directly attach to the PC motherboard for better power and signaling

4 Power on & display



Note: Please refer to the user manual for connection polarity and voltage.

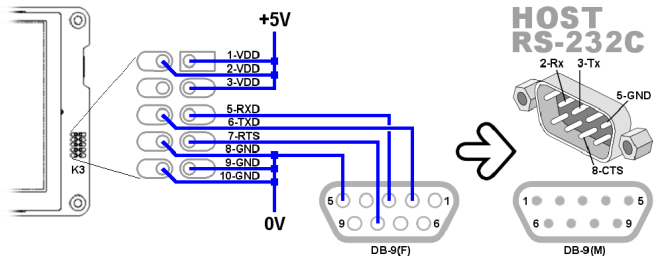
5 Connect & Show data



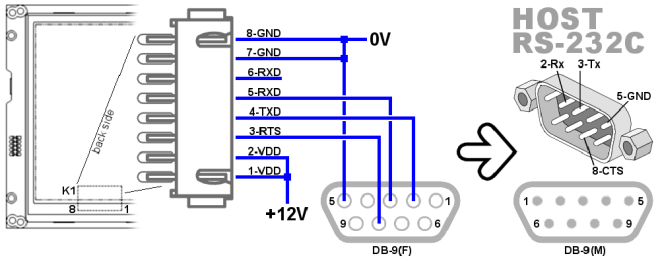
Note: RS-232C terminal is common grounded with the supply (some models providing logic level UART interface)

Please also refer to Product User Manual for details.

1.2 Smart LCD Connection Examples



HMT050CC-C connection example



HMT070CE-C connection example

Please also refer to Product User Manual for details.

1.3 Quick Start Example

Please refer to "Basic Function Example" section

2 Basic Descriptions

TOPWAY **Smart LCDs** provide a display engine with a versatile range of TFT display sizes and Touch-Panels to support a wide range of industrial and instrumentation applications.
The pre-loaded User Interface (UI) reduces the host system's workload and provides a much faster interaction with the user.
UI designs are implemented under usage of **SGTools** allowing designs with zero coding. It dramatically simplifies and speeds up the whole product design process.

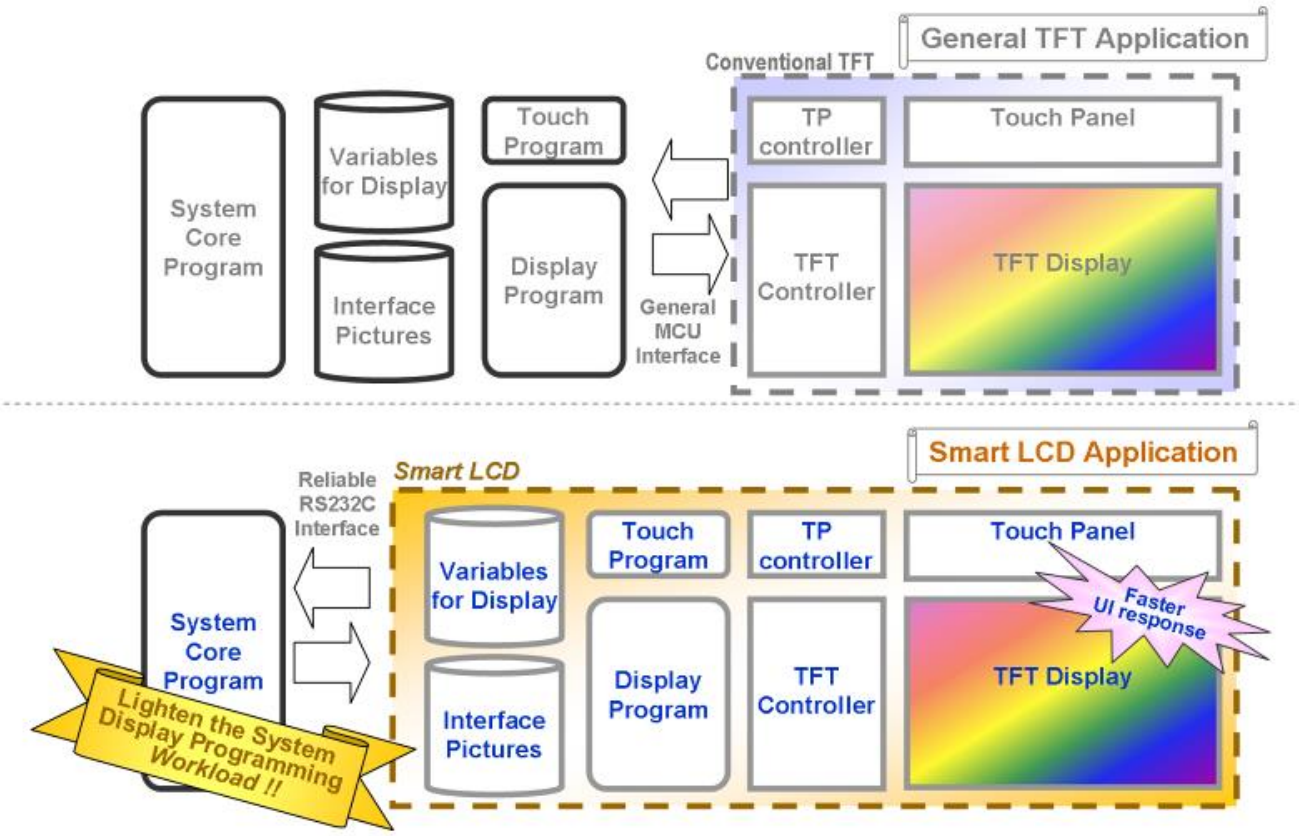
2.1 Smart LCD Highlight

- Standard RS232-C communication interface
- Reliable packet protocol ensures reliable communication
- Host data could be accepted at any moment
- Free the host form interface response and handling
- Direct connect the USB terminal to PC for development
- USB thumb drive with OTG cable can be used for data preload in production stage (options)
- 256Mbyte Flash (vary by model) for interface pictures preload (more than 300 pictures(800x480))

2.2 SGTools Highlight

- Professional Visual design interface
- Web page like page base UI design
- Various kind of touch screen effect available
- User friendly work space
- Support various countries font ASCII and extended char
- Support font import and fine font adjustment
- Only need few minutes to show a UI sample with zero coding
- One click download

2.3 Functional Block



3 Smart LCD Features and Functions

3.1 Basic Concept

3.1.1 PAGE
Each display interface is a PAGE.
It could contain / link with all the predefined content
(e.g. background image, page elements, etc.)

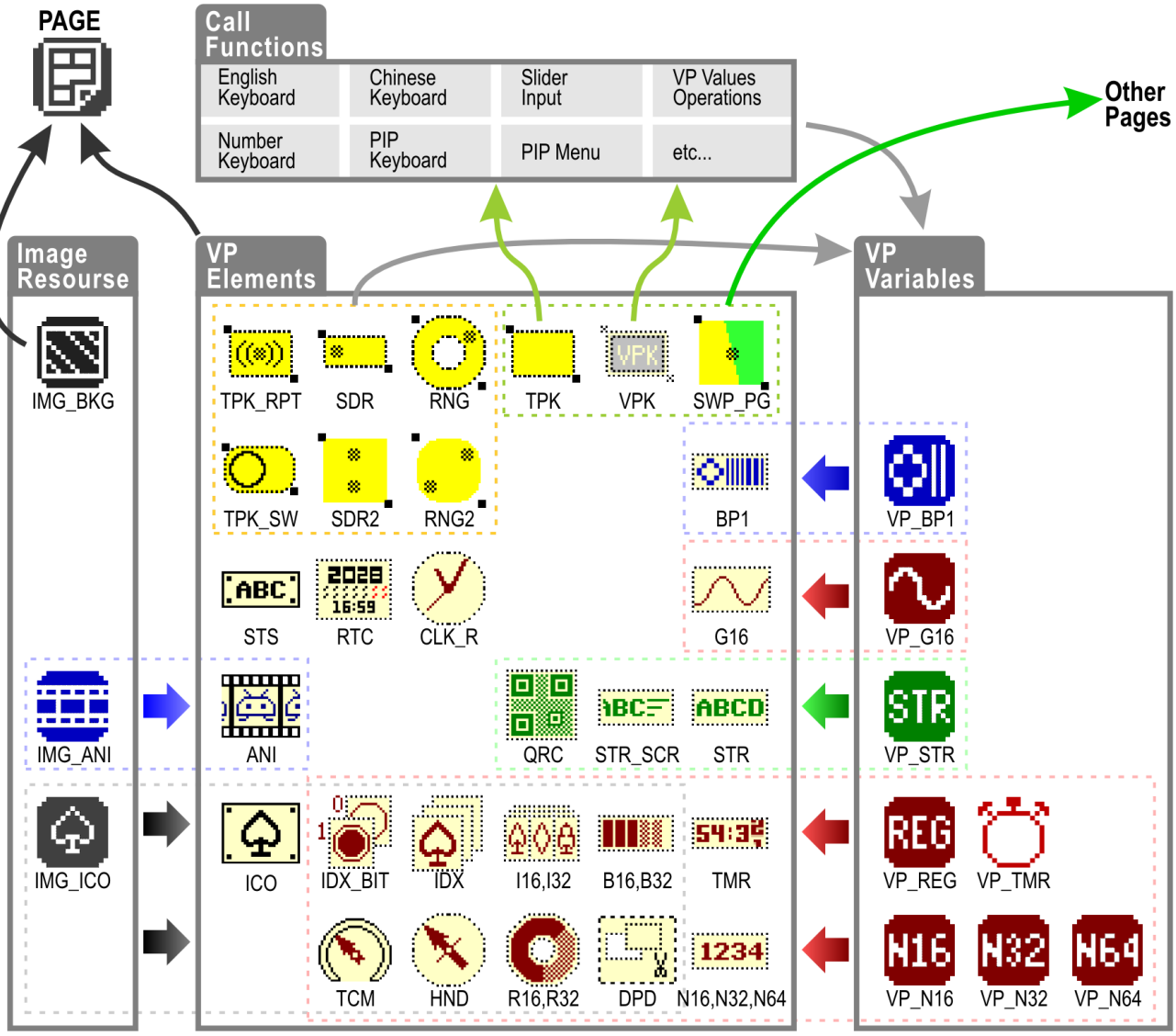
3.1.2 Page Elements
29 type page elements could be use on screen
9 action type elements, 6 Character (Alpha Numeric) type elements,
6 image type elements, 8 graphics type elements
Most of them are linked with VP variable to generate dynamic display content.

3.1.3 Image Recourses
Image Recourses include background images (IMG_BKG), icon images (IMG_ICO) and animation images (IMG_ANI).
They could link by PAGE or Elements to be show on screen.

3.1.4 VP Variables
VP Variables is a RAM area to hold functional variable values.
They could be accessed by host via serial port command,
value operations or on screen Keyboard etc.

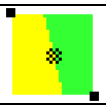
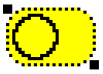
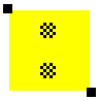
3.1.5 Call Functions
Call Functions are functions (e.g. keyboard, values operations, etc) that could be trigged by a Page start, Touch Key or Virtual Touch Key.

3.2 Display and Functional Relationships



3.3 Page Elements

3.3.1 Action Type Elements

icon	Mnemonic	Name	Descriptions
	**TPK**	Touch Key	Touch Key Element could place inside a page. It will be triggered by user touching on its assigned area - Touch Key assigned area provides visual touch response (e.g. inverse color or show a icon, etc) - It will also report to the host machine about its ID (Page_ID / Key_ID, operated VP_address and value, etc) - Its call functions could provide various kinds of actions (e.g. keyboards, value operations, page jump, etc.)
	**VPK**	Virtual Key	Virtual Key is a non-display element. It could be defined in a PAGE and trigged by a condition like "content of a VP equal to constant value" - Virtual Key assigned area will NOT provide visual response - Its call functions could provide various kinds of actions (e.g. keyboards, value operations, page jump, etc.) - After being triggered, the monitored VP will be cleared as 0 (note: only the PAGE with VPK showing on screen could be trigged)
	**SWP_PG**	Swap Page	Swap Page Element is a full screen element.. It allow the user to jump to another PAGE - Sweep should start on screen area without any other touch element. - It can jump to two different PAGE depends on the horizontal sweep direction (left-to-right or right-to-left) - It will also report to the host machine about its Target Page_ID
	**TPK_RPT**	Touch Key with Repeat	Touch Key with Repeat is an element (similar as TPK) which provide long-press input. - It assigned area provides visual touch response (e.g. inverse color or show a icon, etc) - It only provide VP:=VP+value function - It provide additional on long-press functionality which can provide repeated the VP:=VP+value function (assign negative value can provide minus function) - It will also report to the host machine about its ID (Page_ID / Key_ID, operated VP_address and value, etc)
	**TPK_SW**	Touch Switch	Touch Switch is an element is that provide bit operation - Touch Switch assigned area provides visual touch response (e.g. show a icon, etc) - It will toggle the selected bit of a VP (after the touch 0→1 or 0→1) - It will also report to the host machine about its ID (Page_ID / Key_ID, operated VP_address and value, etc)
	**SDR**	Slider	Slider is an element that provide sliding value input - Slider touch area can be defined as Horizontal or Vertical slide with Absolute or Relative mode options - It does not provide visual response (it may overlay with B16, B32, etc as corresponding visual effect) - It can give an input value between the Content Min/Max value in ratio with sweep - It will also report to the host machine about its ID (Page_ID / Key_ID, operated VP_address and value, etc)
	**SDR2**	Slider 2	Slider 2 is a full screen element (similar as SDR) which can act with two point touch operation - Two point touch should start on screen area without any other touch element. - It can be defined as Horizontal or Vertical slide with Gain options - It does not provide visual response (it may overlay with B16, B32, etc as corresponding visual effect) - It can give an input value between the Content Min/Max value in ratio with sweep It will also report to the host machine about its ID (Page_ID / Key_ID, operated VP_address and value, etc)
	**RNG**	Touch Ring	Touch Ring is an round shape element is that provide circular sliding input - Touch Ring touch area can be refined with the Radius and Angle setting - It does not provide visual response (it may overlay with R16, R32, etc as corresponding visual effect) - It can give an input value between the Content Min/Max value in ratio with the assigned Sweep Angle - It will also report to the host machine about its ID (Page_ID / Key_ID, operated VP_address and value, etc)
	**RNG2**	Touch Ring 2	Touch Ring 2 is a full screen element (similar as RNG) which can act with two point touch operation - Two point touch should start on screen area without any other touch element. - It does not provide visual response (it may overlay with R16, R32, etc as corresponding visual effect) - It can give an input value between the Content Min/Max value with respect to the two point rotation angle. - It will also report to the host machine about its ID (Page_ID / Key_ID, operated VP_address and value, etc)

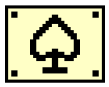
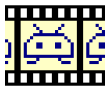
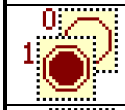
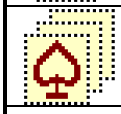
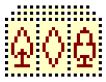
note: Elements overlapped in the PAGE might affect the display result

3.3.2 Character (Alpha Numeric) Type Elements

Icon	Mnemonic	Name	Descriptions
	**STS**	Static String	Static String Element shows text string defined by its properties directly.
	**STR**	String Element	String Element is for displaying VP_STR content - Display the VP_STR content in PAGE with alignment and formatting - String Element will be updated correspondingly in real-time, if the VP_STR content changed.
	**STR_SCR**	Scrolling String	Scrolling String Elements is for displaying VP_STR content (similar as STR) which can provide scrolling effect - Display the VP_STR content in PAGE with alignment and formatting - Scrolling direction could be config as horizontal or vertical with speed options - String Element will be updated correspondingly in real-time, if the VP_STR content changed.
	**N16** **N32** **N64**	Number Element	Number Element is for displaying VP_N16, VP_N32, VP_N64 content - Display the VP_N16, VP_N32 and VP_N64 content in PAGE with alignment and formatting - Number Element will be updated correspondingly in real-time, if the VP_N16, VP_N32 and VP_N64 content changed.
	**TMR**	Timer Display	Timer Display Element links to a timer addressed inside VP_N32. - It Display the timer value with alignment and formatting
	**RTC**	Real Time Clock	Real Time Clock Element shows the Smart LCM internal clock with formatting.

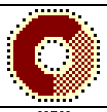
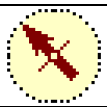
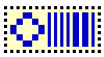
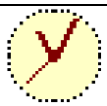
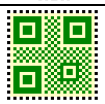
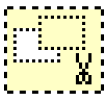
note: Elements overlapped in the PAGE might affect the display result

3.3.3 Image Type Elements

Icon	Mnemonic	Name	Descriptions
	**ICO**	Static Icon	Static Icon Element links to an IMG_ICO and shows it on screen
	**ANI**	Animation Element	Animation Element links to an IMG_ANI and shows it on the screen It is animation speed could be defined.
	**IDX_BIT**	Bit Icon	Bit Icon Element links with one bit value of VP_N16 or VP_N32 which could point to an IMG_ICON and display accordingly with its value
	**IDX**	Indexed Icon	Indexed Icon Element links with VP_N16 or VP_N32 which could point to an IMG_ICON and display accordingly If the value in side the VP is outside the defined max/min rang, it will display nothing
	**I16** **I32**	Decimal Icon	Decimal Icon Element links with VP_N16 and display as decimal formatted icons It should linked with 12 icons for full operation (where the indexed picture sequence is 0~9, dot, minus)
	**TCM**	Tachometer	Tachometer Element link with VP_N16 or VP_N32 which show as a meter display accordingly. If the value in side the VP is outside the defined max/min rang, it will display nothing

note: Elements overlapped in the PAGE might affect the display result

3.3.4 Graphics Type Elements Details

Icon	Mnemonic	Name	Descriptions
	**B16**	Progress Bar	Progress Bar Element links with VP_N16 and display a bar based on its value. The bar length is a percentage of the defined max/min value with the VP_N16 value. An ICON pointer could also be link with it as an option
	**R16, R32**	Progress Ring	Progress Ring element links with VP_N16 or R32 and display a ring based on its value. The ring angle is a percentage of the defined max/min value with the VP value. An ICON pointer could also be link with it as an option
	**HND**	Hand Tachometer	Hand Tachometer Element link with VP_N16 or VP_N32 which show as a meter display accordingly. It can also generate the meter face with marking as well. If the value in side the VP is outside the defined max/min rang, it will show the max or min pointing accordingly.
	**G16**	Graph Element	Graph Element display graphical plot of the VP_G16 content - It provide real time update of the VP_G16 value
	**BP1**	Bitmap Element	Bitmap Element display a mono picture content which store inside VP_BP1 - it show picture in 1bpp - It provide LUT for mapping 0 and 1 to different defined color - It provide real time update of the VP_BP1 value
	**CLK_R**	Round Clock	Round Clock Element shows the Smart LCM internal clock with hands. It can also generate the meter face with marking as well.
	**QRC**	QR Code Element	QR Code Element generates a QR code with a linked VP_STR
	**DPD**	Draw Pad	Draw Pad Element is an element that execute a drawing function that store inside VP_N16 which point by its properties VP_address. Once the command value updated, the drawing will be updated in real time. ICON can also could be shown with by command.

note: Elements overlapped in the PAGE might affect the display result

3.4 Page, IMAGE Resource and VP Variables

3.4.1 Page and IMAGE Resource

Icon	Mnemonic	Name	Descriptions
	**PAGE**	Page	Page is the basic unit of display. It links to elements and background Image(background color) predefined in Editor
	**IMG_BKG**	Background Image	Background Image is one of the Picture Resources. Picture files could be imported into Editor as Background Image. It could also be used (automated crop) as TPK touch down effect image.
	**IMG_ICO**	Icon	Icon is one of the Picture Recourses. Icon files could be imported in to the Editor and linked by various elements. (e.g. TPK ,IDX ,I32/16 ,B16 , ICO, etc)
	**IMG_ANI**	Animation	Animation is one of the Picture Resources It is a series of images file which imported into the Editor and linked by ANI element to play.

Note: PAGEs and IMAGEs are store inside Smart LCD Flash memory.

3.4.2 VP Variable

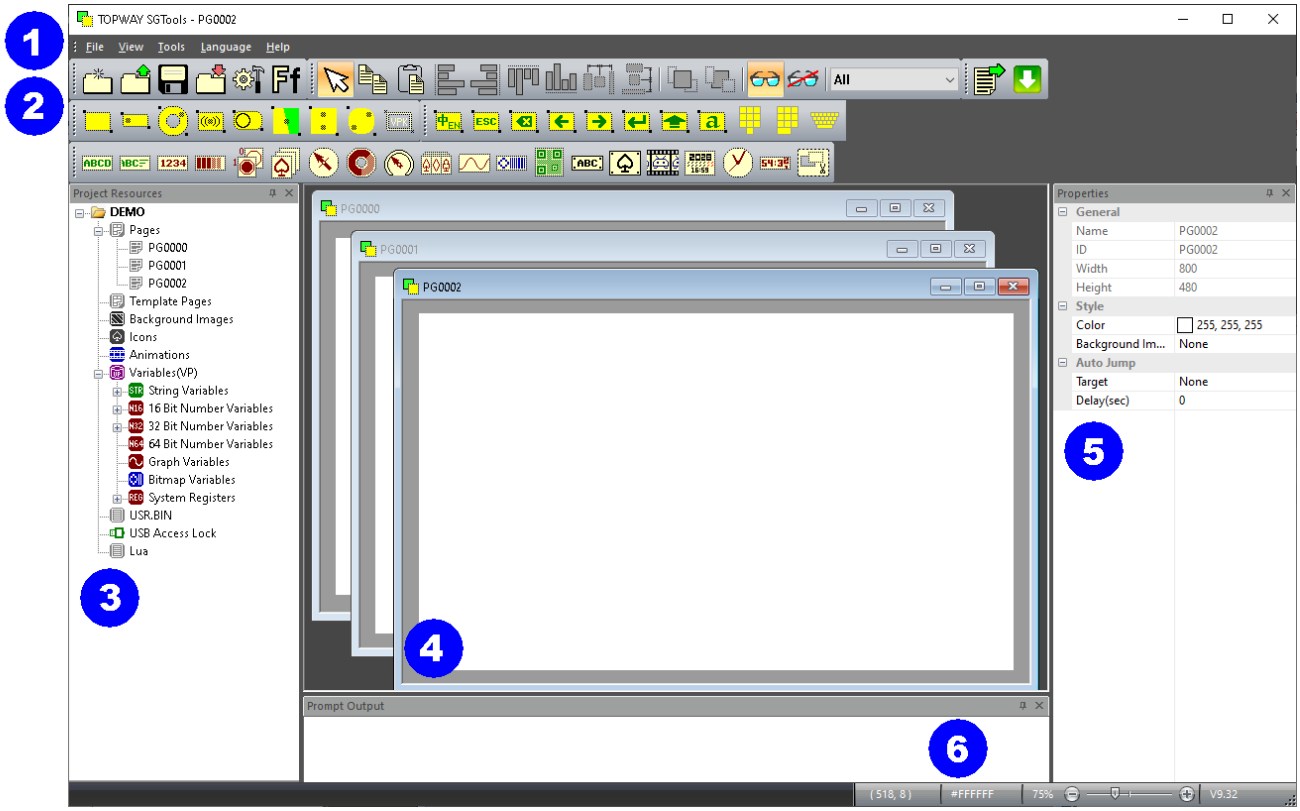
Icon	Mnemonic	Name	Descriptions
	**VP_STR**	String Variable	String Variable with 128bit length for character strange storage (note: content must end with "\0') The memory space could be allocated in Editor, and link and display by elements like STR, QR code, etc.
	**VP_N16**	16bit Integer Variable	range: -32767~32767 The memory space could be allocated in Editor, and linked and display by elements like N16, IDX, I16, VPK, etc.
	**VP_N32**	32bit Integer Variable	range: -2147483647 ~ 2147483647 The memory space could be allocated in Editor, and linked and display by elements like N32, I32, etc.
	**VP_N64**	64bit Integer Variable	range: -9223372036854775807 ~ 9223372036854775806 (-9223372036854775808 (0x8000 0000 0000 0000) is reserved value) (9223372036854775807 (0x7FFF FFFF FFFF FFFF) is reserved value) The memory space could be allocated in Editor, and linked and display by elements like N64, etc.
	**VP_G16**	16bit Graph Variable	groups of 16bit integer values for graphical-curve display data storage Range: -32767 ~32767 (-32768d (0xFFFF) is reserved value) The memory space could be allocated in Editor, and linked/display by elements G16, etc
	**VP_BP1**	Bitmap Variable	groups of picture data in 1bpp The memory space could be allocated in Editor, and linked/display by element BP1
	**VP_REG**	Register Variable	Special Register Variable for some of the system configuration. Timer Control, RTC Control, Buzzer Control, Backlight Control, Screen Saver Control, Code Page Control, Country Code Control.
	**VP_TMR**	Timer Variable	Timer counter inside VP_N32

Note: VP variable is inside the Smart LCD RAM.

4 SGTools

UI designs are implemented under usage of **SGTools** allowing designs with zero coding. It dramatically simplifies and speeds up the whole product design process.

4.1 SGTools Layout



① Menu	Provide basic software operation, View options, tools options, etc
② Tools bar	There are four type of tools - file tools for project open, save, compile output, etc - alignment and display filter tools - display elements tools - compile and download tools
③ Project Resources window	Resource windows (right click on the resources) - built new page, - import pictures (IMG_BKG, IMG_ICO, IMG_ANI) - allocated VP variable (VP_N16, VP_N32, VP_N64) - user file, etc... (*1)
④ Working Area	The working area for composing the display page. User could build element onto the page.
⑤ Properties Window	Display the selected element properties or Page properties
⑥ Prompt Output Window	Prompt output window show the compiling information, warning and error information

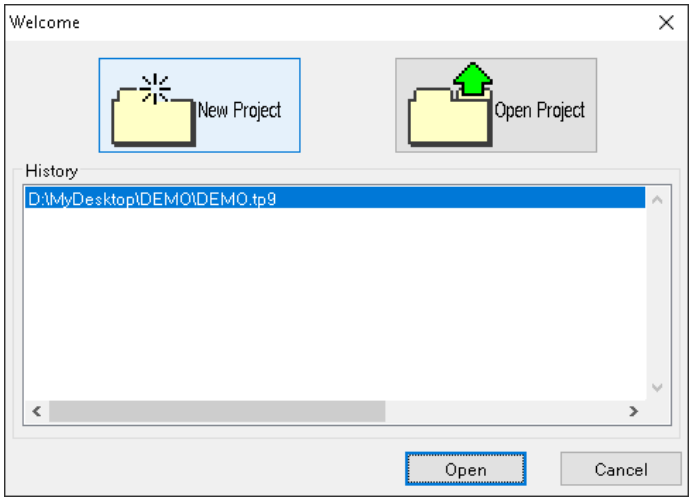
Note: Lua feature available on some of the model only

4.2 General Operations

Please refer to the "Examples" section for general operation examples

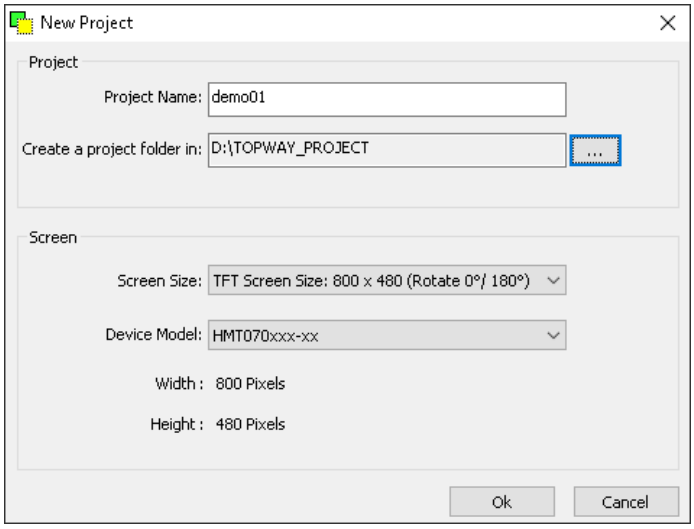
4.3 Editor Menu

4.3.1 Start



At the start up of the SGTools,
It will pop up a Welcome interface for use to select the previous Edited Project, Create a New Project or Open Project somewhere else.

4.3.2 New Project (Menu - File - New Project)



For New Project, user can type in the project name and select the folder for that project.

It is important to ensure to select the correct screen size that match the target Smart LCD.
(0°/180° for landscape projects)
(90°/270° for portrait projects)

After click the OK button, SGTools will create two folders in to the Project Folder.

In this case, it creates
D:\TOPWAY_PROJECT\demo01
D:\TOPWAY_PROJECT\demo01.tmp
(.tmp folder is the working folder)

4.3.3 Open Project (Menu - File - Open Project)

Open Project look for the project folder with .tpj file inside

4.3.4 Save (Menu - File - Save)

Save the current project

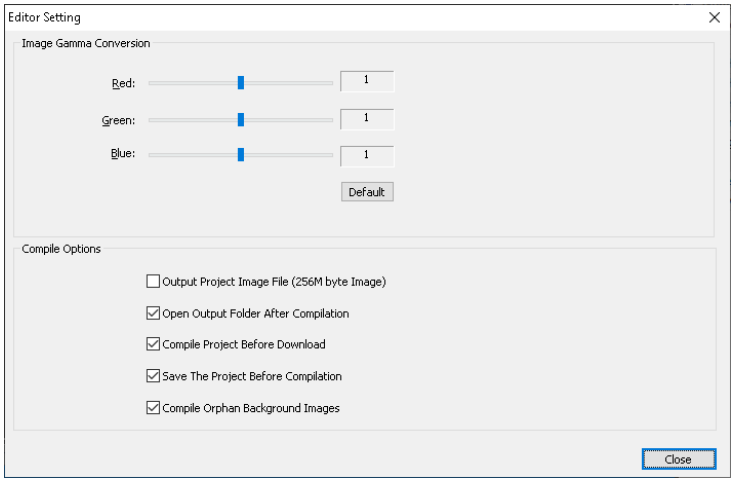
4.3.5 Save As (Menu - File - Save As)

Save the current project with another name

4.3.6 Close Project (Menu - File - Close)

Close the current project

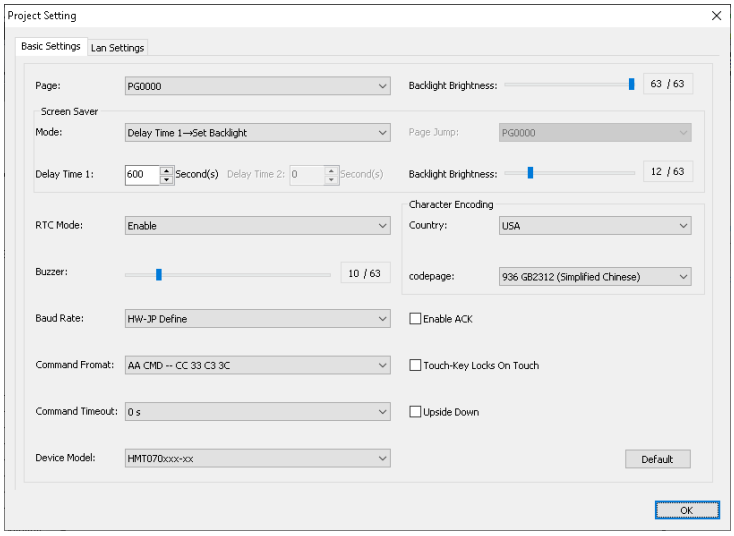
4.3.7 Editor Options (Menu - Tools - Options)



In this window, user can

- fine adjust all the image color tone during compile by setting Image Gamma
- Select Compile Options
- Output Project Image File
  (see "Download the display project" section for details)
- Open Output folder after compile
- Compile Project before download
- Save the project before compile

4.3.8 Project Setting (Menu - Tools - Project Setting)

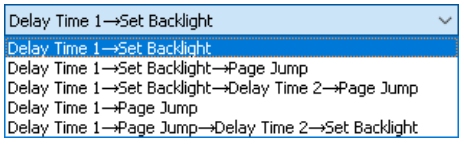


In this window, user can set
- "Start Page" to show at power on
- power on "Backlight Brightness" level
- select one of the "Screen Saver Mode" (*1)
- set "Buzzer" beeping length (0=no sound)
- set RTC (real time clock) operation mode (*2)
- set power on "RS232 Baudrate"
- set "Command Format" (*3)
- set "Command Timeout" (0=no timeout)
- set power on "Country Code" for ASCII display
- set power on "Code Page" for ext. char & decoding
- set "Enable ACK" to provide command responses
  ":>" : ready for new command
  "!>" : command error
- set "Touch-Key lock on touch" to
  lock the touch down key and action on release
- set "Upside-down" to show the generate 180 deg rotated display content

Note:

*1. Screen Saver Mode

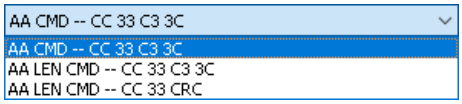
User could select one of them with related parameter.



*2. RTC mode

*3. Command Format

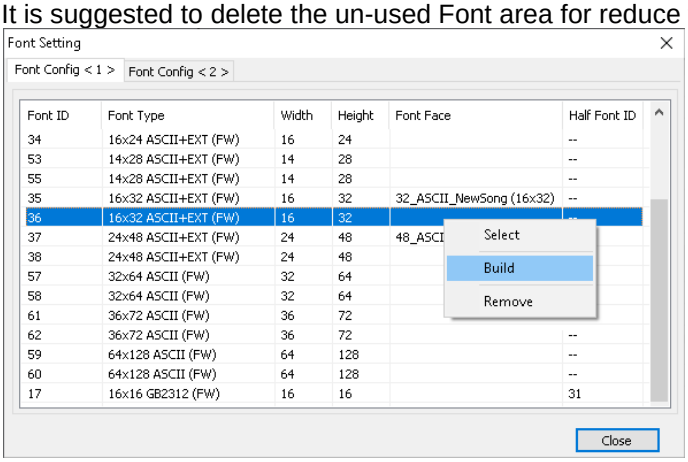
Three kinds of Command Format are aviable.



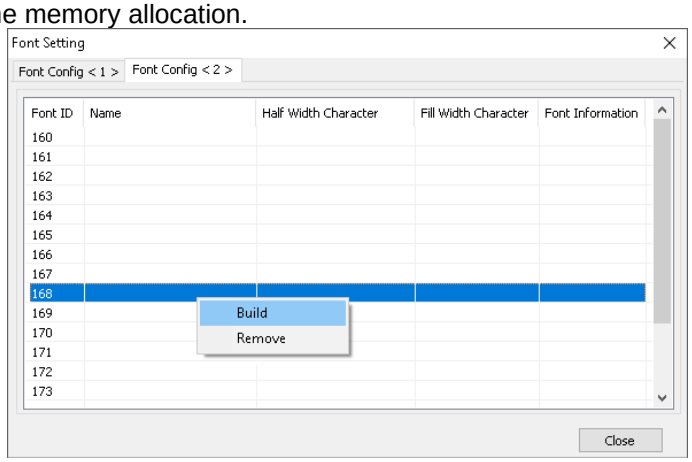
RTC Mode	Operating with RTC battery	Operating without RTC battery	Descriptions
Enable	1st power up takes 6s; next power up takes 1s	every power up takes 6s	RTC run with correct init
Disable	every power up takes 1s	every power up takes 1s	RTC stop
Engineering Mode	every power up takes 1s	every power up takes 1s	RTC run without init RTC might not run correctly It is NOT suggested for production setting

4.3.9 Font Setting (Menu - Tools - Font Setting)

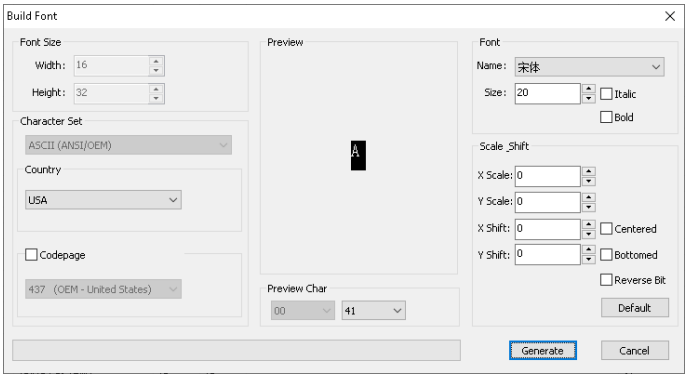
There are 2 sections of Fonts.
Font Config <1>, the Font Width and Height are fixed and mainly for ASCII Char.
(with some default font, vary by model)
Font Config <2>, provide more free option about Size and Decoding selection. (without font by default)
Right click on the font table, select "build" could build the font with several options.
It is suggested to delete the un-used Font area for reduce the memory allocation.



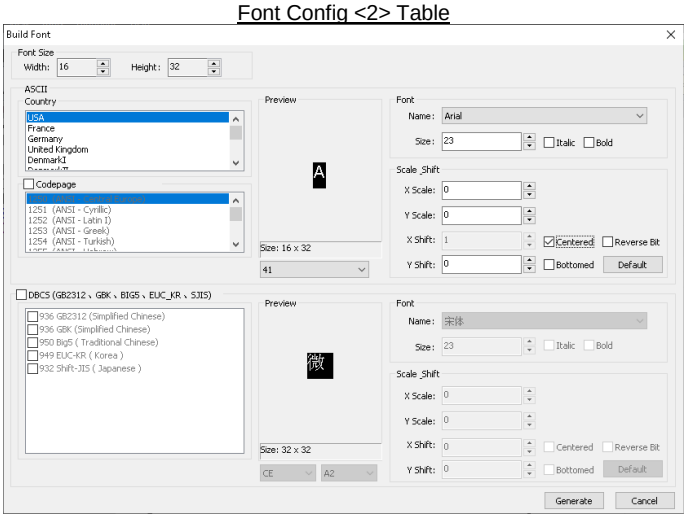
Font Config <1> Table



Font Config <2> Table



Build Font <1>

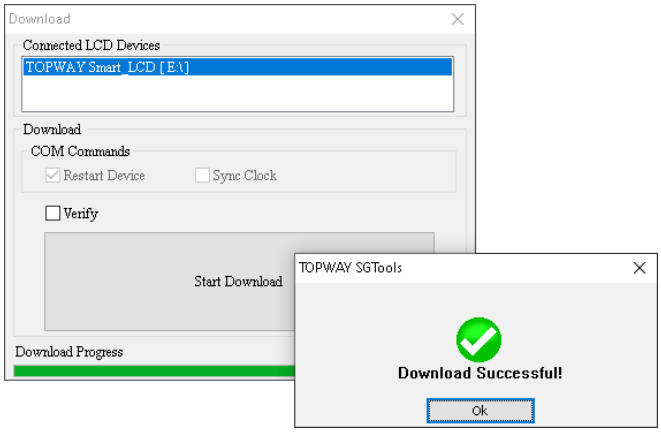


Build Font <2>

4.3.10 Built Project Files (Menu - Tools - Built Project Files)

After finish the layout, "Built Project Files" will compile all the resource and font etc in to a set of files. It could download or copy to the Smart LCD at any time.
It will pop-up the output folder inside the Project Folder

4.3.11 Download to Module (Menu - Tools - Download to Module)

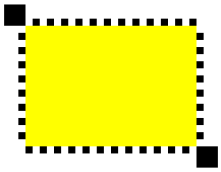


After connect the Smart LCD USB to user PC, the Smart LCD will appear as a removable drive. Using "Download to Module" could copy the compiled project file into the Smart LCD.

Note. Graphics Editor will refuse to download without Smart LCD

4.4 Elements Configurations

4.4.1 Touch Key (TPK)



Properties	
General	
Name	Touch Key
ID	0
X	235
Y	23
Width	100
Height	100
Visual Effect	
On Press Down	None
Icon/BgImg	None
Target	
Target Page	None
Call	
Call Keyboard	None
Call Operation	None
Call Key	None
Content	
VP Address	None
Compile As	Auto
Data Type	Signed
Return	
Return Value	None
Properties Control	
Enable VP	None

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Visual Effect
- On Press Down options are
  None, Inverse Color, Show Icon or Show Cropped BgImg
- Icon/BgImage base on the above option
  select a Background Image or an Icon for the visual effect.

