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Delta Lua Instruction Manual

Delta Lua Instruction Manual

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Lua Instruction Manual

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1. Introduction to Lua

Lua is a lightweight programming language created by the Computer Graphics Technology Group (Tecgraf) in Brazil. Its scripting language is simple and easy to learn and use, helping programmers to quickly complete their programming tasks. With Delta HMI's support of the Lua programming language, you can have more flexibility in designing screens.

■ Lua editor window

Click [Project] > [Program] > [Main], then you can start writing the Lua programs, as shown in Figure 1.1.

When writing the Lua program, you can use the program example assistant to quickly get familiar with the commands, or move the mouse pointer to the commands to see its description. Refer to Figure 1.2.

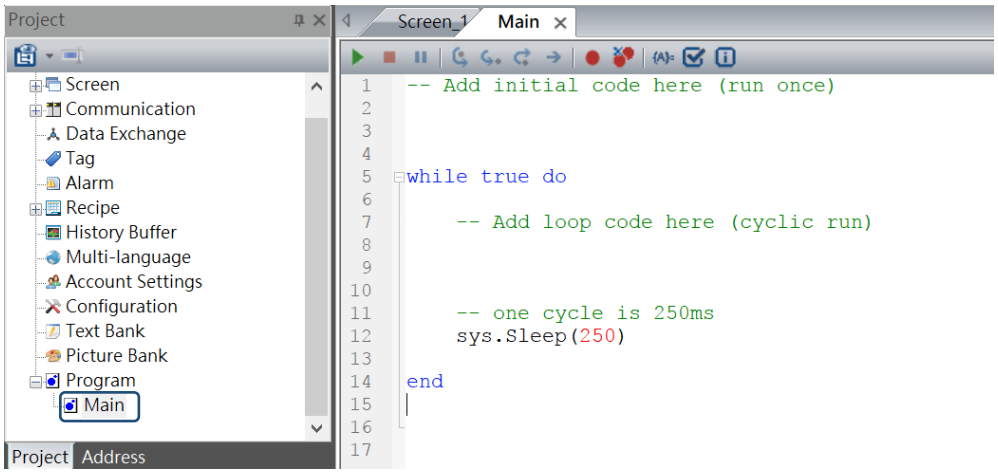


Figure 1.1 The Lua programming interface

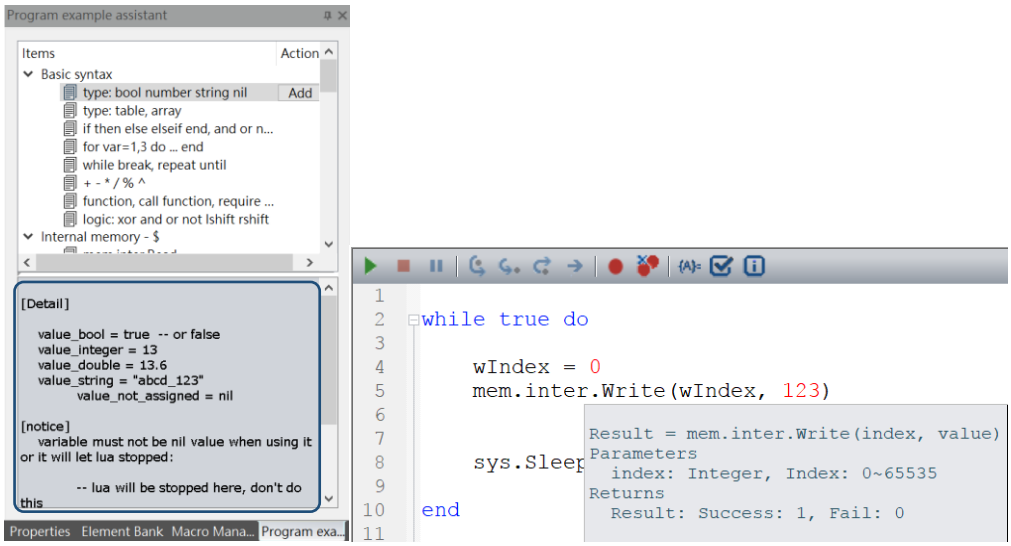


Figure 1.2 The Lua program example assistant and description

You can also go to the Action field in the Lua window and click **Add** to quickly add basic Lua command templates to the program.

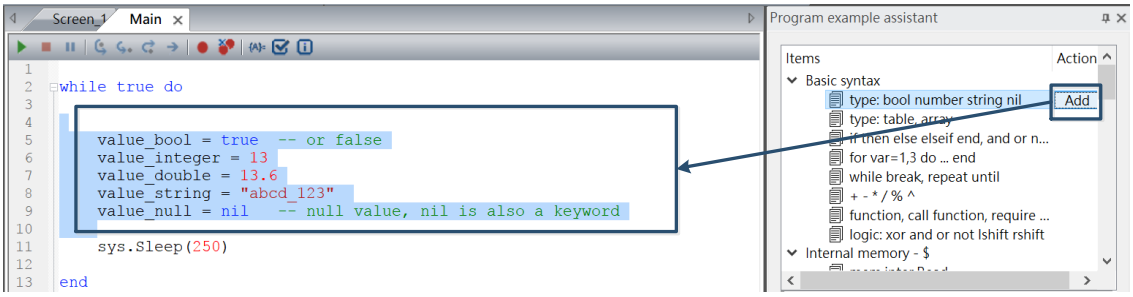


Figure 1.3 Quick input of Lua commands

2. Basic Lua programming syntax

The following is a summary of the basic Lua programming syntax.

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Chunk or block</td><td>■ A statement in the Lua program is called a chunk, which can refer to a command or a group of commands; the execution results are the same. For example:
==========
a=1
mem.inter.WriteBit(1,0,a)
Or
a=1 mem.inter.WriteBit(1,0,a)</td></tr>
<tr><td>Program comments</td><td>There are two types of comments in Lua :
■ Single-line comment: starts with two dashes (--) and continues until the end of the line.
Example:
-- Lua
■ Multi-line comment: starts with two dashes and two upper brackets (--[[) and ends with two lower brackets. The contents within these brackets are skipped and not executed.
Example:
--[[This is
a multi-line
comment]]</td></tr>
<tr><td>Identifiers and reserved words</td><td>■ In Lua, variables and function names are represented by identifiers with combinations of English letters, numbers, and underscores. However, the first character of the string cannot be a number. Note that when setting variables, do not use the following 22 reserved words.
<table>
<tr><td>local</td><td>nil</td><td>not</td><td>or</td></tr>
<tr><td>and</td><td>if</td><td>then</td><td>else</td></tr>
<tr><td>elseif</td><td>for</td><td>end</td><td>in</td></tr>
<tr><td>do</td><td>while</td><td>until</td><td>repeat</td></tr>
<tr><td>break</td><td>true</td><td>false</td><td>function</td></tr>
<tr><td>return</td><td>goto</td><td>-</td><td>-</td></tr>
</table>
Note: Lua is case sensitive, so while goto is a reserved word, GOTO can be a variable.</td></tr>
</table>

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Global and local variables</td><td>
■ All variables are global variables unless they are declared as local.
Example:
==========
A=100
■ Local variables are variables declared as local. Their scope is limited to the block in which they are located, such as in functions, branch control instructions, loops, or do end structures.
Example:
==========
if a=1 then
local A=100
end
</td></tr>
<tr><td>Multiple assignments</td><td>
■ You can assign values to multiple variables at the same time in a single statement and use a comma to separate each variable.
Example:
==========
a,b,c=1,2,3
mem.inter.Write(1,b)
</td></tr>
<tr><td>Data type</td><td>
■ Variables are typeless, so there is no need to specify the data type when declaring variables, but the variable values have types, namely nil, booleans, numbers, and strings.
Table 2.1 Lua data types
<table>
<tr><th>Basic types</th><th>Description</th></tr>
<tr><td>nil</td><td>Missing value</td></tr>
<tr><td>boolean</td><td>False and true</td></tr>
<tr><td>number</td><td>Double-precision real floating-point number</td></tr>
<tr><td>string</td><td>Character string; represented by a pair of double quotation marks or single quotation marks</td></tr>
</table>
</td></tr>
</table>

3. Lua command list

Command	Command expression	Description
Basic syntax	Type: bool number string nil	Data type
	Type: table, array	Matrix operations
	if then else elseif end, and or not	Comparison
	for var=1,3 do … end	*for* loop
	while break, repeat until	*while, repeat* loop
	+-*/%^	Mathematical operations
	function, call function, require return	Flow control
	Logic: xor and or not lshift rshift	Logical operations
Internal memory - $	mem.inter.Read	Read the value of the internal memory (unit: Word)
	mem.inter.ReadDW	Read the value of the internal memory (unit: Double Word)
	mem.inter.ReadFloat	Read the value of the internal memory (unit: Float)
	mem.inter.ReadBit	Read the bit of the internal memory
	mem.inter.ReadDouble	Read the value of the internal memory (unit: double-precision floating-point numbers; 64 bits)
	mem.inter.Write	Write the value to the internal memory (unit: Word)
	mem.inter.WriteDW	Write the value to the internal memory (unit: Double Word)
	mem.inter.WriteFloat	Write the value to the internal memory (unit: Float)
	mem.inter.WriteBit	Write the bit to the internal memory
	mem.inter.WriteDouble	Write the value to the internal memory (unit: double-precision floating-point numbers; 64 bits)
	mem.inter.ReadAscii	Read the sting of the internal memory
	mem.inter.WriteAscii	Write the string to the internal memory
Static memory - $M	mem.static.Read	Read the value of the static memory (unit: Word)
	mem.static.ReadDW	Read the value of the static memory (unit: Double Word)
	mem.static.ReadFloat	Read the value of the static memory (unit: Float)
	mem.static.ReadBit	Read the bit of the static memory
	mem.static.ReadDouble	Read the value of the static memory (unit: double-precision floating-point numbers; 64 bits)
	mem.static.Write	Write the value to the static memory (unit: Word)
	mem.static.WriteDW	Write the value to the static memory (unit: Double Word)
	mem.static.WriteFloat	Write the value to the static memory (unit: Float)
	mem.static.WriteBit	Write the bit to the static memory
	mem.static.WriteDouble	Write the value to the static memory (unit: double-precision floating-point numbers; 64 bits)
	mem.static.ReadAscii	Read the string of the static memory
	mem.static.WriteAscii	Write the string to the static memory

Command	Command expression	Description
External link (external memory)	link.Read	Read the value of the external memory (unit: Word)
	link.ReadDW	Read the value of the external memory (unit: Double Word)
	link.ReadFloat	Read the value of the external memory (unit: Float)
	link.ReadBit	Read the bit of the external memory
	link.ReadAscii	Read the string of the external memory
	link.ReadDouble	Read the value of the external memory (unit: double-precision floating-point numbers; 64 bits)
	link.Write	Write the value to the external memory (unit: Word)
	link.WriteDW	Write the value to the external memory (unit: Double Word)
	link.WriteFloat	Write the value to the external memory (unit: Float)
	link.WriteBit	Write the bit to the external memory
	link.WriteAscii	Write the string to the external memory
	link.WriteDouble	Write the value to the external memory (unit: double-precision floating-point numbers; 64 bits)
	link.CopyFromInter	Copy data from the HMI internal memory to the external memory
	link.CopyToInter	Copy data from the external memory to the HMI internal memory
	link.CopyArray	Copy data from the HMI internal/external memory to the HMI internal/external memory
	link.DownloadPLC	Use the COM communication to download the isp or dvp program to the PLC through HMI
	link.DownloadEthPLC	Use the network communication to download the isp or dvp program to the PLC through HMI
	link.WritePasswordPLC	Use the COM communication to write the system password to the PLC
	link.SetDefaultStationNo	Set the default PLC Station number for the HMI to communicate with
	link.SetHMIStationNo	Set the HMI Slave station number (Modbus Slave)
	link.CODESYSAppDownload	Use the network communication to download the CODESYS program to the PLC through HMI
	link.CODESYSAppUpload	Use the network communication to upload the CODESYS program to the USB storage device connected to the HMI
File (read/write/export/ delete/print files)	file.Open	Create/open file
	file.Read	Read file data
	file.ReadLine	Read file (unit: one line)
	file.Write	Write to file
	file.Length	Read the file length
	file.GetLineCount	Read the total line count in the file
	file.Seek	Set the pointer
	file.GetPos	Get the current pointer position

Command	Command expression	Description
File (read/write/export/ delete/print files)	file.GetError	Check file
	file.Close	Close file
	file.List	Get a list of the files stored in the HMI
	file.Export	Export file
	file.Delete	Delete file
	file.DeleteDir	Delete directory
	file.ToPDF	Convert the file to PDF
	file.ToPrinter	Print file
	file.ListExternal	Get a list of the files stored in the external device
	file.Exist	Check if the file exists
	file.PDFToPrinter	Print PDF file
	file.Copy	Copy file
	file.Move	Move file
FileSlot (file access)	fileslot.Read	Read the fileslot file
	fileslot.Write	Write the fileslot file
	fileslot.ReadValue	Read the value of the fileslot
	fileslot.WriteValue	Write the value to the fileslot
	fileslot.GetLength	Get the content length of the fileslot
	fileslot.Remove	Remove the fileslot
	fileslot.Import	Import the fileslot file
	fileslot.Export	Export the fileslot file
	fileslot.SetName	Set the fileslot filename
	fileslot.GetName	Get the fileslot filename
	fileslot.GetID	Get the fileslot file ID
FTP Client (FTP transfer function)	ftpc.Download	FTP download
	ftpc.Upload	FTP upload
Math (mathematical operations)	math.abs	Get the absolute value of the number
	math.exp	Get the value of the exponential function with the base *e*
	math.log	Get the value of the logarithmic function
	math.sin	Get the sine value
	math.sinh	Get the hyperbolic sine value
	math.cos	Get the cosine value
	math.cosh	Get the hyperbolic cosine value
	math.tan	Get the tangent value
	math.tanh	Get the hyperbolic tangent value
	math.asin	Get the arcsine value
	math.acos	Get the arccosine value
	math.atan	Get the arctangent value
	math.atan2	Get the arctangent value (two parameters)
	math.deg	Get the angle corresponding to the radians
	math.rad	Get the radians corresponding to the angle
	math.min	Get the minimum value
	math.max	Get the maximum value
	math.modf	Split the value into an integer and a decimal

Command	Command expression	Description
Math (mathematical operations)	math.pi	Pi (π)
	math.pow	Get the power value
	math.randomseed	Random seed
	math.random	Get a random value
	math.sqrt	Get the square root value
Recipe	recipe.GetCurRcpNoIndex	Get the current recipe number index
	recipe.GetCurRcpGIndex	Get the current recipe group index
	recipe.GetRcpWord	Get the value of the specified recipe address (Word)
	recipe.GetRcpDWord	Get the value of the specified recipe address (Double Word)
	recipe.GetRcpFloat	Get the value of the specified recipe address (Float)
	recipe.GetCurEnRcpNoName	Get the index name of the current enhanced recipe number
	recipe.GetCurEnRcpGName	Get the index name of the current enhanced recipe group
	recipe.GetCurEnRcpNoIndex	Get the index of the current enhanced recipe number
	recipe.GetCurEnRcpGIndex	Get the index of the current enhanced recipe group
	recipe.GetEnRcpWord	Get the value of the specified enhanced recipe address (Word)
	recipe.GetEnRcpDWord	Get the value of the specified enhanced recipe address (Double Word)
	recipe.GetEnRcpFloat	Get the value of the specified enhanced recipe address (Float)
	recipe.GetEnRcpAscii	Get the string of the specified enhanced recipe address
	recipe.SetRcpWord	Set parameters to the recipe address (Word)
	recipe.SetRcpDWord	Set parameters to the recipe address (Double Word)
	recipe.SetRcpFloat	Set parameters to the recipe address (Float)
	recipe.SetCurEnRcpNoName	Set the name of the enhanced recipe number
	recipe.SetCurEnRcpGName	Set the name of the enhanced recipe group
	recipe.SetEnRcpWord	Set parameters to the enhanced recipe address (Word)
	recipe.SetEnRcpDWord	Set parameters to the enhanced recipe address (Double Word)
	recipe.SetEnRcpFloat	Set parameters to the enhanced recipe address (Float)
	recipe.SetEnRcpAscii	Set the string to the enhanced recipe address
	recipe.ChangeRcpNoIndex	Change the index of the recipe number
	recipe.ChangeRcpGIndex	Change the index of the recipe group
	recipe.ChangeEnRcpNoIndex	Change the index of the enhanced recipe number
	recipe.ChangeEnRcpGIndex	Change the index of the enhanced recipe group

Command	Command expression	Description
Recipe	recipe.SetEnRcpDouble	Set parameters to the enhanced recipe address (double-precision floating-point number)
	recipe.GetEnRcpDouble	Get the value of the specified enhanced recipe address (double-precision floating-point number)
Screen (screen control)	screen.Open	Open the specified screen
	screen.CloseSub	Close the specified screen
	screen.IsOpened	Check whether the specified screen is open
	screen.Capture	Capture screenshot and save it to the external storage device
String (string operations)	string.len	Calculate the string length
	string.format	String formatting
	string.split	Split the string
	string.find	Locate the string
	string.sub	Find the string
	string.rep	Repeat the string
	string.trim	Remove the blank spaces before and after the string
	string.lower	Convert the string to lowercase
	string.upper	Convert the string to uppercase
	string.reverse	Reverse the string
	string.byte	Convert the string to decimal value
	string.char	Convert the decimal value to string
	string.gsub	Replace the specified string with another string
	string.gmatch	Find the part in the string that matches the pattern string, and then return the matching parameters Note: must be used with *for* loop.
	string.match	Find the part in the string that matches the pattern string, and then return the matching parameters Note: the difference between *string.match* and *string.gmatch* is that *string.gmatch* returns all matching strings, while *string.match* only returns the first set of matching strings.
System library (system parameters)	sys.Sleep	System delay
	sys.GetTick	Get the total up time of the HMI so far
	sys.GetInterParam	Get the internal parameters of the HMI
	sys.BuzzerOn	Turn on the buzzer
	sys.GetDate	Get current time
	sys.GetDateString	Get current time (in string)
	sys.GetDays	Get the number of days from 1970/01/01 to the set date
	sys.GetSecs	Get the number of seconds elapsed from 00:00:00 to the set time
	sys.GetTime	Get system time
	sys.ToDate	Get the date after the set number of days from 1970/01/01
	sys.ToTime	Get the time after the set number of seconds from 00:00:00

Command	Command expression	Description
System library (system parameters)	sys.GetDiskSpace	Get the disk space of the external storage device
Serial port communication (COM communication)	com.Open	Open the COM port communication
	com.ReadChars	Read characters from the specified communication port (COM)
	com.WriteChars	Write characters to the specified communication port (COM)
	com.ClearBuffer	Clear buffer data
	com.StationCheck	Select the communication port and station number to check whether the communication is successful
	com.Close	Close the communication port
	com.CheckAlive	Select the communication parameters to check whether the communication is successful
	com.StationOn	Station On
	com.StationOff	Station Off
	com.GetStatus	Get the COM port status
TCP communication	tcp.Open	Open the TCP network communication
	tcp.Read	Read characters (TCP)
	tcp.Write	Write characters (TCP)
	tcp.Close	Close the connection (TCP)
	tcp.GetMaxCount	Get the maximum number of connections (TCP)
	tcp.GetRunCount	Get the number of running sockets (TCP)
	tcp.GetStatus	Check the communication status of the socket (TCP)
UDP communication	udp.Open	Open the UDP network communication
	udp.Read	Read characters (UDP)
	udp.Write	Write characters (UDP)
	udp.Close	Close the connection (UDP)
	udp.GetMaxCount	Get the maximum number of connections (UDP)
	udp.GeRunCount	Get the number of running sockets (UDP)
	udp.GetStatus	Check the communication status of the socket (UDP)
Text encoding (encoding format change)	text.GbkToUtf8	Convert GBK to UTF-8
Utility (CRC calculation)	util.Crc16Modbus	Calculate the CRC value
Convert (floating-point number conversion)	convert.IntToFloat	Convert the integer to a floating-point number
	convert.ToNum	Convert the string to a 64-bit floating-point number
Account (permissions and password setup)	account.Add	Add permissions account
	account.Delete	Delete permissions account
	account.ChangeName	Change permissions account name
	account.ChangePassword	Change permissions password
	account.ChangeLevel	Change permission level of the account
	account.GetPassword	Get user password

Command	Command expression	Description
Account (permissions and password setup)	account.GetLevel	Get permission level of the account
	account.GetCurrentLogin	Get current login account
	account.IsExist	Check whether the account exists
	account.Login	Log in to permissions account
	account.ResetLockStatus	Unlock a locked account
	account.ChangeUserExpiredDays	Change account expiration time
	account.ChangePwdExpiredDays	Change password expiration
	account.GetStatus	Get account status
	account.GetLockedList	Get a list of locked accounts
Mail	mail.Status	Mail function status
	mail.Send	Send email
	mail.SendFile	Send email (including files)
	mail.SendAlarm	Send email (including alarms)
	mail.SendHistory	Send email (including history data)
Draw (drawing function)	draw.Point	Draw (point)
	draw.Line	Draw (line)
	draw.Rect	Draw (rectangle)
	draw.Ellipse	Draw (ellipse)
	draw.Clear	Clear the drawing
	draw.SetAntialiasing	Enable/disable anti-aliasing

4. Detailed explanation of Lua commands

Lua commands include:

- Basic syntax
- Internal memory - $
- Static memory - $M
- External link (external memory)
- File (read/write/export/delete/print files)
- FileSlot (file access)
- FTP Client (FTP transfer function)
- Math (mathematical operations)
- Recipe
- Screen (screen control)
- String (string operations)
- System library (system parameters)
- Serial port communication (COM communication)
- TCP communication
- UDP communication
- Text encoding (encoding format change)
- Utility (CRC calculation)
- Convert (floating-point number conversion)
- Account (permissions and password setup)
- Mail
- Draw (drawing function)

The following chapters will introduce each type of Lua command.

4.1 Basic syntax

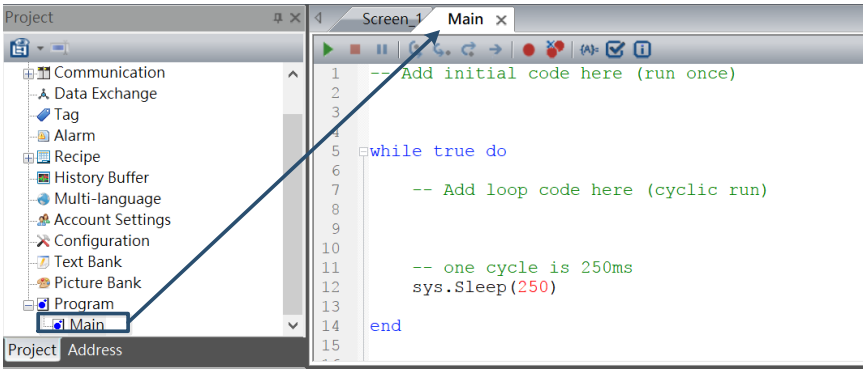
Basic syntax commands help you perform matrix operations, comparisons, *for* loops, *while* loops, basic mathematical operations, and subprogram production and logical operations. The commands include:

Command	Command Expression	Description
Basic syntax	Type: bool number string nil	Data type
	Type: table, array	Matrix operations
	if then else elseif end, and or not	Comparison
	for var=1,3 do … end	*for* loop
	while break, repeat until	*while, repeat* loop
	+-*/%^	Mathematical operations
	function, call function, require return	Flow control
	logic: xor and or not lshift rshift	Logical operations

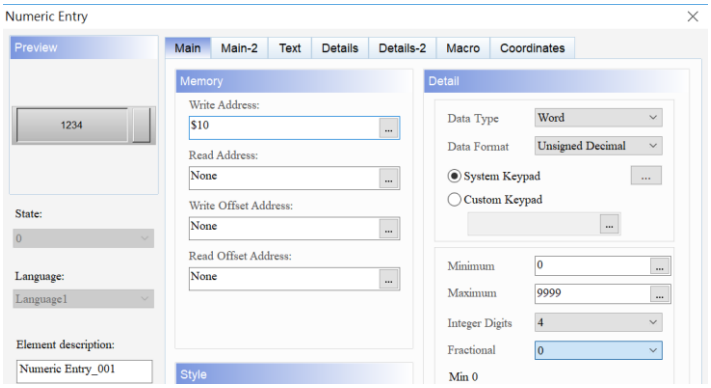
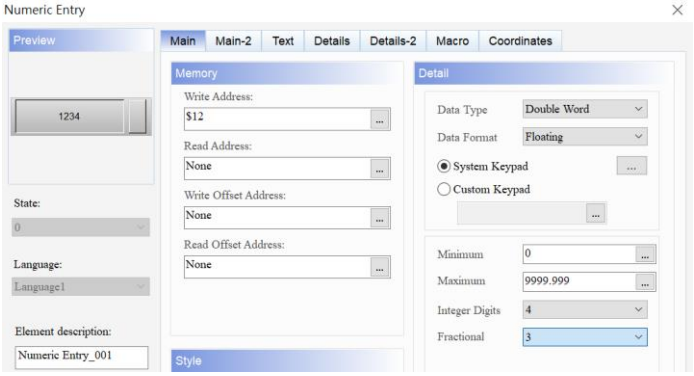
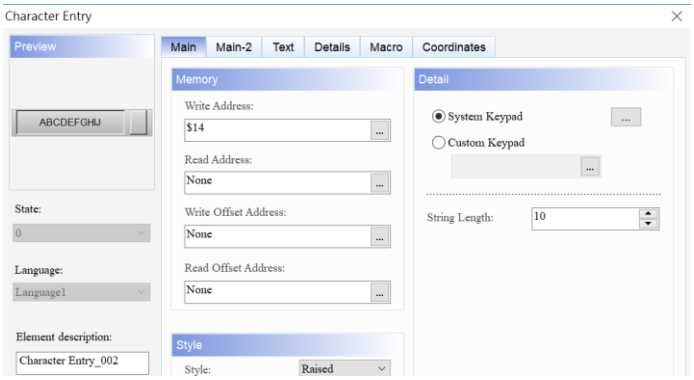
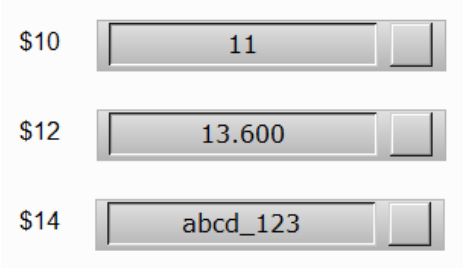
The following sections will explain each in detail.

4.1.1 Type: bool, number, string, nil (data type)

Variables do not have types, so there is no need to specify the data type when declaring variables, but the variable values have types. The types of variables provided by Lua are Boolean expressions, integers, decimals, and strings. Examples of their use are as follows:

<table>
<tr><th colspan="2">Example</th></tr>
<tr><td>Open Lua</td><td>■ Click [Project] > [Program] > [Main] to display the Lua editor window.
 
</td></tr>
<tr><td>Build
Lua program</td><td>■ Set value_bool = true, value_integer = 11, value_double = 13.6, value_string = "abcd_123".
■ When value_bool is true, write value_integer (integer) to $10 with value_integer as length, write value_double (decimal) to $12 with value_double as length, and write value_string (string) to $14 with value_string as length.

while true do
value_bool=true
value_integer=11
value_double = 13.6
value_string = "abcd_123"
if value_bool==true then
mem.inter.Write(10,value_integer,string.len(value_integer))
mem.inter.WriteFloat(12,value_double,string.len(value_double))
mem.inter.WriteAscii(14,value_string,string.len(value_string))
end
end</td></tr>
</table>

Example	
Create Numeric Entry and Character Entry elements	■ Create 2 Numeric Entry elements and set the Write Addresses to $10 and $12. The Data Types are Word and Double Word, and the Data Formats are Unsigned Decimal and Floating. The parameter settings are as follows:   ■ Create a Character Entry element, set the Write Address to $14 and String Length to 10. The settings are as follows. 
Execution results	■ After building the Lua program and creating the elements, compile and download the project to the HMI. ■ The elements which memory addresses are $10, $12, and $14 respectively display the corresponding results: 

Except for the above defined variables (Boolean expressions, integers, decimals, strings), the undefined variables are not allowed in Lua. Using undefined variables causes the Lua program to terminate. The following is a simple example.

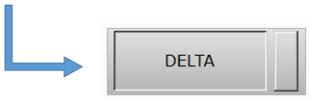
Example

- Specify the uppercase expression of Delta as v1 and write the v1 string to $100, shown as follows.

```
============================================================
  while true do
      v1=string.upper(Delta)
      mem.inter.WriteAscii(100,v1,string.len(v1))
  end
```

- Since Delta is an undefined variable (not a string or constant), the Lua program terminates at the second line, displays an error message "Lua runtime error" on the screen, and does not execute the write action.
- The correct syntax is:

```
============================================================
  while true do
      v1=string.upper("Delta")
      mem.inter.WriteAscii(100,v1,string.len(v1))
  end
```



- After adding " " to Delta, Delta becomes a string, and v1 is the uppercase expression of Delta. Then, write the v1 string to $100.

4.1.2 Type: table, array (matrix operations)

These commands help you calculate and design the matrix. The following sections will explain each in detail.

The following tables are the lists for array commands.

- { }: define array

Command name	t = { }
Command expression	t = **{**var1, var2, var3, var4, var5**}**
Parameter definition	var1, var2, and so on: elements

Example	t= { 11, 22, 33, "s1", "s2" }
	t [1] = 111;
	t [2] = 222;
	t [3] = 333;

Example description	After creating the array t= {11, 22, 33, "s1", "s2”}, change t [1] from 11 to 111, t [2] from 22 to 222, and t [3] from 33 to 333.
Return value	No return value

- table.count: get the number of elements in the array

Command name	table.count
Command expression	Count = **table.count**(myTable)
Parameter definition	myTable: table
Example	t = {11, 22, 33} count = table.count(t) t ["a1"] = 10 count = table.count(t)
Example description	Create an array t = {11, 22, 33}; the t array contains 3 elements. > Count = 3. Add t ["a1"] = 10; now, the t array contains 4 elements. > Count = 4.
Return value	Count = integer; the number of items in the table

■ table.insert: insert elements into the array

Command name	table.insert
Command expression	**table.insert**(myTable, [pos,]value)
Parameter definition	myTable: table pos: the position for the element to be inserted (this parameter is not mandatory) value: basic type
Example	t1 = {1, 3, "four"} table.insert(t1, 2, "two") t2 = {1, 3, "four"} table.insert(t2, "five")
Example description	Insert the string *two* into the second position specified in the t array. t1 = {1, "two", 3, "four"} If no position is specified, add the string *five* to the end of the t array. t2 = {1, 3, "four", "five"}
Return value	No return value

■ table.remove: remove elements

Command name	table.remove
Command expression	**table.remove**(myTable, [pos,])
Parameter definition	myTable: table pos: the position of the parameter to be removed (this parameter is not mandatory)
Example	t = {1, 4, "three"} table.remove(t, 2) t = {1, 4, "three"} table.remove(t)
Example description	Remove the parameter of the second position specified in the t array. t = {1, "three"} If no position is specified, remove the last parameter. t2 = {1, 4}
Return value	No return value

■ table.concat: concatenate the array into a string

Command name	table.concat
Command expression	valueString = **table.concat**(myTable, sepChar)
Parameter definition	myTable: table sepChar: string; concatenate the parameters in the table with this string
Example	t = {1, 2, "three", 4, "five"} str = table.concat(t, ",")
Example description	Concatenate the t array into a string with ",", str = 1,2,three,4,five.
Return value	str = string; the string after combination

■ table.sort: sort the array

Command name	table.sort
Command expression	**table.sort**(myTable, compareFunc)
Parameter definition	myTable: table compareFunc: function
Example	t = {3, 2, 5, 1, 4} table.sort (t, function(a,b) return a>b end)
Example description	Sort and position the values in the array from large to small. t = {5 ,4 ,3 ,2 ,1}
Return value	No return value

4.1.3 if…then…else…elseif…end, and or not (comparison)

These commands help you design loops of *if* conditional expressions in Lua. The following sections will explain each in detail.

The following table is the list for if...else...end commands.

Basic syntax	Command	Expression	Description
Comparison	If…then…end	If Var1 == Var2 then -- Do Something A end	If Var1 is equal to Var2, run action A.

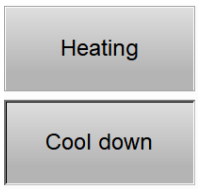
	If…then…else…end	If Var1 == Var2 then
		--Do Something A
		else
		--Do Something B
		end
			If Var1 is equal to Var2, then run action A, otherwise run action B.

	If…then…elseif…else…end	If Var1 > Var2 then
		--Do Something A
		elseIf Var1 < Var3
		--Do Something B
		else
		--Do Something C
		end
			If Var1 is greater than Var2, run action A;
			if Var1 is less than Var3, run action B, otherwise run action C.

Example (if…then…elseif…else…end)	

Build Lua program (temperature response measure)	■ Var1 represents the temparture and its read address is $10. If the temperature (Var1) is over 100, turn on the cooler (address 1.0) and turn off the heater. If the temperature (Var1) is lower than 20, turn on the heater (address 2.0) and turn off the cooler, otherwise turn off the cooler (address 1.0) and heater (address 2.0).
	`while true do`
	`  Var1 = mem.inter.Read(10)`
	`  if (Var1 > 100) then`
	`  mem.inter.WriteBit(1, 0, 1)`
	`  mem.inter.WriteBit(2, 0, 0)`
	`  elseif (Var1 < 20) then`
	`  mem.inter.WriteBit(2, 0, 1)`
	`  mem.inter.WriteBit(1, 0, 0)`
	`  else`
	`  mem.inter.WriteBit(1, 0, 0)`
	`  mem.inter.WriteBit(2, 0, 0)`
	`  end`
	`end`

Create Numeric Display and Maintained Button elements	■ Create a Numeric Display element and set the Read Address to $10. ■ Create 2 Maintained Button elements and set the Write Addresses to $1.0 and $2.0.

<table>
<tr><th colspan="2">Example (if…then…elseif…else…end)</th></tr>
<tr><td>Execution results</td><td>
■ After building the Lua program and creating the elements, compile and download the project to the HMI.
■ When the temperature is over 100, trigger $1.0 to turn on the cooler; when the temperature is lower than 20, turn off $1.0 and trigger $2.0 to enable the heater. When the temperature is between 20 and 110, turn off $1.0 and $2.0.
<table>
<tr><th></th><th>Scenario 1</th><th>Scenario 2</th><th>Scenario 3</th></tr>
<tr><td>Condition</td><td>$100 > 0
  </td><td>$100 < 20
  </td><td>20 < $100 < 110
  </td></tr>
<tr><td>Execution results</td><td>Bit on $1.0
  </td><td>Bit on $2.0
  </td><td>Bit off $1.0 and $2.0
  </td></tr>
</table>
</td></tr>
</table>

4.1.4 for var=1, 3 do… end (*for* loop)

These commands help you design the *for* loops in Lua. The following sections will explain each in detail.

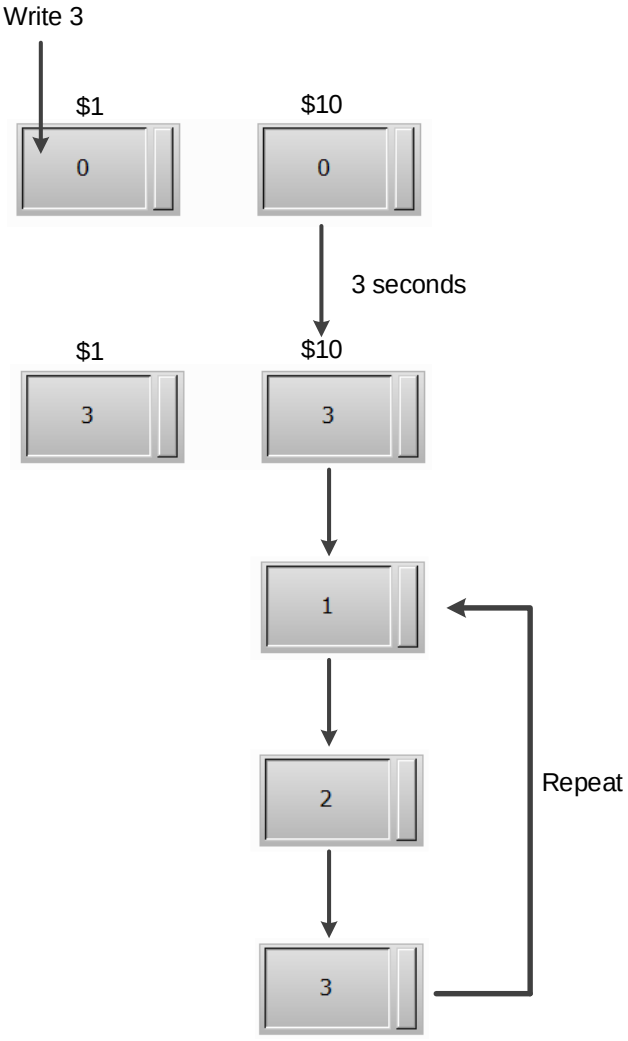
The following table is the list of *for* commands.

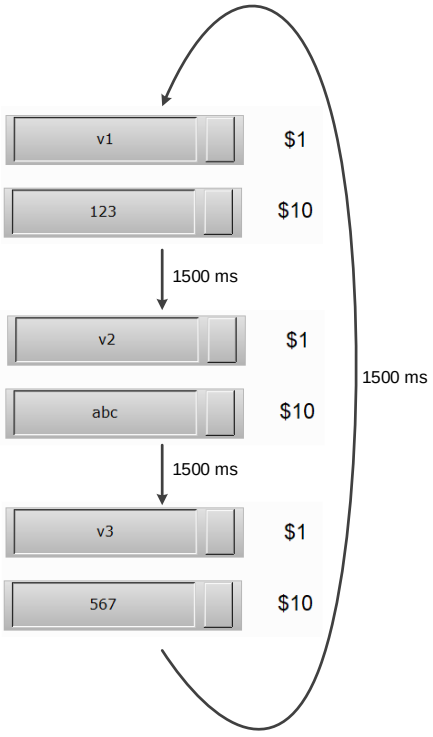
■ for: execute the loop

Command name	for
Command expression	**for** [condition1] do --[code block 1] end
Example	for t= 1, 6 do mem.inter.Write(t, 123) end
Example description	Execute the loop for 6 times and write the value 123 respectively to the internal memory of $1 to $6.
Return value	No return value

Example 1	

Build Lua program	■ Set the initial value v as 0 and read the address $1 as the value v1. Enter the *for* loop, execute v = v + 1 every 1000 ms and write the result to the memory address $10; execute v1 times in total. Lastly, set v to 0, then repeat the above steps.
	`v = 0`
	`while true do`
	`  v1=mem.inter.Read(1)`
	`  for i = 1,v1 do`
	`  v = v + 1`
	`  mem.inter.Write(10, v)`
	`  sys.Sleep(1000)`
	`  end`
	`  v=0`
	`end`

Create Numeric Entry elements	■ Create a Numeric Entry element and set the Write Address to $1. ■ Create a Numeric Entry element and set the Write Address to $10.
Execution results	■ After building the Lua program and creating the elements, compile and download the project to the HMI. ■ Enter 3 to memory address $1, execute v = v + 1 every 1000 ms and write the result to the memory address $10. Execute 3 times in total, then repeat 1, 2, and 3. 

<table>
<tr><th colspan="2">Example 2</th></tr>
<tr><td>Build Lua program
(Move once every 1.5 seconds)</td><td>■ Create a t array. Execute the loop every 1500 ms, each time it searches for the parameters of the t array, sequentially pairs the parameters to the key and value variables, and writes the results to $10 and $1. During the search, the parameters that are already paired will be skipped.
<pre>
while true do
    t = {v1=123, v2="abc", v3=567}
        for key,value in pairs(t) do
            mem.inter.WriteAscii(10,key,string.len(key))
            mem.inter.WriteAscii(1,value,string.len(value))
            sys.Sleep(1500)
        end
end
</pre></td></tr>
<tr><td>Create Character Entry elements</td><td>■ Create 2 Character Entry elements with the Write Addresses as $1 and $10.</td></tr>
<tr><td>Execution results</td><td>■ After building the Lua program and creating the elements, compile and download the project to the HMI.
■ Execute the loop every 1500 ms, write the key to $1 and the value to $10 consecutively.
 
</td></tr>
</table>

4.1.5 while break, repeat until (*while, repeat* loop)

These commands help you design the *while* and *repeat* loops in Lua. The following sections will explain each in detail.

- while...end: execute the loop when...

Command name	while…end
Command expression	**while** [condition1] do -- [code block 1] **end**
Parameter definition	No parameters

Example	while i ~= 5 do
	i = i+1
	If i > 100 then
	break
	end
	end

Example description	When *i* is not equal to 5, execute the loop i = i+1. If i > 100, break out of the loop with the *break* command.
Return value	No return value

- repeat...until: repeatedly execute the loop until...

