



Instruction Set

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
<i>Robert</i>	Peng Jun		



Table of Contents

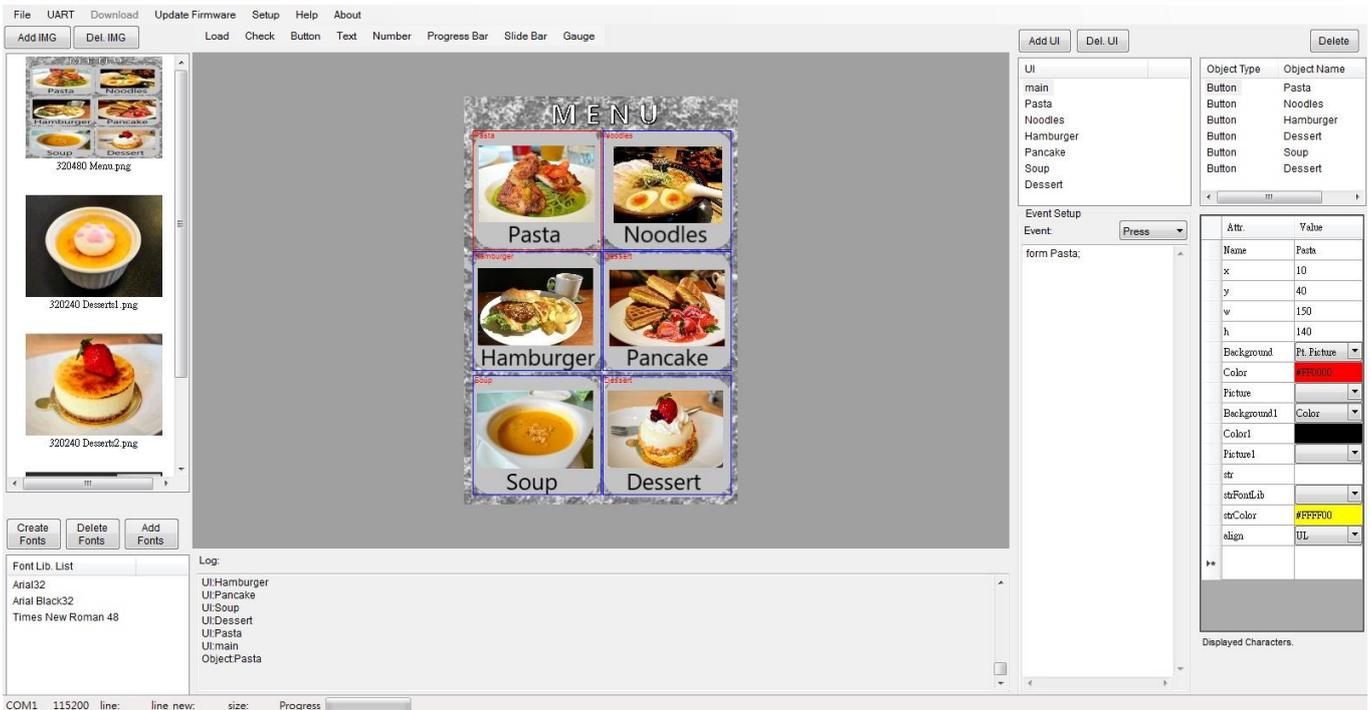
List	Description	Page No.
	Cover	1
	Revision Record	2
	Table of Contents	3
1	Scope	4
2	General Information	4
3	User Interface	4
4	Libraries	5
5	Functions	6
6	Widgets	7
7	Programming	11

1. Scope

This manual defines general instruction for the UI Editing Tool for UART TFT LCD module supplied by AMSON electronics.

2. General Information

There are several widgets for designing the user interface. By clicking any widget, the corresponding icon will show on the window. User can set various attributes, e.g. the location, size, text in the right column.



3. User Interface

User can create new User Interface, in which they can set pictures, buttons, gauges, and so on. Note that the maximum quantity of UI is 10.