Target
- Target Page is for page jump function after touch

Call
- Call Keyboard is for call up a keyboard after touch
- Call Operation is for simple calculation after touch
- Call Key is for building PIP_Keyboard

Content
- VP Address is for calculation or Keyboard input result
- Compile As can force VP variable work different than default (Auto)
  VP_N16 (two successive VP_N16) work as VP_N32
  VP_N32 (first two byte of VP_N32) work as VP_N16
  VP_N64 (first two byte of VP_N64) work as VP_N16
  VP_N64 (first four byte of VP_N64) work as VP_N32
- Data type should be signed by default (*1)

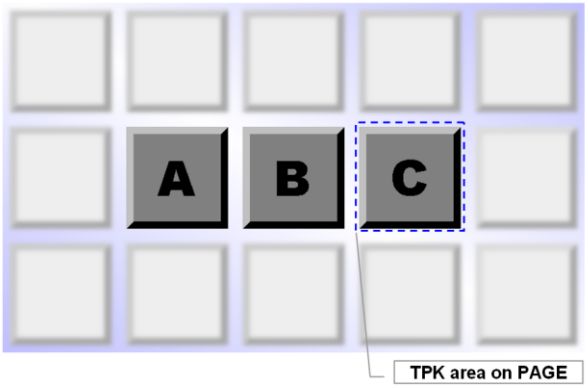
Return
- Return Value for select type of notification to host during touch
  It can notify the Host via Touch Key ID Response code (0x78) (*3)
  none, no notification (by default)
  Up PGID + TPKID, send on TPK release
  Down PGID + TPKID, send on TPK touch
  Down Up PGID + TPKID, send on TPK touch and release

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value

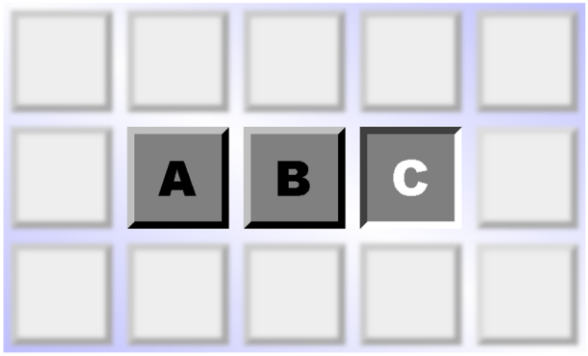
Note:
*1. Please also see "TPK, VPK Call Functions" section for Call Features
*2. TPK support touch and move, action on release. It could change to "Touch-Key lock on touch" in "Project Setting".
*3. Please also see "Command" section for details

*4. TPK Visual Effect - Inverse Color Operation Idea

PAGE's Background Image



Display Result of Touching the TPK on 'C'

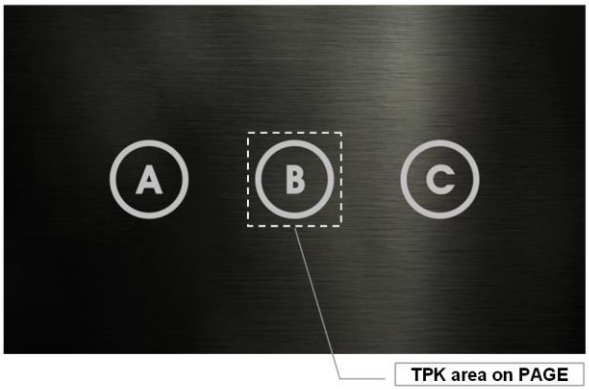


Properties Highlights

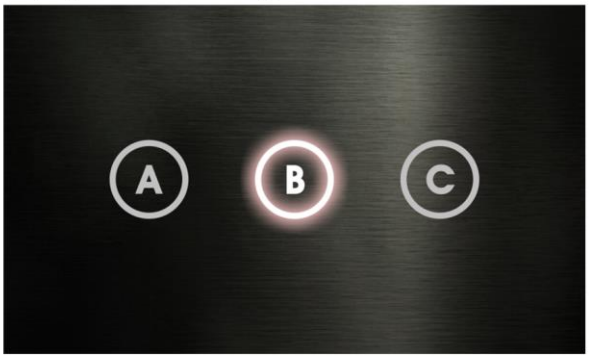
On Press Down	Inverse
Icon/BgImage	--

*5. TPK Visual Effect - Show Cropped BgImage Operation Idea

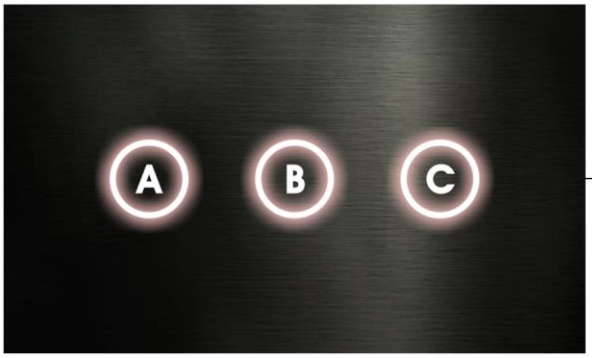
PAGE's Background Image



Display Result of Touching the TPK on 'B'



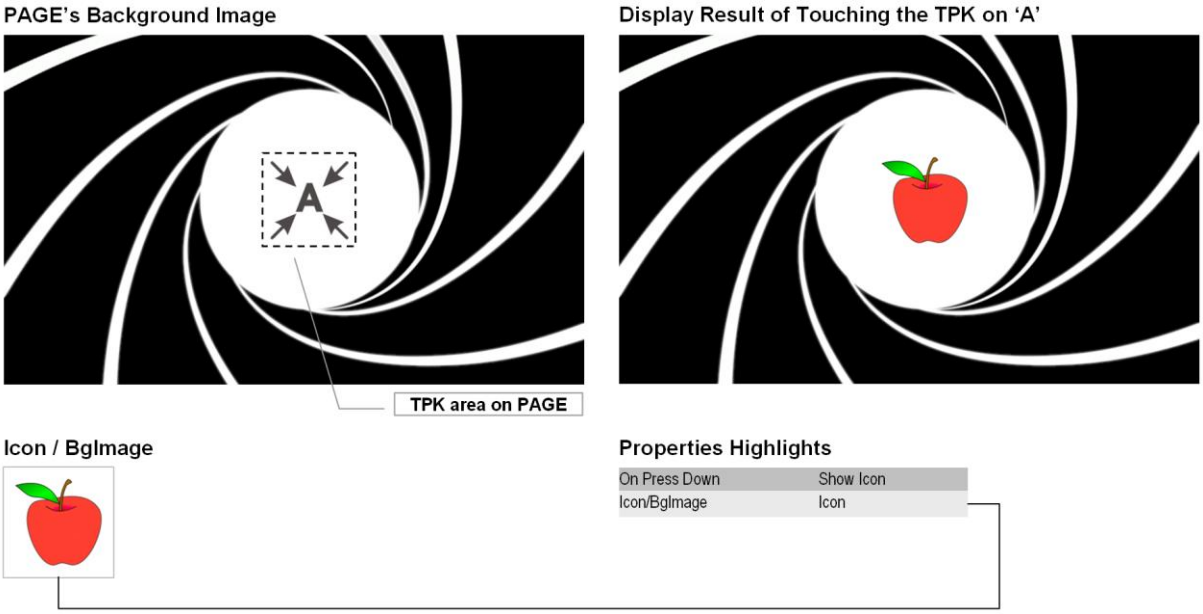
Icon / BgImage



Properties Highlights

On Press Down	Show Cropped BgImg
Icon/BgImage	Background Image

*6. TPK Visual Effect - Show Icon Operation Idea



*7. Floating point value could only be operate with N32 (or Compile As N32) and PIP Number Keyboard

4.4.2 Virtual Key (VPK)

Properties	
General	
Name	Virtual Key
ID	0
X	137
Y	163
Width	50
Height	50
Condition	
Monitor-VP	None
Monitor-Value	1
Target	
Target Page	None
Call	
Call Keyboard	None
Call Operation	None
Call Key	None
Content	
VP Address	None
Compile As	Auto
Data Type	Signed
Properties Control	
Enable VP	None

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels
- This element's X, Y, Width, Height are not related to its functionality.

Condition
- Monitor-VP is a VP to trigger this Virtual Key
- Monitor-Value is the Value for trigging this element

Target
- Target Page is for page jump function after touch

Call
- Call Keyboard is for call up a keyboard after touch
- Call Operation is for simple calculation after touch
- Call Key is for building PIP_Keyboard

Content
- VP Address is for calculation or Keyboard input result
- Compile As can force VP variable work different than default (Auto)
  VP_N16 (two successive VP_N16) work as VP_N32
  VP_N32 (first two byte of VP_N32) work as VP_N16
  VP_N64 (first two byte of VP_N64) work as VP_N16
  VP_N64 (first four byte of VP_N64) work as VP_N32
- Data type should be signed by default (*1)

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value

Note:
*1. Please also see "TPK, VPK Call Functions" section for Call Features
*2. Floating point value could only operate with N32
(or Compile As N32) and PIP Number Keyboard

4.4.3 Swap Page (SWP_PG)

Properties

General	
Name	Swap_Page
ID	0
X	98
Y	76
Width	50
Height	50
Style	
Sweep Thresh...	400
Target	
Left Side Page	None
Right Side Page	None
Return	
Return Value	None
Properties Control	
Enable VP	None

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels
- This element's X, Y, Width, Height are not related to its functionality.

Style
- Sweep Threshold defines the sweeping distance which start the feature
  Smaller value makes it more easy to be trigger
  Bigger value makes it slower response to the action

(Sweep should start on screen area without any other touch element)

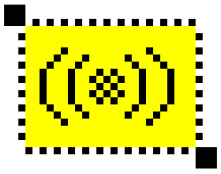
Target
- Left Side Page is the target page that pull-out form left side while the touch sweeping form left to right
- Right Side Page is the target page that pull-out form right side while the touch sweeping form right to left

Return
- Return Value for select type of notification to host during touch
  It can notify the Host via Touch Key ID Response code (0x32)
  none, no notification (by default) (*1)
  Target PGID, send on sweep release

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value

Note:
*1. Please also see "Command" section for details

4.4.4 Touch Key with Repeat (TPK_RPT)



Properties	
General	
Name	TPK_Repeat
ID	1
X	50
Y	50
Width	100
Height	100
Visual Effect	
On Press Down	None
Icon/BgImg	None
Style	
Mode	Down Action
Long Press Ti...	1000
Long Press	
Cycle(ms)	300
Value	20
Short Press	
Value	10
Content	
VP Resource	VP_N16
VP Address	None
Min Value	1
Max Value	100
Return	
Up,PGID+TPKID	False
Down,PGID+T...	False
Up,VP Addres...	False
Down,VP Add...	False
Cycling,VP Ad...	False
Up,VP Addres...	False
Down,VP Add...	False
Properties Control	
Enable VP	None
Status VP	None

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Visual Effect
- On Press Down options are
  None, Inverse Color, Show Icon or Show Copped Image
- Icon/BgImage base on the above option
  select a Background Image or an Icon for the visual effect.

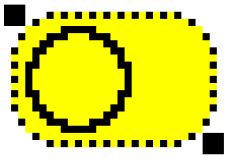
Style
- Mode is touch action moment
  Down Action will trigger the Short Press feature while touch down
  Up Action will trigger the Short Press feature while touch up
- Long Press Time is the time for Long Press feature to be trigger
- Long Press Cycle is the repeat action cycle time for long Press
- Long Press Value is operation (VP:=VP+value) value for Long Press
- Short Press Value is the operation (VP:=VP+value) value for Short Press
  (negative value for minus operation)

Content
- VP Resource is the type of VP to be used
- VP Address is the VP for the operation
- Min Value is the bottom value that will be limited by the operation
- Max Value is the top value that will be limited by the operation

Return
- Return Value / VP / Status VP for select type of notification to host
  (multiple notification can be enable)
- Up, PGID+TPKID
- Down, PGID+TPKID
- Up, VP Address+Value
- Down, VP Address+Value
- Cycling, VP Address+Value
- Up, Vp Address+Status Value
- Down, Vp Address+Status Value

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Status VP is none by default
  Select a VP for storing the real time status
  0=no touch, 1=touch down, 2= long press

4.4.5 Touch Key (TPK)



General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Properties

General	
Name	TPK_Switch
ID	3
X	474
Y	80
Width	100
Height	100
Style	
Mode	Down Action
Content	
VP Resource	VP_N16
VP Address	None
Bit Position	0
Display Effect	Show Icon
Icon/BgImg	None
Return	
Return Value	
Up,PGID+TPKID	False
Down,PGID+TP...	False
Return VP	
Up,VP Address+...	False
Down,VP Addre...	False
Cycling,VP Addr...	False
Return "Status VP"	
Up,VP Address+...	False
Down,VP Addre...	False
Properties Control	
Enable VP	None
Status VP	None

Style
- Mode is touch action moment
  Down Action will trigger the Short Press feature while touch down
  Up Action will trigger the Short Press feature while touch up

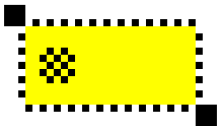
Visual Effect
- Display Effect options are
  Show Icon or Show Copped Image
- Icon/BgImage base on the above option
  select a Background Image or an Icon for the visual effect.

Content
- VP Resource is the type of VP to be used
- VP Address is the VP for the operation
- Bit Position is the bit to be triggered (inversed) in the VP address

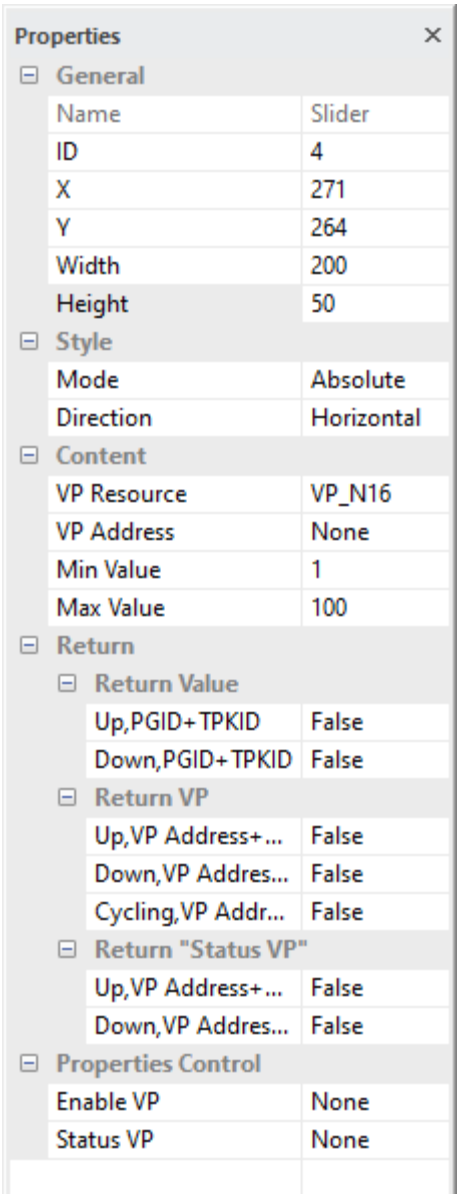
Return
- Return Value / VP / Status VP for select type of notification to host
  (multiple notification can be enable)
- Up, PGID+TPKID
- Down, PGID+TPKID
- Up, VP Address+Value
- Down, VP Address+Value
- Cycling, VP Address+Value (reserved)
- Up, Vp Address+Status Value
- Down, Vp Address+Status Value

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Status VP is none by default
  Select a VP for storing the real time status
  0=no touch, 1=touch down

4.4.6 Slider (SDR)



General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels



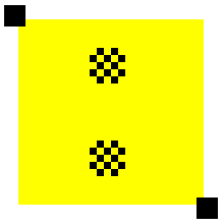
Style
- Mode is touch action way
  Absolute=give the value direct proportion to the element area
  Relative=give more fine value by multiple sliding action
- Direction is for the slider sense direction
  Horizontal=horizontal sliding
  Vertical=vertical sliding

Content
- VP Resource is the type of VP to be used
- VP Address is the VP for the operation
- Min Value is the bottom value that will be limited by the operation
- Max Value is the top value that will be limited by the operation

Return
- Return Value / VP / Status VP for select type of notification to host
  (multiple notification can be enable)
- Up, PGID+TPKID
- Down, PGID+TPKID
- Up, VP Address+Value
- Down, VP Address+Value
- Cycling, VP Address+Value
- Up, Vp Address+Status Value
- Down, Vp Address+Status Value

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Status VP is none by default
  Select a VP for storing the real time status
  0=no touch, 1=touch down

4.4.7 Slider 2 (SDR2)



Properties	
General	
Name	Slider_2
ID	5
X	629
Y	70
Width	50
Height	50
Style	
Direction	Horizontal
Gain(1/1000)	2000
Content	
VP Resource	VP_N16
VP Address	None
Min Value	1
Max Value	100
Return	
Return VP	
Up,VP Address+V...	False
Down,VP Address...	False
Cycling,VP Addre...	False
Return "Status VP"	
Up,VP Address+S...	False
Down,VP Address...	False
Properties Control	
Enable VP	None
Status VP	None

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels
- This element's X, Y, Width, Height are not related to its functionality.

Style
- Direction is for the two pint sliding sense direction
  Horizontal=horizontal sliding
  Vertical=vertical sliding
- Gain defines the two pint sliding amplification
  Smaller value make the move-to-value gain less
  Bigger value make the move-to-value gain more

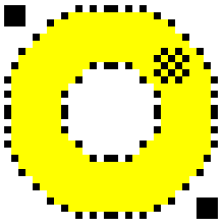
(Sweep should start on screen area without any other touch element)

Content
- VP Resource is the type of VP to be used
- VP Address is the VP for the operation
- Min Value is the bottom value that will be limited by the operation
- Max Value is the top value that will be limited by the operation

Return
- Return Value / Status VP for select type of notification to host
  (multiple notification can be enable)
- Up, VP Address+Value
- Down, VP Address+Value
- Cycling, VP Address+Value
- Up, Vp Address+Status Value
- Down, Vp Address+Status Value

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Status VP is none by default
  Select a VP for storing the real time status
  0=no touch, 1=touch down

4.4.8 Touch Ring (RNG)



Properties	
General	
Name	Ring
ID	6
X	512
Y	218
Width	100
Height	100
Style	
Mode	Absolute
Direction	Clockwise
External Radius	50
Internal Radius	30
Start Angle	0
Sweep Angle	360
Content	
VP Resource	VP_N16
VP Address	None
Min Value	1
Max Value	100
Return	
Return Value	
Up,PGID+TPKID	False
Down,PGID+TPKID	False
Return VP	
Up,VP Address+Va...	False
Down,VP Address...	False
Cycling,VP Addres...	False
Return "Status VP"	
Up,VP Address+St...	False
Down,VP Address...	False
Properties Control	
Enable VP	None
Status VP	None

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Mode is touch action way
  Absolute=give the value direct proportion to the element area
- Direction is for the slider direction Clockwise or Counterclockwise
- External Radius define the outer boundary of the sensing ring (*1)
- Internal Radius define the inner boundary of the sensing ring (*1)
- Start Angle is the angular location of the min value
- Sweep Angle is the effective angular area
  that relatively begin form the Start Angle for sensing

(the above 4 value define the boundary of the sensing area)

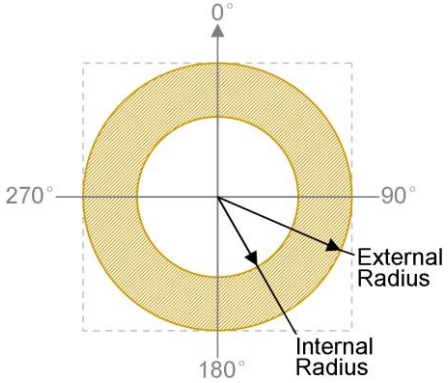
Content
- VP Resource is the type of VP to be used
- VP Address is the VP for the operation
- Min Value is the bottom value that will be limited by the operation
- Max Value is the top value that will be limited by the operation

Return
- Return Value / VP / Status VP for select type of notification to host
  (multiple notification can be enable)
- Up, PGID+TPKID
- Down, PGID+TPKID
- Up, VP Address+Value
- Down, VP Address+Value
- Cycling, VP Address+Value
- Up, Vp Address+Status Value
- Down, Vp Address+Status Value

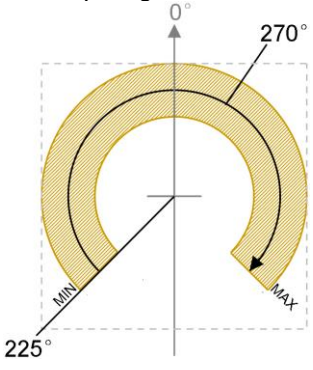
Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Status VP is none by default
  Select a VP for storing the real time status
  0=no touch, 1=touch down

Note:

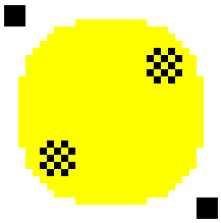
*1. Radius and Angle Definition



*2. example
Direction = Clockwise
Start Angle = 255°
Sweep Angle = 270



4.4.9 Touch Ring 2 (RNG2)



Properties

General	
Name	Ring_2
ID	7
X	87
Y	262
Width	50
Height	50
Style	
Gain(1/1000)	2000
Content	
VP Resource	VP_N16
VP Address	None
Min Value	1
Max Value	100
Return	
Return VP	
Up,VP Address+V...	False
Down,VP Address...	False
Cycling,VP Addre...	False
Return "Status VP"	
Up,VP Address+St...	False
Down,VP Address...	False
Properties Control	
Enable VP	None
Status VP	None

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels
- This element's X, Y, Width, Height are not related to its functionality.

Style
- Gain defines the two pint sliding amplification
  Smaller value makes the move-to-value gain less
  Bigger value makes the move-to-value gain more

(Sweep should start on screen area without any other touch element)

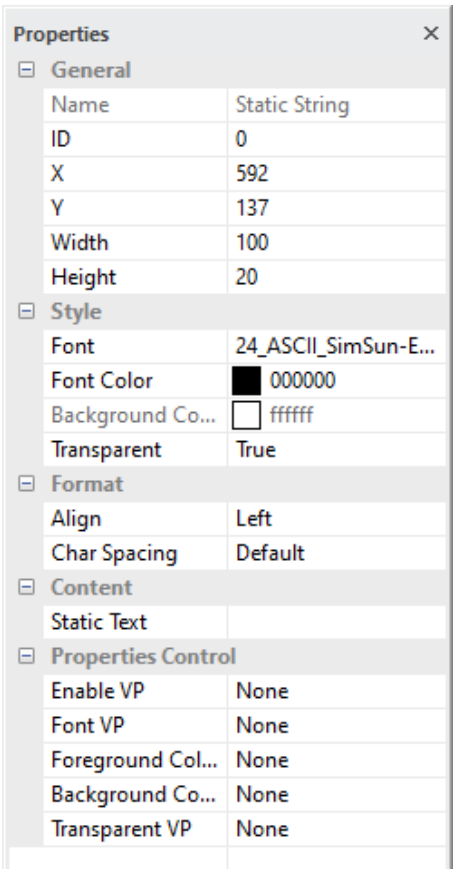
Visual Effect
- On Press Down options are
  None, Inverse Color, Show Icon or Show Copped Image
- Icon/BgImage base on the above option
  select a Background Image or an Icon for the visual effect.

Content
- VP Resource is the type of VP to be used
- VP Address is the VP for the operation
- Min Value is the bottom value that will be limited by the operation
- Max Value is the top value that will be limited by the operation

Return
- Return Value / Status VP for select type of notification to host
  (multiple notification can be enable)
- Up, VP Address+Value
- Down, VP Address+Value
- Cycling, VP Address+Value
- Up, Vp Address+Status Value
- Down, Vp Address+Status Value

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Status VP is none by default
  Select a VP for storing the real time status
  0=no touch, 1=touch down

4.4.10 Static String (STS)



General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

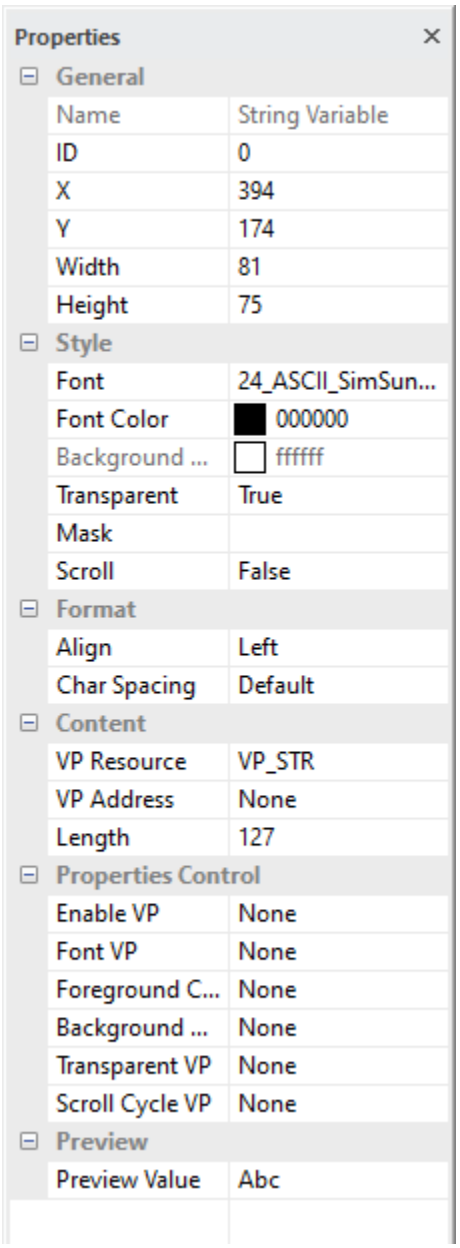
Style
- Font face could be selected at here
- Font Color is the font face color
- Background Color only available with Transparent disable
- Transparent = true, disable the Background Color box to be show

Format
- Align could be: Left / Right / Center
- Char spacing option: Default, Shrink

Content
- Static Test is the text going to be display

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Font VP is none by default (using the above selected font)
  Select a VP for real time font ID change
  VP value will copy the above ID at power-on.
- Foreground color VP is none by default (using the above selected color)
  Select a VP for real time foreground color adjustment
  VP value will copy the above selected color at power-on.
- Backgound color VP is none by default (using the above selected color)
  Select a VP for real time background color adjustment
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enable by a non-zero value or disable by a zero

4.4.11 String Element (STR)



General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Font face could be selected at here
- Font Color is the font face color
- Background Color only available with Transparent disable
- Transparent = true, disable the Background Color box to be show
- Mask could be any char to "represent" as the char
  (Keep empty for normal operation)
- Scroll = false as default
  true = convert itself as Scrolling String element (see STR_SCR for details)

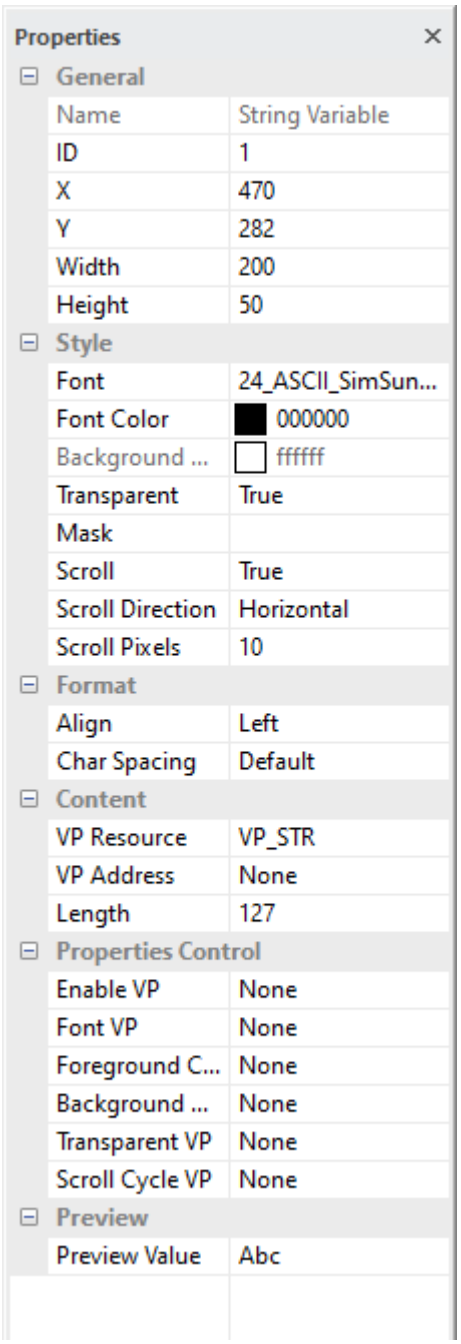
Format
- Align could be:
  Left / Right / Center / Multi-line Left / Multi-line Right / Multi line center
- Char Spacing option: Default, Shrink

Content
- VP Resource is the type of VP hold the text content (VP_STR by default)
- VP Address is the VP that hold the string content
  (all the string should be end with \0 (0x00))
- Length is no. of Char going to display

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Font VP is none by default (using the above selected font)
  Select a VP for real time font ID change
  VP value will copy the above ID at power-on.
- Foreground color VP is none by default (using the above selected color)
  Select a VP for real time foreground color adjustment
  VP value will copy the above selected color at power-on.
- Backgound color VP is none by default (using the above selected color)
  Select a VP for real time background color adjustment
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero

Preview
- Preview Value is for simulation in Graphics Editor environment.

4.4.12 Scrolling String Element (STR_SCR)



General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Font face could be selected at here
- Font Color is the font face color
- Background Color only available with Transparent disable
- Transparent = true, disable the Background Color box to be show
- Mask could be any char to "represent" as the char
  (Keep empty for normal operation)
- Scroll = true as default
  false = convert itself as String element (see STR for details)
- Scroll Direction can be Horizontal or Vertical
- Scroll Pixels defined the text scrolling speed
  0=no scroll

Format
- Align could be:
  Left / Right / Center / Multi-line Left / Multi-line Right / Multi line center
- Char Sacing option: Default, Shrink

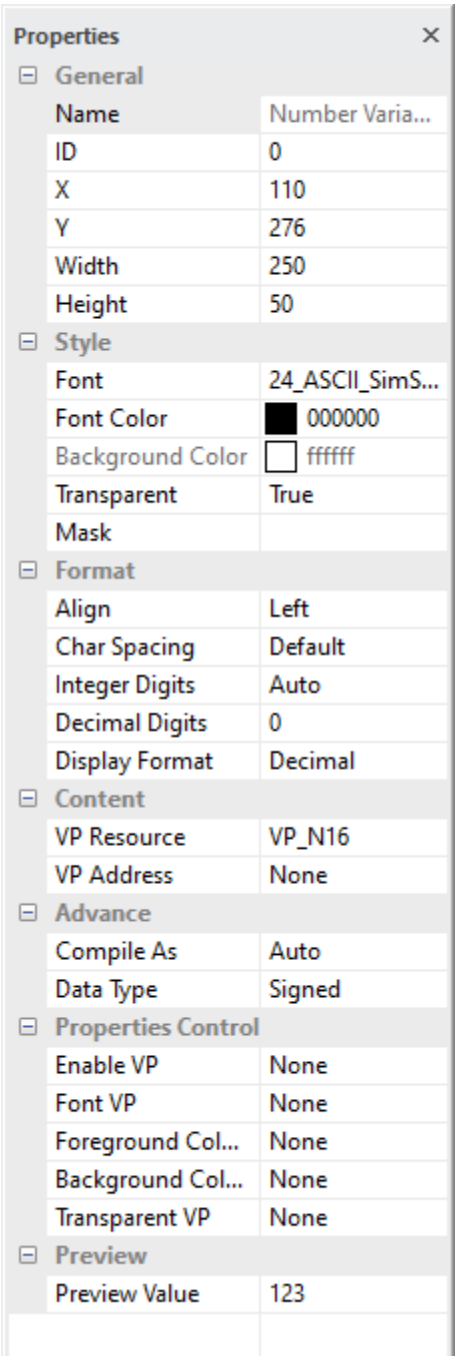
Content
- VP Resource is the type of VP hold the text content (VP_STR by default)
- VP Address is the VP that hold the string content
  (all the string should be end with \0 (0x00))
- Length is no. of Char going to display

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Font VP is none by default (using the above selected font)
  Select a VP for real time font ID change
  VP value will copy the above ID at power-on.
- Foreground color VP is none by default (using the above selected color)
  Select a VP for real time foreground color adjustment
  VP value will copy the above selected color at power-on.
- Backgound color VP is none by default (using the above selected color)
  Select a VP for real time background color adjustment
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero
- Scroll Cycle VP is none by default (using the default speed)
  Select a VP for real time scroll cycle speed control
  0=reserved, 1=fastest, 1000=slowest

Preview
- Preview Value is for simulation in Graphics Editor environment.

4.4.13 Number Elements (N16, N32, N64)

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels



Style
- Font face could be selected at here
- Font Color is the font face color
- Background Color only available with Transparent disable
- Transparent = true, disable the Background Color box to be show
- Mask could be any char to "represent" as the char
  (Keep empty for normal operation)

Format
- Align could be: Left / Right / Center
- Char Spacing option: Default, Shrink
- Integer Digits is the no. of digit on left side of the dot (default Auto) (*1)(*2)
- Decimal Digits is the no of digit on right side of the dot (*1)(*2)
- Display Format option: Decimal, Hexadecimal

Content
- VP Resource is the type of VP hold the content (VP_N16 by default)
- VP Address is the VP that hold the value

Advance
- Compile As can force VP variable work different than default (Auto)
  VP_N16 (two successive VP_N16) work as VP_N32
  VP_N32 (first two byte of VP_N32) work as VP_N16
  VP_N64 (first two byte of VP_N64) work as VP_N16
  VP_N64 (first four byte of VP_N64) work as VP_N32
- Data type as signed by default for the decoding of the RAM content
  It could also present unsigned value or floating value, too
  (please make sure the value in the VP variable appropriate for the type)

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Font VP is none by default (using the above selected font)
  Select a VP for real time font ID change
  VP value will copy the above ID at power-on.
- Foreground color VP is none by default (using the above selected color)
  Select a VP for real time foreground color adjustment
  VP value will copy the above selected color at power-on.
- Backgound color VP is none by default (using the above selected color)
  Select a VP for real time background color adjustment
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero

Preview
- Character is for simulation in Graphics Editor environment.

Note:

*1. Integer Digits / Decimal Digits Formatting Examples

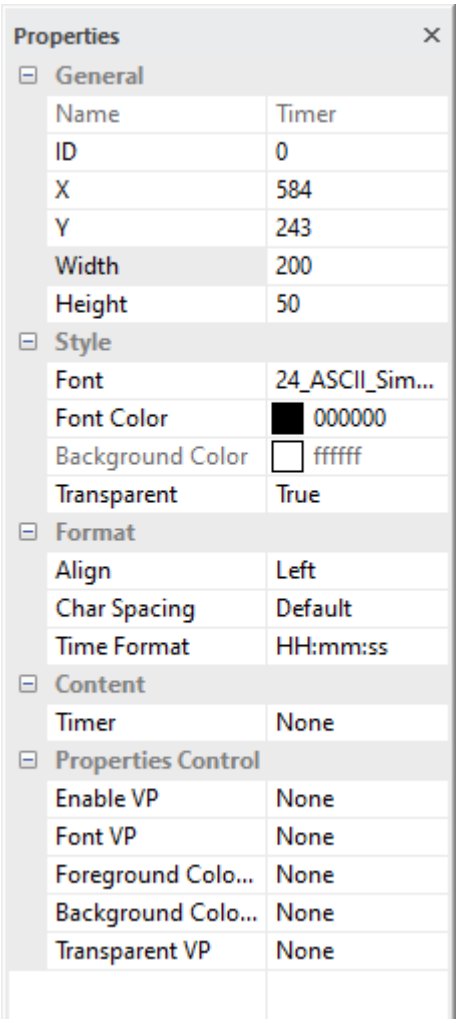
VP's value (10's)	Integer Digits	Decimal Digits	Display Result	Descriptions
15	Auto	3	0.015	Decimal Digits = 3, zero prefix is added. Integer Digits = Auto, a minimal 0 is shown
23762	Auto	3	23.762	Decimal Digits = 3, least 3 digit as decimal value Integer Digits = Auto, unlimited Integer digit
5629	5	1	00562.9	Decimal Digits = 1, least 1 digit as decimal value Integer Digits = 5, zero prefix is added
-87913	3	2	-879.13	Decimal Digits = 2, two decimals Integer Digits = 3, show all the rest as integer Negative signed value use ”-“ as prefix
-13277	2	2	-99.99	The VP's value over the maximum value that could be display, the max value (within the display format) shown with sign.
1758	3	0	999	The VP's value over the maximum value that could be display, the max value (within the display format) shown.

*2. Float type value might rounded or truncated due to hex-dec conversion

*3. Float type value is suggested to select: Integer Digits=Auto, Decimal Digits=1~9.
to prevent over maximum value presentation error

4.4.14 Timer Display (TMR)

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels



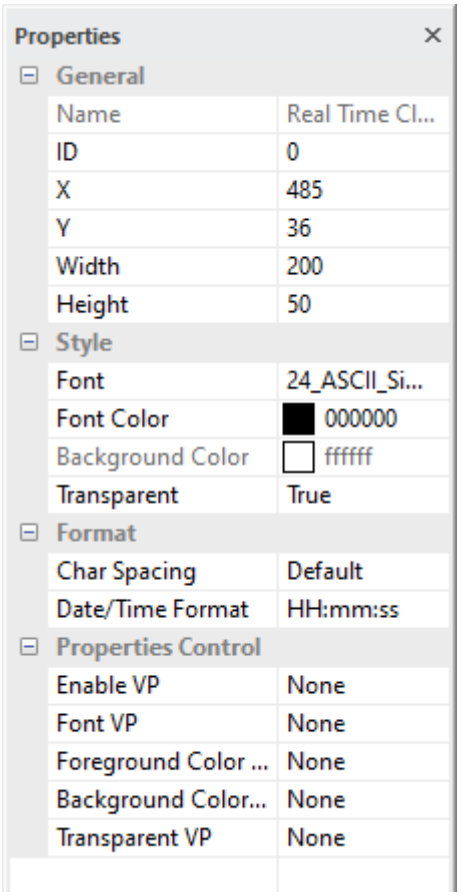
Style
- Font face could be selected at here
- Font Color is the font face color
- Background Color only available with Transparent disable
- Transparent = true, disable the Background Color box to be show

Format
- Align could be: Left / Right / Center
- Char Spacing option: Default, Shrink
- Time Format could be: HH:mm:ss / mm:ss / ss

Content
- Timer: select a timer specific inside VP_N32 area

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Font VP is none by default (using the above selected font)
  Select a VP for real time font ID change
  VP value will copy the above ID at power-on.
- Foreground color VP is none by default (using the above selected color)
  Select a VP for real time foreground color adjustment
  VP value will copy the above selected color at power-on.
- Backgound color VP is none by default (using the above selected color)
  Select a VP for real time background color adjustment
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero

4.4.15 Real Time Clock (RTC)



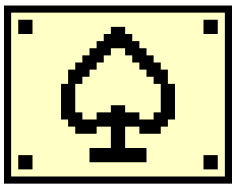
General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Font face could be selected at here
- Font Color is the font face color
- Background Color only available with Transparent disable
- Transparent = true, disable the Background Color box to be show

Format
- Char Spacing option: Default, Shrink
- Date / Time Format could be shown as :
  YYYY-MM-dd / YYYY-MM-dd HH:mm:ss /
  W YYYY-MM-dd / W YYYY-MM-dd HH:mm:ss /
  YYYY / MM / DD / HH / mm / ss

Parameter modification (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Font VP is none by default (using the above selected font)
  Select a VP for real time font ID change
  VP value will copy the above ID at power-on.
- Foreground color VP is none by default (using the above selected color)
  Select a VP for real time foreground color adjustment
  VP value will copy the above selected color at power-on.
- Backgound color VP is none by default (using the above selected color)
  Select a VP for real time background color adjustment
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero

4.4.16 Static Icon (ICO)



Properties	
General	
Name	Static Icon
ID	0
X	697
Y	27
Width	66
Height	66
Style	
Transparent	False
Transparent Color	ffffff
Content	
Icon	None
Properties Control	
Enable VP	None
ICON VP	None
Transparent Color VP	None
Transparent VP	None

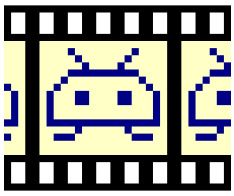
General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Transparent = False by default
  True: enable transparent effect to show the IMG_ICO
  Auto: enable transparent effect and pick a high possible color
  as Transparent color
- Transparent Color one color in the IMG_ICO could show as transparent.
  (it is suggested to use pure color for transparent effect)
  (e.g. pure-magenta pure-black, pure-white, etc…)

Content
- ICON select a IMG_ICO to show

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- ICON VP is none by default (using the above selected font)
  Select a VP for real time font IMG_ICON change
  VP value will copy the above IMG_ICO ID at power-on.
- Transparent color VP is none by default (using the above selected color)
  Select a VP for real time transparent color change
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero

4.4.17 Animation Element (ANI)



Properties	
General	
Name	Animation
ID	0
X	694
Y	113
Width	62
Height	62
Style	
Transparent	False
Transparent Color	ffffff
Format	
Loop-Play	False
Play Speed	100
Content	
Animation	None
Properties Control	
Enable VP	None
Animation VP	None
Transparent Color VP	None
Transparent VP	None

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

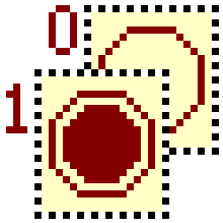
Style
- Transparent = False by default
  True: enable transparent effect to show the IMG_ANI
- Transparent Color one color in the IMG_ANI could show as transparent.
  (it is suggested to use pure color for transparent effect)
  (e.g. pure-magenta pure-black, pure-white, etc…)

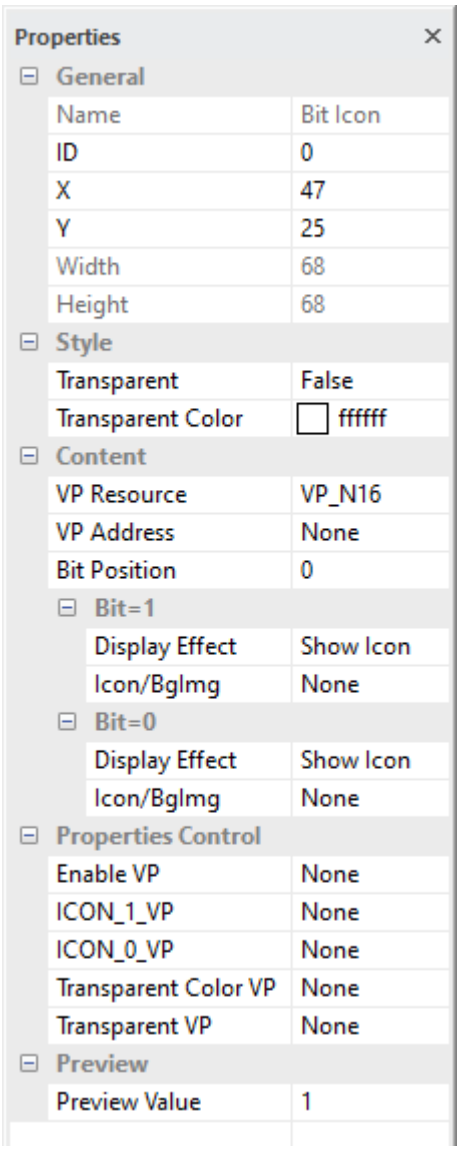
Format
Loop-Play = false by default, it shows the last frame on screen
Play Speed = 100ms per frame by default

Content
- Animation select a IMG_ANI to show

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- ICON VP is none by default (using the above selected font)
  Select a VP for real time font IMG_ICON change
  VP value will copy the above IMG_ICO ID at power-on.
- Transparent color VP is none by default (using the above selected color)
  Select a VP for real time transparent color change
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero

4.4.18 Bit Icon (IDX_BIT)





General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

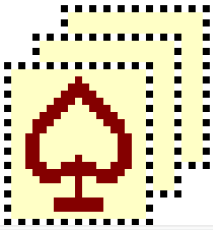
Style
- Transparent = False by default
  True: enable transparent effect to show the IMG_ICO
- Transparent Color one color in the IMG_ICO could show as transparent.
  (it is suggested to use pure color for transparent effect)
  (e.g. pure-magenta pure-black, pure-white, etc…)

Content
- VP Resource is the type of VP hold the content (VP_N16 by default)
- VP Address is the VP that hold a value
- Bit Position select a bit in the VP as monitor bit
- Bit=1, Display options are Show Icon or Show Cropped BgImg
  when monitor bit content = 1
- Bit=1, Icon/BgImage base on the above option
  select a Background Image or an Icon for the visual effect.
  none by default (monitor bit content = 1; no icon to show)
- Bit=0, Display options are Show Icon or Show Cropped BgImg
  when monitor bit content = 1
- Bit=0, Icon/BgImage base on the above option
  select a Background Image or an Icon for the visual effect.
  none by default (monitor bit content = 1; no icon to show)

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- ICON_1_VP is none by default (using the above selected font)
  Select a VP for real time change the IMG_ICO ID (monitor bit content = 1)
  VP value will copy the above ID at power-on.
- ICON_0_VP is none by default (using the above selected font)
  Select a VP for real time change the IMG_ICO ID (monitor bit content = 0)
  VP value will copy the above ID at power-on.
- Transparent color VP is none by default (using the above selected color)
  Select a VP for real time transparent color change
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero

Preview
- Preview Value is for simulation in Graphics Editor environment.