Command name	repeat…until
Command expression	**Repeat** -- [code block 1] **Until** [condition1]
Parameter definition	No parameters
Example	repeat i = i + 1 until(i > 15)
Example description	Repeatedly execute i = i + 1 until i > 15.
Return value	No return value

Example (while, repeat)

Build Lua program

■ Build the Lua program as follows:

```
while true do
    if (mem.inter.ReadBit(10,0)==1) then
        v1 = mem.inter.Read(20)
            while v1~=10 do
                v1 = v1 + 1
                sys.Sleep(100)
                mem.inter.Write(20, v1)
                    if v1>=10 then
                        em.inter.WriteBit(10,0,0)
                    break
                    end
            end
    end
    if (mem.inter.Read(100,0)==1) then
            repeat
                v1 = v1 - 1
                sys.Sleep(100)
                mem.inter.Write(20, v1)
            until( v1 ==0 )
        mem.inter.WriteBit(100,0,0)
    end
end
```

■ If $10.0 is triggered, read $20 as v1. When v1 is not equal to 10, execute v1 = v1 + 1 and write the result to $20. If the result (v1) is greater than or equal to 10, stop the execution.

```
if (mem.inter.ReadBit(10,0)==1) then
    v1 = mem.inter.Read(20)
        while v1~=10 do
            v1 = v1 + 1
            sys.Sleep(100)
            mem.inter.Write(20, v1)
                if v1>=10 then
                    mem.inter.WriteBit(10,0,0)
                break
                end
        end
end
```

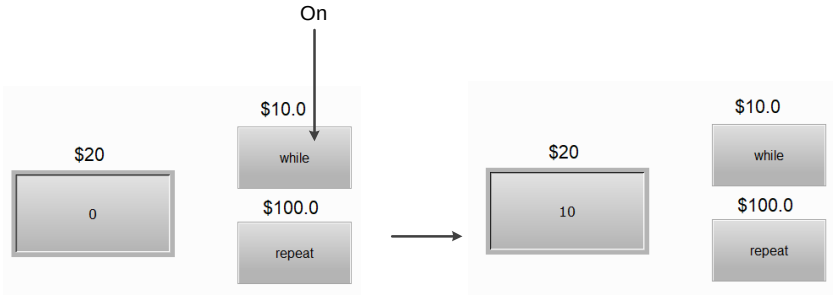
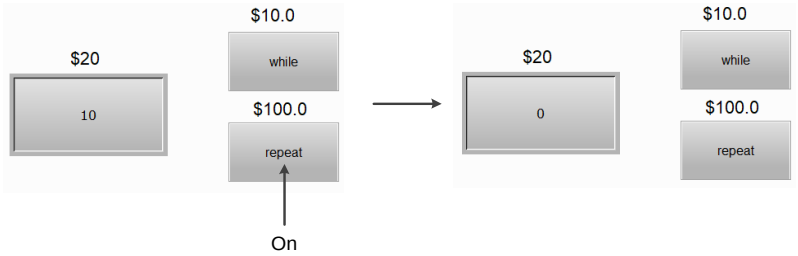
■ If $100.0 is triggered, repeat v1 = v1 - 1 and write the result to $20 until v1 = 0, then close $100.0.

```
if (mem.inter.Read(100,0)==1) then
        repeat
            v1 = v1 - 1
            sys.Sleep(100)
            mem.inter.Write(20, v1)
        until( v1 ==0 )
    mem.inter.WriteBit(100,0,0)
end
```

Create Numeric Display and Maintained Button elements

■ Create a Numeric Display element and set the Write Address to $20.

■ Create 2 Maintained Button elements and set the Write Addresses to $10.0 and $100.0.

Example (while, repeat)	
Execution results	■ After building the Lua program and creating the elements, compile and download the project to the HMI. ■ Trigger $10.0 and execute v1 = v1 + 1. Stop executing the loop when the result (v1) is greater than or equal to 10, then close $10.0.  ■ Trigger $100.0, execute v1 = v1 - 1 until v1 = 0, and close $100.0. 

4.1.6 +-*/%^ (mathematical operations)

These commands help you design mathematical operations in Lua. The following sections will explain each in detail.

The following table is the list for +-*/%^ commands.

Basic syntax	Command	Expression	Description
Mathematical operations	+	Var1=Var2+Var3	Addition
	-	Var1=Var2-Var3	Subtraction
	*	Var1=Var2*Var3	Multiplication
	/	Var1=Var2/Var3	Division
	%	Var1=Var2%Var3	Remainder operation
	^	Var1=Var2^Var3	Involution (power) operation

4.1.7 function, call function, require return (flow control)

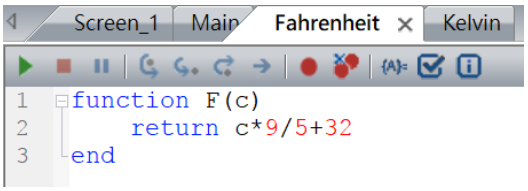
A function can wrap and name the Lua code blocks, and it is called in a program for execution, which makes the program planning simpler. The following sections will explain each in detail.

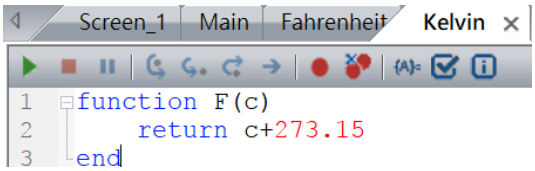
- function: create a function

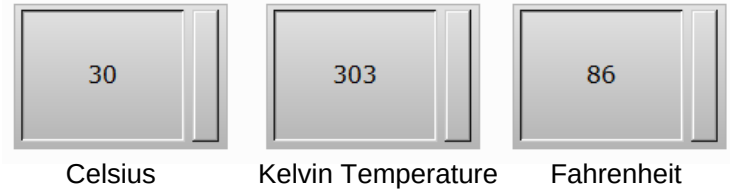
Command name	function
Command expression	**function** [function name 1] -- [code block 1] return [result 1] end
Parameter definition	No parameters
Example	function Add (a, b) return a+b, a*b end
Example description	Create an *Add(a, b)* command and return the results of a+b and a*b.
Return value	No return value

- require: load the module

Command name	require
Command expression	**require** [program name 1]
Parameter definition	No parameters
Example	-- in Prog001 program function Add (a, b) return a+b, a*b end -- in main program require "Prog001" v1, v2 = Add (10, 20)
Example description	Create a function *Add(a, b)* in the Prog001 program, load the Prog001 program in the main program with the *require* command, then use the *Add(a, b)* function to make v1=10+20, v2=10*20; v1=30, and v2=200.
Return value	No return value

<table>
<tr><th colspan="2">Example (function, call function)</th></tr>
<tr><td>Build Lua subprogram</td><td>■ In the subprogram interface, create a Lua subprogram. F(c)=c*9/5+32 means converting Celsius to Fahrenheit.
 

==========
function F(c)
return c*9/5+32
end
■ In the subprogram interface, create a Lua subprogram. K(c)=c+273.15 means converting Celsius to Kelvin.
 

==========
function K(c)
return c+273.15
end</td></tr>
<tr><td>Build Lua main program</td><td>■ In the main program, use the require command to call the subprogram filename. Now, you can directly use F(c) and K(c) to execute F(c)=c*9/5+32 and K(c)=c+273.15, then write the results to $200 and $300 respectively.
while true do
require"Fahrenheit"
require"Kelvin"
c= mem.inter.Read(100)
K_temperature=K(c)
F_temperature=F(c)
mem.inter.Write(200, K_temperature)
mem.inter.Write(300, F_temperature)
end</td></tr>
<tr><td>Create Numeric Entry elements</td><td>■ Create 3 Numeric Entry elements with the Write Addresses as $100, $200, and $300.</td></tr>
<tr><td>Execution results</td><td>■ After the building the Lua program and creating the elements, compile and download the project to the HMI.
■ Enter 30 degrees Celsius for $100, then $200 and $300 each displays the temperature in Kelvin and Fahrenheit.
 
</td></tr>
</table>

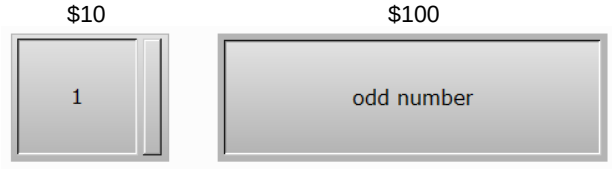
4.1.8 logic: xor and or not lshift rshift (logical operations)

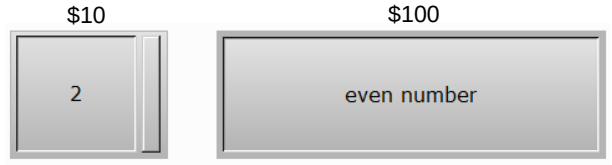
This command helps you to perform logical operations. The following sections will explain each in detail.

The following are the lists for logical operation commands.

Basic syntax	Command	Expression examples	Description
Logical operations	math.bxor	Var1 = math.bxor(0x01, 0x03)	Var1 performs *xor* operation on 0x01 and 0x03. -- output: Var1 = 2
	math.band	Var1 = math.band(0x01, 0x03)	Var1 performs *and* operation on 0x01 and 0x03. -- output: Var1 = 1
	math.bor	Var1 = math.bor(0x01, 0x03)	Var1 performs *or* operation on 0x01 and 0x03. -- output: Var1 = 3
	math.bnot	Var1 = math.bnot(0x01)	Var1 performs *not* operation on 0x01. -- output: Var1 = 0xFFFFFFFE
	math.lshift	Var1 = math.lshift(0x01, 2)	Convert 1 from hexadecimal to binary and shift it to the left by two bits. -- output: Var1 = 4
	math.rshift	Var1 = math.rshift(0x04, 2)	Convert 4 from hexadecimal to binary and shift it to the right by two bits. -- output: Var1 = 1

Logical operation list				
Operand 1	0	1	0	1
Operand 2	0	0	1	1
XOR	0	1	1	0
AND	0	0	0	1
OR	0	1	1	1

<table>
<tr><th colspan="2">Example (logic)</th></tr>
<tr><td>Build Lua program (determining odd/even number)</td><td>
■ Read $10 as c, perform the and logical operation on c and 1 (it is known that in the and operation, only 1 and 1 yield 1,which means that with the and operation, odd numbers and 1 yield 1; even numbers and 1 yield 0). So, if the variable g is 1, judge is the string “odd number”; if g is 0, judge is the string “even number”. Lastly, write judge to $100.
==========
<pre>
while true do
    c = mem.inter.Read(10)
    g = math.band(1, c)
        if g==1 then
            judge="odd number"
        else
            judge="even number"
        end
    mem.inter.WriteAscii(100, judge, string.len(judge))
end
</pre>
</td></tr>
<tr><td>Create Numeric Entry and Character Display elements</td><td>
■ Create a Numeric Entry element and set the Write Address to $10.
■ Create a Character Display element and set the Read Address to $100.
</td></tr>
<tr><td>Execution results</td><td>
■ After building the Lua program and creating the elements, compile and download the project to the HMI.
■ Enter 1 for $10, then $100 displays odd number.
Enter 2 for $10, then $100 displays even number.




</td></tr>
</table>

4.2 Internal memory - $

These commands help you read and write to the internal memory address. The commands include:

Command	Command expression	Description
Internal memory - $	mem.inter.Read	Read the value of the internal memory (unit: Word)
	mem.inter.ReadDW	Read the value of the internal memory (unit: Double Word)
	mem.inter.ReadFloat	Read the value of the internal memory (unit: Float)
	mem.inter.ReadBit	Read the bit of the internal memory
	mem.inter.ReadDouble	Read the value of the internal memory (unit: double-precision floating-point numbers)
	mem.inter.Write	Write the value to the internal memory (unit: Word)
	mem.inter.WriteDW	Write the value to the internal memory (unit: Double Word)
	mem.inter.WriteFloat	Write the value to the internal memory (unit: Float)
	mem.inter.WriteBit	Write the bit to the internal memory
	mem.inter.ReadAscii	Read the string of the internal memory
	mem.inter.WriteAscii	Write the string to the internal memory
	mem.inter.WriteDouble	Write the value to the internal memory (unit: double-precision floating-point numbers)

The following sections will explain each in detail.

- mem.inter.Read: read the value of the internal memory (unit: Word)

Command name	mem.inter.Read
Command expression	Value = **mem.inter.Read**(index, [value_format])
Parameter definition	index: integer; memory index with the range of 0 to 199999 value_format: format string. Fill in "signed" for signed numbers; this parameter is not mandatory.
Example	v1 = mem.inter.Read(0)
Example description	Read the value of $0 in units of Word.
Return value	v1: 0x0000 to 0xFFFF; return 0 on failure

- mem.inter.ReadDW: read the value of the internal memory (unit: Double Word)

Command name	mem.inter.ReadDW
Command expression	Value = **mem.inter.ReadDW**(index, [value_format])
Parameter definition	index: integer; memory index with the range of 0 to 199998 value_format: format string. Fill in "signed" for signed numbers; this parameter is not mandatory.
Example	dw = mem.inter.ReadDW(0)
Example description	Read the value of $0 in units of Double Word.
Return value	v1: 0x00000000 to 0xFFFFFFFF; return 0 on failure

- mem.inter.ReadFloat: read the value of the internal memory (unit: Float)

Command name	mem.inter.ReadFloat
Command expression	Value = **mem.inter.ReadFloat**(index)
Parameter definition	index: integer; memory index with the range of 0 to 199998
Example	f1 = mem.inter.ReadFloat(0)
Example description	Read the value of $0 in units of Float.
Return value	f1: single-precision floating-point number

- mem.inter.ReadBit: read the bit of the internal memory

Command name	mem.inter.ReadBit
Command expression	Result = **mem.inter.ReadBit**(index, bit)
Parameter definition	index: integer; memory index with the range of 0 to 199999 bit: integer; BIT index with the range of 0 to 15
Example	b1 = mem.inter.ReadBit(0, 15)
Example description	Read the bit of $0.15.
Return value	b1: integer; 1 or 0; return 0 on failure

- mem.inter.ReadDouble: read the value of the internal memory (unit: double-precision floating-point numbers)

Command name	mem.inter.ReadDouble
Command expression	Result = **mem.inter.ReadDouble**(index)
Parameter definition	index: integer; memory index with the range of 0 to 199996
Example	Q1 = mem.inter.ReadDouble(0)
Example description	Read the value of $0 in units of double-precision floating-point numbers.
Return value	Q1: double-precision floating-point numbers

- mem.inter.Write: write the value to the internal memory (unit: Word)

Command name	mem.inter.Write
Command expression	Result = **mem.inter.Write**(index, value)
Parameter definition	index: integer; memory index with the range of 0 to 199999 value: decimal integer
Example	result = mem.inter.Write(0, 123)
Example description	Write the value 123 to $0 in units of Word.
Return value	Result: return 1 on success; return 0 on failure

- mem.inter.WriteDW: write the value to the internal memory (unit: Double Word)

Command name	mem.inter.WriteDW
Command expression	Result = **mem.inter.WriteDW**(index, value)
Parameter definition	index: integer; memory index with the range of 0 to 199998 value: decimal integer
Example	result = mem.inter.WriteDW(0, 65536)
Example description	Write the value 65536 to $0 in units of Double Word.
Return value	Result: return 1 on success; return 0 on failure

- mem.inter.WriteFloat: write the value to the internal memory (unit: Float)

Command name	mem.inter.WriteFloat
Command expression	Result = **mem.inter.WriteFloat**(index, float_value)
Parameter definition	index: integer; memory index with the range of 0 to 199998 float_value: single-precision floating-point number
Example	result = mem.inter.WriteFloat(0, 1.23)
Example description	Write the value 1.23 to $0 in units of Float.
Return value	Result: return 1 on success; return 0 on failure

- mem.inter.WriteBit: write the bit to the internal memory

Command name	mem.inter.WriteBit
Command expression	Result = **mem.inter.WriteBit**(index, bit, logic)
Parameter definition	index: integer; memory index with the range of 0 to 199999 bit: integer; BIT index with the range range of 0 to 15 logic: integer; 1 or 0
Example	result = mem.inter.WriteBit(0, 0, 1)
Example description	Set the $0.0 bit to On.
Return value	Result: return 1 on success; return 0 on failure

- mem.inter.WriteDouble: write the value to the internal memory (unit: double-precision floating-point numbers)

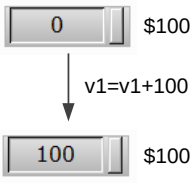
Command name	mem.inter.WriteDouble
Command expression	Result = **mem.inter.WriteDouble**(index, Double_value)
Parameter definition	index: integer; memory index with the range of 0 to 199996 Double_value: double-precision floating-point number
Example	result = mem.inter.WriteDouble(10, 123456789.99)
Example description	Write 123456789.99 to $10 in units of double-precision floating-point numbers.
Return value	Result: return 1 on success; return 0 on failure

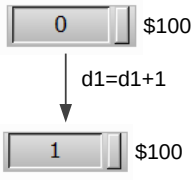
■ mem.inter.ReadAscii: read the string of the internal memory

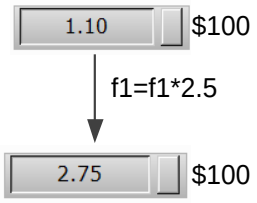
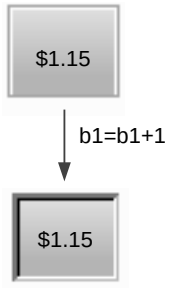
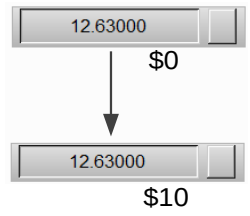
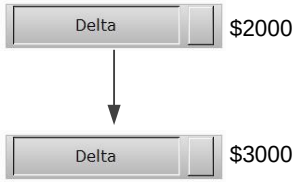
Command name	mem.inter.ReadAscii
Command expression	ascii_string = **mem.inter.ReadAscii**(start_index, string_len)
Parameter definition	start_index: integer; memory index with the range of 0 to 199999 string_len: integer; ascii number (in bytes)
Example	ascii_string = mem.inter.ReadAscii(0, 4)
Example description	Read the $0 string with the length of 4 bytes.
Return value	ascii_string: ascii string

■ mem.inter.WriteAscii: write the string to the internal memory

Command name	mem.inter.WriteAscii
Command expression	Result = **mem.inter.WriteAscii**(start_index, asci_string, string_len)
Parameter definition	start_index: integer; memory index with the range of 0 to 199999 asci_string: ascii string string_len: integer; ascii number (in bytes)
Example	Result = mem.inter.WriteAscii(0, "posheng", string.len("posheng"))
Example description	Write *posheng* to $0 with the string length of "posheng". Note: the characters "\0" will be added to the end of the written data.
Return value	Result: integer; the number of the written ascii (in bytes)

Command	Example	Execution results
mem.inter.Read mem.inter.Write	while true do v1 = mem.inter.Read(100) v1 = v1 + 100 mem.inter.Write(100, v1) end	
	Description of command	
	Read the internal memory address $100 as v1. After adding 100 to v1, write the result to the internal memory address $100.	

Command	Example	Execution results
mem.inter.ReadDW mem.inter.WriteDW	while true do d1 = mem.inter.ReadDW(100) d1 = d1 + 1 mem.inter.WriteDW(100, d1) end	
	Description of command	
	Read the internal memory address $100 as d1. After adding 1 to d1, write the result to the internal memory address $100. The unit of reading and writing is Double Word.	

Command	Example	Execution results
mem.inter.ReadFloat mem.inter.WriteFloat	while true do mem.inter.WriteFloat(100,1.1) d1 = mem.inter.ReadFloat(100) d1 = d1 *2.5 mem.inter.WriteFloat(100, d1) end	
	Description of command	
	Write the floating-point number 1.1 to the internal memory address $100 and read the internal memory address $100 floating-point number as f1. After multiplying f1 by 2.5, write the result to the internal memory address $100. The unit of reading and writing is floating-point number.	
Command	Example	Execution results
mem.inter.ReadBit mem.inter.WriteBit	while true do b1 = mem.inter.ReadBit(1,15) b1=b1+1 mem.inter.WriteBit(1,15,b1) end	
	Description of command	
	Read the internal memory address $1.15 as b1. After adding 1 to b1, write the result to the internal memory address $1.15.	
Command	Example	Execution results
mem.inter.ReadDouble mem.inter.Write Double	while true do q1 = mem.inter.ReadDouble (0) mem.inter.WriteDouble (10, q1) end	
	Description of command	
	After reading the internal memory address $0 as q1, write q1 to the internal memory address $10. The unit of reading and writing is double-precision floating-point number.	
Command	Example	Execution results
mem.inter.ReadAscii mem.inter.WriteAscii	while true do str2 = mem.inter.ReadAscii(2000, 5) mem.inter.WriteAscii(3000, str2, string.len(str2)) end	
	Description of command	
	With the string length of 5, read the string from the internal memory address $2000 as str2, and write the string str2 to the internal memory address $3000. Note: the unit of string length is byte.	

4.3 Static memory - $M

These commands help you read from and write to the internal memory address in the HMI when the power is off. The commands include:

Command	Command expression	Description
Static memory - $M	mem.static.Read	Read the value of the static memory (unit: Word)
	mem.static.ReadDW	Read the value of the static memory (unit: Double Word)
	mem.static.ReadFloat	Read the value of the static memory (unit: Float)
	mem.static.ReadBit	Read the bit of the static memory
	mem.static.ReadDouble	Read the value of the static memory (unit: double-precision floating-point numbers)
	mem.static.Write	Write the value to the static memory (unit: Word)
	mem.static.WriteDW	Write the value to the static memory (unit: Double Word)
	mem.static.WriteFloat	Write the value to the static memory (unit: Float)
	mem.static.WriteBit	Write the bit to the static memory
	mem.static.WriteDouble	Write the value to the static memory (unit: double-precision floating-point numbers)
	mem.static.ReadAscii	Read the string of the static memory
	mem.static.WriteAscii	Write the string to the static memory

The following will explain each in detail.

- mem.static.Read: read the value of the static memory (unit: Word)

Command name	mem.static.Read
Command expression	Value = **mem.static.Read**(index, [value_format])
Parameter definition	index: integer; memory index with the range of 0 to 1023 value_format: format string. Fill in "signed" for signed numbers; this parameter is not mandatory.
Example	v1 = mem.static.Read(0)
Example description	Read the value of $M0 in units of Word.
Return value	v1: 0x0000 to 0xFFFF; return 0 on failure

- mem.static.ReadDW: read the value of the static memory (unit: Double Word)

Command name	mem.static.ReadDW
Command expression	Value = **mem.static.ReadDW**(index, [value_format])
Parameter definition	index: integer; memory index with the range of 0 to 1022 value_format: format string. Fill in "signed" for signed numbers; this parameter is not mandatory.
Example	dw = mem.static.ReadDW(0)
Example description	Read the value of $M0 in units of Double Word.
Return value	dw: 0x00000000 to 0xFFFFFFFF; return 0 on failure

- mem.static.ReadFloat: read the value of the static memory (unit: Float)

Command name	mem.static.ReadFloat
Command expression	Value = **mem.static.ReadFloat**(index)
Parameter definition	index: integer; memory index with the range of 0 to 1022
Example	f1 = mem.static.ReadFloat(0)
Example description	Read the value of $M0 in units of Float.
Return value	f1: single-precision floating-point number

- mem.static.ReadBit: read the bit of the static memory

Command name	mem.static.ReadBit
Command expression	Result = **mem.static.ReadBit**(index, bit)
Parameter definition	index: integer; memory index with the range of 0 to 1023 bit: integer; BIT index with the range of 0 to 15
Example	b1 = mem.static.ReadBit(0, 15)
Example description	Read the bit of the static memory address $M0.15.
Return value	b1: integer; 1 or 0

- mem.static.ReadDouble: read the value of the static memory (unit: double-precision floating-point numbers)

Command name	mem.static.ReadDouble
Command expression	Result = **mem.static.ReadDouble**(index)
Parameter definition	index: integer; memory index with the range of 0 to 1020
Example	Q1 = mem.static.ReadDouble(0)
Example description	Read the value of $M0 in units of double-precision floating-point numbers.
Return value	Q1: double-precision floating-point numbers

- mem.static.ReadAscii: read the string of the static memory

Command name	mem.static.ReadAscii
Command expression	ascii_string = **mem.static.ReadAscii**(start_index, string_len)
Parameter definition	start_index: integer; memory index with the range of 0 to 1023 string_len: integer; ascii number (in bytes)
Example	ascii_string = mem.static.ReadAscii(0, 4)
Example description	Read the string of static memory address $M0 with the length of 4 bytes.
Return value	ascii_string: ascii string

- mem.static.Write: write the value to the static memory (unit: Word)

Command name	mem.static.Write
Command expression	Result = **mem.static.Write**(index, value)
Parameter definition	index: integer; memory index with the range of 0 to 1023 value: integer
Example	result = mem.static.Write(0, 123)
Example description	Write the value 123 to $M0 in units of Word.
Return value	Result: return 1 on success; return 0 on failure

- mem.static.WriteDW: write the value to the static memory (unit: Double Word)

Command name	mem.static.WriteDW
Command expression	Result = **mem.static.WriteDW**(index, value)
Parameter definition	index: integer; memory index with the range of 0 to 1023 value: integer
Example	result = mem.static.WriteDW(0, 65535)
Example description	Write the value 65535 to $M0 in units of Double Word.
Return value	Result: return 1 on success; return 0 on failure

- mem.static.WriteFloat: write the value to the static memory (unit: Float)

Command name	mem.static.WriteFloat
Command expression	Result = **mem.static.WriteFloat**(index, value_float)
Parameter definition	index: integer; memory index with the range of 0 to 1023 value_float: single-precision floating-point number
Example	result = mem.static.WriteFloat(0, 1.23)
Example description	Write the value 1.23 to $M0 in units of Float.
Return value	Result: return 1 on success; return 0 on failure

- mem.static.WriteBit: write the bit to the static memory

Command name	mem.static.WriteBit
Command expression	Result = **mem.static.WriteBit**(index, bit, logic)
Parameter definition	index: integer; memory index with the range of 0 to 1023 bit: integer; BIT index with the range of 0 to 15 logic: integer; 1 or 0
Example	result = mem.static.WriteBit(0, 0, 1)
Example description	Set the bit of the static memory $M0.0 to On.
Return value	Result: return 1 on success; return 0 on failure

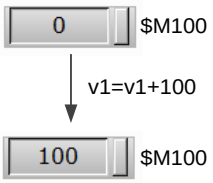
■ mem.static.WriteDouble: write the value to the static memory

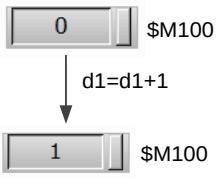
(unit: double-precision floating-point numbers)

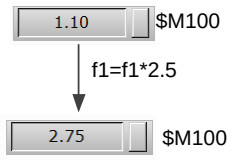
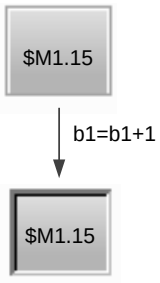
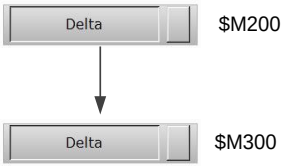
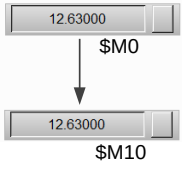
Command name	mem.static.WriteDouble
Command expression	Result = **mem.static.WriteDouble**(index, Double_value)
Parameter definition	index: integer; memory index with the range of 0 to 1020 Double_value: double-precision floating-point numbers
Example	result = mem.static.WriteDouble(10, 123456789.99)
Example description	Write 123456789.99 to $M10 in units of double-precision floating-point numbers.
Return value	Result: return 1 on success; return 0 on failure

■ mem.static.WriteAscii: write the string to the static memory

Command name	mem.static.WriteAscii
Command expression	Result = **mem.static.WriteAscii**(start_index, ascii_string, string_len)
Parameter definition	start_index: integer; memory index with the range of 0 to 1023 ascii_string: ascii string string_len: integer; number of ascii in bytes
Example	result = mem.static.WriteAscii(0, "posheng", string.len("posheng"))
Example description	Write *posheng* to $M0 with the string length of "posheng". Note: the characters "\0" will be added to the end of the written data.
Return value	Result: return 1 on success; return 0 on failure

Command	Example	Execution results
mem.static.Read mem.static.Write	v1 = mem.static.Read(100) v1 = v1 + 100 mem.static.Write(100, v1)	
	Description of command	
	Read the static memory address $M100 as v1. After adding 100 to v1, write the result to the static memory address $M100.	

Command	Example	Execution results
mem.static.ReadDW mem.static.WriteDW	d1 = mem.static.ReadDW(100) d1 = d1 + 1 mem.static.WriteDW(100, d1)	
	Description of command	
	Read the static memory address $M100 as d1. After adding 1 to d1, write the result to the static memory address $M100. The unit of reading and writing is Double Word.	

Command	Example	Execution results
mem.static.ReadFloat mem.static.WriteFloat	mem.static.WriteFloat(100,1.1) f1 = mem.static.ReadFloat(100) f1 = f1 *2.5 mem.static.WriteFloat(100, f1) **Description of command** Write the floating-point number 1.1 to the static memory address $M100, and read the floating-point number of the static memory address $M100 as f1. After multiplying f1 by 2.5, write the result to the static memory address $M100. The unit of reading and writing is floating-point number.	
Command	Example	Execution results
mem.static.ReadBit mem.static.WriteBit	b1 = mem.static.ReadBit(1,15) b1=b1+1 mem.static.WriteBit(1,15,b1) **Description of command** Read the static memory address $M1.15 as b1. After adding 1 to b1, write the result to the static memory address $M1.15.	
Command	Example	Execution results
mem.static.ReadAscii mem.static.WriteAscii	str2 = mem.static.ReadAscii(200, 5) mem.static.WriteAscii(300, str2, 5) **Description of command** Read the string of the static memory address $M200 as str2 with the string length of 5. Then, write the string str2 to the static memory address $M300 with the string length of 5. Note: the unit of string length is byte.	
Command	Example	Execution results
mem.static.ReadDouble mem.static.WriteDouble	while true do q1 = mem.static.ReadDouble (0) mem.static.WriteDouble (10, q1) end **Description of command** After reading the static memory address $M0 as q1, write q1 to the static memory address $M10. The unit of reading and writing is double-precision floating-point number.	

4.4 External link (external memory)

These commands help you read from and write to the memory address of the external device connected to the HMI. The commands include:

Command	Command expression	Description
External link (external memory)	link.Read	Read the value of the external memory (unit: Word)
	link.ReadDW	Read the value of the external memory (unit: Double Word)
	link.ReadFloat	Read the value of the external memory (unit: Float)
	link.ReadBit	Read the bit of the external memory
	link.ReadAscii	Read the string of the external memory
	link.ReadDouble	Read the value of the external memory (unit: double-precision floating-point numbers; 64 bits)
	link.Write	Write the value to the external memory (unit: Word)
	link.WriteDW	Write the value to the external memory (unit: Double Word)
	link.WriteFloat	Write the value to the external memory (unit: Float)
	link.WriteBit	Write the bit to the external memory
	link.WriteAscii	Write the string to the external memory
	link.WriteDouble	Write the value to the external memory (unit: double-precision floating-point numbers; 64 bits)
	link.CopyFromInter	Copy data from the HMI internal memory to the external memory
	link.CopyToInter	Copy data from the external memory to the HMI internal memory
	link.CopyArray	Copy data from the HMI internal/external memory to the HMI internal/external memory
	link.DownloadPLC	Use the COM communication to download the isp or dvp program to the PLC through HMI
	link.DownloadEthPLC	Use the network communication to download the isp or dvp program to the PLC through HMI
	link.WritePasswordPLC	Use the COM communication to write the system password to the PLC
	link.SetDefaultStationNo	Set the PLC default station number for the HMI to communicate with
	link.SetHMIStationNo	Set the HMI Slave station number (Modbus Slave)
	link.CODESYSAppDownload	Use the network communication to download the CODESYS program to the PLC through HMI
	link.CODESYSAppUpload	Use the network communication to upload the CODESYS program to the the USB storage device connected to the HMI

The following sections will explain each in detail.

- link.Read: read the value of the external memory (unit: Word)

Command name	link.Read
Command expression	Result = **link.Read**(addr, [value_format])
Parameter definition	addr: string, memory address, for example: "{Link2}1@D1" value_format: format string. Fill in "signed" for signed numbers; this parameter is not mandatory.
Example	v1 = link.Read("{Link2}1@D1")
Example description	Read the values of the following external memory address in units of Word: the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	v1: integer

- link.ReadDW: read the value of the external memory (unit: Double Word)

Command name	link.ReadDW
Command expression	Result = **link.ReadDW**(addr, [value_format])
Parameter definition	addr: string; memory address, such as "{Link2}1@D1" value_format: format string. Fill in "signed" for signed numbers; this parameter is not mandatory.
Example	dw = link.ReadDW("{Link2}1@D1")
Example description	Read the values of the following external memory address in units of Double Word: the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	dw: integer

- link.ReadFloat: read the value of the external memory (unit: Float)

Command name	link.ReadFloat
Command expression	Result = **link.ReadFloat**(addr)
Parameter definition	addr: string; memory address,such as "{Link2}1@D1"
Example	f1 = link.ReadFloat("{Link2}1@D1")
Example description	Read the values of the following external memory address in units of Float: the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	f1: single-precision floating-point number

- link.ReadBit: read the bit of the external memory

Command name	link.ReadBit
Command expression	Result = **link.ReadBit**(addr)
Parameter definition	addr: string; memory address, such as "{Link2}1@M100"
Example	b = link.ReadBit("{Link2}1@M1")
Example description	Read the bit of the following external memory address: the controller memory which link number is 2, the station number is 1, and the communication address is M1.
Return value	v1: integer; 1 or 0

- link.ReadAscii: read the string of the external memory

Command name	link.ReadAscii
Command expression	asciiString, result, errMsg = **link.ReadAscii**(addr, string_len)
Parameter definition	addr: string; memory address, for example: "{Link2}1@D1" string_len: integer; number of ascii in bytes
Example	ascii, ret, errMsg = link.ReadAscii("{Link2}1@D1", 20)
Example description	Read the string of the following external memory address in units of 20 bytes: the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	ascii: ascii string ret: 1: success; 0: failure errMsg: string; error message

- link.ReadDouble: read the value of the external memory

  (unit: double-precision floating-point numbers; 64 bits)

Command name	link.ReadDouble
Command expression	Result = **link.ReadDouble**(addr)
Parameter definition	addr: string; memory address, such as "{Link2}1@D1"
Example	A1 = link.ReadDouble("{Link2}1@D1")
Example description	Read the value of the following external memory address in double-precision floating-point format: the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	A1: double-precision floating-point numbers

- link.Write: write the value to the external memory (unit: Word)

Command name	link.Write
Command expression	Result = **link.Write**(addr, value_word)
Parameter definition	addr: string; memory address, such as "{Link2}1@D0" value_word: integer
Example	Result = link.Write("{Link2}1@D1", 123)
Example description	Write the value 123 in units of Word to the following external memory address: the controller memory which link number is 2, the station number is 1, and the communication address is D0.
Return value	Result: return 1 on success; return 0 on failure

- link.WriteDW: write the value to the external memory (unit: Double Word)

Command name	link.WriteDW
Command expression	Result = **link.WriteDW**(addr, value_dword)
Parameter definition	addr: string; memory address, such as "{Link2}1@D0" value_dword: integer
Example	Result = link.WriteDW("{Link2}1@D1", 65536)
Example description	Write the value 65536 in units of Double Word to the following external memory address: the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	Result: return 1 on success; return 0 on failure

- link.WriteFloat: write the value to the external memory (unit: Float)

Command name	link.WriteFloat
Command expression	Result = **link.WriteFloat**(addr, value_float)
Parameter definition	addr: string; memory address, such as "{Link2}1@D0" value_float: single-precision floating-point number
Example	Result = link.WriteFloat("{Link2}1@D1", 1.23)
Example description	Write the value 1.23 in units of Float to the following external memory address: the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	Result: return 1 on success; return 0 on failure

- link.WriteBit: write the bit to the external memory

Command name	link.WriteBit
Command expression	Result = **link.WriteBit**(addr, value_bit)
Parameter definition	addr: string; memory address, such as "{Link2}1@M100" value_bit: integer; 1 or 0
Example	Result = link.WriteBit("{Link2}1@M1", 1)
Example description	Set the bit of the following external memory address to On: the controller memory which link number is 2, the station number is 1, and the communication address is M1.
Return value	Result: return 1 on success; return 0 on failure

- link.WriteAscii: write the string to the external memory

Command name	link.WriteAscii
Command expression	Result = **link.WriteAscii**(addr, ascii, asci_len)
Parameter definition	addr: string; memory address, such as "{Link2}1@D0" ascii: string, UTF-8 encoding (in bytes) asci_len: integer, number of ascii in bytes
Example	Result = link.WriteAscii("{Link2}1@D1", "posheng", string.len("posheng"))
Example description	Write *posheng* to the following external memory address with the string length of "posheng": the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	Result: return 1 on success; return 0 on failure

- link.WriteDouble: write the value to the external memory

  (unit: double-precision floating-point numbers; 64 bits)

Command name	link.WriteDouble
Command expression	Result = **link.WriteDouble**(addr, value_double)
Parameter definition	addr: string; memory address, such as "{Link2}1@D0" value_double: double-precision floating-point number
Example	Result = link.WriteDouble("{Link2}1@D1", 1234567.89)
Example description	Write the value 1234567.89 in units of double-precision floating-point numbers to the following external memory address: the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	Result: return 1 on success; return 0 on failure

■ link.CopyFromInter: copy data from the HMI internal memory to the external memory

Command name	link.CopyFromInter
Command expression	result = **link.CopyFromInter**(addr, interMemIndex, wordLen)
Parameter definition	addr: string; memory address, such as "{Link2}1@D1" interMemIndex: integer; starting address of the internal memory wordLen: integer; number of Word
Example	Result = link.CopyFromInter("{Link2}1@D1", 100, 6)
Example description	Move the data with the length of 6 words from the HMI internal memory address $100 to the following external memory address: the controller memory which link number is 2, the station number is 1, and the communication address is D1.
Return value	Result: return 1 on success; return 0 on failure

■ link.CopyToInter: copy data from the external memory to the HMI internal memory

Command name	link.CopyToInter
Command expression	result = **link.CopyToInter**(addr, interMemIndex, wordLen)
Parameter definition	addr: string; memory address, such as "{Link2}1@D1" interMemIndex: integer; starting address of the internal memory wordLen: integer; number of Word
Example	Result = link.CopyToInter("{Link2}1@D1", 100, 6)
Example description	Move the data with the length of 6 words from the controller memory address (Link number 2, station number 1, communication address D1) to $100 of the HMI.
Return value	Result: return 1 on success; return 0 on failure

■ link.CopyArray: copy data from the HMI internal/external memory to the HMI internal/external memory

Command name	link.CopyArray
Command expression	result = **link.CopyArray**(dst_addr, dst_offset, src_addr, src_offset, wordLen)
Parameter definition	dst_addr: string or integer; target address dst_offset: integer; target offset length src_addr: string or integer; source address src_offset: integer; source offset length wordLen: integer; copy length
Example	Example 1: result = link.CopyArray(95, 0, 190, 3, 6) Example 2: result = link.CopyArray(95, 0,"{Link2}1@D0", 0, 6)
Example description	Example 1: move the data with the length of 6 words from addresses $193 to $198 to addresses $95 to $100. Example 2: move the data with the length of 6 words from {Link2}1@D0 - {Link2}1@D5 to $95 - $100.
Return value	Result: return 1 on success; return 0 on failure; return -1 on parameter error

- link.DownloadPLC: use the COM communication to download the isp or dvp program to the PLC through HMI

Command name	link.DownloadPLC
Command expression	ret, errDesc = **link.DownloadPLC**(comNo, stationNo, diskID, fileName, projectPwd, plcSystemSecurityPwd)
Parameter definition	comNo: integer; communication serial port number, 1: COM1; 2: COM2, and so on stationNo: integer: 1 to 255 diskID: integer; disk ID; 2: USB drive; 3: SD card fileName: string; filename, such as ss.dvp and ss.isp projectPwd: string; project password plcSystemSecurityPwd: string; PLC system security password
Example	ret, errDesc = link.DownloadPLC(2, 1, 2, "EH.dvp", "1234", "5678")
Example description	Use COM2 as the interface to download the program EH.dvp stored in the USB drive to the PLC with the project password 1234 and system password 5678. Note: 1. This command only supports the COM communication, but not the network communication. 2. You must first ensure the communication between the HMI and the PLC. 3. Currently available on Delta DVP, AS, and AH series PLC.
Return value	ret: return 1 on success; return 0 on failure errDesc: string; error message