* A maximum of 32 objects is limited for each UI.

4. Libraries

User can store up to 40 images. Note that the resolution of the image must be the same as that of the TFT LCD module while choosing Ext. Picture for the background of the UI.



User must Create Fonts before inputting text.



* A maximum of 16 ascii characters is limited for the name length of each file.

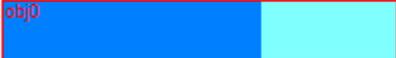


5. Functions

Item	Attributes
File	New, open, save and exit.
UART	Choose the corresponding port and Baud Rate. The Baud Rate is used for setting the communication baud rate between the UART TFT LCD module and the host.
Update Firmware	Open a *.bin file and update the firmware.
Setup	To be decided.
Help	Link to the UI Editing Tool Manual.
About	Describe the software version.
Load	Upload the user interface(s.)
Check	Choose the object and check its code; Simulation works as a simulator.

6. Widgets

Item	Attributes																																
Button	<p>With location, background (color, picture or transparent) and str (text,) user can set the Background & Background1 to make a simple color button or a self-made one by Ext. Picture.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>↓ press</p>  </div> <table border="1" data-bbox="935 524 1267 1005"> <tr><td>Background</td><td>Color</td></tr> <tr><td>Color</td><td>#808080</td></tr> <tr><td>Picture</td><td></td></tr> <tr><td>Background1</td><td>Color</td></tr> <tr><td>Color1</td><td>#C0C0C0</td></tr> <tr><td>Picture1</td><td></td></tr> <tr><td>str</td><td>Send</td></tr> <tr><td>strFontLib</td><td>Arial48</td></tr> <tr><td>strColor</td><td>#000080</td></tr> <tr><td>align</td><td>CC</td></tr> </table> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  <p>↓ press</p>  </div> <table border="1" data-bbox="946 1144 1278 1431"> <tr><td>Background</td><td>Ext. Picture</td></tr> <tr><td>Color</td><td></td></tr> <tr><td>Picture</td><td>BUTTON1</td></tr> <tr><td>Background1</td><td>Ext. Picture</td></tr> <tr><td>Color1</td><td></td></tr> <tr><td>Picture1</td><td>BUTTON2</td></tr> </table> </div>	Background	Color	Color	#808080	Picture		Background1	Color	Color1	#C0C0C0	Picture1		str	Send	strFontLib	Arial48	strColor	#000080	align	CC	Background	Ext. Picture	Color		Picture	BUTTON1	Background1	Ext. Picture	Color1		Picture1	BUTTON2
	Background	Color																															
Color	#808080																																
Picture																																	
Background1	Color																																
Color1	#C0C0C0																																
Picture1																																	
str	Send																																
strFontLib	Arial48																																
strColor	#000080																																
align	CC																																
Background	Ext. Picture																																
Color																																	
Picture	BUTTON1																																
Background1	Ext. Picture																																
Color1																																	
Picture1	BUTTON2																																
<p>In the Event column, user can set up the program when the button is pressed or released.</p> <div style="border: 1px solid gray; padding: 5px; margin: 10px auto; width: fit-content;"> <p>Event Setup</p> <p>Event: Press</p> <p>form Pasta;</p> </div>																																	