4.4.19 Indexed Icon (IDX)



Properties	
General	
Name	Indexed Icon
ID	0
X	391
Y	16
Width	60
Height	60
Style	
Transparent	False
Transparent Color	ffffff
Content	
VP Resource	VP_N16
VP Address	None
First Icon	None
Min Value	0
Max Value	0
Properties Control	
Enable VP	None
ICON VP	None
Transparent Color VP	None
Transparent VP	None
Preview	
Preview Value	0

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

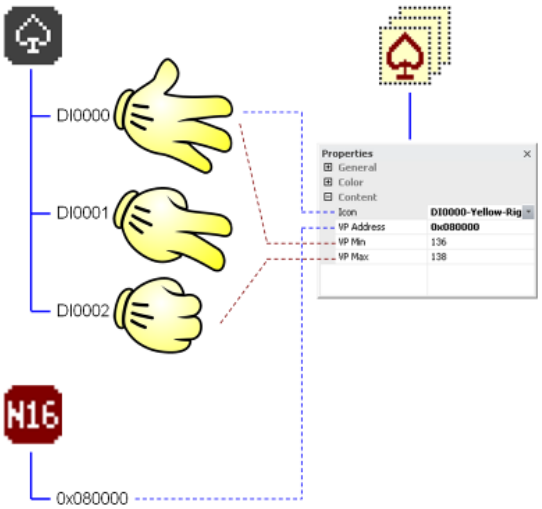
Style
- Transparent = False by default
  True: enable transparent effect to show the IMG_ICO
- Transparent Color one color in the IMG_ICO could show as transparent.
  (it is suggested to use pure color for transparent effect)
  (e.g. pure-magenta pure-black, pure-white, etc…)

Content
- VP Resource is the type of VP hold the content (VP_N16 by default)
- VP Address is the VP that hold the value
- First Icon is the first IMG_ICO of a series of icons to be use
- Min Value is the value that link to the first of the IMG_ICO series
- Max Value is the value that link to the last of the IMG_ICO series

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- ICON VP is none by default (using the above selected font)
  Select a VP for real time change the first IMG_ICO ID
  of a series of icons to be use
  VP value will copy the above ID at power-on.
- Transparent color VP is none by default (using the above selected color)
  Select a VP for real time transparent color change
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero

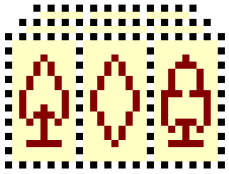
Preview
- Preview Value is for simulation in Graphics Editor environment.

note:
*1. Operation example



VP value	IDX display result
0x080000=0 (outside range, less than MIN)	Blank
0x080000=136 (within range, same as MIN)	(show 1st ICON) 
0x080000=137 (within range, MIN+1)	(show 2nd ICON) 
0x080000=138 (within range, MIN+2)	(show 3rd) 
0x080000=9997 (outside range, less than MIN)	blank

4.4.20 Decimal Icon (I16, I32)



Properties	
General	
Name	Decimal Icon
ID	0
X	436
Y	104
Width	120
Height	50
Style	
Transparent	False
Transparent Color	ffffff
Format	
Align	Left
Integer Digits	Auto
Decimal Digits	0
Content	
VP Resource	VP_N16
VP Address	None
First Icon	None
Advance	
Compile As	Auto
Location Pointer	None
Properties Control	
Enable VP	None
ICON VP	None
Transparent Color VP	None
Transparent VP	None
Preview	
Preview Value	0

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Transparent = False by default
  True: enable transparent effect to show the IMG_ICO
- Transparent Color one color in the IMG_ICO could show as transparent.
  (it is suggested to use pure color for transparent effect)
  (e.g. pure-magenta pure-black, pure-white, etc…)

Format
- Align could be: Left / Right / Center
- Integer Digits is the no. of digit on left side of the dot (Auto by default)
- Decimal Digits is the no of digit on right side of the dot

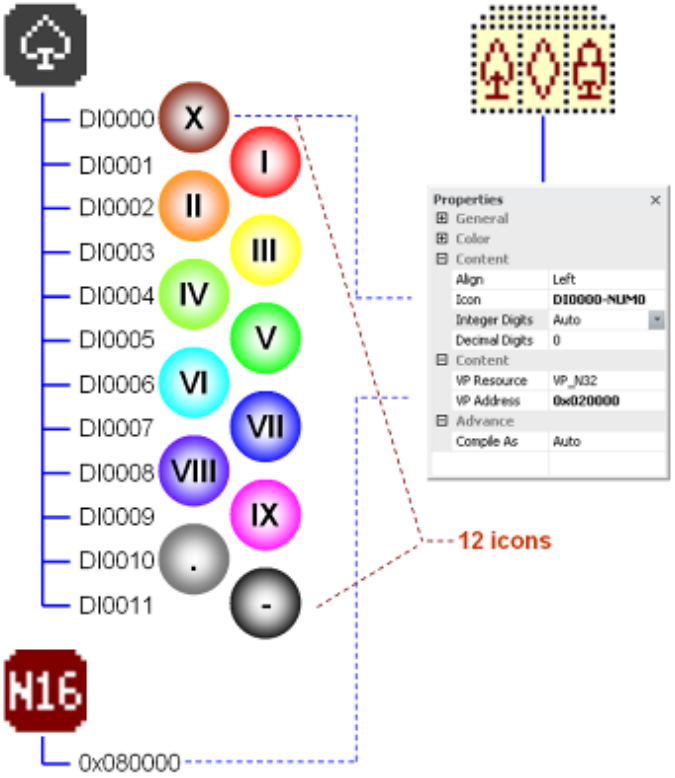
Content
- VP Resource is the type of VP hold the content (VP_N16 by default)
- VP Address is the VP that hold the value
- First Icon is the first IMG_ICO of a series of icons
  to be use as "number font"

Advance
- Compile As can force VP variable work different than default (Auto)
  VP_N16 (two successive VP_N16) work as VP_N32
  VP_N32 (first two byte of VP_N32) work as VP_N16
  VP_N64 (first two byte of VP_N64) work as VP_N16
  VP_N64 (first four byte of VP_N64) work as VP_N32
- Location pointer is reserved, keep none for normal operation

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- ICON VP is none by default (using the above selected font)
  Select a VP for real time change the first IMG_ICO ID
  of a series of icons to be use
  VP value will copy the above ID at power-on.
- Transparent color VP is none by default (using the above selected color)
  Select a VP for real time transparent color change
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero

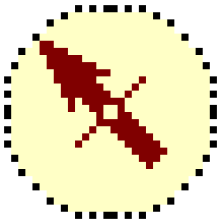
Preview
- Preview Value is for simulation in Graphics Editor environment.

note:
*1. Decimal Icon Operation Idea



VP value	I32 display result
0x080000=52	V II
0x080000=-379	- III VII IX
0x080000=6185	VI I VIII V
0x080000=0	X
0x080000=3426	III IV II VI

4.4.21 Tachometer (TCM) - Hand Mode



Properties

General	
Style	
Mode	Hand
Direction	Clockwise
Start Angle	0
Sweep Angle	360
Background	
Marking&Label Enable	True
Show Base Color	True
Base Color	c0c0c0
Major Marking Radius	50
No.Of Major Marking	5
Major Marking Width	3
Major Marking Color	a0ffff
Show Label	True
Label Font	24_ASCII_Si...
Label Color	000000
Label Min Value	0
Label Max Value	180
Show Minor Marking	True
No.Of Minor Marking	5
Minor Marking Width	1
Minor Marking Color	000000
Foreground	
Hands Type	Quadrangle
Hands Color	ff0000
Center Mark Color	808080
Rotation Center Point	
Rotation Center	Auto
Rotation Center X	44
Rotation Center Y	46
Content	
VP Resource	VP_N16
VP Address	None
Min Value	0
Max Value	100
Properties Control	
Enable VP	None
Transparent VP	None
Base Color VP	None
Hands Type VP	None
Hands Color VP	None
Center Mark Color VP	None
Major Marking Color VP	None
Minor Marking Color VP	None
Label Color VP	None
Preview	
Preview Value	100

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Mode options: Hand / Donut / Icon / Pseudo Icon
- Direction could be Clockwise or Anticlockwise
- Start Angle is corresponding to the Min Value of content
  (0° denote as the Foreground Icon original orientation)
- Sweep Angle is corresponding to the Value range
  (180° denote as the Foreground Icon rotated by 180°)

Background
- Marking & Label Enable can generate the meter face details
- Base Color, Label, Minor Marking can be enable and define at here
- Label Min Value and Label Max Value is for meter face only
  It show beside the Major Marking

Foreground
- Hands Type can be Line / Quadrangle / Trangle
- Hands Color is for the pointer color
- Center Mark Color is color mark at the center of the meter

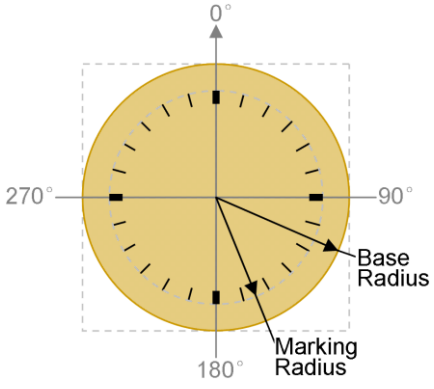
Rotation Center Point
- Rotation Center Point could be Icon Center (auto select) or by manual
- Rotation Center X , Y define the the rotation reference point

Content
- VP Resource is the type of VP hold the content (VP_N16 by default)
- VP Address is the VP that hold the value
- Min Value is the minimum tachometer value to be show
  (value smaller than this value will stop at the min location)
- Max Value is the maximum tachometer value to be show
  (value bigger than this value will stop at the max location)

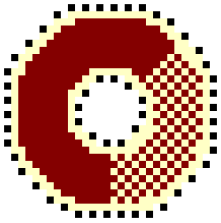
Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Hands Type VP is for changing the hand shape for visual effect
  VP value will copy the above selection at power-on.
- Color VP is for changing the color for visual effect
  VP value will copy the above selected Color at power-on.

Preview
- Preview Value is for simulation
  in Graphics Editor environment.

note:
*1. Radius and Angle Definition



4.4.22 Tachometer (TCM) - Donut Mix Color Mode / Donut Discolor Mode



Properties

General	
Name	Tachometer
ID	1
X	534
Y	23
Width	200
Height	200
Style	
Mode	Donut Mix Color
Direction	Clockwise
Start Angle	0
Sweep Angle	360
Background	
Show Base Color	True
Base Color	c0c0c0
Internal Radius	49
Edge Width	0
Foreground	
Step Value	5
Gap Value	0
No.Of Levels	2
Levels	
Color 0	ff0000
Color 1	00ff00
Rotation Center Point	
Rotation Center	Auto
Rotation Center X	100
Rotation Center Y	100
Content	
VP Resource	VP_N16
VP Address	None
Min Value	0
Max Value	100
Properties Control	
Enable VP	None
Color Array VP	None
Preview	
Preview Value	100

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Mode options: Hand / Donut / Icon / Pseudo Icon
- Direction could be Clockwise or Anticlockwise
- Start Angle is corresponding to the Min Value of content
  (0° denote as the Foreground Icon original orientation)
- Sweep Angle is corresponding to the Value range
  (180° denote as the Foreground Icon rotated by 180°)

Background
- Show Base Color show the Donut shape background even at min value
  (Mix Color Mode, Background color is the Gap color)
- Base Color is the Donut background color
  (Mix Color Mode, Background color is the Gap color)
- Internal Radius define the middle hole of the Donut
- Edge Width can selected as an outline over the Donut

Foreground
- Step Width is for adjust display Levels color size
- Gap Width is for adjust the display Levels color gap which show Base Color
- No.Of Levels
  2 for Donut Mix Color Mode show a gradient mix of two color
  3-26 for Donut Discolor Mode change the whole donut color w.r.t. VP value

Rotation Center
- Rotation Center could be Icon Center (auto select) or by manual
- Rotation Center X, Y define the is the rotation reference point

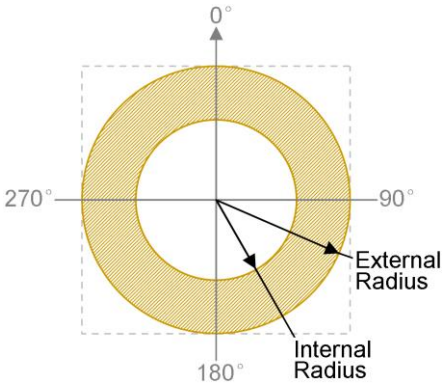
Content
- VP Resource is the type of VP hold the content (VP_N16 by default)
- VP Address is the VP that hold the value
- Min Value is the minimum tachometer value to be show
  (value smaller than this value will hide the tachometer)
- Max Value is the maximum tachometer value to be show
  (value bigger than this value will hide the tachometer)

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Color Array VP is for changing the color for visual effect
  VP value will copy the above selected Color at power-on.

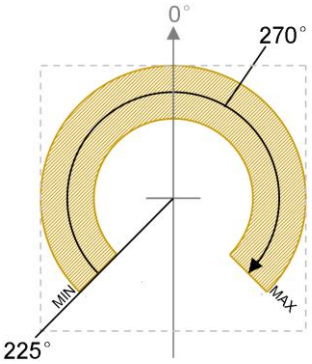
Preview
- Preview Value is for simulation in Graphics Editor environment.

Note:

*1. Radius and Angle Definition



*2. example
Direction = Clockwise
Start Angle = 255°
Sweep Angle = 270



*3. Donut Mix Color Mode example

*4. Donut Discolor Mode example

4.4.23 Tachometer (TCM) - Icon Rotation Mode / Icon Open Mode

Properties	
General	
Name	Tachometer
ID	0
X	241
Y	98
Width	280
Height	280
Style	
Mode	Icon Rotation
Direction	Clockwise
Start Angle	0
Sweep Angle	360
Foreground	
Icon	None
Transparent	False
Transparent Color	c0c0c0
Icon Center	Auto
Icon Center X	0
Icon Center Y	0
Rotation Center Point	
Rotation Center	Auto
Rotation Center X	150
Rotation Center Y	133
Content	
VP Resource	VP_N16
VP Address	None
Min Value	0
Max Value	100
Properties Control	
Enable VP	None
Transparent VP	None
Transparent Color VP	None
ICON VP	None
Preview	
Preview Value	100

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Mode options: Hand / Donut / Icon / Pseudo Icon
- Direction could be Clockwise or Anticlockwise
- Start Angle is corresponding to the Min Value of content
  (0° denote as the Foreground Icon original orientation)
- Sweep Angle is corresponding to the Value range
  (180° denote as the Foreground Icon rotated by 180°)

Foreground
- Icon is an IMG_ICO selected as tachometer foreground (or pointer)
  The size should be same as the backgorund one.
- Transparent = False by default
  True: enable transparent effect to show the IMG_ICO
- Transparent Color one color in the IMG_ICO could show as transparent.
  (it is suggested to use pure color for transparent effect)
  (e.g. pure-magenta pure-black, pure-white, etc…)
- Icon Center could be Icon Center (auto select) or by manual
- Icon Center X, Y define the is the rotation reference point

Rotation Center Point
- Rotation Center Point could be Icon Center (auto select) or by manual
- Rotation Center X , Y define the the rotation reference point

Content
- VP Resource is the type of VP hold the content (VP_N16 by default)
- VP Address is the VP that hold the value
- Min Value is the minimum tachometer value to be show
  (value smaller than this value will hide the tachometer)
- Max Value is the maximum tachometer value to be show
  (value bigger than this value will hide the tachometer)

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Transparent VP is for real time Transparent control.
  It can be disabled (not transparent) by a zero value
  VP value will copy the above Transparent Color at power-on.
- Transparent Color VP is for changing the transparent color for visual effect
  VP value will copy the above Transparent Color at power-on.
- ICON VP is none by default (using the above selected font)
  Select a VP for real time change the first IMG_ICO ID for rotation
  VP value will copy the above ID at power-on.

Preview
- Preview Value is for simulation in Graphics Editor environment.

Note.
*1. Icon Rotation Mode is similar to Pseudo Icon Rotation Mode. It show the Icon by its own with rotation.
*2. Icon Open Mode is similar to Pseudo Icon Open Mode. It show the Icon by its own opened angle section.

4.4.24 Tachometer (TCM) - Pseudo Icon Rotation Mode / Pseudo Icon Open Mode

Properties	
General	
Name	Tachometer
ID	1
X	332
Y	65
Width	99
Height	99
Style	
Mode	Pseudo Icon Rot...
Direction	Clockwise
Start Angle	0
Sweep Angle	360
Background	
Icon	None
Transparent	False
Transparent Color	c0c0c0
Foreground	
Icon	None
Transparent Mode	Normal
Transparent Color	000000
Rotation Center Point	
Rotation Center	Auto
Rotation Center X	44
Rotation Center Y	46
Content	
VP Resource	VP_N16
VP Address	None
Min Value	0
Max Value	100
Properties Control	
Enable VP	None
Preview	
Preview Value	100

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Rotation mode
- Mode options: Hand / Donut / Icon / Pseudo Icon
- Direction could be Clockwise or Anticlockwise
- Start Angle is corresponding to the Min Value of content
  (0° denote as the Foreground Icon original orientation)
- Sweep Angle is corresponding to the Value range
  (180° denote as the Icon show 180°)

Background
- Icon is an IMG_ICO selected as tachometer background
- Transparent = False by default
  True: enable transparent effect to show the IMG_ICO
- Transparent Color one color in the IMG_ICO could show as transparent.
  (it is suggested to use pure color for transparent effect)
  (e.g. pure-magenta pure-black, pure-white, etc…)

Foreground
- Icon is an IMG_ICO selected as tachometer foreground (or pointer)
  The size should be same as the backgorund one.
- Transparent = False by default
  True: enable transparent effect to show the IMG_ICO
- Transparent Color one color in the IMG_ICO could show as transparent.
  (it is suggested to use pure color for transparent effect)
  (e.g. pure-magenta pure-black, pure-white, etc…)

Rotation Center
- Rotation Center Point could be Icon Center (auto select) or by manual
- Rotation Center X , Y define the is the rotation reference point

Content
- VP Resource is the type of VP hold the content (VP_N16 by default)
- VP Address is the VP that hold the value
- Min Value is the minimum tachometer value to be show
  (value smaller than this value will hide the tachometer)
- Max Value is the maximum tachometer value to be show
  (value bigger than this value will hide the tachometer)

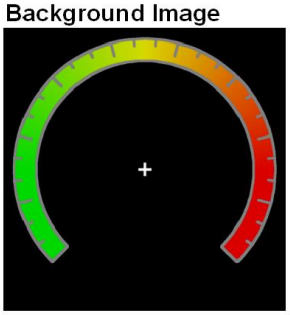
Parameter modification (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value

Preview
- Preview Value is for simulation in Graphics Editor environment.

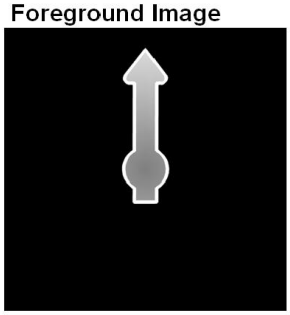
Note.
*1 Pseudo Icon Rotation Mode is similar to Icon Rotation Mode.
It show the Icon with combined background
*2 Pseudo Icon Open Mode is similar to Icon Open Mode.
It show the Icon opened angle section with combined background

*3. Tachometer (Pseudo Icon Rotation mode) Operation Idea

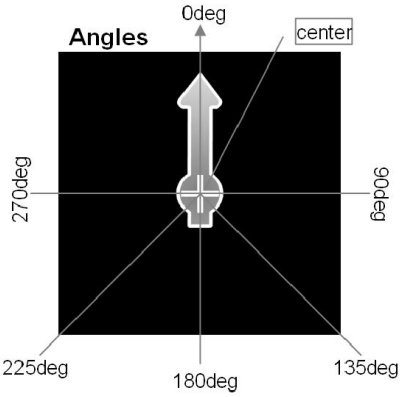
Background Image



Foreground Image



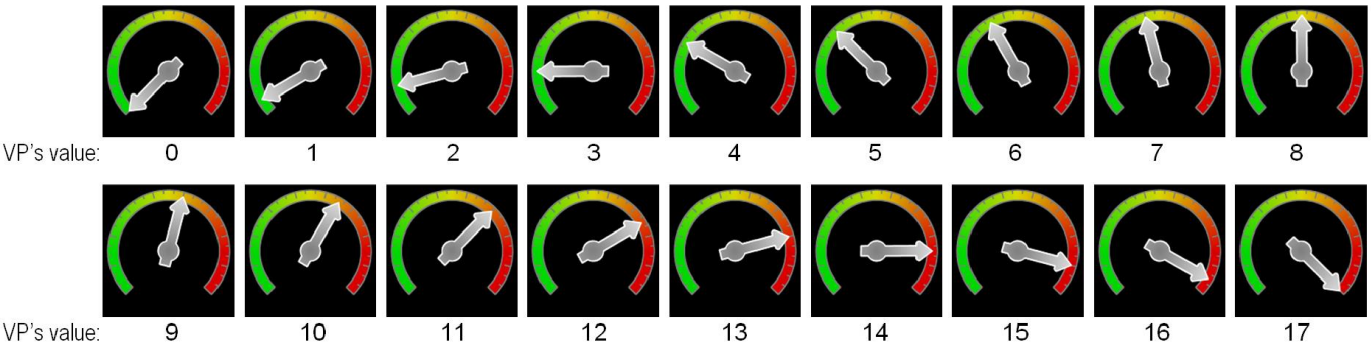
Angles



Properties Highlights

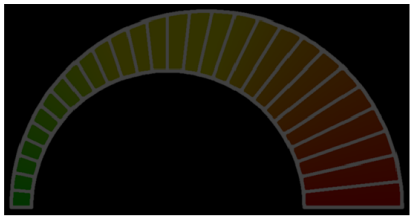
mode	Rotation mode
Rotation Center Point	Icon Center
Start Angle	225deg
Sweep Angle	270deg
direction	Clockwise
MIN	00
MAX	17
Foreground Trans' mode	Normal
Foreground Trans' color	000000
Background Trans'	False
Background Trans' color	--

Element Display Result



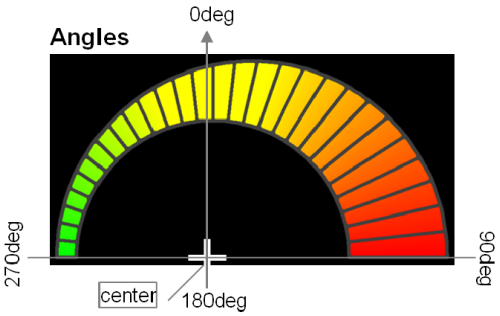
*4. Tachometer (Pseudo Icon Open mode) Operation Idea

Background Image

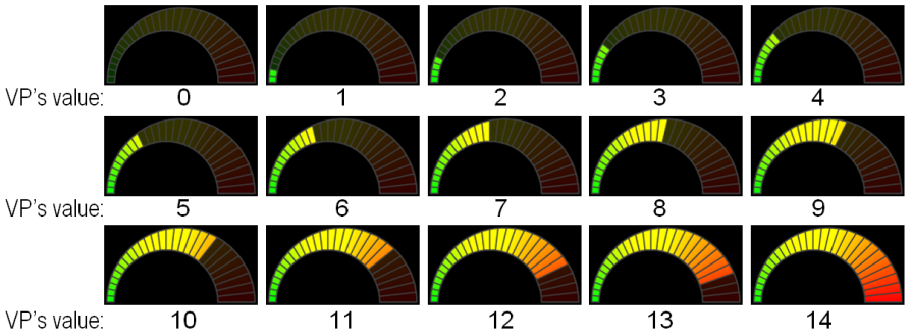


Foreground Image

Angles



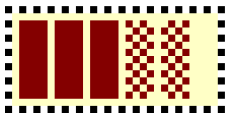
Element Display Result

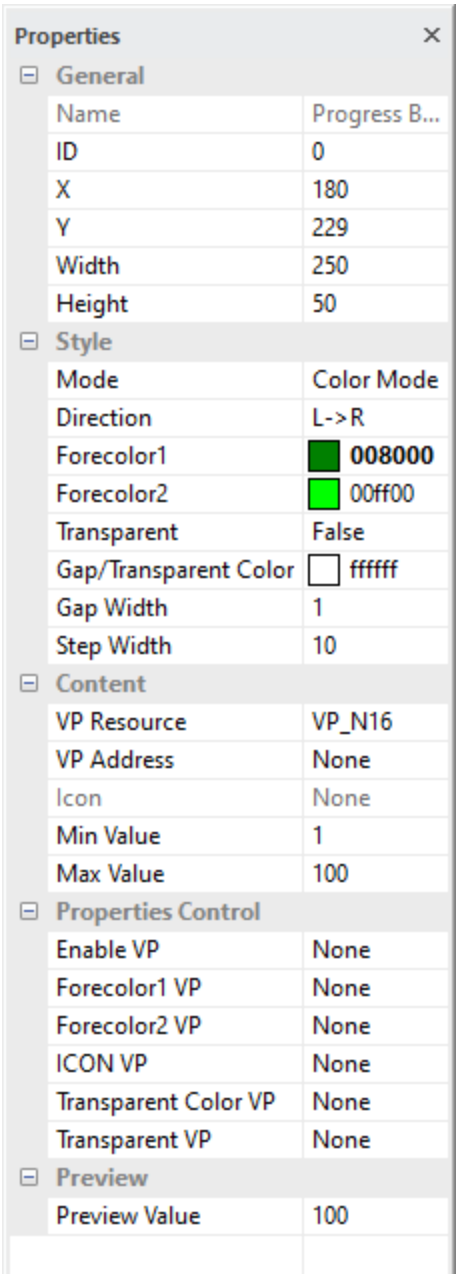


Properties Highlights

mode	Angle open mode
Rotation Center Point	Manual
Start Angle	270deg
Sweep Angle	180deg
direction	Clockwise
MIN	00
MAX	14
Foreground Trans' mode	Normal
Foreground Trans' color	000000
Background Trans'	False
Background Trans' color	--

4.4.25 Progress Bar (B16)





General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

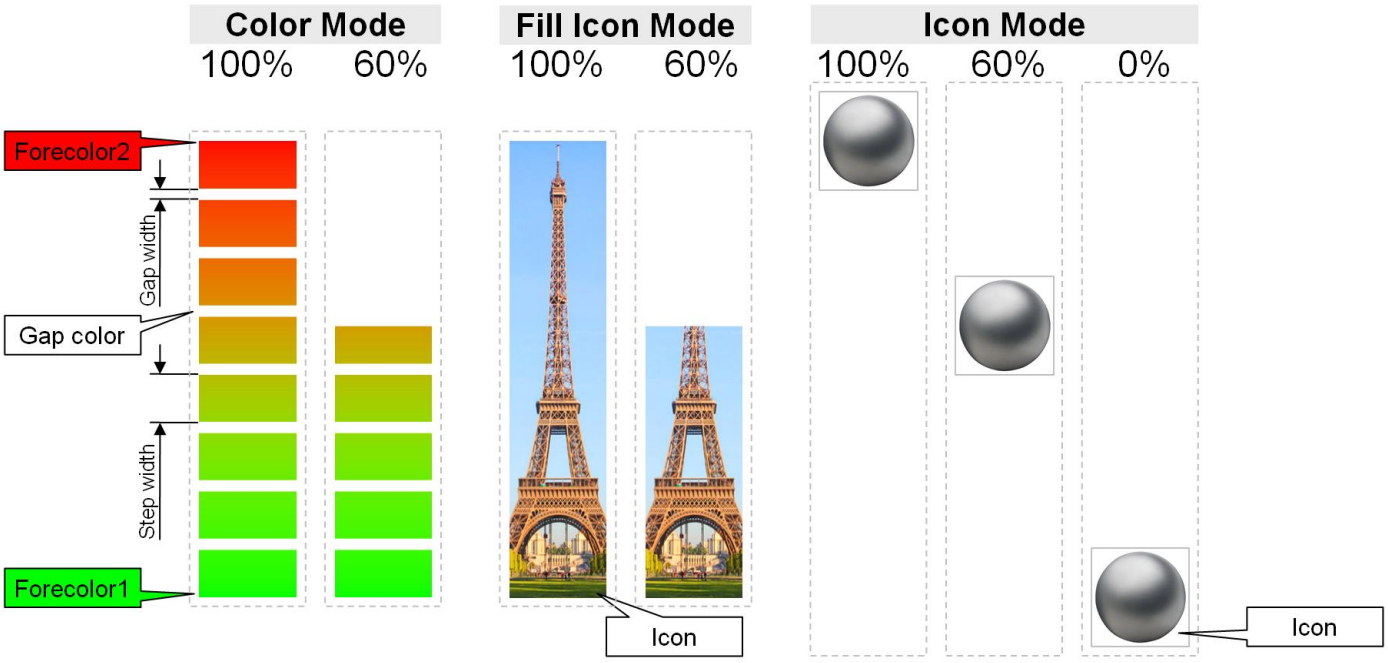
Style
- Mode
  Color Mode: longer color bar could be show with a no. close to max (bar color could also be a mix of Forecolor1 & 2)
  Icon Mode: Icon will move to the far end with a no. close to max
  Fill Icon Mode: bar color could be replaced by an IMG_ICO
- Direction: L→R / R→L / Up→Dn / Dn→Up
- Forecolor1 Progress start color
- Forecolor2 Progress end color
- Transparent = False by default
  True: enable transparent effect to show the IMG_ICO
- Gap Transparent Color function depends on mode selected
  In Fill Color Mode, the selected color is gap color in the Progress Bar
  In Icon Mode with Transparent Enabled,
  the selected color in the IMG_ICO will show as transparent.
  (it is suggested to use pure color for transparent effect)
  (e.g. pure-magenta pure-black, pure-white, etc…)
- Gap Width is in pixel for gap in the bar
- Step Width is in pixel for the distance between gap

Content
- VP Resource is the type of VP hold the content (VP_N16 by default)
- VP Address is the VP that hold the value
- Icon for Move Icon mode or Fill Icon mode
- Min Value is the minimum Progress Bar value
- Max Value is the maximum Progress Bar value

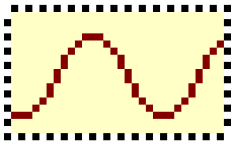
Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Foreground color1 VP is none by default (using the above selected color)
  Select a VP for real time color change
  VP value will copy the above selected color at power-on.
- Foreground color2 VP is none by default (using the above selected color)
  Select a VP for real time color change
  VP value will copy the above selected color at power-on.
- Transparent color VP is none by default (using the above selected color)
  Select a VP for real time transparent color change
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the above option)
  Select a VP for real time transparent background control
  VP value will copy the above transparent config at power-on.
  It can be enabled by a non-zero value or disable by a zero
- ICON VP is none by default (using the above selected font)
  Select a VP for real time change the IMG_ICO ID
  VP value will copy the above ID at power-on.

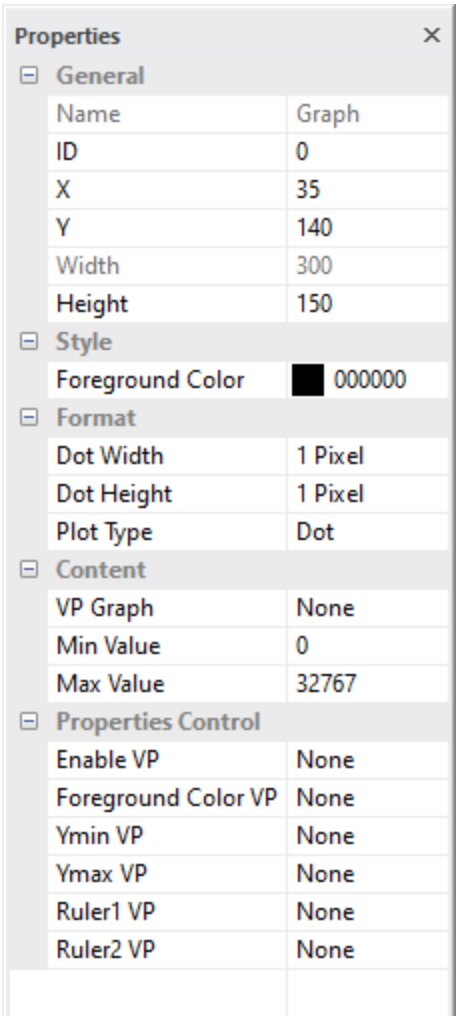
Preview
- Preview Value is for simulation in Graphics Editor environment.

note:
*1. Progress Bar Operating Mode (Dn→Up) Idea



4.4.26 Graph Element (G16)





General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

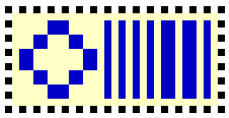
Style
- Foreground Color is the color for of graph

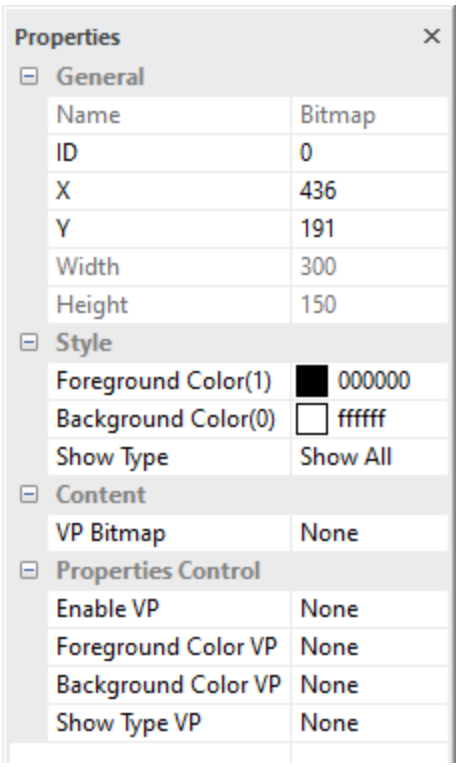
Format
- Dot Width could also affect the X direction scale
  1-4pixel could be selected
- Dot Height could also affect the X direction scale
  1-4pixel could be selected
- Plot Type could be
  Dot, only plot the dot on the screen
  Line, joint the plotted Dot with lines
  Area, fill the area between 0 and the plotted dot
  Top Fill, fill the area between Max Value and the plotted dot
  Bottom Fill, fill the area between Min Value and the plotted dot

Content
- VP Graph select a VP_G16 array to be port on screen
- Min Value is minimal graph potting value
- Max Value is maximum graph potting value

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Foreground color VP is none by default (using the above selected color)
  Select a VP for real time color change
  VP value will copy the above selected color at power-on.
- Ymin VP is none by default (using the above selected color)
  Select a VP for real time graph Min Value for Y scale zoom or pan
  VP value will copy the above selected color at power-on.
- Ymax VP is none by default (using the above selected color)
  Select a VP for real time graph Max Value for Y scale zoom or pan
  VP value will copy the above selected color at power-on.
- Rule1 VP is none by default
  Select a VP for real time horizontal line to be show in graph
- Rule2 VP is none by default
  Select a VP for another real time horizontal line to be show in graph

4.4.27 Bitmap Element (BP1)





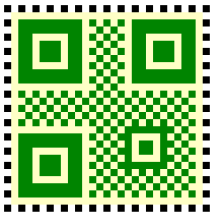
General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Foreground Color is the color for "1" bits
- Background Color is the color for "0" bits
- Show Type are having three options
  Show all (default) show all Foreground and Background Color
  Show Foreground only show the "1" bits' color
  Show Background only show the "0" bits' color

Content
- VP Bitmap select a VP_BP1 array for the 1bpp graph data

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value
- Foreground color VP is none by default (using the above selected color)
  Select a VP for real time color change
  VP value will copy the above selected color at power-on.
- Background color VP is none by default (using the above selected color)
  Select a VP for real time color change
  VP value will copy the above selected color at power-on.
- Transparent VP is none by default (using the Show Type)
  Select a VP for real time Show Type change
  0: Show all (default) show all Foreground and Background Color
  1: Show Foreground only show the "1" bits' color
  2: Show Background only show the "0" bits' color
  VP value will copy the above selected Show Type at power-on.

4.4.28 QR Code Element (QRC)



Properties	
General	
Name	QR Code
ID	0
X	148
Y	35
Width	188
Height	188
Style	
Scale	4
Format	
Size	45x45 (154 Byte)
Content	
VP Resource	VP_N16
VP Address	None
Properties Control	
Enable VP	None
Preview	
Preview Value	QR Code 0

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Scale could adjust the size of the QR code display on the screen

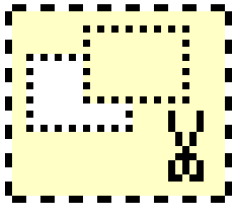
Format
- Size is the QR coding container size

Content
- VP Resource is the type of VP hold the text content
  VP_N16 by default, VP_STR is suggested for simple operation
- VP Address is the VP that hold the value

Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value

Preview
- Preview Value is for simulation in Graphics Editor environment.