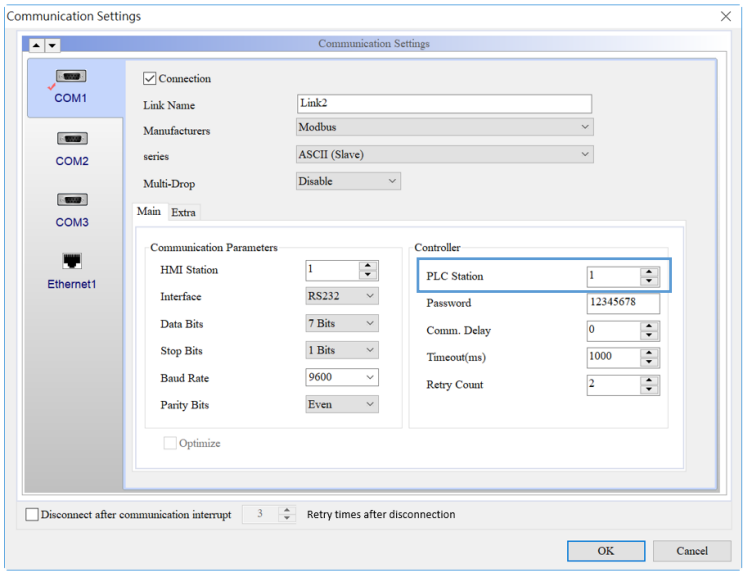
- link.DownloadEthPLC: use the network communication to download the isp or dvp program to the PLC through HMI

Command name	link.DownloadEthPLC
Command expression	ret, errDesc = **link.DownloadEthPLC**(ip, port, stationNo, diskID, fileName, projectPwd, plcSystemSecurityPwd)
Parameter definition	ip: string; "192.168.0.1", and so on port: integer stationNo: integer; station number: 1 to 255 diskID: integer; disk ID; 2: USB drive; 3: SD card fileName: string; filename, such as delta.dvp and delta.isp projectPwd: string; project password plcSystemSecurityPwd: string; PLC system security password
Example	ret, errDesc = link.DownloadEthPLC("192.168.123.205", 502, 1, 2, "delta.isp", "1234", "5678")
Example description	Using the network as the interface, download the program delta.isp stored in the USB drive to the PLC with the project password 1234 and system password 5678. Note: 1. This command only supports the network communication, but not the COM communication. 2. You must first ensure that the HMI and PLC are in the same network domain. 3. Currently availale on Delta DVP, AS, and AH series PLC.
Return value	ret: return 1 on success; return 0 on failure errDesc: string; error message

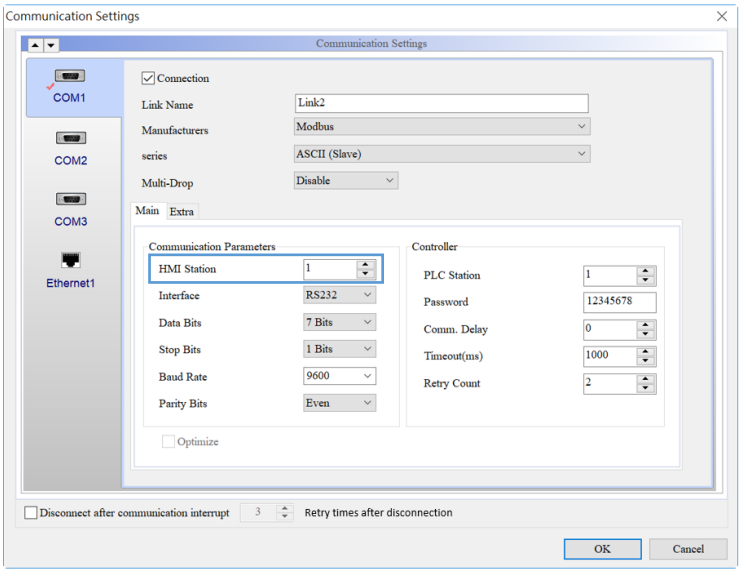
■ link.WritePasswordPLC: use the COM communication to write the system password to the PLC

Command name	link.WritePasswordPLC
Command expression	ret, errDesc = **link.WritePasswordPLC**(comNo, stationNo, oldPlcSystemPwd, newPlcSystemPwd)
Parameter definition	comNo: integer; communication serial port number. 1: COM1; 2: COM2, and so on. stationNo: integer: 1 to 255 oldPlcSystemPwd: string; the old PLC system security password newPlcSystemPwd: string; the new PLC system security password
Example	ret, errDesc = link.WritePasswordPLC(2, 1, "1234", "2222")
Example description	Use COM2 as the interface to change the PLC password to 2222. If the PLC already has a system password, the command checks whether the password matches "1234". Note: 1. This command only supports the COM communication, but not the network communication. 2. You must first ensure the communication between the HMI and the PLC. 3. Currently available on Delta DVP, AS, AH series PLC.
Return value	ret: return 1 on success; return 0 on failure errDesc: string; error message

■ link.SetDefaultStationNo: set the default PLC Station number for the HMI to communicate with

Command name	link.SetDefaultStationNo
Command expression	ret = **link.SetDefaultStationNo**(link_number, station_number)
Parameter definition	link_number: integer; communication serial port number. 0: COM1; 1: COM2, and so on. station_number: integer: 1 to 255
Example	ret = link.SetDefaultStationNo(0, 1)
Example description	Change the default PLC Station number of COM1 communication to 1 dynamically. 
Return value	ret: return 1 on success; return -1 on parameter error

■ link.SetHMIStationNo: set the HMI Slave station number (Modbus Slave)

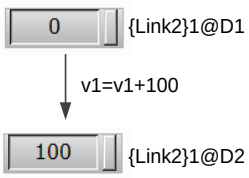
Command name	link.SetHMIStationNo
Command expression	ret = **link.SetHMIStationNo**(link_number, station_number)
Parameter definition	link_number: integer; communication serial port number. 0: COM1; 1: COM2, and so on. station_number: integer: 1 to 255
Example	ret = link.SetHMIStationNo(0, 1) Note: you can only use this command when the HMI is a Modbus Slave, so you must set the communication parameters to Modbus ASCII/RTU (Slave).
Example description	When you change the COM1 HMI Station number to 1, you must set the communication parameters to Modbus ASCII/RTU (Slave). 
Return value	ret: return 1 on success; return -1 on parameter error

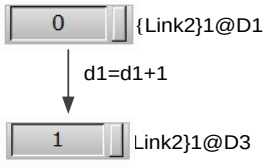
- link.CODESYSAppDownload: use the network communication to download the CODESYS program to the PLC through HMI

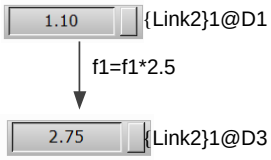
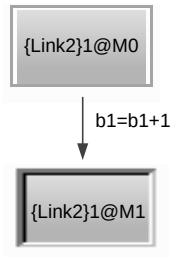
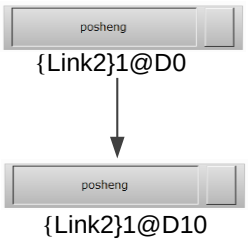
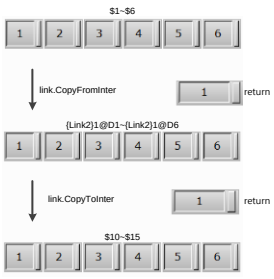
Command name	link.CODESYSAppDownload
Command expression	ret, errDesc = **link.CODESYSAppDownload**(connMethodID, address, diskID, appFile, showMsgBox, username, password)
Parameter definition	connMethodID: integer; connection code. 0: PLC IP address; 1: PLC logical address address: string. PLC IP address: "192.168.0.1"; PLC IP logical address: "002D" diskID: integer; disk ID. 2: USB drive; 8: AX8 controller appFile: string; application filename, such as "Application.app" showMsgBox: integer. 1: an error window appears when the download fails; 0: an error window does not appear when the download fails username: string; authenticated username: "Admin"; blank string "" means no authentication password: string; authenticated user password: "12345"; blank string "" means no authentication
Example	connMethodID = 0 address = "192.168.123.23" diskID = 2 appFile = "AddressOffset.app" showMsgBox = 1 username = "" password = "" ret, errDesc = link.CODESYSAppDownload(connMethodID, address, diskID, appFile, showMsgBox, username, password)
Example description	Download the "AddressOffset.app" program in the USB drive connected to the HMI to the CODESYS PLC. An error window and error message appear if the download fails. Note: the download folder must contain a .CRC file, such as AddressOffset.CRC.
Return value	ret: return 1 on success; return 0 on failure errDesc: string; error message

■ link.CODESYSAppUpload: use the network communication to upload the CODESYS program to the USB storage device connected to the HMI

Command name	link.CODESYSAppUpload
Command expression	ret, errDesc = **link.CODESYSAppUpload**(connMethodID, address, diskID, appFile, showMsgBox, username, password)
Parameter definition	connMethodID: integer; connection code. 0: PLC IP address; 1: PLC logical address address: string. PLC IP address: "192.168.0.1"; PLC IP logical address: "002D" diskID: integer; disk ID. 2: USB drive; 8: AX8 controller appFile: string; application filename, such as "Application.app" showMsgBox: integer. 1: an error window appears when the download fails; 0: an error window does not appear when the download fails username: string; authenticated username: "Admin"; blank string "" means no authentication password: string; authenticated user password: "12345"; blank string "" means no authentication
Example	connMethodID = 0 address = "192.168.123.23" diskID = 2 appFile = "DELTA.app" showMsgBox = 1 username = "" password = "" ret, errDesc = link.CODESYSAppUpload(connMethodID, address, diskID, appFile, showMsgBox, username, password)
Example description	Upload the CODESYS PLC program to the USB drive connected to the HMI. An error window and error message appear if the upload fails.
Return value	ret: return 1 on success; return 0 on failure errDesc: string; error message

Command	Example	Execution results
link.Read link.Write	v1 = link.Read("{Link2}1@D1") v1 = v1 + 100 link.Write("{Link2}1@D2",v1)	
	Description of command	
	Read the external memory address {Link2}1@D1 as v1. After adding 100 to v1, write the result to the external memory address {Link2}1@D2. The unit of reading and writing is Word.	

Command	Example	Execution results
link.ReadDW link.WriteDW	d1 = link.ReadDW("{Link2}1@D1") d1 = d1 + 1 link.WriteDW("{Link2}1@D3",d1)	
	Description of command	
	Read the external memory address {Link2}1@D1 as d1. After adding 100 to d1, write the result to the external memory address {Link2}1@D3. The unit of reading and writing is Double Word.	

Command	Example	Execution results
link.ReadFloat link.WriteFloat	link.WriteFloat("{Link2}1@D1", 1.1) f1 = link.ReadFloat("{Link2}1@D1") f1 = f1 * 2.5 link.WriteFloat("{Link2}1@D3",f1)	
	Description of command	
	Write the floating-point number 1.1 to the external memory address {Link2}1@D1, and read the external memory address {Link2}1@D1 floating-point number as f1. Multiply f1 by 2.5, and write the result to the external memory address {Link2}1@D3. The unit of reading and writing is floating-point number.	
Command	Example	Execution results
link.ReadBit link.WriteBit	b1 = link.ReadBit("{Link2}1@M0") b1 = b1 + 1 link.WriteBit("{Link2}1@M1",b1)	
	Description of command	
	Read the external memory address {Link2}1@M0 as b1, add 1 to b1, and write the result to the external memory address {Link2}1@M1.	
Command	Example	Execution results
link.ReadAscii link.WriteAscii	link.WriteAscii("{Link2}1@D0", "posheng",7) ascii, ret, errMsg = link.ReadAscii("{Link2}1@D0", 20) link.WriteAscii("{Link2}1@D10", 20)	
	Description of command	
	Write the string “posheng” with the string length of 7 to the external memory address {Link2}1@D0. Read the external memory address {Link2}1@D0 in units of 20 bytes as the ascii string, and write the ascii string in units of 20 bytes to the external memory address {Link2}1@D10.	
Command	Example	Execution results
link.CopyFromInter link.CopyToInter	result = link.CopyFromInter("{Link2}1@D1", 1, 6) mem.inter.Write(100,result) result = link.CopyToInter("{Link2}1@D1", 10, 6) mem.inter.Write(200,result)	
	Description of command	
	Copy the data of $1 to {Link2}1@D1 with the length of 6, and write the return value to $100. Then, copy the data of {Link2}1@D1 to $10, and write the return value to $200.	

4.5 File (read/write/export/delete/print files)

These commands help you read, write, export, print files, and create pdf files from the files.

The commands include:

Command	Command expression	Description
File (read/write/export/ delete/print files)	file.Open	Create/open file
	file.Read	Read file data
	file.ReadLine	Read file (unit: one line)
	file.Write	Write to file
	file.Length	Read the file length
	file.GetLineCount	Read the total line count in the file
	file.Seek	Set the pointer
	file.GetPos	Get the current pointer position
	file.GetError	Check file
	file.Close	Close file
	file.List	Get a list of the files stored in the HMI
	file.Export	Export file
	file.Delete	Delete file
	file.DeleteDir	Delete directory
	file.ToPDF	Convert the file to PDF
	file.ToPrinter	Print file
	file.ListExternal	Get a list of the files stored in the external device
	file.Exist	Check if the file exists
	file.PDFToPrinter	Print PDF file
	file.Copy	Copy file
	file.Move	Move file

The following sections will explain each in detail.

■ file.Open: create/open file

Command name	file.Open
Command expression	ret, fileHandle = **file.Open**(disk_id, file_name, add_utf8_id)
Parameter definition	disk_id: integer; 0: internal memory of HMI; 2: USB drive; 3: SD card file_name: string; filename add_utf8_id: 1: add utf-8 identifiers; others: do not add additional identifiers
Example	ret, fileHandle = file.Open(2, "myFile001.txt")
Example description	Open or create a file named "myFile001.txt" in the external USB drive. fileHandle is the file data to be used for subsequent commands. Note: if the storage device contains the file you specify, it is opened; if not, a new file with the name you specify is created.
Return value	ret: return 1 on success; return 0 on failure fileHandle: integer; file pointer

Return value	Description
-1	Invalid parameter
-106	The specified disk is not ready
-107	Cannot open the specified file
-136	Invalid file path

■ file.Read: read file data

Command name	file.Read
Command expression	ret, data = **file.Read**(fileHandle, len)
Parameter definition	fileHandle: integer; file pointer len: integer; character length
Example	ret, data = file.Read(fileHandle, 10) Note: the *fileHandle* parameter is generated by the *file.Open* command.
Example description	With the current pointer position as the initial address, read the fileHandle file data with the length of 10 bytes. After reading, the current pointer address is changed to [initial address + read length]. Note: if you need to read a specific pointer address, you can use the *file.Seek* command to change the current pointer address.
Return value	ret: integer. Success: the length of the read string; failure: -1 data: character set. Success: character content; failure: nil

■ file.ReadLine: read file (unit: one line)

Command name	file.ReadLine
Command expression	ret, data = **file.ReadLine**(fileHandle)
Parameter definition	fileHandle: integer; file pointer
Example	ret, data = file.ReadLine(fileHandle) Note: the *fileHandle* parameter is generated by the *file.Open* command.
Example description	With the current pointer position as the initial address, read the fileHandle file data in units of one line. Note: 1. A line ends at a carriage return symbol ("/r") or newline symbol ("/n"). 2. You can read the file with the third-party software Notepad++ and check for the carriage return and newline symbols.
Return value	ret: integer; success: the length of the string read; failure: a negative number Return value / Description: -1 — Invalid parameter; -102 — Read failure data: character set; success: character content; failure: nil

■ file.Write: write to file

Command name	file.Write
Command expression	ret = **file.Write**(fileHandle, buffer, len)
Parameter definition	fileHandle: integer; file pointer buffer: Ascii character set; text content (UTF-8 format) len: integer; length of written characters
Example	ret = file.Write(fileHandle, "posheng", 6) Note: The *fileHandle* parameter is generated by the *file.Open* command.
Example description	With the current pointer position as the initial address, write the string *posheng* to the fileHandle file with the length of 6 bytes. Note: to read a specific pointer address, you can use the *file.Seek* command to change the current pointer address.
Return value	ret: integer; success: the length of the written string; failure: -1

- file.Length: read the file length

Command name	file.Length
Command expression	ret, len = **file.Length**(fileHandle)
Parameter definition	fileHandle: integer; file pointer
Example	ret, len = file.Length(fileHandle) Note: the *fileHandle* parameter is generated by the *file.Open* command.
Example description	Read the length of the file fileHandle in Bytes.
Return value	ret: success: 1; failure: 0 len: success: file length; failure: less than 0

- file.GetLineCount: read the total line count in the file

Command name	file.GetLineCount
Command expression	ret, lineCount = **file.GetLineCount**(fileHandle)
Parameter definition	fileHandle: integer; file pointer
Example	ret, lineCount = file.GetLineCount(fileHandle) Note: the *fileHandle* parameter is generated by the *file.Open* command
Example description	Read the total number of lines in the file fileHandle. Note: 1. A line ends at a carriage return symbol ("/r") or newline symbol ("/n"). 2. You can read the file with the third-party software Notepad++ and check for the carriage return and newline symbols.
Return value	ret: success: 1; failure: 0 lineCount: Success: the total number of lines; failure: -1

- file.Seek: set the pointer

Command name	file.Seek
Command expression	ret = **file.Seek**(fileHandle, offset, origin)
Parameter definition	fileHandle: integer; file pointer offset: integer; number of offset for the file (in bytes) origin: the starting reference position of the offset; 0: the start position of the file, 1: current position, 2: the end position of the file
Example	ret = file.Seek(fileHandle, 5, 0) Note: the *fileHandle* parameter is generated by the *file.Open* command.
Example description	Set the current pointer to a position offset by 5 bytes from the beginning of the file.
Return value	ret: success: 1; invalid parameter: others

■ file.GetPos: get the current pointer position

Command name	file.GetPos
Command expression	ret, pos = **file.GetPos**(fileHandle)
Parameter definition	fileHandle: integer; file pointer
Example	ret, pos = file.GetPos(fileHandle) Note: the *fileHandle* parameter is generated by the *file.Open* command.
Example description	Get the current pointer position.
Return value	ret: integer; success: 1; failure: -1 pos: integer; file pointer position

■ file.GetError: check file

Command name	file.GetError
Command expression	ret = **file.GetError**(fileHandle)
Parameter definition	fileHandle: integer; file pointer
Example	ret = file.GetError(fileHandle) Note: the *fileHandle* parameter is generated by the *file.Open* command.
Example description	Check file.
Return value	ret: integer; success: 1; failure: negative number

Return value	Description
-1	Invalid
-117	Failed to read data
-118	Failed to access file

■ file.Close: close file

Command name	file.Close
Command expression	**file.Close**(fileHandle)
Parameter definition	fileHandle: integer; file pointer
Example	file.Close(fileHandle) Note: the *fileHandle* parameter is generated by the *file.Open* command.
Example description	Close the *fileHandle* file.
Return value	No return value

■ file.List: get a list of the files stored in the HMI

Command name	file.List
Command expression	ret, nameList = **file.List**()
Parameter definition	No parameters
Example	ret, nameList = file.List()
Example description	Get the list of files stored in the HMI; nameList is the list, nameList[1] is the first filename, nameList[2] is the second filename, and so on.
Return value	ret: success: 1; failure or no file: 0 nameList: matrix table; success: filename list; failure: nil

■ file.Export: export file

Command name	file.Export
Command expression	ret, errCode = **file.Export**(name, disk_id)
Parameter definition	name: string; filename disk_id: integer; 2: USB drive; 3: SD card
Example	ret, errCode = file.Export(“myFile.txt”, 2)
Example description	Export the file *myFile.txt* created by *file.Open* to the external USB device. Note: only supports txt files.
Return value	ret: integer. Success: 1; failure: 0 errCode: error code

Return value	Description
-1	Parameter setting error
-106	External storage device not ready
-110	File does not exist
-111	Export failed
-136	Invalid path

■ file.Delete: delete file

Command name	file.Delete
Command expression	ret, err, errText = **file.Delete**(diskNo, fileName)
Parameter definition	diskNo: integer; 0: HMI; 2: USB drive; 3: SD card filename: string; filename
Example	ret, err, errText = file.Delete(0, “myFile.txt”)
Example description	Delete the file myFile.txt stored in the HMI.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
-1	Parameter setting error
-106	External storage device not ready
-114	Failed to delete
-136	Invalid path

errText: string; error description

■ file.DeleteDir: delete directory

Command name	file.DeleteDir
Command expression	ret, err, errText = **file.DeleteDir**(diskNo, dirName)
Parameter definition	diskNo: integer; 0: HMI; 2: USB drive; 3: SD card dirName: string; directory name
Example	ret, err, errText = file.DeleteDir(2, "/DELTA")
Example description	Delete the directory named DELTA saved on the USB drive.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code Return value / Description -1 / Parameter setting error -106 / External storage device not ready -114 / Failed to delete -136 / Invalid path errText: string; error description

■ file.ToPDF: convert the file to PDF

Command name	file.ToPDF
Command expression	ret, errCode = **file.ToPDF**(disk_id, srcFileName, pdfFileName, paperSize, fontSize, landscape)
Parameter definition	disk_id: integer; 0: HMI; 2: USB drive; 3: SD card srcFileName: string; source filename pdfFileName: PDF filename paperSize: string; "A3", "A4" fontSize: integer; font size: 8, 10, 12 and so on landscape: integer; 0: portrait; 1: landscape
Example	ret, errCode = file.ToPDF(2, "file001.txt", "out001.pdf", "A4", 10, 0)
Example description	Convert the file file001.txt saved on the USB drive to PDF, and set the name to out001.pdf, the format to A4, the layout to portrait, and font size to 10.
Return value	ret: integer. Success: 1; failure: 0 errCode: integer; error code

■ file.ToPrinter: print file

Command name	file.ToPrinter
Command expression	ret, errCode = **file.ToPrinter**(disk_id, srcFileName, fontSize, outputPDF)
Parameter definition	disk_id: integer; 0: HMI; 2: USB drive; 3: SD card srcFileName: string; source filename (must include the file extension), must be a txt or csv file fontSize: integer; 8, 10, 12 and so on outputPDF: integer; 0: do not generate PDF; 1: generate PDF
Example	ret, errCode = file.ToPrinter(2, "file001.txt", 10, 1)
Example description	Print the file file001.txt and convert it to a pdf file to the USB drive with the font size of 10. Note: 1. Must first set up the printer and connect it to the HMI. 2. See Chapter 26 of the DOPSoft User Manual for printer setup.
Return value	ret: integer. Success: 1; failure: 0 errCode: integer; error code

- file.ListExternal: get a list of the files stored in the external device

Command name	file.ListExternal
Command expression	ret, nameList = **file.ListExternal**(disk_id, sub_dir)
Parameter definition	disk_id: integer; 2: USB drive; 3: SD card sub_dir: string; subdirectory; can be nil
Example	ret, nameList = file.ListExternal(2,"file1/file2")
Example description	Get the file list stored under the USB path /file1/file2; nameList is the list, nameList[1] is the first filename, nameList[2] is the second filename, and so on.
Return value	ret: integer; success: 1; failure or no file: 0 nameList: array table; success: filename list; failure: nil

- file.Exist: check if the file exists

Command name	file.Exist
Command expression	ret, err, errText = **file.Exist**(disk_id, file_name)
Parameter definition	disk_id: integer; 0: HMI; 2: USB drive; 3: SD card file_name: string; filename
Example	ret, err, errText = file.Exist(0, "myFile001")
Example description	Check whether the file myFile001.txt exists in the HMI.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code errText: string; error description

- file.PDFToPrinter: print PDF file

Command name	file.PDFToPrinter
Command expression	ret, errCode = **file.PDFToPrinter**(disk_id, srcFileName)
Parameter definition	disk_id: integer; 0: HMI; 2: USB drive; 3: SD card srcFileName: string; source PDF filename
Example	ret, errCode = file.PDFToPrinter(2, "file001.pdf")
Example description	Print the file file001.pdf saved on the USB device. Note: before printing, make sure that the HMI is connected to the printer.
Return value	ret: integer. Success: 1; failure: 0 errCode: integer; error code

■ file.Copy: copy file

Command name	file.Copy
Command expression	ret, errCode = **file.Copy**(src_name, src_disk_id, dest_name, dest_disk_id)
Parameter definition	src_name: string; source filename src_disk_id: integer; 0: HMI; 2: USB drive; 3: SD card dest_name: string; destination filename dest_disk_id: integer; 0: HMI; 2: USB drive; 3: SD card
Example	ret, err = file.Copy("myFile001.txt", 0, "myFile001Out.txt", 2)
Example description	Copy the file myFile001.txt stored in the HMI to the USB drive, and name the file as myFile001Out.txt. Note: if the destination address contains a file with the same filename, the system overwrites the file.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
0	No errors
-1	Invalid parameter
-106	The specified disk is not ready
-110	The specified filename does not exist
-111	Unable to copy file
-136	Invalid file path

■ file.Move: move file

Command name	file.Move
Command expression	ret, errCode = **file.Move**(src_name, src_disk_id, dest_name, dest_disk_id)
Parameter definition	src_name: string; source filename src_disk_id: integer; 0: HMI; 2: USB drive; 3: SD card dest_name: string; destination filename dest_disk_id: integer; 0: HMI; 2: USB drive; 3: SD card
Example	ret = file.Move("myFile001.txt", 0, "myFile001Out.txt", 2)
Example description	Move the file myFile001.txt stored from the HMI to the USB drive, and name the file as myFile001Out.txt. Note: if the destination address contains a file with the same filename, the system overwrites the file.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
0	No errors
-1	Invalid parameter
-106	The specified disk is not ready
-110	The specified filename does not exist
-111	Cannot move file
-136	Invalid file path

Example (handshake the data of two HMIs through the *file* command)

■ The concept of handshaking is as follows. Use the *file* commands on HMI #1 to create a txt file, write the internal memory address data to the file and then export the file to the USB drive. Then, insert this USB drive to HMI #2, use the *file* commands to read the relevant parameters and write these parameters to the internal memory of HMI #2.

■ Build Lua program, shown as follows.

Build Lua program

HMI #1 Lua program:

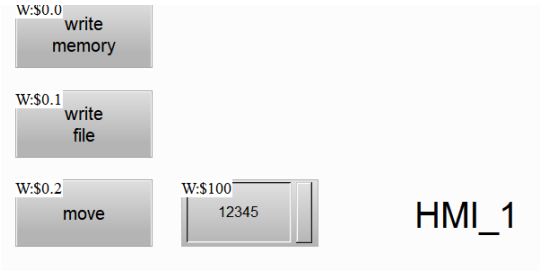
```
disk_id = 0
file_name = " DELTA.txt"
ret, fileHandle = file.Open(disk_id, file_name)

while true do

    if mem.inter.ReadBit(0,0)==1 then
        mem.inter.WriteAscii(1,"posheng",7)
        mem.inter.WriteBit(0,0,0)
    end
    if mem.inter.ReadBit(0,1)==1 then
        str_100w=mem.inter.ReadAscii(1,7)
        file.Write(fileHandle,str_100w,string.len(str_100w))
        file.Close(fileHandle)
        mem.inter.WriteBit(0,1,0)
    end

    if mem.inter.ReadBit(0,2)==1 then
        SrcDiskNo = 0
        DestDiskNo = 2
        ret = file.Move("DELTA.txt", SrcDiskNo, " DELTA.txt", DestDiskNo)
        mem.inter.Write(100,ret)
        mem.inter.WriteBit(0,2,0)
    end

end
```

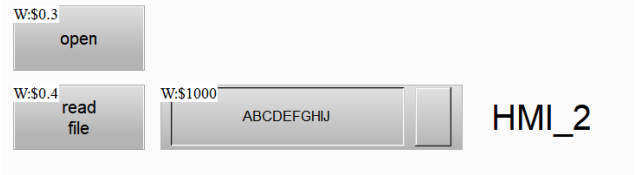
<table>
<tr><th colspan="2">Example (handshake the data of two HMIs through the file command)</th></tr>
<tr><td>Build Lua program</td><td>HMI #2 Lua program:

while true do

    if mem.inter.ReadBit(0,3)==1 then
        disk_id = 2
        file_name = " DELTA.txt"
        ret, fileHandle = file.Open(disk_id, file_name)
        mem.inter.WriteBit(0,3,0)
    end

    if mem.inter.ReadBit(0,4)==1 then
        ret, len = file.Length(fileHandle)
        ret, data = file.Read(fileHandle, len)
        mem.inter.WriteAscii(1000,data,string.len(data))
        mem.inter.WriteBit(0,4,0)
    end

end</td></tr>
<tr><td>Create elements</td><td>■ Create 3 Maintained Buttons on HMI #1 with the Write Addresses as $0.0, $0.1, and $0.2. Then, create a Numeric Entry element with the Write Address as $100.
 

■ Create 2 Maintained Buttons on HMI #2 with the Write Addresses as $0.3 and $0.4. Then, create a Character Entry element with the Write Address as $1000.
 
</td></tr>
</table>

Example (handshake the data of two HMIs through the *file* command)

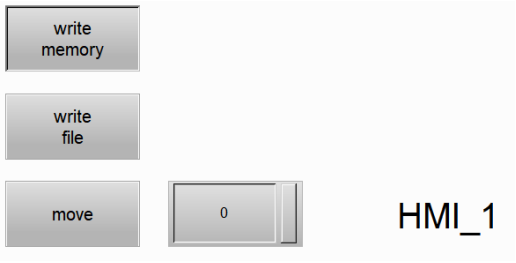
Execution results

- After building the Lua program and creating the elements, compile and load the project respectively to the HMIs.
- When HMI #1 is booted, the HMI creates the DELTA.txt file in the internal memory.

```
disk_id = 0
file_name = "DELTA.txt"
ret, fileHandle = file.Open(disk_id, file_name)
```

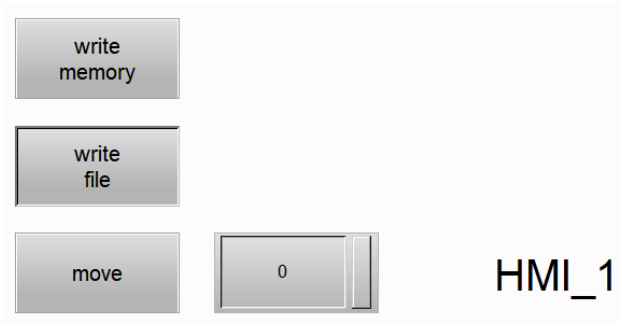
- After pressing $0.0, the system writes the string "posheng" to the internal memory address $1.

```
if mem.inter.ReadBit(0,0)==1 then
    mem.inter.WriteAscii(1,"posheng",7)
    mem.inter.WriteBit(0,0,0)
end
```



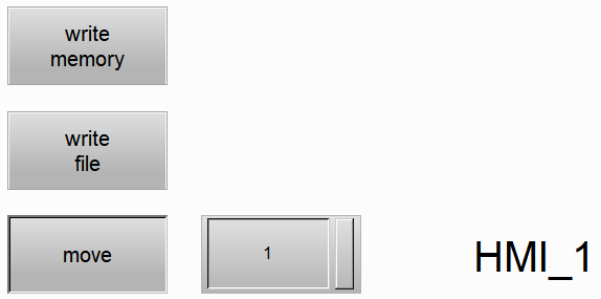
- Press $0.1 to read the data of $1 with the string length of 7 bytes, then write the data to the DELTA.txt file.

```
if mem.inter.ReadBit(0,1)==1 then
    str_100w=mem.inter.ReadAscii(1,7)
    file.Write(fileHandle,str_100w,string.len(str_100w))
    file.Close(fileHandle)
    mem.inter.WriteBit(0,1,0)
end
```



- Press $0.2 to move the DELTA.txt file stored in the HMI to the USB drive.

```
if mem.inter.ReadBit(0,2)==1 then
    SrcDiskNo = 0
    DestDiskNo = 2
    ret = file.Move("DELTA.txt", SrcDiskNo, " DELTA.txt", DestDiskNo)
    mem.inter.Write(100,ret)
    mem.inter.WriteBit(0,2,0)
end
```



Example (handshake the data of two HMIs through the *file* command)	

Execution results	■ At this time, the data has been stored on the USB drive. After the storage is complete, insert the USB drive into HMI #2.
	■ On HMI #2, press $0.3 to open the "DELTA.txt" file.
	`if mem.inter.ReadBit(0,3)==1 then`
	`  disk_id = 2`
	`  file_name = '' DELTA.txt''`
	`  ret, fileHandle = file.Open(disk_id, file_name)`
	`  mem.inter.WriteBit(0,3,0)`
	`end`
	 
	■ Press $0.4 to read "DELTA.txt" and write the data to $1000. Then, you get the data as "posheng".
	`if mem.inter.ReadBit(0,4)==1 then`
	`  ret, len = file.Length(fileHandle)`
	`  ret, data = file.Read(fileHandle, len)`
	`  mem.inter.WriteAscii(1000,data,string.len(data))`
	`  mem.inter.WriteBit(0,4,0)`
	`end`
	 

4.6 FileSlot (file access)

These commands help you read, write, export files, and create pdf files from the files.

The commands include:

Command	Command expression	Description
FileSlot (file access)	fileslot.Read	Read the fileslot file
	fileslot.Write	Write the fileslot file
	fileslot.ReadValue	Read the value of the fileslot
	fileslot.WriteValue	Write the value to the fileslot
	fileslot.GetLength	Get the content length of the fileslot
	fileslot.Remove	Remove the fileslot
	fileslot.Import	Import the fileslot file
	fileslot.Export	Export the fileslot file
	fileslot.SetName	Set the fileslot filename
	fileslot.GetName	Get the fileslot filename
	fileslot.GetID	Get the fileslot file ID

The following sections will explain each in detail.

■ fileslot.Read: read the fileslot file

Command name	fileslot.Read
Command expression	ret, err = **fileslot.Read**(FS_ID, FS_Pos, Device, MemIdx, length)
Parameter definition	FS_ID: unsigned integer; FileSlot ID FS_Pos: unsigned integer; FileSlot reading position Device: unsigned integer; 1: internal memory ($); 2: static memory ($M) MemIdx: unsigned integer; read or write address of the device length: unsigned integer; data length
Example	ret, err = fileslot.Read(1, 0, 1, 20, 5)
Example description	Read the data of 5 Words starting from position 0 in the content of FileSlot ID 1 to the destination address $20.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-13	Data read error
-14	Data writing error
-24	Memory error
-51	FileSlot ID error
-52	FileSlot processing error
-53	FileSlot read error
-54	FileSlot search error
-55	FileSlot writing error
-56	FileSlot deletion error
-57	FileSlot data length error
-62	FileSlot operation error
-63	External file operation error
-84	FileSlot name acquisition error
-86	FileSlot name setting error
-87	FileSlot ID acquisition error
-88	FileSlot write position error

■ fileslot.Write: write to the fileslot file

Command name	fileslot.Write
Command expression	ret, err = **fileslot.Write**(FS_ID, FS_Pos, Device, MemIdx, length)
Parameter definition	FS_ID: unsigned integer; FileSlot ID FS_Pos: unsigned integer; FileSlot reading position Device: unsigned integer; 1: internal memory ($); 2: static memory ($M) MemIdx: unsigned integer; read or write address of the device length: unsigned integer; data length
Example	ret, err = fileslot.Write(1, 0, 1, 10, 5)
Example description	Write the data of 5 Words starting from $10 to the FileSlot with FileSlot ID 1 and address 0.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-13	Data read error
-14	Data writing error
-24	Memory error
-51	FileSlot ID error
-52	FileSlot processing error
-53	FileSlot read error
-54	FileSlot search error
-55	FileSlot writing error
-56	FileSlot deletion error
-57	FileSlot data length error
-62	FileSlot operation error
-63	External file operation error
-84	FileSlot name acquisition error
-86	FileSlot name setting error
-87	FileSlot ID acquisition error
-88	FileSlot write position error

■ fileslot.ReadValue: read the value of the fileslot

Command name	fileslot.ReadValue
Command expression	ret, err = **fileslot.ReadValue**(FS_ID, FS_Pos, Format, [value_format])
Parameter definition	FS_ID: unsigned integer; FileSlot ID FS_Pos: unsigned integer; FileSlot reading position Format: unsigned integer; 2: length (WORD); 3: length (DWORD) value_format: string. Fill in "signed" for signed numbers; this parameter is not mandatory.
Example	ret, err = fileslot.ReadValue(1, 0, 2, "SIGNED")
Example description	Read the FileSlot with FileSlot ID 1 and address 0 in units of signed Word.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-13	Data read error
-14	Data writing error
-24	Memory error
-51	FileSlot ID error
-52	FileSlot processing error
-53	FileSlot read error
-54	FileSlot search error
-55	FileSlot writing error
-56	FileSlot deletion error
-57	FileSlot data length error
-62	FileSlot operation error
-63	External file operation error
-84	FileSlot name acquisition error
-86	FileSlot name setting error
-87	FileSlot ID acquisition error
-88	FileSlot write position error

■ fileslot.WriteValue: write the value to the fileslot

Command name	fileslot.WriteValue
Command expression	ret, err = **fileslot.WriteValue**(FS_ID, FS_Pos, Format, Value)
Parameter definition	FS_ID: unsigned integer; FileSlot ID FS_Pos: unsigned integer; FileSlot reading position Format: unsigned integer; 2: length (WORD); 3: length (DWORD) Value: unsigned integer; data content
Example	ret, err = fileslot.WriteValue(1, 0, 2, 99)
Example description	Write the unsigned integer 99 in units of Word to the FileSlot which ID is 1 and address is 0.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-13	Data read error
-14	Data writin error
-24	Memory error
-51	FileSlot ID error
-52	FileSlot processing error
-53	FileSlot read error
-54	FileSlot search error
-55	FileSlot writing error
-56	FileSlot deletion error
-57	FileSlot data length error
-62	FileSlot operation error
-63	External file operation error
-84	FileSlot name aquisition error
-86	FileSlot name setting error
-87	FileSlot ID aquisition error
-88	FileSlot write position error

■ fileslot.GetLength: get the content length of the fileslot

Command name	fileslot.GetLength
Command expression	ret, err = **fileslot.GetLength**(FS_ID)
Parameter definition	FS_ID: unsigned integer; FileSlot ID
Example	ret, err = fileslot.GetLength(1)
Example description	Get the content length of FileSlot ID 1.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-51	FileSlot ID error
-57	FileSlot data length error

■ fileslot.Remove: remove the fileslot

Command name	fileslot.Remove
Command expression	ret, err = **fileslot.Remove**(FS_ID)
Parameter definition	FS_ID: unsigned integer; FileSlot ID
Example	ret, err = fileslot.Remove(1)
Example description	Remove FileSlot ID 1.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-51	FileSlot ID error
-56	FileSlot deletion error

■ fileslot.Import: import the fileslot file

Command name	fileslot.Import
Command expression	ret, err = **fileslot.Import**(FS_ID, DiskID, ExtFileName)
Parameter definition	FS_ID: unsigned integer; FileSlot ID DiskID: integer; disk ID. 2: USB drive; 3: SD card ExtFileName: string, external filename
Example	ret, err = fileslot.Import(1, 2, "myfile.txt")
Example description	Import the text file named "myfile.txt" from the USB drive to FileSlot ID 1.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-59	FileSlot export error
-61	FileSlot import error
-62	FileSlot operation error
-63	External file operation error
-64	FileSlot copy error
-106	External storage device not ready
-136	External filename error

■ fileslot.Export: export the fileslot file

Command name	fileslot.Export
Command expression	ret, err = **fileslot.Export**(FS_ID, DiskID, ExtFileName)
Parameter definition	FS_ID: unsigned integer; FileSlot ID DiskID: integer, disk ID; 2: USB drive; 3: SD card ExtFileName: string, external filename
Example	ret, err = fileslot.Export(10, 2, "Newfile.txt")
Example description	Export the data of FileSlot ID 10 to the USB drive and name it "Newfile.txt".
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-59	FileSlot export error
-61	FileSlot import error
-62	FileSlot operation error
-63	External file operation error
-64	FileSlot copy error
-106	External storage device not ready
-136	External filename error

■ fileslot.SetName: set the fileslot filename

Command name	fileslot.SetName
Command expression	et, err = **fileslot.SetName**(FS_ID, FS_Name)
Parameter definition	FS_ID: unsigned integer; FileSlot ID FS_Name: string, filename
Example	ret, err = fileslot.SetName(1, "myfile.txt") ret, err = fileslot.Export(1, 2, "folder1/")
Example description	Name the FileSlot ID 1 file “myfile.txt”, and export the file to the folder named *folder1*. Note: you must first create the *folder1* folder on the USB drive.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-51	FileSlot ID error
-66	Failed to set the FileSlot name

■ fileslot.GetName: get the fileslot filename

Command name	fileslot.GetName
Command expression	ret, err = **fileslot.GetName**(FS_ID)
Parameter definition	FS_ID: unsigned integer; FileSlot ID
Example	ret, err = fileslot.GetName(5)
Example description	Get the name of FileSlot ID 5.
Return value	ret: integer. Success: filename string; failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-51	FileSlot ID error
-84	FileSlot name aquisition error

■ fileslot.GetID: get the fileslot file ID

Command name	fileslot.GetID
Command expression	ret, err = **fileslot.GetID**(FS_Name)
Parameter definition	FS_Name: string, filename
Example	ret, err = fileslot.SetName(1, "myfile") ret, err = fileslot.GetID("myfile")
Example description	Name the FileSlot ID 1 file “myfile”. Get the FileSlot ID of “myfile”, and the result is 1.
Return value	ret: integer. Success: the corresponding FileSlot ID; FileSlot ID does not exist or failure: 0 err: integer; error code

Return value	Description
1	No errors
-1	Invalid parameter
-51	FileSlot ID error
-87	FileSlot ID aquisition error

4.7 FTP Client (FTP transfer function)

These commands help you upload and download with the FTP. The commands include:

Command	Command expression	Description
FTP Client	ftpc.Download	FTP download
	ftpc.Upload	FTP upload

The following sections will explain each in detail.

