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Preface

Macros are a simple programming language that enables the user to write their own programs for specific functions. The main purposes of macro are for automation or for triggering other functions according to certain criteria. For those who are familiar with programming language can effective take advantage of human and machine interface register and save time on screen editing.

Macro Editor

Interface Description

Create to open the macro editor from the Macro Library. The editing screen consists of a toolbar, a functional window, an editing window, and an error window. See the figure below.

toolbar

editing window

functional window

Figure. Macro Editor

error window

Toolbar

All the functions provided by the toolbar are listed in the following table.

Figure. Toolbar Function Description

Name	Function
	Clearing out macro data from the editing window
	Reading the script from the file
	Saving macros into the file
	Cutting the selected macro
	Copying the selected macro
	Pasting the cut or copied macro
	Searching data inside the editing window
	Opening /closing row number display
	Run syntax analysis
	Opening / closing the automatic syntax analysis
	Opening the online PDF Help file

a. ScriptClearing

Click from the toolbar to delete all the edited data from the screen to complete the initialization of the macro editor.

b. ScriptReading

Click from the toolbar to open the to be read data file (*.txt). See the figure below.

Figure. Script Reading

c. ScriptSaving

Click from the toolbar to save the macro data from the editing screen into a file (*.txt). See the figure below.

Figure. Script Saving

d. Cut

Select the cutting range, and either click from the toolbar or press the hotkey Ctrl+X to cut the selected macros.

e. Copy

Select the copying range and either click from the toolbar or press the hotkey Ctrl+C to cut the selected macros.

f. Paste

To paste a copied or cut macro, choose from the toolbar, or press Ctrl+V.

g. Search

To search macro data in the editing screen, click from the toolbar to change from the toolbox to the search tab or directly click to carry out tab switching. See the figure below.

Figure. Functional Window: (a) Toolbox; (b) Search

h. RungNumber

The rung number displayed at the side of the editing window enables the user to juxtapose it with the macro rung number. Click from the toolbar to open/close the rung number display. See the figure below.

Figure. Rung Number Display: (a) Displaying Rung Number; (b) Hiding Rung Number

i. SyntaxAnalysis

To check if the macro syntax in the editing screen is correct or not, click from the toolbar for the analysis function. The result will be displayed at the Error window. See the figure below.

Figure. Syntax Analysis error window

i. Auto SyntaxAnalysis

When writing macros in the editing screen, the system will run automatic syntax analysis and display the result at the bottom of the screen. The default setting of this function is ON.

k. Help

Click from the toolbar to open the instruction manual (PDF file). Use Adobe Acrobat Reader software to read the manual.

FunctionWindow

The macro editing function window provides a toolbox and a search tab, which can be modified according to the requirement of the user. The user can also directly click or to change tab. See the figure below.

Figure. Functional Window: (a) Toolbox; (b) Search

a. Toolbox

The toolbox provides syntax that can be used by editing macros. The user directly clicks on the required syntax, which will be automatically transferred to the editing window. See the figure below.

Figure. Set up Syntax Function

b. Search

To search macro data in the editing screen, click from the toolbar to change from the toolbox to the search tab or directly click to change tab. See the figure below.

Figure. Search Function

The user only needs to enter the to be searched text into the box and click to carry out the search. See the figure below.

Figure. Search Target

Please note that absolute upper or lower cases are required for macro editing, or otherwise a warning window will pop out to remind the user. See the figure below.

Figure. Warning Window

First, enter the to be replaced text into the box and click to carry out the search. Next, click or for the replacing action. See the figure below.

(a)

(b)

Figure. Search Function: (a) Search; (b) Replace

Editingwindow

The macro editing window of the macro editor enables the user to make modifications on ID descriptions, to write macro syntax, and to arrange subroutines and the triggering setup. See the figure below.

Name	Function
ID: 0000 Comment	Editing macro descriptive name
Channel	Changing the control communication port
	Setting as a subroutine
	Changing data mode
Trigger Setup	Setting up macro triggering criteria
Enlarge Script Area / Display Setting	Enlarging/returning to the editing window
Input Device	Selecting the input device

Figure. Editing Screen

a. ID: 0000

ID: 0000 is the code of the macro that means the user is currently editing. See the figure below.