4.4.29 Draw Pad (DPD)



Properties	
General	
Name	Draw Pad
ID	0
X	144
Y	151
Width	480
Height	280
Content	
VP Resource	VP_N16
VP Address	None
Properties Control	
Enable VP	None

General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Content
- VP Resource is the type of VP hold the text content
  VP_N16 by default, VP_STR is suggested for simple operation
- VP Address is the start address of VPs that hold a series of draw command

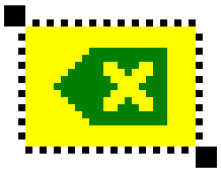
Properties Control (advance feature)
- Enable VP is none by default (element operate normally)
  Select a VP for real time element control.
  VP value will set to 1 as enable at power-on.
  It can be disabled (hidden) by a zero value

Note.
*1. see the Draw Pad in-memory command Functions section for details

4.4.30 Predefined Touch Key (ESC)

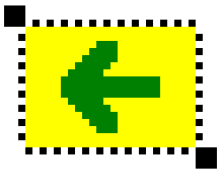
- PIP keyboard's Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- Predefined as Call Key = "ESC"

4.4.31 Predefined Touch Key (DEL)



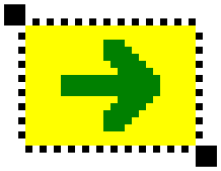
- PIP keyboard's Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- Predefined as Call Key = "DelLastChar(VP)"

4.4.32 Predefined Touch Key (Left)



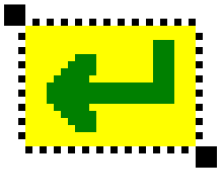
- PIP keyboard Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- Predefined as Call Key = "Move Cursor Left"

4.4.33 Predefined Touch Key (Right)



- PIP keyboard's Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- Predefined as Call Key = "Move Cursor Right"

4.4.34 Predefined Touch Key (ESC)

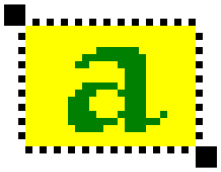


- PIP keyboard's Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- Predefined as Call Key = "Enter"

4.4.35 Predefined Touch Key (CapLock)

- PIP keyboard's Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- Predefined as Call Key = "CapLock"

4.4.36 Predefined Touch Key (char)

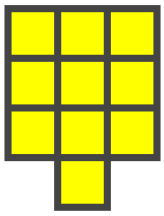


- PIP keyboard's Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- Predefined as Call Key = "Con(Buff, Cap/Norm(Byte0/Byte1"
- "Value" should be assigned for the key input

Example:

Value	CapLock input	Normal input	Descriptions
0x4161	A	a	Value(Hi) = 0x41 ="A"; Value(Lo) = 0x61 ="a"
0x4262	B	b	Value(Hi) = 0x42 ="B"; Value(Lo) = 0x61 ="b"
0x4363	C	c	Value(Hi) = 0x43 ="C"; Value(Lo) = 0x61 ="c"
0x2131	!	1	Value(Hi) = 0x21 ="!"; Value(Lo) = 0x31 ="1"
0x4032	@	2	Value(Hi) = 0x40 ="@"; Value(Lo) = 0x32 ="2"
0x2333	#	3	Value(Hi) = 0x23 ="#"; Value(Lo) = 0x33 ="3"
"4"	Invalid	4	Value(Hi) = 0x00 = is not an valid value; Value(Lo) = 0x34 ="4" Suitable for the number keyboard without CapLock
"5"	Invalid	5	Value(Hi) = 0x00 = is not an valid value; Value(Lo) = 0x34 ="4" Suitable for the number keyboard without CapLock
"6"	Invalid	6	Value(Hi) = 0x00 = is not an valid value; Value(Lo) = 0x34 ="4" Suitable for the number keyboard without CapLock
"P"	Invalid	P	Value(Hi) = 0x00 = is not an valid value; Value(Lo) = 0x50 ="P" Suitable for the keyboard without CapLock
"Q"	Invalid	Q	Value(Hi) = 0x00 = is not an valid value; Value(Lo) = 0x51 ="Q" Suitable for the keyboard without CapLock
"R"	Invalid	R	Value(Hi) = 0x00 = is not an valid value; Value(Lo) = 0x52 ="R" Suitable for the keyboard without CapLock

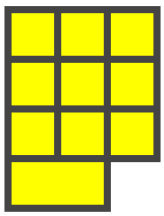
4.4.37 Predefined Touch Key - Set (number keyboard 1)



- PIP keyboard's Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- generate a set of keys (telephone-like) for quick PIP keyboard generation
- totally generate 4x4 → 16keys
- user may design a background art work before overlaying the Key - Set

1	**2**	**3**	**ESC**
4	**5**	**6**	**←**
7	**8**	**9**	**-**
Clear	**0**	**.**	**ENTER**

4.4.38 Predefined Touch Key - Set (number keyboard 2)



- PIP keyboard's Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- generate a set of keys (PC-KB-like) for quick PIP keyboard generation
- totally generate 4x4 → 15keys
- user may design a background art work before overlaying the Key - Set

7	8	9	ESC
4	5	6	←
1	2	3	-
0		.	ENTER

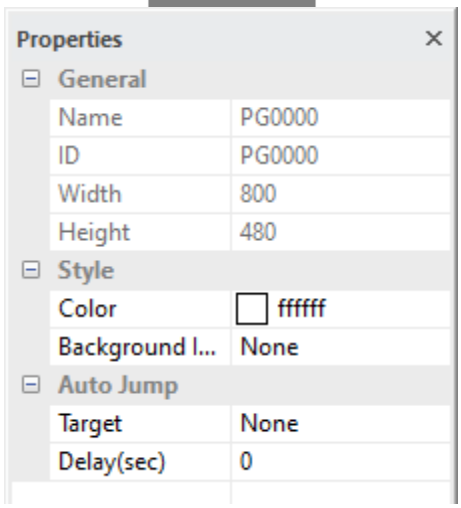
4.4.39 Predefined Touch Key - Set (English keyboard)

- PIP keyboard's Element
- For building PIP keyboard only
- Similar as Touch Key (TPK)
- generate a set of keys (QWERTY) for quick PIP keyboard generation
- totally generate 54keys
- user may design a background art work before overlaying the Key - Set

~ `	— -	+ =	" '	{ [	}]	←	→	Close	
! 1	@ 2	# 3	$ 4	% 5	^ 6	& 7	* 8	(9	) 0
Q	W	E	R	T	Y	U	I	O	P
A	S	D	F	G	H	J	K	L	DEL
| \	Z	X	C	V	B	N	M	? /	
Cap	< ,	> .	Space				: ;	OK	

Page Configurations

4.4.40 Page Properties

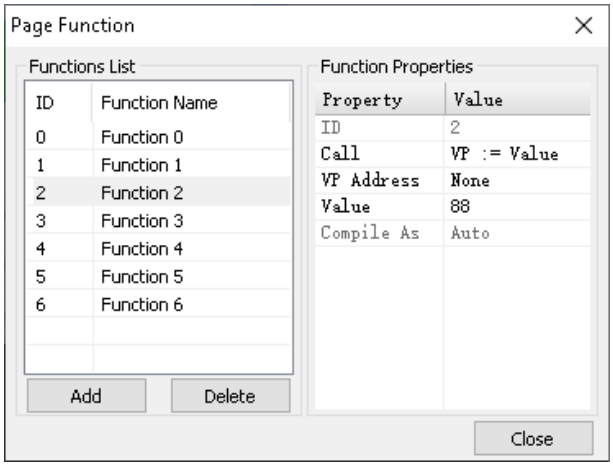


General
- Show the basic information of the element
- X and Y is the location of element on screen
  (top-left corner of the screen = 0,0)
  element top-left corner is the reference point
- Width and Height are in pixels

Style
- Color select a color for page background
- Background Image select a Background Image

Auto Jump
- Target select a target page to jump to
- Delay(sec) the delay before page jump

4.4.41 Page Functions



Page functions are a series of VP operations that could carry out at the moment a page going to be display.
e.g. assign a value to a VP

Every page have its own Page Functions,

Right click on the empty space of a Page and select Page functions could bring up the Page Functions window.

User may add several functions to any of the page.

Note.

*1. Operation functions that could be called in Page Functions

```
VP:= Value
VP:= VP + Value
VP:= VP - Value
VP:= VP * Value
VP:= VP/Value
*VP:= *VP XOR Value

Byte0(VP):= Byte0(Value)
Byte1(VP):= Byte0(Value)
Byte2(VP):= Byte0(Value)
Byte3(VP):= Byte0(Value)

VP:= BUFF
BUFF:= VP
VP:= DelLastChar(VP)
VP:=Concatenate(VP,Value)

Bit0(VP):= LSB(Value)
Bit1(VP):= LSB(Value)
Bit2(VP):= LSB(Value)
Bit3(VP):= LSB(Value)
Bit4(VP):= LSB(Value)
Bit5(VP):= LSB(Value)
Bit6(VP):= LSB(Value)
Bit7(VP):= LSB(Value)
```

4.5 Elements Sub Functions Details

4.5.1 Draw Pad (DPD) in-memory command Functions

- Draw Pad element is an element that execute a drawing function that store inside VP_N16which point by its properties VP_address.
- Host could send the Function Pack into VP by using Multi_Write (0x82) or N16_Write (0x3D) command.
- it is possible to adjust the function or parameter by VPK, TPK or Page_Call.
- And it will refresh/update the Draw Pad content accordingly.
- Each Draw Pad Element could only execute ONE command multiple times.
- The coordinate of the drawing content is based on the page coordinate.
- The Draw Pad element area is the valid area that shows the content.

Draw Pad Element Function Pack Structure

Add	Content	Descriptions
VP	CMD	Command function
VP+2	Number_of_Parmeter_SET	Number of parameter set (*2)
VP+4	Parameter_set	Parameter sets for command (*1)

Draw Pad Element Functions

CMD	Name	Parameter Set			Descriptions
		Relative Add Seq	Size in byte	Definitions	
0x0001	Draw_dot	0x00	4	xh,xl,yh,yl	Dot coordinate (*1)
		0x04	2	Color	Dot color
0x0002	Draw_successive_line	0x00	2	Color	Line color (*3)
		0x02	4	x0h,x0l,y0h,y0l	Coordinate of the line starting point (*1)
		0x06	4	X1h,x1l,y1h,y1l	Line to this coordinate
		:	4	:	:
		0x02+4*n	4	xnh,xnl,ynh,ynl	Last coordinate for line
0x0003	Draw_line	0x00	4	xsh,xsl,ysh,ysl	Line start coordinate (*1)
		0x04	4	xeh,xel,yeh,yel	Line end coordinate
		0x08	2	Color	Line color
0x0004	Draw_rectangle	0x00	4	xsh,xsl,ysh,ysl	Top-left corner coordinate (*1)
		0x04	4	xeh,xel,yeh,yel	Bottom-right corner coordinate
		0x08	2	Color	Rectangle line color
0x0005	Fill_rectangle	0x00	4	xsh,xsl,ysh,ysl	Top-left corner coordinate (*1)
		0x04	4	xeh,xel,yeh,yel	Bottom-right corner coordinate
		0x08	2	Color	Rectangle fill color
0x0006	Show_crop_Page_BKG	0x00	2	PAGE_IDh,PAGE_IDl	PAGE's background image (NOT IMG_BKG) to be crop and show (*1)
		0x02	4	xsh,xsl,ysh,ysl	Top-left corner coordinate for crop
		0x06	4	xeh,xel,yeh,yel	Bottom-right corner coordinate for crop
		0x0a	4	xh,xl,yh,yl	Top-left corner coordinate for showing the cropped image on screen
0x0007	Show_IMG_ICO	0x00	4	xh,xl,yh,yl	Top-left corner coordinate for showing the cropped image on screen (*1)
		0x04	2	IMG_ICO_ID	IMG_ICON to be show
0x0008	Show_text	0x00	4	xh,xl,yh,yl	Top-left corner coordinate for showing the text on screen (*1)
		0x04	2	Color	Text color
		0x06(0x06H)	1	FONT_ID	Font ID
		0x07(0x06L)	1	Text_len	Text length in no. of byte
		0x08	n	Text_STRING	Text content

Note.

*1. First byte of this parameter could "control" the functionality
- 0xFF terminate the following draw function
- 0xFE terminate current parmeter_set, jump to next parameter_set

*2. Draw_successive_line need n set for (n-1) lines

*3. Color is excluded from Number_of_Parmeter_SET

4.5.2 TPK, VPK Call Functions

Call functions are functions which could be called up by TPK or VPK.

4.5.2.1 Call Functions - Keyboards

Function	Descriptions
Keyboard Number	Number Keyboard for number value input and report the value to the host.(*1) The input value will be stored inside the predefined VP Variable
Keyboard Password	Password Keyboard for number password input. (display as *, 9char max.) and report the input value to the host. (*1) The input value will be stored inside the predefined VP Variable
Keyboard English	English Keyboard for English input and report the input value to the host. (*1) The input value will be stored inside the predefined VP Variable
Keyboard Chinese	Chinese Pinyin Keyboard for number value input and report the value to the host. (*1) The input value will be stored inside the predefined VP Variable
PIP Menu	Page-in-page Menu is a customizable menu. It pop-up a little window of another page as a menu selection input and report the input value to the host. (*1) The input value will be stored inside the predefined VP Variable
PIP Keyboard	Page-in-page Keyboard is a customizable keyboard. It could pop up a little window of another page as a keyboard keys and report the input value to the host. (*1) The input value will be stored inside the predefined VP Variable.
PIP Number Keyboard	Page-in-page Number Keyboard is a customizable keyboard. It pop up a little window of another page as a keyboard keys and report the input value to the host. (*1) The input value will be stored inside the predefined VP Variable.
PIP RTC	Page-in-page RTC is a customizable interface to adjust the Real Time Clock time. It could pop up a little window of another page as a keyboard keys.
Adjust Backlight	Backlight brightness level setting.
Adjust RTC	Real Time Clock time adjust interface.
Slider Single	Single slider input interface input is corresponding ratio of the predefined max. min. value and report the input value to the host. (*1) The input value will be stored inside the predefined VP Variable.
Slider Dual	Dual slider input interface function as Single Slider with two VP Variable input, Where, the two slider will limit each other for non-overlapped value input and report the input value to the host. (*1) The two input value will be stored inside two successive predefined VP Variable.
Listing	VP_STR listing window Display the VP_STR content with predefined VP_STR Address and no. of VP_STR to be display. Providing touch and scroll interface.
Listing with Slider	VP_STR listing window Display the VP_STR content with predefined VP_STR Address and no. of VP_STR to be display. Providing slider bar for scroll.

Note: *1. Entered value that report to host with command header 0x77

4.5.2.2 Call Functions - PIP Keyboard's keys

Function	Descriptions
Enter	Enter key for PIP keyboard for finishing and confirming the input.
Esc	Escape key for PIP keyboard/menu. It could cancel the input and close the PIP keyboard/menu.
CapsLock	CapsLock key function for PIP Keyboard
VP:= Value, Enter	Directly assigning the value into VP variable and follow with a Enter to confirm the input. Mainly for PIP menu items selection
Buff:=Con(Buff,Cap, Nom(Byte0/Byte1))	Generally key call for PIP keyboard with (Capslock feature) It will put the lower byte value into the end of Buff area. If the CapsLock toggled, the high byte will be insert into the end of the Buff area (note: its value in properties should be a 16bit formatted value)
VP:=Concatenate(VP,Value)	Put its properties value to the end of the content of the predefined VP value Mainly work with BUFF as a general char input E.g. VP(BUFF)= “123”, Properties' Value = 4, after call VP(BUFF)=“1234”
VP:= DelLastChar(VP)	Delete the last byte of the the VP variable Mainly for VP(BUFF) as a backspace funciton. E.g. VP(BUFF)=“123”, after call VP(BUFF)=“12”

4.5.2.3 Call Functions - Operations

Function	Descriptions
VP:= VP XOR Value	Predefine VP variable XOR with a constant stay in Value, and store the result back into the VP variable E.g. VP_N32(0x020000)=0x0055, properties' Value= 0x00AA; result VP_N32 (0x020000)=0x00FF
BUFF:= VP	Copy the VP variable content to the BUFF(string format) location. E.g. VP_N32(0x020000)=123; result VP_STR(BUFF)="123" (note: number converted to string)
VP:= BUFF	Copy the BUFF content to a VP variable (integer or a string) E.g. VP(BUFF)="123", result VP_N32(0x020000)=123 (note: string converted to interger)
VP:= Value	Copy a constant stay in Value to a VP variable E.g. properties' Value= 123; result VP_N32(0x020000)=123
VP:= VP + Value	Predefine VP variable add with a constant stay in Value, and store the result back into the VP variable E.g. VP_N32(0x020000)=666, Value=2; result VP_N32 (0x020000)=668
VP:= VP - Value	Predefine VP variable minus by a constant stay in Value, and store the result back into the VP variable E.g. VP_N32(0x020000)=666, Value=10; result VP_N32 (0x020000)=656
VP:= VP + Value, loop	Predefine VP variable times by a constant stay in Value, and store the result back into the VP variable If the value is bigger than the predefined maximum, it will "loop" to the predefined minimum. E.g. VP_N32(0x020000)=666, Value=2; result VP_N32 (0x020000)=668
VP:= VP - Value, loop	Predefine VP variable minus by a constant stay in Value, and store the result back into the VP variable If the value is smaller than the predefined minimum, it will "loop" to the predefined maximum. E.g. VP_N32(0x020000)=666, Value=10; result VP_N32 (0x020000)=656
VP:= VP * Value	Predefine VP variable times by a constant stay in Value, and store the result back into the VP variable Eg: VP_N32(0x020000)=666, Value=10; result VP_N32 (0x020000)=6660
VP:= VP/Value	Predefine VP variable divided by a constant stay in Value, and store the result back into the VP variable E.g. VP_N32(0x020000)=666, Value=2; result VP_N32 (0x020000)=333
Byte0(VP):= Byte0(Value)	Copy the constant byte0(lowest byte) stay in Value to VP variable byte0(Lowest byte) location E.g. VP_N32(0x020000)=0x5555, Value=0x0A; result VP_N32 (0x020000)=0x550A
Byte1(VP):= Byte0(Value)	Copy the constant byte0(lowest byte) stay in Value to VP variable byte1 location E.g. VP_N32(0x020000)=0x5555, Value=0x0A; result VP_N32 (0x020000)=0x0A55
Byte2(VP):= Byte0(Value)	Copy the constant byte0(lowest byte) stay in Value to VP variable byte2 location E.g. VP_N32(0x020000)=0x5555, Value=0x0A; result VP_N32 (0x020000)=0x0A5555
Byte3(VP):= Byte0(Value)	Copy the constant byte0(lowest byte) stay in Value to VP variable byte3(Highest byte) location E.g. VP_N32(0x020000)=0x5555, Value=0x0A; result VP_N32 (0x020000)=0x0A005555
Bit0(VP):= LSB(Value)	Copy the constant LSB stay in Value to VP variable bit0(LSB) location E.g. VP_N32(0x020000)=0x0000, Value=0x01; result VP_N32 (0x020000)=0x0001
Bit1(VP):= LSB(Value)	Copy the constante LSB stay in Value to VP variable bit1 location Eg: VP_N32(0x020000)=0x0000, Value=0x01; result VP_N32 (0x020000)=0x0002
Bit2(VP):= LSB(Value)	Copy the constant LSB stay in Value to VP variable bit2 location E.g. VP_N32(0x020000)=0x0000, Value=0x01; result VP_N32 (0x020000)=0x0004
Bit3(VP):= LSB(Value)	Copy the constant LSB stay in Value to VP variable bit3 location E.g. VP_N32(0x020000)=0x0000, Value=0x01; result VP_N32 (0x020000)=0x0008
Bit4(VP):= LSB(Value)	Copy the constant LSB stay in Value to VP variable bit4 location E.g. VP_N32(0x020000)=0x0000, Value=0x01; result VP_N32 (0x020000)=0x0010
Bit5(VP):= LSB(Value)	Copy the constant LSB stay in Value to VP variable bit5 location E.g. VP_N32(0x020000)=0x0000, Value= 0x01; result VP_N32 (0x020000)=0x0020
Bit6(VP):= LSB(Value)	Copy the constant LSB stay in Value to VP variable bit6 location E.g. VP_N32(0x020000)=0x0000, Value= 0x01; result VP_N32 (0x020000)=0x0040
Bit7(VP):= LSB(Value)	Copy the constant LSB stay in Value to VP variable bit7 location E.g. VP_N32(0x020000)=0x0000, Value= 0x01; result VP_N32 (0x020000)=0x0080

5 Serial Communication

Smart LCD serial command is for real-time control and access. Host machine get the data which input through the Smart LCD interface or provide the data for display.

5.1.1 Hardware connection

Smart LCDs serial UART interface are base on RS232-C standard by default config as 8N1 115200bps.

5.1.2 Communication Packet Structure

Commands and Response Packet should be format as follow (host→module):

Seq	Code	Code type	Description
1	0xAA	Packet header	1byte
2	Cmd-code	Command code	1byte
3	Par-data	Parameter or Data	(*1)
:	:	-	-
:	:	-	-
:	:	-	-
N-3 th	0xCC	Packet tail	4byte
N-2 th	0x33		
N-1 th	0xC3		
N th	0x3C		

Note.
*1. Unless otherwise specified,
all the multi-byte values, data, address' byte sequence are MSB first, LSB last.
e.g. 0x12345678 should send as following sequency, 0x12(first), 0x34, 0x56, 0x78(last)

5.1.3 Packet Acknowledgment

Packet Acknowledgment is two byte in ASCII (module → host):

Response	code	Description
Command (in packet) executed and wait for next Command	":>"	In ASCII (0x3a, 0x3e)
Command (in packet) error and wait for next Command	"!>"	In ASCII (0x21,0x3e)
Invalid Packet	null	No response

Note.
*1. Packet Acknowledgement response to a valid packet only.
*2. Acknowledgement could be disable in Editor option (Manual → Tools → Project Setting→ RS232 → Enable ACK)

5.1.4 Color Data Value Configuration

16 bit color value															
R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B4	B3	B2	B1	B0
High byte (MSB)								Low byte (LSB)							
D7	D6	D5	D4	D3	D2	D1	D0	D7	D6	D5	D4	D3	D2	D1	D0

5.1.5 Data / Address / Page_ID / Location Values Configuration

64 bit number value							
D63…D56	D55…D48	D47…D40	D39..D32	D31…D24	D23…D16	D15…D8	D7…D0
Byte7 (MSB)							Byte0 (LSB)
D7…D0	D7…D0	D7…D0	D7…D0	D7…D0	D7…D0	D7…D0	D7…D0

32 bit number value			
D31…D24	D23…D16	D15…D8	D7…D0
Byte3 (MSB)			Byte0 (LSB)
D7…D0	D7…D0	D7…D0	D7…D0

16 bit number value	
D15…D8	D7…D0
High Byte (MSB)	Low Byte (LSB)
D7…D0	D7…D0

5.2 Command Summary

Functions	Name	Code	Description
Config/ Status Functions	hand_shake	0x30	Read a Hand Shake
	read_ver	0x31	Read firmware version
	read_pg_id	0x32	Read Current page ID
	touch_response	0x72/0x73/0x77 0x78/0x79	see also set_sys_config
	set_sys_config	0xE0	System parameter configuration and Baud Rate
	sel_project	0xE1	Specify operating project folder
	touch_calib	0xE4	Touch panel calibration
	screen_saver	0x5E	Screen saver (backlight dim down time out)
	backlight_ctrl	0x5F	backlight brightness control (64 levels)
	buzzer_touch_sound	0x79	buzzer enable time length (in 10ms step)
	Buzzer_ctrl	0x7A	Buzzer control
	Flash_write	0x90	Write data to the flash
	Flash_read	0x91	Read data from the flash
	RTC_set	0x9C	Set the RTC
	RTC_read	0x9B	Read the RTC values
	USR_bin_read	0x93	Read data from the USR_bin
	u_drv_format	0xE2	Format the u_drive
	u_drv_unlock	0xE3	Unlock the u_drive with pre-stored password
Display Control/ Draw Functions	disp_page	0x70	Display a pre-stored TML file (page)
	set_element_fg	0x7E	Set the foreground color of STR, N16, N32 or N64
	set_element_bg	0x7F	Set the background color of STR, N16, N32 or N64
	set_codepage	0xE7	Sets country character set and code-page character set
	suspend_vp_fresh	0xE8	Set the screen to pause the refresh and deactivate the touchkey or release the pause to refresh and enable the touchkey
VP Functions	Successive_write	0x82	Write successive value to VP_N16, VP_N32, VP_N64
	Successive_read	0x83	Read successive value from VP_N16, VP_N32, VP_N64
	STR_write	0x42	Write string to VP_STR
	STR_read	0x43	Read string form VP_STR
	STR_fill	0x46	Fill strings to the VP_STR
	N16_write	0x3D	Write 16bit (signed integer) value to VP_N16
	N16_read	0x3E	Read 16bit (signed integer) value from VP_N16
	N16_fill	0x3F	Fill numbers to the VP_N16
	N32_write	0x44	Write 32bit (signed integer) value to VP_N32
	N32_read	0x45	Read 32bit (signed integer) value from VP_N32
	N32_fill	0x47	Fill numbers to the VP_N32
	N64_write	0x48	Write 64bit (signed integer) value to VP_N64
	N64_read	0x49	Read 64bit (signed integer) value from VP_N64
	N64_fill	0x4A	Fill numbers to the VP_N64
	Successive_write	0x82	Write successive value to VP_N16, VP_N32, VP_N64
	Successive_read	0x83	Read successive value from VP_N16,VP_N32,VP_N64
	BP1_write	0x4B	Write bit-map (1bpp) data to VP_BP1
	BP1_write_comp	0x4C	Write compressed bit-map (1bpp) data to VP_BP1
	G16_write	0x4D	Write 16bit (signed integer) graphic array to VP_G16
	G16_write_rotate	0x4E	Rotate the VP_G16 array data inside the module and write a 16bit (signed integer) value into end-of-array
	System Register (Timer_Ctrl)Write	0x3B	Write System Register
	System Register （Timer_Ctrl ）Read	0x3C	Read System Register

5.3 Command Details

5.3.1 Config / Status Functions

	Header	Command	Data:no_of_byte	Tail
hand_shake	AA	30	--	CC 33 C3 3C
(0x30)	e.g. [host]: AA 30 CC 33 C3 3C e.g. [LCM]: AA 30 54 6F 70 77 61 79 20 48 4D 54 20 52 65 61 64 79 00 CC 33 C3 3C (return "Topway HMT Ready" in ASCII)			
Read_ver	AA	31	--	CC 33 C3 3C
(0x31)	e.g. [host]: AA 31 CC 33 C3 3C e.g. [LCM]: AA 31 31 2E 31 32 CC 33 C3 3C (return "1.12" in ASCII)			
read_pg_id	AA	32	Nil or ID:2	CC 33 C3 3C
(0x32)	e.g. [host]: AA 32 CC 33 C3 3C e.g. [LCM]: AA 32 00 01 CC 33 C3 3C (current page's ID is 0x0001)			
touch_response	AA	72/73	X:2 Y:2	CC 33 C3 3C
(0x72/0x73)	e.g. [LCM]: AA 72 00 32 00 64 CC 33 C3 3C (touch release coordinate is(50,100)) e.g. [LCM]: AA 73 00 32 00 64 CC 33 C3 3C (touch down coordinate is(50,100))			
data_entered	AA	77	Addr_ID:4 Data:2/4/8/n	CC 33 C3 3C
(0x77)	e.g. [LCM]: AA 77 00 02 00 00 00 00 00 32 CC 33 C3 3C (Addr_ID 0x020000's 32bit data is 0x0000 0032) (please refer to Editor description about Addr_ID and Data size)			
touch_response	AA	78/79	Page_ID:2 TPK_ID:1	CC 33 C3 3C
(0x78/0x79)	e.g. [LCM]: AA 78 00 02 01 CC 33 C3 3C (PAGE:0x0002 TPK:0x01 key up) e.g. [LCM]: AA 79 00 02 01 CC 33 C3 3C (PAGE:0x0002 TPK:0x01 key down)			
set_sys_config	AA	E0 55 AA 5A A5	BaudRate:1 sys_par1:1 sys_par2:1	CC 33 C3 3C
(0xE0)	e.g. [host]:AA E0 55 AA 5A A5 07 83 00 CC 33 C3 3C (config baud rate to 152000, and enable TPK response (the most common setting)) (Baud rate will back to project default setting after next power on)			
Set_project	AA	E1	Prj_ID:1	CC 33 C3 3C
(0xE1)	e.g. [host]: AA E1 01 CC 33 C3 3C (switch to project 0x01, (THMT01 folder))			
Touch_calib	AA	E4 55 AA 5A A5	--	CC 33 C3 3C
(0xE4)	e.g. [host]: AA E4 55 AA 5A A5 CC 33 C3 3C (start touch calibration)			
screen_saver	AA	5E	Time:2 Level:1	CC 33 C3 3C
(0x5E)	e.g. [host]: AA 5E 00 0A 00 CC 33 C3 3C (after 10sec of idel, backlight down to 0)			
Backlight_ctrl	AA	5F	Level:1	CC 33 C3 3C
(0x5F)	e.g. [host]: AA 5F 3F CC 33 C3 3C (adjust the backlight to highest level 0x3f)			
Buzzer_touch_sound	AA	79	Time(in10ms):1	CC 33 C3 3C
(0x79)	e.g. [host] : AA 79 01 CC 33 C3 3C (adjust the buzzer beeping duration to 0x01= 1x10ms)			
Buzzer_ctrl	AA	7A	Loops T1 T2 Freq1 Freq2	CC 33 C3 3C
(0x7A)	e.g. [host] : AA 7A 10 0A 08 05 32 CC 33 C3 3C (sound the buzzer beeping 16loops of 1sec 500Hz → 0.8sec 5kHz			

	Header	Command	Data:(no. of byte)	Tail
Flash_write (0x90)	AA	90	ADDR:4 Len:2 Data:n	CC 33 C3 3C

e.g. [host]: AA 90 00 00 00 00 00 02 30 31 CC 33 C3 3C
(start form user flash area address 0x0000000 write 2bye of data 0x30 & 0x31)
(note. it is a must to ensure the power supply during the write process)

Flash_read (0x91)	AA	91	ADDR:4 Len:2 or Data:n	CC 33 C3 3C

e.g. [host]: AA 91 00 00 00 00 00 02 CC 33 C3 3C
(read 2byte start form address 0x0000000)
e.g. [LCM]: AA 91 30 31 CC 33 C3 3C
(return of two byte data 0x30 0x31)

RTC_set (0x9C)	AA	9C	YYMMDDHHMMSS:6	CC 33 C3 3C

e.g. [host]: AA 9C 0E 07 0A 17 3B 30 CC 33 C3 3C
(set the real time clock to 2014 - 07- 10 23:59:48

RTC_read (0x9B)	AA	9B	-- or YYMMDDHHMMSS:6	CC 33 C3 3C

e.g. [host]: AA 9B CC 33 C3 3C (ask for full data time)
e.g. [LCM]: AA 9B 0E 07 0B 00 01 12 CC 33 C3 3C
(return the day and time 2014-07-11 00:01:18

Usr_bin_read (0x93)	AA	93	ADDR:4 Len:2 or Data:n	CC 33 C3 3C

e.g. [host]: AA 93 00 00 00 00 00 02 CC 33 C3 3C
(request for 2 byte of data form the preloaded usr.bin file at address 0x0000 0000)
e.g. [LCM]: AA 93 30 31 CC 33 C3 3C
(return 2byte of requested data 0x30 0x31)

U_drv_format (0xE2)	AA	E2	55 AA 5A A5	CC 33 C3 3C

e.g. [host]: AA E2 55 AA 5A A5 CC 33 C3 3C
(format the whole internal flash memory space)

U_drv_unlock (0xE3)	AA	E3	PWD:n	CC 33 C3 3C

e.g. [host]: AA E3 30 31 32 33 34 35 36 00 CC 33 C3 3C
(send a password "0123456" to un-lock the USB interface for file access
Note: password defined in the display project by using editor,
where password string should end with "\0")

note. Please refer to the Smart_LCD user manual for the details

5.3.2 Display Control / Draw Functions

	Header	Command	Data:no_of_byte	Tail
Disp_page (0x70)	AA	70	Page_id:2	CC 33 C3 3C

e.g. [host]: AA 70 00 01 CC 33 C3 3C
(show page 0x0001)

Set_element_fg (0x7E)	AA	7E	Element_type:1 Page_ID:2 Element_ID:1 color:2 0x00	CC 33 C3 3C

e.g. [host]: AA 7E 00 00 03 05 FF FF 00 CC 33 C3 3C
(change the STR_ID=0x05's foreground to white in Page_ID=0x0003)

Set_element_bg (0x7F)	AA	7F	Element:1 Page_ID:2 Element_ID:1 color:2 mode:1	CC 33 C3 3C

e.g. [host]: AA 7F 00 00 03 05 00 00 00 CC 33 C3 3C
(change the STR_ID=0x05's foreground to (non-transparent) black in Page_ID=0x0003)

Set_codepage (0xE7)	AA	E7	Country Codepage	CC 33 C3 3C

e.g. [host]: AA E5 03 07 CC 33 C3 3C
switch the ASCII to German, Extended Codepage as 866 (OEM - Russian)

Suspend_vp_reflesh (0xE8)	AA	E8	55 AA 5A A5 mode	CC 33 C3 3C

e.g. [host]: AA E8 55 AA 5A A5 01 CC 33 C3 3C
(pause the refresh and deactivate the touch key; mode=00 for release the pause)

note. please refer to the Smart_LCD user manual for the details

5.3.3 VP Functions

	Header	Command	Data:no_of_byte	Tail
Successive_write (0x82)	AA	82	Add:4 Len:1 Value:n	CC 33 C3 3C

e.g. [host]: AA 82 00 08 00 00 03 00 00 11 11 22 22 CC 33 C3 3C
Write 3 sucessive 16bit value to VP_N16 address 0x0008 0000
e.g. [host]: AA 82 00 02 00 00 02 55 55 55 55 66 66 66 66 CC 33 C3 3C
Write 2 sucessive 32bit value to VP_N32 address 0x0002 0000

Successive_read (0x83)	AA	83	Add:4 Len:1 or Value:n	CC 33 C3 3C

e.g. [host]: AA 83 00 08 00 00 03 CC 33 C3 3C
Read 3 sucessive 16bit value from VP_N16 address start at 0x0008 0000
e.g. [host]: AA 83 00 02 00 00 02 CC 33 C3 3C
Read 2 sucessive 32bit value from VP_N32 address start at 0x0002 0000

STR_write (0x42)	AA	42	Add:4 Text:n	CC 33 C3 3C

e.g. [host]: AA 42 00 00 00 80 54 4F 50 57 41 59 00 CC 33 C3 3C
(write string “TOPWAY“ to VP_STR address 0x0000 0080 (string should end with "\0"))

STR_read (0x43)	AA	43	Add:4 or Text:n	CC 33 C3 3C

e.g. [host]: AA 43 00 00 00 80 CC 33 C3 3C
(request for VP_STR address 0x0000 0080 content value)
e.g. [LCM]: AA 43 54 4F 50 57 41 59 00 CC 33 C3 3C
(the feedback content value is "TOPWAY" (string end with "\0"))

STR_fill (0x46)	AA	46	Add:4 Len:2 Text:n	CC 33 C3 3C

e.g. [host]: AA 46 00 00 00 80 00 03 54 4F 50 57 41 59 00 CC 33 C3 3C
(fill 0x0003 VP_STR as "TOPWAY" (string should end with "\0")
Start form the VP_STR address 0x00000080)

N16_write (0x3D)	AA	3D	Add:4 Value:2	CC 33 C3 3C

e.g. [host]: AA 3D 00 08 00 00 00 32 CC 33 C3 3C
(write a 16bit value 0x0032 into VP_N16 address 0x0008 00000)

N16_read (0x3E)	AA	3E	Add:4 or Value:2	CC 33 C3 3C

e.g. [host]: AA 3E 00 08 00 00 CC 33 C3 3C
(read VP_N16 address 0x0008 0000's 16bit data content)
e.g. [LCM]: AA 3E 00 32 CC 33 C3 3C
(feed back the VP_N16 content value 0x0032)

N16_fill (0x3F)	AA	3F	Add:4 Len:2 Value:2	CC 33 C3 3C

e.g. [host]: AA 3F 00 08 00 00 00 03 00 32 CC 33 C3 3C
(fill 0x0003 VP_N16 with 0x0032 start form VP_N16 address 0x0008 0000)

N32_write (0x44)	AA	44	Add:4 Value:4	CC 33 C3 3C

e.g. [host]: AA 44 00 02 00 00 00 00 00 32 CC 33 C3 3C
(write a 32bit value 0x0000 0032 into VP_N32 address 0x0002 0000)

N32_read (0x45)	AA	45	Add:4 or Value:4	CC 33 C3 3C

e.g. [host]: AA 45 00 02 00 00 CC 33 C3 3C
(read VP_N32 address 0x0002 0000's 32bit data content)
e.g. [LCM]: AA 45 00 00 00 32 CC 33 C3 3C
(feed back the VP_N32 content value 0x0000 0032)

N32_fill (0x47)	AA	47	Add:4 Len:2 Value:4	CC 33 C3 3C

e.g. [host]: AA 47 00 02 00 00 00 03 00 00 00 32 CC 33 C3 3C
(fill 0x0003 VP_N32 with 0x0000 0032 start form VP_N32 address 0x0002 0000)

	Header	Command	Data:no_of_byte	Tail
N64_write (0x48)	AA	48	Add:4 Value:8	CC 33 C3 3C
	e.g. [host]: AA 48 00 03 00 00 00 00 00 00 00 00 00 32 CC 33 C3 3C (write a 64bit value 0x0000 0000 0000 0032 into VP_N64 address 0x0003 0000)			
N64_read (0x49)	AA	49	Add:4 or Value:8	CC 33 C3 3C
	e.g. [host]: AA 49 00 03 00 00 CC 33 C3 3C (read VP_N64 address 0x0003 0000's 64bit data content) e.g. [LCM]: AA 49 00 00 00 00 00 00 00 32 CC 33 C3 3C (feed back the VP_N64 content value 0x0000 0000 0000 0032)			
N64_fill (0x4A)	AA	4A	Add:4 Len:2 Value:8	CC 33 C3 3C
	e.g. [host]: AA 4A 00 03 00 00 00 03 00 00 00 00 00 00 00 32 CC 33 C3 3C (fill 0x0003 VP_N64 with 0x0000 0000 0000 0032 start form VP_N64 address 0x0003 0000)			
BP1_write (0x4B)	AA	4B	Add:4 Len:4	CC 33 C3 3C
	e.g. [host]: AA 4B 00 04 00 00 00 00 02 00 CC 33 C3 3C + 512byte data... (fill 512 byte of graphics data (1bpp) in to BP1 address 0x0004 0000)			
BP1_write_comp (0x4C)	AA	4C	Add:4 Len:4	CC 33 C3 3C
	e.g. [host]: AA 4C 00 04 00 00 00 00 02 00 CC 33 C3 3C +512byte data... (fill 512 byte of compressed graphics data (1bpp) in to BP1 address 0x0004 0000)			
G16_write (0x4D)	AA	4D	Add:4 Len:2 Value:2n	CC 33 C3 3C
	e.g. [host]: AA 4D 00 06 00 00 00 02 00 32 00 33 CC 33 C3 3C (fill 0x0002 16bit graph data(0x0032, 0x0033) into G16 address 0x0006 0000			
G16_write_rotate (0x4E)	AA	4E	Add:4 Size:2 Data:2	CC 33 C3 3C
	e.g. [host]: AA 4E 00 06 00 00 00 32 00 33 CC 33 C3 3C (place rotate 0x0032 of G16 forward which address 0x0006 0000 and place 0x0033 at the last)			
System_register_write (timer_ctrl) (0x3B)	AA	3B	Add:4 Data:1	CC 33 C3 3C
	e.g. [host]: AA 3B 00 FF FF 00 01 CC 33 C3 3C (start the timer_ctrl0 as count down mode)			
System_register_read (timer_ctrl) (0x3C)	AA	3C	Add:4	CC 33 C3 3C
	e.g. [host]: AA 3C 00 FF FF 00 CC 33 C3 3C (read the timer_ctrl status value)			

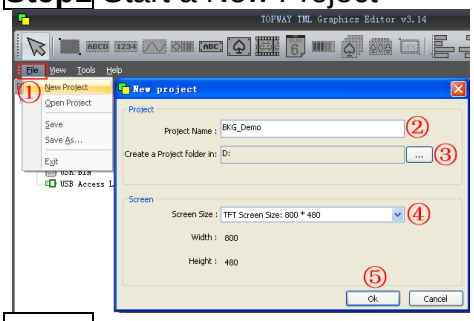
note. Please also refer to the Smart_LCD user manual for the details

6 Basic Function Examples

6.1 Display a PAGE with background image (IMG_BKG)

(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

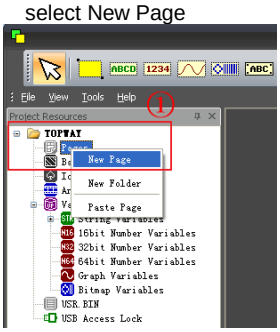
Step1 Start a New Project



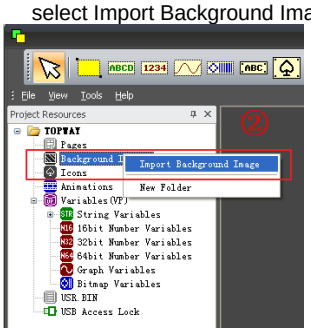
① start TOPWAY TML Graphics Editor software, start a new project through manual bar File --> New Project
② Enter the Project name
Project Name: BKG_Demo (as an example)
③ Select a Project folder location
Create a Project Folder in: D:
④ Select the display resolution of the SmartLCD
Screen Size: 800x480 (for this example HMT050CC-C)
⑤ Click “OK”

Step2 Built a Page and import a picture as Background Image

① In Resource window, right click on Pages, select New Page



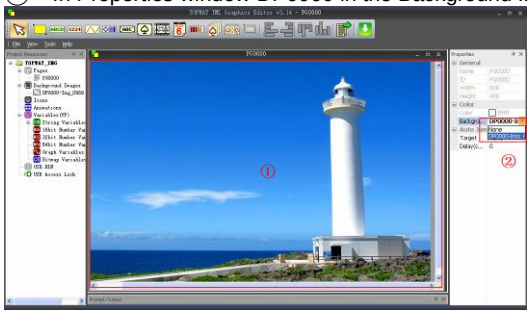
② In Resource window, right click on Background Images, select Import Background Image



Note: Editor supports BMP, JPG, PNG. In this case a 800x480 picture could be best fit to the display. or Editor will resize it to fit the display

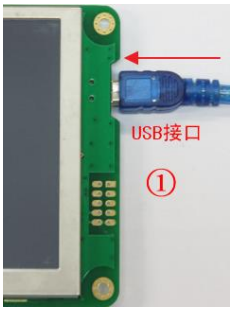
Step3 Link the page with image

① Click on the working area of the page, its properties will show on the right.
② In Properties window DP0000 in the Background Image.