■ ftpc.Download: FTP download

Command name	ftpc.Download
Command expression	ret, err = **ftpc.Download**(IPAddress, Port, UserName, Password, LocalFileName, RemoteFileName, OverWrite)
Parameter definition	IPAddress: string, IP address Port: unsigned integer; port number with the range of 1 to 65535 UserName: string; login username. If no username is required, set to "" (anonymous login). Password: string; login password. If no password is required, set it to "". LocalFileName: string; local filename. Use "/HMI/filename" or "/FILESLOT/FS_ID" to select the file in the HMI or FileSlot. RemoteFileName: string; external filename OverWrite: unsigned integer. 0: do not overwrite when the file exists; 1: overwrite when the file exists
Example	IPAddress = "192.168.123.144" Port = 21 UserName = "chen" Password = "123" LocalFileName = "/FILESLOT/1" RemoteFileName = "delta.txt" OverWrite = 0 ret, err = ftpc.Download(IPAddress, Port, UserName, Password, LocalFileName, RemoteFileName, OverWrite)
Example description	Log into the FTP with the username "chen" and password "123" through port 21 of the IP address 192.168.123.144. Download the file "delta.txt", and write it to FileSlot ID 1.
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

Return value	Description
0	No errors
-10	Invalid parameter (IP address)
-11	Invalid parameter (Port number)
-12	Invalid parameter (login username)
-13	Invalid parameter (login password)
-14	Invalid parameter (local filename)
-15	Invalid parameter (external filename)
-16	Invalid parameter (overwrite parameter)
-20	Login failure
-21	Logout failure
-22	Failed to set directory
-23	Failed to obtain external directory information
-24	Local file does not exist
-25	Local file exists
-26	External file does not exist
-27	External file already exists
-28	Failed to download file
-29	Failed to upload file
-41	Duplicate FileSlot name
-42	FileSlot ID error
-43	FileSlot does not have enough space

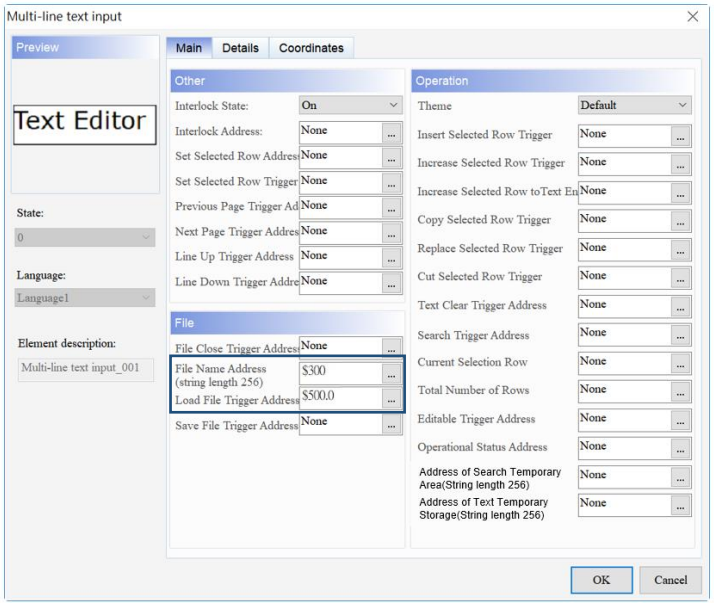
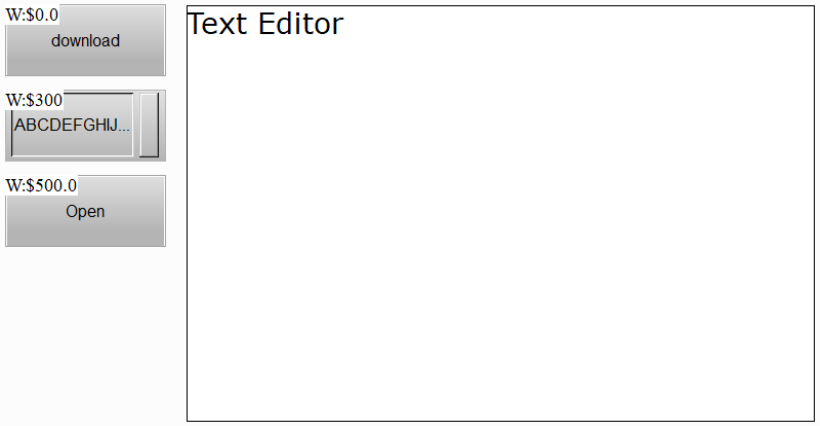
■ ftpc.Upload: FTP upload

Command name	ftpc.Upload
Command expression	ret, err = **ftpc.Upload**(IPAddress, Port, UserName, Password, LocalFileName, RemoteFileName, OverWrite)
Parameter definition	IPAddress: string; IP address Port: unsigned integer; port number with the range of 1 to 65535 UserName: string; login username. If no username is required, set to "" (anonymous login). Password: string; login password. If no password is required, set it to "". LocalFileName: string; local filename. Use "/HMI/filename" or "/FILESLOT/FS_ID" to select the file in HMI or FileSlot. RemoteFileName: string; external filename OverWrite: unsigned integer. 0: do not overwrite when the file exists; 1: overwrite when the file exists
Example	IPAddress = "192.168.123.144" Port = 21 UserName = "chen" Password = "123" LocalFileName = "/FILESLOT/1" RemoteFileName = "delta.txt" OverWrite = 0 ret, err = ftpc.Upload(IPAddress, Port, UserName, Password, LocalFileName, RemoteFileName, OverWrite)
Example description	Log into the FTP with the username "chen" and password "123" through port 21 of the IP address 192.168.123.144. Upload the contents of FileSlot ID 1 to the FTP Server directory, and name it "delta.txt".
Return value	ret: integer. Success: 1; failure: 0 err: integer; error code

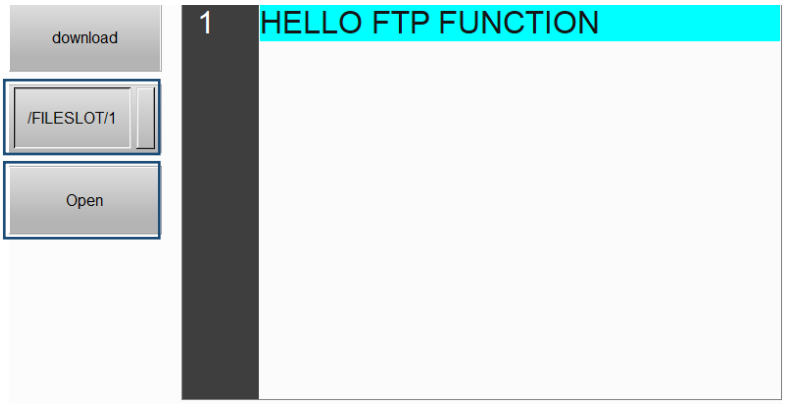
Return value	Description
0	No errors
-10	Invalid parameter (IP address)
-11	Invalid parameter (Port number)
-12	Invalid parameter (login username)
-13	Invalid parameter (login password)
-14	Invalid parameter (local filename)
-15	Invalid parameter (external filename)
-16	Invalid parameter (overwrite parameter)
-20	Login failure
-21	Logout failure
-22	Failed to set directory
-23	Failed to obtain external directory information
-24	Local file does not exist
-25	Local file already exists
-26	External file does not exist
-27	External file already exists
-28	Failed to download file
-29	Failed to upload file
-41	Duplicate FileSlot name
-42	FileSlot ID error
-43	FileSlot does not have enough space

Example (upload/download files via ftp command)	

Build Lua program	■ Build Lua program:
	`if mem.inter.ReadBit(0,0)==1 then`
	`IPAddress = "192.168.123.144"`
	`Port = 21`
	`UserName = "chen"`
	`Password = ""`
	`LocalFileName = "/FILESLOT/1"`
	`RemoteFileName = "delta.txt"`
	`OverWrite = 0`
	`ret, err = ftpc.Download(IPAddress, Port, UserName, Password, LocalFileName, RemoteFileName, OverWrite)`
	`mem.inter.WriteBit(0,0,0)`
	`end`

Create elements	■ Create two Maintained buttons with the Write Addresses as $0.0 and $500.0. ■ Create a Character Entry element with the Write Address as $300. ■ Create a Multi-line text input element with the File Name Address as $300 and the Load File Trigger Address as $500.0.  

Example (upload/download files via ftp command)	

Execution results	■ Download a third-party FTP Server software, and create an FTP Server directory with the software.
	■ Create a notepad file named "delta.txt", and place it in the above mentioned FTP Server directory.
	■ Download the project to the HMI. Trigger $0.0 and download "delta.txt" to fileslot ID 1.
	`if mem.inter.ReadBit(0,0)==1 then`
	`IPAddress = "192.168.123.144"`
	`Port = 21`
	`UserName = "chen"`
	`Password = ""`
	`LocalFileName = "/FILESLOT/1"`
	`RemoteFileName = "delta.txt"`
	`OverWrite = 0`
	`ret, err = ftpc.Download(IPAddress, Port, UserName, Password, LocalFileName, RemoteFileName, OverWrite)`
	`mem.inter.WriteBit(0,0,0)`
	`end`
	■ Enter “/FILESLOT/1” to $300 to trigger $500.0 and display the contents of FileSlot ID 1 in the Multi-line text input element.
	 

4.8 Math (mathematical operations)

These commands help you perform mathematical operations. The commands include:

Command	Command expression	Description
Math (mathematical operations)	math.abs	Get the absolute value of the number
	math.exp	Get the value of the exponential function with the base *e*
	math.log	Get the value of the logarithmic function
	math.sin	Get the sine value
	math.sinh	Get the hyperbolic sine value
	math.cos	Get the cosine value
	math.cosh	Get the hyperbolic cosine value
	math.tan	Get the tangent value
	math.tanh	Get the hyperbolic tangent value
	math.asin	Get the arcsine value
	math.acos	Get the arccosine value
	math.atan	Get the arctangent value
	math.atan2	Get the arctangent value (two parameters)
	math.deg	Get the angle corresponding to the radians
	math.rad	Get the radians corresponding to the angle
	math.min	Get the minimum value
	math.max	Get the maximum value
	math.modf	Split the value into an integer and a decimal
	math.pi	Pi (π)
	math.pow	Get the power value
	math.randomseed	Random seed
	math.random	Get a random value
	math.sqrt	Get the square root value

The following sections will explain each in detail.

- math.abs: get the absolute value of the number

Command name	math.abs
Command expression	value = **math.abs**(value_number)
Parameter definition	value_number: signed integer
Example	v = math.abs(-123)
Example description	Get the absolute value of -123, then v = 123.
Return value	v: unsigned integer

- math.exp: get the value of the exponential function with the base *e*

Command name	math.exp
Command expression	value = **math.exp**(x)
Parameter definition	x: power
Example	v = math.exp(1)
Example description	Get the value of the natural exponential *e* raised to power 1, then v = 2.718281828459.
Return value	v: the value of the natural exponential *e* raised to power x

- math.log: get the value of the logarithmic function

Command name	math.log
Command expression	value= **math.log**(x, base)
Parameter definition	x: value base: the logarithm base; if left blank, the base is a natural exponent.
Example	v = math.log(1000, 10)
Example description	Use 10 as the base to calculate the logarithmic of 1000, then v = 3.
Return value	v: logarithm

- math.sin: get the sine value

Command name	math.sin
Command expression	value = **math.sin**(radian)
Parameter definition	radian: floating-point number; radians
Example	v = math.sin(math.rad(30))
Example description	v is the value of sin30°, then v = 0.499999.
Return value	v: floating-point number

■ math.sinh: get the hyperbolic sine value

Command name	math.sinh
Command expression	value = **math.sinh**(tangenhValue)
Parameter definition	tangenhValue: number; tangens hiperboliczny values
Example	v = math.sinh(2)
Example description	Get the value of sinh(2), then v = 3.62860.
Return value	v: hyperbolic function value

■ math.cos: get the cosine value

Command name	math.cos
Command expression	value = **math.cos**(radian)
Parameter definition	radian: floating-point number; radians
Example	v = math.cos(math.rad(30))
Example description	Get the value of cos30°, then v = 0.866025.
Return value	v: floating-point number

■ math.cosh: get the hyperbolic cosine value

Command name	math.cosh
Command expression	value = **math.cosh**(tangenhValue)
Parameter definition	tangenhValue: number; tangens hiperboliczny values
Example	v = math.cosh(2)
Example description	Get the value of cosh(2), then v = 3.7621956910.
Return value	v: hyperbolic function value

■ math.tan: get the tangent value

Command name	math.tan
Command expression	value = **math.tan**(radian)
Parameter definition	radian: floating-point number; radians
Example	v = math.tan(math.rad(30))
Example description	Get the value of tan30°, then v = 0.599350.
Return value	v: floating-point number

■ math.tanh: get the hyperbolic tangent value

Command name	math.tanh
Command expression	value = **math.tanh**(tangenhValue)
Parameter definition	tangenhValue: number; tangens hiperboliczny values
Example	v = math.tanh(2)
Example description	Get the value of tanh(2), then v = 0.964027580.
Return value	v: hyperbolic function value

■ math.asin: get the arcsine value

Command name	math.asin
Command expression	value = **math.asin**(radian)
Parameter definition	radian: floating-point number; radians
Example	v = math.asin(math.rad(30))
Example description	Get the value of arcsin 30°, then v = 0.551069.
Return value	v: floating-point number

■ math.acos: get the arccosine value

Command name	math.acos
Command expression	value = **math.acos**(radian)
Parameter definition	radian: floating-point number; radians
Example	v = math.acos(math.rad(30))
Example description	Get the value of arccos 30°, then v = 1.019726.
Return value	v: floating-point number

■ math.atan: get the arctangent value

Command name	math.atan
Command expression	value = **math.atan**(radian)
Parameter definition	radian: floating-point number; radians
Example	v = math.atan(math.rad(30))
Example description	Get the value of arctan 30°, then v = 0.482347.
Return value	v: floating-point number

■ math.atan2: get the arctangent value (two parameters)

Command name	math.atan2
Command expression	value = **math.atan2**(yRadian, xRadian)
Parameter definition	yRadian: number; length of y-axis xRadian: number; length of x-axis, can be 0
Example	v = math.atan2(math.rad(30), math.rad(60))
Example description	Get the value of atan2 (30°, 60°), then v = 0.463647609000806. Note: atan2 (30°, 60°) = atan(30°/60°).
Return value	v: floating-point number

■ math.deg: get the angle corresponding to the radians

Command name	math.deg
Command expression	angle = **math.deg**(radian)
Parameter definition	radian: floating-point number; radians
Example	v = math.deg(math.pi)
Example description	Convert π to degrees, then v = 180.
Return value	v: floating-point number, angle

■ math.rad: get the radians corresponding to the angle

Command name	math.rad
Command expression	radian = **math.rad**(angle)
Parameter definition	angle: floating-point number; angle
Example	v = math.rad(180)
Example description	Convert π to radians, then v = 3.14159265.
Return value	v: positive number

■ math.min: get the minimum value

Command name	math.min
Command expression	min_value = **math.min**(v1, v2)
Parameter definition	v1, v2: floating-point numbers; numerical values
Example	v = math.min(-2, 3.6)
Example description	Get the minimum value between -2 and 3.6, then v = -2.
Return value	v: floating-point number; minimum value

- math.max: get the maximum value

Command name	math.max
Command expression	max_value = **math.max**(v1, v2)
Parameter definition	v1, v2: floating-point numbers; numerical values
Example	v = math.max(-2, 3.6)
Example description	Get the maximum value between -2 and 3.6, then v = 3.6.
Return value	v: floating-point number; maximum value

- math.modf: split the value into an integer and a decimal

Command name	math.modf
Command expression	Integer, fraction = **math.modf**(v1)
Parameter definition	v1: floating-point number
Example	v1, v2 = math.modf(3.6)
Example description	Split 3.6 into an integer and a decimal, then v1 = 3, and v2 = 0.6.
Return value	v1: integer value v2: decimal value

- math.pi: Pi (π)

Command name	math.pi
Command expression	value = **math.pi**
Parameter definition	No parameters
Example	v = math.pi
Example description	v = 3.1415926535898.
Return value	v: Pi (π)

- math.pow: get the power value

Command name	math.pow
Command expression	value = **math.pow**(x, y)
Parameter definition	x: base y: power
Example	v = math.pow(2, 3)
Example description	Get the value of 2 to the 3rd power, then v = 8.
Return value	v: x to the power of y

■ math.randomseed: random seed (used with the *math.random* command)

Command name	math.randomseed
Command expression	**math.randomseed**(seedValue)
Parameter definition	seedValue: initial random seed; you can set this variable to a time
Example	math.randomseed(sys.GetTick()) v = math.random(0, 1000)
Example description	■ When the *random* function is used, it generates the same numbers with the same order. To generate random numbers with different orders, you can specify a random seed with the *randomSeed* function before using the random function. ■ v can be any integer randomly generated from 0 to 1000.
Return value	v: integer

■ math.random: get a random value

Command name	math.random
Command expression	value = **math.random**(lower, upper)
Parameter definition	lower: upper limit upper: lower limit
Example	math.randomseed(sys.GetTick()) v = math.random(0, 1000)
Example description	■ When the *random* function is used, it generates the same numbers with the same order. To generate random numbers with different orders, you can specify a random seed with the *randomSeed* function before using the random function. ■ v can be any integer randomly generated from 0 to 1000.
Return value	v: integer

■ math.sqrt: get the square root value

Command name	math.sqrt
Command expression	sqrt = **math.sqrt**(nSquare)
Parameter definition	nSquare: the radicand
Example	v = math.sqrt(100)
Example description	Get the square root value of 100, then v = 10.
Return value	v: square root

4.9 Recipe

These commands help you read and write the recipes. The recipes include 16-bit recipes, 32-bit recipes, and enhanced recipes. If you need to specify a 16-bit recipe, the recipe group is 0. If you need a 32-bit recipe, the recipe group is from 1 to 255. The commands include:

Command	Command expression	Description
Recipe	recipe.GetCurRcpNoIndex	Get the current recipe number index
	recipe.GetCurRcpGIndex	Get the current recipe group index
	recipe.GetRcpWord	Get the value of the specified recipe address (Word)
	recipe.GetRcpDWord	Get the value of the specified recipe address (Double Word)
	recipe.GetRcpFloat	Get the value of the specified recipe address (Float)
	recipe.GetCurEnRcpNoName	Get the index name of the current enhanced recipe number
	recipe.GetCurEnRcpGName	Get the index name of the current enhanced recipe group
	recipe.GetCurEnRcpNoIndex	Get the index of the current enhanced recipe number
	recipe.GetCurEnRcpGIndex	Get the index of the current enhanced recipe group
	recipe.GetEnRcpWord	Get the value of the specified enhanced recipe address (Word)
	recipe.GetEnRcpDWord	Get the value of the specified enhanced recipe address (Double Word)
	recipe.GetEnRcpFloat	Get the value of the specified enhanced recipe address (Float)
	recipe.GetEnRcpAscii	Get the string of the specified enhanced recipe address
	recipe.SetRcpWord	Set parameters to the recipe address (Word)
	recipe.SetRcpDWord	Set parameters to the recipe address (Double Word)
	recipe.SetRcpFloat	Set parameters to the recipe address (Float)
	recipe.SetCurEnRcpNoName	Set the name of the enhanced recipe number
	recipe.SetCurEnRcpGName	Set the name of the enhanced recipe group
	recipe.SetEnRcpWord	Set parameters to the enhanced recipe address (Word)
	recipe.SetEnRcpDWord	Set parameters to the enhanced recipe address (Double Word)
	recipe.SetEnRcpFloat	Set parameters to the enhanced recipe address (Float)
	recipe.SetEnRcpAscii	Set the string to the enhanced recipe address
	recipe.ChangeRcpNoIndex	Change the index of the recipe number
	recipe.ChangeRcpGIndex	Change the index of the recipe group
	recipe.ChangeEnRcpNoIndex	Change the index of the enhanced recipe number
	recipe.ChangeEnRcpGIndex	Change the index of the enhanced recipe group
	recipe.SetEnRcpDouble	Set parameters to the enhanced recipe address (double-precision floating-point number)
	recipe.GetEnRcpDouble	Get the value of the specified enhanced recipe address (double-precision floating-point number)

The following sections will explain each in detail.

■ recipe.GetCurRcpNoIndex: get the current recipe number index

Command name	recipe.GetCurRcpNoIndex
Command expression	ret, noIdx = **recipe.GetCurRcpNoIndex**()
Parameter definition	No parameters
Example	ret, noIdx = recipe.GetCurRcpNoIndex()
Example description	Get the current recipe number index.
Return value	ret: return 1 on success; return 0 on failure noIdx: integer; recipe number index

■ recipe.GetCurRcpGIndex: get the current recipe group index

Command name	recipe.GetCurRcpGIndex
Command expression	ret, gIdx = **recipe.GetCurRcpGIndex**()
Parameter definition	No parameters
Example	ret, gIdx = recipe.GetCurRcpGIndex()
Example description	Get the current recipe group index.
Return value	ret: return 1 on success; return 0 on failure gIdx: integer, recipe group index

■ recipe.GetRcpWord: get the value of the specified recipe address (Word)

Command name	recipe.GetRcpWord
Command expression	ret, value = **recipe.GetRcpWord**(index)
Parameter definition	index: integer; recipe index
Example	ret, value = recipe.GetRcpWord(1)
Example description	Get the value of the specified recipe address (RCP1) in units of unsigned Word.
Return value	ret: return 1 on success; return 0 on failure value: integer; unsigned recipe address value in units of Word

■ recipe.GetRcpDWord: get the value of the specified recipe address (Double Word)

Command name	recipe.GetRcpDWord
Command expression	ret, value = **recipe.GetRcpDWord**(index, [value_format])
Parameter definition	index: integer; recipe index value_format: formatted string.Fill in "signed" for signed numbers; this parameter is not mandatory.
Example	ret, value = recipe.GetRcpDWord(1)
Example description	Get the value of the specified recipe address (RCP1) in units of Double Word.
Return value	ret: return 1 on success; return 0 on failure value: integer; recipe address value in units of Double Word

■ recipe.GetRcpFloat: get the value of the specified recipe address (Float)

Command name	recipe.GetRcpFloat
Command expression	ret, value = **recipe.GetRcpFloat**(index)
Parameter definition	index: integer; recipe index
Example	ret, value = recipe.GetRcpFloat(1)
Example description	Get the value of the specified recipe address (RCP1) in units of Float.
Return value	ret: return 1 on success; return 0 on failure value: floating-point number; the recipe address value in units of 32-bit floating-point number

■ recipe.GetCurEnRcpNoName: get the index name of the current enhanced recipe number

Command name	recipe.GetCurEnRcpNoName
Command expression	ret, noName = **recipe.GetCurEnRcpNoName**()
Parameter definition	No parameters
Example	ret, noName = recipe.GetCurEnRcpNoName()
Example description	Get the index name of the current enhanced recipe number.
Return value	ret: return 1 on success; return 0 on failure noName: string; the name of the currently active enhanced recipe number

■ recipe.GetCurEnRcpGName: get the index name of the current enhanced recipe group

Command name	recipe.GetCurEnRcpGName
Command expression	ret, gName = **recipe.GetCurEnRcpGName**()
Parameter definition	No parameters
Example	ret, gName = recipe.GetCurEnRcpGName()
Example description	Get the index name of the current enhanced recipe group.
Return value	ret: return 1 on success; return 0 on failure gName: string; the name of the currently active enhanced recipe group

■ recipe.GetCurEnRcpNoIndex: get the index of the current enhanced recipe number

Command name	recipe.GetCurEnRcpNoIndex
Command expression	ret, noIdx = **recipe.GetCurEnRcpNoIndex**()
Parameter definition	No parameters
Example	ret, noIdx = recipe.GetCurEnRcpNoIndex()
Example description	Get the index of the current enhanced recipe number.
Return value	ret: return 1 on success; return 0 on failure noIdx: integer; the index of the currently active enhanced recipe number

- recipe.GetCurEnRcpGIndex: get the index of the current enhanced recipe group

Command name	recipe.GetCurEnRcpGIndex
Command expression	ret, gIdx = **recipe.GetCurEnRcpGIndex**()
Parameter definition	No parameters
Example	ret, gIdx = recipe.GetCurEnRcpGIndex()
Example description	Get the index of the current enhanced recipe group.
Return value	ret: return 1 on success; return 0 on failure gIdx: integer; the index of the currently active enhanced recipe group

- recipe.GetEnRcpWord: get the value of the specified enhanced recipe address (Word)

Command name	recipe.GetEnRcpWord
Command expression	ret, value = **recipe.GetEnRcpWord**(index)
Parameter definition	index: integer; enhanced recipe index
Example	ret, value = recipe.GetEnRcpWord(2)
Example description	Get the value of the specified enhanced recipe address (ENRCP2) in units of unsigned Word.
Return value	ret: return 1 on success; return 0 on failure value: integer; the enhanced recipe address value in units of Word

- recipe.GetEnRcpDWord: get the value of the specified enhanced recipe address (Double Word)

Command name	recipe.GetEnRcpDWord
Command expression	ret, value = **recipe.GetEnRcpDWord**(index, [value_format])
Parameter definition	index: integer, enhanced recipe index value_format: formatted string. Fill in "signed" for signed numbers; this parameter is not mandatory.
Example	ret, value = recipe.GetEnRcpDWord(2)
Example description	Get the value of the specified enhanced recipe address (ENRCP2) in units of Double Word.
Return value	ret: return 1 on success; return 0 on failure

- recipe.GetEnRcpFloat: get the value of the specified enhanced recipe address (Float)

Command name	recipe.GetEnRcpFloat
Command expression	ret, value = **recipe.GetEnRcpFloat**(index)
Parameter definition	index: Integer, enhanced recipe index
Example	ret, value = recipe.GetEnRcpFloat(2)
Example description	Get the value of the specified enhanced recipe address (ENRCP2) in units of Float.
Return value	ret: return 1 on success; return 0 on failure value: floating-point number; the enhanced recipe address value in units of 32-bit floating-point number

■ recipe.GetEnRcpAscii: get the string of the specified enhanced recipe address

Command name	recipe.GetEnRcpAscii
Command expression	ret, str = **recipe.GetEnRcpAscii**(index)
Parameter definition	index: integer; enhanced recipe index
Example	ret, str = recipe.GetEnRcpAscii(2)
Example description	Get the string of the specified enhanced recipe address (ENRCP2).
Return value	ret: return 1 on success; return 0 on failure str: string; string of the enhanced recipe address

■ recipe.SetRcpWord: set parameters to the recipe address (Word)

Command name	recipe.SetRcpWord
Command expression	ret = **recipe.SetRcpWord**(index, word)
Parameter definition	index: integer; recipe index word: integer; unsigned recipe address value in units of Word
Example	ret = recipe.SetRcpWord(1, 5)
Example description	Set 5 to the recipe address RCP1.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.SetRcpDWord: set parameters to the recipe address (Double Word)

Command name	recipe.SetRcpDWord
Command expression	ret = **recipe.SetRcpDWord**(index, dword)
Parameter definition	index: integer; recipe index dword: integer; the recipe address value in units of Double Word
Example	ret = recipe.SetRcpDWord(1, 65536)
Example description	Set 65536 to the recipe address RCP1.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.SetRcpFloat: set parameters to the recipe address (Float)

Command name	recipe.SetRcpFloat
Command expression	ret = **recipe.SetRcpFloat**(index, floatValue)
Parameter definition	index: integer; recipe index floatValue: floating-point number; the recipe address value in units of 32-bit floating-point number
Example	ret = recipe.SetRcpFloat(1, 9.9)
Example description	Set 9.9 to the recipe address RCP1.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.SetCurEnRcpNoName: set the name of the enhanced recipe number

Command name	recipe.SetCurEnRcpNoName
Command expression	ret = **recipe.SetCurEnRcpNoName**(newName)
Parameter definition	newName: string; the name to be set for the enhanced recipe number
Example	ret = recipe.SetCurEnRcpNoName("POSHENG")
Example description	Set POSHENG as the name of the currently specified enhanced recipe number.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.SetCurEnRcpGName: set the name of the enhanced recipe group

Command name	recipe.SetCurEnRcpGName
Command expression	ret = **recipe.SetCurEnRcpGName**(newName)
Parameter definition	newName: string; the name to be set for the enhanced recipe group
Example	ret = recipe.SetCurEnRcpGName("POSHENG")
Example description	Set POSHENG as the name of the currently specified enhanced recipe group.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.SetEnRcpWord: set parameters to the enhanced recipe address (Word)

Command name	recipe.SetEnRcpWord
Command expression	ret = **recipe.SetEnRcpWord**(index, word)
Parameter definition	Index: integer; enhanced recipe index Word: integer; the enhanced recipe address value in units of Word
Example	ret = recipe.SetEnRcpWord(1, 88)
Example description	Set 88 to the current enhanced recipe address ENRCP1.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.SetEnRcpDWord: set parameters to the enhanced recipe address (Double Word)

Command name	recipe.SetEnRcpDWord
Command expression	ret = **recipe.SetEnRcpDWord**(index, dword)
Parameter definition	Index: integer; enhanced recipe index dword: integer; the enhanced recipe address value in units of Double Word
Example	ret = recipe.SetEnRcpDWord(2, 65536)
Example description	Set 65536 to the current enhanced recipe address ENRCP2.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.SetEnRcpFloat: set parameters to the enhanced recipe address (Float)

Command name	recipe.SetEnRcpFloat
Command expression	ret = **recipe.SetEnRcpFloat**(index, floatValue)
Parameter definition	Index: integer; enhanced recipe index floatValue: floating-point number; the enhanced recipe address value in units of 32-bit floating-point number
Example	ret = recipe.SetEnRcpFloat(3, 99.9)
Example description	Set 99.9 to the enhanced recipe address ENRCP3.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.SetEnRcpAscii: set the string to the enhanced recipe address

Command name	recipe.SetEnRcpAscii
Command expression	ret = **recipe.SetEnRcpAscii**(index, str, len)
Parameter definition	Index: integer; enhanced recipe index str: string; string of the enhanced recipe len: integer; string length
Example	ret = recipe.SetEnRcpAscii(4, "POSHENG", 6)
Example description	Set POSHENG to the enhanced recipe address ENRCP4 with the length of 6 bytes.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.ChangeRcpNoIndex: change the index of the recipe number

Command name	recipe.ChangeRcpNoIndex
Command expression	ret = **recipe.ChangeRcpNoIndex**(noIdx)
Parameter definition	noIdx: integer; recipe number index
Example	ret = recipe.ChangeRcpNoIndex(1)
Example description	Change the recipe number index to 1.
Return value	ret: return 1 on success; return 0 on failure

■ recipe.ChangeRcpGIndex: change the index of the recipe group

Command name	recipe.ChangeRcpGIndex
Command expression	ret = **recipe.ChangeRcpGIndex**(gIdx)
Parameter definition	gIdx: integer; recipe group index
Example	ret = recipe.ChangeRcpGIndex(1)
Example description	Change the recipe group index to 1.
Return value	ret: return 1 on success; return 0 on failure

- recipe.ChangeEnRcpNoIndex: change the index of the enhanced recipe number

Command name	recipe.ChangeEnRcpNoIndex
Command expression	ret = **recipe.ChangeEnRcpNoIndex**(noIdx)
Parameter definition	noIdx: integer; enhanced recipe number index
Example	ret = recipe.ChangeEnRcpNoIndex(3)
Example description	Change the enhanced recipe number index to 3.
Return value	ret: return 1 on success; return 0 on failure

- recipe.ChangeEnRcpGIndex: change the index of the enhanced recipe group

Command name	recipe.ChangeEnRcpGIndex
Command expression	ret = **recipe.ChangeEnRcpGIndex**(gIdx)
Parameter definition	gIdx: integer; enhanced recipe group index
Example	ret = recipe.ChangeEnRcpGIndex(2)
Example description	Change the enhanced recipe group index to 2.
Return value	ret: return 1 on success; return 0 on failure

- recipe.SetEnRcpDouble: set parameters to the enhanced recipe address (double-precision floating-point number)

Command name	recipe.SetEnRcpDouble
Command expression	ret = **recipe.SetEnRcpDouble**(index, doubleValue)
Parameter definition	Index: integer; enhanced recipe index doubleValue: floating-point number; the enhanced recipe address value in units of 64-bit floating-point number
Example	ret = recipe.SetEnRcpDouble(0, 22.22)
Example description	Set 22.22 to the enhanced recipe address ENRCP0.
Return value	ret: return 1 on success; return 0 on failure

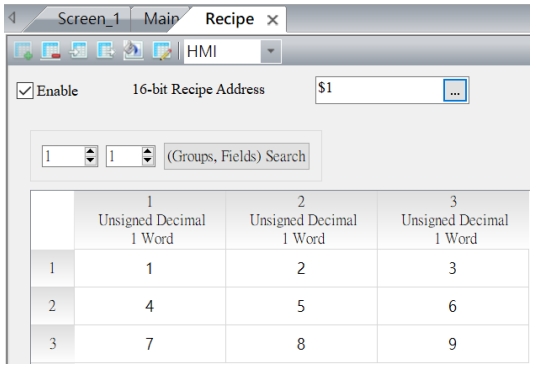
- recipe.GetEnRcpDouble: get the value of the specified enhanced recipe address (double-precision floating-point number)

Command name	recipe.GetEnRcpDouble
Command expression	ret, value = **recipe.GetEnRcpDouble**(index)
Parameter definition	Index: integer; enhanced recipe index
Example	ret, value = recipe.GetEnRcpDouble(0)
Example description	Get the value of the specified enhanced recipe address (ENRCP0) in units of 64-bit floating-point number.
Return value	ret: return 1 on success; return 0 on failure

Examples (recipe.GetCurRcpNoIndex, recipe.GetCurRcpGIndex, recipe.GetRcpWord, recipe.GetRcpDWord, recipe.GetRcpFloat)

Create 16-bit and 32-bit recipes

■ In the DOPSoft, go to [Options] > [Recipe] > [16-Bit Recipe] > to add a recipe with the button.



	1 Unsigned Decimal 1 Word	2 Unsigned Decimal 1 Word	3 Unsigned Decimal 1 Word
1	1	2	3
2	4	5	6
3	7	8	9

■ In the DOPSoft, go to [Options] > [Recipe] > [32-Bit Recipe] > to add 2 new recipes with the button.

Group 1:

	1 Unsigned Decimal 2 Word	2 Unsigned Decimal 2 Word	3 Unsigned Decimal 2 Word
1	10000	20000	30000
2	40000	50000	60000
3	70000	80000	90000

Group 2:

	1 Floating 2 Word	2 Floating 2 Word	3 Floating 2 Word
1	1.10	2.20	3.30
2	4.40	5.50	6.60
3	7.70	8.80	9.90

Build Lua program

■ Enter the Lua command as follows.

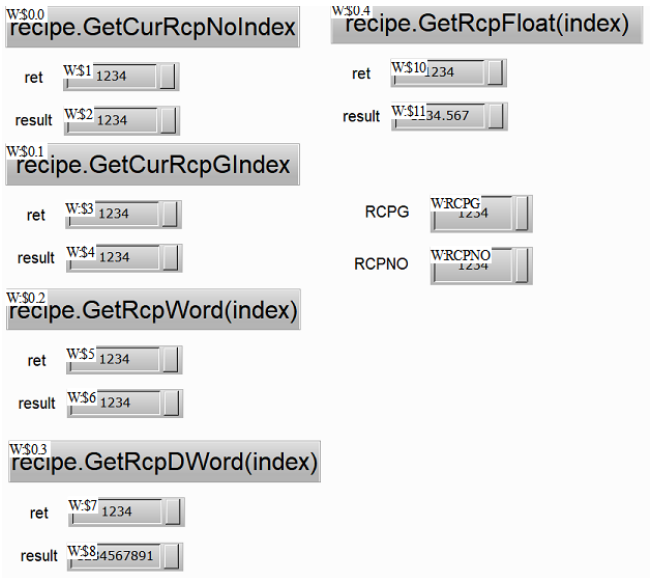
```
index=1
while true do
    if mem.inter.ReadBit(0,0)==1 then
        ret, noIdx = recipe.GetCurRcpNoIndex()
        mem.inter.Write(1, ret)
        mem.inter.Write(2,noIdx)
    end

    if mem.inter.ReadBit(0,1)==1 then
        ret, gIdx = recipe.GetCurRcpGIndex()
        mem.inter.Write(3, ret)
        mem.inter.Write(4,gIdx)
    end

    if mem.inter.ReadBit(0,2)==1 then
        ret, value = recipe.GetRcpWord(index)
        mem.inter.Write(5, ret)
        mem.inter.Write(6,value)
    end

    if mem.inter.ReadBit(0,3)==1 then
        ret, value = recipe.GetRcpDWord(index)
        mem.inter.Write(7, ret)
        mem.inter.WriteDW(8,value)
```

Examples (recipe.GetCurRcpNoIndex, recipe.GetCurRcpGIndex, recipe.GetRcpWord, recipe.GetRcpDWord, recipe.GetRcpFloat)

```
    end

    if mem.inter.ReadBit(0,4)==1 then
        ret, value = recipe.GetRcpFloat(index)
        mem.inter.Write(10, ret)
        mem.inter.WriteFloat(11,value)
    end
end
```

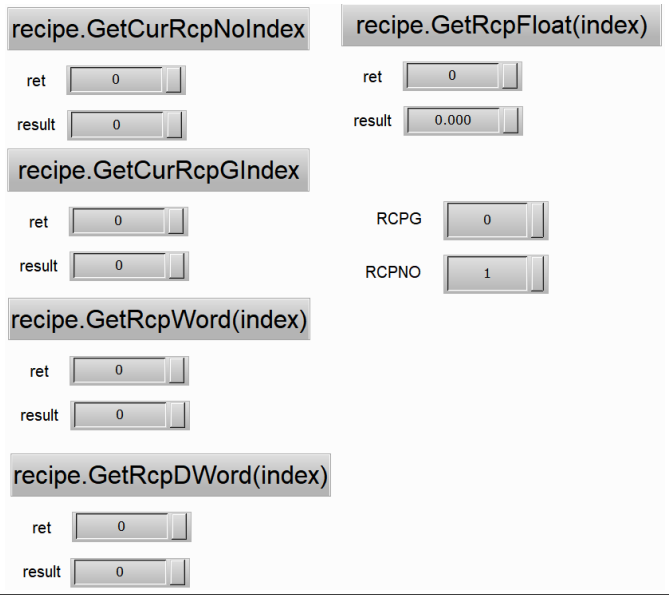
Create elements

- Create 5 Maintained buttons with the Write Addresses as $0.0, $0.1, $0.2, $0.3, and $0.4.
- Create 8 Numeric Entry elements with the Data Type as Word and the Data Format as Unsigned Decimal, and then set the Write Addresses to $1, $2, $3, $4, $5, $6, $7, and $10.
- Create a Numeric Entry element with the Data Type as Double Word and the Data Format as Floating, and then set the Write Address to $11.
- Create a Numeric Entry element with the Data Type as Double Word and the Data Format as Unsigned Decimal, and then set the Write Address to $8.
- Create 2 Numeric Entry elements, and set the Write Addresses to RCPG and RCPNO.

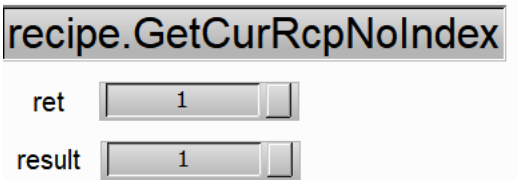
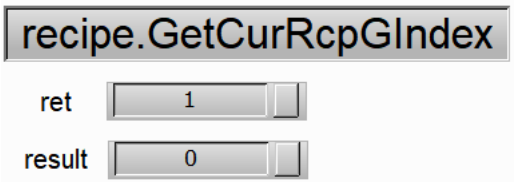
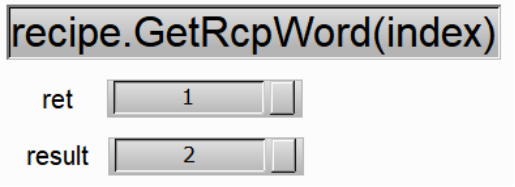
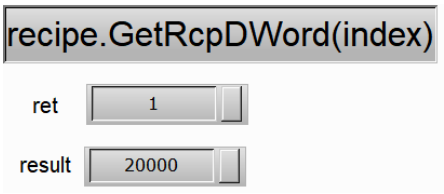


Execution results

- After building the Lua program and creating the elements, compile and download the project to the HMI.