Figure. ID Code

b. Comment

To make modifications on the content of the description, the user can edit the required text in the description box, which will make later viewing more convenient. See the figure below.

Figure. Description on Modifications

c. Cannel

To set up communication port devices, use the pull down menu to select the required communication port device. See the figure below.

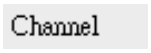

Figure. Changing Communication Port

One of macro editor can carry out macro editing for only one set device with the human machine interface.

d. Subfuntion

Select from the macro editor to change macro programs to sub **f**untion. The macro library will display these programs as sub **f**untion. When a macro is a sub **f**untion, the user needs to use command to call and to run a sub **f**untion. See the figure below.

Figure. Setting up a sub **f**untion

e. Data Mode

To change the data mode of a device from with signed to unsigned or vice versa, select or accordingly. See the figure below.

Figure. Changing Data Mode

f. TriggeringSetup

When selecting the triggering mode, the program will run the macro according to the triggering criteria. If the user chooses no effect for the triggering mode, the macro will be run continuously.

To set up macro trigger criteria, click to open the *Trigger Setup* window. From there, the user can modify the trigger mode and the criteria. See Figure 3 14 28 below.

Triggering Mode	Description
Ordinary	No Triggering Mode
ON	Delivering actions only when the device is ON
OFF	Delivering actions only when the device is OFF
Range	Delivering actions only when the value of the device is within this range.
Multiple bit Trigger	Delivering actions only when all the devices (more than two) have met the criteria.

Figure 3 16 216 Descriptions on the Triggering Mode Setup

The *Triggering Mode Setup* has multiple bit trigger and 2 number of devices. Click to open the *Device Setup* window, and set the triggering devices as M1 and M2, respectively. Press *OK* to send the files to HMI. Button pressing would trigger further actions only when M1 and M2 buttons are both ON. See Figure 3 6 294 below.

(a)

(b)

Figure 3 6 237 Multiple bit Trigger: (a) The Multiple bit Triggering Setup Window; (b) Setting up the Devices

g. EnlargeScriptArea

To enlarge the script editing screen, click Enlarge Script Area to enlarge the editing screen and extend the screen toward the top of the screen. Next, click Display Setting to return to the original state. See the figure below.

(a)

(b)

Figure. Editing Screen: (a) Enlarge Script Area; (b) Display Setting

h. Input Device

For device installation, click to open the *Device Setting* dialog box. From there, the user can modify the device mode. After selecting the mode, click again to open the *Device Setup* dialog box. Press *OK* to complete the setup. See Figure 3 ₦ ₂9.

(a)

(b)

Figure 3 ₦ ₂9 Input Devices : (a) Setting up the Format; (b) Setting up the Device

Error Window

Error Window is available for carrying out syntax analysis when editing macro programs in order to ensure the correctness of the program. The user can make correction according to the message described in the error window. See the figure below.

Figure. Error Window

Introducing the Basic Commands

a. Operation Description

Click *Syntax* in the function window to have it moved to the editing window directly. Programming language and devices are presented in the corresponding colors. The macro program will be run repeatedly. See the figure below.

Figure. Operation Description

b. DeviceUsage

Macro editing follows the general programming language with internal syntax rules. The user can freely change the devices, the operational symbols, and the conditionals. A more detailed description is provided in Table 3 4 24 below Figure. Description on Syntax Rules, Operational Symbols, and Conditionals

DeviceSyntax: StationNumber, 32 bit, Float, Word Device, Bit Device

Device	Example	Description
Bit		Using general bit
	D.	Using bits as words
	W.D.	Using bits as 32 bit words
	1.	Assigning PLC station code using general bit
	1.D.	Assigning PLC station code using bits as words
	1.W.D.	Assigning PLC station code using bits as 32 bit words
Word		Using general bit
	W.	Using bits as 32 bit words
	.01	Using words as bits
	1.	Assigning PLC station code using general words
	1.W.	Assigning PLC station code using 32 bit words
	1. .01	Assigning PLC station code using words as bits
	F.	Real floating points
Operational Symbol	+ , r, * , / , %, & , | , <<, >>	
Conditional	==, != , < , > , <=, >=, && , ||	

Apply float points as the device for calculating the data if mathematical functions are used.

c. Control statement

Detailed statement control commands are described in the table below.