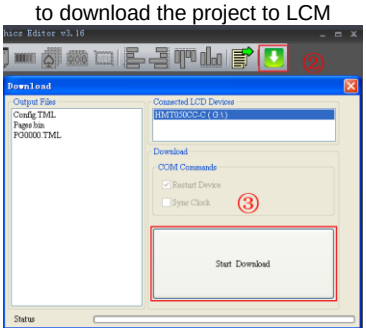


Step4 Compile and download

① Connect the Smart LCD with PC by using an mini USB cable

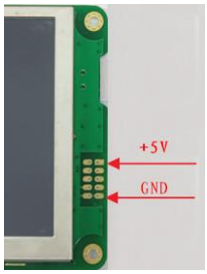


② In tool bar, click on download(or F9)
③ click “Start Download” to download the project to LCM



Step5 Power on and display

① disconnect the mini USB cable
② power on the Smart LCD with 5V
③ display



-- done --

6.2 Using Touch Key (TPK) to Jump to a Page

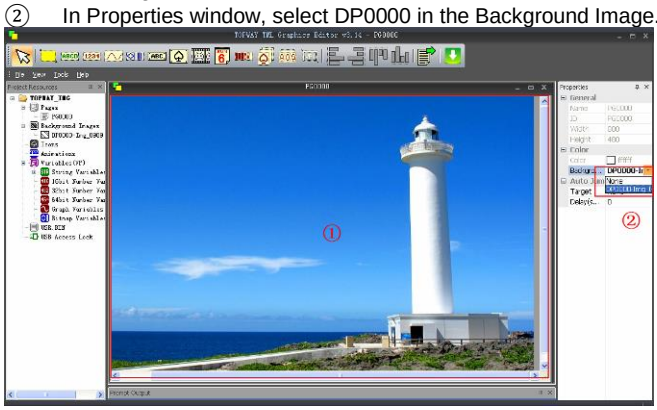
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built 2 pages, import 2 pictures as background
(please refer to the previous examples)

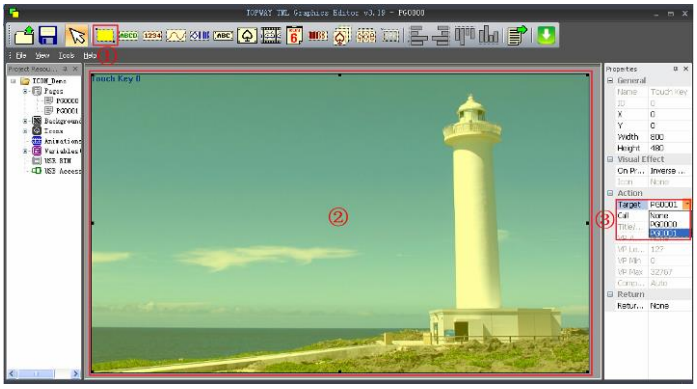
Step3 Link the page (PG0000)with the image

① Click on the working area of the page, its properties will show on the right.
② In Properties window, select DP0000 in the Background Image.



Step4 Built a Touch Key (TPK)

① In tools bar, select Touch Key
② create a rectangle touch key area on PG0000
③ In touch key properties, set Target as PG0001



Step5 Link the page (PG0001) with the image

① Click on the working area of PG0001, its properties will show on the right.
② In Properties window, select DP0001 in the Background Image.

Step6 Compile and download
(please refer to the previous examples)

Step7 Power on and display

① disconnect the mini USB cable
② power on the Smart LCD with 5V
③ display
④ touch on the touch key area
⑤ when release, the display will jump to the target page

-- done --

6.3 Show a Static Icon (ICO)

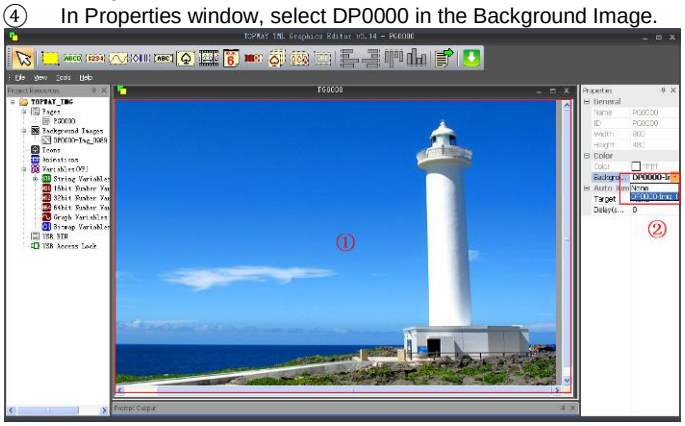
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a pictures as background
(please refer to the previous examples)

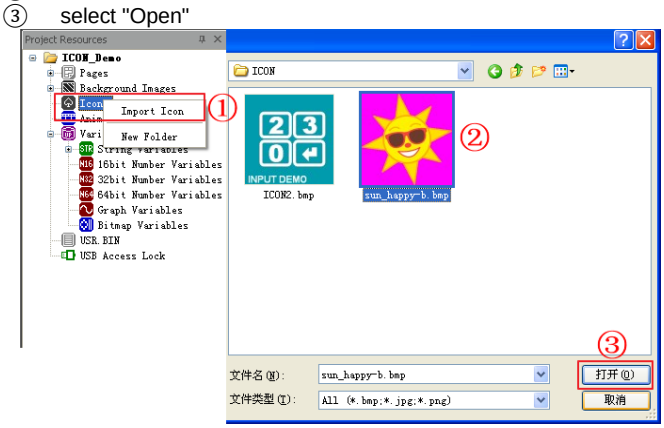
Step3 Link the page with the image

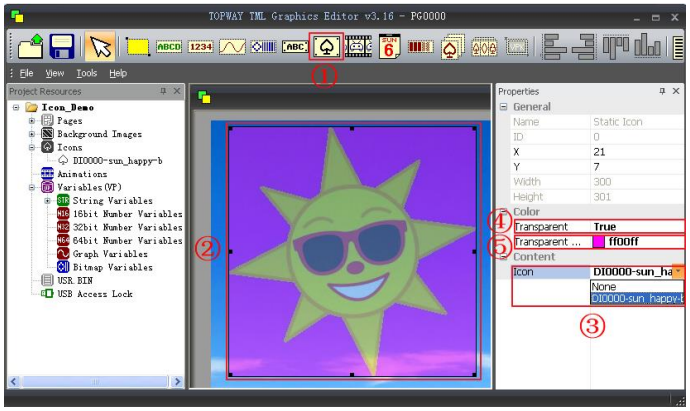
③ Click on the working area of the page, its properties will show on the right.
④ In Properties window, select DP0000 in the Background Image.



Step4 Import an icon

① In Resources window, right click Icons select Import Icon.
② Select a icon file
③ select "Open"





Step5 Built a static icon on the page

① In tool bar, select static icon.
② Create a rectangle static icon area on page
③ In static icon properties, select the imported icon DI0000
④ In static icon properties, set Transparent as "True"
⑤ In static icon properties, set Transparent Color as "0xff00ff"

Step6 Compile and download
(please refer to the previous examples)

Step7 Power on and display
(please refer to the previous examples)

-- done --

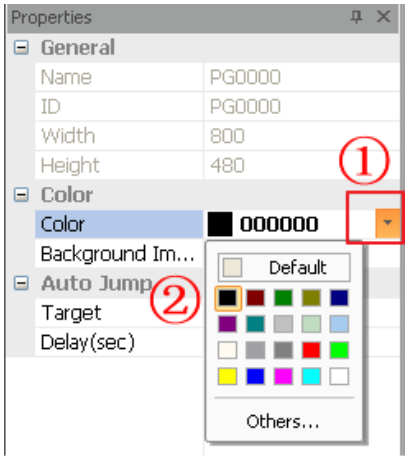
6.4 Show a Static String (STS)

(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a new project and built a page
(please refer to the previous examples)

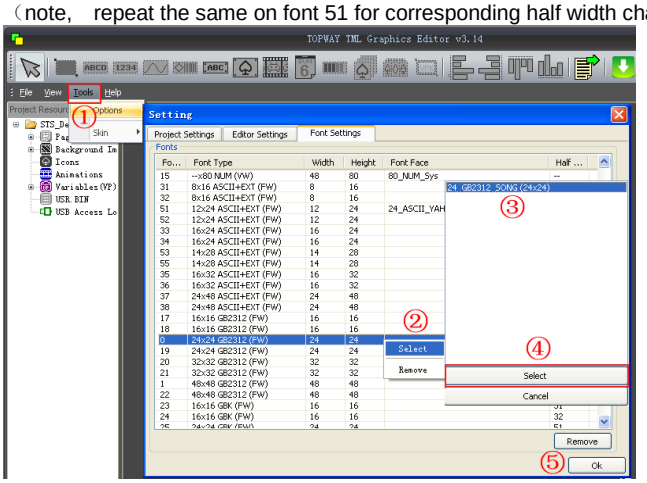
Step2 Select a background color for PAGE

① In PAGE properties, click Color pull down menu
② Select black (0x000000) as background color



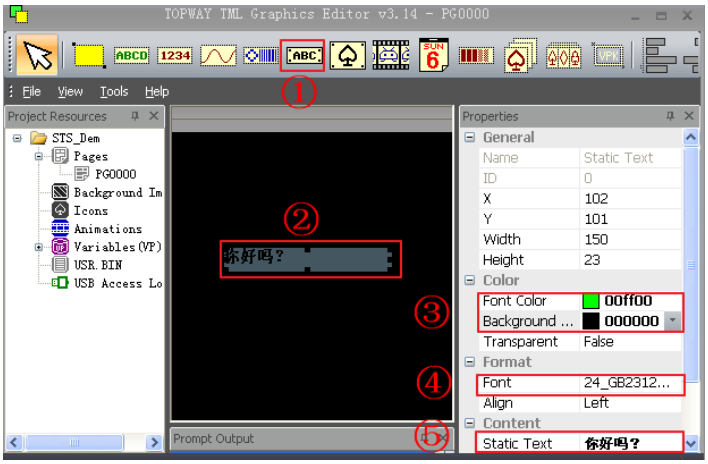
Step3 Import a Font Face

① In menu bar, Tools-->Options-->Font Setting.
② Right click on font 0 then "Select"
③ Select "24_GB2312_SONG(24X24)" (a full width char font)
④ Click "Select"
⑤ Click "OK"
（note, repeat the same on font 51 for corresponding half width char font）



Step4 Built a Static String on page

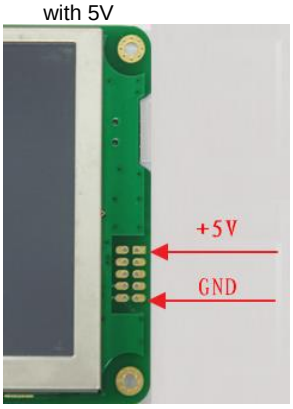
① In tools bar, select Static String
② Create a rectangle static string area on page
③ In static string properties, select font color
Font Color & Background Color
④ select Font as 24_GB2312_SONG(24X24)
⑤ Input Static Text: "你好吗？"



Step5 Compile and download
(please refer to the previous examples)

Step6 Power on and display
(please refer to the previous examples)

① disconnect the mini USB cable
② power on the Smart LCD with 5V
③ display



-- done --

6.5 Show an Animation Element (ANI)

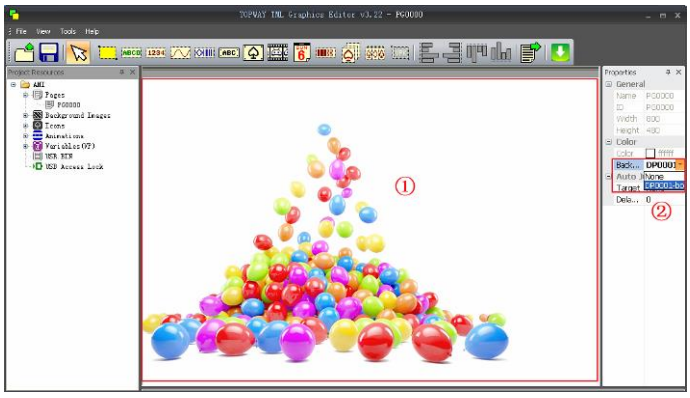
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a pictures as background
(please refer to the previous examples)

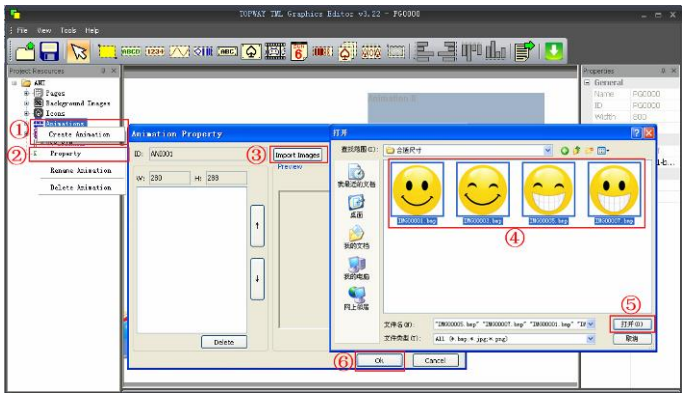
Step3 Link the page with the image

① Click on the working area of the page, its properties will show on the right.
② In Properties window, select DP0000 in the Background Image.



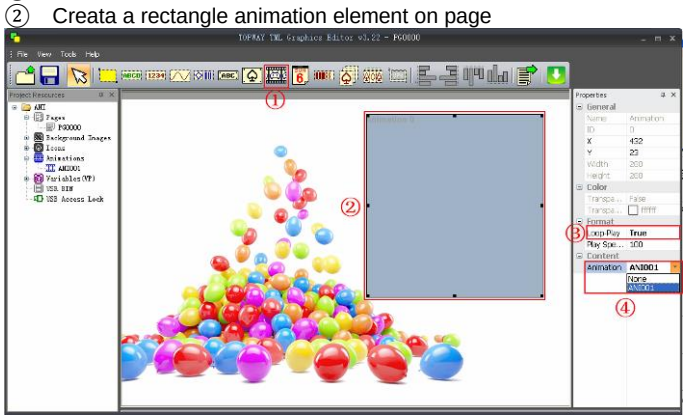
Step4 Import pictures as Animation

① In resources window, right click Animations, select "Create Animation"
② In resources window, right click on ANI001 select "Property"
③ In Animation Property's window click “Import Images”
④ select a series of animation-pictures (in same size)
⑤ click "OPEN"
⑥ click “OK”



Step5 Built a Animation Element

① In tool bar, select animation element
② Creata a rectangle animation element on page



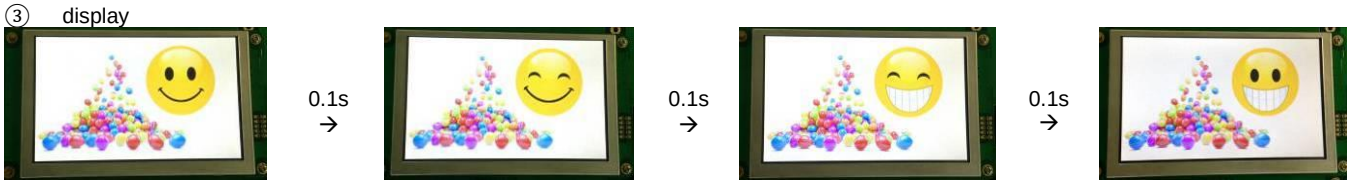
Step6 Link the Animation with the Element

③ In Animation Element properties, set Loop-Play as True
④ In Animation Element properties, select the Animation import in step4

Step7 Compile and download
(please refer to the previous examples)

Step8 Power on and display
(please refer to the previous examples)

① disconnect the mini USB cable
② power on the Smart LCD with 5V
③ display



-- done --

7 VP_Variables and Keyboard Examples

7.1 Using Internal Number Keyboard to input a value to a VP_N32

(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

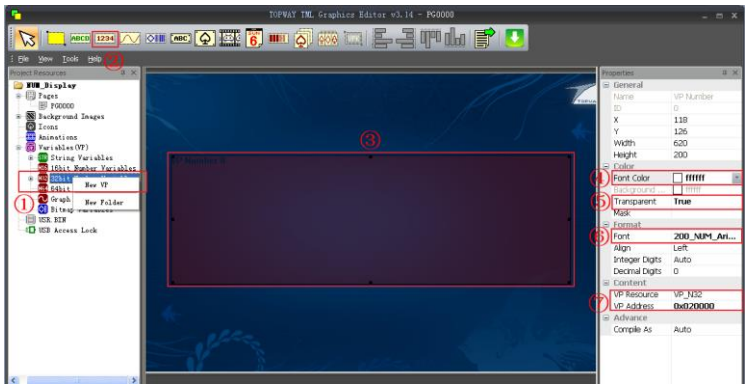
Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a pictures as IMG_BKG
(please refer to the previous examples)

Step3 Link the page with the IMG_BKG

Step4 Import a Font Face

① In menu bar, Tools-->Options-->Font Setting.
② Right click on font 50 then “Select”
③ Select “120x200NUM“ font face
④ Click “Select”
⑤ Click "OK"

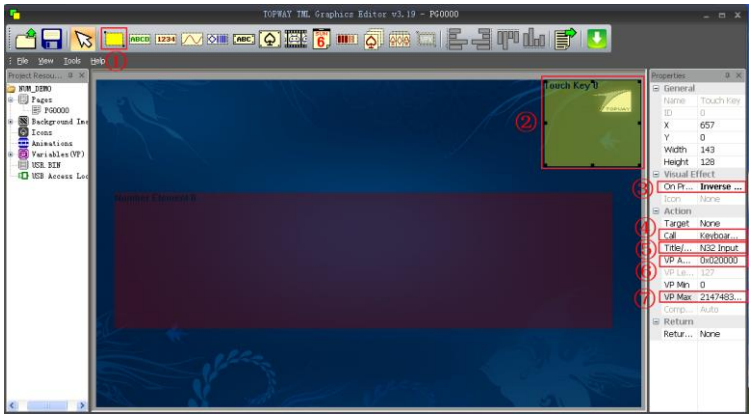


Step5 Allocate a VP_N32 variable

① In Resources window, right click on "32bit Number Variables" select :"New VP"

Step6 Built a Number Element and link with VP

① In tools bar, select number element
② Create a rectangle Number element area on page
③ In Number Element properties,
set "Font color" as "0xFFFFFF"
④ set "Transparent" as “True”
⑤ set "font" as "Font 50"
⑥ set "VP Address" link to "VP_N32 0x020000"



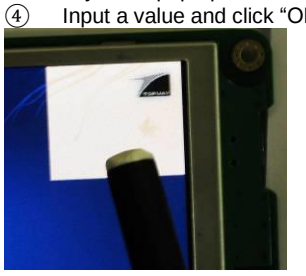
Step7 Built a Touch Key (TPK) to call out Number Keyboard

① In tools bar, select Touch Key
② Create a rectangle touch key area on the PAGE
③ In touch key properties,
set "On Press Down" as "Inverse Color"
④ set CALL as “Keyboard Number”
⑤ set "Title/Value" as “N32 Input”
⑥ set "VP Address" as 0x020000
⑦ set "VP Max" as "2147483647"

Step8 Compile and download
(please refer to the previous examples)

Step9 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ Touch the TPK, a number keyboard pop up.
④ Input a value and click “OK”



-- done --

7.2 Using Internal English Keyboard to input a string to a VP_STR

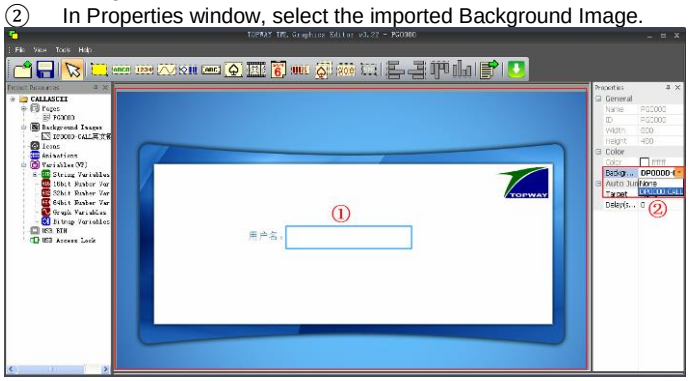
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a pictures as IMG_BKG
(please refer to the previous examples)

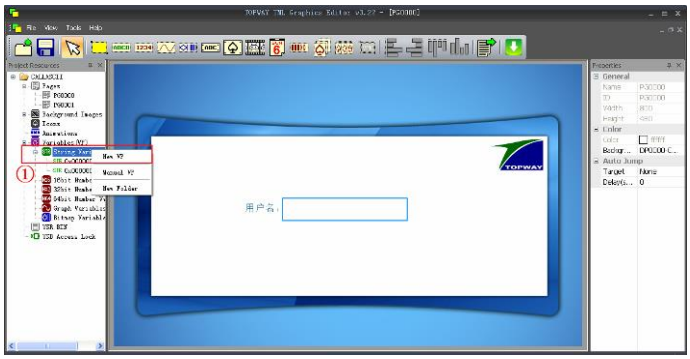
Step3 Link the page with the IMG_BKG

① Click on the working area of the PAGE, its properties will show on the right.
② In Properties window, select the imported Background Image.



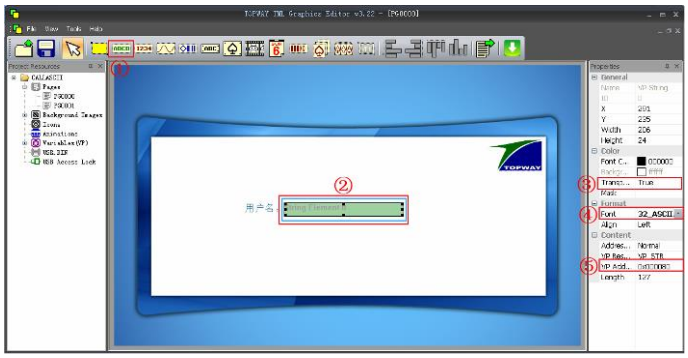
Step4 Allocate a VP_STR

① In Resources window, right click on "String Variables" select "New VP"



Step5 Built a String Element and linke with VP

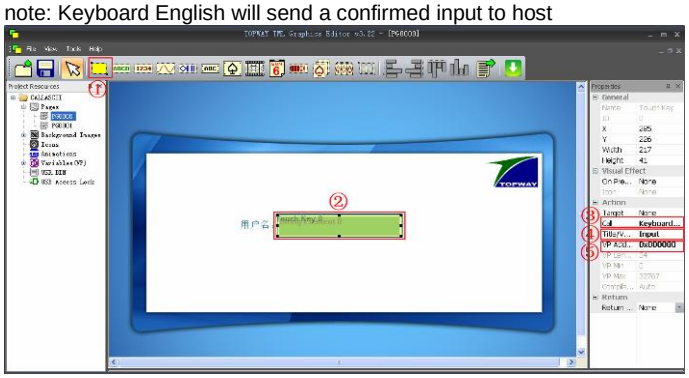
① In tools bar, select String Element
② Create a rectangle String Element area on PAGE
③ In String Element properties set Transparent as “True”
④ In String Element properties, set Font as: "32_ASCII_SysBold"
⑤ In String Element properties, set VP Address link to VP_STR 0x000080



Step6 Built a Touch Key (TPK) to call out English Keyboard

① In tools bar, select Touch Key
② Create rectangle touch key area on the PAGE
③ In touch key properties,
set "CALL" as "Keyboard English"
④ set "Title/Value" as “Input”
⑤ set "VP Address" as 0x000080

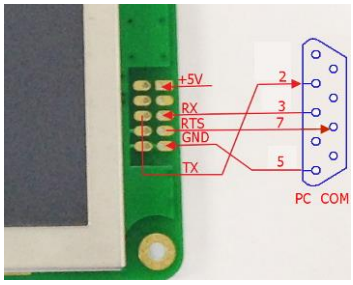
note: Keyboard English will send a confirmed input to host

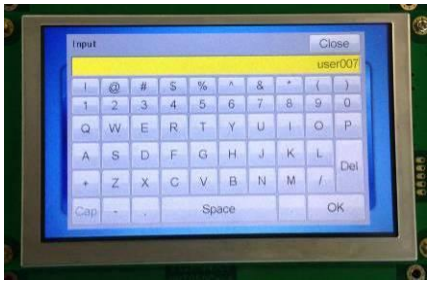


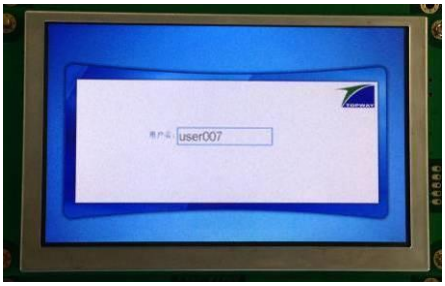
Step7 Compile and download (please refer to the previous examples)

Step8 Power on and Display

① Disconnect the mini USB cable
② Power the Smart LCD with5V
③ Connect to PC (115200,8,n,1) with a RS232-C cable
④ touch the TPK area
⑤ type in “user007”
⑥ click “OK”
⑦ Host PC could also see "user007" in packet with any serial terminal program.







-- done --

7.3 Using Internal Password Keyboard to input a number pin

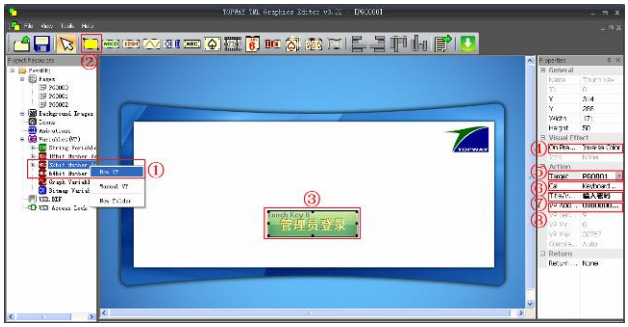
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project

(please refer to the previous examples)

Step2 Built 3 pages, import 3 pictures as IMG_BKG

(please refer to the previous examples)



Step3 Link the pages with the IMG_BKGs

① Click on the working area of each Page, the properties will show on the right.
② In Properties window, select the imported Background image where DP0000 for login, DP0001 for login failed, DP0002 for successfully login

Step4 Allocate a VP_N32

① In Resources Window, right click on 32bit Number Variables select "New VP"

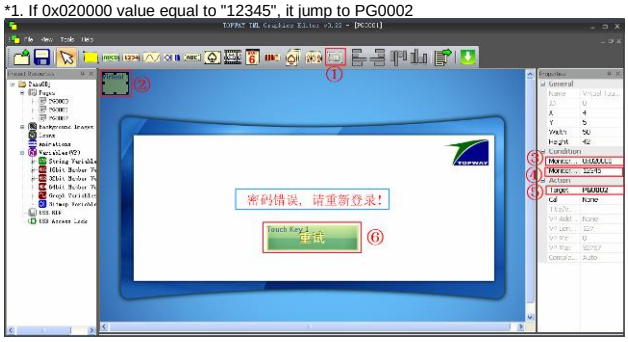
Step5 Built a Touch Key (TPK) to call out Password Keyboard

① In tools bar, select Touch Key
② Create rectangle touch key area on the PAGE
③ In Touch Key properties,
set "On Press Down" as "Inverse Color"
④ set "Target" as "PG0001"
⑤ set "Call" as "Keyboard password"
⑥ set "Title/Value" as “Input Password”
⑦ set "VP Address" as "0x000000 (BUFF)"

Step6 Built a Virtual Touch Key (VPK) to trigger a page jump

① In tool bar, select Virtual Touch Key
② Create rectangle VPK area on the PAGE
③ In Touch Key properties,
set "Monitor-VP" as "0x020000"
④ set "Monitor-Value" as "12345"(*1)
⑤ set "Target" as "PG0002"
⑥ Built a retry TPK on DP0001 (login failed) page for jump back to PG0000 (login page)

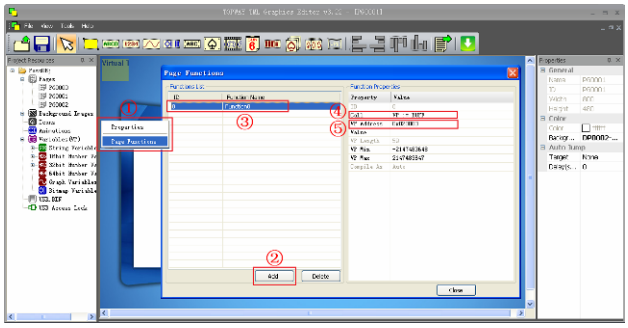
*1. If 0x020000 value equal to "12345", it jump to PG0002



Step7 Page Function that action at Page loading

(copy the BUFF value that input by password keyboard to the Monitor-VP)

① Right click on the empty area of DP0001
select "Page Functions”
② Click on "Add”
③ select the Functions List ID:0
④ set "Call" as "VP:=BUFF"
⑤ set "VP Address" "0x020000"
⑥ click "Close" to finish



Step8 Compile and download

(please refer to the previous examples)

Step9 Power on and Display

① Disconnect the mini USB cable
② Power the Smart LCD with 5V
③ touch the login key
④ input “12345”
⑤ click “ok”
⑥ for wrong password, click retry




-- done --

7.4 Using Internal Real-Time-Clock Keyboard to set the Real-Time-Clock(RTC) time

(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project

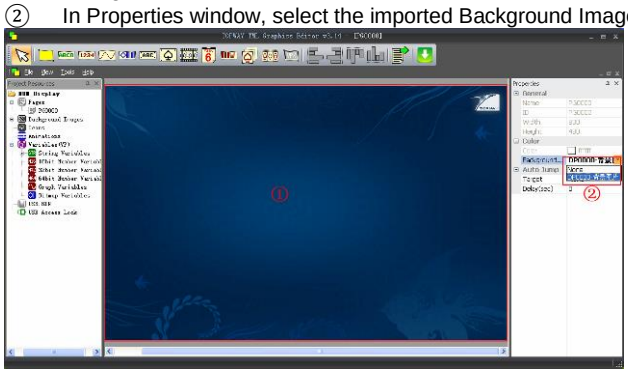
(please refer to the previous examples)

Step2 Built a page, import a pictures as IMG_BKG

(please refer to the previous examples)

Step3 Link the page with the IMG_BKG

① Click on the working area of the PAGE, its properties will show on the right.
② In Properties window, select the imported Background Image.



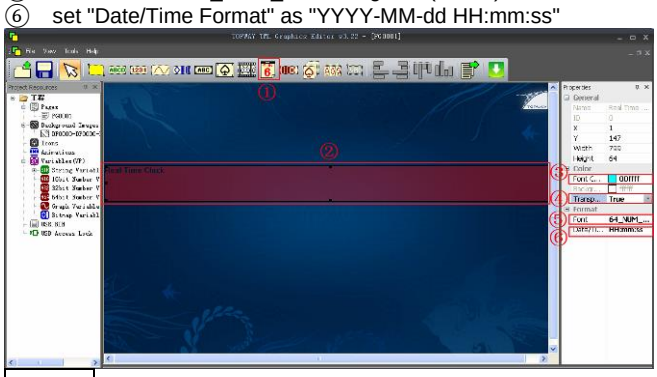
Step4 Import a Font Face

(please refer to the previous examples)

① In menu bar, Tools-->Options-->Font Setting.
② Right click on font 44 then “Select”
③ Select “64_NUM_SevenSegment(40x64)"
④ Click “Select”
⑤ Click “OK”

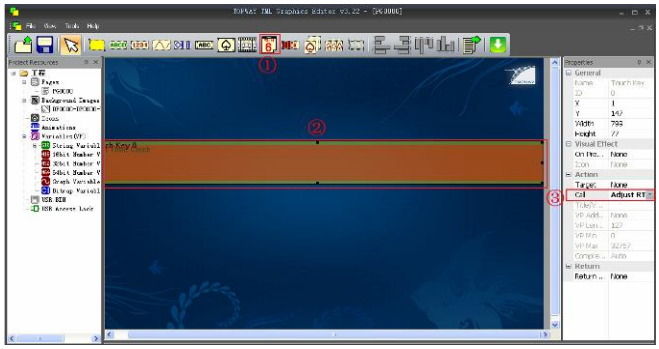
Step5 Built a RTC on screen RTC

① In tools bar, select RTC
② Create a rectangle area on page
③ In Touch Key properties,
set "Font Color" as "0x00FFFF" (CYAN)
④ set "Transparent" as "True”
⑤ set "Font" as "64_NUM_SevenSegment(40x64)"
⑥ set "Date/Time Format" as "YYYY-MM-dd HH:mm:ss"



Step6 Built a Touch Key (TPK) to call RTC Keyboard

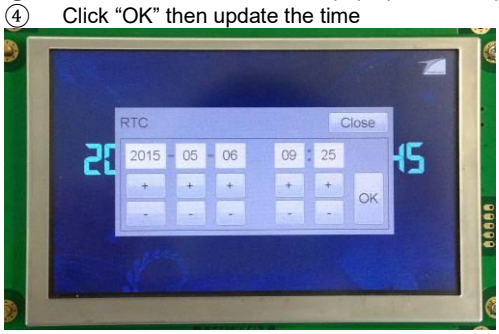
① In tool bar, select Touch Key
② Creat a rectangle touch key area on the PAGE
③ In touch key properties,
set "Call" as "Adjust RTC"



Step7 Compile and download (please refer to the previous examples)

Step8 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ Touch on the RTC area and pop up a RTC keyboard for time adjustment.
④ Click “OK” then update the time



-- done --

7.5 Using PIP Menu to input a String Value

(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

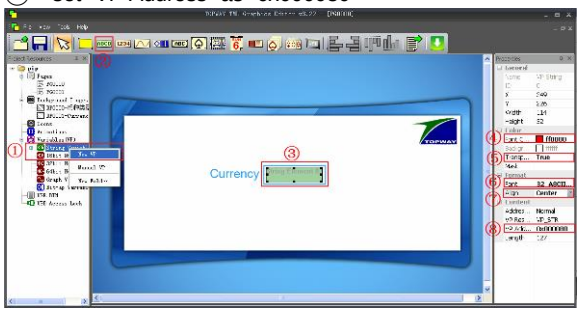
Step2 Built two pages, import a pictures as IMG_BKG (please refer to the previous examples)

① Click on the working area of the PAGE, its properties will show on the right.
② In Properties window, select the imported Background Image.
note: DP0000 is for main page; DP0001 for PIP menu page

Step3 Link the page with the IMG_BKG
(please refer to the previous examples)

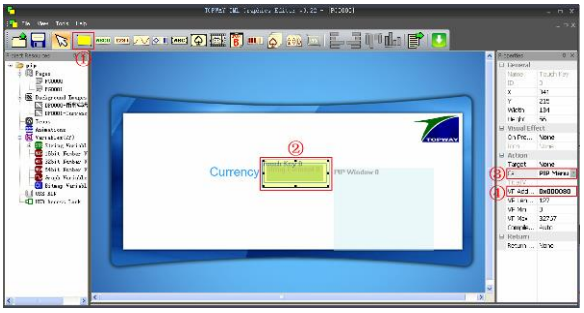
Step4 Allocate a VP_STR and show on page

① In Resources Window, right click on String Variables, select "New VP"
② In tools bar, select String Element
③ Create rectangle string element area on the PAGE
④ In String Element properties,
set "Font Color" as "0xFF0000"
⑤ set "Transparent" as "True"
⑥ set "Font" as "32_ASCII_SysBold"
⑦ set "Align" as "Center"
⑧ set "VP Address" as "0x000080"



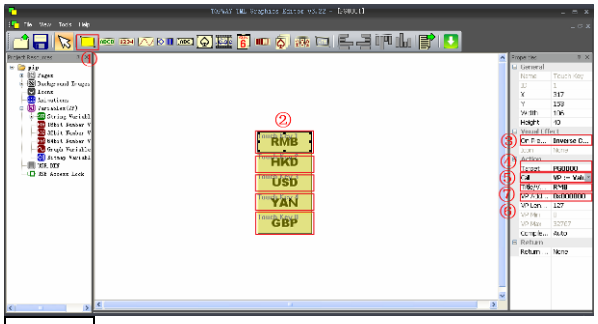
Step5 Built a Touch Key (TPK) to call PIP Menu

① In tools bar, select Touch Key
② Create rectangle touch key area on the PAGE
③ In Touch Key properties,
set "Call" as "PIP Menu"
④ set "VP Address" as "0x000080"



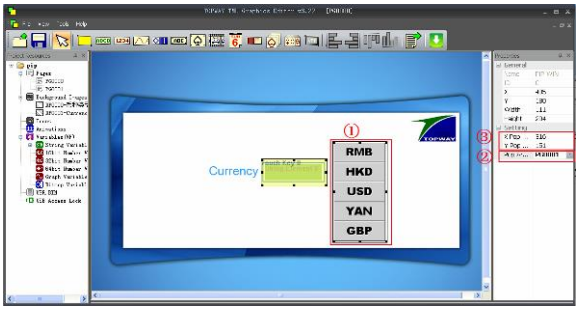
Step6 Built 5keys in PIP menu page (PG0001)

① In tools bar, select Touch Key
② Create 5 rectangle touch keys area on the PAGE
③ In Touch Key properties
set all 5 TPKs' "On Press Down" as "Inverse Color"
④ set all 5 TPKs' "Target" as "PG0000"
⑤ set all 5 TPKs' "Call" as "VP:=value"
⑥ set all 5 TPKs' "VP Address" as "0x000080"
⑦ set each TPK "Title/Value" as "RMB", "HKD", "USD". "YAN" and "GBP"



Step7 PIP Menu window configuration

① click on PIP Menu window
② In PIP WIN properties,
set "Pop Area of Page" as "PG0001"(the menu page)
③ set "PIP WIN X/Y" pop up position
(hold the Ctrl key with mouse to shift the PIP window content area)
(After selected the TPK by mouse click, PIP window will show on page)



Step8 Compile and download (please refer to the previous examples)

Step9 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ Click on the input box, and select the PIP MENU
④ The corresponding string show screen

-- done --

7.6 Using PIP (Number) Keyboard to input a value

(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

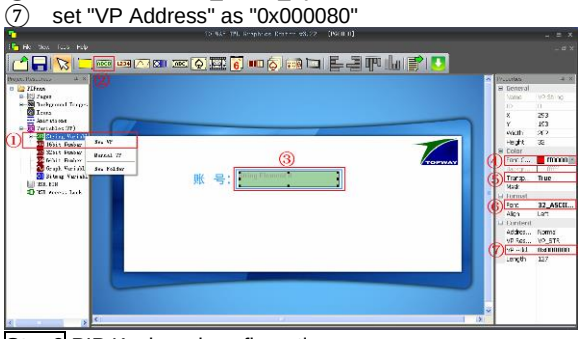
Step2 Built two pages, import a pictures as IMG_BKG (please refer to the previous examples)

① Click on the working area of the PAGE, its properties will show on the right.
② In Properties window, select the imported Background Image.
note: DP0000 is for main page; DP0001 for PIP(number) Keyboard page, where DP0002 for press down effect only.