Examples (recipe.GetCurRcpNoIndex, recipe.GetCurRcpGIndex, recipe.GetRcpWord, recipe.GetRcpDWord, recipe.GetRcpFloat)	

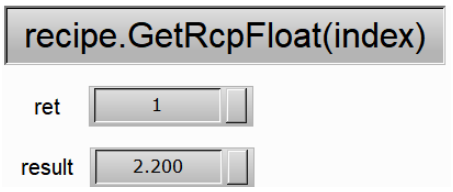
Execution results	■ Press $0.0 to write the return value to $1 and write the current number index RCPNO to $2.
	`if mem.inter.ReadBit(0,0)==1 then`
	`ret, noIdx = recipe.GetCurRcpNoIndex()`
	`mem.inter.Write(1, ret)`
	`mem.inter.Write(2,noIdx)`
	`end.`
	 
	■ Press $0.1 to write the return value to $3 and write the current group index RCPG to $4.
	`if mem.inter.ReadBit(0,1)==1 then`
	`ret, gIdx = recipe.GetCurRcpGIndex()`
	`mem.inter.Write(3, ret)`
	`mem.inter.Write(4,gIdx)`
	`end`
	 
	■ Press $0.2. Since the index is 1, the HMI gets the value of RCP1 through *recipe.GetRcpWord*, and writes the result to $5 and $6.
	`if mem.inter.ReadBit(0,2)==1 then`
	`ret, value = recipe.GetRcpWord(index)`
	`mem.inter.Write(5, ret)`
	`mem.inter.Write(6,value)`
	`end`
	 
	■ Switch the recipe group RCPG to 1. Press $0.3 to write RCP to $8 in Double Word.
	`if mem.inter.ReadBit(0,3)==1 then`
	`ret, value = recipe.GetRcpDWord(index)`
	`mem.inter.Write(7, ret)`
	`mem.inter.WriteDW(8,value)`
	`end`
	 

Examples (recipe.GetCurRcpNoIndex, recipe.GetCurRcpGIndex, recipe.GetRcpWord, recipe.GetRcpDWord, recipe.GetRcpFloat)

Execution results

■ Switch the recipe group RCPG to 2. Press $0.4 to write RCP1 to $11.

```
if mem.inter.ReadBit(0,4)==1 then
    ret, value = recipe.GetRcpFloat(index)
    mem.inter.Write(10, ret)
    mem.inter.WriteFloat(11,value)
end
```



Example (recipe.GetCurEnRcpNoName, recipe.GetCurEnRcpGName, recipe.GetCurEnRcpNoIndex, recipe.GetCurEnRcpGIndex, recipe.GetEnRcpWord, recipe.GetEnRcpDWord, recipe.GetEnRcpFloat, recipe.GetEnRcpAscii)

Create Enhanced Recipe

■ In the DOPSoft, go to [Options] > [Recipe] > [Enhanced Recipe] > to add an enhanced recipe with the  button.

1:recipe1 (4X4)

	RCPNO Name	1 Unsigned Decimal 1 Word	2 Floating 2 Word	3 Char 3 Word	4 Unsigned Decimal 2 Word
Title					
1	1	1	1.1	A	11
2	2	2	2.2	B	22
3	3	3	3.3	C	33
4	4	4	4.4	D	44

Build Lua program

■ Enter the Lua command as follows.

```
while true do
    if mem.inter.ReadBit(0,6)==1 then
        ret, noName = recipe.GetCurEnRcpNoName()
        mem.inter.Write(15,ret)
        mem.inter.WriteAscii(16,noName,string.len(noName))
    end

    if mem.inter.ReadBit(0,7)==1 then
        ret, gName = recipe.GetCurEnRcpGName()
        mem.inter.Write(20,ret)
        mem.inter.WriteAscii(21,gName,string.len(gName))
    end

    if mem.inter.ReadBit(0,8)==1 then
        ret, noIdx = recipe.GetCurEnRcpNoIndex()
        mem.inter.Write(25,ret)
        mem.inter.Write(26,noIdx)
    end

    if mem.inter.ReadBit(0,9)==1 then
        ret, gIdx = recipe.GetCurEnRcpGIndex()
        mem.inter.Write(27,ret)
        mem.inter.Write(28,gIdx)
    end

    if mem.inter.ReadBit(0,10)==1 then
        ret, value = recipe.GetEnRcpWord(0)
        mem.inter.Write(29,ret)
        mem.inter.Write(30,value)
```

Example (recipe.GetCurEnRcpNoName, recipe.GetCurEnRcpGName, recipe.GetCurEnRcpNoIndex, recipe.GetCurEnRcpGIndex, recipe.GetEnRcpWord, recipe.GetEnRcpDWord, recipe.GetEnRcpFloat, recipe.GetEnRcpAscii)

```
        end

        if mem.inter.ReadBit(0,11)==1 then
            ret, value = recipe.GetEnRcpDWord(3)
            mem.inter.Write(31,ret)
            mem.inter.WriteFloat(32,value)
        end

        if mem.inter.ReadBit(0,12)==1 then
            ret, value = recipe.GetEnRcpFloat(1)
            mem.inter.Write(34,ret)
            mem.inter.WriteFloat(35,value)
        end

        if mem.inter.ReadBit(0,13)==1 then
            ret, str = recipe.GetEnRcpAscii(2)
            mem.inter.Write(37,ret)
            mem.inter.WriteAscii(38,str,string.len(str))
        end
end
```

Create elements

- Create 8 Maintained buttons with the Write Addresses as $0.6, $0.7, $0.8, $0.9, $0.10, $0.11, $0.12, and $0.13.
- Create 11 Numeric Entry elements with the Data Type as Word and the Data Format as Unsigned Decimal, and set the Write Addresses to $15, $20, $25, $26, $27, $28, $29, $30, $31, $34, and $37.
- Create 3 Character Entry elements with the Write Addresses as $16, $21, and $38, and the String Lengths as 4, 10, and 10 respectively.
- Create 2 Numeric Entry elements with the Data Type as Double Word and the Data Format as Float, and set the Write Addresses to $32 and $35.
- Create 2 Numeric Entry elements with the Write Addresses as ENRCPG and ENRCPNO.

Execution results

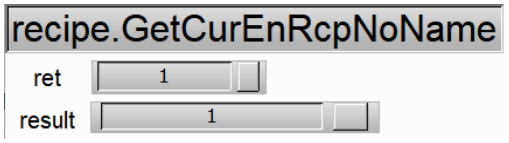
- After building the Lua program and creating the elements, compile and download the project to the HMI.

Example (recipe.GetCurEnRcpNoName, recipe.GetCurEnRcpGName, recipe.GetCurEnRcpNoIndex, recipe.GetCurEnRcpGIndex, recipe.GetEnRcpWord, recipe.GetEnRcpDWord, recipe.GetEnRcpFloat, recipe.GetEnRcpAscii)

Execution results

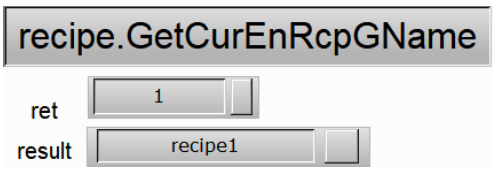
■ Press $0.6 to write the return value to $15 and write the name of the current enhanced recipe number to $16.

```
if mem.inter.ReadBit(0,6)==1 then
    ret, noName = recipe.GetCurEnRcpNoName()
    mem.inter.Write(15,ret)
    mem.inter.WriteAscii(16,noName,string.len(noName))
end
```



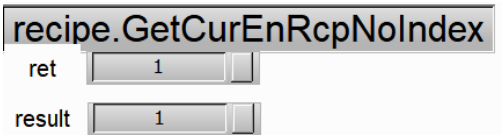
■ Press $0.7 to write the return value to $20 and write the name of the current enhanced recipe group to $21.

```
if mem.inter.ReadBit(0,7)==1 then
    ret, gName = recipe.GetCurEnRcpGName()
    mem.inter.Write(20,ret)
    mem.inter.WriteAscii(21,gName,string.len(gName))
end
```



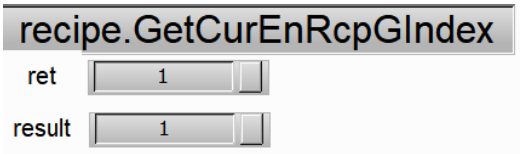
■ Press $0.8 to write the return value to $25 and write the index of the current enhanced recipe number to $26.

```
if mem.inter.ReadBit(0,8)==1 then
    ret, noIdx = recipe.GetCurEnRcpNoIndex()
    mem.inter.Write(25,ret)
    mem.inter.Write(26,noIdx)
end
```

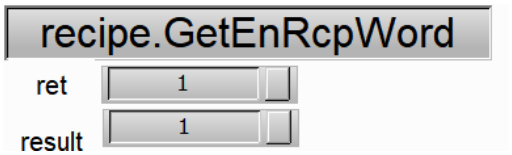
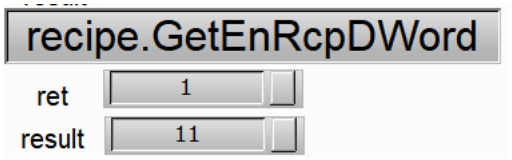
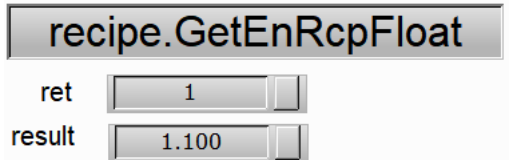
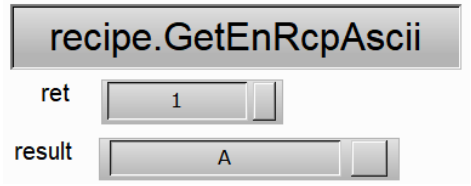


■ Press $0.9 to write the return value to $27 and write the index of the current enhanced recipe group to $28.

```
if mem.inter.ReadBit(0,9)==1 then
    ret, gIdx = recipe.GetCurEnRcpGIndex()
    mem.inter.Write(27,ret)
    mem.inter.Write(28,gIdx)
end
```



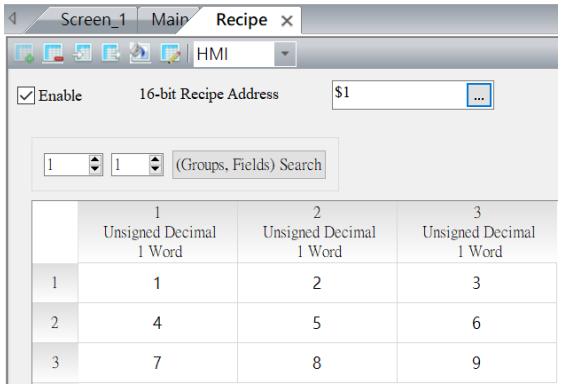
Example (recipe.GetCurEnRcpNoName, recipe.GetCurEnRcpGName, recipe.GetCurEnRcpNoIndex, recipe.GetCurEnRcpGIndex, recipe.GetEnRcpWord, recipe.GetEnRcpDWord, recipe.GetEnRcpFloat, recipe.GetEnRcpAscii)	

Execution results	■ Press $0.10 to write the return value to $29 and write the value of ENRCP0 to $30 in Word.
	`if mem.inter.ReadBit(0,10)==1 then`
	`ret, value = recipe.GetEnRcpWord(0)`
	`mem.inter.Write(29,ret)`
	`mem.inter.Write(30,value)`
	`end`
	 
	■ Press $0.11 to write the return value to $31 and write the value of ENRCP3 to $32 in Double Word.
	`if mem.inter.ReadBit(0,11)==1 then`
	`ret, value = recipe.GetEnRcpDWord(3)`
	`mem.inter.Write(31,ret)`
	`mem.inter.WriteFloat(32,value)`
	`end`
	 
	■ Press $0.12 to write the return value to $34 and write ENRCP1 to $35 in floating-point number.
	`if mem.inter.ReadBit(0,12)==1 then`
	`ret, value = recipe.GetEnRcpFloat(1)`
	`mem.inter.Write(34,ret)`
	`mem.inter.WriteFloat(35,value)`
	`end`
	 
	■ Press $0.13 to write the return value to $37 and write ENRCP2 to $38 in string.
	`if mem.inter.ReadBit(0,13)==1 then`
	`ret, str = recipe.GetEnRcpAscii(2)`
	`mem.inter.Write(37,ret)`
	`mem.inter.WriteAscii(38,str,string.len(str))`
	`end`
	 

Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)

Create recipes

■ In the DOPSoft, go to [Options] > [Recipe] > [16-Bit Recipe] > to add a recipe with the button.



	1 Unsigned Decimal 1 Word	2 Unsigned Decimal 1 Word	3 Unsigned Decimal 1 Word
1	1	2	3
2	4	5	6
3	7	8	9

■ In the DOPSoft, go to [Options] > [Recipe] > [32-Bit Recipe] > to add two recipes with the button.

Group 1:

1 (3X3) 2 (3X3)

	1 Unsigned Decimal 2 Word	2 Unsigned Decimal 2 Word	3 Unsigned Decimal 2 Word
1	10000	20000	30000
2	40000	50000	60000
3	70000	80000	90000

Group 2:

1 (3X3) 2 (3X3)

	1 Floating 2 Word	2 Floating 2 Word	3 Floating 2 Word
1	1.10	2.20	3.30
2	4.40	5.50	6.60
3	7.70	8.80	9.90

■ In the DOPSoft, go to [Options] > [Recipe] > [Enhanced Recipe] > to add two enhanced recipes with the button.

Group 1:

1:recipe (3X4) 2:recipe2 (3X4)

	RCPNO Name	1 Unsigned Decimal 1 Word	2 Floating 2 Word	3 Char 3 Word	4 Unsigned Decimal 2 Word
Title					
1	1	1	1.1	A	11
2	2	2	2.2	B	22
3	3	3	3.3	C	33

Group 2:

1:recipe (3X4) 2:recipe2 (3X4)

	RCPNO Name	1 Unsigned Decimal 1 Word	2 Floating 2 Word	3 Char 3 Word	4 Unsigned Decimal 2 Word
Title					
1	1	4	4.4	D	44
2	2	5	5.5	E	55
3	3	6	6.6	F	66

Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)

Build Lua program

■ Enter the Lua command as follows.

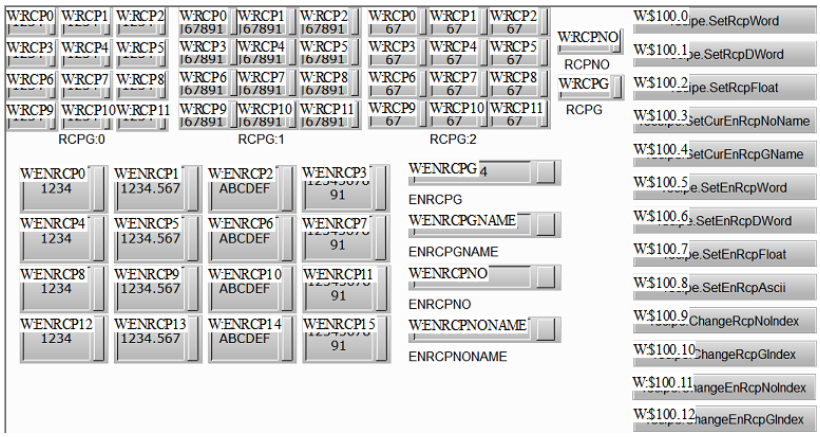
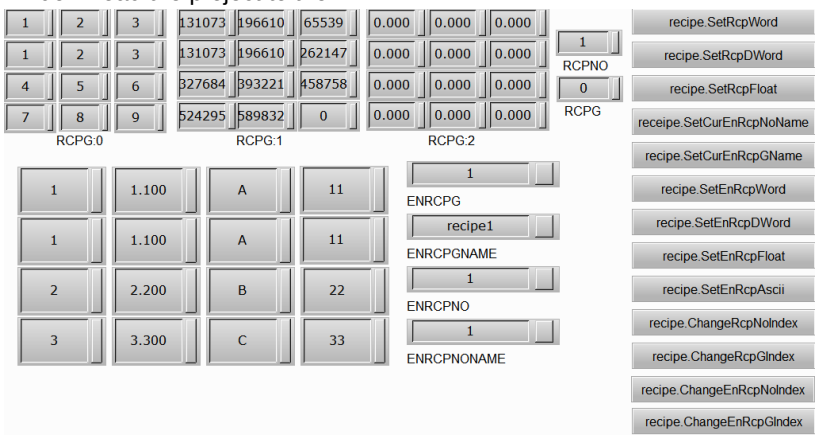
```
while true do
        if mem.inter.ReadBit(100,0)==1 then
            index=3
            word=100
            ret = recipe.SetRcpWord(index, word)
        end

        if mem.inter.ReadBit(100,1)==1 then
            index=3
            dword=70000
            ret = recipe.SetRcpDWord(index, dword)
        end

        if mem.inter.ReadBit(100,2)==1 then
            index=3
            floatValue=10.10
            ret = recipe.SetRcpFloat(index, floatValue)
        end

        if mem.inter.ReadBit(100,3)==1 then
            newName="recipe_NoName"
            ret = recipe.SetCurEnRcpNoName(newName)
        end

        if mem.inter.ReadBit(100,4)==1 then
            newName="recipe_GName"
            ret = recipe.SetCurEnRcpGName(newName)
        end

        if mem.inter.ReadBit(100,5)==1 then
            index=4
            word=88
            ret = recipe.SetEnRcpWord(index, word)
        end

        if mem.inter.ReadBit(100,6)==1 then
            index=7
            dword=70000
            ret = recipe.SetEnRcpDWord(index, dword)
        end

        if mem.inter.ReadBit(100,7)==1 then
            index=5
            dword=99.99
            ret = recipe.SetEnRcpFloat(index, floatValue)
        end

        if mem.inter.ReadBit(100,8)==1 then
            index=6
            str="POSHEN"
            len=6
            ret = recipe.SetEnRcpAscii(index, str, len)
        end
```

Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)

```
        if mem.inter.ReadBit(100,9)==1 then
            noIdx=2
            ret = recipe.ChangeRcpNoIndex(noIdx)
        end

        if mem.inter.ReadBit(100,10)==1 then
            gIdx=2
            ret = recipe.ChangeRcpGIndex(gIdx)
        end

        if mem.inter.ReadBit(100,11)==1 then
            noIdx=3
            ret = recipe.ChangeEnRcpNoIndex(noIdx)
        end

        if mem.inter.ReadBit(100,12)==1 then
            gIdx=2
            ret = recipe.ChangeEnRcpGIndex(gIdx)
        end
end
```

Create elements

- Create 12 Numeric Entry elements with the Write Addresses as RCP0, RCP1, RCP2, ... RCP11, the Data Type as Word, and the Data Format as Unsigned Decimal.
- Create 12 Numeric Entry elements with the Write Addresses as RCP0, RCP1, RCP2, ... RCP11, the Data Type as Double Word, and the Data Format as Unsigned Decimal.
- Create 12 Numeric Entry elements with the Write Addresses as RCP0, RCP1, RCP2, ... RCP11, the Data Type as Double Word, and the Data Format as Floating.
- Create 4 Numeric Entry elements with the Write Addresses as ENRCP0, ENRCP4, ENRCP8, and ENRCP12, the Data Type as Word, and the Data Format as Unsigned Decimal.
- Create 4 Numeric Entry Elements with the Write Addresses as ENRCP1, ENRCP5, ENRCP9, and ENRCP13, the Data Type as Double Word, and the Data Format as Floating.
- Create 4 Character Entry elements with the Write Addresses as ENRCP2, ENRCP6, ENRCP10, and ENRCP14, and the String Length as 6.
- Create 4 Numeric Entry elements with the Write Addresses as ENRCP3, ENRCP7, ENRCP11, and ENRCP15, the Data Type as Double Word, and the Data Format as Unsigned Decimal.

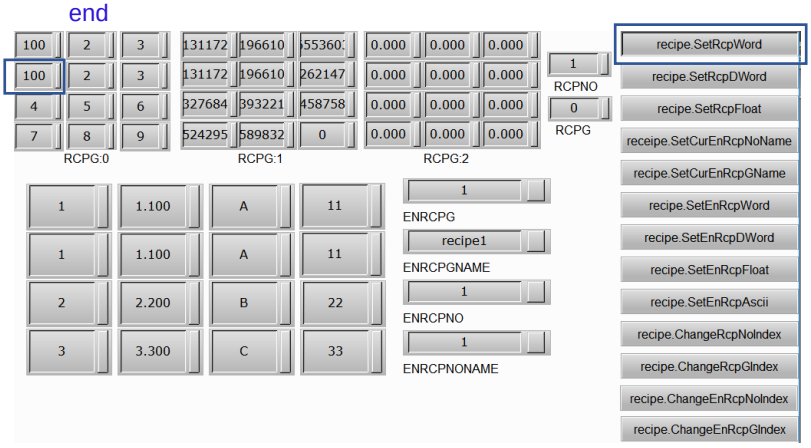
Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)	
Create elements	■ Create 2 Numeric Entry elements with the Write Addresses as RCPNO and RCPG. ■ Create 2 Character Entry elements with the Write Addresses as ENRCPGNAME and ENRCPNONAME. ■ Create 2 Numeric Entry elements with the Write Addresses as ENRCPNO and ENRCPG. ■ Create 13 Maintained buttons with the Write Addresses as $100.0, $100.1, $100.2, …, $100.12. ■ The following figure shows the results. 
Execution results	■ After building the Lua program and creating the elements, compile and download the project to the HMI. 

Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)

Execution results

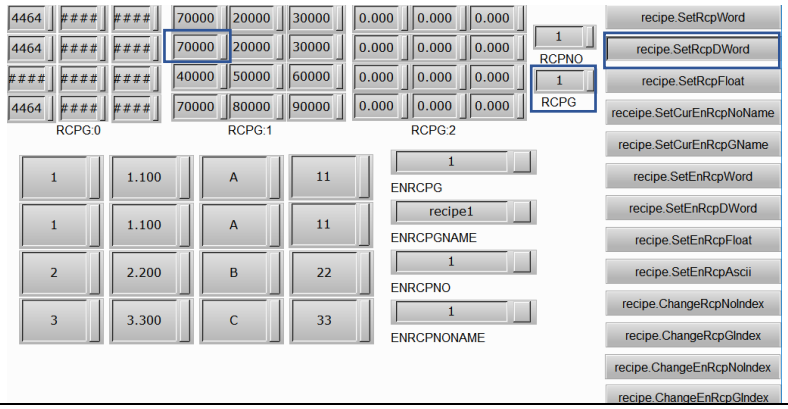
■ Press $100.0 to write the value 100 to the address RCP3 of the recipe in units of Word.

```
if mem.inter.ReadBit(100,0)==1 then
    index=3
    word=100
    ret = recipe.SetRcpWord(index, word)
end
```



■ Switch RCPG to 1, and press $100.1 to write the value 70000 to the address RCP3 of the recipe in units of DWord.

```
if mem.inter.ReadBit(100,1)==1 then
    index=3
    dword=70000
    ret = recipe.SetRcpDWord(index, dword)
end
```

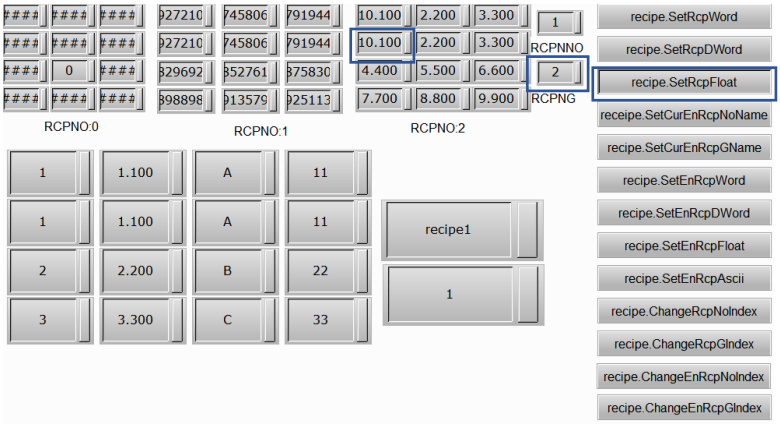


Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)

Execution results

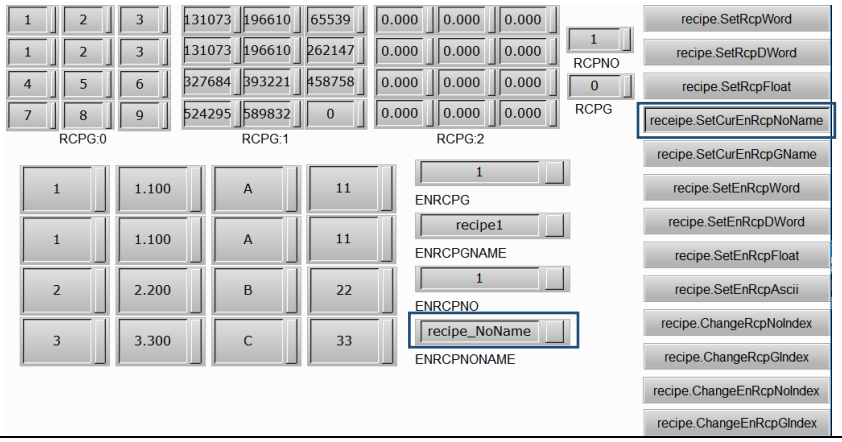
■ Switch RCPG to 2, and press $100.2 to write the value 10.10 to the address RCP3 of the recipe in units of Float.

```
if mem.inter.ReadBit(100,2)==1 then
    index=3
    floatValue=10.10
    ret = recipe.SetRcpFloat(index, floatValue)
end
```

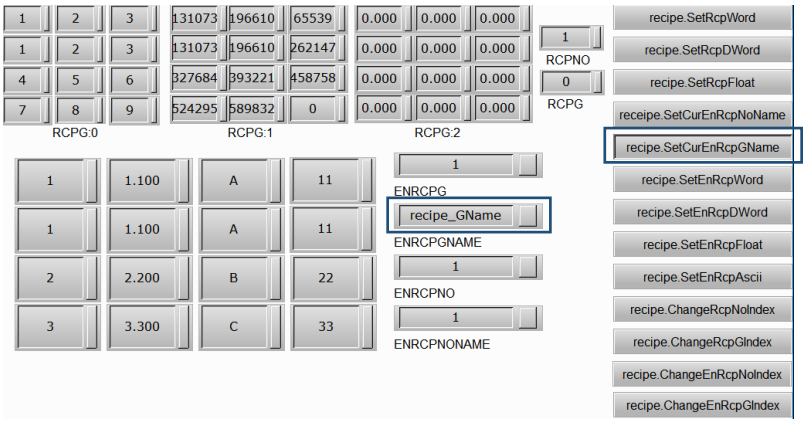
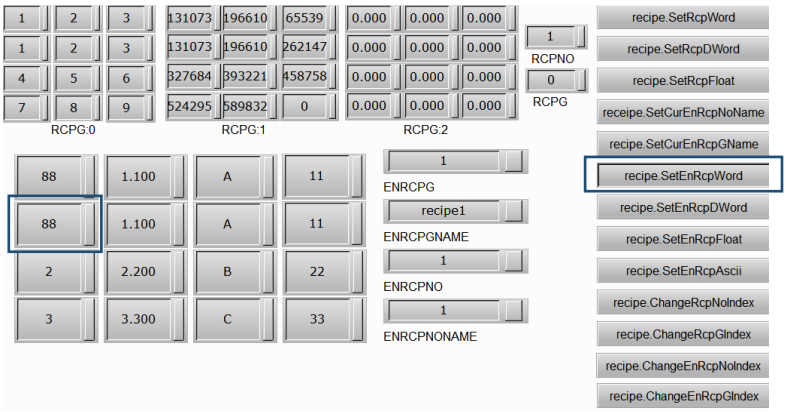


■ Press $100.3 to set the recipe number index name with the string “recipe_NoName”.

```
if mem.inter.ReadBit(100,3)==1 then
    newName="recipe_NoName"
    ret = recipe.SetCurEnRcpNoName(newName)
end
```



Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)	

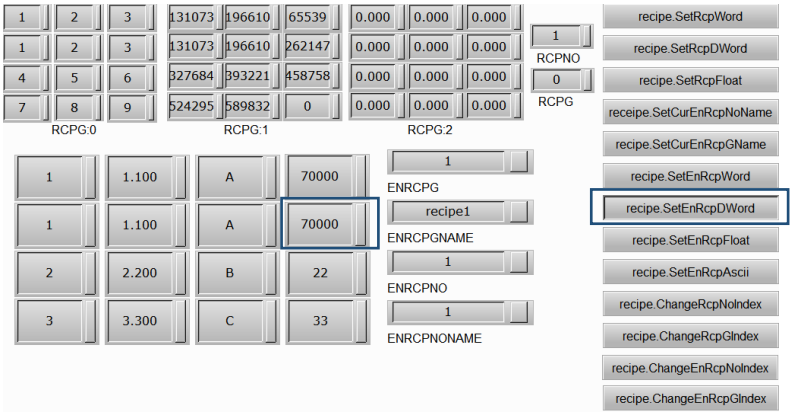
Execution results	■ Press $100.4 to set the recipe group index name with the string “recipe_GName”.
	`if mem.inter.ReadBit(100,4)==1 then`
	`newName="recipe_GName"`
	`ret = recipe.SetCurEnRcpGName(newName)`
	`end`
	 
	
	■ Press $100.5 to write the value 88 to the address ENRCP4 in units of Word.
	`if mem.inter.ReadBit(100,5)==1 then`
	`index=4`
	`word=88`
	`ret = recipe.SetEnRcpWord(index, word)`
	`end`
	 

Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)

Execution results

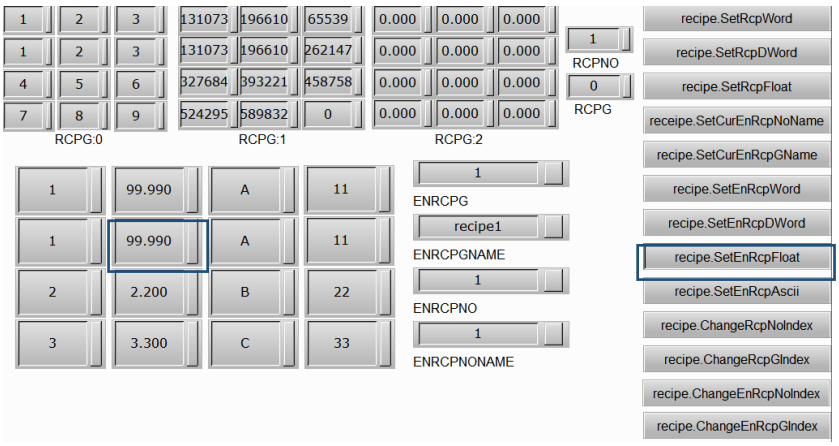
■ Press $100.6 to write the value 70000 to the address ENRCP7 in units of Double Word.

```
if mem.inter.ReadBit(100,6)==1 then
    index=7
    dword=70000
    ret = recipe.SetEnRcpDWord(index, dword)
end
```



■ Press $100.7 to write the value 99.99 to the address ENRCP5 in units of Float.

```
if mem.inter.ReadBit(100,7)==1 then
    index=5
    dword=99.99
    ret = recipe.SetEnRcpFloat(index, floatValue)
end
```

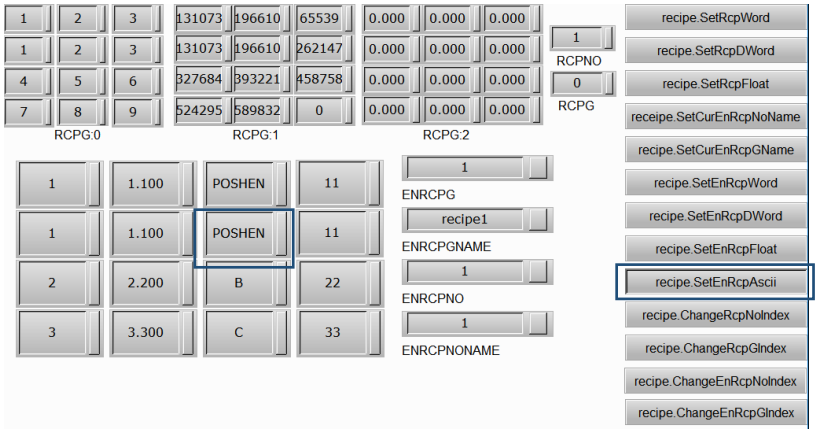


Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)

Execution results

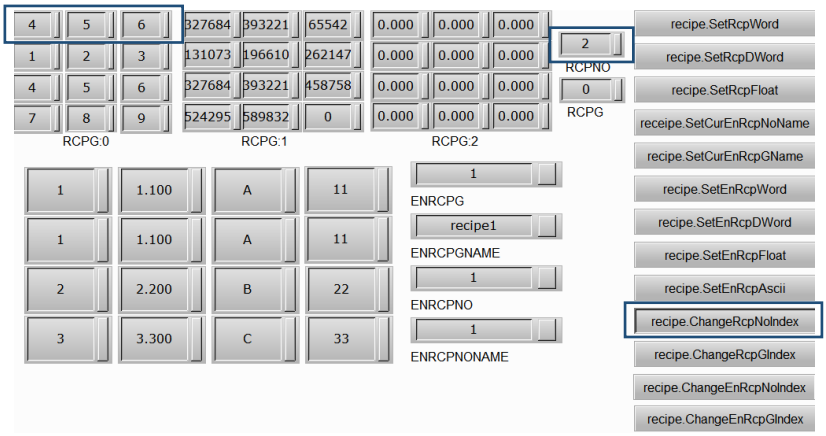
■ Press $100.8 to write the string "POSHEN" to the address ENRCP6 with the length of 6 bytes.

```
if mem.inter.ReadBit(100,8)==1 then
    index=6
    str="POSHEN"
    len=6
    ret = recipe.SetEnRcpAscii(index, str, len)
end
```



■ Press $100.9 to switch RCPNO to 2.

```
if mem.inter.ReadBit(100,9)==1 then
    noIdx=2
    ret = recipe.ChangeRcpNoIndex(noIdx)
end
```

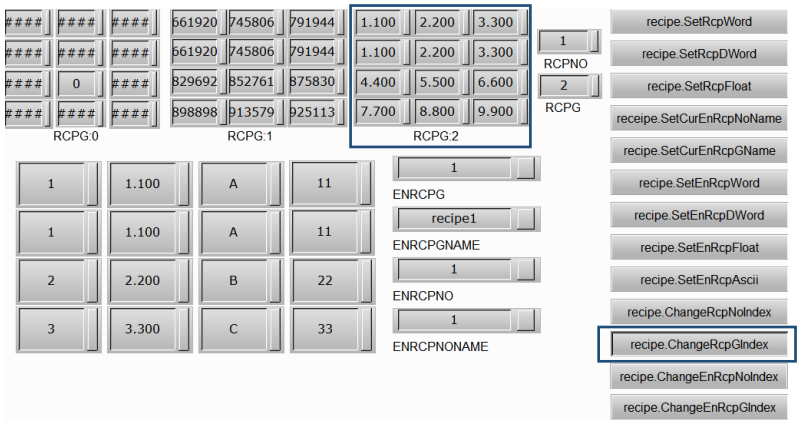


Examples (recipe.SetRcpWord, recipe.SetRcpDWord, recipe.SetRcpFloat, recipe.SetCurEnRcpNoName, recipe.SetCurEnRcpGName, recipe.SetEnRcpWord, recipe.SetEnRcpDWord, recipe.SetEnRcpFloat, recipe.SetEnRcpAscii, recipe.ChangeRcpNoIndex, recipe.ChangeRcpGIndex, recipe.ChangeEnRcpNoIndex, recipe.ChangeEnRcpGIndex)

Execution results

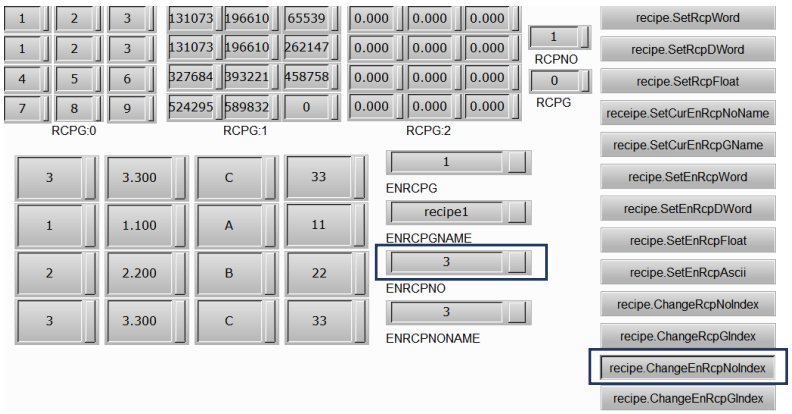
■ Press $100.10 to switch RCPG to 2.

```
if mem.inter.ReadBit(100,10)==1 then
    gIdx=2
    ret = recipe.ChangeRcpGIndex(gIdx)
end
```



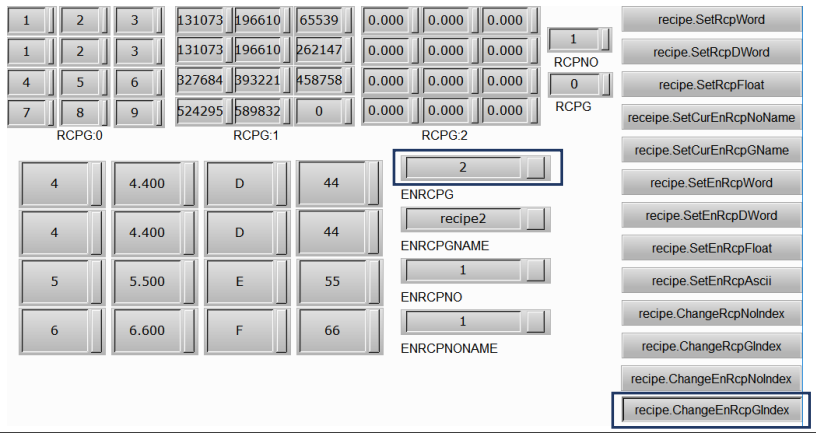
■ Press $100.11 to switch ENRCPNO to 3.

```
if mem.inter.ReadBit(100,11)==1 then
    noIdx=3
    ret = recipe.ChangeEnRcpNoIndex(noIdx)
end
```



■ Press $100.12 to switch ENRCPG to 2.

```
if mem.inter.ReadBit(100,12)==1 then
    gIdx=2
    ret = recipe.ChangeEnRcpGIndex(gIdx)
end
```



4.10 Screen (screen control)

These commands helps you control the screen. The commands include:

Command	Command expression	Description
Screen (screen control)	screen.Open	Open the specified screen
	screen.CloseSub	Close the specified screen
	screen.IsOpened	Check whether the specified screen is open
	screen.Capture	Capture screenshot and save it to the external storage device

The following sections will explain each in detail.