<p>Text</p>	<p>Besides location, background and font color, the alignment of the text is available.</p> <div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <tr><td>Background</td><td>Color</td></tr> <tr><td>Color</td><td>#80FF80</td></tr> <tr><td>Picture</td><td></td></tr> <tr><td>str</td><td>AMSON</td></tr> <tr><td>strFontLib</td><td>1</td></tr> <tr><td>strColor</td><td>#0080FF</td></tr> <tr><td>align</td><td>CC</td></tr> </table> </div>	Background	Color	Color	#80FF80	Picture		str	AMSON	strFontLib	1	strColor	#0080FF	align	CC						
Background	Color																				
Color	#80FF80																				
Picture																					
str	AMSON																				
strFontLib	1																				
strColor	#0080FF																				
align	CC																				
<p>Number</p>	<p>The number can be integer or float. Note that the number of Float digits must be the same while calculating. E.g. If the value of obj.0 is 20.12, there must be 2 numbers following the decimal point upon calculation.</p> <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 20px;"> <p>Event Setup</p> <p>Event: Press</p> <pre>obj0.num -= 0.01;</pre> </div> </div>																				
<p>Progress Bar</p>	<p>User can set the Background & PColor to make a simple color progress bar.</p> <div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <tr><td>Background</td><td>Color</td></tr> <tr><td>Color</td><td>#80FFFF</td></tr> <tr><td>Picture</td><td></td></tr> <tr><td>Progress</td><td>Color</td></tr> <tr><td>PColor</td><td>#0080FF</td></tr> <tr><td>PPicture</td><td></td></tr> <tr><td>Orientation</td><td>Horizontal</td></tr> <tr><td>Maximum</td><td>100</td></tr> <tr><td>Minimum</td><td>0</td></tr> <tr><td>Value</td><td>66</td></tr> </table> </div> <p>(See next page.)</p>	Background	Color	Color	#80FFFF	Picture		Progress	Color	PColor	#0080FF	PPicture		Orientation	Horizontal	Maximum	100	Minimum	0	Value	66
Background	Color																				
Color	#80FFFF																				
Picture																					
Progress	Color																				
PColor	#0080FF																				
PPicture																					
Orientation	Horizontal																				
Maximum	100																				
Minimum	0																				
Value	66																				

For a different design, user should prepare a full-resolution picture and locate the progress bar at the corresponding coordinates, choosing certain color for the Background and Pt. Picture for the Progress bar.



Background	Color
Color	#FFFFFF
Picture	
Progress	Pt. Picture
PColor	
PPicture	240320 ...
Orientation	Horizontal
Maximum	100
Minimum	0
Value	41

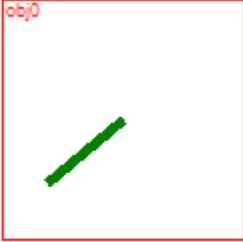
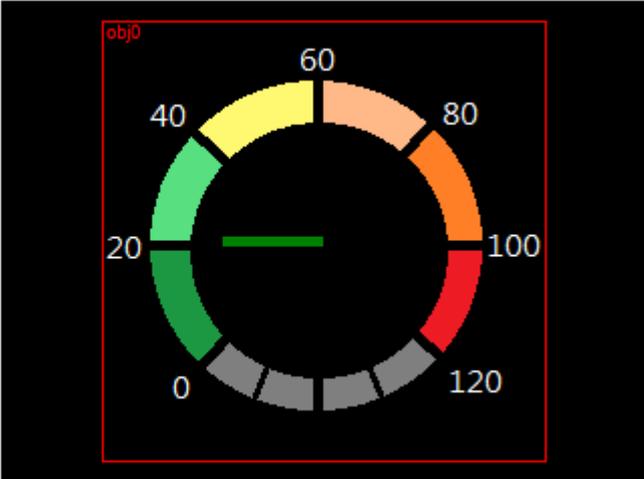
User can set the Background & SColor to make a simple color slide bar.

Slide Bar

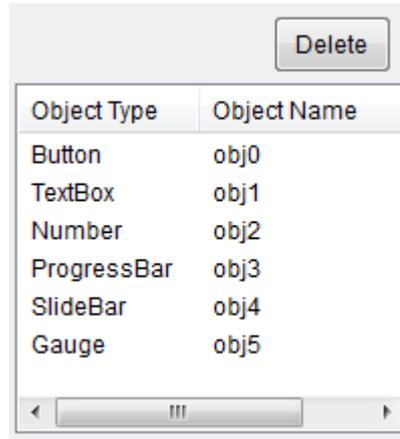


Background	Color
Color	#CACACA
Picture	
Slider	Color
SColor	#008000
SPicture	slider
Orientation	Horizontal
Width	30
Maximum	100
Minimum	0
Value	60

For the other design, user can also choose Ext. Picture to combine specific Background and Slider. (See next page.)