Step3 Link the page with the IMG_BKG
(please refer to the previous examples)

Step4 Allocate a String VP and show on page

① In Resources Window, right click on String Variable, select "New VP"
② In tools bar, select String Element
③ Create rectangle string element area on the PAGE
④ In String Element properties,
set "Font Color" as "0xFF0000"
⑤ set "Transparent" as "True"
⑥ set "Font" as "32_ASCII_SysBold"
⑦ set "VP Address" as "0x000080"

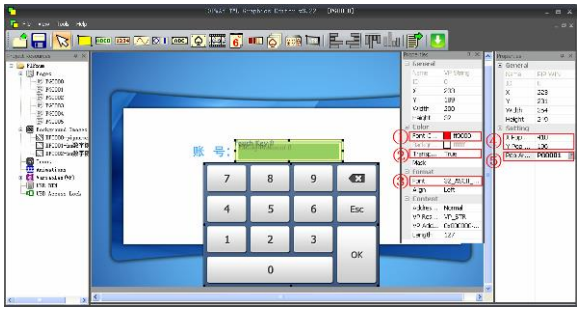


Step5 Built a Touch Key (TPK) to call PIP (Number) Keyboard

① In tools bar, select Touch Key
② Create rectangle touch key area on the PAGE
③ In Touch Key properties,
set "Call" as "PIP Number Keyboard"
④ set "VP Address" as "0x000080"

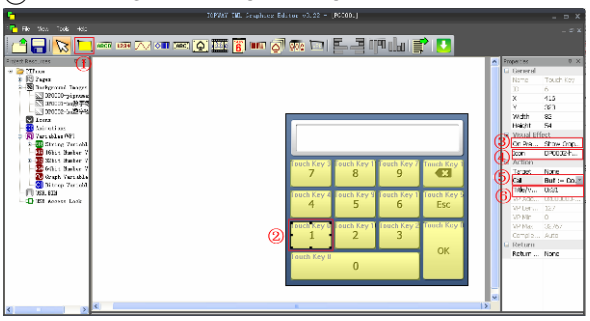
Step6 PIP Keyboard configuration

① In POP TITLE properties
set "Font Color" as "0xFF0000"
② set "Transparent" as "True"
③ set "Font" as "32_ASCII_SysBold"
④ In POP WIN properties,
set "Pop Area of Page" as "PG0001" (keyboard page)
⑤ set "PIP WIN X/Y" pop up position
(hold the Ctrl key with mouse to shift the POP window content area)



Step7 Built PIP keyboard's keys and its setting

① In tools bar, select Touch Key
② Create 13 rectangle touch keys area on the PAGE
③ In Touch Key properties
set all 13 TPKs' "On Press Down" as "Cropped BgImg"
④ set all 13 TPKs' "Icon" as DP0002
⑤ set the 10 numeric TPKs' "Call as "Buf:=Con(Buff,Cap/Nom(Byte0/Byte1))"
set "Title/Value" as its own value(*1)
⑥ set the “X” TPK's "Call" as "vp:=DelLastchar(vp)"
⑦ set the “ESC” TPK's "Call" as "Call=Esc"
⑧ set the “OK” TPK's "Call" as "Call=Enter"



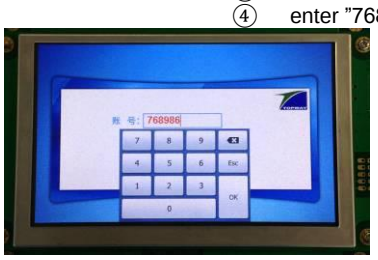
*1. Key and code value

Key	Code Value
0	0x30
1	0x31
2	0x32
:	:
8	0x38
9	0x39

Step8 Compile and download (please refer to the previous examples)

Step9 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ Click on the input box
④ enter ”768986”click "OK"


-- done --

7.7 Using PIP Keyboard to input a value

(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

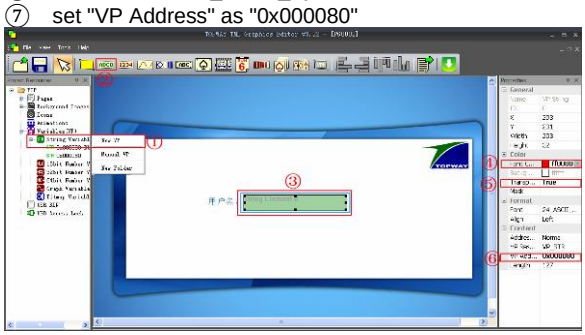
Step2 Built two pages, import a pictures as IMG_BKG (please refer to the previous examples)

① Click on the working area of the PAGE, its properties will show on the right.
② In Properties window, select the imported Background Image.
note: DP0000 is for main page; DP0001 for PIP (English) Keyboard page,

Step3 Link the page with the IMG_BKG
(please refer to the previous examples)

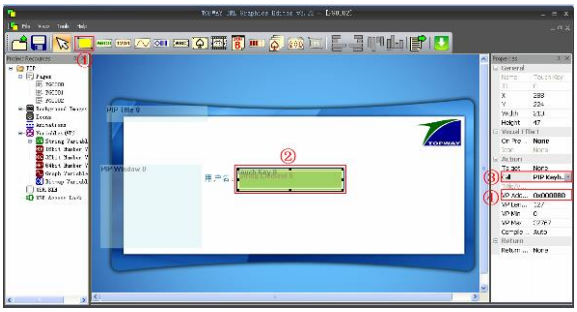
Step4 Allocate a String VP and show on page

① In Resources Window, right click on String Variable, select "New VP"
② In tools bar, select String Element
③ Create rectangle string element area on the PAGE
④ In String Element properties,
set "Font Color" as "0xFF0000"
⑤ set "Transparent" as "True"
⑥ set "Font" as "32_ASCII_SysBold"
⑦ set "VP Address" as "0x000080"



Step5 Built a Touch Key (TPK) to call PIP Keyboard

① In tools bar, select Touch Key
② Create rectangle touch key area on the PAGE
③ In Touch Key properties,
set "Call" as "PIP Keyboard"
④ set "VP Address" as "0x000080"

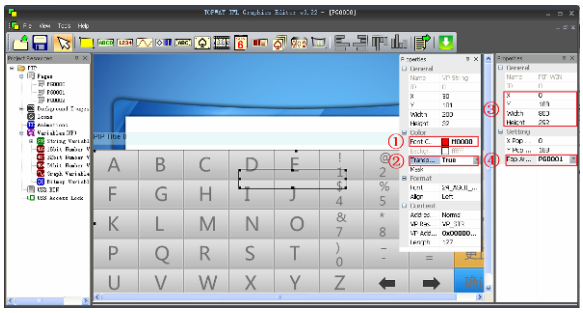


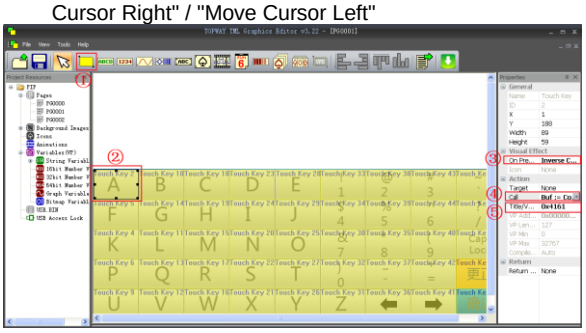
Step6 PIP Keyboard configuration

① In POP TITLE properties
set "Font Color" as "0xFF0000"
② set "Transparent" as "True"
③ set "Font" as "32_ASCII_SysBold"
⑥ In POP WIN properties,
set "Pop Area of Page" as "PG0001" (keyboard page)
set "PIP WIN X/Y" pop up position
(hold the Ctrl key with mouse to shift the POP window content area)

Step7 Built PIP Keyboard's keys and its setting

① In tools bar, select Touch Key
② Create 45 rectangle touch keys area on the PAGE
③ In Touch Key properties
set all 45 TPKs' "On Press Down" as "Inverse Color"
④ set the 40 TPKs' "Call as "Buf:=Con(Buff,Cap/Nom(Byte0/Byte1))"
set "Title/Value" as its own value(*1)
⑤ set the other 5 TPKs "Call" as special functions as "CapLock" / "vp:=DelLastchar(vp)" / "Enter" / "Move Cursor Right" / "Move Cursor Left"





*1 TPK Title/Value

Key Code	Upper	Lower
0x4161	A	a
0x4262	B	b
0x4363	C	c
0x4464	D	d
0x4565	E	e
0x4666	F	f
0x4767	G	g
0x4868	H	h
0x4969	I	i
0x4A6A	J	j
0x4B6B	K	k
0x4C6C	L	l
0x4D6D	M	m
0x4E6E	N	n
0x4F6F	O	o
0x5070	P	p
0x5171	Q	q
0x5272	R	r
0x5373	S	s
0x5474	T	t
0x5575	U	u
0x5676	V	v
0x5777	W	w
0x5878	X	x
0x5979	Y	y
0x5A7A	Z	z
0x7E60	~	`
0x2131	!	1
0x4032	@	2
0x2333	$	3
0x2423	#	4
0x2535	%	5
0x5E36	^	6
0x2637	&	7
0x2A38	*	8
0x2839	(	9
0x2930	)	0
0x5F2D		-
0x2B3D	+	=
0x3F2F	?	/

Step8 Compile and download (please refer to the previous examples)

Step9 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ Click on the input box
④ enter "user006"click "OK"

-- done --

7.8 Using TPK to operate VP value

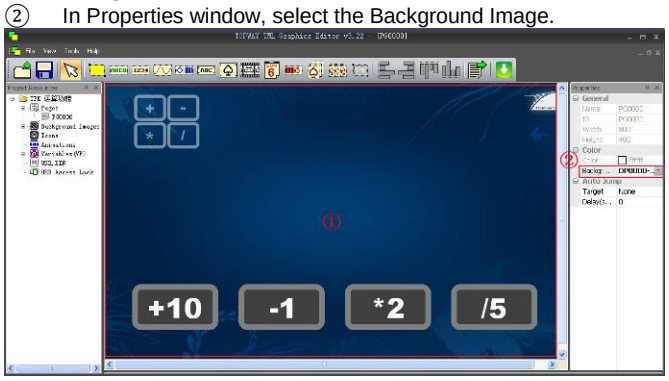
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built two pages, import a pictures as IMG_BKG (please refer to the previous examples)

Step3 Link the page with the IMG_BKG

① Click on the working area of the page, its properties will show on the right.
② In Properties window, select the Background Image.



Step4 Allocate a 32bit Number Variable (N32)

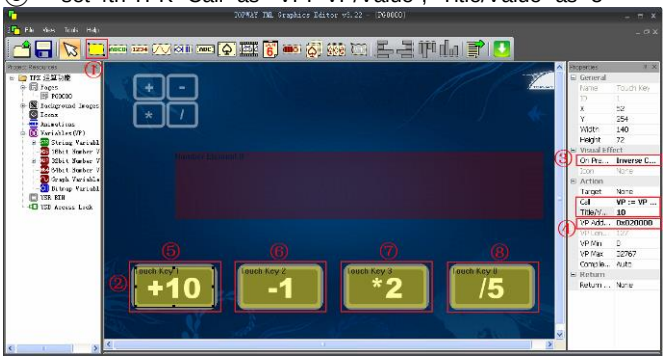
① In Resources window, right click on "32bit Number Variables" select :"New VP

Step6 Built a Number Element and link with VP

② In tools bar, select number element
③ Create a rectangle Number element area on page
④ In Number Element properties,
set "Font Color" as "0x00FFFF"
⑤ set "Transparent" as "True"
⑥ set Font" as "80_NUM_Sys"
⑦ set "Align" as "Right"
⑧ set "VP Address" as "0x020000"

Step6 Built 4 Touch-Key (TPK) on screen

① In tools bar, select Touch-Key element
② Create 4 rectangle Touch-Key element on page
③ In Touch-Key element properties
set "On Press Down" as "Inverse Color"
④ set "VP Address" as "0x020000"
⑤ set 1st TPK "Call" as "VP:=VP+Value", "Title/Value" as "10"
⑥ set 2st TPK "Call" as "VP:=VP-Value", "Title/Value" as "1"
⑦ set 3st TPK "Call" as "VP:=VP*Value", "Title/Value" as "2"
⑧ set 4th TPK "Call" as "VP:=VP/Value", "Title/Value" as "5"



Step8 Compile and download (please refer to the previous examples)

Step9 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ Touch the TPKs, to get VP value update accordingly

-- done --

8 VP and COM communication Examples

8.1 Using Serial Command to update a Number variable

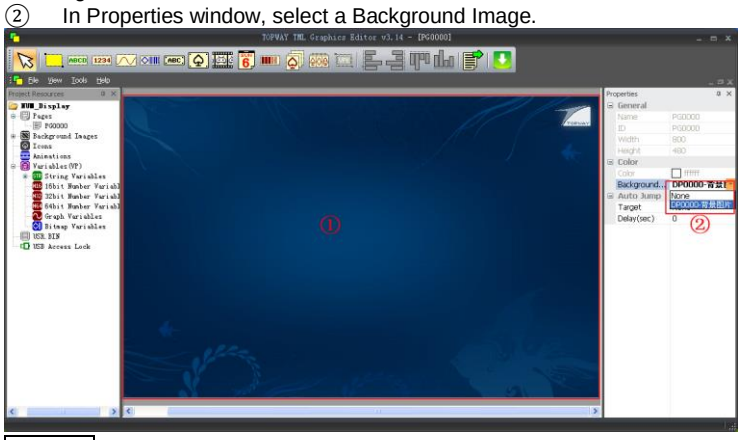
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a pictures as IMG_BKG
(please refer to the previous examples)

Step3 Link the page with the IMG_BKG

① Click on the working area of the page, its properties will show on the right.
② In Properties window, select a Background Image.

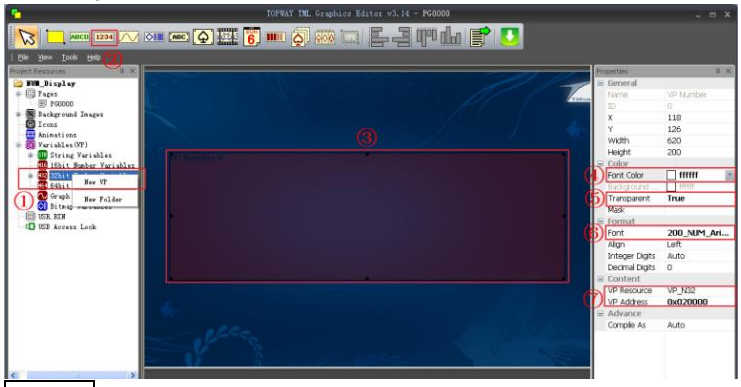


Step4 Import a Font Face

⑥ In menu bar, Tools-->Options-->Font Setting.
⑦ Right click on font 50 then “Select”
⑧ Select “120x200NUM“ font face
⑨ Click “Select”
⑩ Click "OK"

Step5 Allocate a VP_N32 variable

① In Resources window, right click on "32bit Number Variables" select :"New VP"



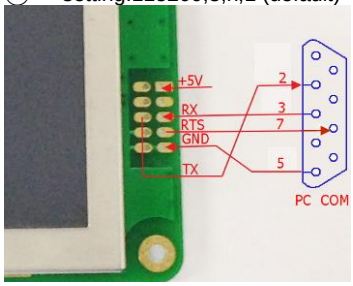
Step6 Built a Number Element and link with VP

② In tools bar, select number element
③ Create a rectangle Number element area on page
④ In Number Element properties,
set "Font color" as "0xFFFFFF"
⑤ set "Transparent" as “True”
⑥ set "font" as "Font 50"
⑦ set "VP Address" link to "VP_N32 0x020000"

Step7 Compile and download (please refer to the previous examples)

Step8 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ connect the serial port
④ setting:115200,8,n,1 (default)



⑤ send a command:
AA 44 00 02 00 00 00 02 90 FA CC 33 C3 3C
(write a value 0x000290FA(168186)
to VP address 0x00020000)

⑥ send a command:
AA 44 00 02 00 00 00 08 AD 6D CC 33 C3 3C
(write a value 0x0008AD6D(568685)
to VP address 0x00020000)

-- done --

9 Advance element Examples

9.1 Show a Progress Bar

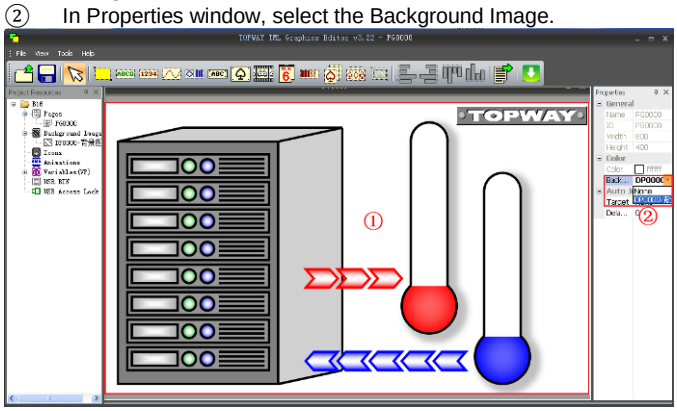
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built two pages, import a pictures as IMG_BKG (please refer to the previous examples)

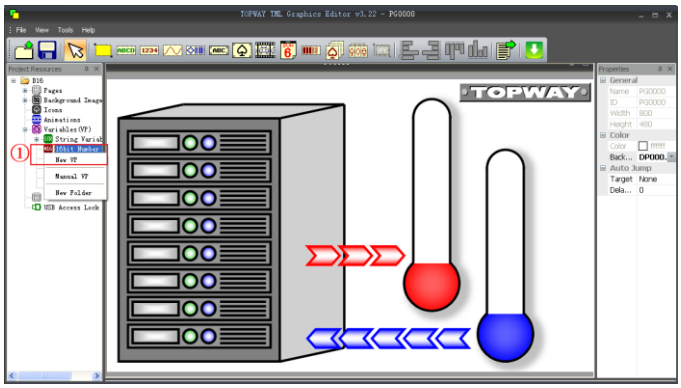
Step3 Link the page with the IMG_BKG

① Click on the working area of the page, its properties will show on the right.
② In Properties window, select the Background Image.



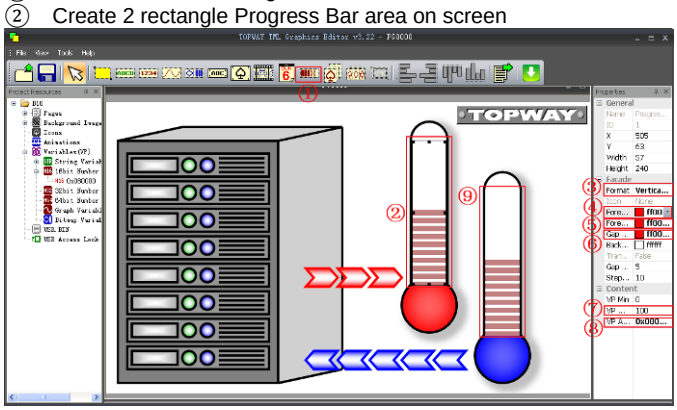
Step4 Allocate a 16bit Number Variable (N16)

① In Resources window, right click on "16bit Number Variables" select :"New VP



Step5 Built a Progress Bar on screen

① In tools bar, select Progress Bar element
② Create 2 rectangle Progress Bar area on screen



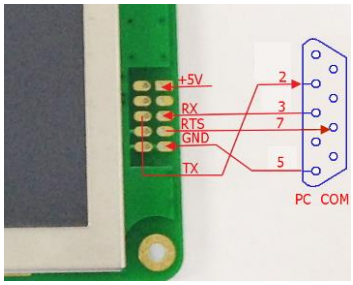
Step6 Config the Progress Bar and link to VP

③ In Progress Bar element properties
set "Format" as "Vertical:Down to Up"
④ set "Forecolor 1" as "0xFF0000"
⑤ set "Forecolor 2" as "0xFF0000"
⑥ set "Gap Color" as "0xFF0000"
⑦ set "VP Max" as "100"
⑧ set "VP Address" as "VP 0x080000"
⑨ repeat the above to the second Progress Bar with another color

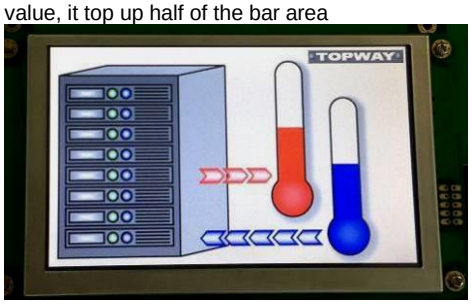
Step8 Compile and download (please refer to the previous examples)

Step9 Power on and Display

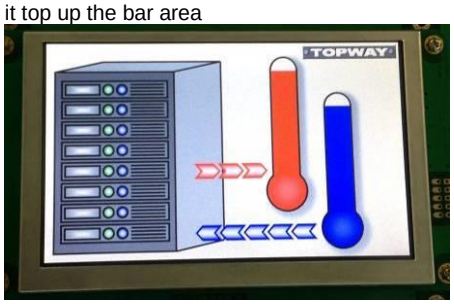
① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ connect the serial port
④ setting:115200,8,n,1 (default)



⑤ send a command:
AA 3D 00 08 00 00 00 32 CC 33 C3 3C
(write a value 0x0032 (50)
to VP address 0x00080000)
Note: the value 50 is a half between MAX/MIN value, it top up half of the bar area



⑥ send a command:
AA 3D 00 08 00 00 00 64 CC 33 C3 3C
(write a value 0x0032 (100)
to VP address 0x00080000)
Note: the value 100 is same as MAX value, it top up the bar area



-- done --

9.2 Using Index Icon

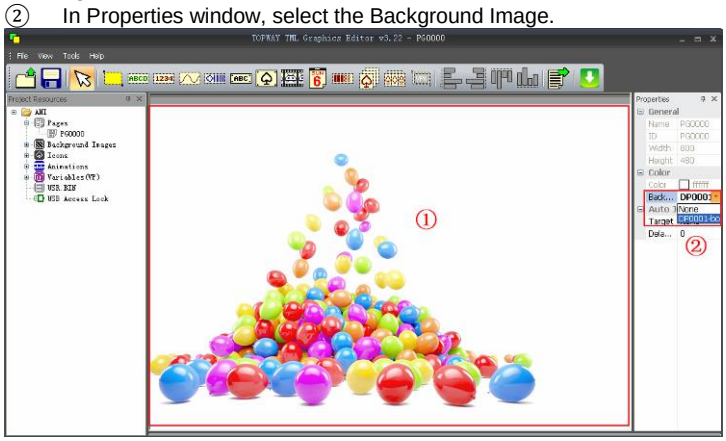
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a pictures as IMG_BKG (please refer to the previous examples)

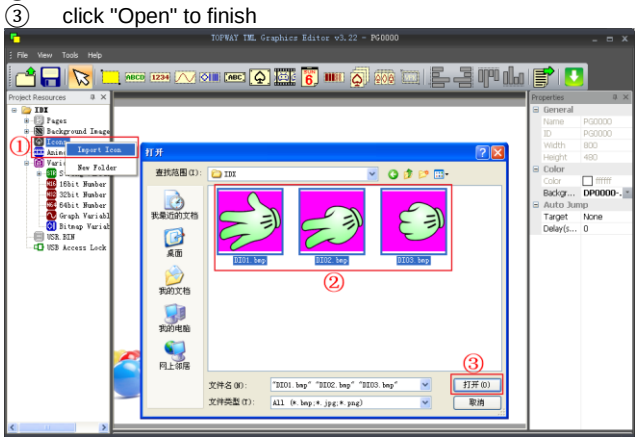
Step3 Link the page with the IMG_BKG

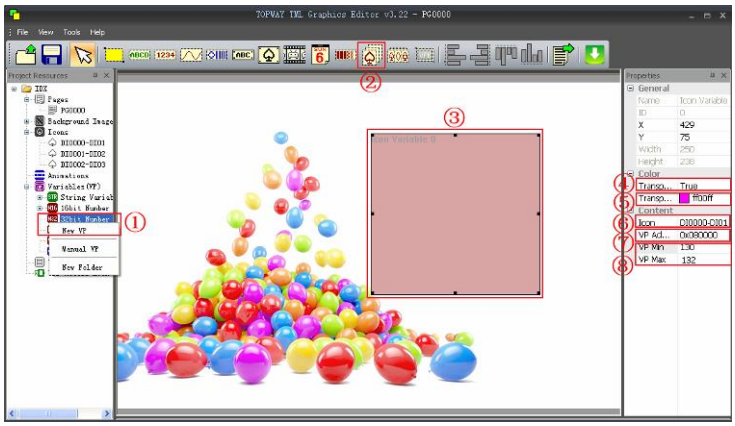
① Click on the working area of the page, its properties will show on the right.
② In Properties window, select the Background Image.



Step4 Import Icons

① In Resources window, right click Icons select "Import Icon"
② select the icon files
③ click "Open" to finish





Step5 Allocate a 16bit Number Variable (N16)

① In Resources window, right click on "16bit Number Variables" select :"New VP"

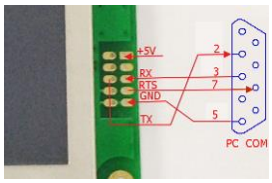
Step6 Built Indexed Icon and link to VP

① In tools bar, select Indexed Icon element
② Create a rectangle Indexed Icon area on screen
③ In Indexed Icon properties,
set "Transparent" as "True"
④ set "Transparent Color" as "0xFF00FF" (icons' background)
⑤ set "ICON" as "DI0000" (the first imported icons)
⑥ set "VP Address" as "VP 0x080000"
⑦ set "VP Min" as "130" and "VP Max" as "132"

Step7 Compile and download
(please refer to the previous examples)

Step8 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ connect the serial port
④ setting:115200,8,n,1 (default)



⑤ send a command:
AA 3D 00 08 00 00 00 82 CC 33 C3 3C
(write a value 0x0083 (131)
to VP address 0x00080000)
Note:
value 0x0082 is same as the (MIN value + 1),
thus, the 2nd icon show on screen

⑥ send a command:
AA 3D 00 08 00 00 00 84 CC 33 C3 3C
(write a value 0x0084 (132)
to VP address 0x00080000)
Note:
value 0x0084 is same as the (MIN value + 2),
Thus the 3rd icon show on screen

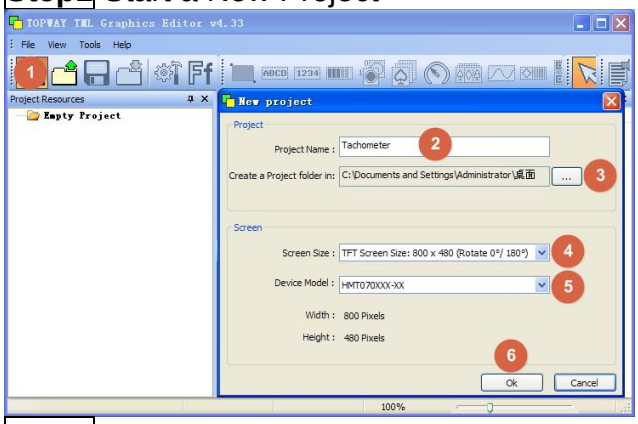
⑦ send a command:
AA 3D 00 08 00 00 00 85 CC 33 C3 3C
(write a value 0x0085 (133)
to VP address 0x00080000)
Note:
value is outside the range of MAX and MIN,
Thus, no icon show on screen)

-- done --

9.3 Using Tachometer Element (Angle Open Mode) Application Example

(This example is using HMT070CQ-C and Editor v4.33)

Step1 Start a New Project



⑥ start TOPWAY TML Graphics Editor v4.33, start a new project through manual bar
File --> New Project

⑦ Enter the Project name
Project Name: Tachometer (as an example)

⑧ Select a Project folder location
Create a Project Folder in: desktop\Tachometer (as an example)

⑨ Select the display resolution of the SmartLCD
Screen Size: 800x480 (for this example HMT070CQ-C)

⑩ Click “OK”

Step2 Built a Page, import Background Image and icons

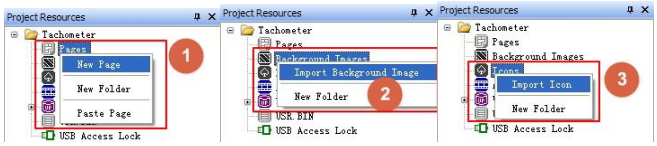
① In Resource window, right click on Pages, select New Page

② In Resource window, right click on Background Images, select Import Background Image

③ Select images for background, select "Open"

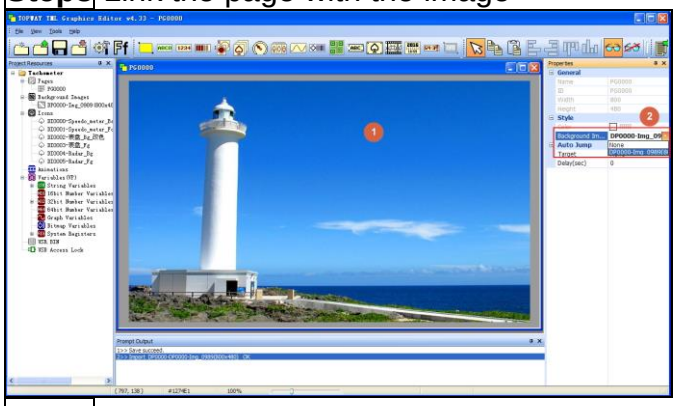
④ In Resources window, right click Icons select Import Icon.

⑤ Select icon files, select "Open"



Note: Editor supports BMP, JPG, PNG. In this case a 800x480 picture could be best fit to the display. or Editor will resize it to fit the display

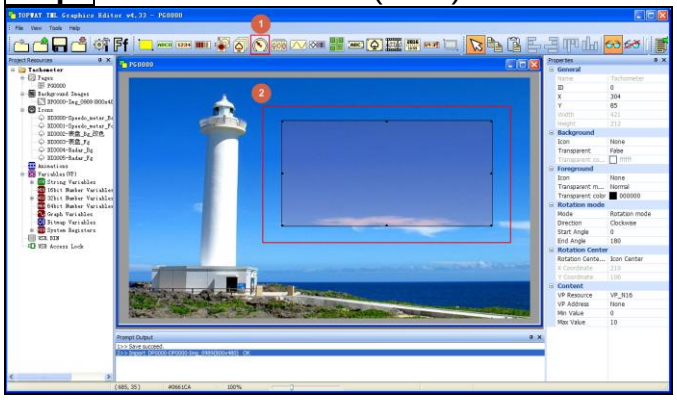
Step3 Link the page with the image



⑤ Click on the working area of the page, its properties will show on the right.

⑥ In Properties window, select DP0000 in the Background Image.

Step4 Built a Tachometer(TCM) Element on the page



① In tool bar, select Tachometer

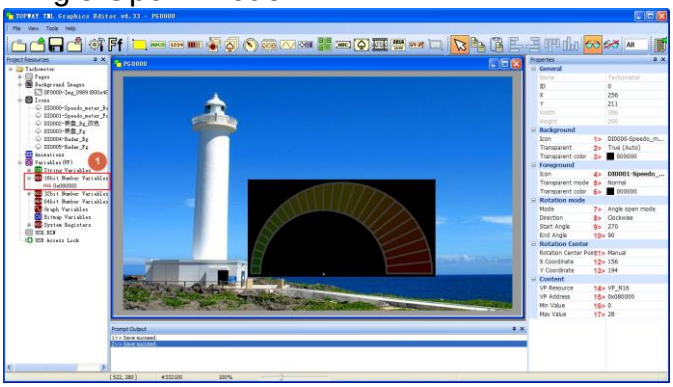
② Create a rectangle static icon area on page

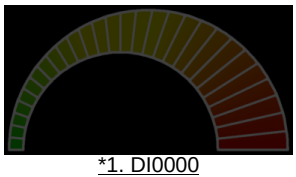
Step5 Config the Tachometer(TCM) Element as "Angle Open" mode

① In Resources window, right click on "16bit Number Variables" select :"New VP" to create a VP 0x080000.

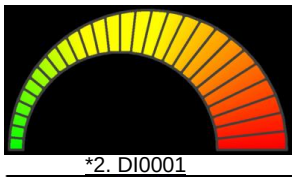
② Config the TCM properties

No.	items	configuration
1	Bg. Icon	Select DI0000 (*1)
2	Bg. Transparent	Select True (Auto)
3	Bg. Transparent color	Black (Auto)
4	Fg. Icon	Select DI0001 (*2)
5	Fg. Transparent mode	Select Normal
6	Fg. Transparent color	Black
7	Mode	Select " Angle Open" mode
8	Direction	Select Clockwise
9	Start Angle	Select 270° (*3)
10	End Angle	Select 90°(*3)
11	Rotation Center Point	Manual
12	X Coordinate	Manual adjust to its center (*4)
13	Y Coordinate	Manual adjust to its center (*4)
14	VP Resource	Link to VP_N16
15	VP Address	Link with VP 0x080000
16	Min Value	0 as no light on
17	Max Value	28 as all light on

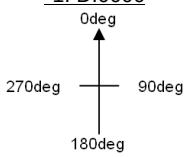




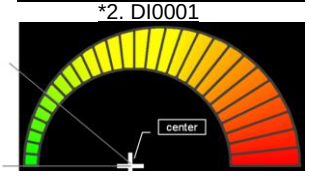
*1. DI0000



*2. DI0001



*3. Start/End Angle



*4. Rotation Center

Step6 Compile and download to the Smart LCD (please refer to the previous examples)

Step7 Power on and Display

⑦ Disconnect the mini USB cable
⑧ Power on the Smart LCD
⑨ connect the serial port
⑩ setting:115200,8,n,1 (default)

⑪ send a values 0 to VP_N16(0x080000) by the following command
AA 3D 00 08 00 00 0000 CC 33 C3 3C

No light on (0/28)

⑫ send a values 23 to VP_N16(0x080000) by the following command
AA 3D 00 08 00 00 0017 CC 33 C3 3C

Some light on (23/28)

note. value outside 0~28 will hide the TCM form the screen

-- done --

9.4 Using Tachometer Element (Rotation Mode) Application Example (Meter)

(This example is using HMT070CQ-C and Editor v4.33)

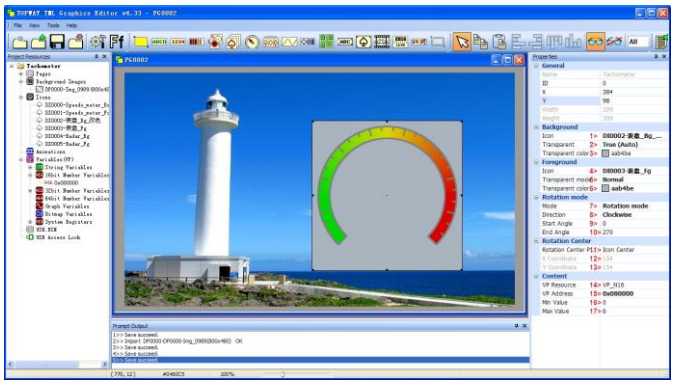
Step1 ~ **Step4** (please refer to the last examples)

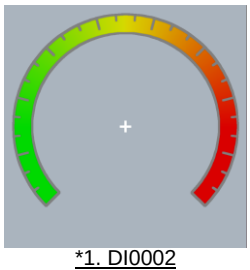
Step5 Config the Tachometer(TCM) Element as "Rotation Mode" mode

① In Resources window, right click on "16bit Number Variables" select :"New VP" to create a VP 0x080000.

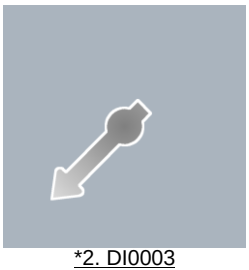
② Config the TCM properties

No.	items	configuration
1	Bg. Icon	Select DI0002 (*1)
2	Bg. Transparent	Select True (Auto)
3	Bg. Transparent color	0xaab4be (Auto)
4	Fg. Icon	Select DI0003 (*2)
5	Fg. Transparent mode	Select Normal
6	Fg. Transparent color	0xaab4be
7	Mode	Select "Rotation" mode
8	Direction	Select Clockwise
9	Start Angle	Select 0° (*3)
10	End Angle	Select 270°(*3)
11	Rotation Center Point	Manual
12	X Coordinate	Manual adjust to its center (*4)
13	Y Coordinate	Manual adjust to its center (*4)
14	VP Resource	Link to VP_N16
15	VP Address	Link with VP 0x080000
16	Min Value	0
17	Max Value	6

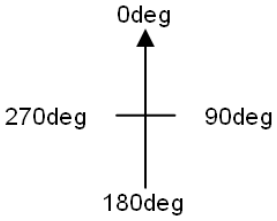




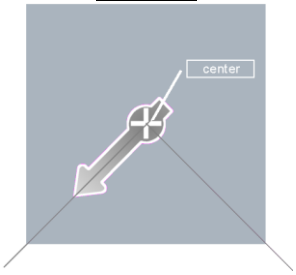
*1. DI0002



*2. DI0003



*3. Start/End Angle



*4. Rotation Center

Step6 Compile and download to the Smart LCD (please refer to the previous examples)

Step7 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD
③ connect the serial port
④ setting:115200,8,n,1 (default)

⑤ send a values 0 to VP_N16(0x080000) by the following command
AA 3D 00 08 00 00 0000 CC 33 C3 3C

Radar point at 359deg (0/6)

⑥ send a values 3 to VP_N16(0x080000) by the following command
AA 3D 00 08 00 00 0003 CC 33 C3 3C

Radar rotate... (3/6)

note. value outside 0~6 will hide the TCM form the screen

-- done --

9.5 Using Tachometer Element (Rotation Mode) Application Example (Radar)

(This example is using HMT070CQ-C and Editor v4.33)

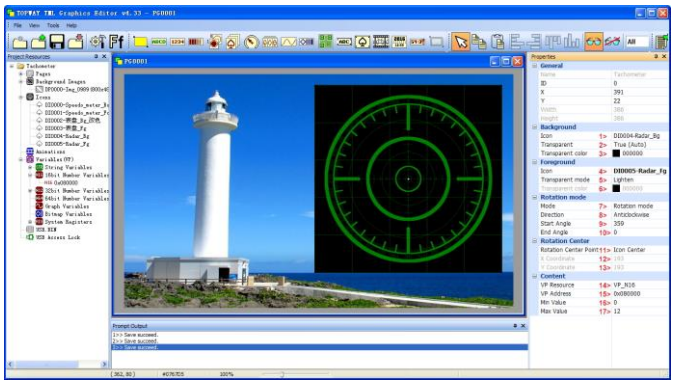
Step1 ~ **Step4** (please refer to the last examples)

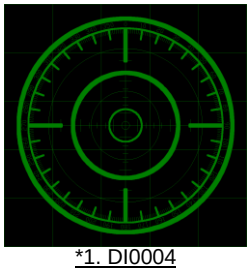
Step5 Config the Tachometer(TCM) Element as "Rotation Mode" mode

① In Resources window, right click on "16bit Number Variables" select :"New VP" to create a VP 0x080000.

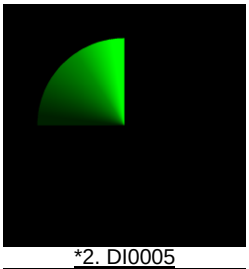
② Config the TCM properties

No.	items	configuration
1	Bg. Icon	Select DI0004 (*1)
2	Bg. Transparent	Select True (Auto)
3	Bg. Transparent color	Black (Auto)
4	Fg. Icon	Select DI0005 (*2)
5	Fg. Transparent mode	Select Lighten
6	Fg. Transparent color	Black (Auto)
7	Mode	Select "Rotation" mode
8	Direction	Select Anti Clockwise
9	Start Angle	Select 0° (*3)
10	End Angle	Select 330°(*3)
11	Rotation Center Point	Manual
12	X Coordinate	Manual adjust to its center (*4)
13	Y Coordinate	Manual adjust to its center (*4)
14	VP Resource	Link to VP_N16
15	VP Address	Link with VP 0x080000
16	Min Value	0
17	Max Value	11

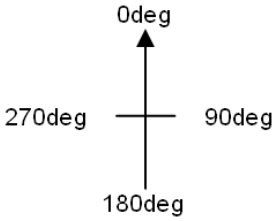




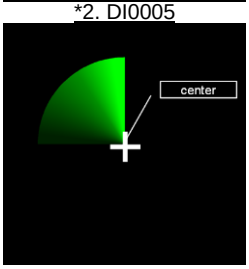
*1. DI0004



*2. DI0005



*3. Start/End Angle



*4. Rotation Center

Step6 Compile and download to the Smart LCD (please refer to the previous examples)

Step7 Power on and Display

⑦ Disconnect the mini USB cable
⑧ Power on the Smart LCD
⑨ connect the serial port
⑩ setting:115200,8,n,1 (default)

⑪ send a values 0 to VP_N16(0x080000) by the following command
AA 3D 00 08 00 00 0000 CC 33 C3 3C

Radar point at 0deg (0/11)

⑫ send a values 4 to VP_N16(0x080000) by the following command
AA 3D 00 08 00 00 0004 CC 33 C3 3C

Radar rotate... (4/11)

note. value outside 0~12 will hide the TCM form the screen

-- done --

9.6 Using Decimal Icon

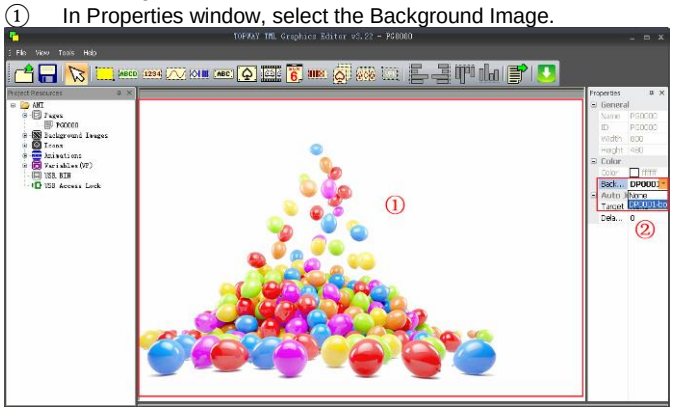
(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a pictures as IMG_BKG (please refer to the previous examples)

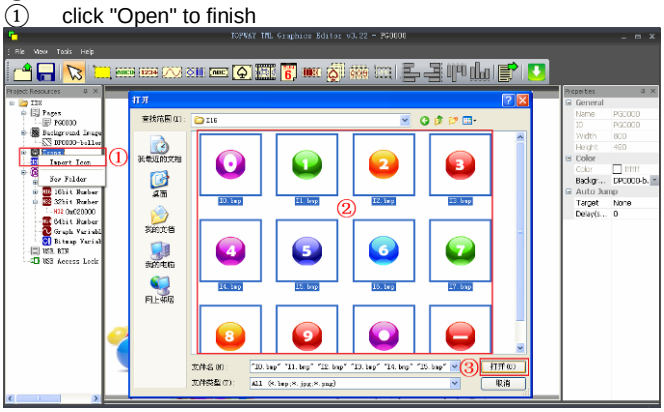
Step3 Link the page with the IMG_BKG

③ Click on the working area of the page, its properties will show on the right.
① In Properties window, select the Background Image.



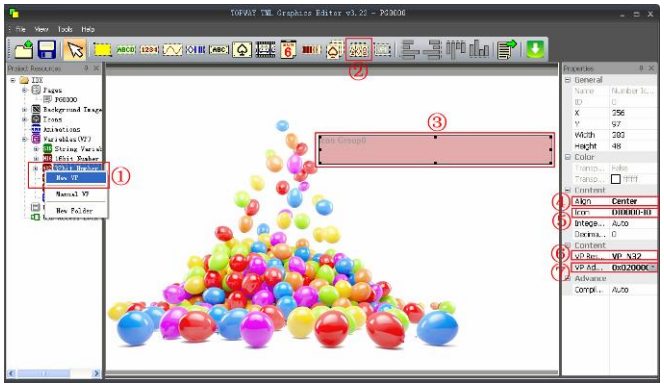
Step4 Import Icons

④ In Resources window, right click Icons select "Import Icon"
⑤ select the icon files
① click "Open" to finish



Note:

1st icon	2nd icon	...	10th icon	11th icon	12th icon
		...			