■ screen.Open: open the specified screen

Command name	screen.Open
Command expression	Result= **screen.Open**(screen_id)
Parameter definition	screen_id: integer; screen ID: 1 to 65535
Example	ret=screen.Open(2)
Example description	Open the screen with the Screen ID as 2.
Return value	ret: return 1 on success; return 0 on failure

■ screen.CloseSub: close the specified screen

Command name	screen.CloseSub
Command expression	ret = **screen.CloseSub**(screen_id)
Parameter definition	screen_id: integer; screen ID: 1 to 65535
Example	ret=screen.CloseSub(2)
Example description	Close the screen with the Screen ID as 2.
Return value	ret: return 1 on success; return 0 on failure

■ screen.IsOpened: check whether the specified screen is open

Command name	screen.IsOpened
Command expression	result = **screen.IsOpened**(screen_id)
Parameter definition	screen_id: integer; screen ID: 1 to 65535
Example	result = screen.IsOpened(1)
Example description	Check whether the screen with the Screen ID as 1 is open.
Return value	ret: return 1 on open; return 0 on not open

■ screen.Capture: capture screenshot and save it to the external storage device

Command name	screen.Capture
Command expression	Result = **screen.Capture**(disk_ID)
Parameter definition	disk_ID: integer; disk ID; 2: USB drive; 3: SD card
Example	Result = screen.Capture(2)
Example description	Capture screenshot and save it to the USB drive.
Return value	ret: return 1 on success; return 0 on failure

Example (Screen)

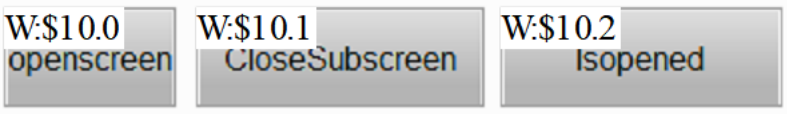
Build Lua program

■ Build the Lua program.
■ When $10.0 is triggered, the HMI opens Screen_2 and writes the return value to $1000, and then closes $10.0.
■ When $10.1 is triggered, the HMI closes Sub Screen_2 and writes the return value to $1000, and then closes $10.1.
■ When $10.2 is triggered, the HMI checks whether Screen_2 is opened, and then closes $10.2.

```
while true do
    if (mem.inter.ReadBit(10,0)==1) then
        ret=screen.Open(2)
        mem.inter.Write(1000,ret)
        mem.inter.WriteBit(10, 0, 0)
    end
    if (mem.inter.ReadBit(10,1)==1) then
        screenID = 2
        ret = screen.CloseSub(screenID)
        mem.inter.Write(1000,ret)
        mem.inter.WriteBit(10, 1, 0)
    end
    if (mem.inter.ReadBit(10,2)==1) then
        diskID = 2
        ret = screen.IsOpened(diskID)
        mem.inter.Write(1000,ret)
        mem.inter.WriteBit(10, 2, 0)
    end
end
```

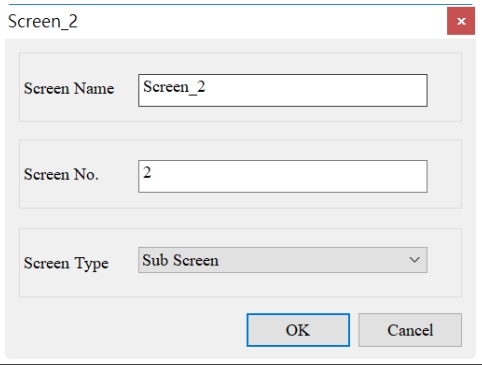
Create Maintained buttons

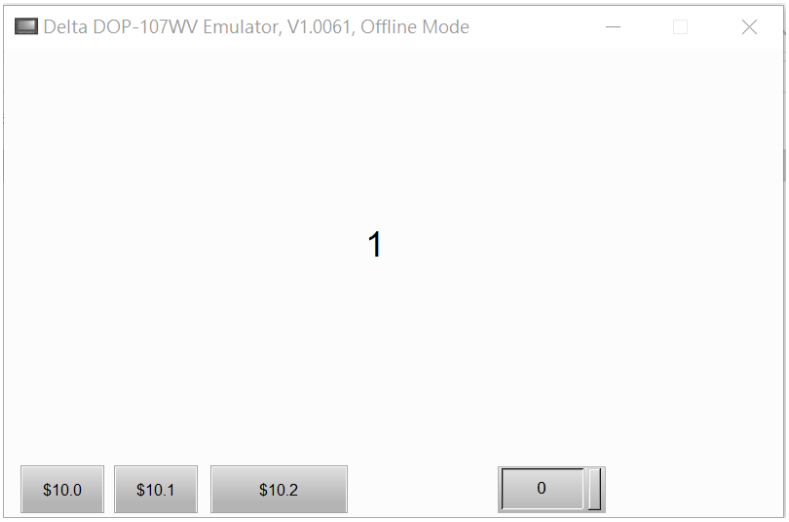
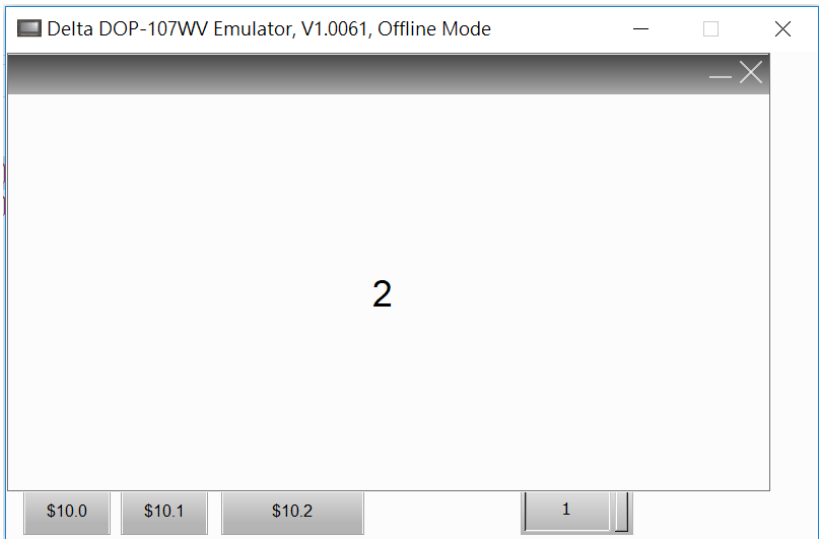
■ Create 3 Maintained buttons with the Write Addresses as $10.0, $10.1, and $10.2.

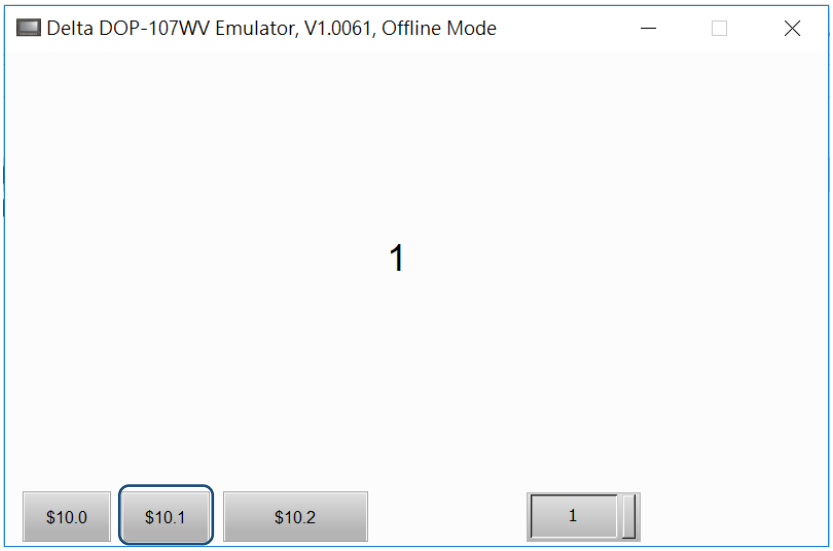
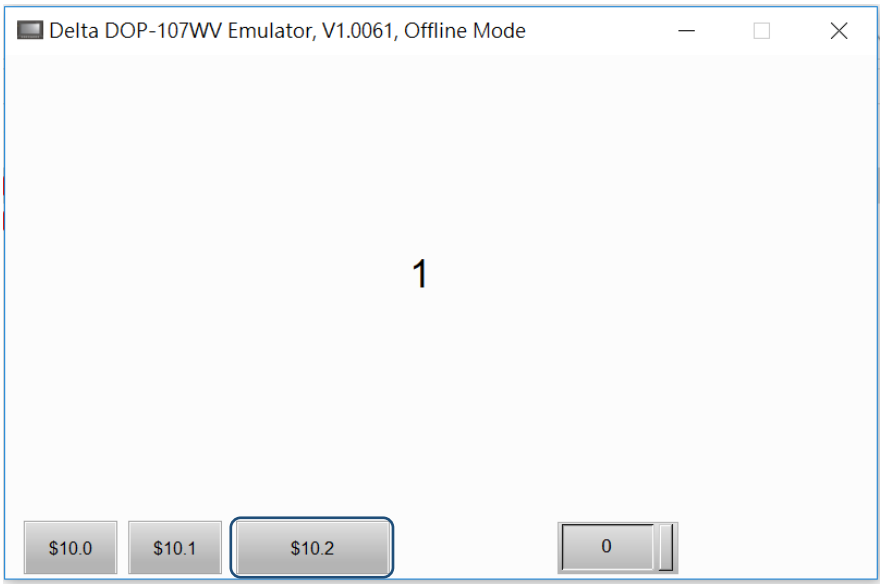


Create Screen_2

■ In the DOPSoft, go to [Screen] > [New Screen] to create a new screen.



Example (Screen)	
Execution results	■ After building the Lua program and creating the elements, compile and download the project to the HMI as shown in the following screen:  ■ When $10.0 is triggered, the HMI opens Screen_2 and returns a success value to $1000. 

Example (Screen)	
Execution results	■ When $10.1 is triggered, the HMI closes Sub Screen_2 and writes a success value to $1000.  ■ Trigger $10.2 to check whether Screen_2 is opened. If Screen_2 is closed, the HMI returns 0 to $1000. 

4.11 String (string operations)

These commands help you perform string operations. The commands include:

Command	Command expression	Description
String (string operations)	string.len	Calculate the string length
	string.format	String formatting
	string.split	Split the string
	string.find	Locate the string
	string.sub	Find the string
	string.rep	Repeat the string
	string.trim	Remove the blank spaces before and after the string
	string.lower	Convert the string to lowercase
	string.upper	Convert the string to uppercase
	string.reverse	Reverse the string
	string.byte	Convert the string to decimal value
	string.char	Convert the decimal value to string
	string.gsub	Replace the specified string with another string
	string.gmatch	Find the part in the string that matches the pattern string, and then return the matching parameters Note: must be used with *for* loop.
	string.match	Find the part in the string that matches the pattern string, and then return the matching parameters Note: the difference between *string.match* and *string.gmatch* is that *string.gmatch* returns all matching strings, while *string.match* only returns the first set of matching strings.

The following sections will explain each in detail.

■ string.len: calculate the string length

Command name	string.len
Command expression	length = **string.len**(string_src)
Parameter definition	string_src: ASCII string
Example	v1 = string.len("ABCDE")
Example description	Calculate the length of the string "ABCDE", and thus v1 = 5.
Return value	v1: string length

■ string.format: string formatting

Command name	string.format
Command expression	string_ret= **string.format**(string_fmt, var1, var2, …)
Parameter definition	string_fmt: ASCII string; variables: %d, %x, %X, %s, %c, %f, and so on var1: the first variable var2: the second variable

Example

% operator	Example	Execution results
%d	v1 = string.format("%d", 10)	v1=10
%X/%x	v1 = string.format("%x", 15)	v1=f
%s	v1 = string.format("%s, "posheng")	v1= posheng
%c	v1 = string.format("%c, 0x30)	v1=0
%o	v1 = string.format("%o, 9)	v1=11
%u	v1 = string.format("%u, 3.14)	v1=3
%E/%e	v1 = string.format("%e", 1000)	v1=1.000000e+03
%f	v1 = string.format("%3.3f", 1.12345)	v1=1.123
%G/%g	v1 = string.format("%g", 1000)	v1=1000
	v1 = string.format("%g", 1000000)	v1= 1e+006
%q	v1 = string.format("%q", "posheng")	v1="posheng"

Example description

String formatting is to convert the string to be output (*var1*, *var2*, and so on) with the *string_fmt* (such as %d).

% operator	Function
%d	Output the string in decimal integer.
%X/%x	Output the string as a hexadecimal integer.
%s	Output the string as a string.
%c	Output the string in characters.
%o	Output the string in octal integer.
%u	Output the string as an unsigned integer.
%E/%e	Output the string in scientific notation.
%f	Output the string in floating-point number.
%G/%g	Output the string in scientific notation (%e) or floating-point number (%f), whichever has the shorter output.
%q	Output the string as a complete string.

Return value	v1: the string after formatting

■ string.split: split the string

Command name	string.split
Command expression	tName = **string.split**(src, ",")
Parameter definition	src: ASCII string
Example	src="John,Andy,Mike" tName = string.split(src, ",")
Example description	Separate the string with "**,**", and thus tName[1]="John", tName[2]="Andy", and tName[3]="Mike".
Return value	tName: array

■ string.find: locate the string

Command name	string.find
Command expression	found_index, end_index = **string.find**(string, pattern, [start_index])
Parameter definition	string: ASCII raw string pattern: target string start_index: integer; the starting index of the string with the index base as 1. This parameter is not mandatory.
Example	src="ABCDE" v1, v2= string.find(src, "BCD")
Example description	Locate the string “BCD” in the variable src, and thus v1 is 2 and v2 is 4.
Return value	v1: integer; the starting index of the found string with the index base as 1 v2: integer; the ending index of the found string with the index base as 1

■ string.sub: find the string

Command name	string.sub
Command expression	string_ret = **string.sub**(string_src, start_index, [end_index])
Parameter definition	string_src: ASCII string start_index: integer; the starting index of the string with the index base as 1 end_index: integer; the ending index of the string with the index base as 1. This parameter is not mandatory.
Example	v1 = string.sub("ABCDE", 2, 4)
Example description	Get the 2nd to 4th bytes of the string "ABCDE", and thus v1= "BCD".
Return value	v1: string; the subset of string

■ string.rep: repeat the string

Command name	string.rep
Command expression	destString = **string.rep**(srcString, repeatCount)
Parameter definition	srcString: string repeatCount: integer; number of repetitions
Example	v1 = string.rep("AB+", 2)
Example description	Repeat the string "AB+" twice, and thus v1= "AB+AB+".
Return value	v1: string; the result string

■ string.trim: remove the blank spaces before and after the string

Command name	string.trim
Command expression	trimStr = **string.trim**(string_src)
Parameter definition	string_src: ASCII string
Example	src=" ABCDE " v1 = string.trim(src)
Example description	Remove the blank spaces before and after the string " ABCDE ", and thus v1= "ABCDE".
Return value	v1: string; the string without the blank spaces

■ string.lower: convert the string to lowercase

Command name	string.lower
Command expression	destString = **string.lower**(srcString)
Parameter definition	srcString: string
Example	name = string.lower(“Posheng”)
Example description	Convert the string "Posheng" to lowercase, and thus name="posheng".
Return value	name: string; the string converted to lowercase

■ string.upper: convert the string to uppercase

Command name	string.upper
Command expression	destString = **string.upper**(srcString)
Parameter definition	srcString: string
Example	name = string.upper("Posheng”)
Example description	Convert the string "Posheng" to uppercase, and thus name="POSHENG".
Return value	name: string; the string converted to uppercase

■ string.reverse: reverse the string

Command name	string.reverse
Command expression	destString = **string.reverse**(srcString)
Parameter definition	srcString: string
Example	v1 = string.reverse("ABCDE")
Example description	Reverse the string "ABCDE", and thus v1="EDCBA".
Return value	v1: string; the reversed string

■ string.byte: convert the string to decimal value

Command name	string.byte
Command expression	num1, num2, … = **string.byte**(string, [start_index, [end_index]])
Parameter definition	string: ASCII string start_index: integer; the starting index of the string with the index base as 1 end_index: integer; the ending index of the string with the index base as 1. This parameter is not mandatory.
Example	v1 = string.byte("ABCDE", 1)
Example description	Convert the first byte of the string "ABCDE" to decimal, and thus v1=65.
Return value	v1: the returned integer

■ string.char: convert the decimal value to string

Command name	string.char
Command expression	destString = **string.char**(il, i2, …)
Parameter definition	i1: integer; the decimal value to be converted to the corresponding ASCII character i2: integer; the decimal value to be converted to the corresponding ASCII character
Example	v1 = string.char(65,66,67)
Example description	Convert the decimal values 65, 66, 67 into a string, and thus v1="ABC".
Return value	v1: the result string

■ string.gsub: replace the specified string with another string

Command name	string.gsub
Command expression	destString = **string.gsub**(srcString, patternString, replacedString)
Parameter definition	srcString: string patternString: the string to be replaced replacedString: variable; the replacing string
Example	s = string.gsub("ABCDE", "C", "x")
Example description	Replace the "C" in the string "ABCDE" with "x", and thus s = "ABxDE".
Return value	s: the string after replacement

- string.gmatch: find the part in the string that matches the pattern string, and then return the matching parameters

Command name	string.gmatch
Command expression	findingIterator = **string.gmatch**(srcString, pattern)
Parameter definition	srcString: string pattern: string; pattern string
Example	for word in string.gmatch("Hello world", "%a+") do w = word end Note: this command must be used with the *for* loop.
Example description	Output the result content corresponding to the *srcString* (such as “Hello world”) using the *pattern* string (such as %a+). The loop is executed twice with the variables *w* respectively being "Hello" and "world". Note: %a is to find the string and %a+ is to find the string to the end of content.
Return value	findingIterator: string; the result string

- string.match: find the part in the string that matches the pattern string, and then return the matching parameters

  (The difference between *string.match* and *string.gmatch* is that *string.gmatch* returns all matching strings, while *string.match* only returns the first set of matching strings)

Command name	string.match
Command expression	destString = **string.match**(srcString, pattern)
Parameter definition	srcString: string pattern: string; pattern string
Example	Example 1: word = string.match("Hello world", "%a") Example 2: s1, s2, s3 = string.match("1/22/333","(%d)/(%d+)/(%d)")
Example description	Example 1 result: word="Hello". Example 2 result: s1=1, s2=22, s3=3. Note: %d is to find the number and %d+ is to find the number to the end of content.
Return value	destString: string; the result string

4.12 System library (system parameters)

The system library commands help you read and write the system parameters. The commands include:

Command	Command expression	Description
System library (system parameters)	sys.Sleep	System delay
	sys.GetTick	Get the total uptime of the HMI so far
	sys.GetInterParam	Get the internal parameters of the HMI
	sys.BuzzerOn	Turn on the buzzer
	sys.GetDate	Get current time
	sys.GetDateString	Get current time (in string)
	sys.GetDays	Get the number of days from 1970/01/01 to the set date
	sys.GetSecs	Get the number of seconds elapsed from 00:00:00 to the set time
	sys.GetTime	Get system time
	sys.ToDate	Get the date after the set number of days from 1970/01/01
	sys.ToTime	Get the time after the set number of seconds from 00:00:00
	sys.GetDiskSpace	Get the disk space of the external storage device

The following sections will explain each in detail.

■ sys.Sleep: system delay

Command name	sys.Sleep
Command expression	**sys.Sleep**(time)
Parameter definition	time: integer (ms)
Example	sys.Sleep(1000)
Example description	The system is delayed for 1000 ms.
Return value	No return value

■ sys.GetTick: get the total uptime of the HMI so far

Command name	sys.GetTick
Command expression	startTick=**sys.GetTick**()
Parameter definition	No parameters
Example	startTick=sys.GetTick()
Example description	Get the total uptime of the HMI so far (in milliseconds).
Return value	startTick: time; unit: milliseconds

■ sys.GetInterParam: get the internal parameters of the HMI

Command name	sys.GetInterParam
Command expression	value, ret =**sys.GetInterParam**("paraName")
Parameter definition	paraName: string; name of the internal parameter, which is the same as the *internal parameter* name in the element address
Example	value, ret = sys.GetInterParam("TP_Y")
Example description	value: the Y coordinate of the position where you pressed the HMI screen.
Return value	y: integer or string; depending on the internal parameters ret: return 1 on success; return 0 on failure

■ sys.BuzzerOn: turn on the buzzer

Command name	sys.BuzzerOn
Command expression	**sys.BuzzerOn**(buzzerType)
Parameter definition	buzzerType: 0: turn off the buzzer; 1: turn on the buzzer; 2: keep the buzzer on
Example	sys.BuzzerOn(1)
Example description	Turn on the buzzer.
Return value	No return value

■ sys.GetDate: get current time

Command name	sys.GetDate
Command expression	year, month, day, week = **sys.GetDate**()
Parameter definition	No parameters
Example	year, month, day, week = sys.GetDate()
Example description	Get the current time (year, month, date, day of the week).
Return value	*year*, *month*, *day* are the year, month, and date; *week* indicates Monday to Sunday with 0 to 6.

■ sys.GetDateString: get current time (in string)

Command name	sys.GetDateString
Command expression	dateStr = **sys.GetDateString**()
Parameter definition	No parameters
Example	dateStr = sys.GetDateString()
Example description	Get the current time (in string).
Return value	dateStr is the system time (in string) represented in the form of year/month/day. If the system time is January 31, 2019, the variable *dateStr* is "2019/01/31".

■ sys.GetDays: get the number of days from 1970/01/01 to the set date

Command name	sys.GetDays
Command expression	days = **sys.GetDays**(year, month, day)
Parameter definition	year: integer; the year month: integer; the month day: integer; the date
Example	days = sys.GetDays(1970, 1, 2)
Example description	days: the number of days from 1970/01/01 to 1970/01/02, and thus days=1.
Return value	days: return the number of days elapsed on success; return nil on failure

■ sys.GetSecs: get the number of seconds elapsed from 00:00:00 to the set time

Command name	sys.GetSecs
Command expression	Result = **sys.GetSecs**(hour, minute, second)
Parameter definition	hour: integer; the hour minute: integer; the minute second: integer; the second
Example	secs = sys.GetSecs(0, 0, 59)
Example description	secs: the number of seconds elapsed from 00:00:00 to 00:00:59, and thus secs=59.
Return value	secs: return the number of seconds elapsed on success; return nil on failure

■ sys.GetTime: get system time

Command name	sys.GetTime
Command expression	h, m, s = **sys.GetTime**()
Parameter definition	No parameters
Example	h, m, s = sys.GetTime()
Example description	Get the system time.
Return value	If the system time is 11:20:35, h=11, m=20, and s=35.

■ sys.ToDate: get the date after the set number of days from 1970/01/01

Command name	sys.ToDate
Command expression	year, month, day = **sys.ToDate**(days)
Parameter definition	days: number of days elapsed
Example	year, month, day = sys.ToDate(5)
Example description	The *year*, *month*, and *day* represent the date 5 days after 1970/01/01, where year=1970, month=1, and day=6.
Return value	The *year*, *month*, and *day* are the year, month, and date after the set number of days from 1970/01/01.

■ sys.ToTime: get the time after the set number of seconds from 00:00:00

Command name	sys.ToTime
Command expression	hour, minute, second = **sys.ToTime**(seconds)
Parameter definition	seconds: number of seconds elapsed
Example	hour, minute, second = sys.ToTime(61)
Example description	The *hour*, *minute*, and *second* represent the time 61 seconds after 00:00:00, where hour=0, minute=1, and second=1.
Return value	The *hour*, *minute*, and *second* are the hour, minute, and second after the set number of seconds from 00:00:00.

■ sys.GetDiskSpace: get the disk space of the external storage device

Command name	sys.GetDiskSpace
Command expression	ret, total, free = **sys.GetDiskSpace**(disk_id)
Parameter definition	disk_id: integer; 2: USB drive; 3: SD card
Example	ret, total, free = sys.GetDiskSpace(2)
Example description	Get the total space and remaining space of the USB drive.
Return value	ret: return 1 on success; return a negative number on failure Return value / Description -1 / Parameter setting error -106 / Disk is not ready total: integer; total disk space (MB) free: integer; remaining disk space (MB)

4.13 Serial port communication (COM communication)

When two devices do not use the same communication protocol, the Delta HMIs use COM (serial port), TCP, or UDP communication for data handshaking.

The following introduces the commands for COM port communication and how to establish connection with these commands. The commands include:

Command	Command expression	Description
Serial port communication (COM communication)	com.Open	Open the COM port communication
	com.ReadChars	Read characters from the specified communication port (COM)
	com.WriteChars	Write characters to the specified communication port (COM)
	com.ClearBuffer	Clear buffer data
	com.StationCheck	Select the communication port and station number to check whether the communication is successful
	com.Close	Close the communication port
	com.CheckAlive	Select the communication parameters to check whether the communication is successful
	com.StationOn	Station On
	com.StationOff	Station Off
	com.GetStatus	Get the COM port status

The following sections will explain each in detail.

■ com.Open: open the COM port communication

Command name	com.Open
Command expression	ret = **com.Open**(com_num, interface, databits, parity, stopbits, baudrate, flowcontrol)
Parameter definition	com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on interface: string; "RS232", "RS422", "RS485" databits: integer; 7, 8 parity: string; "NONE", "ODD", "EVEN", "MARK", "SPACE" stopbits: integer; 1, 2 baudrate: integer; 9600, and so on flowcontrol: string; "OFF", "CTS_RTS"
Example	ret = com.Open(1, "RS232", 8, "EVEN", 1, 19200, "OFF")
Example description	Open the communication port COM1, set the communication interface to RS232, the data bits to 8, the parity bits to "EVEN", the stop bit to 1, the baud rate to 19200, and the flow control to OFF.
Return value	ret: return 1 on success; return -1 on invalid parameters; return -101 on COM port open failure

■ com.ReadChars: read characters from the specified communication port (COM)

Command name	com.ReadChars
Command expression	bytes_read, buffer = **com.ReadChars**(com_num, len, timeout)
Parameter definition	com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on len: integer; ASCII string length timeout: integer; delay time (unit: ms)
Example	bytes_read, buffer = com.ReadChars(1, 10, 1000)
Example description	Read characters from the communication port COM1 with the communication delay time of 1000 ms and the data length of 10 bytes.
Return value	bytes_read: return the length of the read data (in bytes) on success; return a negative number on failure

Return value	Description
0	Read timeout
-1	Parameter setting error
-100	Port not open
-102	Read failure

buffer: the returned string

■ com.WriteChars: write characters to the specified communication port (COM)

Command name	com.WriteChars
Command expression	ret = **com.WriteChars**(com_num, buffer, len, timeout)
Parameter definition	com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on buffer: ASCII string len: integer; ASCII string length timeout: integer; delay time (unit: ms)
Example	ret = com.WriteChars(1, “posheng”, 6, 1000)
Example description	Write the string "posheng" to the communication port COM1 with the communication delay time of 1000 ms and the length of 6 bytes.
Return value	bytes_read: return the length of the written data (in bytes) on success; return a negative number on failure

Return value	Description
-1	Parameter setting error
-100	Port not open
-103	Write failure

buffer: the written string

■ com.ClearBuffer: clear buffer data

Command name	com.ClearBuffer
Command expression	ret = **com.ClearBuffer**(com_num, clear_type)
Parameter definition	com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on clear_type: integer; 1: clear read buffer; 0: clear write buffer
Example	ret = com.ClearBuffer(1, 1)
Example description	Clear the read buffer data of the communication port COM1.
Return value	ret: return 1 on success; return a negative number on failure

Return value	Description
-1	Parameter setting error
-100	Port not open
-104	Failed to clear buffer

■ com.StationCheck: select the communication port and station number to check whether the communication is successful

Command name	com.StationCheck
Command expression	ret = **com.StationCheck**(com_num, station)
Parameter definition	com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on station: integer; station number
Example	ret = com.StationCheck(1, 1)
Example description	Check whether the communication with the station number 1 of communication port COM1 is successful.
Return value	

Return value	Description
1	Successful
0	Failed
-1	Invalid parameter

■ com.Close: close the communication port

Command name	com.Close
Command expression	ret = **com.Close**(com_num)
Parameter definition	com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on
Example	ret = com.Close(1)
Example description	Close COM 1 connection.
Return value	ret: return 1 on success; return -1 on invalid parameter

■ com.CheckAlive: select the communication parameters to check whether the communication is successful

Command name	com.CheckAlive
Command expression	ret = **com.CheckAlive**(modbus_mode, com_num, interface, databits, parity, stopbits, baudrate, flowcontrol, station, timeout)
Parameter definition	modbus_mode: string; modbus mode: "MODBUS_ASCII", "MODBUS_RTU" com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on interface: string; "RS232", "RS422", "RS485" databits: integer; 7 or 8 parity: string; "NONE", "ODD", "EVEN", "MARK", "SPACE" stopbits: integer; 1 or 2 baudrate: integer; 9600, and so on flowcontrol: string; "OFF", "CTS_RTS" station: integer; station number: 0 to 255 timeout: integer; timeout value (ms): 0 to 15000
Example	ret = com.CheckAlive("MODBUS_ASCII", 1, "RS485", 8, "EVEN", 1, 19200, "OFF", 1, 1000)
Example description	In the communication port COM1, set the communication protocol to MODBUS_ASCII, the communication interface to RS485, the data bits to 8, the parity bits to "EVEN", the stop bit to 1, the baud rate to 19200, and the flow control to OFF. Then, send the command to check whether the communication exists. The waiting time for reply is 1000 ms. Note: this command only supports Delta PLC.
Return value	ret: return 1 on success; return the following values on failure

Return value	Description
0	Failed
-1	Invalid parameter
-101	Failed to start COM

■ com.StationOn: station On

Command name	com.StationOn
Command expression	ret = **com.StationOn**(com_num, station)
Parameter definition	com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on station: integer; station number: 0 to 255
Example	ret = com.StationOn(1, 1)
Example description	Turn on the station number 1 controller of the communication port COM1, and then the HMI can communicate with the controller. Note: this command is not related to the communication opened by *com.Open*.
Return value	ret: return 1 on success; return -1 on invalid parameter

■ com.StationOff: station Off

Command name	com.StationOff
Command expression	ret = **com.StationOff**(com_num, station)
Parameter definition	com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on station: integer; station number: 0 to 255
Example	ret = com.StationOff(1, 1)
Example description	Turn off the station number 1 controller of the communication port COM1, and then the HMI cannot communicate with the controller. Note: this command is not related to the communication opened by *com.Open*.
Return value	ret: return 1 on success; return -1 on invalid parameter

■ com.GetStatus: get the COM port status

Command name	com.GetStatus
Command expression	ret = **com.GetStatus**(com_num)
Parameter definition	com_num: integer; serial communication port number: 1: COM1, 2: COM2, and so on
Example	ret = com.GetStatus(1)
Example description	Check the communication status of COM1.
Return value	ret: return 1 on success; return a negative number on failure

Return value	Description
-1	Invalid parameter
-100	Port not open
-101	Failed to open COM port

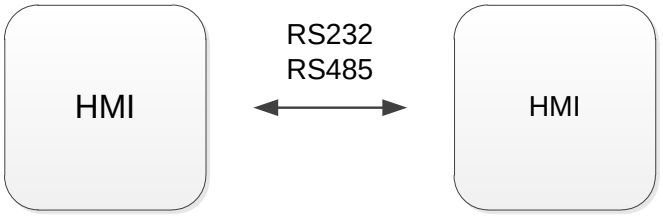
Content of parameter settings			
Variable	**Option**	**Option content**	**Corresponding code**
modbus_mode	Communication Format	MODBUS_ASCII	"MODBUS_ASCII"
		MODBUS_RTU	"MODBUS_RTU"
com_num	COM Port	COM 1	1
		COM 2	2
		COM 3	3
interface	Interface	RS232	"RS232"
		RS422	"RS422"
		RS485	"RS485"
databits	Data Bits	7 Bits	7
		8 Bits	8
parity	Parity Bits	NONE	"NONE"
		ODD	"ODD"
		EVEN	"EVEN"
		MARK	"MARK"
		SPACE	"SPACE"
stopbits	Stop Bits	1 Bit	1
		2 Bits	2

Content of parameter settings			
Variable	**Option**	**Option content**	**Corresponding code**
baudrate	Baud Rate	300	300
		600	600
		900	900
		1200	1200
		2400	2400
		4800	4800
		9600	9600
		14400	14400
		19200	19200
		28800	28800
		38400	38400
		57600	57600
		115200	115200
flowcontrol	Flow Control	OFF	"OFF"
		CTS_RTS	"CTS_RTS"
station	Station No.	1 ~ 255	1 ~ 255
timeout	Communication Time	0 ~ 15000 (ms)	0 ~ 15000

Example (COM communication)

Build hardware connection

■ The concept map of wiring is as follows.



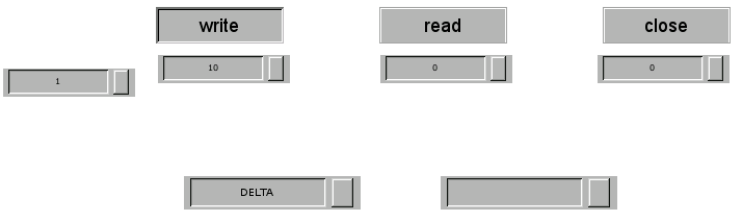
Build Lua commands for COM communication

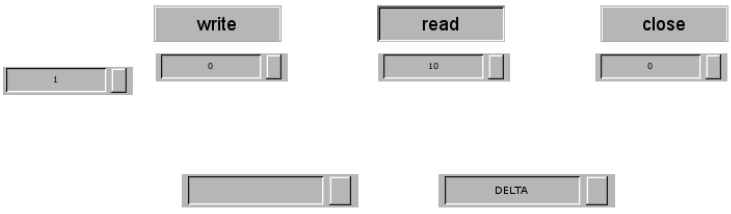
■ The commands are as follows:

```
var1 = com.Open(2, "RS485", 8, "NONE", 1, 9600, "OFF")
mem.inter.Write(11, var1)
while true do
    if (mem.inter.ReadBit(50,0)==1) then
        buffer = mem.inter.ReadAscii(1000,10)
        ret = com.WriteChars(2, buffer, string.len(buffer), 3000)
        mem.inter.Write(12, ret)
    end
    if (mem.inter.ReadBit(60,0)==1) then
        var10, buffer = com.ReadChars(2, 10, 3000)
        mem.inter.WriteAscii(4,buffer,string.len(buffer))
        mem.inter.Write(13, var10)
    end
    if (mem.inter.ReadBit(70,0)==1) then
        ret = com.Close(2)
        mem.inter.Write(14, ret)
    end
end
```

■ The HMI opens the COM port and writes the return value to the memory address $1.

```
var1 = com.Open(2, "RS485", 8, "NONE", 1, 9600, "OFF")
mem.inter.Write(11, var1)
```

<table>
<tr><th colspan="2">Example (COM communication)</th></tr>
<tr><td>Build Lua commands for COM communication</td><td>
■ When $50.0 is triggered, the HMI reads the variable buffer as the string of the memory address $1000 with the length of 10 bytes. Then, the HMI writes the variable buffer to the buffer, and writes the return value to memory address $12.
if (mem.inter.ReadBit(50,0)==1) then
buffer = mem.inter.ReadAscii(1000,10)
ret = com.WriteChars(2, buffer, string.len(buffer), 3000)
mem.inter.Write(12, ret)
end
■ When $60.0 is triggered, the HMI reads the variable buffer from the communication port COM2 with the data length of 10 bytes. Then, the HMI writes the read variable buffer to $4, and writes the return value to the memory address $13.
if (mem.inter.ReadBit(60,0)==1) then
var10, buffer = com.ReadChars(2, 10, 3000)
mem.inter.WriteAscii(4,buffer,string.len(buffer))
mem.inter.Write(13, var10)
end
■ When $70.0 is triggered, the HMI closes the communication port COM2 and writes the return value to $14.
if (mem.inter.ReadBit(70,0)==1) then
ret = com.Close(2)
mem.inter.Write(14, ret)
end
</td></tr>
<tr><td>Create Maintained buttons, Numeric Entry and Character Entry elements</td><td>
■ Create 3 Maintained buttons and set the Write Addresses to $50.0, $60.0, and $70.0.
■ Create 4 Numeric Entry elements and set the Write Addresses to $11, $12, $13, and $14.
■ Create 2 Character Entry elements and set the Write Addresses to $1000 and $4.
</td></tr>
<tr><td>Execution results</td><td>
■ After building the Lua program and creating the elements, compile and download the project to the HMI Screen (two HMIs display the same screen).
■ After the project is downloaded to the HMI, the COM port is successfully opened, and the success value is returned to $11.
■ Write the string DELTA to $1000 and trigger $50.0, and then the string is written to the buffer.


■ On the second HMI, trigger $60.0 to read the buffer data and write it to the memory address $4.


■ Trigger $70.0 to close the communication port COM2.
</td></tr>
</table>

4.14 TCP communication

When two devices do not use the same communication protocol, the Delta HMIs use COM (serial port), TCP, or UDP communication for data handshaking.

The following introduces the commands for TCP communication and how to establish connection with these commands. The commands include:

Command	Command expression	Description
TCP communication	tcp.Open	Open the TCP network communication
	tcp.Read	Read characters (TCP)
	tcp.Write	Write characters (TCP)
	tcp.Close	Close the connection (TCP)
	tcp.GetMaxCount	Get the maximum number of connections (TCP)
	tcp.GetRunCount	Get the number of running sockets (TCP)
	tcp.GetStatus	Check the communication status of the socket (TCP)

The following sections will explain each in detail.

■ tcp.Open: open the TCP network communication

Command name	tcp.Open
Command expression	Socket = **tcp.Open**(ip, port)
Parameter definition	ip: string; "192.168.0.1", and so on port: integer
Example	Socket = tcp.Open(“192.168.0.1”, 502)
Example description	Open the network communication; set the IP address to 192.168.0.1 and the port to 502.
Return value	Socket: return the socket number on success; return a negative value on failure

Return value	Description
> 0	Successful
-1	Invalid parameter
-101	Failed to open socket
-145	Too many sockets have been opened

■ tcp.Read: read characters (TCP)

Command name	tcp.Read
Command expression	bytes_read, buffer = **tcp.Read**(socket, len, timeout)
Parameter definition	socket: integer; 1 to 8 len: integer; string length timeout: integer; delay time (unit: ms)
Example	bytes_read, buffer = tcp.Read(1, 10, 1000)
Example description	Select socket 1 and read the characters with the set communication delay time of 1000 ms and the data length of 10 bytes.
Return value	bytes_read: return the length of the read data (in bytes) on success; return a negative number on failure

Return value	Description
> 1	Successful
-1	Invalid parameter
-100	Socket is not open
-102	Read failure

buffer: the returned string

■ tcp.Write: write characters (TCP)

Command name	tcp.Write
Command expression	ret = **tcp.Write**(socket, buffer, len, timeout)
Parameter definition	socket: integer; 1 to 8 buffer: string len: integer; string length timeout: integer; delay time (ms)
Example	ret = tcp.Write(1, “abc123”, 6, 1000)
Example description	Send the string “abc123” to socket 1 with the length of 6 bytes.
Return value	ret: return 1 on success; return a negative value on failure

Return value	Description
-1	Invalid parameter
-100	Socket is not open
-103	Write failure

■ tcp.Close: close the connection (TCP)

Command name	tcp.Close
Command expression	ret = **tcp.Close**(socket)
Parameter definition	socket: integer; 1 to 8
Example	ret = tcp.Close(1)
Example description	Close the socket 1 connection of the TCP communication.
Return value	ret: return 1 on success; return a negative value or 0 on failure Return value: -1 — Invalid parameter; -100 — Socket is not open

■ tcp.GetMaxCount: get the maximum number of connections (TCP)

Command name	tcp.GetMaxCount
Command expression	count = **tcp.GetMaxCount**()
Parameter definition	No parameters
Example	count = tcp.GetMaxCount()
Example description	Get the maximum connection number of TCP communication.
Return value	count: the maximum number of sockets in the system

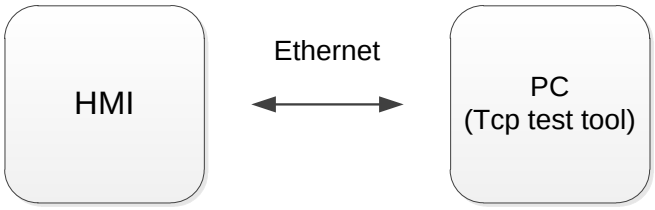
■ tcp.GetRunCount: get the number of running sockets (TCP)

Command name	tcp.GetRunCount
Command expression	count = **tcp.GetRunCount**()
Parameter definition	No parameters
Example	count = **tcp.GetRunCount**()
Example description	Get the number of running sockets of the TCP communication.
Return value	count: the number of running sockets

■ tcp.GetStatus: check the communication status of the socket (TCP)

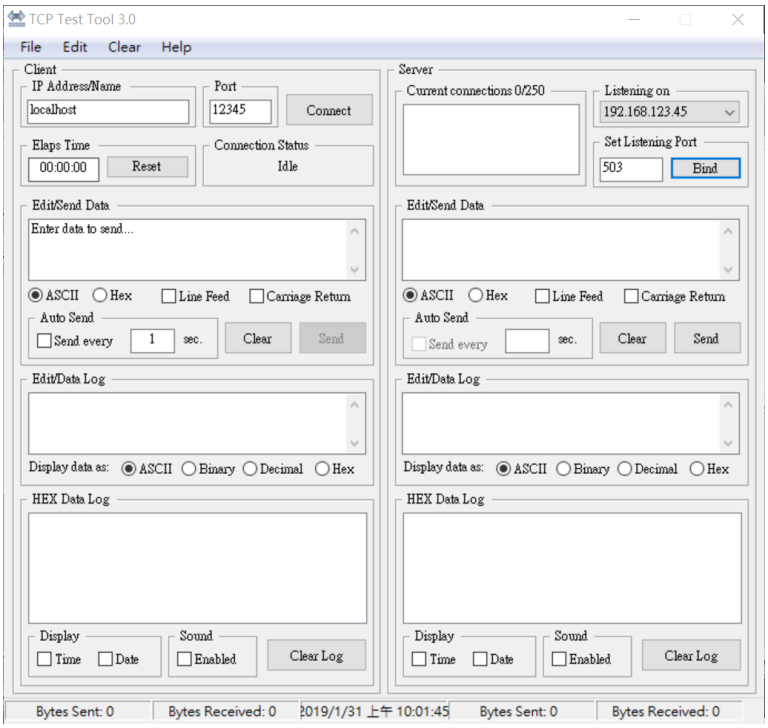
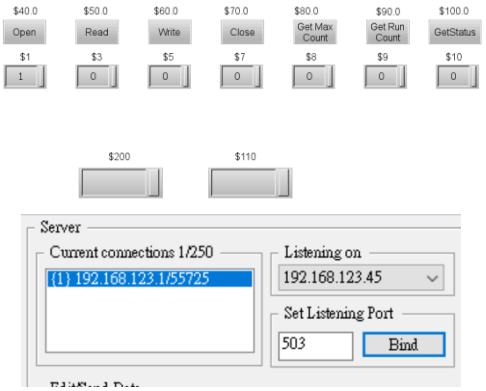
Command name	tcp.GetStatus
Command expression	status = **tcp.GetStatus**(socket)
Parameter definition	socket: integer; 1 to 8
Example	status = tcp.GetStatus(1)
Example description	Check the communication status of socket 1 of the TCP communication.
Return value	Status: return 1 when the socket is open; return 0 when the socket is closed

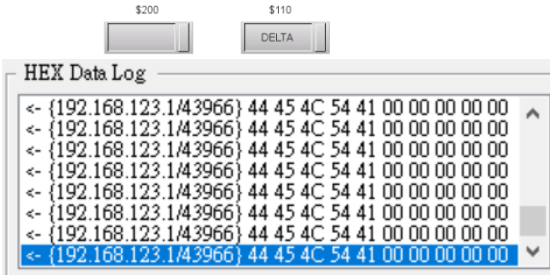
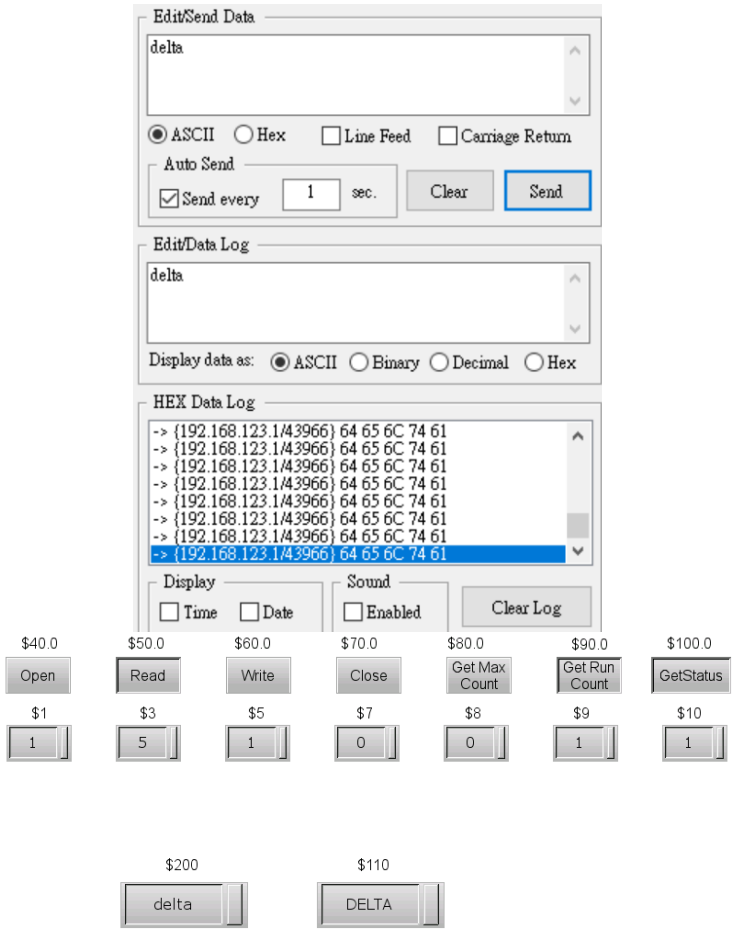
The following is a detailed description with an example of TCP communication.