Figure 3 -4 -24 Descriptions of the Statement Control Commands

Statement Control	Command Function	Example	Action Description
if	Execute if condition holds; Do not execute if condition does not hold;		If HD0=0, HD 1=1
if-else	If condition holds, Excute the true statement; If condition does not hold, Excute the false statement;		If HD0=0, HD 1=1 If HD0 ≠0, HD1=0
while	Execute if condition holds; Stop if condition does not hold;		When HD0=0, HD1=HD1+1 When HD0 ≠0, stop
for	After determining the condition holds, add value accumulatively to the original value.		For HD0<3 ôHD0=HD1 The values of HD0 are 0 W1W2W3 The values of HD1 are 0 W1W2W3
switch	The acquired values, should match the corresponding cases.		If HD0=0, HD 1=1 If HD0=2, HD 1=2

Function

More detailed function commands are described in Table 3.4.25 below.

Figure 3.4.25 Descriptions of the Function Commands

Function	Command Function	Example	Action Description
set(B)	Frequently turning on the bit device		HM0=ON
rst(B)	Frequently closing the bit device		HM0=OFF
alt(B)	Alternating between the ON and OFF of the bit device		HMO alternates continuously.
sub(W/Z)	Calling subroutine		Subroutine calling for ID#3.
fmov(Z,W,Z)	Multicast Values		Transfering numeric value 123 to HD0 and HD1.
bmov(W,W,Z)	Batch transmitting values		Transmitting HD0=123 to HD10 Transmitting HD`=456 to HD11
delay(W/Z)	delay the user setting time		Delay 1000 ms。 (Remark 2)
change(W/Z)	Changing the base screen		Skipping to main screen No.3
Note	1. B：Bit device，W：Word device，N：value of 1 or 2，Z：positive integer 2. After Delay command is executed, HMI will stop the operation. The operation will resume after the delay time has elapsed.		

Figure 3 ‑4 ‑25 Descriptions of the Function Commands

Function	Command Function	Example	Action Description
oWindow(N,W/Z)	Opening overlap window N of code Z screen		Opening overlap screen 1 of code 3 screen
cWindow(N,W/Z)	Closing overlap screen N of code Z screen		Closing overlap screen 2 of code 4 screen
oImpose(N,W/Z)	Opening superimpose screen N of code Z screen		Opening superimpose screen 1 of code 3 screen
cImpose(N,W/Z)	Closing superimpose screen N of code Z screen		Closing superimpose screen 2 of code 4 screen
Note	B: Bit Device;Q: Word Device;N: numericalof 1 or 2 (1 2 ‘ § v); Z: Positiveintegral		

e. Arithmetic Function

More detailed function commands are described in the table below.

Figure. Description on Arithmetic Function Commands

Arithmetic Function	Command Function	Example
sin(W/R)	Get positive sine of x	
cos(W)	Get positive cosine of x	
tan(W)	Get positive tangent of x	
asin(W/R)	Get asin(X)	
acos(W)	Get acos(X)	
atan(W)	Get atan(X)	
Note	W: Word Device	

Figure. Description on Arithmetic Function Commands

Arithmetic Function	Command Function	Example	Action Description
ln(W/X)	Get ln(X)		HD1=ln5
log(W/X)	Get log(X)		HD1= $\log_{10}5$
exp(W/X)	Exp(X)		HD1=e^5
ldexp(W/X,W/Y)	Get X * 2^Y		HD2=5*2^{10}
pow(W/X,W/Y)	Get X^Y		HD2=5^{10}
sqrt(W/X)	Get the square root of X		HD1=$\sqrt{5}$
abs(W/X)	Get the absolute value of x		HD1=|-5|=5
Note	W: Word Device;X and Y: Integrals		

In the case when math functions from the macro editor are used to calculate $\sqrt{3^2}$ =3, for which the actual answer from the calculation is 3, but device setup will affect the displayed data. In this case, one should use the real float point device to run the math function computation. The highest accuracy of float point device is five digits after the decimal point. See the table below for more details.