Step5 Allocate a 32bit Number Variable (N32)

② In Resources window, right click on "32bit Number Variables" select :"New VP

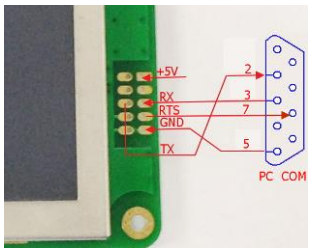
Step6 Built Indexed Icon and link to VP

① In tools bar, select Decimal Icon element
② Create a rectangel Decimal Icon element on screen
③ In Decimal Icon properties,
set "Align" as "Center"
④ set "ICON" as "DI0000"
⑤ set "VP Resource" as "VP_N32"
⑥ set "VP Address" as "VP: 0x020000"

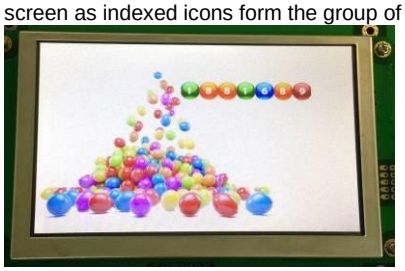
Step7 Compile and download
(please refer to the previous examples)

Step8 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ connect the serial port
④ setting:115200,8,n,1 (default)



⑤ send a command:
AA 44 00 02 00 00 00 1C B6 59 CC 33 C3 3C
(write a value 0x001CB659 (1881689)
to VP address:0x00020000)
Note:
the value in decimal 1881689 are showing on screen as indexed icons form the group of icons



⑥ send a command:
AA 44 00 02 00 00 66 14 49 CC 33 C3 3C
(write a value 0x00661449 (6689865)
To VP address 0x00020000)
Note:
The value in decimal6689865 are showing on screen as indexed icons form the group of icons

-- done --

9.7 Using Graph Element

(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

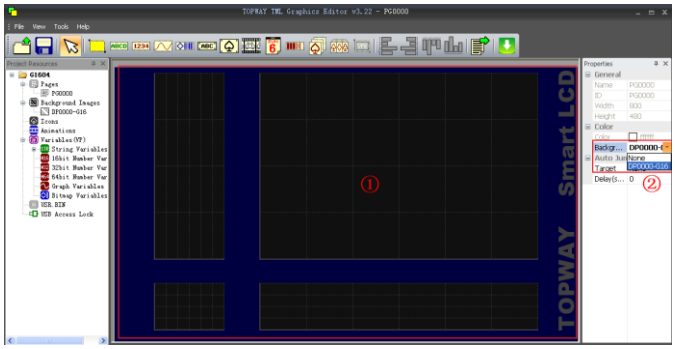
Step1 Start a New Project

(please refer to the previous examples)

Step2 Built a page, import a pictures as IMG_BKG (please refer to the previous examples)

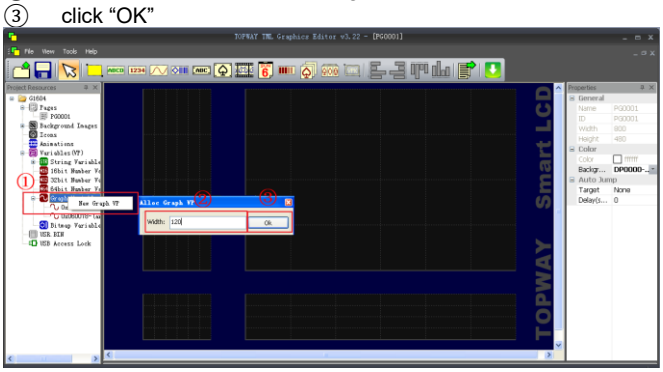
Step3 Link the page with the IMG_BKG

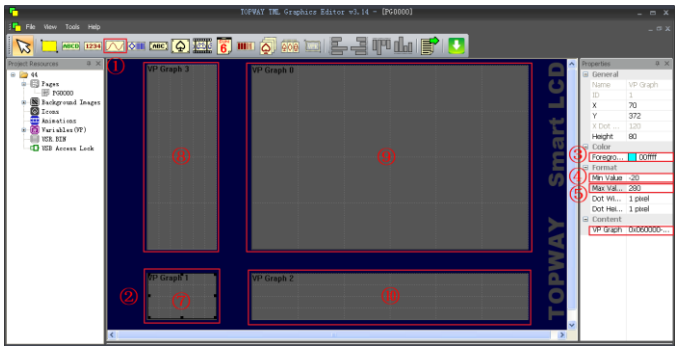
① Click on the working area of the page, its properties will show on the right.
② In Properties window, select the Background Image.



Step4 Allocate a Graph Variables

① In Resources window, right click on "Graph Variables" select "New Graph VP"
② Enter 120 into the Width setting
③ click “OK”





Step5 Built 4 Graph Element and link to VP

① In tools bar, select Graph Element
② Create 4 rectangle Graph area on screen
③ In Graph Properties,
set all 4 "Foreground Color" as "0x00FFFF"
④ set all 4 "Min Value" as -20
⑤ set all 4 "Max Value" as 280
⑥ set all 4 "VP Graph" as "0x060000"
⑦ set one of the graphs "Dot Width" & "Dot Height" as 1 & 1
⑧ set one of the graphs "Dot Width" & "Dot Height" as 1 & 4
⑨ set one of the graphs "Dot Width" & "Dot Height" as 4 & 4
⑩ set one of the graphs "Dot Width" & "Dot Height" as 4 & 1

Step6 Compile and download

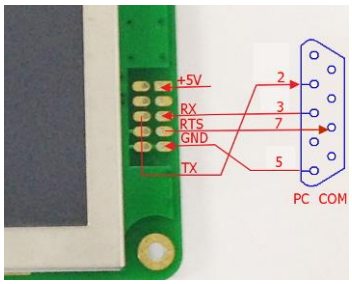
(please refer to the previous examples)

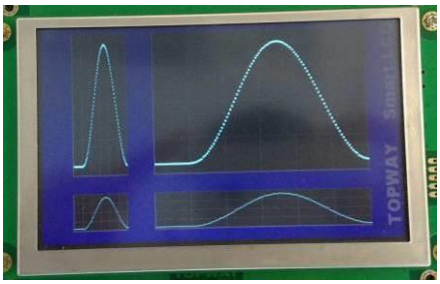
Step7 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with 5V
③ connect the serial port
④ setting:115200,8,n,1 (default)
⑤ using "G16_write_rotate" commands (0x4E) to "insert" the data to the end of the graph array and shift all the data and show a "moving" graph.
⑥

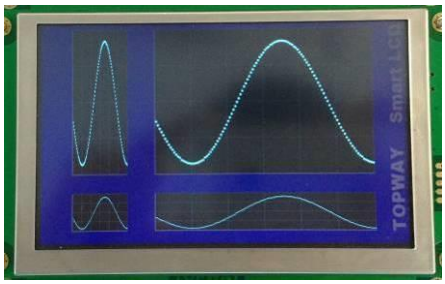
Packet head	command	G16 Add	Insert at (*2)	Value (*3)	Packet tail
AA	4E	00 06 00 00	02 25	00 00	CC 33 C3 3C
AA	4E	00 06 00 00	02 25	00 00	CC 33 C3 3C
AA	4E	00 06 00 00	02 25	00 01	CC 33 C3 3C
AA	4E	00 06 00 00	02 25	00 02	CC 33 C3 3C
:	:	:	:	:	:

Note:
*1. data insert command
*2. insert at the end of the graph data array
*3. SIN value sequence





Inserted 100 data



Inserted 200 data

-- done --

9.8 Show a Bitmap Element

(This example is using TOPWAY Smart LCD (HMT050CC-C) and Editor v3.22)

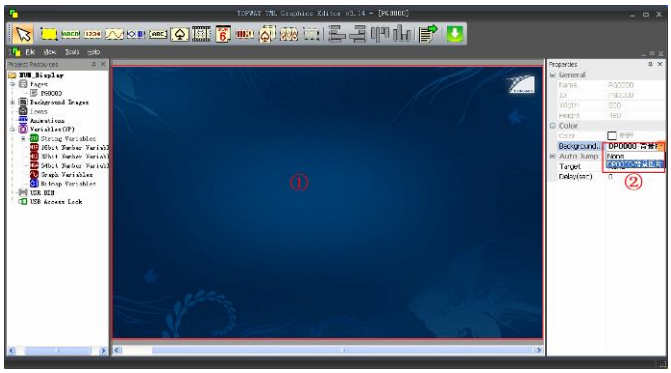
Step1 Start a New Project

(please refer to the previous examples)

Step2 Built a page, import a pictures as IMG_BKG (please refer to the previous examples)

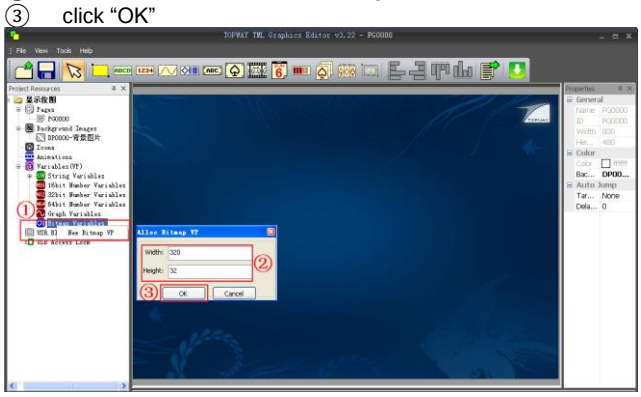
Step3 Link the page with the IMG_BKG

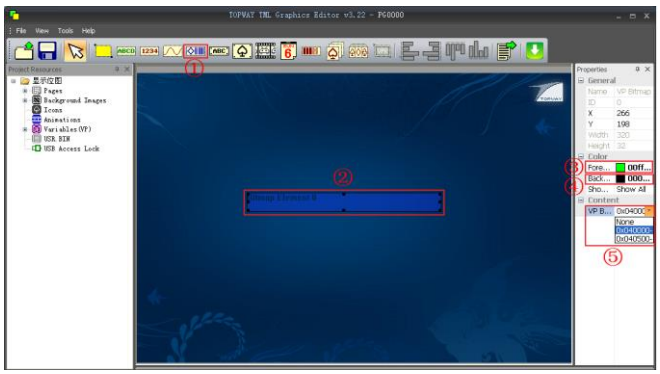
① Click on the working area of the page, its properties will show on the right.
② In Properties window, select the Background Image.



Step4 Allocate a Bitmap variable

① In Resources window, right click on "Bitmap Variables" select "New Bitmap VP"
② Enter 320 to Width and 32 to Height
③ click “OK”





Step5 Built a Bitmap Element and link to VP

① In tool bar, select Bitmap Element
② Create a rectangle Bitmap area on screen
③ In Bitmap Properties,
set "Foreground Color" as "0x00FF00"
④ set "Background Color" as "0x000000"
⑤ set "VP Bitmap" as "0x040000"

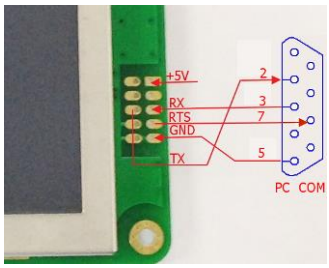
Note:
Bitmap data 1 for Foreground Color, 0 for Background Color

Step6 Compile and download

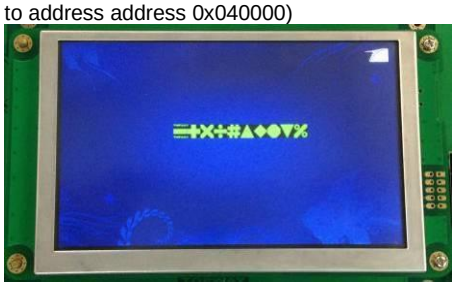
(please refer to the previous examples)

Step7 Power on and Display

① Power on the Smart LCD with 5V
② connect the serial port
③ setting:115200,8,n,1 (default)



④ send a command
AA 4B 00 04 00 00 00 00 05 00 CC 33 C3 3C
(write 0x00000500 ((320*32)/8=1280) byte data to address address 0x040000)



⑤ follow with 1280 byte of data
0XF9,0XCF,0X22,0X22,0X20,0X00,0X00,0X00,
0X00,0X00,0X00,0X00,0X00,0X00,0X00,0X00,
0X00,0X00,0X00,0X00,0X00,... … ……

Data Example:

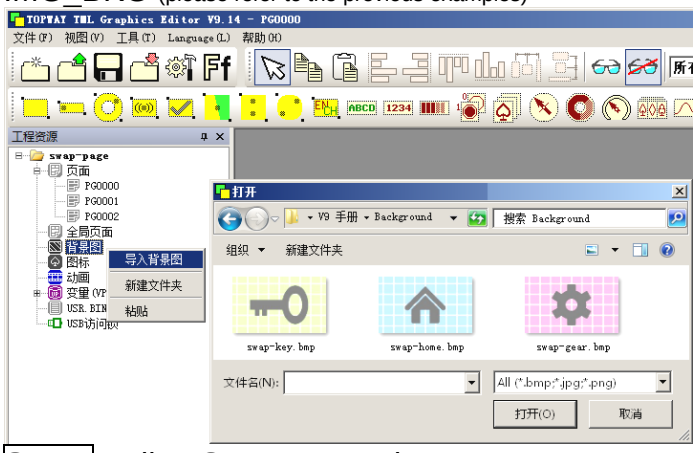
Black dot as 1; White dot as 0
Start form top left
1st row left 8 dots :11111001(0xF9) (as 1st byte)
2nd row left 8 dots : 11001111(0xCF) (as 2nd byte)
3rd row left 8dots : 00100010(0x22) (as 3rd byte)
:
:

-- done --

9.9 Using Swap Page Element

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built three page, import 3 pictures as IMG_BKG (please refer to the previous examples)



Step3 Link the page with the IMG_BKG

① Click on the working area of the PAGE,
its properties will show on the right

② In Properties window, select the imported Background Image
PG0000 link asDP0000,
PG0001 link as DP0001,
PG0002 link as DP0002

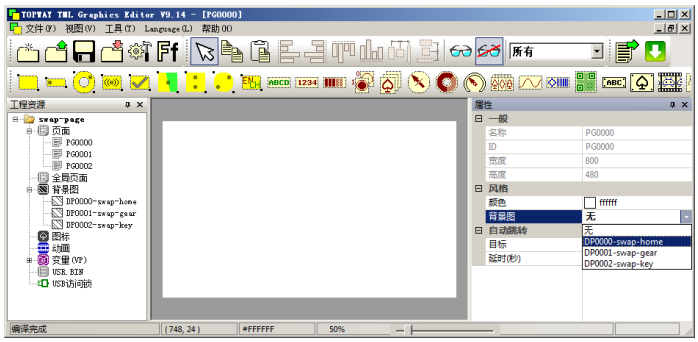
Step4 Built a Swap Page Element

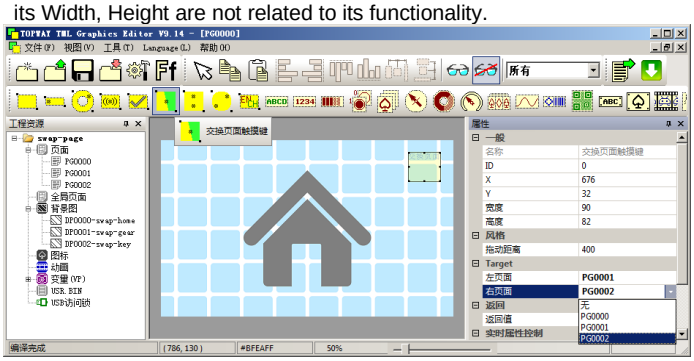
① select the Swap Page Element

② put it inside any empty area of the PAGE

③ set the Swap Page Element properties'
Left side Page and Right Side Page
PG0000: Left Side Page=PG0001, Right Side Page=PG0002
PG0001: Left Side Page=PG0002, Right Side Page=PG0000
PG0002: Left Side Page=PG0000, Right Side Page=PG0001

Note:
This element work for full page,
its Width, Height are not related to its functionality.

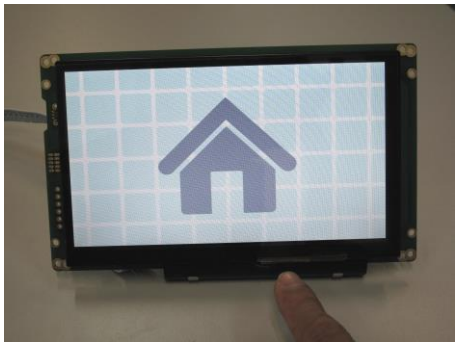




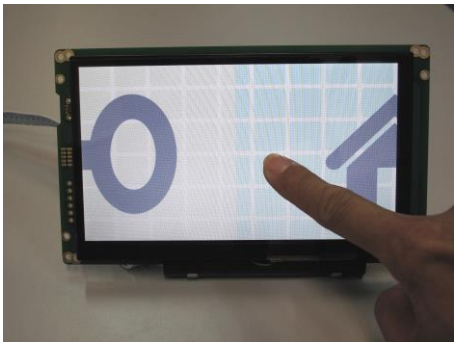
Step5 Compile and download (please refer to the previous examples)

Step6 Power on and Display

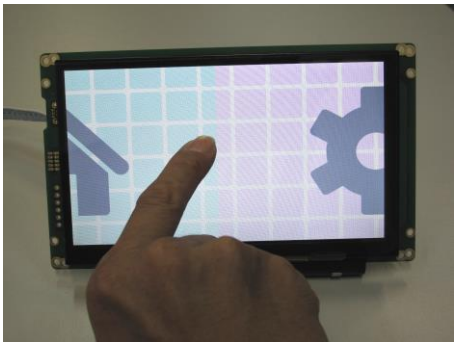
⑤ Disconnect the mini USB cable
⑥ Power on the Smart LCD with supply



PD0000 is show at power on



On PD0000, sweep form left to right
and show the PD0001



On PD0000, sweep form right to left
and show the PD0002

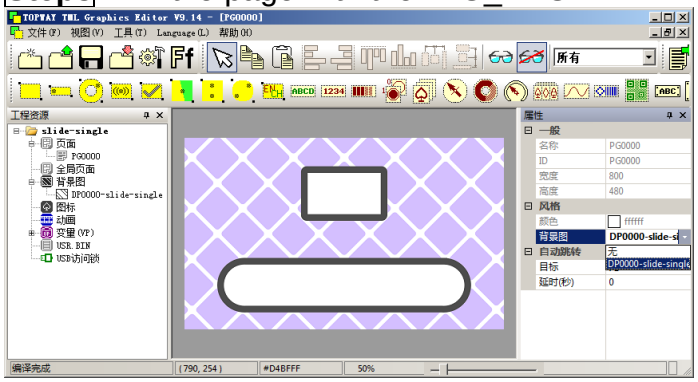
- Done -

9.10 Using Slider Element

Step1 Start a New Project
(please refer to the previous examples)

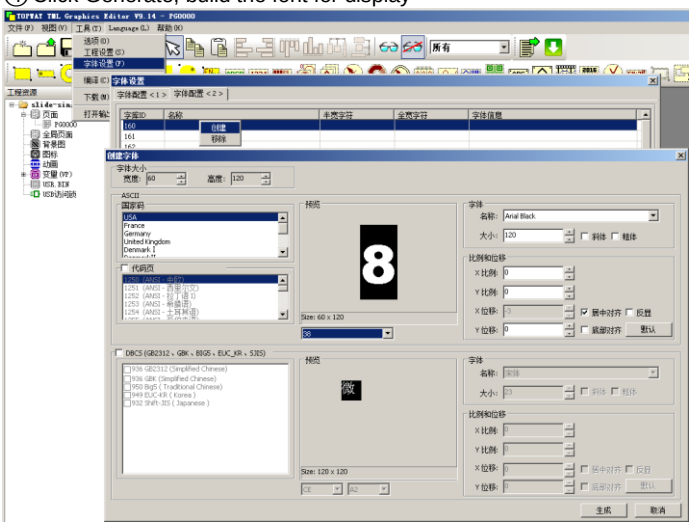
Step2 Built a page, import a picture as IMG_BKG
(please refer to the previous examples)

Step3 Link the page with the IMG_BKG



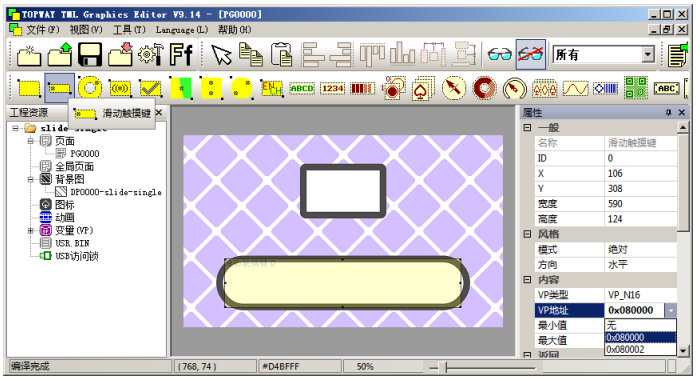
Step4 Build a Font Face

① In menu bar, Tools→ Font Setting → Font Config<2> → right click on 160 → Build
② set font size Width=60, Height=120
③ Font=Arial Black, Size=120, select centered
④ Click Generate, build the font for display



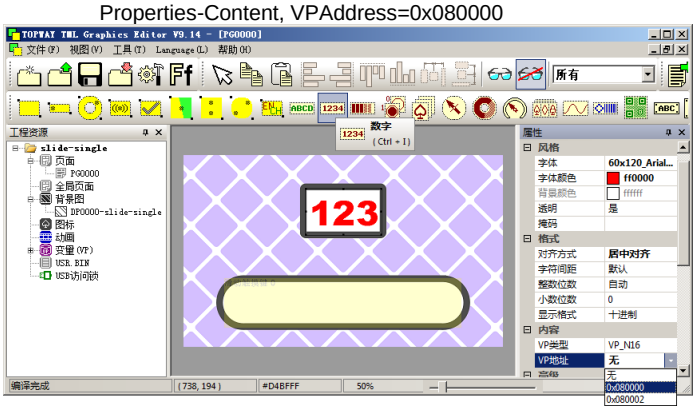
Step5 Build Slider Element

① Select Slider Element Tool
② Align the Element on the sliding area
③ set Properties, VP Address=0x080000



Step6 Build Number Element

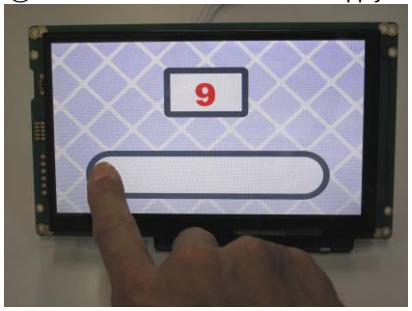
① Select Number Element Tool
② Align the Element on the center box
③ set Properties-Style, Font=60x120_Arial Black_160
Properties-Style, Font Color=ff0000,
Properties-Format, Align=Center
Properties-Content, VPAddress=0x080000

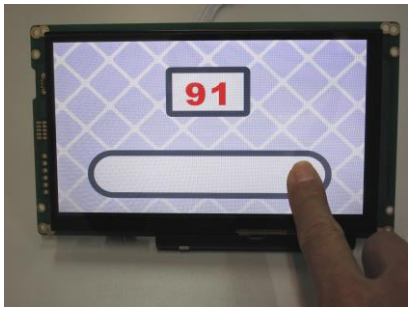


Step7 Compile and download (please refer to the previous examples)

Step8 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with supply
③ Display show on screen
④ Sweep on the Slider area to adjust the VP value





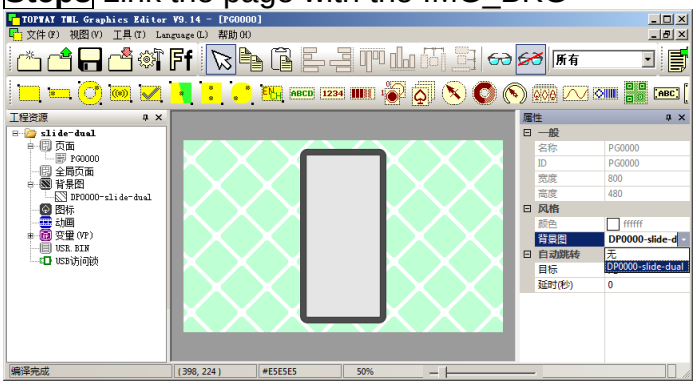
- Done -

9.11 Using Slider 2 Element (SDR2)

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a picture as IMG_BKG
(please refer to the previous examples)

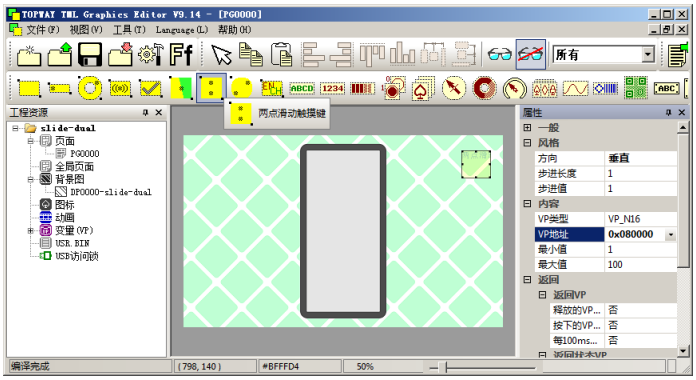
Step3 Link the page with the IMG_BKG



Step4 Build a Slider_2 Element

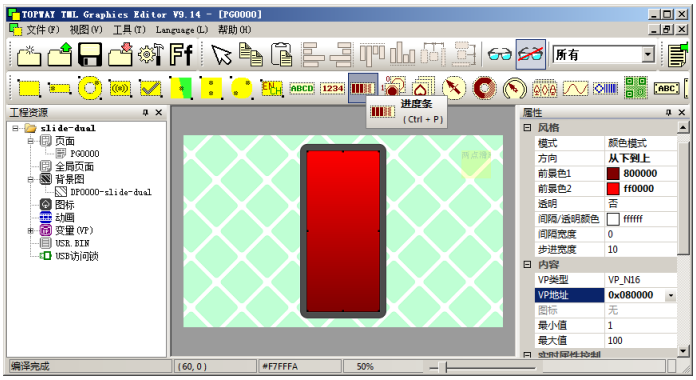
①select Slider_2 tool
②create the element on somewhere of the screen area
③set Properties-Style, Direction=Vertical
Properties-Style, Gain=2000
Properties-Content, VP Address=080000

Note:
This element work for full page,
its Width, Height are not related to its functionality.



Step5 Build a Progress Bar Element

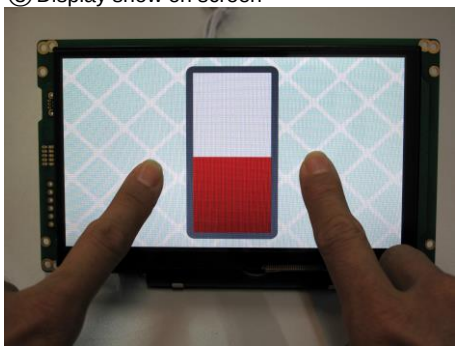
①Select Progress Bar tool
②Align the Element on the center box
③set Properties-Style, Direction=Dn→Up
Properties-Style, Forecolor1=800000,
Properties-Style, Forecolor2=ff0000
Properties-Content, VP Address=0x080000

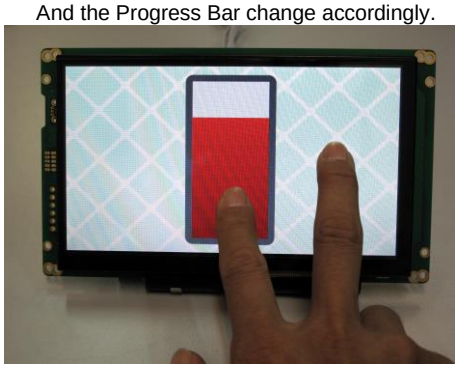


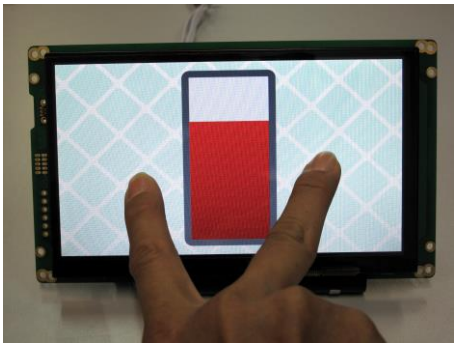
Step6 Compile and download (please refer to the previous examples)

Step7 Power on and Display

①Disconnect the mini USB cable
②Power on the Smart LCD with supply
③Display show on screen
④Use two finger Sweep on anywhere of the screen to adjust the VP value.
And the Progress Bar change accordingly.







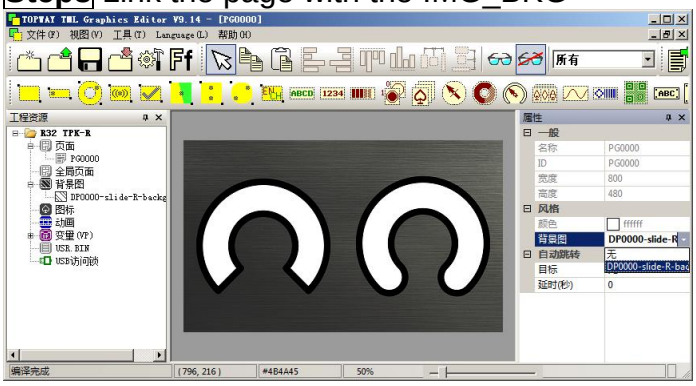
- Done -

9.12 Using Ring Element with Tachometer(Donut Mode) Element

Step1 Start a New Project
(please refer to the previous examples)

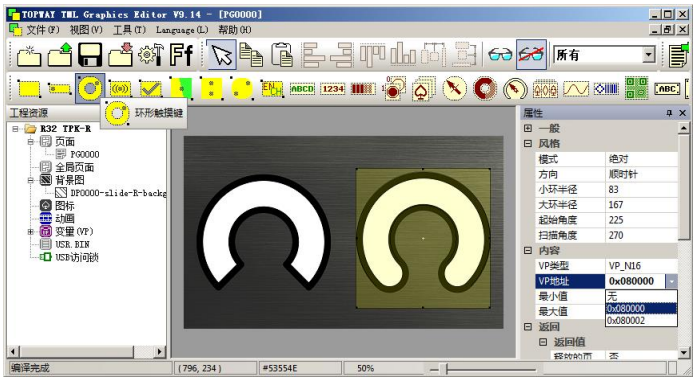
Step2 Built a page, import a picture as IMG_BKG
(please refer to the previous examples)

Step3 Link the page with the IMG_BKG



Step4 Build a Ring Element

① select Ring tool
② Align the element on the right side of the screen area
③ set Properties-Style, Start angle=225
Properties-Style, Sweep Angle=270
Properties-Content, VP Address=080000



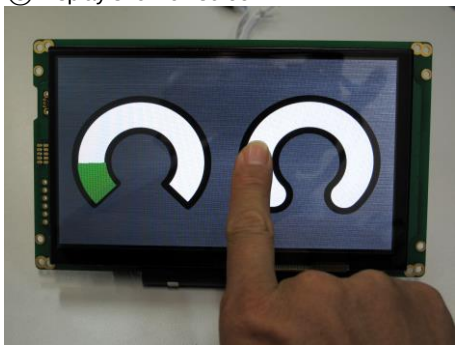
Step5 Build a Tachometer (Donut)Element

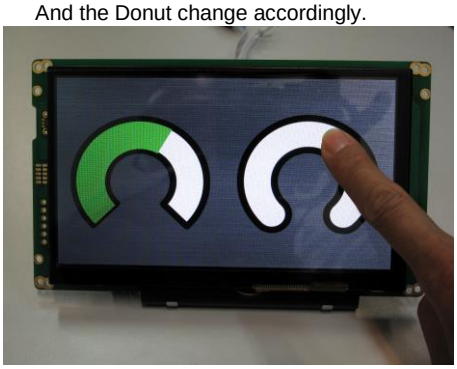
① select Tachometer (Donut) tool
② Align the element on the left side of the screen area
③ set Properties-Style, Mode Donut Mix Color
Properties-Style, Start angle=225
Properties-Style, Sweep Angle=270
Properties-Style, Show Base Color=false
Properties-Foreground, Color0=004400
Properties-Foreground, Color1=00ff00
Properties-Content, VP Address=080000

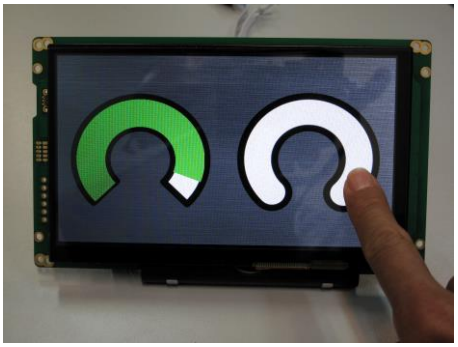
Step6 Compile and download (please refer to the previous examples)

Step7 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with supply
③ Display show on screen
④ Sweep on ring element area to adjust the VP value. And the Donut change accordingly.







- Done -

9.13 Using Ring_2 element with Tachometer(Icon Rotation Mode) Element

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a picture as IMG_BKG
(please refer to the previous examples)

Step3 Link the page with the IMG_BKG
(please refer to the previous examples)

Step4 Build a Font Face

① In menu bar, Tools→ Font Setting → Font Config<2> → right click on 160 → Build
② set font size Width=60, Height=120
③ Font=Arial Black, Size=120, select centered
④ Click Generate, build the font for display

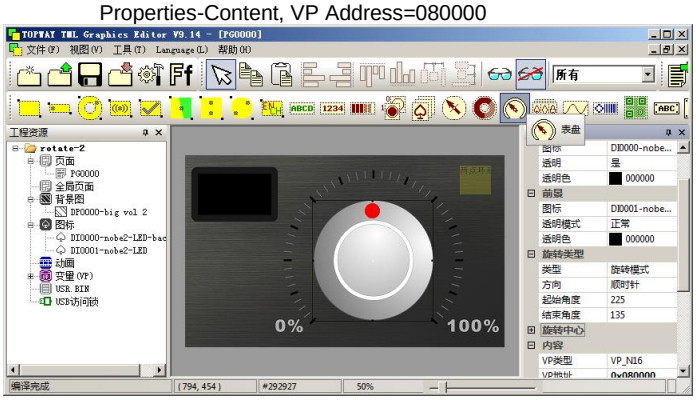
Step5 Build a Ring_2 Element

① select Ring_2 tool
② create the element on somewhere of the screen area
③ set Properties-Content, VP Address=080000

Note:
This element work for full page,
its Width, Height are not related to its functionality.

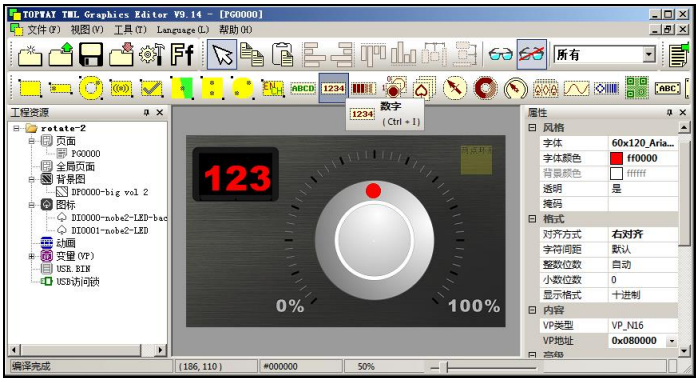
Step6 Build an Icon Rotation Element

① Select Icon Rotation Element
② Align the element on the node area
③ set Properties-Style, Mode=Icon Rotation
Properties-Style, Direction=Clockwise
Properties-Style, Start Angle=255, Sweep Angle=270
Properties-Foreground, Icon=(a black icon with a red dot)
Properties-Foreground, Transparent=true
Properties-Foreground, Transparent Color=000000
Properties-Content, VP Address=080000



Step7 Build Number Element

① Select Number Element Tool
② Align the Element on the box
③ set Properties-Style, Font=60x120_Arial Black_160
Properties-Style, Font Color=ff0000,
Properties-Format, Align=Center
Properties-Content, VP Address=0x080000

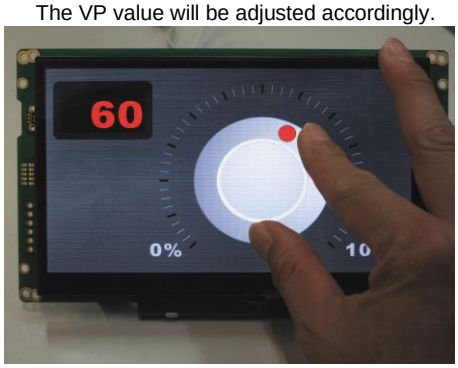


Step8 Compile and download
(please refer to the previous examples)

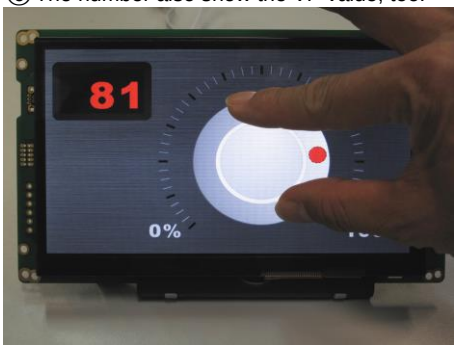
Step9 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with supply
③ Display show on screen

④ Put two fingers on anywhere of the screen twist at the same time(like turning the node) The VP value will be adjusted accordingly.



⑤ At the same time, the icon (with red dot) will be rotated with respect to the VP value
⑥ The number also show the VP value, too.

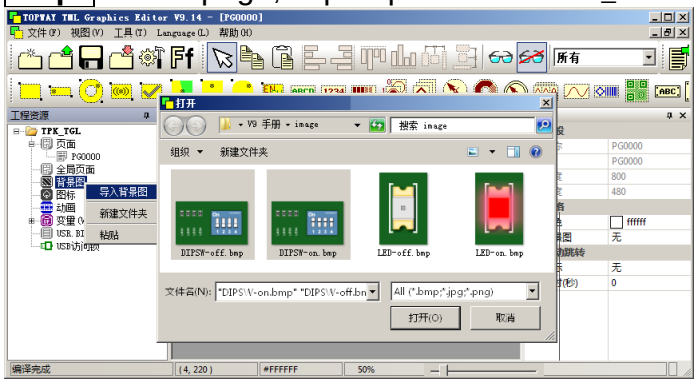


- Done -

9.14 Using Touch Switch (TPK_SW)

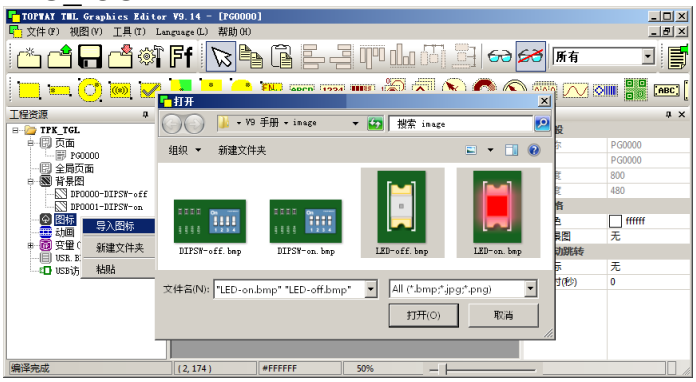
Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import pictures as IMG_BKG



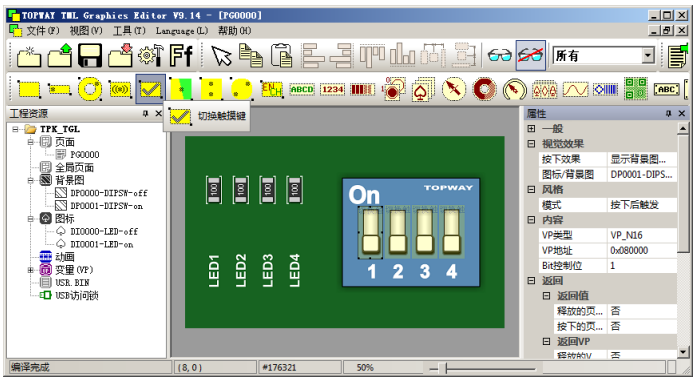
Step3 Link the page with the IMG_BKG
(please refer to the previous examples)

Step4 Built a page, import pictures as IMG_ICO



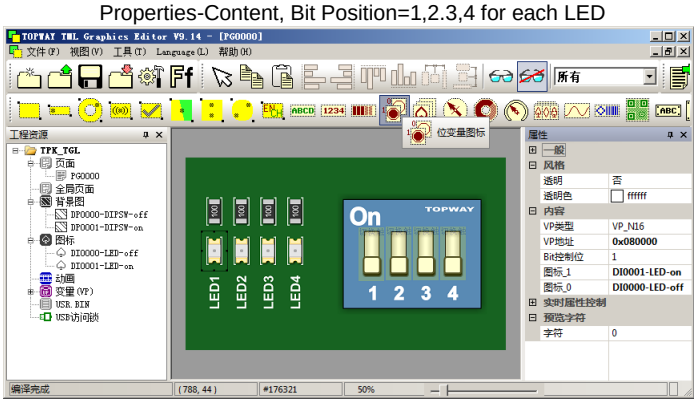
Step5 Built Touch Switch Element

① Select Touch Switch Element Tool
② Align 4 elements on switches area
③ set Properties-Visual Effect, Display Effect=Show Cropped BgImg
Properties-Visual Effect, Icon/BgImg=DP0001
Properties-Content, VP Address=0x080000
Properties-Content, Bit Position=1,2.3,4 for each switch



Step6 Built Bit Icon Element

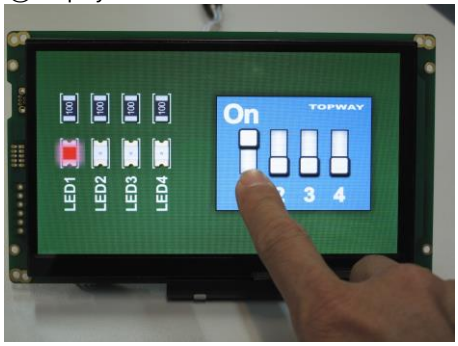
① Select Bit Icon Element Tool
② Align 4 elements on LEDs area
③ set Properties-Visual Effect, Bit=1 Display Effect=Show Icon
Properties-Visual Effect, Bit=1 Icon/BgImg=DIDP0001
Properties-Visual Effect, Bit=0 Display Effect=Show Icon
Properties-Visual Effect, Bit=0 Icon/BgImg=DIDP0000
Properties-Content, VP Address=0x080000
Properties-Content, Bit Position=1,2.3,4 for each LED



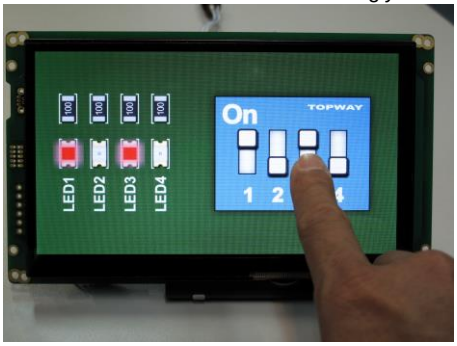
Step7 Compile and download (please refer to the previous examples)

Step8 Power on and Display

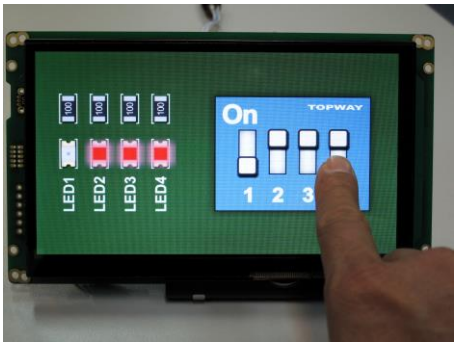
① Disconnect the mini USB cable
② Power on the Smart LCD with supply
③ Display show on screen



④ Touch onto the TPK_SW area
Its bit value can be toggle 0→1 or 1→0
The visual effect will show accordingly.