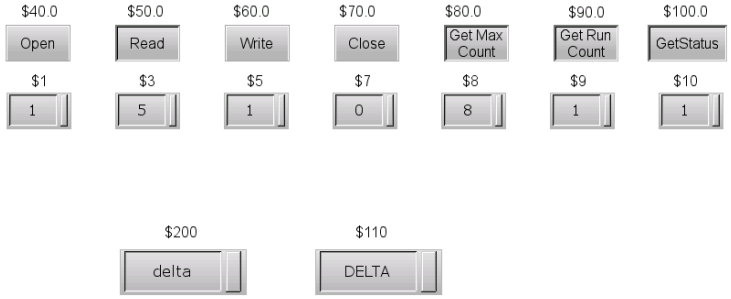
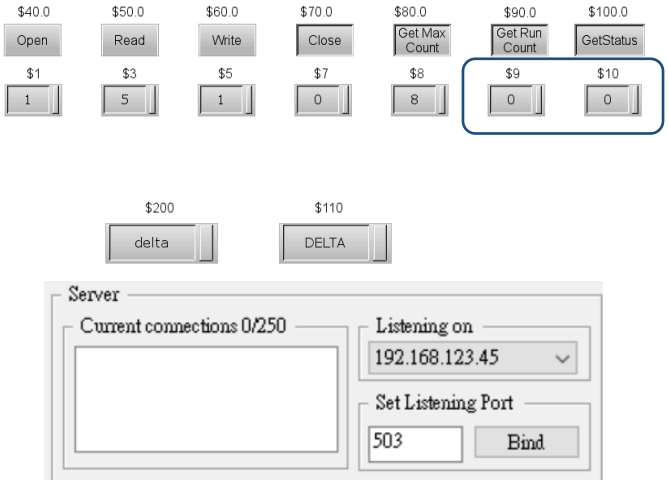
<table>
<tr><th colspan="2">TCP communication</th></tr>
<tr><td>Build hardware connection</td><td>■ In the concept map of wiring, the HMI is the Client, and the PC is the Server which receives data from the Client.
 
</td></tr>
<tr><td>Build Lua commands for TCP communication</td><td>The commands are as follows:
<pre>
while true do
    if (mem.inter.ReadBit(40,0)==1) then
        ip = "192.168.123.45"
        port = 503
        socket = tcp.Open(ip, port)
        mem.inter.Write(1,Socket)
            if socket==1 then
                mem.inter.WriteBit(40,0,0)
            end
    end
    if (mem.inter.ReadBit(50,0)==1) then
        len = 5
        timeout = 3000
        bytes_read, buffer = tcp.Read(socket, len, timeout)
        mem.inter.Write(3,bytes_read)
        mem.inter.WriteAscii(200,buffer,string.len(buffer))
    end
    if (mem.inter.ReadBit(60,0)==1) then
        buffer = mem.inter.ReadAscii(110,10)
        ret = tcp.Write(1, buffer, string.len(buffer), 1000)
        mem.inter.Write(5, ret,string.len(ret))
    end
    if (mem.inter.ReadBit(70,0)==1) then
        socket = 1
        ret = tcp.Close(socket)
        mem.inter.Write(7,ret)
    end
    if (mem.inter.ReadBit(80,0)==1) then
        count = tcp.GetMaxCount()
        mem.inter.Write(8,count)
    end
    if (mem.inter.ReadBit(90,0)==1) then
        count = tcp.RunCount(socket)
        mem.inter.Write(9,count)
    end
    if (mem.inter.ReadBit(100,0)==1) then
        status = tcp.GetStatus(socket)
        mem.inter.Write(10,status)
    end
end
</pre></td></tr>
</table>

TCP communication	

Build Lua commands for TCP communication	■ When $40.0 is triggered, the HMI turns on the network and writes the return value to the memory address $1. When the first connection is established, $40.0 is turned off.
	`if (mem.inter.ReadBit(40,0)==1) then`
	`  ip = "192.168.123.45"`
	`  port = 503`
	`  socket = tcp.Open(ip, port)`
	`  mem.inter.Write(1,Socket)`
	`  if socket==1 then`
	`  mem.inter.WriteBit(40,0,0)`
	`  end`
	`end`
	■ When $50.0 is triggered, the HMI reads the data as *buffer* with the length of 5 bytes and the communication time of 3000 ms. Then, the HMI writes the return value to the memory address $3, and writes the data *buffer* to $200.
	`if (mem.inter.ReadBit(50,0)==1) then`
	`  len = 5`
	`  timeout = 3000`
	`  bytes_read, buffer = tcp.Read(socket, len, timeout)`
	`  mem.inter.Write(3,bytes_read)`
	`  mem.inter.WriteAscii(200,buffer,string.len(buffer))`
	`end`
	■ When $60.0 is triggered, the HMI reads the data of memory address $110 as the string “buffer” with the length of 10 bytes. Then, the HMI writes the read data to the first (socket) connection, and writes the return value to $5.
	`if (mem.inter.ReadBit(60,0)==1) then`
	`  buffer = mem.inter.ReadAscii(110,10)`
	`  ret = tcp.Write(1, buffer, string.len(buffer), 1000)`
	`  mem.inter.Write(5, ret,string.len(ret))`
	`end`
	■ When $70.0 is triggered, the HMI closes the first (socket) communication, and writes the return value to $7.
	`if (mem.inter.ReadBit(70,0)==1) then`
	`  socket = 1`
	`  ret = tcp.Close(socket)`
	`  mem.inter.Write(7,ret)`
	`end`
	■ When $80.0 is triggered, the HMI obtains information about the maximum number of connections.
	`if (mem.inter.ReadBit(80,0)==1) then`
	`  count = tcp.GetMaxCount()`
	`  mem.inter.Write(8,count)`
	`end`
	■ When $90.0 is triggered, the HMI checks whether the specified socket communication is in use, and writes the return value to $9.
	`if (mem.inter.ReadBit(90,0)==1) then`
	`  count = tcp.RunCount(socket)`
	`  mem.inter.Write(9,count)`
	`end`
	■ When $100.0 is triggered, the HMI checks the connection status of the specified socket.
	`if (mem.inter.ReadBit(100,0)==1) then`
	`  status = tcp.GetStatus(socket)`
	`  mem.inter.Write(10,status)`
	`end`

TCP communication	
Create Maintained buttons, Numeric Entry and Character Entry elements	■ Create 7 Maintained buttons and set the Write Addresses to $40.0, $50.0, $60.0, $70.0, $80.0, $90.0, and $100.0. ■ Create 7 Numeric Entry elements and set the Write Addresses to $1, $3, $5, $7, $8, $9, and $10. ■ Create 2 Character Entry elements and set the Write Addresses to $200 and $110.
Execution results	■ After building the Lua program and creating the elements, compile and download the project to the HMI Screen (two HMIs display the same screen). ■ Open the TCP Test Tool. With the PC as the Server, set the listening port and then click **Bind** to wait for the Client to connect.  ■ Trigger $40.0 to establish a connection. Then, the HMI writes the return value to $1, and closes $40.0. You can see the connection message in the TCP Test Tool interface.  ■ Write a string to $100 to trigger $60.0. Then, the HMI read the string *buffer* from $110 and writes it to the communication of the specified socket, and then writes the return value to $5.

TCP communication	
Execution results	■ Trigger $90.0 and $100.0 to write the return values to $9 and $10 respectively. Because the data is written through the first (socket), $9 and $10 are both 1, which means that the first (socket) communication is in use.   ■ Send the string “delta” to the buffer with the TCP Test Tool. When $50.0 is triggered, the HMI reads the buffer data, writes the data to $100, and writes the return value to $3. 

TCP communication	
Execution results	■ Trigger $80.0, and the maximum number of supported connections of 8 is obtained.  ■ Trigger $70.0 to close the first (socket) connection. $9 and $10 display 0, which indicates that this connection is closed. You can also see from the TCP Test Tool interface that the connection message disappears. 

4.15 UDP communication

When two devices do not use the same communication protocol, the Delta HMIs use COM (serial port), TCP, or UDP communication for data handshaking.

The following introduces the commands for UDP communication and how to establish connection with these commands. The commands include:

Command	Command expression	Description
UDP communication	udp.Open	Open the UDP network communication
	udp.Read	Read characters (UDP)
	udp.Write	Write characters (UDP)
	udp.Close	Close the connection (UDP)
	udp.GetMaxCount	Get the maximum number of connections (UDP)
	udp.GeRunCount	Get the number of running sockets (UDP)
	udp.GetStatus	Check the communication status of the socket (UDP)

The following sections will explain each in detail.

■ udp.Open: open the UDP network communication

Command name	udp.Open
Command expression	Socket = **udp.Open**(ip, port, local_port)
Parameter definition	ip: string; IP address of the receiver, such as "192.168.0.1" port: integer; port of the receiver local_port: integer; port of the sender
Example	Socket = udp.Open(“192.168.123.134”, 502, 602)
Example description	Open the UDP network communication with the IP address as 192.168.123.134, the sender communication port as 602, and the receiver communication port as 502.
Return value	Socket: return the socket number on success; return a negative value on failure

Return value	Description
> 0	Successful
-1	Invalid parameter
-101	Failed to open socket
-145	Too many sockets have been opened

■ udp.Read: read characters (UDP)

Command name	udp.Read
Command expression	bytes_read, buffer = **udp.Read**(socket, len, timeout)
Parameter definition	socket: integer; 1 to 8 len: integer; string length timeout: integer; delay time (unit: ms)
Example	bytes_read, buffer = udp.Read(1, 15, 1000)
Example description	Select socket 1, and read the characters with the set communication delay time of 1000 ms and the data length of 15 bytes.
Return value	bytes_read: return the length of the read data (in bytes) on success; return a negative value on failure

Return value	Description
> 1	Successful
-1	Invalid parameter
-100	Socket is not open
-102	Read failure

buffer: the returned string

■ udp.Write: write characters (UDP)

Command name	udp.Write
Command expression	ret = **udp.Write**(socket, buffer, len, timeout)
Parameter definition	socket: integer; 1 to 8 buffer: string len: integer; string length timeout: integer; delay time (ms)
Example	ret = udp.Write(1, “DELTA”, 5, 1000)
Example description	Write the string “DELTA” to socket 1 with the length of 5 bytes.
Return value	ret: return 1 on success; return a negative value on failure

Return value	Description
-1	Invalid parameter
-100	Socket is not open
-103	Write failure

■ udp.Close: close the connection (UDP)

Command name	udp.Close
Command expression	ret = **udp.Close**(socket)
Parameter definition	socket: integer; 1 to 8
Example	ret = udp.Close(1)
Example description	Close the socket 1 connection of UDP communication.
Return value	ret: return 1 on success; return 0 or a negative value on failure

Return value	Description
-1	Invalid parameter
-100	Socket is not open

■ udp.GetMaxCount: get the maximum number of connections (UDP)

Command name	udp.GetMaxCount
Command expression	count = **udp.GetMaxCount**()
Parameter definition	No parameters
Example	count = udp.GetMaxCount()
Example description	Get the maximum number of connections for UDP communication.
Return value	count: the maximum number of sockets in the system

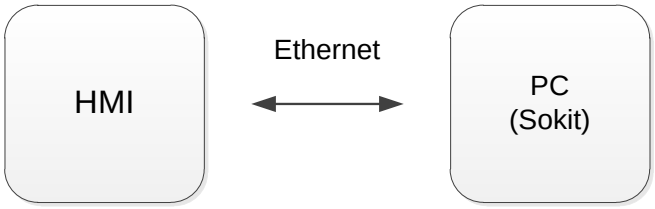
■ udp.GetRunCount: get the number of running sockets (UDP)

Command name	udp.GetRunCount
Command expression	count = **udp.GetRunCount**()
Parameter definition	No parameters
Example	count = udp.GetRunCount()
Example description	Get the number of running sockets of the UDP communication.
Return value	count: number of running sockets

■ udp.GetStatus: check the communication status of the socket (UDP)

Command name	udp.GetStatus
Command expression	status = **udp.GetStatus**(socket)
Parameter definition	socket: integer; 1 to 8
Example	status = udp.GetStatus(1)
Example description	Check the communication status of socket 1 of the UDP communication.
Return value	Status: return 1 when the socket is open; return 0 when the socket is closed

The following is a detailed description with an example of UDP communication.

<table>
<tr><th colspan="2">UDP communication</th></tr>
<tr><td>Build hardware connection</td><td>■ The concept map for wiring is as follows.
■ Use the HMI as the Client and the PC as the Server to receive data from the Client. Or use the PC as the Client and the HMI as the Server to receive data from the Client.
 
</td></tr>
<tr><td>Build Lua commands for UDP communication</td><td>The commands are as follows:
<pre>
while true do
    if mem.inter.ReadBit(0,0)==1 then
        ip = "192.168.123.144"
        port = 552
        local_port = 602
        Socket = udp.Open(ip, port, local_port)
        mem.inter.Write(1, Socket)
        mem.inter.WriteBit(0,0,0)
    end

    if mem.inter.ReadBit(0,1)==1 then
        socket = 1
        buffer = "DELTA"
        len = 5
        timeout = 1000
        ret = udp.Write(socket, buffer, len, timeout)
        mem.inter.Write(5, ret)
        mem.inter.WriteBit(0,1,0)
    end

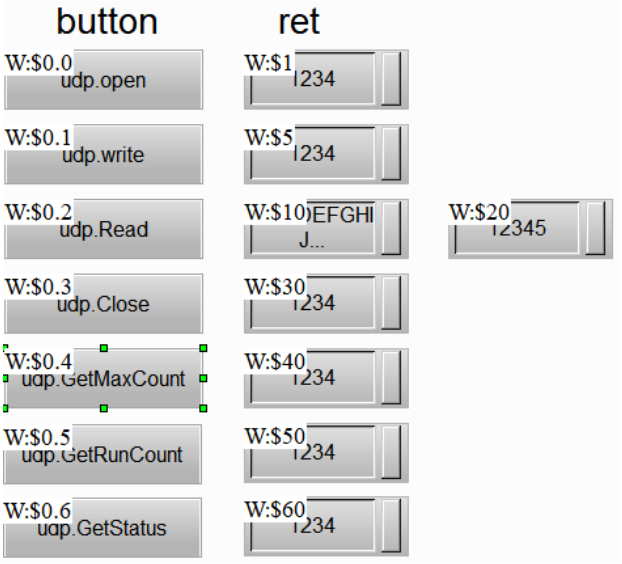
    if mem.inter.ReadBit(0,2)==1 then
        socket = 1
        len = 15
        timeout = 1000
        bytes_read, buffer = udp.Read(socket, len, timeout)
        mem.inter.WriteAscii(10, buffer,string.len(buffer))
        mem.inter.Write(20,bytes_read)
        mem.inter.WriteBit(0,2,0)
    end

    if mem.inter.ReadBit(0,3)==1 then
        socket = 1
        ret = udp.Close(socket)
          mem.inter.Write(30,ret)
        mem.inter.WriteBit(0,3,0)
    end

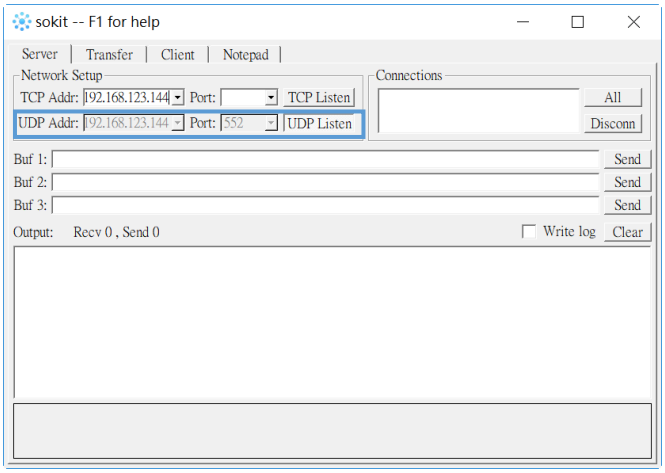
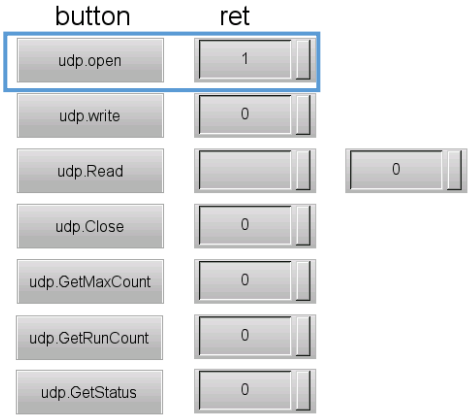
    if mem.inter.ReadBit(0,4)==1 then
        count = udp.GetMaxCount()
          mem.inter.Write(40,count)
        mem.inter.WriteBit(0,4,0)
    end
</pre></td></tr>
</table>

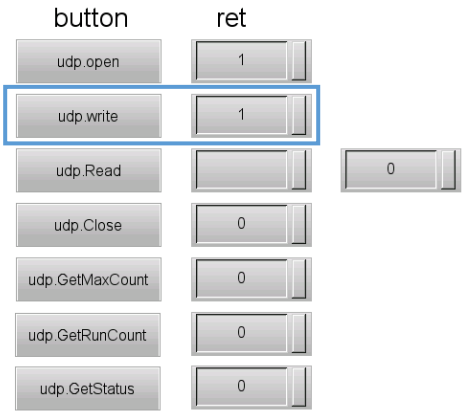
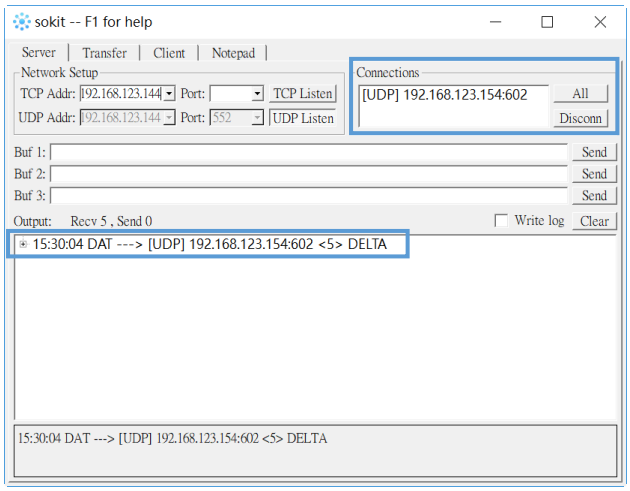
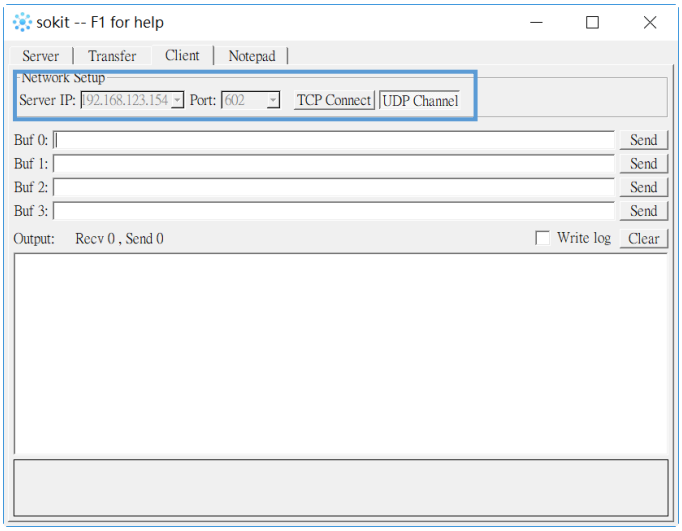
UDP communication	

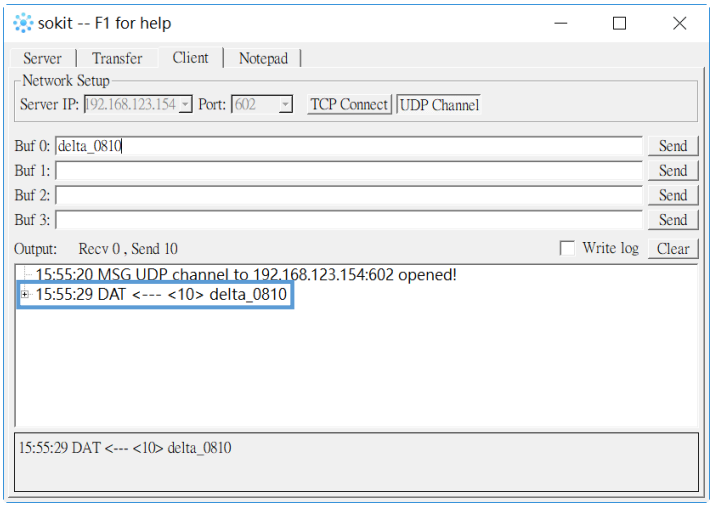
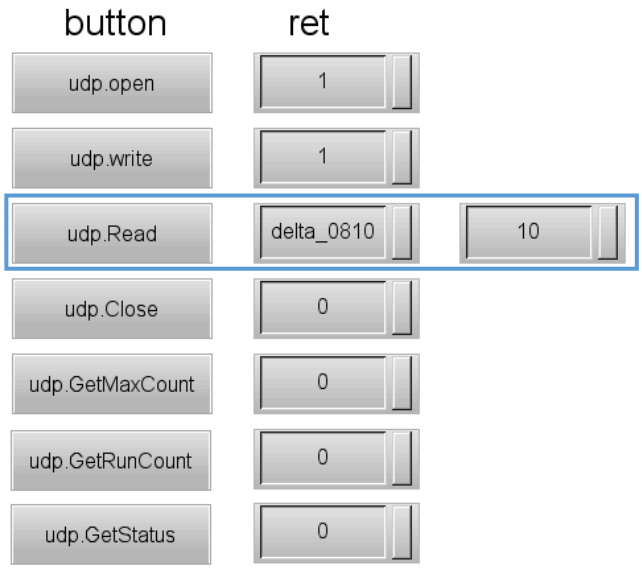
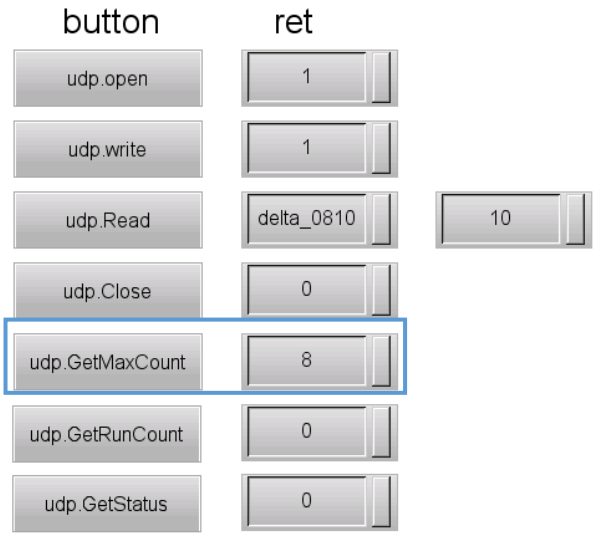
Build Lua commands for UDP communication	if mem.inter.ReadBit(0,5)==1 then
	count = udp.GetRunCount()
	mem.inter.Write(50,count)
	mem.inter.WriteBit(0,5,0)
	end
	
	if mem.inter.ReadBit(0,6)==1 then
	status = udp.GetStatus(1)
	mem.inter.Write(60,count)
	mem.inter.WriteBit(0,6,0)
	end
	end
	■ When $0.0 is triggered, the HMI establishes the network settings with the HMI Port as 602, the destination IP address as 192.168.123.144, and the port of the sender as 552. The HMI writes the return value to the memory address $1, and then closes $0.0.
	if mem.inter.ReadBit(0,0)==1 then
	ip = "192.168.123.144"
	port = 552
	local_port = 602
	Socket = udp.Open(ip, port, local_port)
	mem.inter.Write(1, Socket)
	mem.inter.WriteBit(0,0,0)
	end
	■ When $0.1 is triggered, the HMI writes the string "DELTA" to the first (socket) connection with the length of 5 bytes, writes the return value to $5, and then closes $0.1.
	if mem.inter.ReadBit(0,1)==1 then
	socket = 1
	buffer = "DELTA"
	len =5
	timeout = 1000
	ret = udp.Write(socket, buffer, len, timeout)
	mem.inter.Write(5, ret)
	mem.inter.WriteBit(0,1,0)
	end
	■ When $0.2 is triggered, the HMI reads the data *buffer* with the length of 15 bytes and the communication time of 1000 ms, then writes the data *buffer* to $10, writes the return value to the memory address $20, and then closes $0.2.
	if mem.inter.ReadBit(0,2)==1 then
	socket = 1
	len = 15
	timeout = 1000
	bytes_read, buffer = udp.Read(socket, len, timeout)
	mem.inter.WriteAscii(10, buffer,string.len(buffer))
	mem.inter.Write(20,bytes_read)
	mem.inter.WriteBit(0,2,0)
	end
	■ When $0.3 is triggered, the HMI closes the first (socket) communication, writes the return value to $30, and then closes $0.3.
	if mem.inter.ReadBit(0,3)==1 then
	socket = 1
	ret = udp.Close(socket)
	mem.inter.Write(30,ret)
	mem.inter.WriteBit(0,3,0)
	end

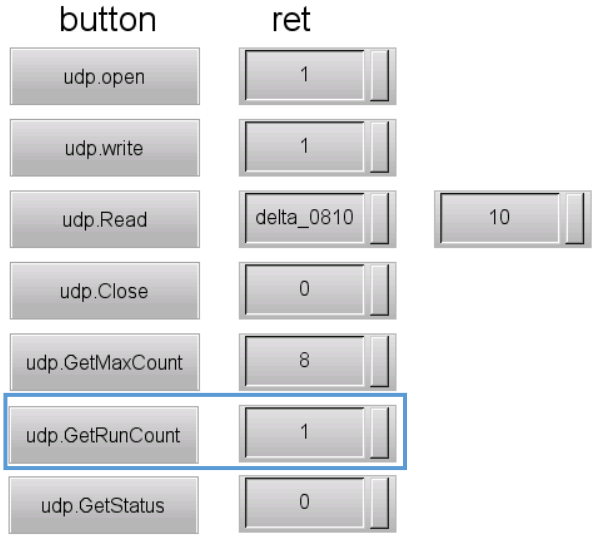
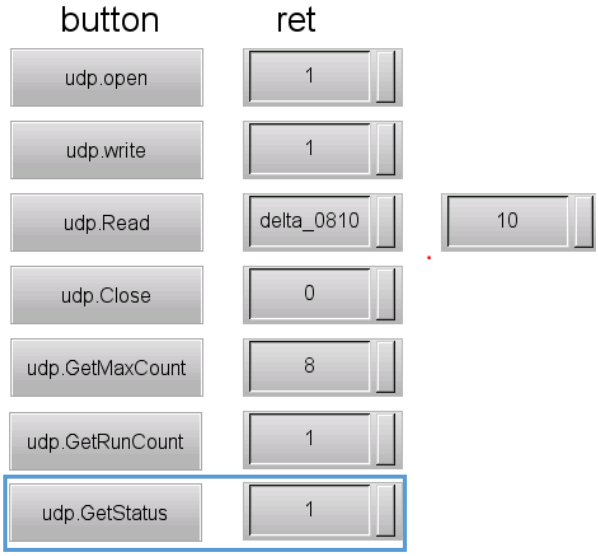
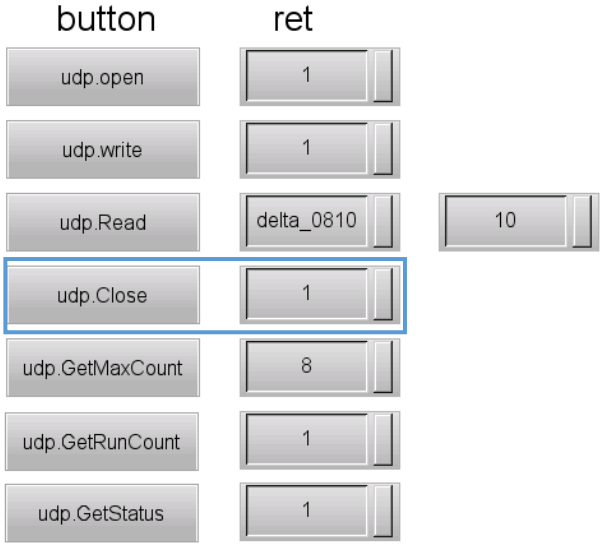
<table>
<tr><th colspan="2">UDP communication</th></tr>
<tr><td>Build Lua commands for UDP communication</td><td>
■ When $0.4 is triggered, the HMI obtains information about the maximum number of supported connections, writes the value to $40, and closes $0.4.
<pre>
if mem.inter.ReadBit(0,4)==1 then
    count = udp.GetMaxCount()
    mem.inter.Write(40,count)
    mem.inter.WriteBit(0,4,0)
end
</pre>
■ When $0.5 is triggered, the HMI checks the number of currently running sockets, writes the value to $50, and closes $0.5.
<pre>
if mem.inter.ReadBit(0,5)==1 then
    count = udp.GetRunCount()
    mem.inter.Write(50,count)
    mem.inter.WriteBit(0,5,0)
end
</pre>
■ When $0.6 is triggered, the HMI checks the connection status of the specified socket, writes the value to $60, and closes $0.6.
<pre>
if mem.inter.ReadBit(0,6)==1 then
    status = udp.GetStatus(1)
    mem.inter.Write(60,count)
    mem.inter.WriteBit(0,6,0)
end
</pre>
</td></tr>
<tr><td>Create Maintained buttons, Numeric Entry and Character Entry elements</td><td>
■ Create 7 Maintained buttons and set the Write Addresses to $0.0, $0.1, $0.2, $0.3, $0.4, $0.5, and $0.6.
■ Create 7 Numeric Entry elements and set the Write Addresses to $1, $5, $20, $30, $40, $50, and $60.
■ Create a Character Entry element and set the Write Address to $10.


</td></tr>
</table>

UDP communication	
Execution results	■ After building the Lua program and creating the elements, compile and download the project to the HMI. ■ Use the third-party software sokit and set the computer as the Server. Set the listening port and press **UDP Listen** to wait for the Client to connect.  ■ Trigger $0.0 to establish connection settings, and the HMI writes the return value to $1, and then closes $0.1. 

UDP communication	
Execution results	■ Trigger $0.1 to write the string “DELTA” to the specified socket communication, and the HMI writes the return value to $5. You can see the written content in the third-party software sokit.   ■ Set the PC as the Client, set the Server IP address and Port, and establish a connection. 

UDP communication	
Execution results	■ Write the string ”delta_0810” to the buffer through sokit. Trigger $0.2 on the HMI, and the HMI reads the data in the buffer, writes the data to $10, and writes the return value to $20.   ■ Trigger $0.4, and the maximum number of supported connections of 8 is obtained. 

UDP communication	
Execution results	■ Trigger $0.5 to get the number of running sockets, and the result is written to $10.  ■ Trigger $0.6 to obtain the status of the specified Socket. 1 means opened.  ■ Trigger $0.3 to close the Socket. 

4.16 Text encoding (encoding format change)

This command helps you convert the encoding format from GBK to UTF-8. The command includes:

Command	Command expression	Description
Text encoding (encoding format change)	text.GbkToUtf8	Convert GBK to UTF-8

The following section will explain the command in detail.

■ text.GbkToUtf8: convert GBK to UTF-8

Command name	text.GbkToUtf8
Command expression	utf8_len, utf8_string = **text.GbkToUtf8**(ascii_string, ascii_len)
Parameter definition	ascii_string: GBK string ascii_len: integer; string length (in bytes)
Example	utf8_len, utf8_string = text.GbkToUtf8("简体", string.len("简体"))
Example description	Use *string.len("简体")* as the string length to convert the string "简体" to a string in UTF-8 format.
Return value	utf8_len: integer; the length of the UTF-8 string after conversion (in bytes); if the return value is less than or equal to 0, it indicates an exception. utf8_string: string; the UTF-8 string after conversion; if *nil* is returned, it indicates an exception.

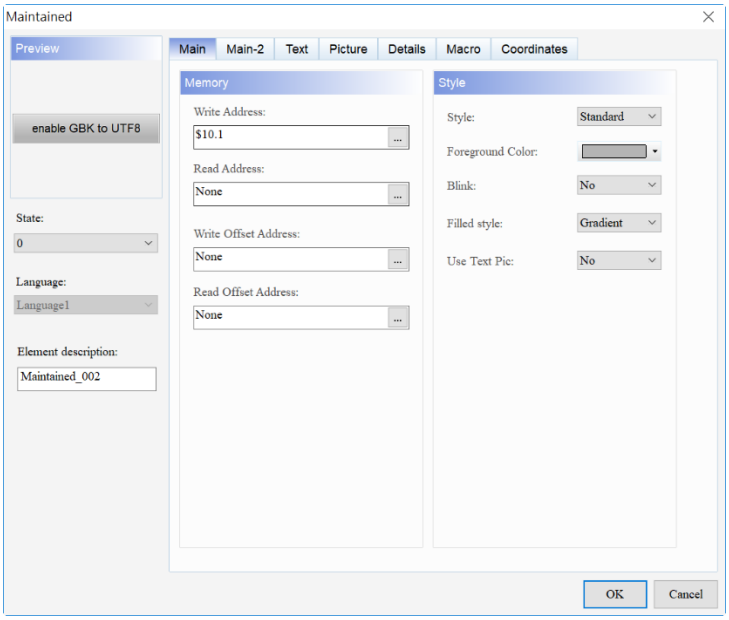
Example (text.GbkToUtf8)	

Build Lua program	■ Build a Lua program to convert data formats.
	■ If $10.1 is triggered, the HMI reads the string of Read Address $100 as “buffer” with the length of 4, converts the string “buffer” to UTF-8 encoding format, and lastly writes the result string to $600.
	`while true do`
	`  if (mem.inter.ReadBit(10, 1) == 1) then`
	`  buffer = mem.inter.ReadAscii(100, 4)`
	`  str_bytes, utf_str = text.GbkToUtf8(buffer, 4)`
	`  mem.inter.WriteAscii(600, utf_str, str_bytes)`
	`  end`
	`end`

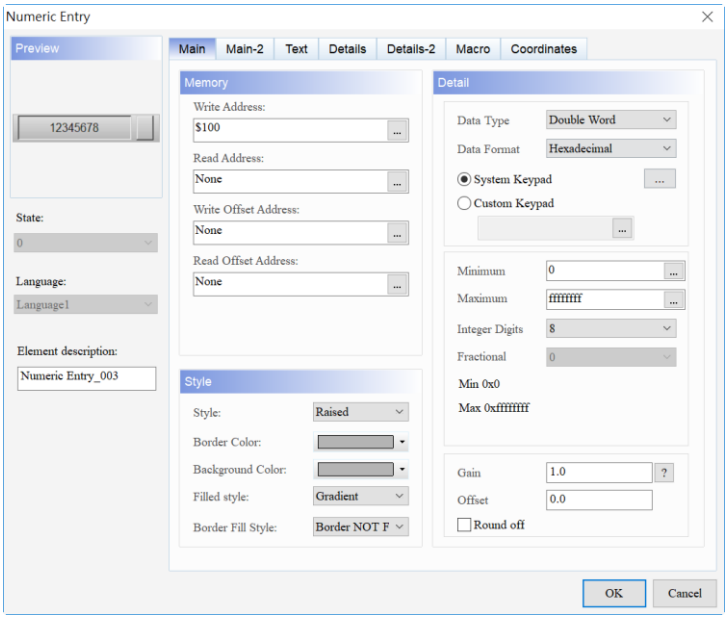
Example (text.GbkToUtf8)

Create Maintained button, Numeric Entry and Multi-language Input elements

■ Create a Maintained button and set the Write Address to $10.1.



■ Create a Numeric Entry element, and set the Write Address to $100 and the Data Format to Hexadecimal.

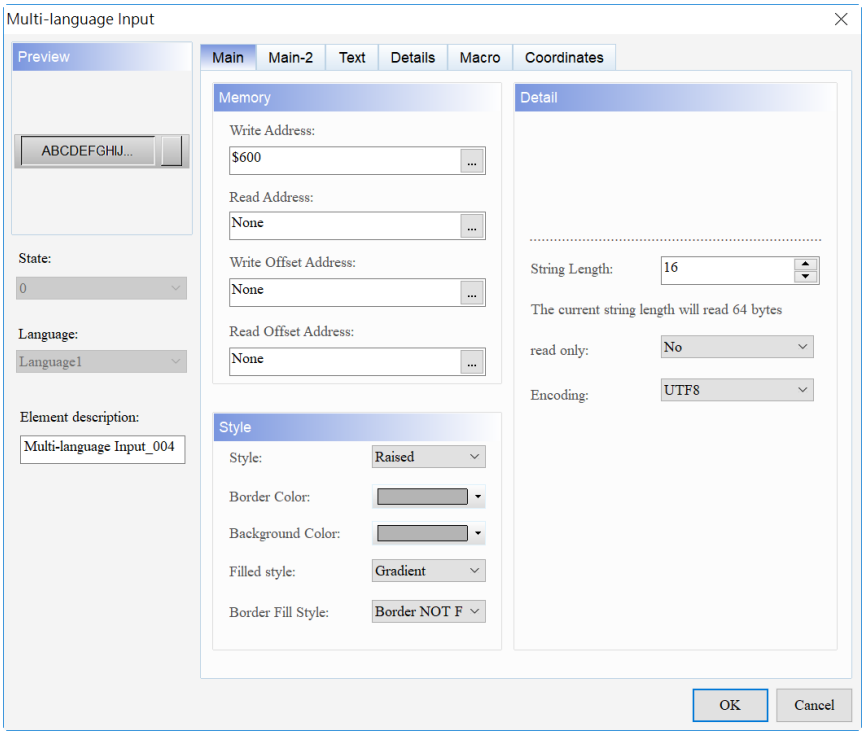


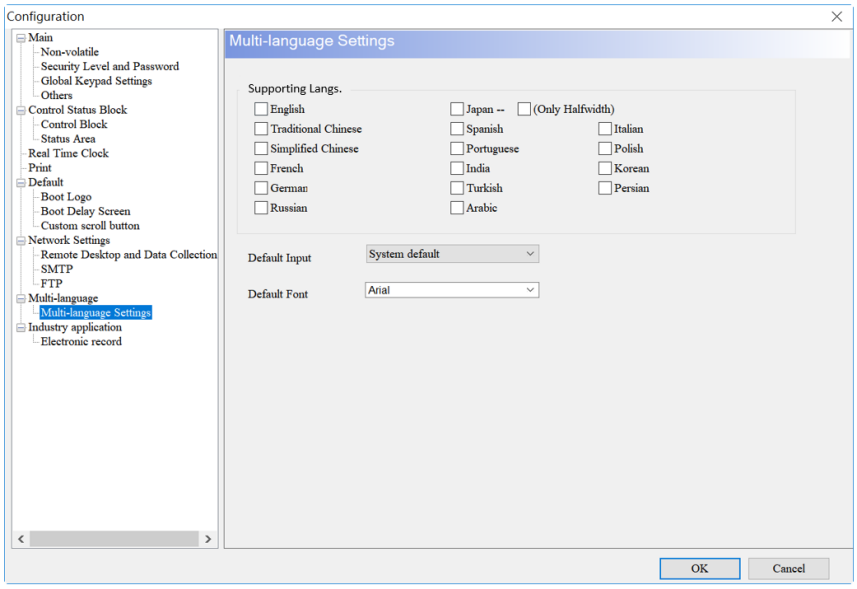
Example (text.GbkToUtf8)

Create Maintained button, Numeric Entry and Multi-language Input elements

■ Create a Multi-language Input element. Set the Write Address to $600, the Encoding to UTF8, and the String Length to 16.