Figure. Description on Device Setup

State	Device1	Device2	Result
1	HD0	HD2	0
2	HD0	F.HD2	0
3	F.HD0	HD2	3
4	F.HD0	F.HD2	3

The PLC brands supported by Macro commands fmova and bmov are listed in the following table.

Figure. PLC Series Supporting Brands

Macro Command	Full Support	Partial Support	No Support
fmov bmov	Mitsubishi	Delta DVP FATEK FB OMRON Panasonic VIGOR V	SIEMENS

Appendix A General Practice

Interlock Keys

Open Editor 2.0 Software and set up the following components in the editing screen in order to have a key interlock function. Read the following Table for more details.

1

3

2

Code	Device	Description
1	HM3	Indicator Light
2	HM1	Alternating Key
3	HM2	

Figure. Component Device Description

Choose from of the toolbar to open the *Macro Library* dialog box. Click Create to open the *Macro Editor* dialog box for editing. Please use the following figure as a reference for macro writing.

Figure. Macro Editor

When HM1 and HM2 keys are both activated, the indicator light of HM3 will be turned on. Otherwise, the indicator light of HM3 will go off. The procedure flow chart is presented in the figure below.

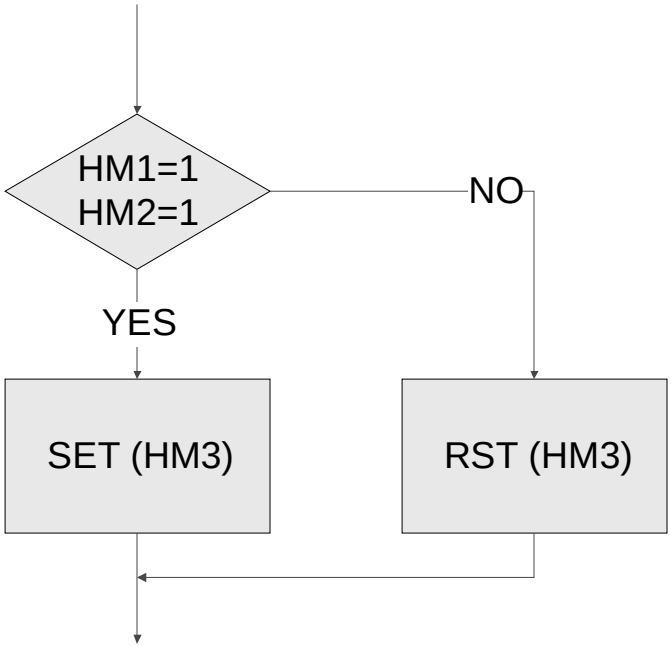

Figure. The Procedure Flow Chart

Criteria Selection for Export

Open EU Editor 2.0 Software and create the following components to obtain criteria selection export functions. Read the following Table for more details.

1

2 6

3 7

4

5

Code	Device	Description
1	HD0	Data Input
2	HD1	Data Output
3	HD2	
4	HD5	
5	HD6	
6	HD10	
7	HD11	

Figure. Component Device Description

Choose from of the toolbar to open the *Macro Library* dialog box. Click Create to open the *Macro Editor* dialog box for editing. Please use the following figure as a reference for macro writing.

Figure. Macro Editor

When the input value of HD0 is 1, macro function would transfer the data in the devices of HD1 and HD2 to HD10 and HD11. When the input value of HD0 is 2, the data in HD5 and HD6 will be transferred to HD10 and HD11. The procedure flow chart is presented as follows.