⑤ Bit Icon also based on those bit value and show the on-LED and off-LED

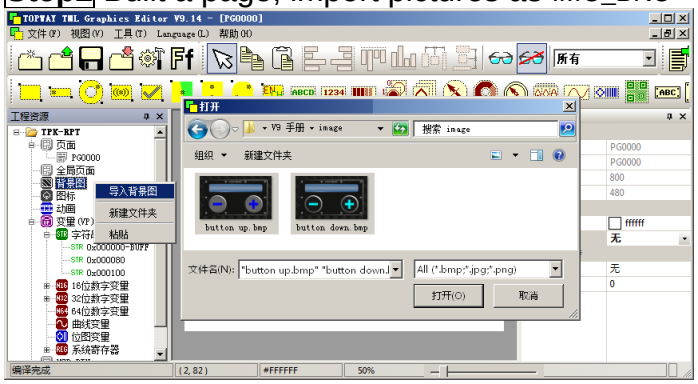


- Done -

9.15 Using Touch Key with Repeat(TPK_RPT)

Step1 Start a New Project
(please refer to the previous examples)

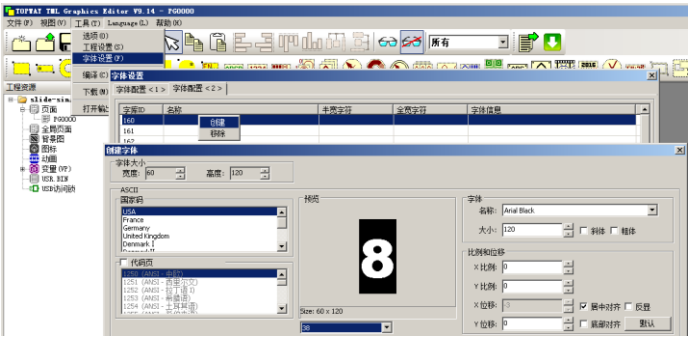
Step2 Built a page, import pictures as IMG_BKG



Step3 Link the page with the IMG_BKG
(please refer to the previous examples)

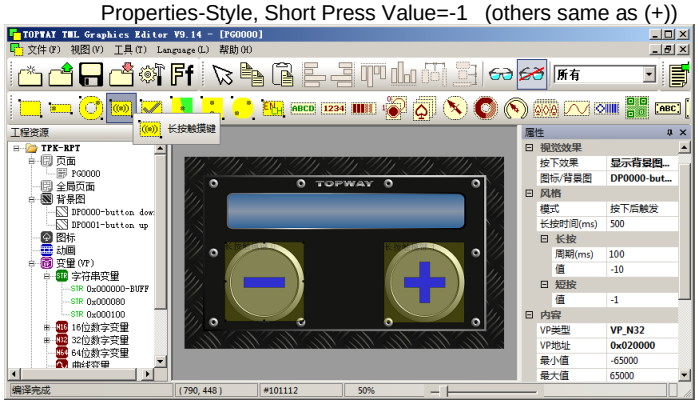
Step4 Build a Font Face

① In menu bar, Tools→ Font Setting → Font Config<2> → right click on 160 → Build
② set font size Width=60, Height=120
③ Font=Arial Black, Size=120, select centered
④ Click Generate, build the font for display



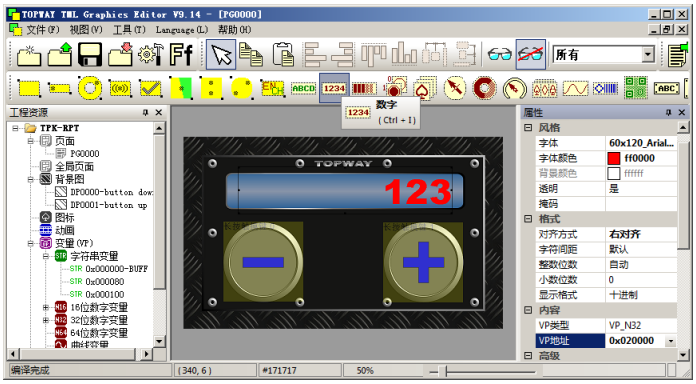
Step5 Built TPK_RPT Element

① Select TPK_RPT Element Tool
② Align 2 elements on button area
③ set(+) Properties-Visual Effect, Display Effect=Show Cropped BgImg
Properties-Visual Effect, Icon/BgImg=DP0000
Properties-Style, Long Press Time=500
Properties-Style, Long Press Cycle=100
Properties-Style, Long Press Value=10
Properties-Style, Short Press Value=1
Properties-Content, VP Resource=VP_N32
Properties-Content, VP Address=0x020000
④ set(-) Properties-Style, Long Press Value=-10
Properties-Style, Short Press Value=-1 (others same as (+))



Step6 Build Number Element

① Select Number Element Tool
② Align the Element on the box
③ set Properties-Style, Font=60x120_Arial Black_160
Properties-Style, Font Color=ff0000,
Properties-Format, Align=Right
Properties-Content, VP Address=0x080000



Step7 Compile and download (please refer to the previous examples)

Step8 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with supply
③ Display show on screen

④ Touch on the (+)
Short touch (+) VP value +1
Long touch (+) VP value +10

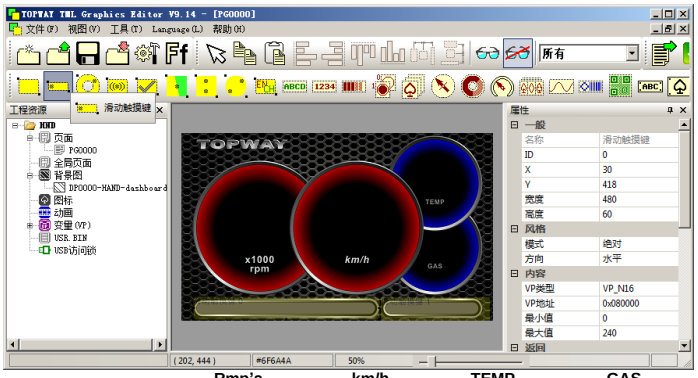
⑤ Similarly on the (-)
Short touch (+) VP value +1
Long touch (+) VP value +10

- Done -

9.16 Using Tachometer(Hand Mode) Element

Step1 Start a New Project
(please refer to the previous examples)

Step2 Built a page, import a picture as IMG_BKG
(please refer to the previous examples)



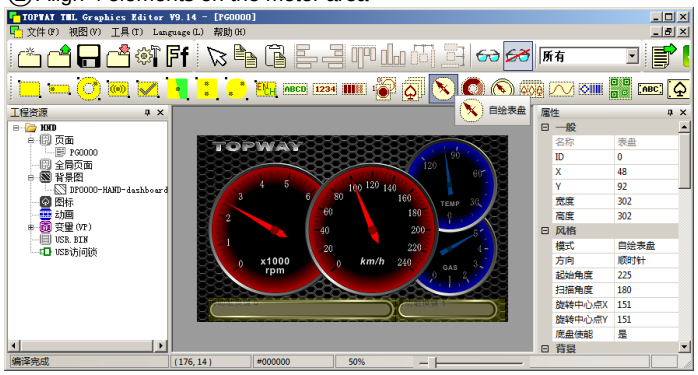
Step3 Link the page with the IMG_BKG

Step4 Build Slider Element

① Select Slider Element Tool
② Align 2 Element on the sliding area
③ set (left) Properties-Content, VP Address=0x080000
Properties-Content, Min Value=0
Properties-Content, Max Value=240
③ set (right) Properties-Content, VP Address=0x080000
Properties-Content, Min Value=0
Properties-Content, Max Value=120

Step5 Build Tachometer(Hand Mode) Element

① select Tachometer (Hand Mode) tool
② Align 4 elements on the meter area



③ Set the RMP, km/h, TEMP, GAS properties
(see right side table)

属性	Rmp's	km/h	TEMP	GAS
一般				
名称	表盘	表盘	表盘	表盘
ID	0	1	2	3
X	48	300	548	548
Y	92	92	26	190
宽度	302	302	202	204
高度	302	302	202	204
风格				
模式	自绘表盘	自绘表盘	自绘表盘	自绘表盘
方向	顺时针	顺时针	逆时针	逆时针
起始角度	225	225	180	210
扫描角度	180	270	225	150
旋转中心...	151	151	101	101
旋转中心...	151	151	101	101
底盘使能	是	是	是	是
背景				
透明	是	是	是	是
背景颜色	c0c0c0	c0c0c0	c0c0c0	c0c0c0
底盘半径	151	151	101	101
刻度半径	150	150	100	100
刻度颜色	000000	000000	808080	808080
刻度宽度	3	5	3	3
刻度数量	6	12	4	5
刻度最小值	0	0	0	0
刻度最大值	6	240	120	5
子刻度颜色	000000	000000	808080	808080
子刻度宽度	1	1	1	1
子刻度数量	5	5	3	2
字体	24_ASCII_SONG ...	24_ASCII_SONG ...	24_ASCII_SONG ...	24_ASCII_SONG ...
字体颜色	ffffff	ffffff	808080	808080
指针				
指针类型	四边形	四边形	三角形	三角形
指针颜色	ff0000	ff0000	004080	004080
中心点颜色	800000	800000	002040	002040
内容				
VP类型	VP_N16	VP_N16	VP_N16	VP_N16
VP地址	0x080000	0x080000	0x080002	0x080002
最小值	0	0	0	0
最大值	240	240	120	50
实时属性控制				
预览字符				

Step6 Compile and download
(please refer to the previous examples)

Step7 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with supply
③ Display show on screen

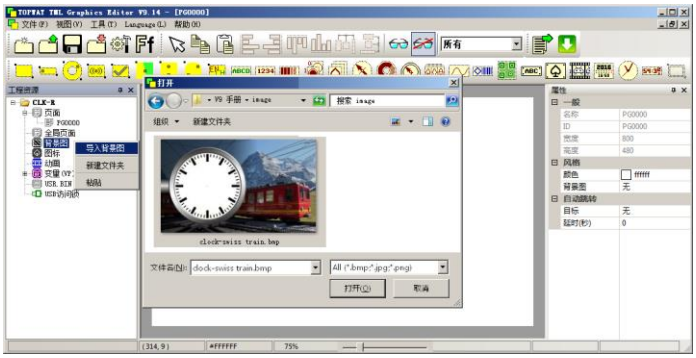
④ Slide the left slider
rpm and km/h hands move accordingly
As they are having different range,
Their rotate refer to its Max Min value

⑤ Slide the right slider
TEMP and GAS hands move accordingly.
The two hands set as anticlockwise
When VP value higher than its max,
it stay as max (see GAS hand as example)

- Done -

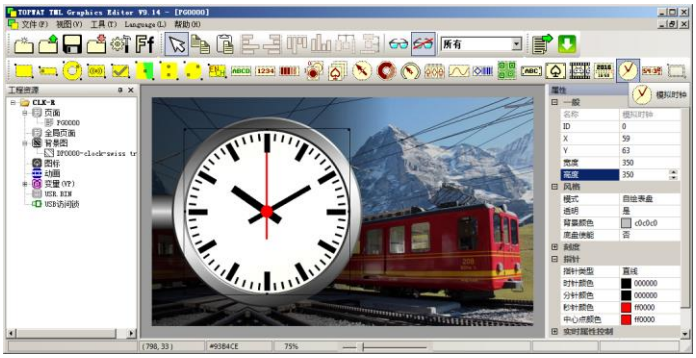
9.17 Using Round Clock Element

Step1 Start a New Project
(please refer to the previous examples)



Step2 Built a page, import pictures as IMG_BKG
(please refer to the previous examples)

Step3 Link the page with the IMG_BKG
(please refer to the previous examples)



Step5 Build Round Clock Element

① select Round Clock tool
② Align the elements on the clock face area
③ set Properties-Style, Mode=Hand
Properties-Style, Transparent=true
Properties-Style, Face=false
Properties-Hands, Hands Type=Line
Properties-Hands, Hour Hands Color=000000
Properties-Hands, Minute Hand Color=000000
Properties-Hands, Second Hand Color=ff0000
Properties-Hands, Center Mark Color=ff0000

Step6 Compile and download
(please refer to the previous examples)

Step7 Power on and Display

① Disconnect the mini USB cable
② Power on the Smart LCD with supply
③ Display show on screen
④ Connect the serial cable
⑤ select default baud rate setting：115200,8,n,1
⑥ send a command：
AA 9C 12 0A 0D 0A 09 00 CC 33 C3 3C (set RTC as 10:09:00)

9.18 - Done -

10 Appendix

10.1 SGTools Shortcut Keys

File Tools

icon	Name	Shortcut Key
	New Project	Ctrl + N
	Open Project	Ctrl + O
	Save Project	Ctrl + S
	Close Project	--
	Generate Files	F7
	Download to Module	F9

Alignment Tools

icon	Name	Shortcut Key
	Align Left	--
	Align Right	--
	Align Top	--
	Align Bottom	--
	Horizontal Distribute	--
	Vertical Distribute	--

Action Element Tools

icon	Mnemonic	Name	Shortcut Key
	TPK	Touch Key	Ctrl + K
	VPK	Virtual Key	--

String Element Tools

icon	Mnemonic	Name	Shortcut Key
	STS	Static String	Ctrl + Shift + T
	STR	String Element	Ctrl + T
	N16 N32 N64	Number Element	Ctrl + M
	TMR	Timer Display	--
	RTC	Real Time Clock	Ctrl + R

Image Element Tools

icon	Mnemonic	Name	Shortcut Key
	ICO	Static Icon	Ctrl + Shift + I
	ANI	Animation Element	Ctrl + Shift + A
	IDX_BIT	Bit Icon	--
	IDX	Indexed Icon	--
	TCM	Tachometer	--
	I16 I32	Decimal Icon	--

Graphics Element Tools

icon	Mnemonic	Name	Shortcut Key
	B16	Progress Bar	Ctrl + P
	G16	Graph Element	Ctrl + G
	BP1	Bitmap Element	Ctrl + B
	QRC	QR Code Element	--
	DPD	Draw Pad	--

10.2 Project Limitation

10.2.1 PAGEs, Image-Resources and VP-Variables Limitation

icon	Mnemonic	Name	Linked VP.	Linked IMG	Editor Limit	Memory Limit	Address range
	PAGE	Page	--	IMG_BKG	≤1000/project	256M byte (*4)	PG0000 ~ PG0999
	IMG_BKG	Background Image	--	--	≤10000/project (*1)		DP0000 ~ DP9999
	IMG_ICO	Icon	--	--	≤10000/project (*2)		DI0000 ~ DI9999
	IMG_ANI	Animation	--	--	≤1000/project (*2)(*3)		ANI000 ~ ANI999
	VP_STR	String Variable	--	--	≤1024 / project	1024(MAX) x (127+1)byte	0x000000 ~ 0x01FF80
	VP_N16	16bit Integer Variable	--	--	≤32512 / project	32512(MAX) x (2)byte	0x080000 ~ 0x08FDFE
	VP_N32	32bit Integer Variable	--	--	≤16128 / project	16128(MAX) x (4)byte	0x020000 ~ 0x02FBFC
	VP_N64	64bit Integer Variable	--	--	≤7936 / project	7936(MAX) x (8)byte	0x030000 ~ 0x03F7F8
	VP_G16	16bit Graph Variable	--	--	≤16384 / project	16384(MAX) x (8)byte (dynamic array allocation)	0x060000 ~ 0x07FFF8
	VP_BP1	Bitmap Variable	--	--	≤2048 / project	2048(MAX) x (64)byte (dynamic array allocation)	0x060000 ~ 0x05FFBF
	**VP_REG**	Register Variable	--	--	--	--	0xFFFF00 ~ 0xFFFFFF
	**VP_TMR**	Timer Variable	--	--	≤8 / project	--	0x02FFE0 ~ 0x02FFFC

Note:
*1. IMG_BKG must >1/2 of Full-Screen (SGT auto resize to fit screen)
*2. IMG_ICON and IMG_ANI Size Limit

Project resolution	Size Limit
320x240	320x240 max. (Full-Screen)
480x272	480x272 max. (Full-Screen)
640x480	131072pixels (42% of Full Screen)
800x480	131072pixels (34% of Full Screen)
800x600	131072pixels (27% of Full Screen)
1366X480	131072pixels (20% of Full Screen)

*3. 1~128frame max.
*4. Memory Size may vary by model.

10.2.2 Page's Elements Limitation

icon	Mnemonic	Name	Linked VP.	Linked IMG	Editor Limit	Memory Limit	ID range
	**TPK**	Touch Key	--	1x IMG_ICO or 1x IMG_BKG (*1)	≤256 / PAGE	--	0 ~ 255 (each page)
	**VPK**	Virtual Key	VP_N16 (*2) VP_N32 (*2)	--	≤64 / PAGE	--	0 ~ 63 (each page)
	**STS**	Static String	--	--	≤128 / PAGE	--	0 ~ 127 (each page)
	**STR**	String Element	VP_STR	--	≤128 / PAGE	--	0 ~ 127 (each page)
	**N16** **N32** **N64**	Number Element	VP_N16 VP_N32 VP_V64	--	≤120 / PAGE	-- -- --	0 ~ 119 (each page)
	**TMR**	Timer Display	VP_N32 (timer only)	--	≤8 / PAGE	--	0 ~ 7 (each page)
	**RTC**	Real Time Clock	--	--	≤8 / PAGE	--	0 ~ 7 (each page)
	**ICO**	Static Icon	--	1x IMG_ICO	≤128 / PAGE	--	0 ~ 127 (each page)
	**ANI**	Animation Element	--	1x IMG_ANI	≤8 / PAGE	--	0 ~ 7 (each page)
	**IDX_BIT**	Bit Icon	VP_N16 VP_N32	2(MAX) x IMG_ICON	≤64 / PAGE	--	0 ~ 63 (each page)
	**IDX**	Indexed Icon	VP_N16	10000(MAX) x IMG_ICON	≤64 / PAGE	--	0 ~ 63 (each page)
	**TCM**	Tachometer	VP_N16	181(MAX) x IMG_ICON		--	
	**I16** **I32**	Decimal Icon	VP_N16 VP_N32	12x IMG_ICON (0~9,".","-")	≤32 / PAGE	--	0 ~ 31 (each page)
	**B16**	Progress Bar	VP_N16	1x IMG_ICON	≤32 / PAGE	--	0 ~ 31 (each page)
	**G16**	Graph Element	VP_G16	--	≤8 / PAGE	--	0 ~ 7 (each page)
	**BP1**	Bitmap Element	VP_BP1	--	≤32 / PAGE	--	0 ~ 31 (each page)
	**QRC**	QR Code Element	VP_STR VP_N16 (in seq.)	--	≤4 / PAGE	--	0 ~ 3 (each page)
	**DPD**	Draw Pad	VP_N16 (in seq.)	--	≤4 / PAGE	--	0 ~ 3 (each page)

Note:
*1. IMG_ICO for key-down display, IMG_BKG will be cropped to key size for key-down display
*2. Monitoring values
*3. Element display Size: 8x8 (MIN), except Bitmap Element
*4. The above limitation is to ensure the display performance, though it can be override by the "config.ini" in the SGTools installation folder.
(Remember to backup the file before edit !)

10.2.3 System Registers

Address	System Register	Descriptions	Note
0xFFFF00 : 0xFFFF07	Timer_Ctrl0 : Timer_Ctrl7	D[0]=0 : stop the timer D[0]=1 : start the timer D[1]=0 : count down, time down to 0x00000000 D[1]=1 : count up, time up to 0x7fffffff D[7:2]=000000 : reserved	(*1)
0xFFFF10	RTC_Year	Value=0~99	0xffff10~0xffff16 should be written at the same time
0xFFFF11	RTC_Month	Value=1~12	
0xFFFF12	RTC_Day	Value=1~31	
0xFFFF13	RTC_Hour	Value=0~23	
0xFFFF14	RTC_Minute	Value=0~59	
0xFFFF15	RTC_Second	Value=0~59	
0xFFFF16	RTC_Set	Value=1 : sync the time	
0xFFFF20	Buzzer	Value=0~63 buzzer beeping duration (*1)	See Project Setting for details
0xFFFF21	Backlight	Value=0~63 Real time backlight brightness setting (*1)	
0xFFFF22	ScreenSaverBacklight	Value=0~63 Screen Saver Backlight Brightness (*1)	see Screen Saver section for details
0xFFFF23	ScreenSaverPage_H	Value=0~999 Screen Saver display Page (*2)	
0xFFFF24	ScreenSaverPage_L		
0xFFFF25	ScreenSaver Timer1_H	Value=0~65535 Screen saver delay time 1 (*2)	
0xFFFF26	ScreenSaver Timer1_L		
0xFFFF27	ScreenSaver Timer2_H	Value=0~65535 Screen saver delay time 2 (*2)	
0xFFFF28	ScreenSaver Timer2_L		
0xFFFF30	Font_CodePage	Font Code Page index value (*1) (*3)	
0xFFFF31	Font_Country	Font Country index value (*1) (*4)	

Note:

*1. Value can be update by command System_register_write (0xb3) to access the register

*2. Value should be written at the same time by command Sucesstive_write (0x82)

*3. Code Page index value

index	Code Page
1	437(OEM United States)
2	737(OEM Greek437G)
3	852(OEM Latin II)
4	860(OEM Portuguese)
5	863(OEM Canadian French)
6	865(OEM Nordic)
7	866(OEM Russian)
8	874(ANSI/OEM Thai)
9	932(ANSI/OEM Japanese Shift JIS)
10	1250(ANSI Central Europe)
11	1251(ANSI Cyrillic)

index	Code Page
12	1252(ANSI Latin I)
13	1253(ANSI Greek)
14	1254(ANSI Turkish)
15	1255(ANSI Hebrew)
16	1256(ANSI Arabic)
17	1257(ANSI Baltic)
18	1258(ANSI/OEM Viet Nam)
19	GB2312 (Simplified Chinese)
20	GBK (Simplified Chinese)
21	ECU-KR (Korea)
22	BIG5 (Traditional Chinese)

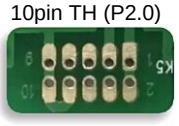
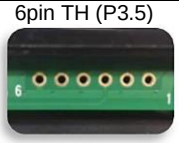
*4. Country index value

index	Code Page
1	USA
2	France
3	Germany
4	UK
5	Denmark Ⅰ
6	Denmark Ⅱ

index	Code Page
7	Denmark Ⅱ
8	Sweden
9	Italy
10	Spain
11	Japan

10.3 Smart LCD Terminals

There are mainly two terminals on a Smart LCD
- Power supply and signal terminal for operation
- USB terminal for pre-load display project

No.	Power and Signal	Pin details
1	10pin FFC termina (P1.0) 	pin1-3 : VDD pin5 : Rx pin6 : Tx pin8-10 : GND (*2, *3)
2	8pin header (P2.5) 	pin1-2 : VDD pin3 : NC pin4 : Tx pin5-6 : Rx pin7-8 : GND (*2, *3)
3	6pin header (P3.5) 	Pins defined for RS232C/RS485/UART and power supply. Please refer to products handbook (*2, *3)
4	10pin TH (P2.0) 	pin1-3 : VDD pin5 : Rx pin6 : Tx pin8-10 : GND (*2, *3)
5	6pin TH (P3.5) 	Pins defined for RS232C/RS485/UART and power supply. Please refer to products handbook. (*2, *3)
6	8pin header (P2.0) 	pin1-2 : VDD pin3 : NC pin4 : Tx pin5-6 : Rx pin7-8 : GND (*2, *3)
7	LAN header (RJ45) 	Standard Ethernet (not support POE) support display project update via network. Power should be supply externally. (*2, *3)

No.	USB	Function details
1	Mini USB 	Connect to PC for display project download (*4) Connect to a U-drive via an OTG cable (and power on the Smart LCD) for auto loading display project image that stored in U-drive. (*5)
2	USB type A 	Plug in a U-drive (and power on the Smart LCD) for auto loading display project image that stored in U-drive. (*5)
3	USB type C 	Connect to PC for display project download (*4) Connect to an U-drive via an OTG cable (and power on the Smart LCD) for auto loading display project image that stored in U-drive. (*5)

Note:
*1. Terminals shows here are standard terminal for Smart LCD.
Please refer to the product user manual for details
(No customized product)
*2. Be aware the signal leveling for Rx and Tx.
RS232 signal can damage UART terminal device.
Miss-matched signal level is not allowed.
*3. Please re-confirm the power supply voltage before power on the Smart LCD.
*4. PC download display project sequence
- no need external power supply
- connect to PC
- use SGTools to download the display project
- dis-connect form PC
(use PC onboard USB for good signal and power supply)
*5. U-drive copy display project sequence
- plug the U-drive (with OTG cable)
on to the Smart LCD USB terminal
- power on the Smart LCD
- wait until image copy to be finished
- power off the Smart LCD
- unplug the U-drive (with OTG cable)

10.4 Download the display project

There are three ways to pre-load display project into the Smart LCD

No.	Download method	Speed	Descriptions
<1>	Using U-drive (with OTG cable)	Fast	Suitable for production line operations
<2>	Using PC, download by SGTools	Very fast	Good for UI development stage with SGTools
<3>	Using PC, files copy	Slow	Not recommended

Note.
- Some of the Smart LCD could only support <1>
- Some of the Smart LCD could only support <2>/<3>
- See product user manual for details

10.4.1 Using U-drive (with OTG cable)

Steps:

1. Design the UI in SGTools and compile as an IMG file
   (see 4.3.7 Editor Option section about output image setting)

Files	Description
Project_Image.img	Display Project Image include all the UI display files (config, pages, pictures, icons, etc)
Project.chk	Verification file contain data for the above files checksum

2. Copy the Project_Image.img and the Project.chk into a U-drive root directory
   (file name should keep no change!)
   (U-drive should be 16GB or below in FAT or FAT32 format; single non-boot partition)
3. Power OFF the Smart LCD
4. Connect the U-drive (with OTG cable) to the Smart LCD
5. Power ON the Smart LCD
6. It will look for the above two files in the U-drive and update accordingly
   (the previous pre-loaded display project will be overwritten!)
7. Wait after the copy and verification
8. Power OFF the Smart LCD
9. Disconnect the U-drive (with OTG cable) from the Smart LCD
10. Done!
11. Power ON the Smart LCD to display …

10.4.2 Using PC, download by SGTools

Steps:

1. Power OFF the Smart LCD
2. Connect the Smart LCD to PC using a standard USB cable
   (wait until the PC recognize the Smart LCD
3. Run the SGTools, open the display project, click the  (short-cut key: F9) download to module
4. SGTools recognized the corresponding device. it will pop up the Download window.
   Please follow the on-screen instruction and wait until it finished.
   (the previous pre-loaded display project will be overwritten!)
5. Disconnect the Smart LCD form the PC
6. Done!
7. Power ON the Smart LCD to display …

10.4.3 Using PC, files copy

Steps:

1. Power OFF the Smart LCD
2. Connect the Smart LCD to PC using a standard USB cable
   (wait until the PC recognize the Smart LCD as a U-drive device [TOPWAY])
3. Run the SGTools, open the display project, click the  (short-cut key: F7) generate files
   “THMT” and “FONT” folder will be generated
4. Copy “THMT” and “FONT” folder to the Smart LCD by file manager (overwrite)
5. Wait until it finished.
   (the previous pre-loaded display project will be overwritten!)
6. Disconnect the Smart LCD form the PC
7. Done!
8. Power ON the Smart LCD to display …

10.5 FAQ

10.5.1 General

What is SGTools?
SGTools is an UI development software dedicated for TOPWAY Smart LCD.
SGTools is an upgraded version over the previous RGTools.
It supports all the Smart LCD with resistive touch or capacitive touch.

How many background image can be store in to Smart LCD?

Memory Space
- There are 256Mbyte Flash (vary by model) in the Smart LCD
- The no. of background image can be preload is depends on the display resolutions (vary by model)

Smart LCD resolutions	No. of background picture
800x600	~270
800x480	~330
480x272	~1000

- The Smart LCD is showing the interface by PAGE and pages can share the same background image
- The maximum no. of PAGE is up to 1000
- It should be good enough for most of the UI design.

What kind of image can be use in the SGTools?

Background Image
- Recommend 24bit BMP
- Recommend matched resolution image
- SGTools will resize the un-matched resolution to fit the screen

Icons
- Recommend 24bit BMP
- Limit to 1/4 of the Smart LCD display resolutions

Animations
- Recommend 24bit BMP, Animated GIF supported
- Limit to 1/4 of the Smart LCD display resolutions

10.5.2 USB issue during display project download

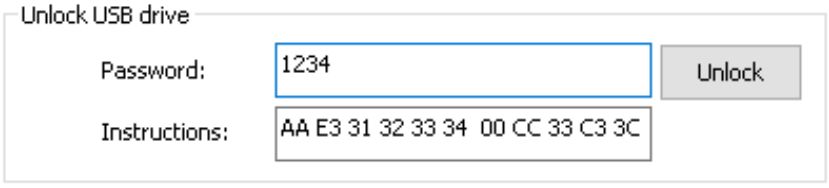
Power off Smart LCD
- Ensure the Smart LCD is totally power off
- Disconnect the power supply cable of the Smart LCD

Cable issue
- Use a good quality USB cable
- Ensure USB power supply(500mA/5V USB supply)
- A dual USB-A to micro-USB cable, may help in some case

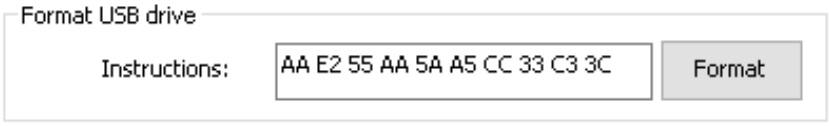
PC USB terminal
- Try another the USB terminal
- Connect to the PC motherboard directly (back side of the is better than the front)

10.5.3 Smart LCD cannot be recognised by PC…

Smart LCD USB access locked
- In case no USB device found on the PC (Smart LCD connected), it is possible than the Smart LCD USB access locked
- Connect the RS-232 terminal to the PCB
- In TOPWAY Command Tools, use the “Unlock USB drive” command with the correct password to unlock the USB access



Smart LCD USB access locked (forgot password)
- In case no USB device found on the PC (Smart LCD connected), it is possible the Smart LCD USB access locked
- Connect the RS-232 terminal to the PCB
- In TOPWAY Command Tools, use the “Format USB drive” command to format the USB drive and the USB access will be unlock at the same time



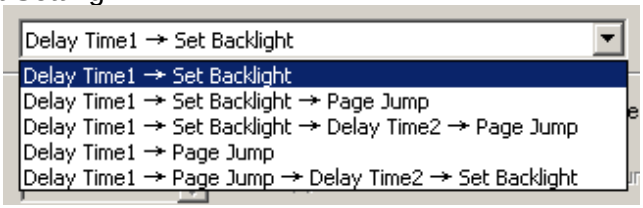
Abnormal USB drive found
- In case no USB device found on the PC (Smart LCD connected), it is possible the Smart LCD USB drive was corrupted during previous download
- Use PC format tools to format the drive

10.5.4 Display Project Configuration

How to config the screen saver?

Screen Saver Mode Settings

- The Screen Saver Mode can be config in the SGTools
  Menu → Tools → Project Setting



Note. Dim down backlight can further extend the backlight LEDs life.

How to wake up form screen saver?

Wake-up form Screen Saver

- Anywhere on screen being touched
- A page jump command received
- A data on screen was updated

How to shorten the power up "Starting RTC" time?

Install RTC battery

- Operate with RTC battery installed can shorten the power up time

RTC Mode Setting

- The RTC mode can be config in the SGTools
  Menu → Tools → Project Setting

- RTC Mode as follow

RTC Mode	Operating with RTC battery	Operating without RTC battery	Descriptions
Enable	1st power up takes 6s; next power up takes 1s	every power up takes 6s	RTC run with correct init
Disable	every power up takes 1s	every power up takes 1s	RTC stop
Engineering Mode	every power up takes 1s	every power up takes 1s	RTC run without init RTC might not run correctly NOT suggest for production setting

10.5.5 UI Elements and Functions

How to calibrate the resistive touch panel?

Power-on Calibration
- Touch and hold the top-right corner of the RTP
- Power on the Smart LCD
- The display will enter the calibrate mode
- Touch the cross on screen to do the calibration

Command Calibration
- Power on the Smart LCD
- Use a E4 command to enter the calibration mode
  (AA E4 55 AA 5A A5 CC 33 C3 3C)
- The display will enter the calibrate mode
- Touch the cross on screen to do the calibration

How to show Value with decimal point?

Integer Value (VP_N16, VP_N32, VP_N64)
- Data Type can be Signed or Un-signed
- Config the Integer Digits and Decimal Digits in the Number elements
- It will show integers with decimal point.
  example as follows:

VP's value (10's)	Integer Digits	Decimal Digits	Display Result
15	Auto	3	0.015
23762	Auto	3	23.762
5629	5	1	00562.9
-87913	3	2	-879.13
-13277	2	2	-99.99
1758	3	0	999

Note. Over range value will show its max value

Floating Value (VP_N32)
- Data Type should be Floating Value
- Float type value is suggested to select:
  Integer Digits=Auto, Decimal Digits=1~9.
  to prevent over maximum value presentation error

Note. Float type value might rounded or truncated due to hex-dec conversion

How to hide an element in page?

Real Time Properties Control

- Enable VP is can be use to hide an element in page
- Enable VP is none by default (element operate normally)
- It can assign a VP address (VP_N16, VP_N32, VP_N64) to it as its Enable control register
- The VP value set to 1 as enable at power-on.
- It can be disabled (hidden) by a zero value

How to display Chinese Char

- Smart LCD support GB2312, GBK, BIG5
- GB2312 support the most command 6763 simplified Chinese
- Select a Chinese Font Char set in the String ElementConfig a VP_STR with it
- Send a GB code string to the VP_STR to display it on screen

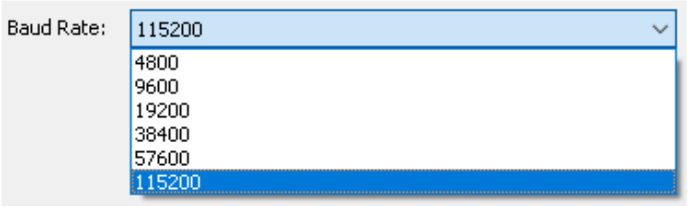
Note. It can generate custom font in SGTools (Menu→ Tools → Font Setting → Font Config <2>)

10.5.6 Communications

How to config the terminal buadrate?

By Project setting

- The terminal baudrate can be config in the SGTools (Menu → Tools → Project Setting)



- default is115200 baud per second

By Command

- It is also possible to change the baudrate by using command.
- Use a E0 command to set sys config (AA E0 55 AA 5A A5 07 83 00 CC 33 C3 3C)
- Baud rate will back to project setting after next power on

How to resolve communication issue?

Physical Connections

- Check the terminal connections cable
- Ensure the GND is connection
- Confirm the cross wiring (Tx to Rx)

Smart_LCD Tx → PC Rx
Smart_LCD Rx ← PC Tx
Smart_LCD RTS → PC CTS

Signal Levels

- Check the terminal signal of the Smart LCD
- There are three kind of Smart LCD terminal (depends on model)
  UART (3.3V) / RS-232C (±12V) / RS-485 (3.3V)
- The host and the Smart LCD must be have the same signal levels
- Only Smart LCD with RS-232C can interface to PC RS-232C signal(±12V)

Byte Packet Config

- Check the baud rate (115200 by default)
- Check the no. of bit, parity and stop bit (8N1 by default)
- All the command are in hex/binary (NOT ASCII)

What is the function of terminal RTS signal?

RTS signal

- RTS is an output signal of the Smart LCD, working like a busy signal
- It will be set, while the Smart LCD input buffer full.
  When RTS set, host should stop sending data/command to prevent data/command lost.
- As Smart LCD is having 32kbyte (various by model) input buffer,
  In most of the case, it may not necessary to use RTS signal.

11 Precautions of using LCD Modules

Mounting

- For mounting use the holes arranged in the four corners of the LCD Module.
- Make sure to provide an even force on to LCD module. Uneven force (ex. twisted stress) should not be applied to the module. The casing on which a module is mounted should have sufficient strength to absorb any external force, so the force can't be transmitted directly to the module.
- It is suggested to attach a transparent protective plate to the surface of the module in order to protect the polarizer. It should have sufficient strength to resist external force.
- The housing should provide sufficient thermal radiation to satisfy the temperature specification.
- Acetic Acid type and Chlorine-type materials for the cover case are not desirable because the former generates corrosive gases, which may attack the polarizer at high temperatures which may cause circuit break by electro-chemical reactions.
- Do not touch, push or rub the exposed polarizer with glass, tweezers or anything harder than HB pencil lead. Never treat the polarizer with chemical agents. Do not touch the surface of polarizer with bare hand or greasy cloth. Otherwise it may result in some cosmetics deterioration of the polarizer.
- When the surface becomes dusty, please wipe gently with absorbent cotton or another soft material. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer may affect the appearance.

Operating

- Spike noise may cause deterioration of the circuitry. Noise should be within a range of ±200mV. (Over and under voltage)
- The LCD response time is depends on the temperature. (At lower temperatures, it becomes slower)
- Brightness depends on the temperature as well. (At lower temperatures, it becomes less bright and it takes more time until the brightness is stable after power on).
- Try to avoid sudden temperature change, because they may cause condensation. Condensation may damage the polarizer or the circuitry. After fading condensation a smear or spot may occur.
- When fixed patterns are displayed for a long time, remnant images are likely to occur.
- The LCD module incorporates high frequency circuitry. Sufficient suppression of electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized interferences.

Electrostatic Discharge Control

- Since a module is composed of electronic circuits, it may be affected by electrostatic discharge.
- Make sure that the worker, who is assembling the module into equipment, is connected to ground through a ESD wrist band or insure other ESD protection.
- Avoid touching any electrical contact of the module without proper ESD protection.

Strong Light Exposure

- Strong light exposure causes degradation of polarizer and color filter.

Storage

- When storing modules as spares for a long time, precautions are necessary.
- Store the LCD modules in a dark place.
- Do not expose the module to sunlight or fluorescent light.
- Keep the temperature between 5°C and 35°C at normal humidity.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

Protection Film

- When the protection film is peeled off, static electricity is generated between the film and polarizer. The film should be peeled off slowly and carefully by people who are electrically grounded. It is suggested to do that process while using an ion air blower or other suitable ESD equipment.
- The protection film is attached to the polarizer with a small amount of glue. If some stress is applied e.g. by rubbing the protection film against the polarizer during the time it is peeled off, some protection film may remain on top of the polarizer. Please carefully peel off the remaining protection film without rubbing it against the polarizer.
- When the module, with protection film attached, is stored for a long time, some very small amount of glue may remain still on the polarizer after the protection film is peeled off. You can remove the glue easily. In such a case please wipe them off with absorbent cotton or another soft material.

Transportation

- The LCD modules should not be exposed to drop, shock, excessive pressure, water or sunshine during transportation.

12 Revisions

Rev.	Descriptions	by	Release Date
0.01	- Draft Release	K.C.	2019-01-24
1.00	- Preliminary New Release	K.C.	2019-10-10
1.01	- update 4.1 SGTools Layout figure - refine 4.4.4, 4.4.5,4.4.12, 4.4.21 descriptions - refine 4.4.22, 4.4.23 descriptions and note - add 4.4.38 Predefined Touch Keys –Set (English keyboard) - update 10.2.1 and 10.2.2 note	K.C.	2020-12-29
1.02	- typo correction on 4.4.3 return code - add 10.3, 10.4, 10.5	K.C.	2024-08-11