	 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>Background</td><td>Ext. Picture</td></tr> <tr><td>Color</td><td></td></tr> <tr><td>Picture</td><td>slider bar</td></tr> <tr><td>Slider</td><td>Ext. Picture</td></tr> <tr><td>SColor</td><td></td></tr> <tr><td>SPicture</td><td>slider</td></tr> <tr><td>Orientation</td><td>Horizontal</td></tr> <tr><td>Width</td><td>40</td></tr> <tr><td>Maximum</td><td>100</td></tr> <tr><td>Minimum</td><td>0</td></tr> <tr><td>Value</td><td>60</td></tr> </table>	Background	Ext. Picture	Color		Picture	slider bar	Slider	Ext. Picture	SColor		SPicture	slider	Orientation	Horizontal	Width	40	Maximum	100	Minimum	0	Value	60										
Background	Ext. Picture																																
Color																																	
Picture	slider bar																																
Slider	Ext. Picture																																
SColor																																	
SPicture	slider																																
Orientation	Horizontal																																
Width	40																																
Maximum	100																																
Minimum	0																																
Value	60																																
Gauge	<p>User can set the Background & GColor to make a simple color gauge.</p> <div style="text-align: center;">  <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>Background</td><td>Color</td></tr> <tr><td>Color</td><td>#FFFFFF</td></tr> <tr><td>Picture</td><td></td></tr> <tr><td>Gauge</td><td>Color</td></tr> <tr><td>GColor</td><td>#008000</td></tr> <tr><td>Length</td><td>50</td></tr> <tr><td>Thickness</td><td>5</td></tr> <tr><td>Value</td><td>320</td></tr> </table> </div> <p>For the other Background, user can choose Ext. Picture, transparent or Pt. Picture depending on the design.</p> <div style="text-align: center;">  <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>Background</td><td>Ext. Picture</td></tr> <tr><td>Color</td><td></td></tr> <tr><td>Picture</td><td>Gauge</td></tr> <tr><td>Gauge</td><td>Color</td></tr> <tr><td>GColor</td><td>#008000</td></tr> <tr><td>Length</td><td>50</td></tr> <tr><td>Thickness</td><td>5</td></tr> <tr><td>Value</td><td>0</td></tr> </table> </div>	Background	Color	Color	#FFFFFF	Picture		Gauge	Color	GColor	#008000	Length	50	Thickness	5	Value	320	Background	Ext. Picture	Color		Picture	Gauge	Gauge	Color	GColor	#008000	Length	50	Thickness	5	Value	0
Background	Color																																
Color	#FFFFFF																																
Picture																																	
Gauge	Color																																
GColor	#008000																																
Length	50																																
Thickness	5																																
Value	320																																
Background	Ext. Picture																																
Color																																	
Picture	Gauge																																
Gauge	Color																																
GColor	#008000																																
Length	50																																
Thickness	5																																
Value	0																																

There's a box on the top right corner, in which user can pick the corresponding object to arrange the settings.