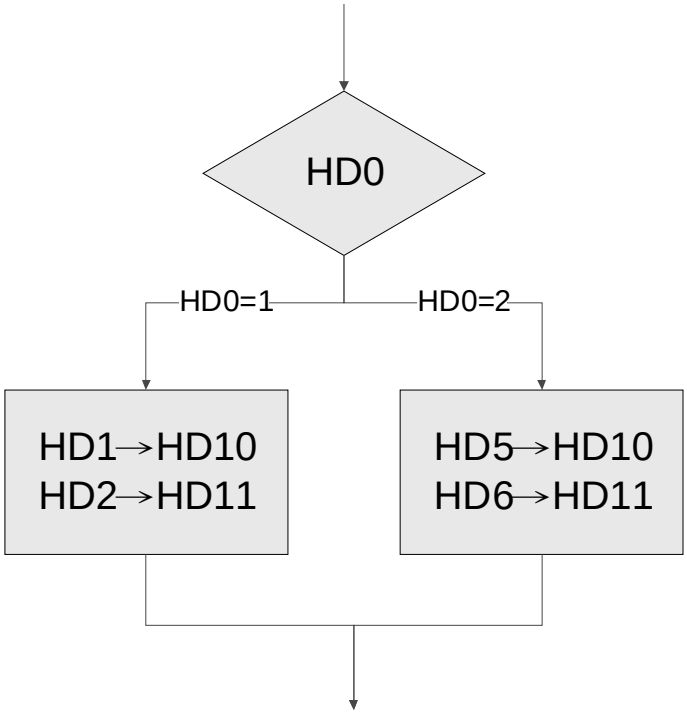

Figure. The Procedure Flow Chart

CallSubfunction

Open EU Editor 2.0 Software and set up the following components in the editing screen to have a subroutine calling function. Read the following table for more details.

1

2

4

3

Code	Device	Description
1	HM1	Front Message Tickers
2	HM0	Alternating Key
3	HD0	Data Display
4	HM2	Indicator Light

Figure. Component Device Description

up 2 macro data in the macro library; one for the main program while the other for the subroutine. See the figure below.

Figure. Macro library

Choose from of the toolbar to open the *Macro Library* dialog box. Click Create to open the *Macro Editor* dialog box for editing. Please use the following figure as a reference for macro writing.

Figure. Main Program

A new set of subroutines is required for run the corresponding action. Select from the Macro Editor to change the macro program to a subroutine. The macro writing is presented below.

Figure. Subroutine

When pressing the HM0 key, the main program would call for the subroutine. Use command to call for and to run the subroutine. After run the subroutine, 123 will be written in HD0 device. Also, the front message ticker HM1 and indicator light HM2 will be turned on. The procedure flow chart is presented below.

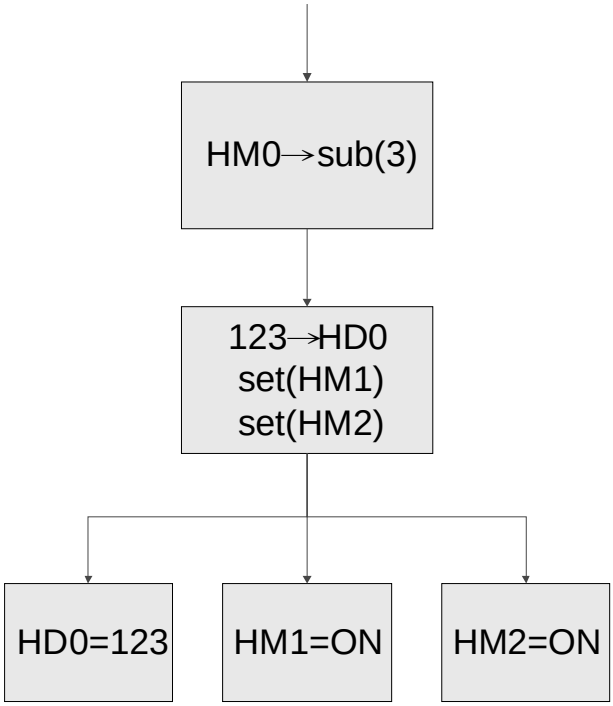

Figure. The Procedure Flow Chart