Note: select at least one language for using the Multi-language Input element.

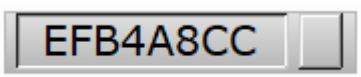
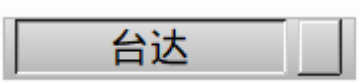




Execution results

■ After building the Lua program and creating the elements, compile and download the project to the HMI.

■ Enter EFB4A8CC to $100, trigger $10.1, and $600 displays the corresponding data.

GBK	UTF-8
	

4.17 Utility (CRC calculation)

This command helps you calculate the CRC value. CRC (Cyclic redundancy check) is used to verify whether an error has occurred during data transmission. This manual does not cover further information on CRC. Refer to the data available on the Internet for more information.

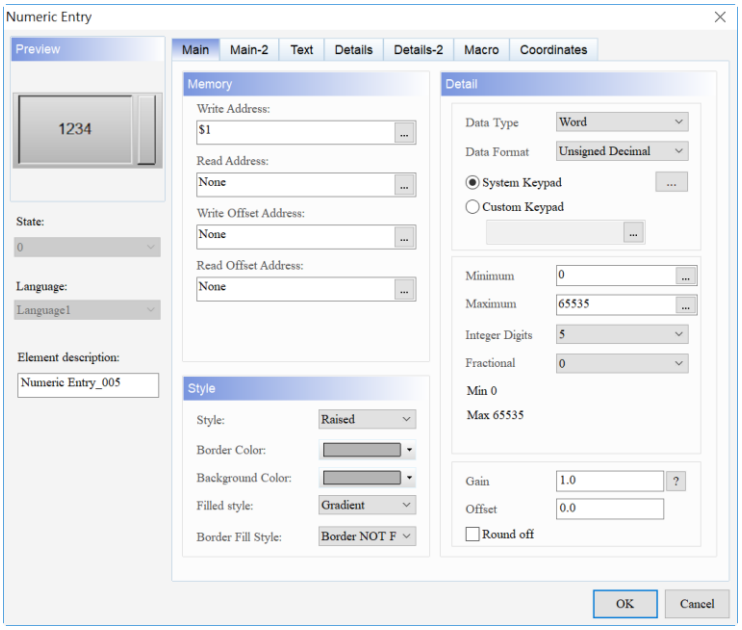
The command includes:

Command	Command expression	Description
Utility (CRC calculation)	util.Crc16Modbus	Calculate the CRC value

The following section will explain the command in detail.

- util.Crc16Modbus: calculate the CRC value

Command name	util.Crc16Modbus
Command expression	crc16 = **util.Crc16Modbus**(str, strLen, initValue)
Parameter definition	str: ASCII string strLen: integer; string length (in bytes) initValue: initial value; the default is 0xFFFF
Example	crc16 = util.Crc16Modbus("abc123", 6, 0xFFFF)
Example description	Create the initial value 0xFFFF in hexadecimal. Calculate the string "abc123" (6 bytes in length) with the initial value to get the CRC value. For the detailed calculation, refer to the information available on the Internet.
Return value	crc16: integer; the result of crc16 calculation

<table>
<tr><th colspan="2">Example (Utility)</th></tr>
<tr><td>Convert the format with Lua</td><td>■ Build the Lua program to convert the data formats, and the value is written to the memory address $1.
<pre>
while true do
    str = "abc123"
    strLen = string.len(str)
    initValue = 0xFFFF
  crc16 = util.Crc16Modbus(str, strLen, initValue)
  mem.inter.Write(1,crc16)
end
</pre></td></tr>
<tr><td>Create Numeric Entry element</td><td>■ Create a Numeric Entry element and set the Write Address to $1.

</td></tr>
<tr><td>Execution results</td><td>■ After building the Lua program and creating the elements, compile and download the project to the HMI.
■ The Numeric Entry element displays the CRC result calculated from the string "abc123" and the initial value.
<table>
<tr><th>The string for CRC calculation</th><th>CRC value</th></tr>
<tr><td>abc123</td><td> 
</td></tr>
</table></td></tr>
</table>

4.18 Convert (floating-point number conversion)

These commands help you convert the data formats. The commands include:

Command	Command expression	Description
Convert (floating-point number conversion)	convert.IntToFloat	Convert the integer to a floating-point number
	convert.ToNum	Convert the string to a 64-bit floating-point number

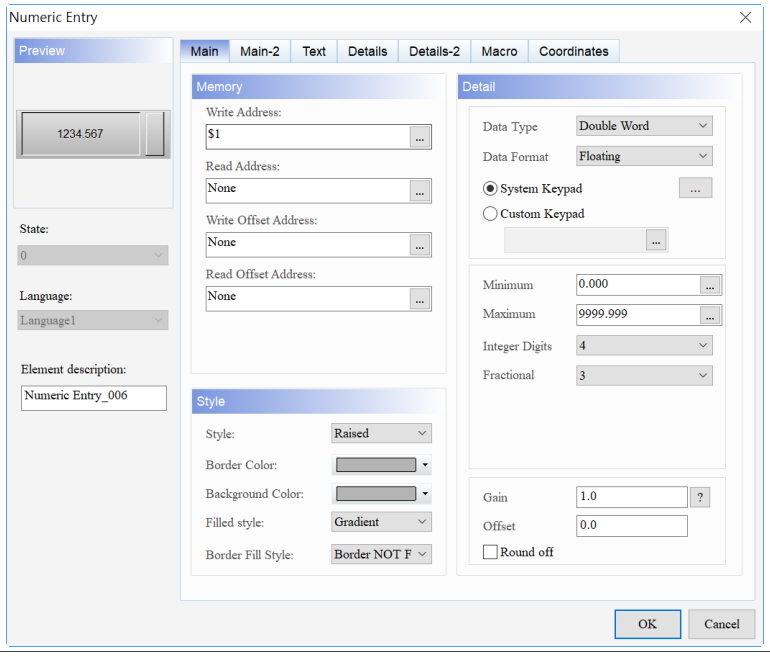
The following sections will explain each in detail.

■ convert.IntToFloat: convert the integer to a floating-point number

Command name	convert.IntToFloat
Command expression	fVal, ret = **convert.IntToFloat**(iVal)
Parameter definition	iVal: 32-bit integer
Example	fVal, ret = convert.IntToFloat(0x42F6E666)
Example description	Convert the data format of 0x42F6E666 from integer to floating-point number.
Return value	ret: return 1 on success; return 0 on failure fVal: the single-precision floating-point number after conversion

■ convert.ToNum: convert the string to a 64-bit floating-point number

Command name	convert.ToNum
Command expression	dVal, ret = **convert.ToNum**(str)
Parameter definition	str: string, for example: "123"
Example	dVal, ret = convert.ToNum("123")
Example description	Convert the string "123" to a 64-bit floating-point number, and thus dVal = 123.
Return value	ret: return 1 on success; return 0 on failure dVal: the 64-bit floating-point number after conversion

<table>
<tr><th colspan="2">convert</th></tr>
<tr><td>Convert the format with Lua</td><td>■ Build the Lua program to convert the data format, and the value is written to the memory address $1.
while true do
fVal = convert.IntToFloat(0x42F6E666)
mem.inter.WriteFloat(1,fVal)
end</td></tr>
<tr><td>Create Numeric Entry element</td><td>■ Create a Numeric Entry element, set the Write Address to $1 and the Data Format to Floating.
 
</td></tr>
<tr><td>Execution results</td><td>■ After building the Lua program and creating the elements, compile and download the project to the HMI.
■ The Numeric Entry element displays the result of converting 0x42F6E666 to a floating-point number.
<table>
<tr><th>Integer</th><th>Float</th></tr>
<tr><td>0x42F6E666</td><td> 
</td></tr>
</table></td></tr>
</table>

4.19 Account (permissions and password setup)

These commands help you manage permissions and passwords. The commands include:

Command	Command expression	Description
Account (permissions and password setup)	account.Add	Add permissions account
	account.Delete	Delete permissions account
	account.ChangeName	Change permissions account name
	account.ChangePassword	Change permissions password
	account.ChangeLevel	Change permission level of the account
	account.GetPassword	Get user password
	account.GetLevel	Get permission level of the account
	account.GetCurrentLogin	Get current login account
	account.IsExist	Check whether the account exists
	account.Login	Log in to permissions account
	account.ResetLockStatus	Unlock a locked account
	account.ChangeUserExpiredDays	Change account expiration time
	account.ChangePwdExpiredDays	Change password expiration
	account.GetStatus	Get account status
	account.GetLockedList	Get a list of locked accounts

The following sections will explain each in detail.

■ account.Add: add permissions account

Command name	account.Add
Command expression	ret = **account.Add**(name, password, level)
Parameter definition	name: account name password: account password level: integer; permission level of the account
Example	ret = account.Add("DELTA", "1234", 5)
Example description	Add an account with the permission level as 5, the username as DELTA, and the password as 1234.
Return value	ret: return 1 on success; return 0 on failure

■ account.Delete: delete permissions account

Command name	account.Delete
Command expression	ret = **account.Delete**(name)
Parameter definition	name: account name
Example	ret = account.Delete(“posheng”)
Example description	Delete the permissions account of the username “posheng”.
Return value	ret: return 1 on success; return 0 on failure

■ account.ChangeName: change permissions account name

Command name	account.ChangeName
Command expression	ret = **account.ChangeName**(srcName, newName)
Parameter definition	srcName: string; the account name to be changed newName: string; new account name
Example	ret = account.ChangeName("DELTA", “posheng”)
Example description	Change the username from "DELTA" to "posheng".
Return value	ret: return 1 on success; return 0 on failure

■ account.ChangePassword: change permissions password

Command name	account.ChangePassword
Command expression	ret = **account.ChangePassword**(Name, newPassword)
Parameter definition	name: string; the account password to be changed newPassword: string; new password
Example	ret = account.ChangePassword("DELTA", "0101")
Example description	Change the password of the user “DELTA” to 0101.
Return value	ret: return 1 on success; return 0 on failure

■ account.ChangeLevel: change permission level of the account

Command name	account.ChangeLevel
Command expression	ret = **account.ChangeLevel**(name, newLevel)
Parameter definition	name: string; the name of the account whose permissions is to be changed newLevel: integer; new permission level
Example	account.ChangeLevel("DELTA", 1)
Example description	Change the permission level of the user “DELTA” to 1.
Return value	ret: return 1 on success; return 0 on failure

■ account.GetPassword: get user password

Command name	account.GetPassword
Command expression	ret, password = **account.GetPassword**(name)
Parameter definition	name: the name of the account whose password is to be obtained
Example	ret, password = account.GetPassword(“DELTA”)
Example description	password = the password of the user “DELTA”.
Return value	ret: return 1 on success; return 0 on failure password: string; the obtained password

■ account.GetLevel: get permission level of the account

Command name	account.GetLevel
Command expression	ret, level = **account.GetLevel**(name)
Parameter definition	name: string; the name of the account whose permission level is to be obtained
Example	ret, level = account.GetLevel("DELTA")
Example description	level = the permission level of the user “DELTA”.
Return value	ret: return 1 on success; return 0 on failure level: integer; the obtained permission level

■ account.GetCurrentLogin: get current login account

Command name	account.GetCurrentLogin
Command expression	ret, name, level = **account.GetCurrentLogin**()
Parameter definition	No parameters
Example	ret, name, level = account.GetCurrentLogin()
Example description	Get the current logged in account.
Return value	ret: return 1 on success; return 0 on failure name: string; the obtained account name level: integer; the obtained permission level

■ account.IsExist: check whether the account exists

Command name	account.IsExist
Command expression	ret = **account.IsExist**(name)
Parameter definition	name: string; account name
Example	ret = account.IsExist("DELTA")
Example description	Check whether the account of the user “DELTA” exists.
Return value	ret: return 1 if it exists; return 0 if it does not exist

■ account.Login: log in to permissions account

Command name	account.Login
Command expression	ret = **account.Login**(name, password)
Parameter definition	name: string; login account password: string; login password
Example	ret = account.Login("DELTA", "0101")
Example description	Use the username “DELTA” and the password “0101” to log in to the permissions account.
Return value	ret: return 1 on success; return 0 on failure

■ account.ResetLockStatus: unlock a locked account

Command name	account.ResetLockStatus
Command expression	ret = **account.ResetLockStatus**(name)
Parameter definition	name: string; account name
Example	ret = account.ResetLockStatus("user01")
Example description	Unlock the locked account “user01”.
Return value	ret: return 1 on success; return 0 on failure

■ account.ChangeUserExpiredDays: change account expiration time

Command name	account.ChangeUserExpiredDays
Command expression	ret = **account.ChangeUserExpiredDays**(name, expiredDays)
Parameter definition	name: string; the name of the account whose account expiration time is to be changed expiredDays: integer; 0 to 9999
Example	ret = account.ChangeUserExpiredDays("11", 2)
Example description	Change the account expiration time of the account name "11" to 2 days. Note: when you log in to this account, the system shows that the account has expired.
Return value	ret: return 1 on success; return 0 on failure; return -1 on parameter setting error

■ account.ChangePwdExpiredDays: change password expiration

Command name	account.ChangePwdExpiredDays
Command expression	ret =**account.ChangePwdExpiredDays**(name, expiredDays)
Parameter definition	name: string; the name of the account whose password expiration is to be changed expiredDays: integer; 0 to 9999
Example	ret = account.ChangePwdExpiredDays("33", 2)
Example description	Change the password expiration of the account name "33" to 2 days. Note: when you log in to this account, the system shows that the password has expired.
Return value	ret: return 1 on success; return 0 on failure; return -1 on parameter setting error

■ account.GetStatus: get account status

Command name	account.GetStatus
Command expression	ret = **account.GetStatus**(name)
Parameter definition	name: string; the name of the account whose account status is to be obtained
Example	ret = account.GetStatus("33")
Example description	Get the account status of the account name "33".
Return value	ret: return 1 if the account is locked; return 0 if the account is not locked; return -1 on parameter setting error

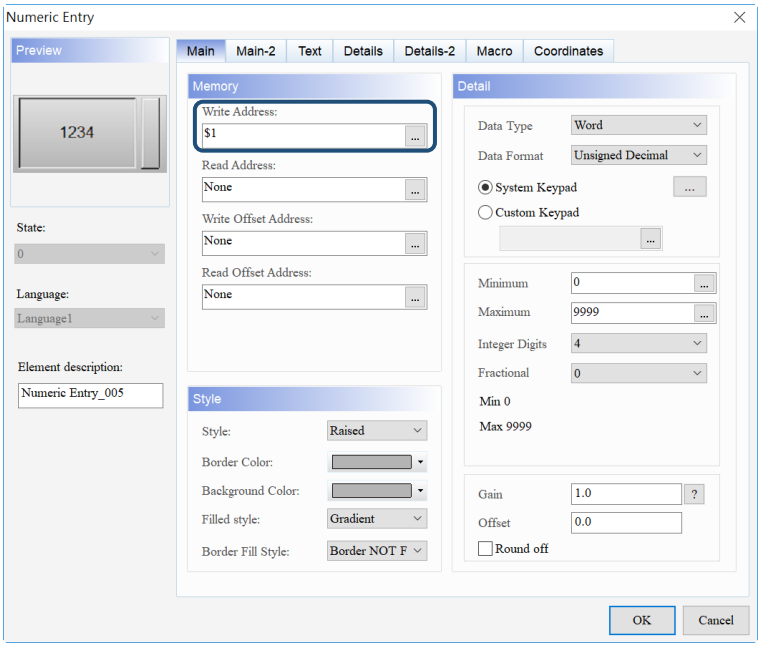
■ account.GetLockedList: get a list of locked accounts

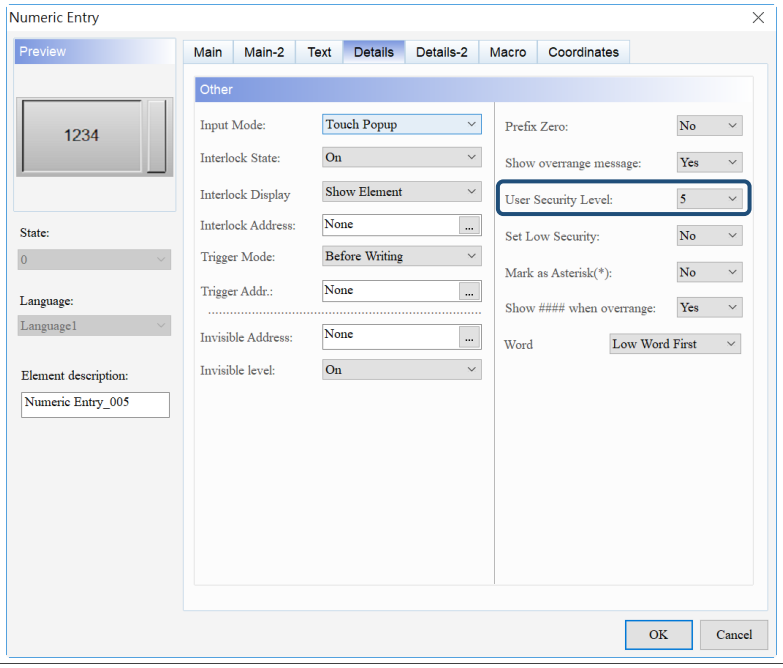
Command name	account.GetLockedList
Command expression	ret, nameList = **account.GetLockedList**()
Parameter definition	No parameters
Example	ret, nameList = account.GetLockedList()
Example description	Get a list of locked accounts.
Return value	ret: return 1 on success; return 0 on failure nameList: matrix table; return a filename list on success; return nil on failure

Example (account)

Create Numeric Entry element

■ Create a Numeric Entry element, and set the Write Address to $1 and the User Security Level to 5.

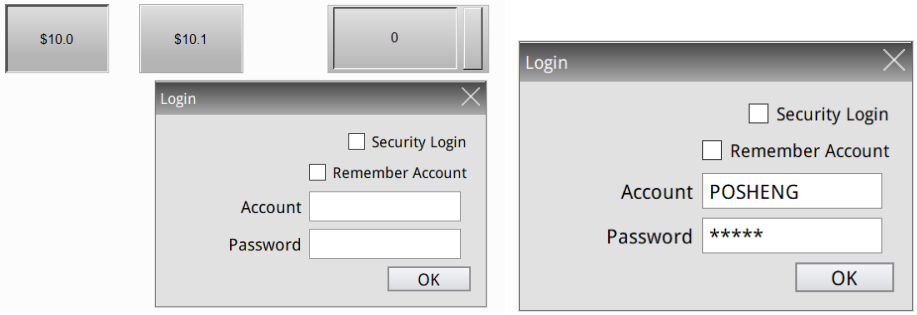


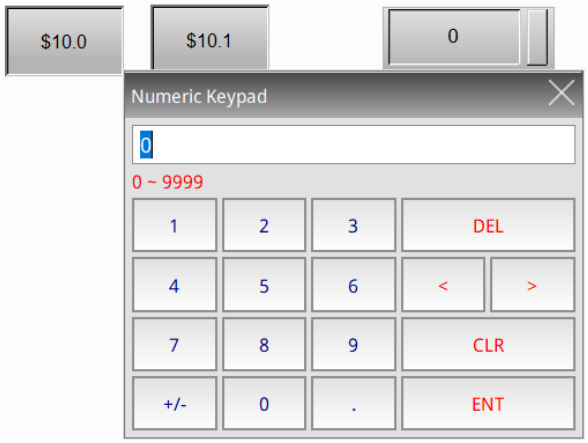


<table>
<tr><th colspan="2">Example (account)</th></tr>
<tr><td>Use Lua to create permissions accounts</td><td>■ Use the Lua program to create permissions accounts. Create a user permissions account when the memory address $10.0 is triggered. The username is POSHENG, the password is DELTA, and the permission level is 5.
<pre>
if (mem.inter.ReadBit(10,0)==1) then
    strName = "POSHENG"
    strPassword = "DELTA"
    intLevel = 5
    ret = account.Add(strName, strPassword, intLevel)
end
</pre></td></tr>
<tr><td>Log in to permissions account through Lua</td><td>■ Enter the Lua command shown as follows.
<pre>
if (mem.inter.ReadBit(10,1)==1) then
    strName = "POSHENG"
    strPassword = "DELTA"
    ret = account.Login(strName, strPassword)
end
</pre></td></tr>
<tr><td>Create Maintained buttons</td><td>■ Create 2 Maintained Buttons and set the Write Addresses to $10.0 and $10.1.

</td></tr>
<tr><td>Execution results</td><td>■ After building the Lua program and creating the elements, compile and download the project to the HMI.


■ Trigger $10.0 to create a permissions account.


■ Press the Numeric Entry element, and then you can directly enter the username and password for login.


■ You can also log in to the permissions account by triggering $10.1, and then you can directly use the Numeric Entry elements.

</td></tr>
</table>

4.20 Mail

You need to complete the SMTP related settings before using these commands to call the Mail Server to send emails or files through the HMI. The commands include:

Command	Command expression	Description
Mail	mail.Status	Mail function status
	mail.Send	Send email
	mail.SendFile	Send email (including files)
	mail.SendAlarm	Send email (including alarms)
	mail.SendHistory	Send email (including history data)

The following sections will explain each in detail.

■ mail.Status: mail function status

Command name	mail.Status
Command expression	status = **mail.Status**()
Parameter definition	No parameters
Example	status = mail.Status()
Example description	Get the current mail function status.
Return value	Return value: 1 — The email has been successfully delivered 0 — Initial value; no email is being delivered, or the delivery task has just started -100 — Host connection failed -101 — Disconnected -102 — Authentication is required -103 — Authentication failed -999 — Unknown error

■ mail.Send: send email

Command name	mail.Send
Command expression	result, error = **mail.Send**(receiver, subject, content)
Parameter definition	receiver: string; email recipient subject: string; email subject. If you don't need a subject, set it to nil. content: string; email content. If you don't need any content, set it to nil.
Example	result, error = mail.Send("test@test.com", "test mail subject", "test mail content")
Example description	Send an email to test@test.com with the subject as "test mail subject" and the content as "test mail content".
Return value	result: integer; 0: email delivery has not yet started; 1: email delivery has started error: integer Return value: 0 — Initial value; no email is being delivered, or the delivery task has just started -1 — Invalid parameter -121 — SMTP is not set

■ mail.SendFile: send email (including files)

Command name	mail.SendFile
Command expression	result, error = **mail.SendFile**(receiver, subject, content, disk_id, file_path, password)
Parameter definition	receiver: string; email recipient subject: string; email subject. If you don't need a subject, set it to nil. content: string; email content. If you don't need any content, set it to nil. disk_id: integer; 0: HMI; 2: USB drive; 3: SD card file_path: string; the file path under the specified disk_id password: string; file password. If no password is required, set it to nil.
Example	result, error = mail.SendFile("test@test.com", "test mail subject", "test mail content", 2, "test/file.txt", "1234")
Example description	Compress the file "test/file.txt" stored in the USB drive, and set the password to "1234". Then, send the file through email to test@test.com with the subject as "test mail subject" and the content as "test mail content".
Return value	result: integer; 0: email delivery has not yet started; 1: email delivery has started error: integer

Return value	Description
0	No errors
-1	Invalid parameter
-106	The specified disk is not ready
-107	Cannot open the specified file
-110	The specified file path does not exist
-121	SMTP is not set
-122	An error occurred while the file is being compressed

■ mail.SendAlarm: send email (including alarms)

Command name	mail.SendAlarm
Command expression	result, error = **mail.SendAlarm**(receiver, subject, content, password)
Parameter definition	receiver: string; email recipient subject: string; email subject. If you don't need a subject, set it to nil. content: string; email content. If you don't need any content, set it to nil. password: string; file password. If no password is required, set it to nil.
Example	result, error = mail.SendAlarm("test@test.com", "test mail subject", "test mail content", "1234")
Example description	Compress the alarm CSV file and set the password to "1234", and then send the file through email to test@test.com with the subject as "test mail subject" and the content as "test mail content".
Return value	result: integer; 0: email delivery has not yet started; 1: email delivery has started error: integer

Return value	Description
0	No errors
-1	Invalid parameter
-107	Cannot open the specified file
-121	SMTP is not set
-122	An error occurred while the file is being compressed
-126	No alarm enabled
-127	Failed to export CSV file

■ mail.SendHistory: send email (including history data)

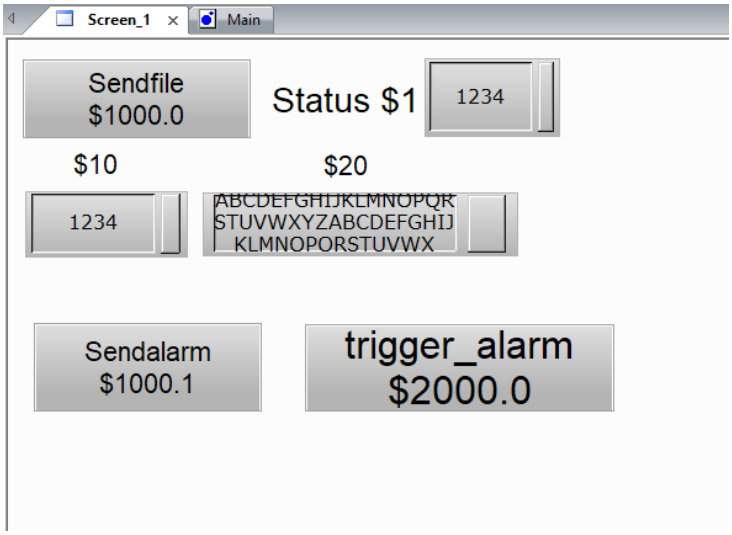
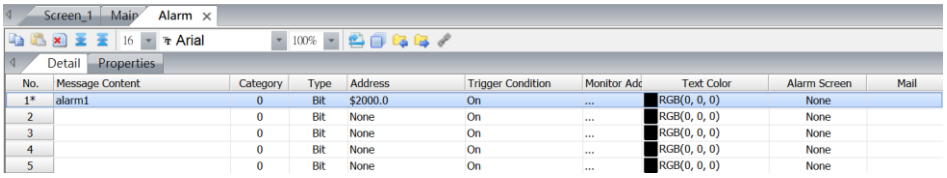
Command name	mail.SendHistory
Command expression	result, error = **mail.SendHistory**(bufferNo, dayRange, receiver, subject, content, password)
Parameter definition	bufferNo: integer; history buffer ID dayRange: integer; the day range of the history buffer CSV file. You have to enable the Save As Multi function to set this parameter with the range of 0 to 7. Set it to 0 to export the contents of 7 days to the CSV file. receiver: string; email recipient subject: string; email subject. If you don't need a subject, set it to nil. content: string; email content. If you don't need any content, set it to nil. password: string; file password. If no password is required, set it to nil.
Example	result, error = mail.SendHistory(1, 0, "test@test.com", "test mail subject", "test mail content", "1234")
Example description	Compress the CSV file of history buffer ID 1 and set the password to "1234", and then send the file through email to test@test.com with the subject as "test mail subject" and the content as "test mail content".
Return value	result: integer; 0: email delivery has not yet started; 1: email delivery has started error: integer

Return value	Description
0	No errors
-1	Invalid parameter
-107	Cannot open the specified file
-121	SMTP is not set
-128	No history buffer enabled
-129	Incorrect history buffer ID
-130	Incorrect range of days
-131	Failed to export history CSV file
-132	Failed to copy history CSV file
-133	No matching files

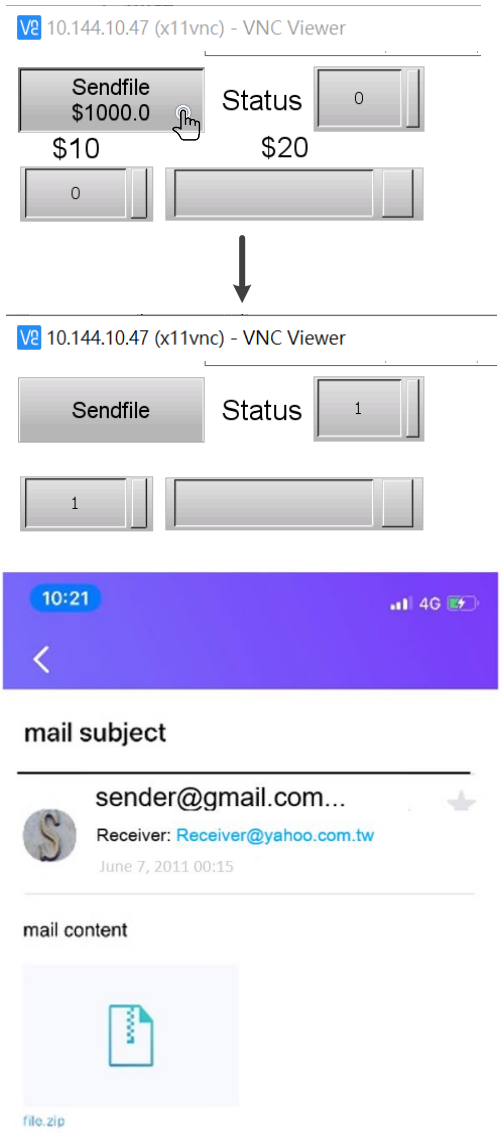
Example (mail)	

Write Lua program	■ Go to [Main] in the project tree on the left side and create the Lua command *mail.SendFile*.
	`if mem.inter.ReadBit(1000,0)==1 then`
	`disk_id = 2`
	`file_name = "posheng.txt"`
	`ret, fileHandle = file.Open(disk_id, file_name)`
	`sys.Sleep(1000)`
	`result, error = mail.SendFile("Receiver@yahoo.com.tw", "mail subject", "mail content", 2, "posheng.txt", "1234")`
	`mem.inter.Write(10,result)`
	`if result ~=1 then`
	`mem.inter.WriteAscii(20,error,string.len(error))`
	`end`
	`mem.inter.WriteBit(1000,0,0)`
	`status = mail.Status()`
	`mem.inter.Write(1,status)`
	`end`
	■ Program description:
	If $1000.0 is triggered, the HMI creates a file named "posheng.txt". After the file is created for 1000 ms, the HMI encrypts the file with the password “1234”, compresses it into a zip file, and then sends it to Receiver@yahoo.com.tw with the email subject as "mail subject" and the email content as "mail content". Lastly, the HMI writes the result of the return value to $10. If the return value is not equal to 1 (that is, the delivery failed), the HMI writes the error code (such as the specified file path does not exist, cannot open the specified file, or the disk is not ready) to $20. Then, the HMI sets $1000.0 to off, checks the SMTP connection status information through *mail.Status* (such as whether the connection to the SMTP Server is successful, or whether the authentication is successful), and returns the data to $1.

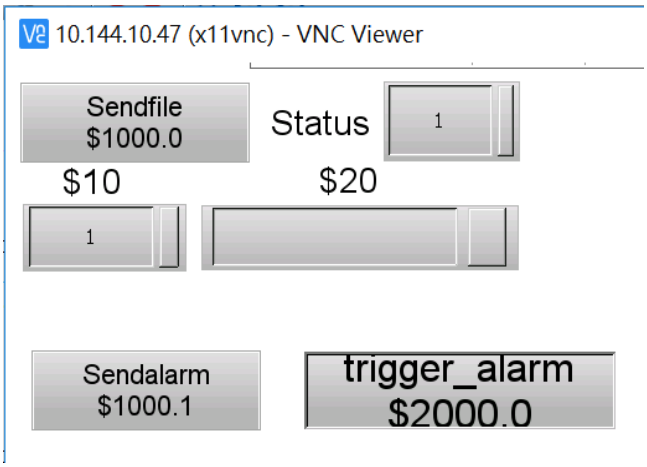
Build Lua program	■ Go to [Main] in the project tree on the left side and create the Lua command *mail.SendAlarm*.
	`if mem.inter.ReadBit(1000,1)==1 then`
	`result, error = mail.SendAlarm("Receiver@yahoo.com.tw", "mail subject", "mail content", "1234")`
	`mem.inter.Write(10,result)`
	`if result ~=1 then`
	`mem.inter.WriteAscii(20,error,string.len(error))`
	`end`
	`status = mail.Status()`
	`mem.inter.Write(1,status)`
	`mem.inter.WriteBit(1000,1,0)`
	`end`
	■ Program description:
	If $1000.1 is triggered, the HMI encrypts the alarm data (.CSV) file with the password “1234”, then compresses it into a zip file, and sends it to Receiver@yahoo.com.tw with the email subject as "mail subject" and the email content as "mail content". Then, the HMI writes the result of the return value to $10. If the return value is not equal to 1 (that is, the delivery failed), the HMI writes the error code to $20. Lastly, the HMI sets $1000.1 to off, checks the SMTP connection status information through *mail.Status*, and returns the data to $1.

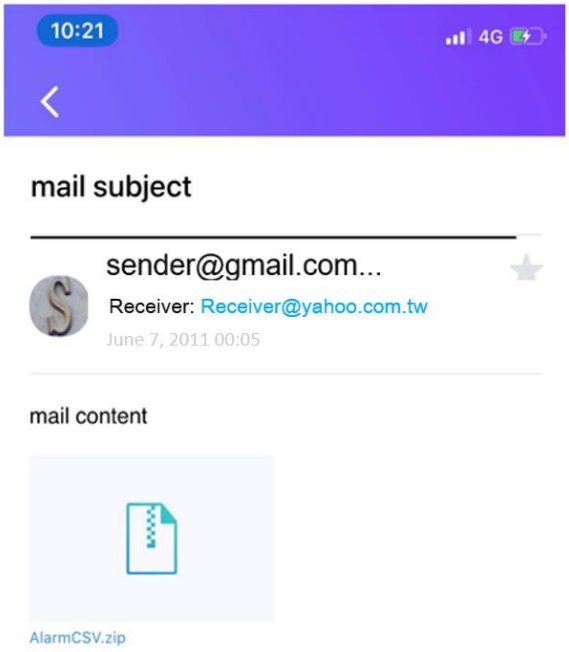
<table>
<tr><th colspan="2">Example (mail)</th></tr>
<tr><td>Create elements</td><td>■ Create 3 Maintained buttons and set the Write Addresses to $1000.0, $1000.1, and $2000.0.
■ Create 2 Numeric Entry elements and set the Write Addresses to $1 and $10.
■ Create a Character Entry element and set the Write Address to $20.
 
</td></tr>
<tr><td>Set alarm</td><td>■ Go to [Options] > [Alarm Settings] to set the alarm message and set the trigger address to $2000.0.
 

<table>
<tr><th>No.</th><th>Message Content</th><th>Category</th><th>Type</th><th>Address</th><th>Trigger Condition</th><th>Monitor Adc</th><th>Text Color</th><th>Alarm Screen</th><th>Mail</th></tr>
<tr><td>1*</td><td>alarm1</td><td>0</td><td>Bit</td><td>$2000.0</td><td>On</td><td>...</td><td>RGB(0, 0, 0)</td><td>None</td><td></td></tr>
<tr><td>2</td><td></td><td>0</td><td>Bit</td><td>None</td><td>On</td><td>...</td><td>RGB(0, 0, 0)</td><td>None</td><td></td></tr>
<tr><td>3</td><td></td><td>0</td><td>Bit</td><td>None</td><td>On</td><td>...</td><td>RGB(0, 0, 0)</td><td>None</td><td></td></tr>
<tr><td>4</td><td></td><td>0</td><td>Bit</td><td>None</td><td>On</td><td>...</td><td>RGB(0, 0, 0)</td><td>None</td><td></td></tr>
<tr><td>5</td><td></td><td>0</td><td>Bit</td><td>None</td><td>On</td><td>...</td><td>RGB(0, 0, 0)</td><td>None</td><td></td></tr>
</table>
Note: alarm1 is triggered when $2000.0 is triggered.</td></tr>
<tr><td>Set SMTP function</td><td>■ Set the SMTP function. For details, see CH27 of the DOPSoft User Manual.</td></tr>
</table>

Example (mail)	
Execution results	■ After building the Lua program and creating the elements, compile and download the project to the HMI. ■ Click **Sendfile**, and you can receive the sent file. 

Example (mail)	
Execution results	■ Click **$2000.0** to trigger the alarm, and click **Sendalarm** to send an email with "mail subject" as the subject. Then, you can receive the CSV data of the alarm in the mailbox.





4.21 Draw (drawing function)

These commands help you draw on the HMI. The commands include:

Command	Command expression	Description
Draw (drawing function)	draw.Point	Draw (point)
	draw.Line	Draw (line)
	draw.Rect	Draw (rectangle)
	draw.Ellipse	Draw (ellipse)
	draw.Clear	Clear the drawing
	draw.SetAntialiasing	Enable/disable anti-aliasing

The following sections will explain each in detail.

■ draw.Point: draw (point)

Command name	draw.Point
Command expression	ret = **draw.Point**(x, y, color)
Parameter definition	x: integer; the x coordinate of the HMI y: integer; the y coordinate of the HMI color: integer; the RGB565 decimal value ranges from 0 to 65535
Example	ret = draw.Point(1, 1, 0)
Example description	Draw a point on the coordinate (1, 1) of the HMI with the color of RGB565 #0 (black).
Return value	ret: return 1 on success; return 0 on failure

■ draw.Line: draw (line)

Command name	draw.Line
Command expression	ret = **draw.Line**(x1, y1, x2, y2, color, penWidth)
Parameter definition	x1: integer; the x coordinate of the starting point of the line y1: integer; the y coordinate of the starting point of the line x2: integer; the x coordinate of the ending point of the line y2: integer; the y coordinate of the ending point of the line color: integer; the RGB565 decimal value ranges from 0 to 65535 penWidth: integer; the width of the line
Example	ret = draw.Line(1, 1, 100, 100, 53388, 5)
Example description	Draw a line from coordinates (1, 1) to (100, 100) of the HMI with the color of RGB565 #53388 (pink).
Return value	ret: return 1 on success; return 0 on failure

■ draw.Rect: draw (rectangle)

Command name	draw.Rect
Command expression	ret = **draw.Rect**(x, y, w, h, color)
Parameter definition	x: integer; the x coordinate of the upper left of the rectangle y: integer; the y coordinate of the upper left of the rectangle w: integer; the width of the rectangle h: integer; the height of the rectangle color: integer; the RGB565 decimal value ranges from 0 to 65535
Example	ret = draw.Rect(50, 50, 100, 20, 53388)
Example description	Draw a rectangle on the coordinate (50, 50) of the HMI with the width of 100, the height of 20, and the color of RGB53388 (pink).
Return value	ret: return 1 on success; return 0 on failure

■ draw.Ellipse: draw (ellipse)

Command name	draw.Ellipse
Command expression	ret = **draw.Ellipse**(x, y, w, h, color)
Parameter definition	x: integer; the x coordinate of the center of the ellipse y: integer; the y coordinate of the center of the ellipse w: integer; the width of the ellipse h: integer; the height of the ellipse color: integer; the RGB565 decimal value ranges from 0 to 65535
Example	ret = draw.Ellipse(50, 50, 100, 100, 53388)
Example description	Draw an ellipse on the coordinate (50, 50) of the HMI with the width of 100, the height of 100, and the color of RGB53388 (pink).
Return value	ret: return 1 on success; return 0 on failure

■ draw.Clear: clear the drawing

Command name	draw.Clear
Command expression	ret = **draw.Clear**()
Parameter definition	No parameters
Example	ret = draw.Clear()
Example description	Clear the drawing.
Return value	ret: return 1 on success; return 0 on failure

■ draw.SetAntialiasing: enable/disable anti-aliasing

Command name	draw.SetAntialiasing
Command expression	ret = **draw.SetAntialiasing**(flag)
Parameter definition	flag: set to 1 to enable the anti-aliasing function; set to 0 to disable the anti-aliasing function
Example	ret = draw.SetAntialiasing(1)
Example description	Enable the anti-aliasing function to make the drawing smoother.
Return value	ret: return 1 on success; return 0 on failure

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Revision History

Release date	Version	Chapter	Revision contents
December, 2021	V1.0 (First edition)		

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