7. Programming – All Case-Sensitive

HEX Command

Function	Protocol Header (4Bytes)	Reserve (1Byte)	Command Type (1Byte)	Data Length (1Byte)	Data (n Bytes)	CRC (2Bytes)
Adjust Backlight PWM	FELP	0x00	11	2	0xA8+0x00(0%=off)~0x0A(100%) e.g. Change to 10% 0x46,0x45,0x4C,0x50,0x00,0x0B,0x02,0xA8,0x01,0xD9,0x21 PWM adjustment range, total10 levels: 0x01=10%; 0x05=50%; 0x0A=100%	CRC 2Bytes
Adjust Backlight PWM Response	FELP	0x00	11	1	0x00=succeed; Otherwise failed.	CRC 2Bytes
LCD Display On/ off	FELP	0x00	12	1	0x00=LCD Display off. 0x46,0x45,0x4C,0x50,0x00,0x0C,0x01,0x00,0x8F,0x13 0x01=LCD Display on. 0x46,0x45,0x4C,0x50,0x00,0x0C,0x01,0x01,0xAE,0x03	CRC 2Bytes
LCD Display On/ off Response	FELP	0x00	12	1	0x00=succeed; 0x01=failed.	CRC 2Bytes
Shift UI	FELP	0x00	36	Length of following data	UI name length + UI name	CRC 2Bytes
Shift UI Response	FELP	0x00	36	1	0x00=succeed; Otherwise failed.	CRC 2Bytes
Change Attribute of Object str	FELP	0x00	37	Length of following data	UI name length +UI name + Object name length + Object name + str length + str	CRC 2Bytes
Change Attribute of Object str Response	FELP	0x00	37	1	0x00=succeed; Otherwise failed.	CRC 2Bytes



Example of hex command: Command Type = 37, change contains of str in object name “STULN1” in UI name “standby1” to “ABC” . Then the host needs to send following data to LCD module through UART.

Header FELP (4 bytes)	Reserve 0x00 (1 byte)	Command 37 (1 byte)	Data length (1 byte)	UI name length (1 byte)*	UI name: standby1 (8 bytes)*	Object name length (1 byte)*	Object name: STULN1 (6 bytes)*	str length (1 byte)*	str: ABC (3 bytes)*	CRC (2 bytes)
0x46,0x45,0x4C,0x50	0x00	0x25	0x14	0x08	0x73,0x74,0x61,0x6E,0x64,0x62,0x79,0x31	0x06	0x53,0x54,0x55,0x4C,0x4E,0x31	3	0x41,0x42,0x43	0xB1,0x11

Remark: Data length is accumulated by those items with star * marks. Hence, 1+8+1+6+1+3 = 20 (hex number: 0x14) is Data Length.

The CRC is calculated base on following code

```
const unsigned short CRC_VALUE=10;
```

```
unsigned short crc16_compute(unsigned char const * p_data, unsigned int size, unsigned short const * p_crc)
```

```
{
    unsigned short crc = (p_crc == NULL) ? 0xFFFF : *p_crc;
    unsigned int i;
    for ( i = 0; i < size; i++)
    {
        crc = (unsigned char)(crc >> 8) | (crc << 8);
        crc ^= p_data[i];
        crc ^= (unsigned char)(crc & 0xFF) >> 4;
        crc ^= (crc << 8) << 4;
        crc ^= ((crc & 0xFF) << 4) << 1;
    }
    return crc;
}
```

Usage Example:

```
unsigned short crc16_result = crc16_compute(COMM_buff, count, &CRC_VALUE);
```

//Where **count** is amount of bytes from Header to last data, for the “Example of Hex Command” shown above, it is from Header to str, the total data length is 27 bytes, hence count=27.

Char/ASCII Command

Function	Protocol Header (4Bytes)	Reserve (1Byte)	Command Type (1Byte)	Data Length (1Byte)	Data (n Bytes)	CRC (2Bytes)
Char/ASCII Command	FELP	0x00	127	Length of following data	Char/ASCII Command, ended with 0x00. Refer to the list below.	CRC 2Bytes
Char/ASCII Command Responds	FELP	0x00	127	1	0x00=succeed; Otherwise failed.	CRC 2Bytes

Char/ASCII Command List:

Function	Command	Example	Description
Switch UI	form	form main	Switch to an UI, the UI name is “main”
Change str value of an object.		obj.str=test	Change the str value of an object name called “obj” to “test”.
Change color of str of an object		Obj.fcolor=#ff0000	Change the str color of an object name called “Obj” to color #ff0000.*



Change background type of an object.	obj.btype=pic obj.btype=ppic obj.btype=bcolor obj.btype=null	pic: change background type of object name "obj" to picture, the size of an picture must have same dimension of object. ppic: change background type of object name "obj" to portion of a picture. bcolor: change background type of object name "obj" to color. null: change background type of object name "obj" to transparent.
Change background picture of an object.	obj.pic=cat	Change background picture of object name "obj" to picture name cat where cat needs to be exist in the project, and background type of "obj" needs to be pic.
Change background color of an object.	Obj.bcolor=#ff0000	Change background color of object name "obj" to color #ff0000 (Red). The background type of "Obj" needs to be bcolor.
Change the display location of an object.	obj.x=160 obj.y=82 obj.w=20 obj.h=43	Change x coordinate of display loation of object name "obj" to 160. Change y coordinate of display location of object name "obj" to 82. Caution: x, y is base on upper left corner of an object. Change x, y location not properly may cause the object size is out of LCD display range. Change width of object name "obj" to 20 pixels. Change height of object name "obj" to 43 pixels.

Remark: Color #ff0000 is hex color code (Red) where is base on RGB color value.

Tips on changing background picture of an object with different size between object and picture.

While background of an object is set as picture, the selected picture size must have exactly same size as object. e.g. object size:20*50 pixels, the picture size also need to be exactly 20*50 pixels. If user want to change background picture size of an object and treat it as next object size, then user should change object background type to null first, then change object width/height to exactly as same as new picture size, set background picture to new picture name, then set background of object to picture. Following is the procedure,

Example shows below as using object name "NUM12", new picture name is TinyCar_Red, and its size is 51*51. Each step means send out that string to LCD Module through UART.

- Step 1: NUM12.btype=null
- Step 2: NUM12.w=51
- Step 3: NUM12.h=51
- Step 4: NUM12.pic=TinyCar_Red
- Step 5: NUM12.btype=pic

Keyword in Code

User can implement C-Language like code in LCD module to run user's designed process. Following list is keywords in the code.

Code needs to be ended with semicolon, ";" for each line except condition statement (if else, while, and, for)

Keyword	Variable Type	Assignable	Return Type	Description
obj.str	string	V	char	Object named "obj" and its content is treated as string.
Examples: TB2.str += "W"; TB2.str = "Hello World"; TB2.str -= 1; TB2.str = TB2.str - 2;				Description: Append string "W" to object TB2. If TB2.str contains "H", then TB2.str becomes "HW" after TB2.str += "W"; Assign string "Hello World" to TB2.str. Delete last character in the TB2.str. Delete last 2 characters in the TB2.str.
obj.num	integer/ float	V	int32 or float	Object named "obj" and its content istreated as integer (1, 2, -3...) or float (-1.2, 2.54...), note that the sign "+" shouldn't be used. However, user can set the sign "-" to make a negative number.
Examples: NU2.num -= 1; NU3.num = TB3.num +2.00;				Description: Set number to object NU2 to subtract 1. If NU2 was set to 4, then it becomes 3 after this operation. Set number to object NU3 to TB3+2.00. If TB3 was set to 8.00, then NU3 becomes 10.00 after this operation. Float digit must has same digit count set in object after decimal point (digits after decimal of NU3, TB3 and number must keep same). e.g. All have two digits after decimal. NU3 needs to be 0.00 (two digits after decimal) TB3 needs to be 0.00 (two digits after decimal) The number 2 needs to be 2.00 (two digits after decimal)
obj.len	integer	NA	int32	Get the current string length (in byte) of the object named "obj".
Example: if (TB2.len > 5)...				Description: To judge in conditional routing. If obj.str = "ABCDEF", then obj.len will return number 6 in 4 bytes length. e.g. 0x06, 0x00, 0x00, 0x00 For numbers type of object, Number/ Progress Bar/ Slide Bar/ Gauge object, the return data for this operate will always be 4 bytes sent by LSB order, 0x04, 0x00, 0x00, 0x00



UI Editing Tool Manual

Version: A

2021-12-13

		E.g. If the string length is 258 bytes, the return data will be 0x02 0x01 0x00 0x00. This demo what LSB means, the string length can not be over 31 characters for an object.		
obj.fcolor	string	V	string	Get/set the font color (as string) of the object named "obj".
Example: TB2.fcolor = "#FF00FF" ;		Description: Assign the TB2 string color to " "#FF00FF"		
obj.btype	string	V	string	Get/set the background type (as string) of the object named "obj".
Example: TB2.btype = "bcolor" ;		Description: Change TB2 background type to bcolor (use color as background). Options can be, "bcolor", use color as background "pic", use extended picture as background "null", use background as background (transparent) "ppic", use portion of picture as background		
obj.pic	string	V	string	Get/set the pic (as string) of the object named "obj".
Example: TB2.str = OBJ1.pic;		Description: Assign the picture name of background of OBJ1 to TB2 string. e.g. if the name of background picture of OBJ1 is called TinyCar, then the TB2.str will become "TinyCar" after this operation.		
obj.bcolor	string	V	string	Get/ set the background color (as string) of the object named "obj".
Example: TB2.str = OBJ1.bcolor;		Description: Assign the RGB color value of background of OBJ1 to TB2 string. e.g. if the RGB color value of background of OBJ1 is #FF00FF, then the TB2.str will become "#FF00FF" after this operation.		
obj.x, obj.y	integer	V	int32	Get/ set the coordinates of the object named "obj".
Example: TB2.x=160; TB2.y=30;		Description: Assign the location of object TB2 to coordinate x=160 pixel, and y=30 pixel. The origin of an object is on the top-left corner of that object. Be careful on changing the location of object to avoid the object area is out of LCD display area.		
obj.w, obj.h	integer	V	int32	Get/ set the width/ height of the object named "obj".
Example: TB2.w=160; TB2.h=25;		Description: Assign the width of object TB2 to 160 pixels, and h=25 pixels. The origin of an object is on the top-left corner of that object. Be careful on changing the size of object to avoid the object area is out of LCD display area. If object's background is extended picture, change the size of object will cause error when changed size is not matching to the size of existed extended picture.		
send	command	NA	NA	Send data out through UART port.
Example: (Send out as string.) send "Text"; send BT2.str; (Send out as number) send 513; send -300; send BT2.num;		Description: String types are str, fcolor, bcolor, and pic. Send out string "Text" through UART. Send out string content of BT2.str. If BT2.str contains "STOP", then string "STOP" will be sent out through UART. Number types are num,x,y,w,h,and len. Send out integer number 513 (int32, LSB format) through UART. The 513 will be sent as 0x01,0x02,0x00,0x00. Send out integer number -300 (int32, LSB format) through UART. The nagtive value will be sent as 1's complemet value, e.g. -300 will be sent as 0xD4,0xFE,0xFF,0xFF Send out content of object BT2.num, it could be integer (int32, LSB format) or float value. The float value is IEEE-754 Floating Point with hexadecimal representation. e.g. If float number is 2.58, then it will be sent as 0xB8,0x1E,0x25,0x40 through UART.		
form	command	NA	NA	Change to UI page.
Example: Form main;		Description: Change current displayed UI to the UI named "main".		
if else	command	Conditional statement.		
while	command	Conditional statement.		
for	command	Conditional statement.		

Take an example on changing background picture of an object with different size between object and picture which shown above by using Char/ASCII Command, and we implement the same function by writing the code for an action when button, for example, is pressed. If it's written in the program for button, following code can be put in code area of button in UI Edit Software

```
NUM12.btype= "null";
NUM12.w=51;
NUM12.h=51;
NUM12.pic="TinyCar";
NUM12.btype="pic";
```